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VOL. 126

"EVERY MAN IS A VALUABLE MEMBER OF SOCIETY WHO, BY HIS OBSERVATIONS, RESEARCHES, AND EXPERIMENTS, PROCURES KNOWLEDGE FOR MEN"—JAMES SMITHSON

(PUBLICATION 4263)

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LEONARD CARMICHAEL,
Secretary, Smithsonian Institution.

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VOLUME 126, NUMBER 1

Mary Vaux Walcott Fund for Publications in Botany

THE BROMELIACEAE OF BRAZIL

By
LYMAN B. SMITH
Department of Botany, U. S. National Museum

With 128 illustrations by
ROBERT J. DOWNS
U. S. Department of Agriculture

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PREFACE

This paper, by Dr. Lyman B. Smith, associate curator of the Department of Botany, U. S. National Museum, is based on 25 years of study in the United States, Europe, and Brazil. Much of the paper has been derived from an unpublished manuscript prepared for the "Flora Brasilica" of the Instituto de Botânica of São Paulo. However, in order to make a more compact work appropriate for the field as well as the herbarium, bibliography has been limited to that strictly essential in Brazil and descriptions have been eliminated in favor of ampler keys.

Illustrations are provided in a proportion slightly better than one to every five species but are irregularly apportioned in order to support the key to the best effect and to cover all the 39 new species proposed.

Jason R. Swallen
Head Curator, Department of Botany
U. S. National Museum

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INTRODUCTION

The present paper is written to organize the mass of recent species of Brazilian Bromeliaceae in relation to past works to form a new basis for other branches of biological study. In doing this it takes into account the interest in the discovery and propagation of bromeliads for economic and horticultural purposes and at the same time the necessity for their destruction in limited areas to effect the control of malaria. I am indebted to a great number of people and institutions for help in the first instance and to the Serviço Nacional de Malária of Brazil and to the Rockefeller Foundation for an understanding of the public health situation.

The Bromeliaceae of Brazil have been covered exhaustively three different times in the last 60 years by their great monographer, Carl Mez.[1] His most recent treatment in 1934 and 1935 in the Pflanzenreich indicated nearly 500 species as native to Brazil, yet since then 135 additional species have been discovered and still continue to appear so rapidly that 39 of them could not be published before the present paper.

This proportionately great increase in our knowledge of the group is due to two sources unavailable to Mez—intensive collections since his monograph, and large collections in the herbaria of the United States and Brazil which, for some reason, he failed to see although they mainly predated his work. Since 1935 the collecting of bromeliads by systematic botanists has continued at much the same pace as before and has resulted in additions to the Brazilian flora, but the great increase in information has come from the horticultural side through the intensive collections of Mulford and Racine Foster and

[1] *In* Martius, Flora Brasiliensis 3, pt. 3: 173–634. 1891–1894. *In* De Candolle, Monographiae Phanerogamarum 9: 1–990. 1896. *In* Engler, Das Pflanzenreich IV. 32: 1–667. 1934–1935.

in public health through the researches of Father Raulino Reitz and Dr. Henrique Pimenta Veloso.

The Fosters have traveled widely in search of striking bromeliads but have made their greatest efforts in the rain forest area of extreme eastern Brazil, the home of the great majority of the ornamental species. I gratefully acknowledge that they have not forgotten to collect the lowly "botanicals" or nonglamorous types at the same time. Also they have the rewarding system of collecting sterile plants, which on blooming years later often prove to be species of exceptional interest. While the general collector frequently neglects or ignores bromeliads because of the great difficulty of collecting and preserving them, the Fosters have concentrated on them to the practical exclusion of all other families. As a result more than half of the new species described since 1935 have been based upon their collections.

Reitz and Veloso have concentrated their efforts on the bromeliads of Santa Catarina in connection with the campaign undertaken in recent years by the Serviço Nacional de Malária. Although Reitz has discovered a number of new species, he has made a much more important contribution to our knowledge of the variation and distribution of species already known. In fact, he has changed the status of the bromeliad flora there from the least known in the eastern rain forest to equality with the best. Veloso, using Reitz's taxonomic studies as a base, has given us a detailed picture of the ecology of the Santa Catarina bromeliads (Anais Botânicos do Herbário "Barbosa Rodrigues": 187–270. 1952) which has yet to be approached elsewhere.

Mez saw the Bromeliaceae in practically all the important European herbaria and from near chaos erected a detailed and logical system. However, he noted little from this side of the Atlantic beyond citing my early papers, and, as these dealt chiefly with non-Brazilian bromeliads, he missed not only most of the novelties but also the rich distributional data in United States and Brazilian herbaria.

For the past 25 years, thanks to Dr. F. C. Hoehne, former director of the Instituto de Botânica in São Paulo, I have enjoyed every advantage of its ample herbarium, from a constant supply of specimens to lavish facilities for publishing and illustrating the results of my studies. Nor should I forget the field experience gained at Alto da Serra and Moysés Kuhlmann's original technique for collecting epiphytes.

To Dr. P. Campos Porto, director of the Jardim Botânico do Rio de Janeiro, I am indebted not only for the opportunity to study in the garden and herbarium but also for the hospitality that enabled me

to collect in the two great national parks administered by the Jardim, Itatiaia and Serra dos Orgãos.

Dra. Heloisa Alberto Tôrres, director of the Museu Nacional, not only provided me with every facility in the herbarium but also arranged for a rapid series of field trips in Rio and Minas with the help of the whole department of botany under the leadership of Dr. F. Segadas Vianna. Here I should explain that owing to the number of people on these trips I was obliged to abbreviate the citation of collections to "Smith & Mus R," indicating that the number was mine but the expedition a joint enterprise.

Dr. Alexandre Curt Brade, both when at the Museu and later at the Jardim, has helped me exceedingly with specimens and with his detailed knowledge of botanical history and geography.

I have studied with Father Raulino Reitz in his Herbário "Barbosa Rodrigues" while enjoying the hospitality of the Seminário at Azambuja, Brusque, and have collected widely with him in eastern Santa Catarina.

As my citations will indicate, I have received help by brief meetings and by correspondence with a number of other Brazilian botanists. Among these are Dr. Felisberto Camargo, former director of the Instituto Agronómico do Norte and authority on the pineapple; Dr. J. Murça Pires, head of the department of botany of the same; Dr. A. Ducke, famous explorer of the Amazon; Father Bento Pickel, formerly of the Instituto das Pesquizas Agronómicas, Pernambuco, and his successor, Dr. Dardano A. Lima; Dr. João José Seabra of the Faculdade de Filosofia da Bahia; Dr. Amaro Macedo of Ituiutaba, Minas Gerais; Dr. Carlos Stellfeld, Director of the Museu Paranaense; Dr. Guenter Tessmann and Dr. Gert Hatschbach of Curitiba, Paraná; the late Father Eugenio Leite; and Father B. Rambo, director of the Herbário Anchieta and authority on the flora of Rio Grande do Sul. Finally, there remain a host of Brazilians too numerous to mention whose help in the herbarium and in the field is warmly remembered.

MATERIAL

I am indebted to those in charge of the following herbaria for the opportunity to study their material (abbreviations wherever possible follow Lanjouw & Stafleu, Index Herbariorum, part 1):[2]

Museo Argentino de Ciencias Naturales Bernardino Rivadavia, Buenos Aires (BA).

Bailey Hortorium, Ithaca, New York (BH).

[2] Regnum Vegetabile 2: 1–167. 1952.

British Museum of Natural History (BM).
Jardin Botanique de l'État, Brussels (BR).
Jenman Herbarium, Department of Agriculture, British Guiana (BRG).
University of Cambridge, Great Britain (CGE).
Chicago Natural History Museum, formerly the Field Museum (F).
Faculdade de Filosofia da Bahia (FF Bahia).
Conservatoire et Jardin Botanique, Geneva (G).
Gray Herbarium of Harvard University (GH).
Herbário "Barbosa Rodrigues," Itajaí, Santa Catarina (HBR).
Instituto Agronómico do Estado de São Paulo, Campinas (IAC).
Instituto Agronómico do Norte, Belém, Pará (IAN).
Instituto Biologico de Pesquisas Técnicas, Curitiba, Paraná (Inst. Biol. Pesq. Tec.).
Instituto de Pesquisas Agronómicas, Recife, Pernambuco (IPA).
Jardim Botânico de Belo Horizonte, Minas Gerais. Material studied now transferred to the Museu Nacional, Rio de Janeiro.
Royal Botanic Gardens, Kew (K).
Institut et Jardin Botanique, Liége, Belgium (LG).
Instituto Miguel Lillo, Tucumán, Argentina (LIL).
Linnean Society of London (LINN).
Botanisches Museum, Munich (M).
Museu Goeldi, Belém, Pará (MG).
University of Michigan (MICH).
Missouri Botanical Garden (MO).
Institut Botanique, Montreal (MT).
New York Botanical Garden (NY).
Muséum National d'Histoire Naturelle, Paris (P).
G. F. J. Pabst, private herbarium, Santa Catarina (Pabst).
Museu Paranaense, Curitiba (Paran.).
Museu Nacional, Rio de Janeiro (R).
Jardim Botânico do Rio de Janeiro (RB).
Riksmuseet, Stockholm (S).
Instituto de Botânica, São Paulo (SP).
University of California (UC).
United States National Museum (US).
United States National Arboretum. Material studied now transferred to the United States National Museum.
Botanischer Garten und Botanisches Institut der Universität, Vienna (WU).

The following are cited on the basis of duplicates, descriptions, and photographs:

Herbário Anchieta, Pôrto Alegre, Rio Grande do Sul (Anchieta).
Botanisches Museum, Berlin (B). Bromeliaceae mostly lost.
Botanical Museum and Herbarium, Copenhagen (C).
Komarov Botanical Institute of the Academy of Sciences of U. S. S. R., Leningrad (LE).
Botanisches Institut der Universität, Leipzig (LZ). Bromeliaceae all lost.
Naturhistorisches Museum, Vienna (W). Bromeliaceae all lost.

Whenever it seems significant, I have cited personally unverified collections and followed them with the name of the person responsible for the record. Thus there are a number of collections in European herbaria that are cited on the authority of Mez in order to give the full distributional data for the species. One instance in particular

needs comment, Mez's list of Bromeliaceae in Luetzelburg, Estudo Botanico do Nordeste 3: 104. 1923. This greatly increases our knowledge of the distribution of species in arid northeastern Brazil, yet curiously enough Mez seems to have forgotten it in his final monograph in the Pflanzenreich. My other large source of data is Reitz, who has kept me constantly informed as he adds to the flora of Santa Catarina.

In a few instances pictures, not specimens, must be cited as types of species. This is particularly the case in Baker's species described from the unpublished Icones of E. Morren. These are at Kew and in some cases can be identified with specimens at Liége, but Baker saw only the pictures.

Since duplicate collections of Bromeliaceae are relatively rare and since the important herbaria as regards the family have been covered, there seems little point in listing exsiccatae. Instead, the numbers of photographic negatives on file in the Chicago Natural History Museum, the Gray Herbarium, and the United States National Museum are noted whenever they are likely to be helpful in establishing the identity of a species.

GEOGRAPHICAL CITATIONS

The citation of localities in Brazil is extremely difficult for a number of reasons. First of all, many of the early collectors did not bother to record localities or their data were lost, with the result that "Brazil" is all we have left. Next, some of the older settlements have ceased to exist and frequently places have changed their names. Who now recognizes São Sebastianópolis as Rio de Janeiro or Desterro as Florianópolis? If it were not for Urban's great study of collectors in the introductory volume of "Flora Brasiliensis," the case would be hopeless.

More recently there is the difficulty of changes in spelling and place names by government action. Xapecó becomes Chapecó, retaining the pronunciation but bewildering the reader. In its "Index to Map of Hispanic America 1: 1,000,000" (p. 402), the American Geographical Society explains the latest Brazilian orthography and its listings cover the majority of localities involved in this paper.

However, since the publication of this index in 1945, there has been a new reform to eliminate duplication of names, not just within a state but for the whole country. Thus, where Bom Jesús could occur as the name for a dozen localities in one state, there must now be but one place with that name in all Brazil. This has been accom-

plished by giving the unadorned name to the locality with the best title to it, and modifying the name or completely changing it for the others. The words "do Norte" are added to the northernmost locality of that name and so on for the points of the compass, others are compounded with the name of the river or mountains which they adjoin. On the other hand, one state capital goes from Paraíba to João Pessoa without a backward glance. Ultimately this latest reform should clarify Brazilian geography greatly, but at the moment it is an additional confusion to one dealing for the most part with the older names for localities.

The recent practice of dividing the states into municípios helps with the identification of many localities, and the Tábuas Itinerárias Brasileiras (Serviço Gráfico do Instituto Brasileiro de Geografia e Estatística–1950) is a very useful index to the municípios. I have also been fortunate in obtaining the latest maps for a few states, notably Paraná and Santa Catarina.

When all other resources have been used, I have appealed to the collectors and they have helped me with their own localities and often with those of past botanists. Dr. E. Asplund of the Riksmuseet, Stockholm, has been most helpful in finding the localities of Swedish botanists in Brazil. In order to save anyone the work of identifying these localities again, on page 259 I have listed those which are not explained in the "Index to Map of Hispanic America 1 : 1,000,000."

In citing localities in the text, the sequence is from the vague to the definite. First come the collections of which we know only that their origin was Brazilian, next come those that are located only as to state, followed by those with named localities within the state, and, finally, by those that are further defined by a município. Locality names which are defined only as far as the state are cited in the text in parentheses, indicating that it has not been possible to plot them on the map.

DISTRIBUTION AND ORIGIN

The map on page 7 (from Goode's series) shows the approximate position of all bromeliad localities in Brazil that it has been possible to identify. The observation that range maps represent where collectors have been rather than where plants are, is peculiarly apt in this case because of the difficulty of collecting and preserving bromeliads. Undoubtedly this situation accounts for the marked breaks in representation in eastern Brazil around the Baía–Espírito Santo boundary and around that between São Paulo and Paraná.

Yet the even more obvious contrast shown between eastern Brazil and the remainder of the country is actually much greater than it is possible to indicate. In preparing the map, it was frequently the case

Distribution of Bromeliaceae in Brazil

that in the east each spot represented several localities too near to each other to be distinguished, while each locality generally included a number of species. Elsewhere the spots usually represent a single locality and very often a single species.

From the map, representation in much of Minas Gerais compares with that about Rio de Janeiro, but the single spot which covers the

Distrito Federal represents dozens of localities, nearly a hundred species, and great quantities of individuals, while one spot in Minas indicates a single locality as a rule and that with few species and individuals.

Great general collectors who have operated in the east and also in the interior give further evidence along this line, as shown by a comparison of A. Glaziou's collections in the state of Rio de Janeiro and in Goiás, or those of F. C. Hoehne in São Paulo and Mato Grosso. In each case the collections in the east are more numerous, as might be expected from the greater amount of time spent there, but they are also significantly richer in species both totally and in relation to the remainder of the flora. Such collectors in the Amazon basin as A. Ducke, R. L. Fróes, B. A. Krukoff, J. G. Kuhlmann, R. E. Schultes, and R. Spruce afford us almost no direct contrast with the bromeliads of the east, but the family is a very insignificant part of their well rounded general collections.

Finally, we have the evidence of collectors who were interested in bromeliads almost exclusively. Dr. J. L. Collins, who traveled extensively investigating the origin of the pineapple, has told me how driving westward in Pernambuco he saw bromeliads in profusion and then abruptly could find none. The following from the unpublished report by K. F. Baker and J. L. Collins of exploration in 1938 and 1939 gives the details:

> On the return trip from Candado we had opportunity to determine more closely the exact point at which the Bromeliaceae stopped in the westward distribution. A short distance east of Salgadinho we suddenly came to the end of the Sertão and passed into the curimataú and with this change immediately passed from a situation of almost no Bromeliads to their supplying one of the dominant elements of the flora.

The Fosters in their journey to Mato Grosso repeatedly found formations that they had learned to associate with bromeliads in the east completely lacking in these plants.

Concerning the origin of the Brazilian bromeliads there seems little reason to alter the general conclusions reached in my "Geographical Evidence on the Lines of Evolution in the Bromeliaceae" (Bot. Jahrb. 66: 446–468. 1934). Using the generally accepted morphological criteria, the Brazilian bromeliads are characterized as derived rather than primitive types. The Bromelioideae, with its consistently inferior ovary and indehiscent fruit, is easily the most advanced of the three subfamilies and has its chief center in eastern Brazil with a number of endemic genera. All this would indicate that the family had arisen in western South America and migrated into Brazil.

It can be argued that structurally *Encholirium* and *Cottendorfia* are as primitive as *Puya,* but they are now widely separated from it geographically and the distribution of the other genera indicates an origin from an ancestral type close to *Puya. Encholirium* and *Cottendorfia* may have entered Brazil on the divide between the Amazon and Paraguay basins, but so long ago that no good evidence remains. The advanced genera, *Dyckia* and *Deuterocohnia,* however, clearly indicate this origin from western Bolivia. The other advanced genera, *Navia* and *Brocchinia,* barely cross the northern boundary of Brazil. *Navia,* at first considered primitive on account of its naked seeds, is now evidently advanced as occasional vestiges of wing prove this condition to be the result of reduction.

The subfamily Tillandsioideae shows evidences of at least three routes of invasion and also a strong reverse movement in the case of *Vriesia,* its largest genus in Brazil. *Tillandsia,* the most primitive genus of the subfamily, shows the height of land as the most probable route for its most primitive subgenus, *Allardtia,* as well as for *Pseudo-Catopsis* and *Phytarrhiza. Anoplophytum* very likely evolved in Brazil and spread westward like the genus *Vriesia.* The subgenus *Diaphoranthema* of *Tillandsia* seems to have invaded from the south, while a few species of the subgenus *Tillandsia* (formerly *Platystachys*) and of the genus *Catopsis* have obviously moved down the coast from the West Indies.

Judged from the extreme concentration of species and genera in eastern Brazil, the subfamily Bromelioideae must have evolved there. Such genera as *Cryptanthus* and *Nidularium* are endemic in the area, and such large and widespread genera as *Aechmea* and *Billbergia* have species ranges that almost seem to explode from that point.

ECONOMIC ASPECTS

The pineapple, *Ananas comosus,* is the one bromeliad of outstanding economic importance. It probably evolved in interior Brazil (see Baker & Collins in American Journal of Botany 26:697), but like so many other economic species it has found its greatest development far from its homeland. In fact the leading center of research on the pineapple is in Hawaii, as might be expected in connection with some three-quarters of the world's export trade in this fruit. In Brazil, although it does not figure as an export, the pineapple is widely grown and appreciated. It also produces a superior fiber but this has not found much use because of the difficulties of preparation.

Research in Brazil has been principally taxonomic as can be seen by the references to F. C. Camargo in the text.

The caroá, *Neoglaziovia variegata,* also produces an excellent fiber which is much used within Brazil. The species is native in the arid northeast where it grows without cultivation on areas too poor for most other commercial crops. For a detailed study see "O Caroá" by Lauro P. Xavier.[3]

Spanish moss, *Tillandsia usneoides,* apparently does not grow so prolifically anywhere in Brazil as it does in the southeastern United States, nor does it appear to have been systematically exploited for filler material for cushions and mattresses as has been done here.

HORTICULTURE

Interest in bromeliads as ornamentals is much more recent than in the pineapple, yet it dates back well over a century. In England the cultivation of the still popular Brazilian *Billbergia pyramidalis* was noted under another name in the Botanical Magazine in 1815 and accompanied by a colored plate. *Billbergia amoena* appeared similarly in Loddiges Botanical Cabinet in 1818 and *B. zebrina* in 1827, and *Aechmea fasciata* in the Botanical Register in 1828. The cultivation of *Bromelia antiacantha* was noted by Bertolini in Italy in 1824. By 1857 many species were in cultivation in Berlin as evidenced by the numerous citations in Beer's "Die Familie der Bromeliaceen," the first comprehensive treatment of the group. Between 1865 and 1885 there was great interest in the family in Belgium centering around Liége where Edouard Morren published many new species with elaborate colored plates in his Belgique Horticole. Also notable for work in horticultural species in the last half of the 19th century were C. Koch in Germany, Regel in Russia, Antoine in Austria, and Lemaire, Linden, and André in France. It is noteworthy that the great majority of ornamental species described in this early period as well as later were of Brazilian origin. The more recent monographers, Baker and Mez, concerned themselves less with horticulture, but fell heirs to the work left unfinished by Morren's untimely death, and published a considerable number of ornamentals nonetheless.

Horticultural activity in bromeliads developed late in the United States, although, according to Mulford Foster (Plant Life 1:71.

[3] Ministério da Agricultura, Departamento Nacional da Produção Vegetal, Divisão de Fomento da Produção Vegetal, Secção de Fomento Agricola, Paraíba.

1945), nurserymen were listing species for sale before the turn of the century. Now cultivation has developed here to the extent of supporting the Bromeliad Society, organized in 1950.

In Brazil, Glaziou was bringing live bromeliads to the imperial gardens in Rio, now the gardens of the Museu Nacional, as early as 1868. Today there are also notable collections at the Jardim Botânico in Rio and at the Instituto de Botânica in São Paulo. Beyond all comparison or possibility of estimate, however, is the private interest in bromeliads. Given a people with a deep appreciation of the colorful, and plants with vivid inflorescences that last for weeks or leaves with highly ornamental markings, the resulting interest is a foregone conclusion. Masses of cut flowers are on sale in the markets and by the roadsides and cultivation is effected simply by removing the plant from one tree and attaching it to another more conveniently situated.

BROMELIAD MALARIA

Under certain exceptional circumstances bromeliads are detrimental to public health because of the malaria-carrying mosquitoes that breed in their tanks. As explained in my article in the Smithsonian Report for 1952, there have been only three instances of serious malaria infestation attributed to bromeliad breeding mosquitoes although the disease is worldwide in tropical and warm temperate regions. The first case was in the coastal rain forest of São Paulo, the second on the British island of Trinidad, and the third and worst in Santa Catarina, again in the coastal rain forest.

The present paper attempts to estimate the possibility of the occurrence of further malaria of this origin by giving a comprehensive view of the distribution of the Bromeliaceae in Brazil. From the map (p. 7) it is immediately evident that the bromeliads are concentrated in the east along the narrow coastal slope just as is the human population. Analysis by genera and species shows that the Bromeliads which store their water in open tanks are still further concentrated in the east, while those storing water in the leaf-tissues predominate in the interior. Thus there is little probability of serious bromeliad malaria on the Planalto or in the Amazon basin. On the other hand, species of bromeliads that are proved hosts of malaria mosquitoes are recorded for practically the entire length of the Brazilian coast. *Gravisia aquilega,* the most important host in Trinidad, is found as far south as Baía, while *Vriesia gigantea* and *Hohenbergia augusta,* the worst offenders in Santa Catarina, extend north to Espírito Santo.

Fortunately much more is involved than the mere presence of the mosquito host, as Veloso has demonstrated in his detailed study noted above. To be effective in the transmission of malaria, the bromeliad species must also occur in great quantity within mosquito range of a large human population. Although there is no survey like that of Veloso to give us an idea of bromeliad concentrations in the other states of Brazil, there is reason to hope that the situation in Santa Catarina is exceptional. Certainly nowhere else have I seen or heard of such dense masses of tank bromeliads as occur there. If there remain no serious foci of bromeliad malaria, as seems to be the case, then public health is concerned only with guarding against their development. The Serviço Nacional de Malária is already doing this in the south, where I have seen their crews protecting a new beach resort by clearing bromeliads from a belt around it. In the north even this seems unnecessary. Probably the only danger there is the remote possibility of artificially stimulating the growth of bromeliads by providing a favorable habitat, as happened in the development of the cacao plantations in Trinidad.

Finally, the needs of public health, though paramount, are not wholly irreconcilable with those of horticulture. Destruction of bromeliads when necessary involves only a narrow belt around a settlement and this is not the only means of control nor even the most feasible one in some instances. The species involved are both common and wide-ranging and their extinction is virtually impossible as long as any forest remains.

PRELIMINARY RECORDS

All necessary preliminary records have been brought together here and placed in alphabetical order so that they can be more easily consulted in monographic studies and so they will not encumber the text when it is used for purposes of identification.

Aechmea bicolor L. B. Smith, sp. nov. FIGURE 100

A *Ae. candida* E. Morren, cui affinis, laminis foliorum valde acutis longioribus angustioribusque subtus omnino cinereo-lepidotis, spinula sepalorum brevi, placentis apicalibus differt.

Stoloniferous; leaves in a slenderly crateriform rosette, 5–6 dm. long, much exceeding the inflorescence, covered beneath with fine appressed cinereous scales, sheaths broadly elliptic, 13 cm. long, blades linear, acute with a thick pungent apical cusp, 25 mm. wide, flat, laxly serrulate with teeth 0.5 mm. long, densely cinereous-lepidote above

becoming more or less glabrous with age; scape slender, erect, white-flocculose when young; scape-bracts lanceolate, acuminate to a thick pungent apex, elsewhere membranaceous, erect, about equaling the internodes, the lowest serrulate; inflorescence simple, laxly cylindric, 5–8 cm. long, white-flocculose; floral bracts broadly ovate, acute, thin, the lowest about equaling the ovary, the others much shorter; flowers polystichous, sessile, divergent; sepals yellow, 4 mm. long exclusive of the slender 1 mm. mucro, connate for nearly half their length, the free lobes broadly ovate and rounded; petals 9 mm. long, white, bearing two lacerate scales above the base, blades elliptic, obtuse, stamens included; ovary broadly obconic, 5–6 mm. long; epigynous tube shallowly crateriform, placentae apical, ovules apiculate.

Type in the U. S. National Herbarium, No. 1952441, collected on trees in dense forest, between Ituaçú and Jequié, State of Baía, Brazil, altitude 480 meters, Oct. 18, 1948, by M. B. Foster (No. 2450).

Aechmea blanchetiana (Baker) L. B. Smith, comb. nov.

Tillandsia blanchetiana Baker, Handb. Bromel. 182. 1889.

Aechmea cariocae L. B. Smith, nom. nov.

Chevalieria comata Mez in DC. Monogr. Phan. 9: 153. 1896. In part: as to description but not as to basonym.

Aechmea castanea L. B. Smith, sp. nov. FIGURE 111

A *Ae. cariocae* L. B. Smith, cui affinis, bracteis florigeris brunneo-lepidotis, sepalis glabris minutissime armatis differt.

Leaves many in a spreading rosette, 1.7 m. long, covered on both sides with a membrane of coalesced scales, thick, coriaceous, sheaths castaneous-lepidote, blades linear, acute with a stout brown apical cusp, 7 cm. wide, buff-lepidote, subdensely serrate with ascending brown teeth 2 mm. long; scape over 35 cm. long, 2 cm. in diameter, brown-flocculose; scape-bracts erect, very densely imbricate, their sheaths elliptic, 8 cm. long, dark castaneous, covered with brown appressed scales but becoming glabrous, their blades ligulate, acute, to 10 cm. long, entire, subcoriaceous; inflorescence simple, densely strobilate with about 15 rows of flowers, slenderly conical, 29 cm. long, 10 cm. in diameter; floral bracts cymbiform, enfolding the base of the flower, thick, woody, the truncate rugose apex densely brown-lepidote, the terminal mucro not more than 3 mm. long; flowers spreading; sepals free, strongly asymmetric with a broad wing, 16 mm. long, coriaceous, thick, glabrous, the delicate mucro less than

0.5 mm. long; petals fleshy, imperfectly known; epigynous tube conspicuous, broad-based.

Type in the Gray Herbarium, collected at Santa Teresa, State of Espírito Santo, Brazil, Aug. 5, 1940, by M. B. & R. Foster (No. 831).

Aechmea chlorophylla L. B. Smith, sp. nov. FIGURE 107

A *Ae. bromeliifolia* (Rudge) Baker, cui affinis, bracteis florigeris sepalisque nullo modo retusis, petalis basi appendiculatis differt.

Leaves 5 dm. long, green, wholly covered with coarse pale appressed scales, sheaths broadly elliptic, 12 cm. long, blades ligulate, acute, 3 cm. wide, laxly serrate with spreading teeth 3 mm. long; scape 4 dm. long, 4 mm. in diameter, densely white-flocculose; scape-bracts thin, roseate, white-lepidote, the lower ones elliptic, about equaling the internodes, serrate near their apices, the upper ones lanceolate, much exceeding the internodes and massed below the inflorescence, entire; inflorescence simple, densely strobilate, ellipsoid, 7–9 cm. long, 35–40 mm. in diameter, covered with white appressed scales; floral bracts suberect, broadly cymbiform, broadly acute or obtuse and apiculate, thick-coriaceous and bicarinate or tricarinate but near the apex rather thin and distinctly nerved, about equaling the ovary; sepals strongly asymmetric, 12 mm. long, connate for 2 mm., unarmed; petals erect, 20 mm. long, bearing 2 lacerate scales at base, fleshy, quickly turning black; epigynous tube broad, conspicuous, placentae apical, ovules long-caudate.

Type in the Gray Herbarium, collected at Santa Teresa, State of Espírito Santo, Brazil, Aug. 6, 1940 (bloomed in cultivation, June 1942), by M. B. & R. Foster (No. 830).

ADDITIONAL SPECIMEN EXAMINED:

ESPÍRITO SANTO: Near Santa Teresa, 1939, *M. B. & R. Foster* 176-b (GH).

Aechmea comata (Gaud.) Baker var. **makoyana** (Mez) L. B. Smith, comb. nov.

Aechmea lindenii var. *makoyana* Mez, Engl. Pflanzenreich IV. 32: 159. 1934.

Aechmea leucolepis L. B. Smith, sp. nov. FIGURE 110

A *Ae. sphaerocephala* (Gaud.) Baker, cui affinis, bracteis superioribus scapi integris, inflorescentia lepidibus albidis adpressis obtecta differt.

Forming dense clusters; flowering shoot to 4 m. high (! Foster); leaves to 4 m. long (! Foster), the single leaf of the type 1.1 m. long, wholly covered with pale appressed scales, the sheath elliptic, 3 dm.

long, dark castaneous, the blade ligulate-attenuate with a stout terminal cusp, 11 cm. broad, very laxly serrate with dark uncinate teeth 5 mm. long; scape stout, only the upper 15 cm. known, glabrous, dark castaneous; upper scape-bracts subfoliaceous, entire, large, erect, densely imbricate; inflorescence simple, densely strobilate, ellipsoid, 14 cm. long, 9 cm. in diameter including the sepals, covered with appressed white scales; floral bracts cymbiform, enfolding the ovary and the bases of the sepals, very thick and woody, broadly truncate with a slender terminal mucro 3 mm. long; sepals 27 mm. long including the slender 3 mm. long mucro, connate for 3 mm., the free lobes ovate, asymmetric, dark castaneous, coriaceous; petals and stamens included, imperfectly known; epigynous tube infundibuliform, 5 mm. long, seeds apparently abortive.

Type in the U. S. National Herbarium, Nos. 1952447 and 1952448, collected between Milagres and Maracás, State of Baía, Brazil, altitude 450 meters, Oct. 18, 1948, by M. B. Foster (No. 2452).

Aechmea lingulata var. **froesii** L. B. Smith, var. nov.

A var. *lingulata* ramis rectis plus minusve recurvatis, bracteis florigeris breviter mucronulatis, sepalis majoribus differt.

Type in the herbarium of the New York Botanical Garden, collected between Colonia Itatinga and Bom Gosto, State of Baía, Brazil, November 1942, by Ricardo de Lemos Fróes (No. 19970).

Aechmea lingulata var. **patentissima** (Mart. ex Schult.) L. B. Smith, comb. nov.

Billbergia patentissima Mart. ex Schult. in R. & S. Syst. 7: pt. 2: 1270. 1830.

Aechmea maculata L. B. Smith, sp. nov. FIGURE 107

A *Ae. bromeliifolia* (Rudge) Baker, cui valde affinis, vaginis foliorum et scapi bracteis purpureo-maculatis, bracteis florigeris apiculatis differt.

Caudex 6–9 dm. long (! Foster); flowering shoot 45 cm. high; leaves rosulate, 27 cm. long, the sheath broadly elliptic, 13 cm. long, covered with white appressed scales, densely and coarsely purple-spotted above, serrate toward apex, the blade ligulate, acute with the extreme apex reflexed, 4 cm. wide, flat, white-lepidote beneath, soon glabrous above, laxly serrate with brown spreading teeth 2 mm. long, concolorous; scape erect, 7 mm. in diameter sparsely white-flocculose; scape-bracts elliptic, thin, roseate, the lower ones erect, about equaling the internodes, white-lepidote, serrulate at apex, the upper ones

divergent, imbricate and massed below the inflorescence, involute, glabrous; inflorescence simple, strobilate, cylindric, 4 cm. long, 2 cm. in diameter, white-flocculose; floral bracts suborbicular, retuse and then apiculate, 10 mm. long, thick and bicarinate with thin apex and margins, dark brown; sepals 8 mm. long, connate for 3.5 mm., the free lobes asymmetric, subquadrate, ecarinate, unarmed; petals 17 mm. long, bearing fimbriate scales near the middle of the claw, blades elliptic; stamens included; epigynous tube 1 mm. long, placentae apical; ovules caudate.

Type in the Gray Herbarium, collected on the Pico de Piedade near Belo Horizonte, State of Minas Gerais, altitude 1,300 meters, July 10, 1940, by M. B. & R. Foster (No. 561).

Aechmea mitis (Mart. ex Schult.) L. B. Smith, comb. nov.

Billbergia mitis Mart. ex Schult. in R. & S. Syst. 7, pt. 2: 1267. 1830.

Aechmea mutica L. B. Smith, sp. nov. FIGURE 96

A *Ae. macrochlamyde* L. B. Smith, cui habitu persimilis, inflorescentia bipinnata, sepalis subduplo minoribus inermibus differt.

Flowering plant 60–65 cm. high; leaves 5–6 dm. long, sheaths elliptic, 16–19 cm. long, much wider than the blades, subdensely and minutely brown-lepidote, blades linear, rounded to a stout pungent terminal cusp, not at all narrowed at base, 3 cm. wide, sparsely and very inconspicuously pale-lepidote, laxly serrate with spreading brown teeth 2 mm. long; scape slightly curved, 5 mm. in diameter, white-lanate, becoming glabrous; scape-bracts lance-oblong, acute, pungent, subcoriaceous, sparsely pale-lepidote, the lower exceeding the internodes, serrulate near their apices, pale green, the upper densely imbricate and massed beneath the inflorescence, roseate; inflorescence densely bipinnate, cylindric, 14–17 cm. long, 6 cm. in diameter, white-lanate especially on the axis; primary bracts spreading, thin, roseate, the lower ones linear and exceeding the spikes, the upper triangular and much shorter; spikes sessile, cylindric, densely 3–4-flowered; rhachis not excavated; floral bracts broadly ovate, acuminate, 20 mm. long including the slender terminal mucro, exceeding and concealing the sepals, thin, prominently nerved, roseate; flowers apparently distichous, sessile, erect; sepals free, asymmetric, elliptic, obtuse, 9 mm. long, unarmed; petals 17 mm. long, blue, bearing 2 bidentate scales at base; epigynous tube 2 mm. long, placentae apical, ovules apiculate.

Type in the Gray Herbarium, collected at Santa Teresa, State of Espírito Santo, Brazil, altitude 765 meters, July 27, 1939, by M. B. & R. Foster (No. 293). Duplicate in the Museu Nacional, Rio de Janeiro.

ADDITIONAL SPECIMEN EXAMINED:

ESPÍRITO SANTO: Santa Teresa, Aug. 5, 1940, *M. B. & R. Foster* 806 (GH).

Aechmea nervata L. B. Smith, sp. nov. FIGURE 105

A *Ae. lamarchei* Mez, cui verisimiliter affinis, bracteis florigeris tenuibus valde nervatis, sepalis breviter connatis differt.

Flowering plant 6 dm. high; leaves unknown; scape straight, 6 mm. in diameter; scape-bracts erect, densely imbricate, broadly elliptic with a pungent brown terminal cusp, covered with fine white appressed scales, the lowest ones serrulate near the apex, the central ones over 10 cm. long, the higher ones entire; inflorescence simple, strobilate, cylindric, acute, 9 cm. long, 25 mm. in diameter, white-flocculose, becoming glabrous; floral bracts erect, densely imbricate, very broadly ovate with a long soft acuminate apex, 16 mm. long, about equaling the sepals, nearly flat, thin, strongly nerved; sepals 8 mm. long, connate for 2 mm., the free lobes asymmetric, subelliptic with an acute but soft apex; petals imperfectly known, bearing 2 subentire scales near the base; epigynous tube 1.5 mm. long, placentae apical, ovules apiculate.

Type in the Gray Herbarium, collected on the litoral at Vitória, State of Espírito Santo, Brazil, July 1939, by M. B. & R. Foster (No. 176-A).

Aechmea nudicaulis (L.) Griseb. var. **aureo-rosea** (Antoine) L. B. Smith, comb. nov.

Hoplophytum aureo-roseum Antoine, Wien Ill. Gartenzeit. 6: 97, *pl. 1.* 1881.

Aechmea ornata var. **hoehneana** L. B. Smith, var. nov. FIGURE 104

Differt inflorescentia graciliore, floribus gracilioribus, petalis azureis.

Differs from the typical variety in its more slender inflorescence and flowers and blue petals.

Type in the Gray Herbarium, collected at Paiól do Meio, State of São Paulo, Brazil, Sept. 19, 1940, by Augusto Gehrt. Duplicate in the Instituto de Botânica, São Paulo (No. 43156).

ADDITIONAL SPECIMENS EXAMINED:

SÃO PAULO: São Bernardo, Aug. 15, 1895, *G. Edwall* (SP).

PARANÁ: In swamp near sea level, Caiobá, Sept. 1, 1939, *M. B. & R. Foster* 452 (GH).

Aechmea podantha L. B. Smith, sp. nov. FIGURE 95

A *Ae. fulgente* Brongn., cui affinis, floribus pedicellatis, ovario verrucoso differt.

Climbing (! Foster); flowering shoot 45 cm. long; leaves to 42 cm. long, the sheaths elliptic to suborbicular, 12 cm. long, subdensely and minutely brown-lepidote, the blades ligulate, subacute and apiculate, slightly narrowed toward the base, 3 cm. wide, subdensely serrulate with antrorse teeth 1 mm. long, sparsely and obscurely pale-lepidote, lustrous; scape curved, 3 mm. in diameter, glabrous; scape-bracts erect, densely imbricate, elliptic, acute, red, membranaceous, obscurely lepidote, the lower ones serrulate; inflorescence laxly bipinnate, pyramidal, 12 cm. long, 7 cm. in diameter, glabrous; primary bracts triangular, the largest only 5 mm. long; branches spreading and lax with a few distichous flowers; rhachis slender, geniculate; floral bracts minute, suborbicular; flowers suberect, on pedicels 1 mm. long; sepals 4 mm. long, connate for 1.5 mm., verrucose, the free lobes strongly asymmetric, retuse; petals imperfectly known, their blades 4 mm. long; ovary globose, red, verrucose, epigynous tube very short, placentae apical, ovules caudate.

Type in the Gray Herbarium, collected at Santa Teresa, State of Espírito Santo, Brazil, Aug. 7, 1940, by M. B. & R. Foster (No. 842).

Aechmea ramosa Mart. var. **festiva** L. B. Smith, var. nov.

Differt sepalis rubris, ovariis albis.

Differs from the typical variety by its red sepals and white ovaries.

Type in the Gray Herbarium, collected at Linhares, Municipio Collatina, State of Espírito Santo, Brazil, altitude 20 to 40 meters, Aug. 2, 1940, by M. B. & R. Foster (No. 770).

Aechmea stelligera L. B. Smith, sp. nov. FIGURE 98

A *Ae. tomentosa* Mez, cui affinis, inflorescentia laxa, bracteis primariis angustis, axibus gracilibus differt.

Epiphytic, plant incompletely known but undoubtedly over a meter high; leaves unknown; scape straight, slender; scape-bracts erect, densely imbricate, lanceolate, acute, entire, over 2 dm. long, chartaceous, rose (! Vasconcellos), brown-lepidote; inflorescence laxly subpyramidal, tripinnate, 4 dm. long, covered with fine brown stellate trichomes; primary bracts linear-lanceolate, the upper ones shorter than their axillary branches; spikes laxly 7–8-flowered; rhachis geniculate, slender; floral bracts acicular from a broadly triangular base, 2 mm. long; flowers more than 2-ranked, sessile, suberect; sepals

12 mm. long, connate for 1 mm., subelliptic, strongly asymmetric, the terminal mucro 1 mm. long; petals about 2 cm. long, each bearing 2 oblong obtuse entire scales near the base; ovary subcylindric, becoming ellipsoid, epigynous tube infundibuliform; placentae extending almost the whole length of the cell, ovules caudate.

Type in the U. S. National Herbarium, No. 2059452, collected in Areia, State of Paraíba, Brazil, Sept. 15, 1944, by Jaime M. Vasconcellos. Duplicate in the Instituto de Botânica, São Paulo (No. 52358).

The collector records the flower as yellow, but it is not clear whether he means to include the petals or not. In the dried material they appear much darker than the sepals.

Aechmea triangularis L. B. Smith, sp. nov. FIGURE 106

A *Ae. bromeliifolia* (Rudge) Baker, cui affinis, laminis foliorum caudato-acuminatis, bracteis florigeris nullo modo retusis, petalis purpureis differt.

Flowering plant to 37 cm. high; leaves to 5 dm. long, covered with a membrane of pale appressed scales, the sheaths elliptic, 18 cm. long, 9 cm. wide, near the apex densely serrate with dark spreading spines 5 mm. long, green with small red spots, elsewhere entire and dark brown, the blades narrowly triangular, caudate-acuminate, 4 cm. wide at base, laxly serrate with spreading or antrorse teeth; scape erect, 3 mm. in diameter, white-flocculose; scape-bracts broadly elliptic, thin, rose-lake (! Foster), inconspicuously lepidote with white appressed scales, the lower ones much shorter than the internodes, caudate, serrate near the apex, the upper ones much longer than the internodes, divergent, serrate throughout; inflorescence simple, strobilate, cylindric, 6 cm. long, 2 cm. in diameter exclusive of the petals, densely lepidote with white subappressed scales; floral bracts orbicular, apiculate, 8 mm. long, exceeding the ovary, coriaceous, bicarinate; sepals 6 mm. long, connate for 2 mm., the free lobes asymmetric, subquadrate, retuse, unarmed; petals 12 mm. long, lavender to purple turning black the second day (! Foster), bearing 2 fimbriate scales high on the claw, blade broadly elliptic, obtuse; epigynous tube almost none, placentae apical, ovules caudate.

Type in the Gray Herbarium, collected at Santa Teresa, State of Espírito Santo, Brazil, Aug. 7, 1940 (bloomed in cultivation Apr. 22, 1941), by M. B. & R. Foster (No. 829).

Aechmea triticina var. **capensis** L. B. Smith, var. nov.

A var. *triticina* scapi bracteis supremis serrulatis, bracteis florigeris sepala superantibus differt.

Type in the Museu Nacional, Rio de Janeiro, Nos. 46221 and 46223, collected near Cabo Frio, State of Rio de Janeiro, Brazil, October 1899, by E. Ule.

Araeococcus goeldianus L. B. Smith, sp. nov. FIGURE 52

A *A. micrantho* Brongniart, cui affinis, inflorescentiae ramis divergentibus paulo ramosis leviter flexuosis differt.

Stemless, 7 dm. high; leaves few in an ellipsoid rosette, the outer ones reduced to acute sheaths, the inner about equaling the inflorescence; sheaths elliptic, about 25 cm. long; blades ligulate, acute, narrowed toward the base, flat, 4 cm. wide, laxly serrulate; scape erect, slender; scape-bracts imbricate, lanceolate; inflorescence laxly tripinnate, 28 cm. long; lower primary bracts like the scape-bracts but smaller, much shorter than the axillary branches; branches divergent, 10 cm. long, few-branched, slightly flexuous, slender, very laxly flowered; floral bracts suborbicular, 3 mm. long, apiculate, minutely serrulate, membranaceous; flowers spreading; sepals free, oblong, asymmetric, 2 mm. long, truncate and apiculate; petals and stamens unknown; fruit globose.

Type in the herbarium of the Museu Goeldi, No. 1067, collected on trees or granite rocks at Cunani, Territorio de Amapá, Brazil, Oct. 15, 1895, by J. Huber (No. 983). Fragment and photograph in the U. S. National Herbarium.

Billbergia amoena (Lodd.) Lindl. var. **viridis** L. B. Smith, var. nov.

Differt petalis omnino viridibus.

Differs from the typical variety in having its petals wholly green instead of dark blue at the apex.

Type in the Gray Herbarium, collected at Santa Teresa, State of Espírito Santo, Brazil, July 27, 1939 (bloomed in cultivation June 1940), by M. B. & R. Foster (No. 246).

Billbergia euphemiae E. Morr. var. **nudiflora** L. B. Smith, var. nov.

Differt inflorescentia subdensa, axi fere recto, bracteis florigeris omnibus vel fere omnibus minutis.

Differs from the typical variety by its subdense inflorescence, nearly straight axis, and in having all or nearly all the floral bracts minute.

Type in the Gray Herbarium, collected at Itapemirim, State of Espírito Santo, Brazil, altitude 900 meters, July 7, 1939, by M. B. & R. Foster (No. 159). Duplicate in the Museu Nacional, Rio de Janeiro.

ADDITIONAL SPECIMENS EXAMINED:

ESPÍRITO SANTO: Monte Carlo, Collatina, July 19, 1939, *M. B. & R. Foster* 217 (GH). Cachoeiro de Itapemirim, Aug. 17, 1940, *M. B. & R. Foster* 969 (GH, US).

Billbergia euphemiae E. Morr. var. **saundersioides** L. B. Smith, var. nov.

Differt foliis pallide maculatis, haud transverse vittatis.

Differs in its leaves which have pale spots instead of transverse bands.

Type in the U. S. National Herbarium, No. 2120883, collected near Maracás, State of Baía, Brazil, Oct. 19, 1948 (bloomed in cultivation December 1953), by M. B. Foster (No. 2470).

Billbergia fosteriana L. B. Smith, sp. nov. FIGURE 122

A *B. saundersii* Hort. Bull. cui affinis, inflorescentia erecta, foliis transverse zonatis differt.

Terrestrial, stoloniferous, flowering shoot 45–60 cm. long; leaves few, to 85 cm. long, densely pale-lepidote and cross-banded beneath, the sheaths as long as or longer than the blades, forming a very slender tube, the blades ligulate, acute and apiculate, 3 cm. wide, laxly serrulate; scape erect, slender, white-flocculose; scape-bracts suberect, lanceolate, 9 cm. long, membranaceous, rose fading to stramineous by anthesis, white-flocculose, the upper ones much exceeding the internodes; inflorescence erect, simple, laxly few-flowered, white-flocculose; axis slender, geniculate; floral bracts much shorter than the pedicels, ovate, acute; pedicels divergent to spreading, very slender, to 18 mm. long; flowers erect, making an angle with the pedicels; sepals elliptic, apiculate, 20 mm. long, lavender; petals 50 mm. long, green with blue-green apices, bearing 2 fimbriate scales at the base and 2 dentate lateral folds above them; stamens and pistil included; ovary subcylindric, 12 mm. long, epigynous tube infundibuliform.

Type in the U. S. National Herbarium, No. 2120880, collected near Maracás, State of Baía, Brazil, Oct. 18, 1948 (bloomed in cultivation December 1953), by M. B. Foster (No. 2447 in part).

Billbergia iridifolia (Nees & Mart.) Lindl. var. **concolor** L. B. Smith, var. nov.

Differt petalis omnino pallide aureis.

Differs from the typical variety in having the petals pale yellow throughout instead of dark blue at the apex.

Type in the Gray Herbarium, collected at Itapemirim, State of Espírito Santo, Brazil, in 1939, by M. B. & R. Foster (No. 160).

ADDITIONAL SPECIMEN EXAMINED:

ESPÍRITO SANTO: On rocks, Vitória, Aug. 9, 1940, *M. B. & R. Foster* 873 (GH).

Billbergia minarum L. B. Smith, sp. nov. FIGURE 120

A *B. lietzei* E. Morr. et *B. leptopoda* L. B. Smith, quibus affinis, bracteis florigeris superioribus minutis differt.

Flowering plants 3–10 dm. high (! Foster); leaves in a tubular rosette, to 54 cm. long, maroon-green mottled with cream-white spots, covered with coarse white appressed scales, becoming glabrous above, the sheath indistinct, somewhat darker than the blade, the blade narrowly triangular, acuminate, about 2 cm. wide at base, very laxly serrulate; scape curved, 2 mm. in diameter, nearly glabrous; scape-bracts lanceolate with an acuminate involute densely white-lepidote apex, to 10 cm. long, thin, roseate, the upper ones much exceeding the internodes; inflorescence pendent, pseudosimple with very short 1-flowered branches, lax with 9 flowers in 2 rows; axis geniculate, very slender, glabrous; lowest floral bract like the scape-bracts but smaller, the upper ones minute, shorter than the pedicels; flowers spreading to reflexed, glabrous; pedicels slender, to 3 mm. long; sepals oblong, broadly acute, to 22 mm. long, the apical third dark blue and the remainder green; petals linear, obtuse, 5 cm. long, exceeding the stamens, green except for the dark blue apex, bearing 2 scales at the base; pollen grains ellipsoid, sculptured, bearing a longitudinal fold when dry; ovary obconic, to 10 mm. long, epigynous tube short, placentae linear, ovules apiculate.

Type in the Gray Herbarium, collected on rocks in dry woods, Gobernador Valadores near the Rio Doce, State of Minas Gerais, Brazil, altitude 600 meters, July 28, 1940, by M. B. & R. Foster (No. 766).

Billbergia tweedieana Baker var. **latisepala** L. B. Smith, var. nov.

Differt sepalis brevibus subduplo longioribus ac latis.

Differs from the typical variety in having sepals barely 13 mm. long, about twice as long as wide.

Type in the Gray Herbarium, collected at Cantagallo, State of Rio de Janeiro, Brazil, by A. Glaziou (No. 15476). Duplicate in the Muséum National d'Histoire Naturelle, Paris.

Billbergia tweedieana Baker var. **minor** L. B. Smith, var. nov.

Differt planta minore, sepalis majoribus, late acutis.

Differs from the typical variety in its much smaller stature and broadly acute sepals 24 mm. long.

Type in the Gray Herbarium, collected at Santa Teresa, State of Espírito Santo, Brazil, altitude 765 meters, July 27, 1939, by M. B. & R. Foster (No. 277). Duplicate in the Museu Nacional, Rio de Janeiro.

Bromelia interior L. B. Smith, sp. nov. FIGURE 80

A *B. glaziovii* Mez, cui affinis, inflorescentia aliquid elongata, sepalis parvis bracteas florales superantibus differt.

Propagating by rhizomes; flowering plant low, probably little more than 5 dm. high at most; leaves 5–10 dm. long, sheaths suborbicular, 7 cm. wide, glabrous above and the lower half beneath, the upper half beneath covered with coarse brown subspreading scales, blades linear, acuminate, not at all constricted at base, 2 cm. wide, glabrous above, covered with white appressed scales beneath, laxly serrate with uncinate teeth 4–7 mm. long, the basal teeth recurved, the others ascending; scape erect, elongate; scape-bracts subfoliaceous, densely imbricate; inflorescence ellipsoid or short-cylindric, much longer than wide, 4 cm. in diameter; primary bracts broadly elliptic, covering all but the apices of the flowers, the lowest with small foliaceous blades; branches short, few-flowered; floral bracts oblong, obtuse, cucullate, carinate, serrulate, white-lepidote; flowers subfasciculate, subsessile, 32–39 mm. long; sepals oblong, obtuse and cucullate, 12–15 mm. or rarely to 20 mm. long, carinate, conduplicate, densely white-lepidote; petals erect, lilac; filaments connate for 5 mm.; ovary slenderly ellipsoid, densely white-lepidote.

Type in the U. S. National Herbarium, No. 2046592, collected in campo at Quintas, Município Goiás, State of Goiás, Brazil, July 6, 1951, by A. Macedo (No. 3260).

ADDITIONAL SPECIMENS EXAMINED:

MATO GROSSO: Between Coxipó da Ponte and Cuiabá, March 1911, *Hoehne in Rondon* 4518 (R); October 1914, *J. G. Kuhlmann* 86 (R). Campo Grande, Sept. 10, 1936, *Archer & Gehrt* 168 (SP, US). Aquiduana, Noreste R. R., Sept. 24, 1940, *Foster* 1075 (GH). Braco, Rio Arinos, Sept. 26, 1943, *Baldwin* 3103 (GH, US).

SÃO PAULO: Itapura, Sept. 29, 1940 (bloomed in cultivation April 1944), *Foster* 1101 (GH).

Cryptanthus duartei L. B. Smith, sp. nov. FIGURE 67

A *C. maritimo* L. B. Smith, cui affinis, bracteis florigeris linearibus sepala subaequantibus, petalis aureis differt.

Stemless; leaves 35 cm. long, the sheaths broadly elliptic, 2 cm. long, serrulate, glabrous, the blades linear-triangular, filiform-acuminate, not at all constricted at the base, 12 mm. wide, glabrous above, covered beneath with pale appressed scales, laxly serrulate with pale ascending teeth 0.5 mm. long; floral bracts linear, about equaling the sepals, membranaceous, subcucullate, densely lepidote toward the apex; sepals 13 mm. long, unequally connate 4–5 mm., oblong, broadly cuspidate-acute, subcucullate, membranaceous, lepidote; petals 4 cm.

long, obtuse, bright orange; stamens and style included; ovary obconic, 5 mm. long.

Type in the U. S. National Herbarium, No. 2121558, collected on micaceous quartzite soil of rocky campo, Serra do Cipó, State of Minas Gerais, Brazil, November 1949, by A. P. Duarte. Duplicate in the herbarium of the Jardim Botânico, Rio de Janeiro (No. 76607).

Cryptanthus marginatus L. B. Smith, sp. nov. FIGURE 70

A *C. lacerdae* Antoine, cui affinis, foliis rubescente marginatis, sepalorum partibus liberis latioribus atrisque differt.

Plants closely aggregated; leaves about 12 in each flat rosette, to 20 cm. long, covered beneath with pale coarse appressed scales, sheaths small and inconspicuous, blades linear-lanceolate, acuminate, 3 cm. wide, becoming glabrous above except near the base, very light green with a narrow reddish margin, the broad flat median band somewhat darker than the equally broad undulate marginal bands, densely serrulate with teeth 0.5 mm. long; fascicles few-flowered, axillary, the distal perfect, the central staminate (! Foster); floral bracts lance-oblong, acute, exceeded by the sepals, thin, lepidote; sepals 11 mm. long, connate for 6 mm., the free lobes subquadrate with broad wings and thick triangular lepidote apiculus, dark; petals obtuse, 25 mm. long, white.

Type in the Gray Herbarium, collected near Santa Teresa, State of Espírito Santo, Brazil, July 25, 1939 (bloomed May 14, 1941), by M. B. and R. Foster (No. 243).

Cryptanthus minarum L. B. Smith, sp. nov. FIGURE 69

Foliis homomorphis, laminis ad basin versus attenuatis, subtus brunneo-lepidotis, supra glabris et verisimiliter linea ampla pallida mediana notatis; laminis sepalorum late ellipticis apiculatis serrulatisque.

Complete caudex unknown, stout; leaves all alike, to 39 cm. long, the sheaths oblong, barely differentiated, the blades ligulate, acuminate, tapered gradually toward the base, 35 mm. wide, covered beneath with brown appressed scales, glabrous above and apparently marked with a broad pale median stripe (not absolutely certain in the dried material), subdensely serrulate with pale upcurved teeth 1 mm. long; inflorescence 3 cm. in diameter; floral bracts oblanceolate, acuminate, about equaling the midpoint of the sepals, serrulate and lepidote toward the apex; sepals 15 mm. long, connate for 8 mm., alate-carinate with the wings decurrent on the ovary, the free lobes broadly

elliptic, apiculate, serrulate, lepidote near the apex; petals 4 cm. long; stamens and pistil included; ovary subcylindric, 11 mm. long.

Type in the Museu Nacional, Rio de Janeiro (No. 46186), collected at Itabira do Campo, State of Minas Gerais, Brazil, June 1902, by A. Melo Matos.

Cryptanthus pickelii L. B. Smith, sp. nov. FIGURE 72

A *C. incrassato* L. B. Smith et *C. diversifolio* Beer, quibus affinis, foliorum laminis supra linea lata pallida mediana pictis differt.

Short-caulescent; leaves densely brown-lepidote, becoming glabrous above, sheaths elliptic, subdensely serrulate, blades caudate-acuminate, laxly and minutely serrulate, marked above with a broad pale median stripe, dimorphic, those of the outer leaves linear-lanceolate, distinctly contracted toward the base, to 35 cm. long, 25 mm. wide, blades of the inner leaves narrowly triangular, not at all contracted toward the base, not over 15 cm. long, 13 mm. wide; inflorescence compound with the flowers fasciculate in the axils of foliaceous bracts; floral bracts elliptic, exceeding the ovary, membranaceous except for the thick pungent apex, serrulate, brown-lepidote; sepals 16 mm. long, carinate, lepidote, connate for 9 mm., the free lobes ovate, acute, entire; petals imperfectly known, about 2 cm. longer than the sepals, exceeding the stamens, white.

Type in the herbarium of the Instituto de Pesquisas Agronómicas, collected in forest, Toró, Escola de São Bento, near Tapera, Municipio São Lourenço da Mata, Pernambuco, Brazil, Mar. 12, 1925, by Bento José Pickel (No. 909 in part). Also the cotype, collected in the Mata do Corrego da Bexiga, Escola de São Bento, May 1927, by B. J. Pickel (No. 909 remainder).

Cryptanthus pseudoscaposus L. B. Smith, sp. nov. FIGURE 68

A *C. acauli* (Lindl.) Beer, cui affinis, stolonibus elongatis nudis, foliis subtus brunneo-lepidotis, floribus subduplo minoribus, bracteis sepalisque lepidotis differt.

Stolons arising from the inflorescence, elongate, naked, at first erect and scape-like; leaves about 15 in each rosette, all alike, to 18 cm. long, completely covered beneath with brown appressed scales, soon glabrous above, sheaths small and inconspicuous, blades linear-lanceolate, filiform-acuminate, 22 mm. wide, subdensely serrulate, the center channeled, the sides undulate; fascicles few-flowered, axillary; floral bracts broadly ovate, slightly exceeded by the sepals, membranaceous, lepidote; sepals 10 mm. long, connate for 4 mm., the free lobes subsymmetrical, lance-ovate, with a thickened pungent apex, densely pale-lepidote; petals obtuse, 14 mm. long, white.

Type in the Gray Herbarium, collected between Domingos Martins and Vitória, State of Espírito Santo, Brazil, altitude 75 meters, July 14, 1939, by M. B. & R. Foster (No. 208). Duplicate in the Museu Nacional, Rio de Janeiro, and in U. S. National Herbarium.

Cryptanthus sinuosus L. B. Smith, nom. nov.

Cryptanthus undulatus Otto & Dietr. Allg. Gartenz. 4:299. 1836. In part. Nomen illegitimum, because of the citation of *Tillandsia acaulis* in its synonymy.

Dyckia heloisae L. B. Smith, sp. nov. FIGURE 16

A *D. hilaireana* Mez, cui affinis, foliis integerrimis, pedicellis elongatis differt.

Subacaulescent, 4–5 dm. high; leaves 10–12 cm. long, entire, the sheaths large, suborbicular, almost black, the blades narrowly triangular, 2 cm. wide at base, thick, rigid, pungent, glabrous above, covered beneath with cinereous appressed scales; scape stout, to 6 mm. in diameter, glabrous at least in age; scape-bracts subfoliaceous, the upper ones much shorter than the internodes; inflorescence laxly racemose, many-flowered, glabrous at least in age; floral bracts narrowly triangular, the lower ones exceeding the pedicels; pedicels slenderly clavate, spreading, frequently curved upward toward the apex, to 14 mm. long; sepals broadly ovate, apparently broadly acute, 9 mm. long; stamens free above the very short tube with the petals; capsule ovoid, short-beaked, about equaling the sepals.

Type in the U. S. National Herbarium, No. 2120193, collected on rocky crest, Serra do Cipó, 5 kilometers north of Chapeu de Sol. Município Jaboticatubas, State of Minas Gerais, Brazil, altitude 1,100 meters, Apr. 29, 1952, by L. B. Smith (No. 6698), F. Segadas-Vianna, W. A. Egler, L. Dau, Z. Lopes da Silva, W. T. Ormond & G. C. Machline.

Encholirium bradeanum L. B. Smith, sp. nov. FIGURE 2

Inter generis species valde singularis, a speciebus omnibus laminis foliorum angustissimis quam longitudine spinarum angustioribus differt.

Flowering plant over 7 dm. high; leaves rosulate, 24 cm. long, appressed-pale-lepidote on both sides, the sheaths small and inconspicuous, the blades linear, 4 mm. wide at base, laxly serrate with slender curved mostly subopposite spines 5 mm. long; scape 8 mm. in diameter, glabrous at least with age; scape-bracts suberect, foliaceous and much exceeding the internodes but the highest small, entire, and shorter than the internodes; inflorescence simple, many-flowered,

dense except near the base, 20 cm. long, 4 cm. in diameter, glabrous at least with age; floral bracts narrowly triangular, exceeding the pedicels; flowers spreading; pedicels 6 mm. long, stout, sulcate; sepals broadly ovate, 5 mm. long; petals and stamens very imperfectly known but apparently free; capsule ovoid, stout, 9 mm. long, dark castaneous; seeds surrounded by a falcate wing.

Type in the U. S. National Herbarium, No. 2104402, collected from cultivated material in the Jardim Botânico do Rio de Janeiro, originating from the region of Diamantina, State of Minas Gerais, Brazil, Feb. 8, 1952, by L. B. Smith & A. C. Brade (No. 5652).

Neoregelia bahiana (Ule) L. B. Smith var. **viridis** L. B. Smith, var. nov.

Differt foliis omnino viridibus.

Leaves wholly green in contrast to the typical variety which has the inner leaves red on the upper side.

Type in the Gray Herbarium, collected on the Serra de Piedade, near Belo Horizonte, State of Minas Gerais, Brazil, altitude 1,300 meters, July 10, 1940 (bloomed in cultivation, June 1, 1943), by M. B. & R. Foster (No. 573).

Neoregelia coriacea (Antoine) L. B. Smith, comb. nov.

Karatas coriacea Antoine, Phyto-Iconogr. 51, *pl. 30, fig. 1.* 1884.

Neoregelia fluminensis L. B. Smith, sp. nov. FIGURE 58

A *N. macahensis* (Ule) L. B. Smith, cui affinis, foliis omnibus similibus angustioribus utrinque lepidibus magnis pallidis adpressis densissime obtectis, pedicellis brevioribus sepalis apiculatis, subsymmetricis differt.

Stoloniferous; leaves all alike, to 36 cm. long, completely covered with coarse pale appressed scales, sheaths broadly elliptic, 11 cm. long, their scales brownish, blades ligulate, rounded and apiculate, 27 mm. wide, laxly serrulate with teeth 0.5 mm. long, green; scape 6 cm. long; inflorescence simple, about 12-flowered; outer bracts ovate, 3 cm. long, membranaceous, densely lepidote; floral bracts oblong, obtuse and apiculate, membranaceous, lepidote; pedicels slender, 14 mm. long; sepals 15 mm. long, connate for 3 mm., the lobes slightly asymmetric, broadly elliptic and apiculate; fruit globose, 6 mm. in diameter.

Type in the Gray Herbarium, collected at Teresópolis, State of Rio de Janeiro, Brazil, Aug. 21, 1940, by M. B. & R. Foster (No. 982).

Neoregelia hoehneana L. B. Smith, sp. nov. FIGURE 56

A *N. ampullacea* (E. Morr.) L. B. Smith, cui affinis, stolonibus arcuato-dependentibus, bracteis florigeris sepala subaequantibus, sepalis obtusis valde asymmetricis, petalis obtusis omnino albis differt.

Stemless, propagating by long slender arching-pendent stolons; leaves about 10 in each rosette, even the inner ones only 15 cm. long, bearing minute dark appressed scales, the sheaths ample, 6 cm. long, forming a subcylindric or ellipsoid tank, densely lepidote, the blades linear, flat, broadly rounded and apiculate, 25 mm. wide, green, very sparsely lepidote, very sparsely serrulate with teeth less than 0.5 mm. long; inflorescence few-flowered, hidden in the center of the leaf-rosette; floral bracts oblong, obtuse, about equaling the sepals, thin, greenish white, subglabrous; pedicels slender, 5 mm. long; sepals short-connate, 12 mm. long, broadly obtuse, strongly asymmetric, green centrally; petals 22 mm. long, white, the blades elliptic, obtuse; stamens included; ovary ellipsoid, 7 mm. long.

Type in the Instituto de Botânica, São Paulo, No. 44469, collected in Caraguatatuba, State of São Paulo, Brazil, Nov. 13, 1940, by A. Gehrt.

Neoregelia johannis (Carr.) L. B. Smith, comb. nov.

Nidularium johannis Carr. Rev. Hortic. 56: 432. 1884.

Neoregelia kuhlmannii L. B. Smith, sp. nov. FIGURE 60

A *N. coriacea* (Antoine) L. B. Smith, cui affinis, foliis viridibus, pedicellis brevissimis differt.

Plant propagating by long rhizomes 7 mm. in diameter; leaves suberect, 25 cm. long, the sheaths broadly elliptic, 11 cm. long, pale green, densely and finely brown-lepidote, the blades ligulate, broadly rounded or even somewhat retuse and apiculate, 5 cm. wide, subentire, green, concolorous, glabrous above, inconspicuously pale-lepidote beneath; scape 3 cm. long, 4 mm. in diameter; scape-bracts suborbicular, 15 mm. long, thin, densely lepidote; inflorescence simple, few-flowered, less than 3 cm. in diameter; outer bracts broadly ovate, acute, nearly equaling the sepals, thin, lepidote toward the apex; floral bracts lance-linear, flat, rounded and apiculate, slightly exceeded by the sepals, thin, sparsely lepidote; pedicels 5 mm. long; sepals lance-linear, acute, slightly asymmetric, 30 mm. long, connate for 8 mm., glabrous; only immature petals and stamens known; ovary subcylindric, 2 cm. long.

Type in the Instituto de Botânica, São Paulo, No. 55355, collected at Fazenda Japuhyba, Angra dos Reis, State of Rio de Janeiro, Brazil, by Moysés Kuhlmann (No. 2652).

Neoregelia leprosa L. B. Smith, sp. nov. FIGURE 57

A *N. macahensis* (Ule) L. B. Smith, cui affinis foliis angustioribus lepidibus magnis pallidis adpressis densissime obtectis, pedicellis brevioribus differt.

Leaves all alike, to 22 cm. long, covered on both sides with coarse cinereous appressed scales, sheaths broadly elliptic, 6–8 cm. long, their scales with brownish centers, blades ligulate, rounded and apiculate, becoming broadly retuse by the reflexing of the apex, 28 mm. wide, subdensely serrulate with teeth less than 1 mm. long, green, darker beneath; scape unknown; inflorescence simple, about 20-flowered; outer bracts broadly ovate, 3 cm. long, thin, lepidote; floral bracts exceeded by the sepals, membranaceous, lepidote; pedicels slender, to 13 mm. long; sepals strongly asymmetric with the acuminate apex extending 3 mm. above the wings, subfree, 14 mm. long, the median part red-purple and lepidote toward the apex, the wings white; petals 18 mm. long, white, their blades broadly ovate, acute; ovary ellipsoid, 7 mm. long.

Type in the Gray Herbarium, collected on the Serra do Cipó, State of Minas Gerais, Brazil, July 13, 1940, by M. B. & R. Foster (No. 656). Duplicate in U. S. National Herbarium.

Neoregelia macrosepala L. B. Smith, sp. nov. FIGURE 61

A *N. farinosa* (Ule) L. B. Smith, cui verisimiliter affinis, vaginis foliorum angustioribus, purpureo suffultis, sepalis majoribus paulo asymmetricis lepidotis differt.

Propagating by short, ascending stolons; leaves about 15 in a spreading rosette, 50–85 cm. long, coarsely pale-lepidote on both sides, sheaths elliptic, 12–20 cm. long, tinged with purple, blades ligulate, rounded and apiculate, 40–45 mm. wide, laxly serrulate with basal teeth 2 mm. long; scape short; scape-bracts densely imbricate; inflorescence many-flowered, 6 cm. in diameter; outer bracts ovate, acute, thin, densely lepidote; floral bracts lanceolate, to 7 cm. long, nearly or quite equaling the sepals, straight; pedicels slender, to 30 mm. long; sepals slightly asymmetric with inconspicuous wings, lanceolate, acuminate, 38 mm. long, connate for 2 mm., sparsely lepidote becoming glabrous; ovary ellipsoid, 12 mm. long.

Type in the Gray Herbarium, collected at Cachoeiro de Itapemirim, State of Espírito Santo, Brazil, Aug. 17, 1940, by M. B. & R. Foster (No. 968). Duplicate in U. S. National Herbarium.

ADDITIONAL SPECIMEN EXAMINED:

ESPÍRITO SANTO: Vargem Alta, Aug. 15, 1940, *M. B. & R. Foster* 929 (GH).

Neoregelia melanodonta L. B. Smith, sp. nov. FIGURE 66

A *N. zonata* L. B. Smith, cui affinis, stolonibus robustis, foliorum laminis brevibus latisque regulariter minuteque albido zonatis, bracteis florigeris amplis cuspidatis differt.

Caudex 35 mm. in diameter (! Foster); leaves many, 15–20 cm. long, pale-lepidote on both sides, the sheaths broadly elliptic, about as long as the blades and slightly darker, blades broadly ligulate, rounded and apiculate becoming retuse by the recession of the apex, 5 cm. wide, sparingly dark-spotted, laxly serrate with black teeth 1.5 mm. long, very regularly and finely marked beneath with white cross-lines; scape very short; inflorescence few-flowered, fusiform, 1 cm. in diameter; outer bracts ovate, cuspidate-acute, serrulate, densely lepidote; floral bracts like the outer bracts but narrower, nearly equaling the sepals; pedicels slender, 20 mm. long; sepals definitely asymmetric, elliptic with an involute-subulate apex, 23 mm. long, connate for 2 mm.; petals light blue (! Foster); ovary ellipsoid, 14 mm. long.

Type in the U. S. National Herbarium, No. 2057905, collected at Cuibiça, State of Espírito Santo, Brazil, Aug. 14, 1940 (bloomed in cultivation October 1952), by M. B. & R. Foster (No. 897).

Neoregelia myrmecophila (Ule) L. B. Smith, comb. nov.

Nidularium myrmecophilum Ule, Verh. Bot. Ver. Brand. 48: 132. 1907.

Neoregelia oligantha L. B. Smith, sp. nov. FIGURE 62

A *N. cruenta* (R. Graham) L. B. Smith, cui affinis, omnibus partibus minoribus, inflorescentia pauciflora, sepalis paulo asymmetricis differt.

Propagating by short ascending stolons; leaves few, 26 cm. long, covered on both sides with pale coarse appressed scales but becoming glabrous above in extreme age, sheaths broadly elliptic, 10 cm. long, blades ligulate, rounded and apiculate, 23 mm. wide, laxly serrulate with strongly uncinate teeth about 1 mm. long; scape very short; inflorescence few-flowered, about 2 cm. in diameter; bracts thin, old and poorly preserved in the only specimen seen; pedicels slender, 12 mm. long; sepals slightly asymmetric, lanceolate, acute, 23 mm. long, connate for 1.5 mm.; ovary ellipsoid, 8 mm. long.

Type in the Gray Herbarium, collected in the Parque Nacional, Ipatinga on the Rio Doce, Município of Antonio Dias, State of Minas Gerais, Brazil, July 26, 1940, by M. B. & R. Foster (No. 742).

Neoregelia pauciflora L. B. Smith, sp. nov. FIGURE 65

A *N. zonata* L. B. Smith, cui affinis, foliorum vaginis intus atro-purpureis, laminis brevibus supra regulariter transverseque albido lineatis, bracteis florigeris brevissimis differt.

Stolons elongate, slender, horizontal; leaves about 12, 15 cm. long, minutely and sparsely lepidote on both sides, sheaths elliptic, as long as or longer than the blades, dark purple above, blades broadly ligulate, rounded and apiculate, 35 mm. wide, laxly serrulate with dark teeth 1 mm. long, marked above with fine regular white cross-lines; scape very short; inflorescence fusiform, few-flowered, less than 2 cm. in diameter; floral bracts shorter than the pedicels, ovate, acute, membranaceous; pedicels slender, 25 mm. long; sepals slightly asymmetric, narrowly lanceolate, acuminate, 20 mm. long, connate for 1 mm.; petals 35 mm. long, white (! Foster); ovary slenderly ellipsoid, 7 mm. long.

Type in the Gray Herbarium, collected at Santa Teresa, State of Espírito Santo, Brazil, altitude 765 meters, July 26, 1939, by M. B. & R. Foster (No. 265).

Neoregelia princeps (Baker) L. B. Smith, var. **phyllanthidea** (Mez) L. B. Smith, comb. nov.

Aregelia princeps var. *phyllanthidea* Mez in DC. Monogr. Phan. 9:76. 1896.

Neoregelia uleana L. B. Smith, sp. nov. FIGURE 59

A *N. leucophoea* (Baker) L. B. Smith, cui affinis, foliorum laminis angustioribus acutis et subulato-mucronatis differt.

Leaves 32 cm. long, bearing dark brown appressed scales, the sheaths broadly elliptic, 10 cm. long, densely lepidote, dark castaneous except for the pale apex, the blades ligulate, acute with a subulate 5 mm. long mucro, 3 cm. wide, apparently concolorous, densely lepidote beneath, becoming glabrous above, laxly serrate with black ascending teeth 2 mm. long; scape 8 cm. long, 2 cm. in diameter; scape-bracts very broadly ovate with a short triangular apex, thin, densely lepidote, the lowest serrate; inflorescence simple, many-flowered, 6 cm. in diameter; outer bracts like the scape-bracts, the highest nearly equaling the sepals; floral bracts linear, slightly exceeded by the sepals, cucullate, mucronulate, thin, densely brown-lepidote toward the apex; pedicels slender, 25 mm. long; sepals lanceolate, acute, somewhat asymmetric, 34 mm. long, connate for 5 mm., brown-lepidote inside, glabrous outside; only very immature petals and stamens seen; ovary ellipsoid, 18 mm. long.

Type in the Museu Nacional, Rio de Janeiro, No. 46406, collected from cultivated material in the gardens of the Museu, May 1896, by E. Ule.

There is no record of the origin of *Neoregelia uleana* nor of *N. leucophoea* which appears to be its nearest relative.

Nidularium apiculatum L. B. Smith, sp. nov. FIGURE 77

A *N. terminale* Ule, cui affinis, foliis multo minoribus angustioribusque, scapo humile differt.

Propagating by short basal offshoots; leaves about 15 in a flat rosette, to 33 cm. long, sheaths elliptic, 10 cm. long, sparsely pale-lepidote, blades ligulate, broadly acute and apiculate, 27 mm. wide, glabrous at maturity, laxly serrulate with teeth 0.5 mm. long, bearing a broad pale median channel toward the base; scape 10 cm. high, distinctly separating the inflorescence from the rosette; scape-bracts foliaceous but much reduced, densely imbricate; outer bracts of the inflorescence subfoliaceous with elongate spreading blades, red-striate; floral bracts oblong, acute, much exceeded by the sepals, serrulate, membranaceous, lepidote; sepals 18 mm. long, connate for 7 mm., the free lobes elliptic, broadly rounded and apiculate at least in drying, entire; petals and stamens unknown.

Type in the Gray Herbarium, collected under trees, Mount Itatiaia, State of Rio de Janeiro, Brazil, June 30, 1939, by M. B. & R. Foster (No. 124).

Nidularium apiculatum L. B. Smith var. **serrulatum** L. B. Smith, var. nov.

Differt sepalis dense serrulatis.

Differing from the typical variety by its densely serrulate sepals.

Type in the Gray Herbarium, collected on rocks in shade, Mount Itatiaia, State of Rio de Janeiro, Brazil, June 30, 1939, by M. B. & R. Foster (No. 121).

Nidularium innocentii Lem. var. **lineatum** (Mez) L. B. Smith, comb. nov.

Nidularium lineatum Mez, Repert. Sp. Nov. Fedde 12: 412. 1913.

Nidularium itatiaiae L. B. Smith, sp. nov. FIGURE 76

A *N. longifloro* Ule et *N. paucifloro* Ule, cuibus affinis, sepalis minoribus altiore connatis late rotundatis mucronulatisque differt.

Leaves rosulate, to 31 cm. long, coarsely appressed-lepidote beneath, sheaths broadly elliptic, 12 cm. long, blades ligulate, broadly acute and apiculate, 35 mm. wide, laxly serrulate with teeth less than 1 mm. long, glabrous above at maturity; scape 9 cm. long; scape-bracts subfoliaceous, densely imbricate; outer bracts of the inflorescence broadly ovate with minute blades, red, serrulate, lepidote; floral bracts elliptic, acute, 25 mm. long, membranaceous, serrulate, densely and coarsely appressed-lepidote; sepals 17 mm. long, connate for

8 mm., the free lobes broadly ovate, mucronulate, entire or erose; petals and stamens unknown.

Type in the Gray Herbarium, collected on trees near Maromba Falls, Mount Itatiaia, State of Rio de Janeiro, Brazil, June 30, 1939, by M. B. & R. Foster (No. 118).

Orthophytum amoenum (Ule) L. B. Smith, comb. nov.

Sincoraea amoena Ule, Bot. Jahrb. 42: 191, *fig. 1 A–F.* 1908.

Orthophytum disjunctum L. B. Smith, sp. nov. FIGURE 85

A *O. folioso* L. B. Smith, cui affinis, foliis utrinque lepidibus patentibus obtectis, inflorescentia fere omnino laxa, bracteis primariis spicas subduplo superantibus dense serratis differt.

Stoloniferous, aggregated, 35–50 cm. high; leaves 15–17 cm. long, covered with pale-cinereous spreading scales, sheaths small and inconspicuous, blades narrowly triangular, acuminate, 17–20 mm. wide, flat, densely serrate with spreading teeth 3 mm. long; scape erect, slender, densely cinereous-flocculose; scape-bracts foliaceous but spreading and almost completely exposing it; inflorescence elongate, lax except for the extreme apex, densely cinereous-flocculose; primary bracts foliaceous but only about twice as long as the axillary spikes, curving-reflexed; spikes subglobose, 15–20 mm. long, few-flowered; floral bracts broadly ovate with an acuminate recurved apex, 13 mm. long, pectinate-serrate; sepals narrowly triangular, 11 mm. long; petals 12 mm. long, white, the scales borne well above the base.

Type in the U. S. National Herbarium, No. 1952419, collected on rocks at Queimada, between Campina Grande and Caruaru, State of Paraíba, Brazil, altitude 450 meters, Oct. 11, 1948, by M. B. Foster (No. 2419).

ADDITIONAL SPECIMEN EXAMINED:

PERNAMBUCO: Mun. Quipapá: Engenheiro Pelada, *Silva & Leal* 247 (RB).

Orthophytum maracasense L. B. Smith, sp. nov. FIGURE 84

A *O. folioso* L. B. Smith, cui affinis, foliis utrinque lepidibus adpressis obtectis, bracteis primariis superioribus spicas subduplo superantibus differt.

Caudex short and thick but evident; flowering plant 3 dm. high; leaves 3 dm. long, covered with white appressed scales but becoming more or less glabrous above with age, sheaths small and inconspicuous, blades narrowly triangular, acuminate, 3 cm. wide, laxly serrate with spreading teeth 3 mm. long; scape erect, white-flocculose; scape-

bracts foliaceous, large, spreading and exposing most of the scape; inflorescence densely cylindric except at base, 13 cm. long, densely white-lepidote; primary bracts foliaceous, spreading, the lowest elongate, the others not more than twice as long as the axillary spikes; spikes subglobose, 3 cm. long; floral bracts broadly ovate with an acuminate spreading or recurving apex, 2 cm. long, pectinate-serrate; sepals narrowly triangular, acuminate, 15 mm. long; petals slightly exceeding the sepals, white, appendaged well above the base.

Type in the U. S. National Herbarium, No. 1952463, collected in Table Rock area near Maracás, State of Baía, Brazil, altitude 900 meters, Oct. 21, 1948, by M. B. Foster (No. 2471).

Orthophytum navioides (L. B. Smith) L. B. Smith, comb. nov.

Cryptanthopsis navioides L. B. Smith, Contr. Gray Herb. 129: 31, *pl. 3, figs. 4–6.* 1940.

Orthophytum rubrum L. B. Smith, sp. nov. FIGURE 83

Ab omnibus speciebus adhuc cognitis inflorescentia digitata, spicis elongatis rubris differt.

Leaves numerous, 55 cm. long, covered at first with white appressed scales, the sheaths suborbicular, 2–3 cm. long, pale brown, becoming glabrous and lustrous, the blades linear-triangular, caudate-acuminate, 2 cm. wide, laxly serrate with pale ascending spines 2 mm. long, becoming glabrous above; scape elongate; scape-bracts foliaceous, spreading; inflorescence digitate from a few spikes; primary bracts foliaceous, about twice as long as the spikes, spreading; spikes ellipsoid, densely many-flowered, 4 cm. long, 25 mm. in diameter, red; floral bracts divergent, broadly ovate, acuminate, 2 cm. long, serrate, nerved, soon glabrous; sepals triangular, mucronulate, 12 mm. long, the posterior ones very broadly alate-carinate; petals 15 mm. long, white, appendaged well above the base; stamens included; ovary subglobose.

Type in the U. S. National Herbarium, No. 2057911, collected on Table Rock, near Maracás, State of Baía, Brazil, in 1948, by M. B. Foster (No. 2444), and flowered in cultivation in 1952.

Orthophytum saxicola (Ule) L. B. Smith, comb. nov.

Cryptanthopsis saxicola Ule, Bot. Jahrb. 42: 193, *fig. 1 G–K.* 1908.

Quesnelia edmundoi L. B. Smith, sp. nov. FIGURE 113

A *Q. laterale* Wawra atque *Q. blanda* (Schott) Mez, quibus affinis, foliis grosse subdenseque serratis, inflorescentia cylindrica magna, bracteis florigeris cucullatis subcoriaceis differt.

Known only from fragments, the flowering shoot over 4 dm. high; leaves 4–5 dm. long, bearing appressed brown scales throughout, the sheaths elliptic, ample, the blades ligulate, rounded and apiculate, 4 cm. wide, subdensely serrate with straight or slightly curved spines 4 mm. long; scape straight, 6 mm. in diameter, brown-lepidote; inflorescence strobilate, cylindric, 15 cm. long, 3 cm. in diameter; floral bracts in about 8 ranks, erect, broadly ovate, acute, cucullate, 25 mm. long, slightly exceeding the sepals, subcoriaceous except for the thin narrow margins, glabrous, nerved toward the apex; sepals oblong, slightly asymmetric, broadly obtuse, 14 mm. long; petals and stamens unknown; ovary globose, epigynous tube infundibuliform, 2 mm. long, ovules borne at the top of the cell.

Type in the U. S. National Herbarium, No. 2121556, collected at Barreiras, Baixada Fluminensis, at the base of the Serra de Teresópolis, State of Rio de Janeiro, Brazil, Dec. 8, 1948, by Edmundo Pereira and A. P. Duarte (No. 1522). Duplicate in the herbarium of the Jardim Botânico do Rio de Janeiro (No. 65289).

Vriesia segadas-viannae L. B. Smith, sp. nov. FIGURE 40

A *V. penduliflora* L. B. Smith, cui affinis, ramis inflorescentiae prophyllatis, bracteis florigeris quam sepalis subduplo brevioribus differt.

Stemless, 8 dm. high; leaves 4 dm. long, finely and densely brown-lepidote throughout, the sheaths elliptic, 16 cm. long, very dark castaneous except near the apex, the blades ligulate, acute, 45 mm. wide; scape erect, slender, glabrous; scape-bracts ovate, acute, slightly exceeding the internodes; inflorescence bipinnate, 3 dm. long, glabrous at least with age; primary bracts like the scape-bracts, about equaling the sterile bases of the branches; branches erect or suberect, very slender, the lateral ones 9 cm. long including the abortive apical flower, 3–4-flowered, the terminal 7-flowered, the sterile base short and bearing one or two prophyllae; floral bracts becoming downwardly secund with the flowers, broadly ovate, acute, carinate, thin, about half as long as the sepals; pedicels obconic, 8 mm. long; sepals oblong, obtuse, 20 mm. long; petals and stamens unknown; capsule cylindric, acute, 3 cm. long, coma pale brown.

Type in the U. S. National Herbarium, No. 2120196, collected at Palacio, Serra do Cipó, Município Jaboticatubas, State of Minas Gerais, Brazil, altitude 1,200 meters, Apr. 28, 1952, by L. B. Smith (No. 6755), F. Segadas-Vianna, L. Dau & W. T. Ormond.

Vriesia splendens (Brongn.) Lem. var. **longibracteata** (Baker) L. B. Smith, comb. nov.

Tillandsia longibracteata Baker, Journ. Bot. 26: 81. 1888.
Vriesia longibracteata Mez in DC. Monogr. Phan. 9: 568. 1896.

TYPE LOCALITY: Venezuela; Mountains of Tovar. Type collected by Fendler (No. 2449).
DISTRIBUTION: Tobago, Trinidad, Venezuela, British Guiana.

Vriesia splendens var. *longibracteata* can be said to differ from the typical variety only in its concolorous leaf-blades, yet its different range makes a designation for it desirable.

Wittrockia azurea L. B. Smith, n. sp. FIGURE 90

Ab omnibus speciebus adhuc cognitis sepalis minimis, petalis azureis differt.

Flowering shoot 2 dm. high; leaves rosulate, 4 dm. long, green with a pale median band, obscurely pale-lepidote, the sheaths elliptic, 8 cm. long, entire except near the apex, the blades linear, acuminate, contracted toward the base, 13 mm. wide, laxly serrulate; scape erect, slender, much exceeding the leaf-sheaths, covered and much exceeded by the foliaceous bracts; inflorescence compact, few-flowered, less than 3 cm. in diameter; primary bracts subfoliaceous, elongate, forming a stellate involucre about the inflorescence; floral bracts oblong, obtuse, about equaling the center of the sepals, densely serrulate, membranaceous, lepidote; sepals oblong, obtuse, 12 mm. long, connate for 3 mm., thin, glabrous, nerved; petals 15 mm. long, bearing 2 fimbriate scales at base, the free lobes elliptic, obtuse, cucullate, blue; stamens included; ovary obconic, 6 mm. long, epigynous tube 1.5 mm. long, placentae central, ovules apiculate.

Type in the herbarium of the Instituto de Botânica, São Paulo, No. 51968, collected in virgin rain forest, Fazenda da Companhia, Coronél Pacheco, State of Minas Gerais, Brazil, Aug. 30, 1944, by Ezechias P. Heringer (No. 1536).

Wittrockia campos-portoi L. B. Smith, sp. nov. FIGURE 89

A *W. smithii* Reitz, cui affinis, foliis viridibus, scapo elongato, inflorescentiae bracteis primariis angustis, petalis callosis apice flavis differt.

Leaves rosulate; scape elongate; raising the compact involucrate inflorescence well above the leaf-sheaths; primary bracts 14 cm. long, obscurely pale-lepidote, the sheaths ovate, ample, concealing all but the apices of the few flowers in each axil, the blades linear, acuminate, 15 mm. wide, reddish, laxly and minutely serrulate; floral bracts

broadly ovate, subacute, 2 cm. long, entire, membranaceous, white; sepals 28 mm. long, connate for 7 mm., the free lobes lanceolate, acute but not pungent, subsymmetric, green; petals 5 cm. long, highly connate, the free lobes 15 mm. long, elliptic, obtuse, cucullate, yellow, the tube green and white, bearing calli above the base; stamens included; ovary globose, 6 mm. long, epigynous tube lacking, placentae central.

Type in the U. S. National Herbarium, No. 2104774, collected from cultivated material received from the Jardim Botânico do Rio de Janeiro, by L. B. Smith. Duplicate in the Herbário "Barbosa Rodrigues."

SYSTEMATIC TREATMENT

CHARACTERS OF THE FAMILY

Herbs or rarely shrubby perennials, largely epiphytic. Roots usually present, but often serving merely as holdfasts in the epiphytic species. Leaves spirally arranged, usually rosulate, dilated-sheathing at the base, simple, entire or spinose-serrate, bearing peltate scales at least when young, and these serving to absorb moisture. Inflorescence simple or compound, of spikes or racemes, usually bearing brightly colored conspicuous bracts. Flowers perfect or sometimes functionally unisexual, that is with both stamens and pistil but only one functional, rarely strictly staminate (*Cryptanthus*). Perianth heterochlamydeous, the sepals and petals free or connate. Stamens 6 in 2 series; filaments free, or joined to the petals or to each other. Styles 3-parted. Ovary superior to inferior, 3-celled. Placentae axile, extending the length of the cell or variously reduced. Fruit capsular or baccate. Seeds naked, winged, or plumose. Embryo small, situated at the base of the copious mealy endosperm.

KEY TO SUBFAMILIES AND GENERA

1. Seeds variously appendaged (naked in *Navia*, but the ovary superior and the fruit dehiscent); ovary wholly or in part superior (wholly inferior in *Pitcairnia anomala*); fruit a capsule (but indehiscent in a few species of *Pitcairnia*).
   2. Seeds with entire appendages, not plumose; ovary usually wholly or in part superior; leaves often spinose-serrate; plants almost always terrestrial. ..... Subfamily 1. **Pitcairnioideae**
   2. Seeds plumose; ovary nearly or quite superior (in the Brazilian genera); leaves always entire; plants chiefly epiphytic.
      Subfamily 2. **Tillandsioideae**
1. Seeds always naked; ovary wholly or in very large part (*Acanthostachys*) inferior; fruit always baccate, fleshy to coriaceous; leaves usually spinose-serrate; plants often epiphytic..... Subfamily 3. **Bromelioideae**

Subfamily 1. PITCAIRNIOIDEAE

1. Seeds appendaged; sepals convolute with the left side of each overlapping the right of the next one (except in *Brocchinia*).
2. Petals free; filaments not forming a tube; flowers always perfect.
3. Ovary wholly superior.
4. Petals naked; herbs.
5. Seeds broad, with a wing surrounding at least three sides; plants usually large and coarse.
6. Petals broad, much more conspicuous than the sepals, strongly twisted together after anthesis; seed-wing little if at all produced. (Fig. 1.) ..... 1. **Puya**
6. Petals narrow, inconspicuous; seed-wing produced dorsally. (Figs. 2, 3.) ..... 2. **Encholirium**
5. Seeds narrow, caudate-appendaged or apiculate at each pole; petals not twisted together after anthesis.
7. Seeds or ovules merely apiculate; placentae basal. (Fig. 4.) 3. **Cottendorfia**
7. Seeds long-caudate; placentae usually extending almost the height of the cell.
8. Petals white, separate after anthesis; sepals not over 5 mm. long, thin, flat; plants slender. (Fig. 5.) ..... 4. **Lindmania**
8. Petals brightly colored, more or less massed together after anthesis but not twisted; sepals larger and firmer; plants relatively robust. (Fig. 6.) ..... 5. **Connellia**
4. Petals each bearing a single large scale near the base; spreading shrubs; scape with a definite cambium layer; inflorescence paniculate. (Fig. 7.) ..... 6. **Deuterocohnia**
3. Ovary at least partly inferior.
9. Flowers large and conspicuous, usually zygomorphic; petals often appendaged, several times as long as the ovary; ovules numerous. (Figs. 8–11.) ..... 7. **Pitcairnia**
9. Flowers minute, regular; petals naked, usually shorter than the ovary; ovules few. (Fig. 12.) ..... 8. **Brocchinia**
2. Petals joined centrally to a tube formed by the bases of the filaments but their margins free, yellow or orange; flowers sometimes with one sex aborted; seeds winged. (Figs. 13–20.) ..... 9. **Dyckia**
1. Seeds naked; sepals cochlear with both posterior ones overlapping the anterior. (Fig. 21.) ..... 10. **Navia**

Subfamily 2. TILLANDSIOIDEAE

1. Appendage of the seed basal, straight at maturity. (Fig. 22.)
2. Petals free or slightly joined, the corolla-tube then deeply included in the calyx.
3. Petals naked; inflorescence of one or more distichous-flowered spikes or rarely simple and polystichous or even one-flowered. (Figs. 22–30.) 11. **Tillandsia**
3. Petals each bearing two scales (or very rarely a single one) on the inner face. (Figs. 31–48.) ..... 12. **Vriesia**

2. Petals joined or closely agglutinated and simulating true fusion, the corolla-tube about equaling the calyx or longer; flowers always polystichous. (Fig. 49.) ..... 13. **Guzmania**

1. Appendage of the seed apical, folded at maturity; sepals strongly asymmetric in most species; flowers polystichous. (Fig. 50.) ..... 14. **Catopsis**

Subfamily 3. BROMELIOIDEAE

1. Petals naked; flowers never in strobilate spikes.
   2. Filaments not forming a tube; petals free or connate by their margins.
      3. Inflorescence elongate or if short (some species of *Streptocalyx*) then the flowers distichous; petals free.
         4. The inflorescence simple, lax; flowers pedicellate. (Fig. 51.) 15. **Fernseea**
         4. The inflorescence compound; flowers pedicellate or sessile.
            5. Sepals not more than 3 mm. long; flowers minute, sessile or pedicellate; ovules few. (Fig. 52.) ..... 16. **Araeococcus**
            5. Sepals 8–23 mm. long; flowers larger, sessile; ovules numerous. (Figs. 53, 54.) ..... 17. **Streptocalyx**
      3. Inflorescence densely capitate or capitiform, often involucrate; flowers never distichous; petals free or connate by their margins.
         6. Flowers on slender pedicels; inflorescence involucrate, sunk in the center of the rosette; petal-blades spreading, acute. (Figs. 55–66.) 18. **Neoregelia**
         6. Flowers sessile or subsessile.
            7. Epigynous tube very short or lacking.
               8. Petals thin, widely spreading, obtuse, white or rarely yellow; bracts of the inflorescence foliaceous; usually some of the flowers unisexual. (Figs. 67–72.) ..... 19. **Cryptanthus**
               8. Petals fleshy, erect or rarely spreading and acute; bracts of the inflorescence not foliaceous; flowers all perfect. (Figs. 73–77.) 20. **Nidularium**
            7. Epigynous tube elongate; scape elongate, slender; inflorescence not involucrate. (Fig. 78.) ..... 21. **Andrea**
   2. Filaments forming a tube to which the fleshy petals are joined along their centers but with their margins free; inflorescence compound, many-flowered, sessile or scapose, globose or elongate. (Figs. 79–81.) 22. **Bromelia**

1. Petals appendaged or when rarely naked then the flowers strobilate.
   9. Ovaries always remaining distinct; inflorescence compound or simple; sepals often mucronate.
      10. Ovary in small part superior; scape naked; inflorescence simple, strobilate, pseudolateral. (Fig. 82.) ..... 23. **Acanthostachys**
      10. Ovary completely inferior.
         11. Scape-bracts foliaceous or the scape lacking; sepals always free; epigynous tube very short or none.
            12. Petal-scales well developed; sepals nearly or quite symmetric, 10–20 mm. long; inflorescence or its spikes few-flowered, small. (Figs. 83–85.) ..... 24. **Orthophytum**

12. Petal-scales vestigial; sepals definitely asymmetric, 25–35 mm. long; inflorescence or its spikes many-flowered, 6–15 cm. in diameter ..... 29. **Aechmea**

11. Scape-bracts distinct from the leaves, or if there is no evident scape (some species of *Aechmea*) then the sepals much connate; epigynous tube often large.

13. Inflorescence involucrate; sepals unarmed, nearly or quite free in most species.

14. Petals completely free. (Figs. 86, 87.)..... 25. **Canistrum**

14. Petals partially connate above the base but often free at the base and exposing the bases of the filaments of the first series. (Figs. 88–90.)..... 26. **Wittrockia**

13. Inflorescence not involucrate or if somewhat so then the sepals mucronate and much connate.

15. The inflorescence compound (simple in depauperate specimens of *Hohenbergia littoralis*); flowers in strobilate spikes, much compressed.

16. Epigynous tube very small or lacking; pollen-grains with 2 or 4 pores. (Figs. 91–93.)..... 27. **Hohenbergia**

16. Epigynous tube well developed; pollen-grains with more than 4 pores. (Fig. 94.)..... 28. **Gravisia**

15. The inflorescence simple or if compound then the flowers not in strobilate spikes.

17. Flowers sessile or if rarely pedicellate then the sepals free.

18. Sepals mucronate or pungent or if blunt then small and the ovules long-caudate. (Figs. 95–111.)..... 29. **Aechmea**

18. Sepals unarmed or soft-apiculate.

19. Ovules numerous.

20. Petals regular, erect or suberect; pollen-grains with pores; flowers sessile. (Figs. 112–114.) 30. **Quesnelia**

20. Petals either zygomorphic or recurved in a spiral; dry pollen-grains usually with a single longitudinal fold; flowers sessile or pedicellate. (Figs. 115–123.) 31. **Billbergia**

19. Ovules few; flowers pedicellate, regular. (Fig. 124.) 32. **Neoglaziovia**

17. Flowers pedicellate; sepals connate; pollen-grains with more than 4 pores. (Fig. 125.)..... 33. **Portea**

9. Ovaries fused with each other and with the fleshy bracts to form a syncarp; inflorescence with an apical coma, simple; sepals never mucronate.

21. Inflorescence with a small inconspicuous coma, never producing basal shoots; plant propagating by elongate rhizomes; petals bearing vertical folds. (Fig. 126.)..... 34. **Pseudananas**

21. Inflorescence with a large conspicuous coma, often with basal shoots; rhizomes lacking; petals usually bearing well developed scales (Figs. 127, 128.)..... 35. **Ananas**

1. *Puya* Molina

Puya Molina, Saggio Chile 160, 351. 1782.

Principally Andean with outlying species in Costa Rica, Guiana, and northwestern Argentina.

1. **Puya floccosa** (Linden) E. Morr. Belg. Hortic. 35:81. 1885. FIGURE 1.
Pourretia floccosa Linden, Catal. 1853 ex Bot. Zeitung 11:718. 1853.
Pitcairnia floccosa Regel, Act. Hort. Petrop. 3:124. 1875.
Pitcairnia guyanensis Baker, Handb. Bromel. 120. 1889.
RIO BRANCO: Serra de Mairori, Rio Branco, Surumú, *Ule* 8371 (K (GH neg. 2550), MG, US).
ALSO: VENEZUELA, COLOMBIA.

2. *Encholirium* Mart. ex Schult. f.

Encholirium Mart. ex Schult. f. in R. & S. Syst. 7, pt. 2: p. lxviii, 1233. 1830.

Endemic in northeastern Brazil.

1. Inflorescence usually compound with spreading more or less decurved branches, curving when simple; dorsal wing of the seed linear, elongate. 1. **E. horridum**
1. Inflorescence usually simple, erect and rigid, when compound the branches strict; dorsal wing of the seed subdeltoid, short.
2. Leaf-blades linear, 4 mm. wide, the spines longer than the width of the blade; plants less than 1 m. high. (Fig. 2.) ..... 2. **E. bradeanum**
2. Leaf-blades narrowly triangular, several times wider than 4 mm., the spines relatively short; plants mostly 2 m. high or more.
3. Floral bracts short and narrow, much exceeded by the sepals.
4. Pedicels slender, 8–14 mm. long, usually longer than the floral bracts. (Fig. 3.) ..... 3. **E. spectabile**
4. Pedicels stout, 5–7 mm. long, shorter than the floral bracts. 4. **E. hoehneanum**
3. Floral bracts conspicuous, nearly equaling to exceeding the sepals.
5. Floral bracts coarsely serrate ..... 5. **E. glaziovii**
5. Floral bracts obscurely serrulate or entire.
6. Sepals narrowly elliptic, nearly equaling the petals. 6. **E. subsecundum**
6. Sepals elliptic or oblong, much shorter than the petals.
7. Axis of the inflorescence completely hidden by the flowers; sepals 10–12 mm. long ..... 7. **E. densiflorum**
7. Axis of the inflorescence visible; sepals 6–7 mm. long. 8. **E. rupestre**

1. ***Encholirium horridum*** L. B. Smith, Contr. Gray Herb. 129:32, *pl. 3, figs. 1–3.* 1940.
ESPÍRITO SANTO: Vitória, *Foster* 193 (GH, type, US neg. 4209, 4210).

2. ***Encholirium bradeanum*** L. B. Smith, p. 26 and fig. 2.
MINAS GERAIS: Region of Diamantina, *Smith & Brade* 5652 (US, type).

3. ***Encholirium spectabile*** Mart. ex Schult. f. in R. & S. Syst. 7, pt. 2: 1233. 1830. FIGURE 3.

Dyckia spectabilis Baker, Handb. Bromel. 138. 1889.

PIAUÍ: Oeiras, *Gardner* 2329 (BM, K (GH neg. 2548), NY).

CEARÁ: Campo Grande, *Dahlgren* 896 (F). Cascavel, *Dahlgren* (GH). Humaïta, *Ducke* (MG).

PARAÍBA: Campina Grande, *Foster* 2418 (US).

PERNAMBUCO: Mun. Caruaru: Carapotos, Caruaru, *Pickel* 4240 (IPA).

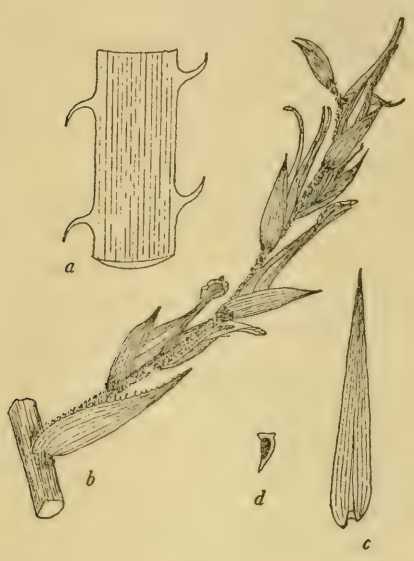

FIG. 1.

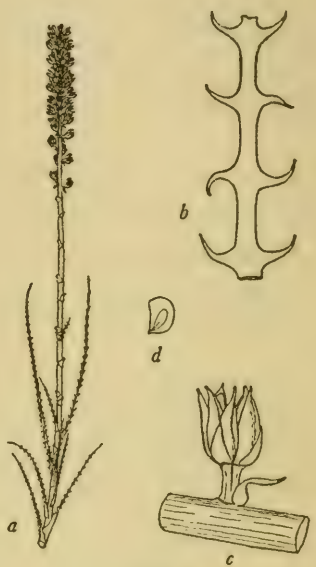

FIG. 2.

FIG. 1.—*Puya floccosa: a,* Section of leaf, × 1; *b,* branch of inflorescence, × ½; *c,* sepal, × 1; *d,* seed, × 2.

FIG. 2.—*Encholirium bradeanum: a,* Habit, × 1/10; *b,* section of leaf, × 1; *c,* flower and capsule, × 1; *d,* seed, × 2.

BAÍA: Itumirim, *Campos Porto* (RB). Joazeiro, *Martius* 2483 (M, type); *Rose & Russell* 19770 (NY, US). Paulo Afonso Falls, *Schery* 505 (GH).

4. ***Encholirium hoehneanum*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 109, *pl. 112.* 1943.

BAÍA: Jacobina, *Foster* 89 (GH, type; R).

5. ***Encholirium glaziovii*** Mez in Mart. Fl. Bras. 3, pt. 3: 505. 1894.

MINAS GERAIS: *Glaziou* 19918 (B, type, F neg. 11456).

6. ***Encholirium subsecundum*** (Baker) Mez in DC. Monogr. Phan. 9: 540. 1896.

Dyckia subsecunda Baker, Handb. Bromel. 135. 1889.

MINAS GERAIS: Milho Verde, *Saint-Hilaire* E-496 (P, type, GH neg. 2995). Serra do Cipó, *Foster* 640 (GH, US). Mun. Jaboticatubas: Serra do Cipó,

6 km. north of Palacio, *Smith & Mus. R* 6881 (R, US). Chapeu de Sol, Serra do Cipó, *Smith & Mus. R* 7036 (R, US).

7. ***Encholirium densiflorum*** Ule, Bot. Jahrb. 42: 198. 1908.

BAÍA: Tamburi *Ule* 7060 (B, type, F neg. 11455). Mun. Amargosa: Milagres, *Foster* 2474 (US).

8. ***Encholirium rupestre*** Ule, Bot. Jahrb. 42: 199. 1908.

BAÍA: Serra do São Ignacio, *Ule* 7223 (B, type, F neg. 11457).

FIG. 3.

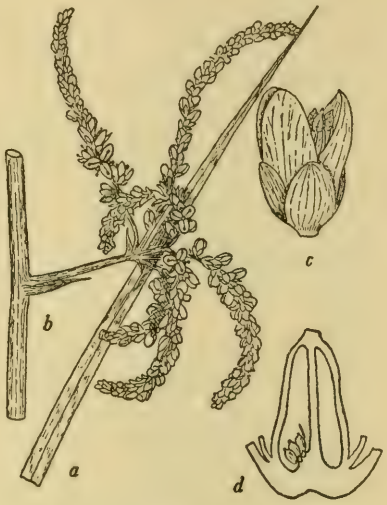

FIG. 4.

FIG. 3.—*Encholirium spectabile: a,* Habit (after M. B. Foster), × 1/40; *b,* section of leaf, × ½; *c,* flower (after Flora Brasiliensis), × 1; *d,* seed, × 1.

FIG. 4.—*Cottendorfia florida: a,* Apex of leaf, × ½; *b,* branch of inflorescence, × ½; *c,* flower, × 2.5; *d,* longitudinal section of ovary, × 5. (All after Flora Brasiliensis.)

3. *Cottendorfia* Schult. f.

Cottendorfia Schult. f. in R. & S. Syst. 7, pt. 2: p. lxiv, 1193. 1830.

A monotypic Brazilian endemic.

1. ***Cottendorfia florida*** Schult. f. in R. & S. Syst. 7, pt. 2: 1193. 1830. FIGURE 4.

PIAUÍ: Southern part of state, *Luetzelburg* (! Mez).

PARAÍBA: Piancó, *Luetzelburg* (! Mez).

BAÍA: Jeremoabo, *Luetzelburg* (! Mez). Serra do Sincorá, *Martius* 1938 (M, type, F neg. 8629); *Ule* 7081 (K).

4. *Lindmania* Mez

Lindmania Mez in DC. Monogr. Phan. 9: 535. 1896.

Southern México to Paraguay and northern Argentina. Chiefly Andean.

1. Inflorescence glabrous; flowers polystichous, spreading; leaf-blades broadest at the base..... 1. **L. guianensis**
1. Inflorescence arachnoid; flowers secund, pendent; leaf-blades broadest at the middle..... 2. **L. micrantha**

1. ***Lindmania guianensis*** (Beer) Mez in DC. Monogr. Phan. 9: 537. 1896. FIGURE 5.

Anoplophytum guianense Beer, Bromel. 44. 1857.

BRAZIL: Probable, but not yet recorded.

BRITISH GUIANA: Kaieteur, *Maguire & Fanshawe* 23158 (GH, NY, US). Berbice, upper Corentyne River, *Rob. Schomburgk* 20 (K, isotype, GH neg. 1396).

VENEZUELA: Southwest slope, Mount Roraima, *Steyermark* 58616 (F, GH).

2. ***Lindmania micrantha*** (Lindl.) L. B. Smith, Contr. Gray Herb. 104: 77. 1934.

Pitcairnia micrantha Lindl. Bot. Reg. 29, Misc.: 44. 1843.

Cottendorfia neogranatensis Baker, Handb. Bromel. 129. 1889.

Lindmania neogranatensis Mez in DC. Monogr. Phan. 9: 538. 1896.

Lindmania flaccida Standley, Journ. Washington Acad. Sci. 13: 364. 1923.

DISTRITO FEDERAL: Rio de Janeiro, *C. Smith* (CGE, type). The only record for Brazil and a very dubious one because based on cultivated material.

ALSO: SOUTHERN MÉXICO, CENTRAL AMERICA.

5. *Connellia* N. E. Brown

Connellia N. E. Brown, Trans. Linn. Soc. Bot. II. 6: 66. 1901.

Southern Venezuela.

1. Inflorescence compound with several flowers in the axil of each major bract; leaf-blades glabrous on both sides..... 1. **C. augustae**
1. Inflorescence simple with a single flower in the axil of each bract; leaf-blades more or less lepidote on one side.
   2. Leaf-blades stout, rigid, densely tomentose-lepidote above, soon glabrous beneath. (Fig. 6.)..... 2. **C. quelchii**
   2. Leaf-blades flaccid, glabrous above, obscurely lepidote beneath, margins white, prominent..... 3. **C. caricifolia**

1. ***Connellia augustae*** (Rich. Schomburgk) N. E. Brown, Trans. Linn. Soc. Bot. II. 6: 66, *pl. 13.* 1901.

Encholirium augustae Rich. Schomburgk, Verh. Preuss. Gartenb. Ver. 18: 130, *pl. 2.* 1847.

Dyckia augustae Baker, Handb. Bromel. 135. 1889.

Puya augustae Mez in DC. Monogr. Phan. 9: 487. 1896.

BRAZIL: Probable, but not yet recorded.

VENEZUELA: Mount Roraima, *McConnell & Quelch* 670 (K); *Schomburgk* 687 (or 1021) (BM, K (GH neg. 1374)); *Steyermark* 58883 (F, GH).

2. ***Connellia quelchii*** N. E. Brown, Trans. Linn. Soc. Bot. II. 6: 67, *pl. 14.* 1901. FIGURE 6.

Puya roraimae Mez, Repert. Sp. Nov. Fedde 12: 417. 1913.

Puya quelchii L. B. Smith, Contr. Gray Herb. 89: 7, 66. 1930.

BRAZIL: Probable, but not yet recorded.

VENEZUELA: Mount Roraima, *im Thurn* 315 (BM, BRG, K, US); *Luetzelburg* 21567 (R); *McConnell & Quelch* 107 (K, type, GH neg. 1377); *Steyermark* 58818 (F, GH); *Ule* 8557 (B, type of *Puya roraimae* Mez (F neg. 11417), MG).

3. ***Connellia caricifolia*** L. B. Smith in Steyermark, Bot. Explor. Venezuela–I, Fieldiana, Bot. 28: 139, *fig. 20 a–b.* 1951.

BRAZIL: Probable, but not yet recorded.

VENEZUELA: Mount Roraima, *Steyermark* 58846 (F, type).

FIG. 5.

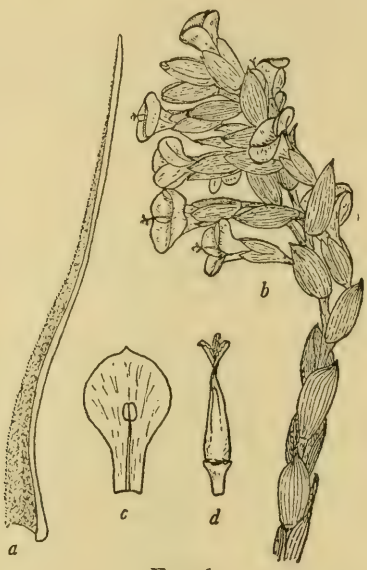

FIG. 6.

FIG. 5.—*Lindmania guianensis: a,* Habit, × 1/10; *b,* section of inflorescence, × 1; *c,* sepal, × 1; *d,* petal and stamen, × 1; *e,* pistil, × 1.

FIG. 6.—*Connellia quelchii: a,* Leaf, × ½; *b,* inflorescence, × ½; *c,* petal and stamen, × 1; *d,* pistil, × 1. (All after N. E. Brown.)

6. *Deuterocohnia* Mez

Deuterocohnia Mez in Mart. Fl. Bras. 3, pt. 3: 506. 1894.

Xerophytic shrubs. Slopes of the Andes in Perú, Bolivia, Argentina, and Chile, also in the basin of the Rio Paraguay in Brazil and Paraguay.

1. ***Deuterocohnia meziana*** O. Kuntze ex Mez in DC. Monogr. Phan. 9: 465. 1896. FIGURE 7.

Deuterocohnia paraguariensis Hassler, Ann. Conserv. & Jard. Bot. Genève 20: 298. 1919.

Deuterocohnia divaricata Mez, Repert. Sp. Nov. Fedde 16: 9. 1919.

MATO GROSSO: Corumbá, *Kuntze* (NY, type); *Hoehne in Rondon* 3543 (R); *Foster* 1045 (GH, US); 1064 (GH).
ALSO: PARAGUAY.

7. *Pitcairnia* L'Hérit.

Pitcairnia L'Hérit. Sert. Angl. 7. 1788, nomen conservandum.
Hepetis Sw. Prodr. 4, 56. 1788.

México and the West Indies to northern Argentina. One species in Africa.

1. Flowers and pedicels stout; floral bracts large, ample; ovary almost wholly superior; leaves entire, petiolate, 6–8 cm. wide. ..... 1. **P. maidifolia**
1. Flowers slender and usually the pedicels also (pedicels almost lacking in *P. anomala*); floral bracts usually small or narrow.
2. Fruit dehiscent; ovary at least half superior; inflorescence simple or compound.
3. Petals naked.
4. Inflorescence amply paniculate; leaf-blades narrowly triangular, not narrowed at the base.
5. Flowers deflexed-secund; sepals 30–37 mm. long..... 2. **P. nuda**
5. Flowers stiffly spreading in all directions; sepals 15–20 mm. long. 3. **P. patentiflora**
4. Inflorescence simple; leaf-blades often narrowed at the base.
6. Blades of all the leaves persistent.
7. Leaves with a distinct slender petiole..... 4. **P. lancifolia**
7. Leaves not petiolate, though often somewhat narrowed at the base.
8. Pedicels 3–5 mm. long, stout, sulcate; petals only a little longer than the sepals; flowers spreading..... 5. **P. encholirioides**
8. Pedicels 8–30 mm. long, slender, even; petals two to three times as long as the sepals.
9. Petals zygomorphic at least by position, not spirally recurving at anthesis. (Fig. 8.)
10. Base of the rosette not thickened; leaves not more than 15 cm. long..... 6. **P. beycalema**
10. Base of the rosette bulbous-thickened; leaves usually much more than 15 cm. long.
11. Sepals distinctly carinate..... 7. **P. carinata**
11. Sepals ecarinate. (Fig. 8.)..... 8. **P. flammea**
9. Petals regular, spirally recurving at anthesis. (Fig. 9.)
12. Rhachis of the inflorescence glabrous; sepals 15–18 mm. long; petals white to yellow..... 9. **P. albiflos**
12. Rhachis of the inflorescence furfuraceous; sepals 19–22 mm. long; petals red..... 10. **P. staminea**
6. Blades of the larger leaves deciduous along a straight transverse line.
13. Leaves serrate on the reduced blades and on the persistent remainder of the large blades..... 11. **P. glaziovii**
13. Leaves all entire..... 12. **P. decidua**
3. Petals each bearing a single scale at base.
14. Leaf-blades narrow and elongate, never more than 22 mm. wide.
15. Inflorescence compound.

16. Inflorescence lax, its axes glabrous..... 13. **P. anthericoides**
16. Inflorescence dense, densely pale-flocculose. ..... 14. **P. ulei**
15. Inflorescence simple.
17. Sepals alate-carinate; leaves dimorphic, the larger ones with serrulate petioles..... 15. **P. ensifolia**
17. Sepals ecarinate.
18. Scape-bracts all exceeding the internodes; sepals acuminate; petals white..... 16. **P. suaveolens**
18. Scape-bracts shorter than the upper internodes; sepals broadly acute or obtuse.
19. Sepals not more than 15 mm. long; leaf-blades 5–8 mm. wide.
20. Leaves dimorphic, the blades of the larger ones deciduous; petals red..... 17. **P. torresiana**
20. Leaves all alike, all persistent; petals white.
18. **P. bradei**
19. Sepals to 30 mm. long; leaf-blades 11–22 mm. wide.
21. Sepals obtuse; seeds caudate; leaf-blades 16–22 mm. wide.
19. **P. subpetiolata**
21. Sepals acute; seeds alate; leaf-blades 11 mm. wide.
20. **P. platypetala**
14. Leaf-blades lanceolate to elliptic-oblong, 3.5–18 cm. wide; seeds narrowly winged; species of the Amazon Basin.
22. Leaf-blades entire, broadly rounded and apiculate, to 18 cm. wide; scape-bracts all much shorter than the internodes.
21. **P. undulata**
22. Leaf-blades serrulate toward the apex, acuminate, not over 9 cm. wide; scape-bracts exceeding at least the upper internodes.
22. **P. sprucei**
2. Fruit indehiscent, pseudocapsular; inflorescence simple; species of the Amazon Basin. (Figs. 10, 11.)
23. Larger part of the ovary superior. (Fig. 10.)
24. Scape elongate, slender; inflorescence lax; pedicels 20 mm. long.
23. **P. uaupensis**
24. Scape very short or none; inflorescence dense; pedicels not more than 2 mm. long..... 24. **P. aphelandriflora**
23. Larger part or all of the ovary inferior. (Fig. 11.)
25. Ovary in small part superior; pedicels evident, slender.
26. Leaf-blades distinctly petiolate, 25–30 mm. wide, reddish-lepidote beneath; inflorescence subdensely many-flowered; pedicels 15–40 mm. long; sepals 22–26 mm. long..... 25. **P. amazonica**
26. Leaf-blades only slightly narrowed at base, 6–13 mm. wide, pale-lepidote beneath; inflorescence laxly few-flowered; pedicels 5–10 mm. long; sepals 15 mm. long..... 26. **P. caricifolia**
25. Ovary wholly inferior; pedicels almost wholly lacking.
27. **P. anomala**

1. ***Pitcairnia maidifolia*** (C. Morr.) Dcne. ex Planch. Fl. des Serres 9: 151, *pl. 915.* 1854.
Puya maidifolia C. Morr. Ann. Soc. Agr. Bot. Gand 5: 453, *pl. 289.* 1849.
Puya funckiana Linden, Catal. 5: 2. 1850.
Pitcairnia funckiana A. Dietr. Allg. Gartenz. 19: 337. 1851.

Pitcairnia macrocalyx Hook. Bot. Mag. 79: *pl. 4705.* 1853.
Pitcairnia zeifolia C. Koch & Sellow ex C. Koch, Ind. Sem. Hort. Berol. 1854. App.: 11. 1855.
Pitcairnia oerstediana Mez in DC. Monogr. Phan. 9: 448. 1896.
BRAZIL: Probable, but not yet recorded.
BRITISH GUIANA: Kaieteur, *Maguire & Fanshawe* 23411 (GH, NY).
ALSO: CENTRAL AMERICA, COLOMBIA, VENEZUELA.

2. ***Pitcairnia nuda*** Baker, Journ. Bot. 19: 269. 1881.
BRAZIL: Probable, but not yet recorded.
BRITISH GUIANA: Rupununi River, *Appun* 1582 (K, type, GH neg. 1389). Kanuku Mountains, *A. C. Smith* 3644 (GH, NY, US).
SURINAM: Tafelberg, *Maguire* 24460 (GH, NY).

3. ***Pitcairnia*** **patentiflora** L. B. Smith, Contr. Gray Herb. 127: 18, *pl. 1, fig. 4.* 1939.
AMAZONAS: Rio Içana, Serra de Tunuí, *Black* 48-2815 (IAN, US).
ALSO: COLOMBIA, VENEZUELA.

4. ***Pitcairnia lancifolia*** Mez in Mart. Fl. Bras. 3, pt. 3: 447. 1894.
1. Sepals 35 mm. long..... Var. a. **lancifolia**
1. Sepals 24 mm. long..... Var. b. **minor**

4a. ***Pitcairnia lancifolia*** var. ***lancifolia.***
RIO DE JANEIRO: Serra dos Orgãos, *Glaziou* 3628 (BR, type).

4b. ***Pitcairnia lancifolia*** var. ***minor*** L. B. Smith, Bol. Mus. Nac. Rio de Janeiro nov. ser. No. 15: 4. 1952.
RIO DE JANEIRO: Teresópolis, *Sampaio* 2444 (R, US neg. 3397).
DISTRITO FEDERAL: Serra da Tijuca, *Brade* (R, 46830, type, US neg. 3395).

5. ***Pitcairnia encholirioides*** L. B. Smith, Arquiv. Jard. Bot. Rio de Janeiro 10: 146, *pl. 2, fig. 6.* 1950.
RIO DE JANEIRO: Mun. Santa Maria Madalena: Pedra das Flores, *Santos Lima & Brade* 13249 (RB, type, US neg. 4203).

6. ***Pitcairnia beycalema*** Beer, Bromel. 63. 1857.
Pitcairnia muscosa sensu Hook. Bot. Mag. 80: *pl. 4770.* 1854. Not Mart.
BRAZIL: Described from cultivated material of unknown origin, *Hb. Kunth* (B, F neg. 11350).
RIO DE JANEIRO: Macaé, *Riedel* 865 in part (! Mez). Old road up the Serra to Petrópolis, *Smith & Mus. R* 6493 (R, US).

7. ***Pitcairnia carinata*** Mez in Mart. Fl. Bras. 3, pt. 3: 448. 1894.
RIO DE JANEIRO: Nova Friburgo, *Glaziou* 13256 (B, type, F neg. 11352). Mun. Santa Maria Madalena: Serra da Furquilha, *Santos Lima & Brade* 14180 (RB).

8. ***Pitcairnia flammea*** Lindl. Bot. Reg. 13: *pl. 1092.* 1827.
1. Leaves covered beneath with spreading scales, mostly 20–36 mm. wide.
2. Axis of the inflorescence glabrous, usually turning black on drying. Var. a. **flammea**
2. Axis of the inflorescence lepidote, usually remaining pale. Var. b. **roezlii**

1. Leaves glabrous or, if lepidote, always less than 20 mm. wide; inflorescence remaining pale.
   3. Axis of the inflorescence glabrous; leaves glabrous.
      4. Inflorescence lax, few-flowered..... Var. c. **corcovadensis**
      4. Inflorescence dense, at least toward the apex, many-flowered.
         5. Petals red. ..... Var. d. **glabrior**
         5. Petals yellowish white..... Var. e. **pallida**
   3. Axis of the inflorescence lepidote..... Var. f. **floccosa**

8a. *Pitcairnia flammea* var. *flammea*. FIGURE 8.

? *Tillandsia laevis* Vell. Fl. Fluminensis 133. 1825; Icon. 3: *pl. 126.* 1835. Not *Pitcairnia laevis* Willd. 1830.

? *Pitcairnia fulgens* Poit. Rev. Hortic. 3:157. Jan. 1836; Mez in DC. Monogr. Phan. 9:430. 1896.

Pitcairnia morelii Lem. Hort. Univ. 7:231, *pl.* 1846.

Pitcairnia laevis Beer, Bromel. 60. 1857. Not Willd. 1830.

Pitcairnia roezlii sensu Baker, Bot. Mag. 117: *pl. 7175.* 1891. Not E. Morr.

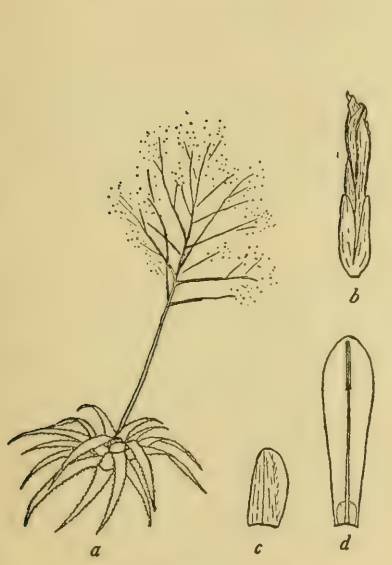

FIG. 7.

FIG. 8.

FIG. 7.—*Deuterocohnia meziana: a,* Habit (after M. B. Foster), × 1/40; *b,* flower, ×1; *c,* sepal, × 1; *d,* petal and stamen, × 1.

FIG. 8.—*Pitcairnia flammea* var. *flammea: a,* Habit, × 1/10; *b,* flower (after Botanical Register), × ½; *c,* sepal, × 1; *d,* petal, × 1.

BRAZIL: Cultivated (K, basis of *"Pitcairnia roezlii"* in Bot. Mag. *pl. 7175*). Cultivated, "Rivage" (G, basis of citation of *Pitcairnia fulgens* Poit. in DC. Monogr. Phan. 9:430).

ESPÍRITO SANTO: Cuibiça, *Foster* 894 (GH). Domingos Martins, *Foster* 233 (GH).

Rio de Janeiro: Itatiaia, *Brade* 17171 (RB); *Luiz* 20 (RB); *Foster* 127 (GH); *L. B. Smith* 2311 (GH). Japuiba, *Hoehne & Gehrt* (SP). (Juturnaiba) *Passarelli* 105 (R); 112 (R). Nova Friburgo, *Lutz* 1339 (R). Serra dos Orgãos, *Gardner* 5896 (BM); *Miers* 2856 (BM); 4078 (BM). Petrópolis, *Goés & Constantino* 23 (RB); *Pabst* 10080 (Pabst). Teresópolis, *Bailey* 1292 (BH, GH); 1301 (BH).

Distrito Federal: Cultivated in England, *Harrison* (CGE, type). Recreio dos Bandeirantes, *Lutz* 902 in part (R). Monte do Cochrane, *L. B. Smith* 1410 (GH). Pedra Dois Irmãos, *Rose & Russell* 20242 (NY, US). Chacara do Fonseca, *Occhioni* (RB). Pedra da Gavea, *Frazão* (RB); *Reitz* 4030 (HBR); *Smith & Mus. R* 6427 (R, US). Praia do Leblon, *Hoehne* (SP). Paineiras, Serra da Carioca, *Pabst* 10085 (Pabst). Avenida Niemeier, *Freire & Vidal* (R). Tijuca, *L. B. Smith* 2130 (GH); *Ule* 4692 in part (R). Restinga da Tijuca, *Machado* (RB).

São Paulo: Santos, *Mosén* 3246 (S). Ubatuba, Santos, *Edwall* (SP).

8b. ***Pitcairnia flammea*** var. ***roezlii*** (E. Morr.) L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 111. 1943.

Pitcairnia roezlii E. Morr. Belg. Hortic. 35: 285, *pls. 18, 19.* 1885.

Pitcairnia hypoleuca Mez in Mart. Fl. Bras. 3, pt. 3: 458. 1894.

Brazil: *Freyreis* (S). Cultivated in Liége, Belgium (LG, type).

Rio de Janeiro: Alto da Serra to Meio da Serra, *L. B. Smith* 2112 (GH). Meio da Serra, *Smith & Brade* 2292 (GH). Petrópolis, *Glaziou* 16474 (P, cotype of *Pitcairnia hypoleuca* Mez, GH neg. 2965). Old road below Petrópolis, *Smith & Mus. R.* 6493a (R, US). Mun. Nova Friburgo: Teodoro de Oliveira to Nova Friburgo, *Smith & Mus. R* 6680a (R, US).

Distrito Federal: Cachoeira, *Siqueira* (R). Rio de Janeiro, *Widgren* (S). Tijuca, *Horta & Brade* 14494 (RB).

8c. ***Pitcairnia flammea*** var. ***corcovadensis*** (Wawra) L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 112. 1943.

Pitcairnia corcovadensis Wawra, Oesterr. Bot. Zeitschr. 12: 384. 1862.

Rio de Janeiro: Teresópolis, *Brade* 16295 (RB); *Frazão* (RB). Mun. Santa Maria Madalena: Furquilha, *Santos Lima* 154 (RB, US neg. 3255).

Distrito Federal: Serra da Carioca, *Brade* 14380 (RB). Corcovado, *Ule* 4166 (R); *Wawra* I–501 (W, type). Pedra da Gavea, *Glaziou* 12237 (K, GH neg. 2543); *Smith & Mus. R* 6429 (R, US). Estrada do Redentor, *Occhioni* 40 (RB). Rio de Janeiro, *Widgren* 76 (S).

8d. ***Pitcairnia flammea*** var. ***glabrior*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 112. 1943.

? *Pitcairnia cinnabarina* A. Dietr. Allg. Gartenz. 18: 202. 1850.

Brazil: Cultivated in Berlin (P, GH neg. 2967).

Minas Gerais: Serra da Caparao, *Brade* 17127 (RB).

Rio de Janeiro: Teresópolis, *Brade* 9756 (R).

Distrito Federal: Tijuca, *Glaziou* 8021 (B (F neg. 11353), P).

São Paulo: Alto da Serra, *Hoehne* (SP, type; GH). Alto dos Marins, *Loefgren* (SP). Itapeva to Campos do Jordão, *Eugenio* 3444 (GH).

Paraná: Cadeado, *Dusén* 8834 (S, US); 11590 (S). São João, Serra do Mar, *Dusén* 7245 (S); 17299 (S, US).

8e. ***Pitcairnia flammea*** var. ***pallida*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 112, *pl. 115.* 1943.

Rio de Janeiro: Teresópolis, *Brade* 9533 (R); *Foster* 1015 (GH, type); *Sampaio* 2903 (R).

8f. ***Pitcairnia flammea*** var. ***floccosa*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 112. 1943.

Pitcairnia muscosa Mart. in R. & S. Syst. 7, pt. 2: 1240. 1830.

Pitcairnia selloana Baker, Handb. Bromel. 100. 1889.

Pitcairnia dietrichiana Wittm. Bot. Jahrb. 13, Beibl. 29: 15. 1891.

Pitcairnia pruinosa Mez in Mart. Fl. Bras. 3, pt. 3: 454. 1894. Not H. B. K. 1816.

Pitcairnia claussenii Mez in Mart. Fl. Bras. 3, pt. 3: 454. 1894.

Pitcairnia weddelliana Mez in DC. Monogr. Phan. 9: 434. 1896. Not Baker 1889.

Pitcairnia minarum Mez in Engl. Pflanzenreich IV. 32: 636. 1935.

Brazil: *Sellow* 1317 (B, type of *Pitcairnia selloana* Baker, F neg. 11381). Cultivated, *Hort. Petrograd* (G).

Ceará: Serra do Araripe, *Luetzelburg* (! Mez). Quixadá, *Luetzelburg* (! Mez).

Paraíba: Cajazeiras, *Luetzelburg* (! Mez). Pianco, *Luetzelburg* (! Mez).

Baía: Central and northeastern parts of the state, *Luetzelburg* (! Mez).

Espírito Santo: Mun. Castelo: Forno Grande, *Brade* 19992 (RB, US).

Minas Gerais: *Claussen* (K, isotype of *Pitcairnia claussenii* Mez, GH neg. 2573); 286 (BM). *Regnell* I–439 (S). *Weddell* 1556 (P, type of *Pitcairnia weddelliana* Mez, GH neg. 2979). Serra da Cachoeira do Campo, *Glaziou* 20524 (B, F neg. 11370). Caeté, Serra da Piedade, *Martius* 1236 (M, type of *Pitcairnia muscosa* Mart.). Serra de Caracol, *Mosén* 4434 (S).

Rio de Janeiro: (Fazenda da Rocinha, Pedra do Rio) *Freire & Xavier* 652 (R).

São Paulo: Atibaia, *Foster* 480 (GH, US); *Ostemayer* (SP, type). Pedra do Baú, São Bento do Sapucai, *Eugenio* 3905 (GH). Bragança Paulista, *Pires* (SP, US). Retiro de Laien, Cajurú, *Regnell* III–1252 (S, US). Itú, Santos, *Hemmendorff* 490 (S). Sorocaba, Santos, *Mosén* 2980 (S).

Paraná: Mun. Morretes: Pico Olimpo, *Hatschbach* 1758 (US).

Santa Catarina: Morro do Baú, Itajaí, *Reitz* C-2074 (HBR, US); 4596 (HBR); 5174 (! Reitz).

9. ***Pitcairnia albiflos*** Herb. Bot. Mag. 53: *pl. 2642.* 1826.

Rio de Janeiro: Niteroi, *Glaziou* 8023 (P); *Foster* 105 (GH).

Distrito Federal: *Regnell* (S). Pedra Bonita, *Brade* 11912 (R). Lagoa Rodrigo de Freitas, *Schwacke* (R, US neg. 3394). Corcovado, *Apparicio & Paulo* 213 (RB); *Widgren* 215 (S). Morro da Viuva, *Glaziou* 3629 (P). Copacabana, *Glaziou* 17281 (P). Morro Flamengo, *Miers* (BM). Gavea, *Guerra* (RB); *Smith & Mus. R* 6428 (R, US). Morro do Grajau, *Mello Filho* 545 (R, US).

10. ***Pitcairnia staminea*** Lodd. Bot. Cab. 8: *pl. 722.* 1823. Figure 9.

Pitcairnia canaliculata Baker, Handb. Bromel. 99. 1889.

Pitcairnia longicauda Hornem. ex Mez in Mart. Fl. Bras. 3, pt. 3: 445. 1894.

Pitcairnia albiflos sensu Mez in Mart. Fl. Bras. 3, pt. 3: *pl. 84.* 1894.

Pitcairnia staminea var. *longicauda* Mez in DC. Monogr. Phan. 9: 439. 1896.

Baía: Salvador to Vitória, *Sellow* bromel 41 (P, GH neg. 2968); *Sellow* 942 (BM). (Baía records unverified, probably from Espírito Santo.)
Epírito Santo: Vitória, *Foster* 232 (GH, R).
Rio de Janeiro: Jurujuba, *Glaziou* 8022 (B, F neg. 11373).
Distrito Federal: *Lay & Collie* (BM); *Weddell* 515 (P). Morro da Babilonia, *Hoehne* 28 (SP, GH neg. 7162). Morro do Flamengo, *Gardner* 846 (BM); *Miers* (BM). Gavea, *Frazão* (RB).

11. ***Pitcairnia glaziovii*** Baker, Handb. Bromel. 92. 1889.
Rio de Janeiro: Serra dos Orgãos, *Glaziou* 17282 (K, type (GH neg. 2604), B (F neg. 11359)).

12. ***Pitcairnia decidua*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 110, *pl. 114.* 1943.
Espírito Santo: Cultivated, *Reitz* 5676 (HBR). Cuibiça, *Foster* 893 (GH, type). Itabapoana, *Mazzini in Hoehne* (SP, US).
Minas Gerais: Araponga, *Bailey* 1036 (GH).

13. ***Pitcairnia anthericoides*** Mez in Mart. Fl. Bras. 3, pt. 3: 441. 1894.
Distrito Federal: São Cristovão, *Glaziou* 8024 (B, type, F neg. 11347); *Hoehne* 140 (SP); *Ule* (R).

14. ***Pitcairnia ulei*** L. B. Smith, Bol. Mus. Nac. Rio de Janeiro nov. ser. No. 15: 5, *pl. 1, figs. h-j.* 1952.
Goiás: Corumbá, *Ule* 788 (R, type, US neg. 3389).

15. ***Pitcairnia ensifolia*** Mez in Mart. Fl. Bras. 3, pt. 3: 436, *pl. 82.* 1894.
Goiás: Serra Dourada, *Schott* 2037 (W, type); *Ule* 511 (R, US neg. 3393); *Ule* 599-A (R, US neg. 3396).

16. ***Pitcairnia suaveolens*** Lindl. Bot. Reg. 13: *pl. 1069.* 1827.
Minas Gerais: *Saint-Hilaire* B[1] 2026 (P).
Rio de Janeiro: *R. Harrison* (CGE, type). Serra dos Orgãos, *Gardner* 5895 (BM, K).

17. ***Pitcairnia torresiana*** L. B. Smith, Bol. Mus. Nac. Rio de Janeiro nov. ser. No. 15: 4, *pl. 1, figs. f, g.* 1952.
Mato Grosso: *H. Smith* (R, type, US neg. 3398). Chapada, *Hoehne in Rondon* 3552, 3553 (R, US neg. 3392); *Malme* 1474-b (S).

18. ***Pitcairnia bradei*** Markgraf, Notizblatt 15: 215. 1940.
Minas Gerais: Montes Claros, *Markgraf, Brade & Mello Barreto* 3918 (B, type; photo RB).

19. ***Pitcairnia subpetiolata*** Baker, Journ. Bot. 19: 267. 1881.
Pitcairnia caldasiana Baker, Handb. Bromel. 100. 1889.
Pitcairnia burchellii Mez in Mart. Fl. Bras. 3, pt. 3: 436. 1894.
Pitcairnia sessiliflora Rusby, Bull. N. Y. Bot. Gard. 4: 457. 1907.
Amazonas: *Xavier* 245 (US).
Minas Gerais: Sabará, *Hoehne in Rondon* 6914 (R). Belo Horizonte, *Sampaio* 7153 (R). Caldas, *Regnell* III–1253 (S, US). Lagoa Santa, *Warming* 2174 (C, F neg. 22330). Mun. Ituiutaba: Carmo, *Macedo* 3215 (US).
Goiás: Cavalcante to Conceição, *Burchell* 8116 (K, type of *Pitcairnia burchellii* Mez, GH neg. 2569).

MATO GROSSO: Ponte de Pedra, *Hoehne in Rondon* 2138 (R). Camizão, *Foster* 1077 (GH). Campo Grande, *Foster* 1096 (GH).
ALSO: PERÚ, BOLIVIA.

20. ***Pitcairnia platypetala*** Mez in Mart. Fl. Bras. 3, pt. 3: 438. 1894.
BRAZIL: *Peters* (LE, type).

21. ***Pitcairnia undulata*** Scheidw. Allg. Gartenz. 10: 275. 1842.
AMAZONAS (?): Cultivated, *E. Morren* (LG); *Barry* (GH).

22. ***Pitcairnia sprucei*** Baker, Journ. Bot. 19: 303. 1881.
AMAZONAS: Manaus, *Spruce* 1653 (K, type (GH neg. 2568), BR); *Black* 47–1150a (IAN, US); *Ducke* (MG); *Krukoff* 9123 (NY); *Schwacke* 4009 (! Mez); *Ule* (! Mez). São Paulo de Olivença, *Krukoff* 9026 (NY).
ALSO: PERÚ.

FIG. 9.

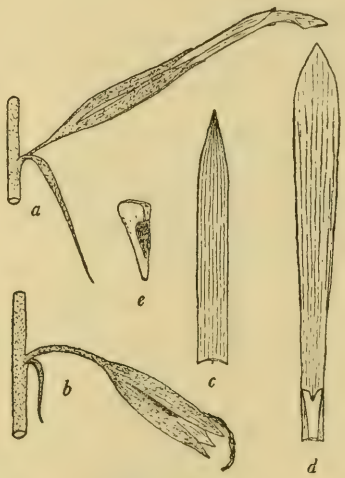

FIG. 10.

FIG. 9.—*Pitcairnia staminea: a,* Habit (after Botanical Cabinet), × 1/40; *b,* apex of leaf, × ¼; *c,* inflorescence, × ¼. (*b* and *c,* after Botanical Magazine.)

FIG. 10.—*Pitcairnia uaupensis: a,* Flower, × ½; *b,* flower with fruit, × ½; *c,* sepal, × 1; *d,* petal, × 1; *e,* seed, × 5.

23. ***Pitcairnia uaupensis*** Baker, Handb. Bromel. 93. 1889. FIGURE 10.
AMAZONAS: *Foster* 1134 (GH). Rio Uaupés, *Spruce* 2667 (K, type, GH neg. 2567). Camanaus, Rio Negro, *Luetzelburg in Rondon* 22654 (M). Rio Içana, *Leutzelburg in Rondon* 22512 (M); 22751 (R); 22782 (M, R). Rio Aiari, Cururu, *Luetzelburg in Rondon* 22533 (R). São Gabriel, Rio Negro, *Pires* 787 (IAN); *Schultes & López* 8788 (US). Rio Curicuriari, *Schultes & López* 8861 (US); 8932 (US). São Felipe, Rio Negro, *Schultes & López* 9594 (US). Manaus, *Corner* 24 (IAN).
ALSO: COLOMBIA.

24. ***Pitcairnia aphelandriflora*** Lem. Ill. Hortic. 16: Misc. 90. 1869.
Pepinia aphelandriflora André, Ill. Hortic. 17: 32, *pl. 5.* 1870.
BRAZIL: Probable, but not yet recorded.
PERÚ: Loreto: Rio Pumayacu (Balsapuerto), *Sandeman* 136 (K).

25. ***Pitcairnia amazonica*** Baker, Handb. Bromel. 117. 1889.
AMAZONAS: Serra Dimití, basin of the upper Rio Negro, *Schultes & López* 10009 (US).
ALSO: VENEZUELA.

26. ***Pitcairnia caricifolia*** Mart. in R. & S. Syst. 7, pt. 2: 1242. 1830. FIGURE 11.
Pitcairnia kegeliana Schlecht. Linnaea 24: 664. 1851.
Pitcairnia pauciflora Baker, Journ. Bot. 19: 230. 1881.
Pitcairnia subjuncta Baker, Handb. Bromel. 116. 1889.
AMAZONAS: Rio Amazonas, *Martius* (M, type, F neg. 18759). (Cachoeira Caranguejo) Rio Cauaburi, *Holt & Blake* 425 (GH, NY, US).
PARÁ: Rio Jaramacarú, *Ducke* (RB).
ALSO: COLOMBIA, VENEZUELA, GUIANA.

27. ***Pitcairnia anomala*** Hoehne in Comm. Linh. Telegr. Estrat. Matto-Grosso [Publ. 47], Annexo 5, Bot. pt. 9: 9, *pl. 161.* 1919.
PARÁ: Capipi Mission, Rio Cururu, *Hoehne in Rondon* 5151 (R, type).
MATO GROSSO: Rio Juruena above Salto Augusto, *Hoehne in Rondon* 5081 (R, US neg. 3390, 3391).

8. *Brocchinia* Schult. f.

Brocchinia Schult. f. in R. & S. Syst. 7, pt. 2: p. lxx, 1250. 1830.

Colombia and Venezuela.

1. Petals without a claw; filaments free or nearly so; ovary wholly inferior.
2. Axes of the inflorescence straight; leaf-blades only nerved, not reticulate; primary bracts subfoliaceous, to 18 cm. long..... 1. **B. tatei**
2. Axes of the inflorescence geniculate; leaf-blades reticulate; primary bracts broadly ovate, small; scape-bracts small, remote.
3. Scape about 3 mm. in diameter; leaves few, erect. (Fig. 12.) 2. **B. reducta**
3. Scape stouter; leaves many, spreading..... 3. **B. hechtioides**
1. Petals with a distinct claw; filaments of the second series much connate with the petals; ovary to one-fourth superior.
4. Inflorescence (including the ovaries) glabrous..... 4. **B. micrantha**
4. Inflorescence (including the ovaries) lepidote..... 5. **B. paniculata**

1. ***Brocchinia tatei*** L. B. Smith, Contr. Gray Herb. 161: 29, *pl. 4, fig. 1.* 1946.
Brocchinia cordylinoides sensu im Thurn ex N. E. Brown, Trans. Linn. Soc. Bot. II. 2: 256, 269. 1887.
BRAZIL: Probable, but not yet recorded.
VENEZUELA: Mount Roraima, *Tate* 514 (NY, type).

2. ***Brocchinia reducta*** Baker, Journ. Bot. 20:331. 1882. FIGURE 12.
BRAZIL: Probable, but not yet recorded.
BRITISH GUIANA: Kaieteur, *Jenman* 873 (K, type, GH neg. 1395); *Maguire & Fanshawe* 23198 (GH, NY).

3. ***Brocchinia hechtioides*** Mez, Repert. Sp. Nov. Fedde 12:414. 1913.
RIO BRANCO: Campo below Roraima, *Ule* 8561 (B, type, F neg. 11329).
ALSO: VENEZUELA, COLOMBIA.

FIG. 11.

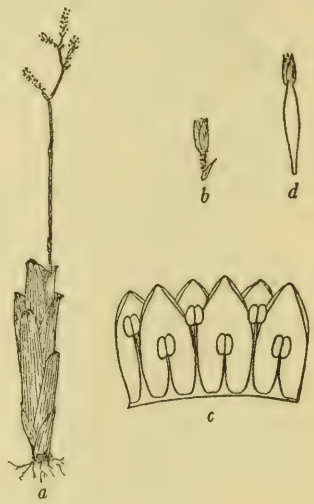

FIG. 12.

FIG. 11.—*Pitcairnia caricifolia: a,* Apex of leaf, × ½; *b,* inflorescence, × ½; *c,* sepal, × 1; *d,* petal, × 1; *e,* seed, × 5.
FIG. 12.—*Brocchinia reducta: a,* Habit, × 1/20; *b,* flower, × 1; *c,* perianth and stamens, × 5; *d,* fruit, × 1.

4. ***Brocchinia micrantha*** (Baker) Mez in Mart. Fl. Bras. 3, pt. 3:464. 1894.
Cordyline micrantha Baker, Gard. Chron. n. ser. 14, pt. 2:243, *fig. 47.* 1880.
Brocchinia cordylinoides Baker, Journ. Bot. 20:330. 1882.
BRAZIL: Probable, but not yet recorded.
BRITISH GUIANA: Kaieteur, *im Thurn* (K, type, GH neg. 1399); *Maguire & Fanshawe* 23300 (NY, US).

5. ***Brocchinia paniculata*** Schult. f. in R. & S. Syst. 7, pt. 2:1250. 1830.
BRAZIL: Probable, but not yet recorded.
COLOMBIA: Serra de Araracoara, *Martius* (M, type; F neg. 8632).

9. *Dyckia* Schult. f.

Dyckia Schult. f. in R. & S. Syst. 7, pt. 2: p. lxv, 1194. 1830.

Chiefly native of the dry open campos of Brazil with outlying species in Bolivia, Paraguay, Uruguay, and northern Argentina.

1. Pedicels 20 mm. long or more, much exceeding the floral bracts; leaves over 1 m. long, repand-serrate with teeth 4 mm. long..... 1. **D. pedicellata** [1]
1. Pedicels much less than 20 mm. long.
2. Inflorescence densely ferruginous-lepidote, amply tripinnate; leaves lepidote on both sides; floral bracts not more than 3 mm. long, much exceeded by the sepals..... 2. **D. tomentosa** [1]
2. Inflorescence not densely ferruginous-lepidote or else either less than tripinnate or the leaves glabrous above or the floral bracts more than 3 mm. long.
3. Filaments free above the common tube formed by the petals and stamens together. (Fig. 15.) To p. 59.
4. Floral bracts not more than 3 mm. long, exceeding the pedicels; inflorescence ample, 2–3-pinnate; sepals 5 mm. long or less.
5. Leaves densely lepidote; inflorescence completely glabrous; flowers dimorphic; sepals apiculate..... 3. **D. selloa**
5. Leaves nearly glabrous on both sides; inflorescence densely tomentose-lepidote; flowers all perfect; sepals acute.... 4. **D. maritima**
4. Floral bracts much more than 3 mm. long, or shorter than the pedicels (*Dyckia orobanchoides*); inflorescence simple or bipinnate.
6. Stamens distinctly exceeding the petals; floral bracts exceeding the pedicels.
7. Floral bracts broadly ovate or suborbicular, apiculate.
8. Racemes dense; sepals 3–4 mm. long; style nearly the same length as the ovary..... 5. **D. microcalyx**
8. Racemes lax; sepals 6–10 mm. long; style much shorter than the ovary. (Fig. 14.)..... 6. **D. leptostachya**
7. Floral bracts ovate, acuminate; inflorescence simple, few-flowered; sepals 6–7 mm. long..... 7. **D. tenuis**
6. Stamens equaling the petals or shorter, or the floral bracts shorter than the pedicels.
9. Sepals acute, subacute, or apiculate. To p. 58.
10. Inflorescence densely ferruginous-tomentose or ferruginous-lanate, simple to much branched; scape-bracts serrulate.
11. Margins of the sepals obscured by the dense lanate indument; petals barely exceeding the 15-mm.-long sepals; floral bracts entire; leaf-blades glabrous, the spines 3 mm. long. 8. **D. ursina**
11. Margins of the sepals clearly visible; petals greatly exceeding the 8 mm. long sepals; floral bracts serrulate; leaf-blades lepidote beneath, the spines 3–5 mm. long. (Fig. 15.) 9. **D. encholirioides**
10. Inflorescence pale-lepidote or pale-villous or glabrous; usually simple.

[1] *Dyckia pedicellata* and *D. tomentosa* are known from fruiting material only, thus necessitating the artificial treatment given above. It is not even wholly certain that they belong to the genus *Dyckia*.

12. Scape-bracts all with linear blades; leaves entire or subentire, over 40 cm. long; flowers few, 9 mm. long, half as long as the internodes..... 10. **D. burchellii**
12. Scape-bracts diverse, the upper ones bladeless; leaves serrulate, 7–30 cm. long; flowers usually numerous, much more than half as long as the internodes.
13. Floral bracts apiculate or abruptly acute; flowers 11–24 mm. long.
14. Inflorescence compound; pedicels 3 mm. long, exceeding the floral bracts; sepals 7 mm. long, fimbriate, tomentulose..... 11. **D. orobanchoides**
14. Inflorescence simple; pedicels either shorter than the floral bracts or over 3 mm. long.
15. Pedicels about 8 mm. long; inflorescence 2–3-flowered; sepals narrow, 8 mm. long; petals erect, ecarinate, not undulate..... 12. **D. biflora**
15. Pedicels much less than 8 mm. long; inflorescence more than 3-flowered; sepals broad, 8–12 mm. long; petals more or less spreading and carinate.
16. Upper scape-bracts shorter than the internodes. 13. **D. remotiflora**
16. Upper scape-bracts equaling or exceeding the internodes.
17. Axis of the inflorescence lepidote; inflorescence many-flowered..... 14. **D. vaginosa**
17. Axis of the inflorescence white-villous; inflorescence few-flowered..... 15. **D. choristaminea**
13. Floral bracts acuminate; flowers never more than 12 mm. long.
18. Upper scape-bracts equaling or exceeding the internodes; lower floral bracts usually exceeding the flowers; leaf-blades 25–35 mm. wide, short and thick; sepals to 8 mm. long..... 16. **D. brevifolia**
18. Upper scape-bracts shorter than the internodes; lower floral bracts shorter than the flowers; leaf-blades 10–20 mm. wide.
19. Upper scape-bracts entire; leaves to 12 cm. long.
20. Pedicels not more than 3 mm. long; leaf-blades serrulate, 1 cm. wide; sepals 6 mm. long. 17. **D. hilaireana**
20. Pedicels to 14 mm. long; leaf-blades entire, 2 cm. wide; sepals 9 mm. long. (Fig. 16.) 18. **D. heloisae**
19. Upper scape-bracts serrulate; leaves 15–40 cm. long.
21. Style almost as long as the ovary; leaf-blades covered on both sides with a membrane of coarse silvery scales; sepals 6 mm. long. 19. **D. argentea**
21. Style very short; leaf-blades glabrous above; sepals 5–7 (rarely to 9) mm. long. (Fig. 17.) 20. **D. tuberosa**

9. Sepals obtuse.
22. Petals ferruginous-tomentulose outside; petal-filament tube only 0.5 mm. long; styles elongate; plant 1 m. or more high; leaves repand-serrate with teeth 10 mm. long; inflorescence simple, dense; sepals 7–8.5 mm. long; petals suberect, ecarinate. ..... 21. **D. ferruginea**
22. Petals completely glabrous; petal-filament tube longer; styles usually short.
23. Upper scape-bracts equaling or exceeding the internodes.
24. Leaves short and thick, only 6–20 cm. long, but 8–35 mm. wide; inflorescence simple.
25. Floral bracts entire, narrowly lance-triangular; inflorescence soon glabrous; leaf-blades 25–35 mm. wide, glabrous above; sepals to 8 mm. long. 16. **D. brevifolia**
25. Floral bracts serrulate, broadly ovate; inflorescence densely lepidote; leaf-blades 8–10 mm. wide, cinereous-lepidote on both sides; sepals 9–10 mm. long. 22. **D. simulans**
24. Leaves long and narrow, 30–50 cm. long; inflorescence often compound.
26. Floral bracts to 25 mm. long, the lower ones equaling or exceeding the flowers; spines of the leaves 1–1.5 mm. long.
27. Inflorescence compound or with buds in the axils of the lower bracts; pedicels short and stout; petal-blades suborbicular, ecarinate; sepals 7–12 mm. long. 23. **D. trichostachya**
27. Inflorescence simple; pedicels 5 mm. long; petal-blades trapeziform, carinate; sepals 9 mm. long. 24. **D. eminens**
26. Floral bracts not more than 15 mm. long, the lower ones usually equaling the sepals; spines of the leaves to 4 mm. long.
28. Inflorescence brown-furfuraceous; leaf-blades to 45 mm. wide; sepals to 10 mm. long.... 25. **D. frigida**
28. Inflorescence soon glabrous; leaf-blades 17 mm. wide; sepals 7 mm. long..... 26. **D. elata**
23. Upper scape-bracts shorter than the internodes.
29. Inflorescence covered with a dark ferruginous tomentum, its axis strongly flexuous; flowers to 18 mm. long; sepals 8–11 mm. long; petals ecarinate; stigmas subsessile; leaves 5 dm. long, the blades subglabrous on both sides..... 27. **D. sordida**
29. Inflorescence sparsely pale-furfuraceous or glabrous.
30. Upper scape-bracts and floral bracts serrulate.
31. Pedicels short, much exceeded by the floral bracts; leaves 15–40 cm. long; sepals 5–7 (rarely to 9) mm. long. (Fig. 17.)..... 20. **D. tuberosa**

31. Pedicels 5 mm. long, about equaling the floral bracts; leaves 6–8 cm. long; sepals 5 mm. long. (Fig. 18.) 28. **D. macedoi**

30. Upper scape-bracts and floral bracts entire.

32. Pedicels about 7 mm. long; sepals 8 mm. long.

33. Leaves over 40 cm. long; inflorescence many-flowered. ..... 29. **D. linearifolia**

33. Leaves 4 cm. long; inflorescence 2–3-flowered. 12. **D. biflora**

32. Pedicels short and stout.

34. Floral bracts triangular-ovate, acuminate; sepals 6–8 mm. long.

35. Styles very short; leaves to 40 cm. long, the blades 15 mm. wide, the spines stout, to 6 mm. long. ..... 30. **D. elongata**

35. Styles elongate; leaves 14–20 cm. long, the blades 20–35 mm. wide, the spines small and inconspicuous. ..... 31. **D. distachya**

34. Floral bracts broadly ovate to subreniform, apiculate.

36. Sepals 3–4 mm. long; flowers 6–13 mm. long; racemes dense..... 5. **D. microcalyx**

36. Sepals 6–10 mm. long; flowers 13–23 mm. long; racemes lax. (Fig. 14.)... 6. **D. leptostachya**

3. Filaments connate and forming a definite ring above their junction with the petals. (Fig. 20.)

37. Petals without a distinct claw and blade, narrowly elliptic; leaf-blades erect, 13–32 cm. long, the spines nearly straight, 2 mm. long; scape-bracts remote; inflorescence simple, lax; sepals 6–8 mm. long; filaments wholly connate; stigmas subsessile. 32. **D. horridula**

37. Petals with a sharp distinction between the narrow claw and broad blade.

38. Sepals acute or apiculate.

39. Scape-bracts (or the great majority of them) equaling or exceeding the internodes.

40. Pedicels 15 mm. long, stout; inflorescence much branched; leaf-blades 3 cm. wide; scape-bracts serrulate; floral bracts exceeding the sepals; sepals 9–10 mm. long. 33. **D. princeps**

40. Pedicels much less than 15 mm. long.

41. Leaves equally lepidote on both sides.

42. Sepals 11 mm. long; inflorescence branched or with buds in the axils of the lower bracts; leaves nearly 50 cm. long, the blades 30 mm. wide, laxly serrate. 34. **D. cinerea**

42. Sepals 6 mm. long; inflorescence simple; leaves 9–17 cm. long, the blades 8–10 mm. wide, repand-serrate. 35. **D. fosteriana**

41. Leaves much more lepidote on the under side than on the upper; inflorescence simple.

43. The leaves only 5–6 cm. long, the spines 3 mm. long; sepals 7–8 mm. long.
44. Filament-tube continued only 2 mm. above the junction with the petals; scape-bracts ovate with linear blades, obscurely serrulate..... 36. **D. schwackeana**
44. Filaments highly connate above the junction with the petals; scape-bracts acuminate, densely serrulate. 37. **D. densiflora**

43. The leaves 17–50 cm. long.
45. Sepals 16 mm. long; inflorescence soon glabrous. 38. **D. dusenii**
45. Sepals 6–9 mm. long; inflorescence persistently furfuraceous.
46. Filaments not connate for more than 2 mm. above the petal-stamen tube; pedicels to 4 mm. long; sepals 7–9 mm. long; petal-blades suborbicular. (Fig. 19.) 39. **D. minarum**
46. Filaments high-connate above the petal-stamen tube.
47. Sepals 8–9 mm. long, cucullate; petals 16 mm. long, their blades rhombic..... 40. **D. reitzii**
47. Sepals 6 mm. long, mucronulate; petals 12 mm. long, their blades broadly obovate. 41. **D. lagoensis**

39. Scape-bracts shorter than the internodes.
48. Flowers subsessile; sepals 4–6 mm. long; filaments high-connate above the petal-stamen tube.
49. Inflorescence subdense, 4–5 times shorter than the scape; wing of the ovule narrowly falciform... 42. **D. consimilis**
49. Inflorescence lax, nearly as long as the scape; wing of the ovule broadly rounded..... 43. **D. rariflora**
48. Flowers distinctly pedicellate.
50. Floral bracts and scape-bracts serrulate.
51. Inflorescence subglabrous; lower floral bracts about equaling the 9 mm. long sepals..... 44. **D. pseudococcinea**
51. Inflorescence furfuraceous; lower floral bracts exceeding the sepals.
52. Leaves laxly serrate, much more lepidote on the under side; sepals 7–9 mm. long..... 39. **D. minarum**
52. Leaves repand-serrate, equally lepidote on both sides; sepals 6 mm. long..... 35. **D. fosteriana**
50. Floral bracts and scape-bracts entire; sepals 6–8 mm. long.
53. Filaments short-connate above the petal-stamen tube. 45. **D. dissitiflora**
53. Filaments almost completely connate... 46. **D. warmingii**

38. Sepals obtuse.
54. Scape-bracts all exceeding the internodes; filaments connate for 2 mm. above the petal-stamen tube.
55. Sepals 12 mm. long; leaves 50 cm. long; inflorescence branched or with buds in the axils of the lower bracts. 47. **D. bracteata**

55. Sepals not more than 7 mm. long; leaves 6 cm. long; inflorescence simple..... 36. **D. schwackeana**
54. Scape-bracts, or at least the upper ones, shorter than the internodes.
56. Stamens exserted; inflorescence glabrous or subglabrous; filaments high-connate above the petal-stamen tube.
57. Pedicels stout, angled, 2–4 mm. long, 2 to 3 times shorter than the floral bracts; sepals 5–7 mm. long. 48. **D. niederleinii**
57. Pedicels slender, 4–5 mm. long, almost as long as the floral bracts; sepals 8–9 mm. long..... 49. **D. lutziana**
56. Stamens shorter than the petals; inflorescence usually lepidote.
58. Filaments short-connate above the petal-stamen tube; leaves 15–20 cm. long.
59. Floral bracts acuminate, much exceeding the pedicels; inflorescence simple; sepals 8 mm. long. 50. **D. saxatilis**
59. Floral bracts apiculate, barely exceeding the pedicels; inflorescence usually compound; sepals 6 mm. long. 51. **D. maracasensis**
58. Filaments high-connate above the petal-stamen tube.
60. Flowers subsessile; stigmas subsessile.
61. Floral bracts to 10 mm. long; leaves 50 cm. long; scape-bracts entire..... 52. **D. uleana**
61. Floral bracts not over 5 mm. long; leaves only 5 cm. long; scape-bracts obscurely serrulate. 42. **D. consimilis**
60. Flowers distinctly pedicellate; sepals 6–6.5 mm. long; leaves 25–40 cm. long.
62. Upper scape-bracts serrulate; pedicels short and stout but distinct; inflorescence lax..... 53. **D. sellowiana**
62. Upper scape-bracts entire; style half as long as the ovary.
63. Floral bracts 9 mm. long, much exceeding the short pedicels; inflorescence simple or compound. (Fig. 20.) ..... 54. **D. weddelliana**
63. Floral bracts 3 mm. long, about half as long as the pedicels; inflorescence simple.... 55. **D. racemosa**

1. ***Dyckia pedicellata*** Mez in DC. Monogr. Phan. 9: 515. 1896.
MINAS GERAIS: Serra dos Cristais, Diamantina, *Glaziou* 19198a (! Mez); *Schwacke* 8413 (B, type, F neg. 11444).
Identity with the genus *Dyckia* is uncertain because of the lack of petals and stamens.

2. ***Dyckia tomentosa*** Mez in DC. Monogr. Phan. 9: 515. 1896.
RIO GRANDE DO SUL: *Sellow* Bromel. No. 73 (P, type, GH neg. 3003).

3. ***Dyckia selloa*** (C. Koch) Baker, Handb. Bromel. 136. 1889.
Prionophyllum selloum C. Koch, Ind. Sem. Hort. Berol. for 1873, App. 4: 7. 1874.
Dyckia grandifolia Baker, Handb. Bromel. 136. 1889.

Dyckia macracantha Baker, Handb. Bromel. 137. 1889.
Dyckia myriostachya Baker, Handb. Bromel. 137. 1889.

RIO GRANDE DO SUL: *Gaudichaud* 276 (P, GH neg. 3008). Rio Pardo to Caçapava, *Sellow* 1615 (! Mez).

ALSO: URUGUAY.

4. ***Dyckia maritima*** Baker, Handb. Bromel. 136. 1889. FIGURE 13.
Prionophyllum maritimum Mez in DC. Monogr. Phan. 9: 542. 1896.

SANTA CATARINA: Mun. Araranguá: Peroba, *Reitz* C-755 (GH, HBR); C-909 (GH, HBR, US); 1369 (R). Mun. Itajaí: Cabeçudas lighthouse, *Reitz* (! Reitz).

RIO GRANDE DO SUL: *Tweedie* (K, type). Estação Capela, *Eugenio* 2640 (GH). Salvador, *Eugenio* 2640-b (GH). Tôrres, *Reitz* 4427 (HBR); 5000 (! Reitz); *Smith & Reitz* 5824 (R, RB, US). Mun. São Leopoldo: Morro Sapucaia, *Eugenio* 220 (SP); 2640-a (GH).

5. ***Dyckia microcalyx*** Baker, Handb. Bromel. 133. 1889.
Dyckia microcalyx var. *inermis* Hassler, Ann. Conserv. & Jard. Bot. Genève 20: 307. 1919.
Dyckia microcalyx var. *micrantha* Hassler, Ann. Conserv. & Jard. Bot. Genève 20: 308. 1919.

PARANÁ: Iguaçu, *J. G. Kuhlmann* (RB).

MATO GROSSO: Campo Grande, *Foster* 1094 (GH).

ALSO: PARAGUAY.

6. ***Dyckia leptostachya*** Baker, Gard. Chron. 1884, pt. 2: 198. 1884. FIGURE 14.
Dyckia conspicua Mez in DC. Monogr. Phan. 9: 513. 1896.
Dyckia hassleri Mez, Bull. Herb. Boiss. II. 3: 134. 1903.
Dyckia rojasii Mez, Repert. Sp. Nov. Fedde 16: 67. 1919.
Dyckia apensis Mez, Repert. Sp. Nov. Fedde 16: 69. 1919.
Dyckia longifolia Mez, Repert. Sp. Nov. Fedde 16: 69. 1919.
Dyckia remotiflora var. *montevidensis* sensu falso, L. B. Smith, Anais Bot. Herb. Barbosa Rodrigues 2: 45. 1950.

MINAS GERAIS: Mun. Ituiutaba: *Macedo* 11 (US). Campos de São Vicente, *Macedo* 1286 in part (RB). Ituiutaba, *Macedo* 1242 (US).

MATO GROSSO: Amolar, Rio Paraguai, *Hoehne in Rondon* 2282 (R). Corumbá, *Hoehne in Rondon* 3548 (R); 5796 (R, US neg. 3606). Rio Pardo, *Romboust* (SP). Mun. Aquidauana: Camizão, *Foster* 1080 (GH).

PARANÁ: Cultivated, *Kew* (K, type, GH neg. 2546).

SANTA CATARINA: Mun. Araranguá: Sombrio, *Reitz* 3815 (HBR); 3835 (HBR); 4282 (HBR).

RIO GRANDE DO SUL: Pôrto Alegre, *Eugenio* 2258 (GH). Mun. Tôrres: Campo Bonito, *Reitz* 4411 (HBR); *Smith & Reitz* 5846 (R, RB, US).

ALSO: PARAGUAY, ARGENTINA.

7. ***Dyckia tenuis*** Mez in Mart. Fl. Bras. 3, pt. 3: 484. 1894.
Dyckia morreniana Mez in Mart. Fl. Bras. 3, pt. 3: 496. 1894.
Dyckia kuntzeana Mez in DC. Monogr. Phan. 9: 523. 1896.

BRAZIL: Cultivated, *Jard. Bot. Liége* (LG, type of *Dyckia morreniana* Mez).

GOIÁS: Cavalcante to Conceição, *Burchell* 7996 (K). Mission de Douro, *Gardner* 3479 (K, isotype, K neg.).

MATO GROSSO: *Kuntze* (NY, type of *Dyckia kuntzeana* Mez). São Luiz de Cáceres, Jacobina, *Hoehne in Rondon* 575 (R, US neg. 3602).

8. ***Dyckia ursina*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 109, *pl. 111.* 1943.

MINAS GERAIS: Mun. Jaboticatubas: Serra do Cipó, *Foster* 636 (GH, type, US neg. 4053). Serra do Cipó, 5 km. north of Chapeu de Sol, *Smith & Mus. R* 6697 (R, US).

9. ***Dyckia encholirioides*** (Gaud.) Mez in DC. Monogr. Phan. 9: 507. 1896.

1. Axes of the inflorescence and the sepals yellow..... Var. a. **encholirioides**
1. Axes of the inflorescence and the sepals red..... Var. b. **rubra**

FIG. 13.

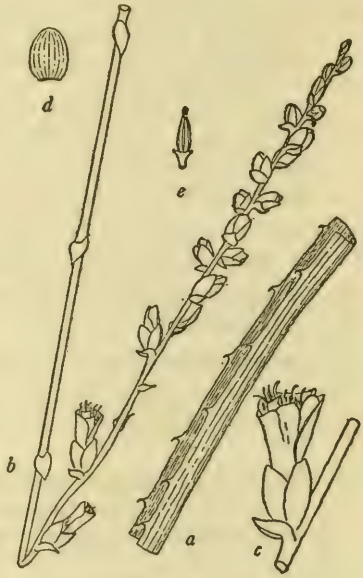

FIG. 14.

FIG. 13.—*Dyckia maritima: a,* Habit; *b,* apex of leaf, × ¼; *c,* branch of inflorescence, × ¼; *d,* flower, × 2; *e,* sepal, × 2; *f,* petals and stamens, × 2; *g,* pistil, × 2.

FIG. 14.—*Dyckia leptostachya: a,* Section of leaf, × ½; *b,* scape and inflorescence, × ½; *c,* flower, × 1; *d,* sepal × 1; *e,* pistil × 1.

9a. ***Dyckia encholirioides*** var. ***encholirioides.*** FIGURE 15.

Garrelia encholirioides Gaud. Atl. Voy. Bonite *pl. 115.* 1851.

Dyckia catharinensis C. Koch, Ind. Sem. Hort. Berol. for 1873, App. 4: 4. 1874.

? *Dyckia catharinensis* var. *dentata* Wittm. Bot. Jahrb. 13, Beibl. 29: 17. 1891.

BRAZIL: Coast, *Tweedie* 795 (K); 796 (K).

SÃO PAULO: Ilha Comprida, Iguapé, *Löfgren & Edwall* (SP).

PARANÁ: Mun. Guaratuba: Morro de Brajatúba, *Frenzel* (Inst. Biol. Pesq. Tec.). Guaratuba, *Reitz* 4247 (HBR); *Stellfeld* (Paran.). Mun. Paranaguá: Caiobá, *Foster* 435 (GH); *M. Kuhlmann* (SP); *Tessmann* (Paran., US). Matinhos, *Hatschbach* 2725 (US).

SANTA CATARINA: Mun. Araquari: Itajuba, *Reitz* 3682 (! Reitz); 3896 (! Reitz). Mun. Florianópolis: Ilha de Santa Catarina: *Gaudichaud* 130 (P, type, GH neg. 2993). Armação do Sul, *Rohr* 654 (LIL). Canavieiras, *Reitz* 4264 (HBR). Mun. Itajaí: Cabeçudas, *Reitz* (HBR); 3682-a (HBR, US). Mun. São Francisco do Sul: Itapema, *Hoehne* (GH, SP). Praia Grande, *Reitz* 3837 (! Reitz). Mun. São José: Mainland opposite Desterro [Florianópolis], *Schenk* 456 (! Mez, type of *Dyckia catharinensis* var. *dentata* Wittm.).

RIO GRANDE DO SUL: *Sellow* (R).

9b. ***Dyckia encholirioides*** var. ***rubra*** (Wittm.) Reitz, Anais Bot. Herb. Barbosa Rodrigues 3: 108. 1951.

Dyckia rubra Wittm. Bot. Jahrb. 13, Beibl. 29: 16. 1891.

SANTA CATARINA: Laguna, *Reitz* 4027 (HBR); *Reitz & Klein* 47 (HBR); *Smith & Reitz* 5970 (US). Mun. Florianopolis: Desterro [Florianopolis], Ilha de Santa Catarina, *Schenk* 619 (? herb., type). Mun. Imarui: Vila Nova to Mirim, *Reitz* 3700 (HBR). Mun. Palhoça: Campo de Massiambu, *Reitz & Klein* 974 (! Reitz). Paulo Lopes, *Reitz & Klein* 38 (HBR).

10. ***Dyckia burchellii*** Baker, Handb. Bromel. 131. 1889.

GOIÁS: Between Conceição and Natividade, *Burchell* 8178 (K, type; BR).

11. ***Dyckia orobanchoides*** Mez in Mart. Fl. Bras. 3, pt. 3: 475. 1894.

BRAZIL: *Tamberlik* (W, type).

12. ***Dyckia biflora*** Mez in Mart. Fl. Bras. 3, pt. 3: 486. 1894.

MINAS GERAIS: Serra do Cipó, *Glaziou* 19919 (B, type, F. neg. 11428); *Schwacke* 8410 (! Mez). Mun. Diamantina: Guinda, *Mello Barreto* 9519 (R).

13. ***Dyckia remotiflora*** Otto & Dietr. Allg. Gartenz. 1: 129. 1833.

1. Floral bracts and upper scape-bracts with broad apiculate summits.
   2. Sepals cucullate, 8–10 mm. long; petals 17–23 mm. long. Var. a. **remotiflora**
   2. Sepals nearly or quite straight, 6–8 mm. long; petals 11–17 mm. long. Var. b. **montevidensis**
1. Floral bracts and upper scape-bracts acuminate..... Var. c. **angustior**

13a. ***Dyckia remotiflora*** var. ***remotiflora.***

Dyckia rariflora sensu Lindl. Bot. Reg. 21: *pl. 1782.* 1836. Not Schult. f. 1830.

Dyckia rariflora var. *"D. remotiflora"* Baker, Handb. Bromel. 132. 1889.

Dyckia rariflora var. *cunninghami* Baker, Handb. Bromel. 132. 1889.

MINAS GERAIS: Mun. Ituiutaba: São Vicente, *Macedo* 1286 in part (SP).

SÃO PAULO: Araraquara, *Loefgren* (SP). Piraçununga, *Rachi-d* (SP, inflorescence with one lateral branch).

PARANÁ: *Miers* 2518 (BM).

ALSO: URUGUAY, ARGENTINA.

13b. ***Dyckia remotiflora*** var. ***montevidensis*** (C. Koch) L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 108. 1943.

Dyckia montevidensis C. Koch, Ind. Sem. Hort. Berol. for 1873, App.: 4. 1874.

Dyckia rariflora var. *"D. montevidensis"* Baker, Handb. Bromel. 132. 1889.

Dyckia rariflora var. *montevidensis* Baker ex Hauman & Vanderveken, An. Mus. Nac. Hist. Nat. Buenos Aires 29:239. 1917.

BRAZIL: *Sellow* Bromel. 43 (P); 46 (US); 48 (P); 53 (P); 57 (P).

RIO GRANDE DO SUL: *Gaudichaud* 278 (P). Rio Irapuá, east of Caçapava, *Sellow* 3247 (B, F neg. 11442). Serra dos Tapes, Cascata, *Lindman* A-935 (S). Pôrto Alegre, *Eugenio* 130 (R); 218 (SP); 2490 (GH); *Jürgens* 356 (US); *Palacios & Cuezzo* 656 (LIL).

ALSO: URUGUAY, PARAGUAY, ARGENTINA.

13c. ***Dyckia remotiflora*** var. ***angustior*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1:108. 1943.

BRAZIL: Cultivated at Berlin, *Hennings* (B, F neg. 11425).

RIO GRANDE DO SUL: Salto Alegre, *Bornmueller* 351 (GH, type).

14. ***Dyckia vaginosa*** Mez in Mart. Fl. Bras. 3, pt. 3:490. 1894.

Dyckia rariflora sensu Graham, Bot. Mag. 62: *pl. 3449*. 1835. Not Schult. f. 1830.

SÃO PAULO: Serra do Picu, *Glaziou* 15497 (B, type, F neg. 11453).

RIO GRANDE DO SUL: *Sellow* Bromel. 305 (R).

ALSO: URUGUAY.

Possibly not more than a variety of *Dyckia remotiflora* Otto & Dietr.

15. ***Dyckia choristaminea*** Mez, Repert. Sp. Nov. Fedde 16:71. 1919.

RIO GRANDE DO SUL: Cultivated in Berlin, *Malme* (B, type). Pôrto Alegre, *Lindman* A-439 (S); *Eugenio* 2249 (GH); *Rambo* (Anchieta, US).

16. ***Dyckia brevifolia*** Baker in Saund. Ref. Bot. 4: *pl. 236*. 1871.

Dyckia sulphurea C. Koch, Ind. Sem. Hort. Berol. for 1873, App. 4:3. 1874.

Dyckia princeps Hort. ex Mez in Mart. Fl. Bras. 3, pt. 3:493. 1894. In part, not Lem. 1853.

Dyckia gemellaria E. Morr. ex Mez in Mart. Fl. Bras. 3, pt. 3:494. 1894.

BRAZIL: Cultivated, *Atkinson* 29 (GH); 30 (GH); *Bailey* (BH); *Hennings* (B, F neg. 11450); *E. Morren* (LG, type of *Dyckia gemellaria* E. Morr., GH neg. 2830).

MINAS GERAIS: *Saint-Hilaire* (! Mez).

DISTRITO FEDERAL: Rio de Janeiro, cultivated ?, *Glaziou* 331 (! Mez).

SÃO PAULO: São Paulo, *Glaziou* 15496 (K, GH neg. 2544).

SANTA CATARINA: Blumenau, *F. Mueller* (! Mez). Salto, Blumenau, *Reitz* 3707 (HBR, US). Rio Itajaí Açu, Encano to Indaial, *Reitz* 3988 (HBR, US).

17. ***Dyckia hilaireana*** Mez in DC. Monogr. Phan. 9:530. 1896.

MINAS GERAIS: *Saint-Hilaire* 924 (P, type, GH neg. 3011). Serra do Cipó, *A. P. Duarte* 2135 (RB, US neg. 3348).

18. ***Dyckia heloisae*** L. B. Smith, p. 26, fig. 16.

MINAS GERAIS: Mun. Jaboticatubas: Serra do Cipó, 5 km. north of Chapeu de Sol, *L. B. Smith & Mus. R* 6698 (US, type, R).

19. ***Dyckia argentea*** Mez in Mart. Fl. Bras. 3, pt. 3:492. 1894.

MINAS GERAIS: São João del Rei, *Glaziou* 17279 in part (C ! Mez); 17280a (B, type, F neg. 11427).

20. ***Dyckia tuberosa*** (Vell.) Beer, Bromel. 157. 1857.

1. Floral bracts shorter than the flowers and usually shorter than the sepals, lance-triangular. ..... Var. a. **tuberosa**

1. Floral bracts exceeding the lowest flowers, narrowly triangular. Var. b. **deltoidea**

20a. ***Dyckia tuberosa*** var. ***tuberosa***. FIGURE 17.

Tillandsia tuberosa Vell. Fl. Fluminensis 135. 1825; Icon. 3: *pl. 136.* 1835.

Dyckia coccinea Mez in Mart. Fl. Bras. 3, pt. 3: 491. 1894.

MINAS GERAIS: Carmo do Rio Claro, *Mello Filho* 628 (R). Mun. Ouro Preto: Casa Branca, *Williams* 8121 (GH).

FIG. 15.

FIG. 16.

FIG. 15.—*Dyckia encholirioides* var. *encholirioides*: *a*, Leaf-blade, × 1/10; *b*, inflorescence, × 1/10; *c*, flower, × 1; *d*, sepal, × 1; *e*, petals and stamens, × 1.

FIG. 16.—*Dyckia heloisae*: *a*, Habit, × 1/10; *b*, flower and capsule, × 1; *c*, seed, × 2.

SÃO PAULO: Atibaia, *Foster* 348 (GH). Campinas, *Viegas* (GH, IAC); *Viegas & Lima* (IAC). Campo Grande, *Edwall* (SP). Itirapina, *Toledo & Gehrt* (GH, SP). Santo Amaro, *Krieger* 182 (SP). São José dos Campos, *Loefgren* (S). Serra da Cunha, *Kuhlmann & Gehrt* (GH, SP). Mun. São Paulo: Bosque da Saude, *Brade* 5926 (S). Ipiranga, *Luederwaldt* (SP, GH neg. 7166); *Hoehne* (GH, SP). Jabaquára, *Brade* (SP). São Paulo, *Sellow* E-23 (B, type of *Dyckia coccinea* Mez, F neg. 11430); *Pickel* 5479 (US); *Tamandaré* 196 (RB). Vila Ema, *Brade* (GH, SP). Vila Mariana, *Usteri* (SP).

PARANÁ: Morungava, *Dusén* 16522 (S). Turma 23, *Jönsson in Dusén* 1323a (S). Mun. Palmeira: Rio do Salto, *Hatschbach* 2620 (US).

SANTA CATARINA: Curitibanos, *Reitz* 4673 (HBR).

At first glance it seems inconsistent to associate a Vellozo name with a

species that has not been recorded from the state of Rio de Janeiro. However, Vellozo collected around Pharmacópolis (now Parati) so that the collection of Kuhlmann and Gehrt from the Serra da Cunha in São Paulo could be a topotype.

20b. ***Dyckia tuberosa*** var. ***deltoidea*** (L. B. Smith) L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 2: 119. 1950.

Dyckia coccinea var. *deltoidea* L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 107. 1943.

PARANÁ: Jaguariaíva, *Dusén* 10373 (BM, K, NY, S); 17357 (GH, type; S).

21. ***Dyckia ferruginea*** Mez in DC. Monogr. Phan. 9: 533. 1896.

MATO GROSSO: Jacobina, *Kuntze* (NY, type). Mun. Aquidauana: Camizão, *Foster* 1082 (GH, US).

22. ***Dyckia simulans*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 108, *pl. 110.* 1943.

MINAS GERAIS: Pico da Piedade, Belo Horizonte, *Foster* 570 (GH, type, US neg. 4055).

23. ***Dyckia trichostachya*** Baker, Handb. Bromel. 133. 1889.

Dyckia micracantha Baker, Handb. Bromel. 135. 1889.

MINAS GERAIS: *Sellow* Bromel. 59 (P, type, GH neg. 3002); *Sellow* 1097 (B, type of *Dyckia micracantha* Baker, F neg. 11452). Itacolomi, *Lauro* (R).

FIG. 17.

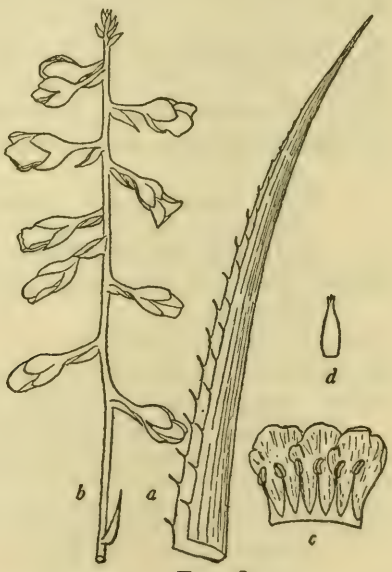

FIG. 18.

FIG. 17.—*Dyckia tuberosa* var. *tuberosa: a,* Habit, × 1/10; *b,* flower, × 1; *c,* sepal, × 1; *d,* petals and stamens, × 1; *e,* pistil, × 1.

FIG. 18.—*Dyckia macedoi: a,* Leaf-blade, × 1; *b,* inflorescence, × 1; *c,* petals and stamens, × 2; *d,* pistil, × 2.

24. ***Dyckia eminens*** Mez, Bot. Jahrb. 30, Beibl. 67: 5. 1901.

GOIÁS: *Glaziou* 22192a (B, type).

Not verified. Characters dubious because the original description is self-contradictory. According to the measurements the lower floral bracts exceed the flowers.

25. ***Dyckia frigida*** (Linden) Hook. f. Bot. Mag. 103: *pl. 6294.* 1877.

Pourretia frigida Linden, Catal. No. 8: 31. 1853.

BRAZIL: Cultivated, *E. Morren* (LG type collection?).

PARANÁ: Ponta Grossa, *Dusén* (S). Vila Velha, *Dusén* 2801 (R); 4059 (R); 14936 (S); 15829 (S); *Foster* 417 (GH); *M. Kuhlmann* (SP, US).

26. ***Dyckia elata*** Mez in DC. Monogr. Phan. 9: 508. 1896.

MINAS GERAIS: Serra de Antonio Pereira, *Schwacke* 8739 (B, type, F neg. 11432).

27. ***Dyckia sordida*** Baker, Handb. Bromel. 132. 1889.

MINAS GERAIS: Itambé, *Saint-Hilaire* 402 (P, type, GH neg. 3004). Serra do Cipó, *Duarte* 2106 (RB, US neg. 3350); *Foster* 623 (G, US).

28. ***Dyckia macedoi*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 2: 195. 1952. FIGURE 18.

MINAS GERAIS: Lagoa Santa, *Pires & Black* 2887 (IAN). Mun. Conceição do Mato Dentro: Serra do Cipó, *Macedo* 2974 (US, type, US neg. 3651).

29. ***Dyckia linearifolia*** Baker, Handb. Bromel. 131. 1889.

MINAS GERAIS: *Saint-Hilaire* 1010 (P, type, GH neg. 3010).

30. ***Dyckia elongata*** Mez in DC. Monogr. Phan. 9: 529. 1896.

BRAZIL: *Sellow* 58 (P, GH neg. 2989).

BAÍA: Milagres to Maracás, *Foster* 2439 (US).

31. ***Dyckia distachya*** Hassler, Ann. Conserv. & Jard. Bot. Genève 20: 308. Feb. 1919.

Dyckia distachya forma *induta* Hassler, Ann. Conserv. & Jard. Bot. Genève 20: 309. Feb. 1919.

Dyckia interrupta Mez, Repert. Sp. Nov. Fedde 16: 70. Nov. 1919.

SANTA CATARINA: Mun. Concordia: Estreito do Uruguai, *Reitz* 3818-a (HBR, US).

ALSO: PARAGUAY, ARGENTINA.

32. ***Dyckia horridula*** Mez, Bot. Jahrb. 30, Beibl. 67: 5. 1901.

GOIÁS: Near Goiás, *Burchell* 6791 (K). Rio Descoberto, near Capelinha, *Glaziou* 22194 (B, type (F neg. 11435), K).

MATO GROSSO: São Jeronimo, *Lindman* 2707b (S). Serra das Araras, *Lindman* 2707c (S).

33. ***Dyckia princeps*** Lem. Jard. Fleur. 3: *pls. 224, 225.* 1853.

Dyckia altissima sensu Baker, Handb. Bromel. 134. 1889. In part, not Lindl.

MINAS GERAIS: Described from material cultivated in Brussels. Apparently no specimens preserved.

34. ***Dyckia cinerea*** Mez in Mart. Fl. Bras. 3, pt. 3: 469. 1894.

BRAZIL: *Glaziou* 18570 (B, type (F neg. 11429), K).

35. ***Dyckia fosteriana*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 107, *pl. 106.* 1943.

PARANÁ: Mun. Campo Largo: Serra São Luiz de Puruna, *Foster* 1154 (GH, type, US neg. 4098); 2526 (US); *Hatschbach* 1567 (US).

By error the type locality was given originally as "Santa Catarina."

36. ***Dyckia schwackeana*** Mez in Mart. Fl. Bras. 3, pt. 3: 478. 1894.

MINAS GERAIS: Pico de Itabira do Campo, *Glaziou* 18572 (B, F neg. 11448); *Schwacke* (R); *Schwacke* 5857 (B, type).

37. ***Dyckia densiflora*** Schult. f. in R. & S. Syst. 7, pt. 2: 1194. 1830.

MINAS GERAIS: Morro da Vila Rica (near Ouro Preto), *Martius* (M, type).

Not verified but see Mez in Mart. Fl. Bras. 3, pt. 3: *pl. 90, fig. 2.*

38. ***Dyckia dusenii*** L. B. Smith, Contr. Gray Herb. 98: 6, *pl. 2.* 1932.

PARANÁ: Pôrto Amazonas, *Dusén* 18081 (S, type). Serrinha, *Dusén* 8686, 8996 (S). Tamandaré, *Jönsson ex Dusén* 1029a (GH, S).

39. ***Dyckia minarum*** Mez in Mart. Fl. Bras. 3, pt. 3: 483, *pl. 91.* 1894. FIGURE 19.

BRAZIL: *Sellow* Bromel. 46 (P); 55 (P); 56 (P); *Weir* (K); *Widgren* (S).

ESPÍRITO SANTO: Serra da Caparao, *Mexia* 4082-a (UC).

MINAS GERAIS: *Claussen* 148 (P); *Mosén* 4443 (S). Barbacena, *Glaziou* 18571 (K). Belo Horizonte, *Hoehne* (SP). Serra do Curral, Belo Horizonte, *Foster* 675 (GH). Serra de Rola Moça, Belo Horizonte, *Foster* 530 (GH). Nova Lima to Belo Horizonte, *Mello Barreto* 4909 (R). Caldas, *Regnell* II-283 (S, US); III-529 (S). Serra de Caparao, *Brade* 16983 (RB, US). Serra São José [João] del Rei, *Glaziou* 17279 (K). São João del Rei, Lindman A-55 (S); A-57 (S); A-59 (S); A-59½ (S); A-61 (S); A-61½ (S). Serra de Lenheiro, *Glaziou* 17280 (K). Serra da Piedade, *Hoehne* 6428 (R). Mun. Baipendi: São Tome das Letras, *Brade & Apparicio* 20479 (RB).

GOIÁS (?): *Glaziou* 22192-a (K).

SÃO PAULO: Pedra Grande, Atibaia, *Gehrt* (SP).

SANTA CATARINA: Campo Alegre, *Reitz* 3765 (HBR); 3912 (HBR).

40. ***Dyckia reitzii*** L. B. Smith, Anais. Bot. Herb. Barbosa Rodrigues 2: 14, *pls. 1–3.* 1950.

SANTA CATARINA: Campo dos Padres, *Reitz* 2690 (US, type (US neg. 3516), HBR).

41. ***Dyckia lagoensis*** Mez in Mart. Fl. Bras. 3, pt. 3: 483. 1894.

MINAS GERAIS: Lagoa Santa, *Warming* 2171 (C, type, F neg. 22328).

42. ***Dyckia consimilis*** Mez in Mart. Fl. Bras. 3, pt. 3: 479, *pl. 90.* 1894.

MINAS GERAIS: *Weddell* 1407 (P, type, GH neg. 2991). Pico de Itabira do Campo, *Glaziou & Schwacke* 17822 (P); *Palacios, Balegno & Cuezzo* 3891 (LIL, US neg. 3310).

43. ***Dyckia rariflora*** Schult. f. in R. & S. Syst. 7, pt. 2: 1195. 1830.

MINAS GERAIS: *Handro* (SP). Ouro Preto to Sorocaba (São Paulo), *Martius* (M, type, F neg. 8631). Serra de Ouro Preto, *Ule* (R, US neg. 3603); 2434 (! Mez). Mun. Jaboticatubas: Serra do Cipó, Chapeu de Sol, *Smith & Mus. R* 7065 (US).

44. ***Dyckia pseudococcinea*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 108, *pl. 109, fig. 1.* 1943.
Rio de Janeiro: *Foster* 1144 (GH, type, US neg. 4054).
São Paulo: Atibaia, *Foster* 348 in part (R).

45. ***Dyckia dissitiflora*** Schult. f. in R. & S. Syst. 7, pt. 2: 1194. 1830.
Piauí: Serra do Brejo, *Luetzelburg* (! Mez).

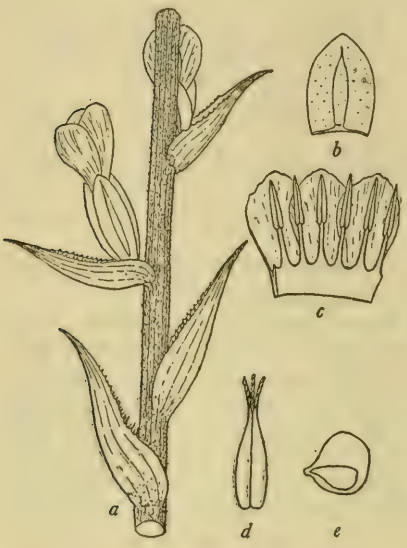

Fig. 19.

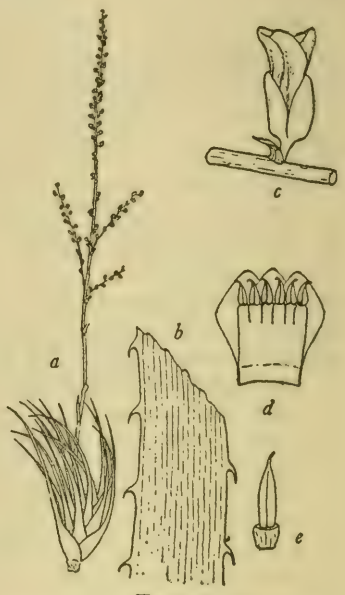

Fig. 20.

Fig. 19.—*Dyckia minarum: a,* Section of inflorescence (After Flora Brasiliensis), × 1; *b,* sepal, × 1; *c,* petals and stamens, × 1; *d,* pistil, × 1; *e,* seed, × 5.

Fig. 20.—*Dyckia weddelliana: a,* Habit, × 1/20; *b,* section of leaf, × 1; *c,* flower, × 1; *d,* petals and stamens, × 1; *e,* pistil, × 2.

Baía: Joazeiro, Rio São Francisco, *Luetzelburg* (! Mez). Serra da Lapa, Rio São Francisco, *Luetzelburg* (! Mez). Sincorá, *Martius* (M, type, F neg. 8630).
Minas Gerais: Lagoa Santa, *Warming* 2171[2] (! Mez).

46. ***Dyckia warmingii*** Mez in Mart. Fl. Bras. 3, pt. 3: 481. 1894.
Minas Gerais: Lagoa Santa, *Hoehne* ex *Rondon* 6363 (R, old specimen, determination uncertain); *Warming* (C, type, F neg. 22329).
Macbride's photograph indicates that some large bracts from some genus other than *Dyckia* are mixed with the type.

47. ***Dyckia bracteata*** (Wittm.) Mez in Mart. Fl. Bras. 3, pt. 3: 470. 1894.
Dyckia dissitiflora var. *bracteata* Wittm. Bot. Jahrb. 13, Beibl. 29: 16. 1891.
Minas Gerais: Serra do Ouro Branco, *Schenck* 3510 (LZ, type).

48. ***Dyckia niederleinii*** Mez in Mart. Fl. Bras. 3, pt. 3: 474. 1894.
Dyckia missionum Mez in Mart. Fl. Bras. 3, pt. 3: 477. 1894.
Dyckia missionum var. *breviflora* Hassler, Ann. Conserv. & Jard. Bot. Genève 20: 316. 1919.
BRAZIL: Probable, but not yet recorded.
ARGENTINA: Sierra de Santa Ana, Territorio de Misiones, *Niederlein* 229 in part (B, type, F neg. 11443); *Niederlein* 229 in part (B, type of *Dyckia missionum* Mez, F neg. 11441).

49. ***Dyckia lutziana*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 107, *pl. 107.* 1943.
BRAZIL: *Foster* 1144b (GH, type, US neg. 4099).

50. ***Dyckia saxatilis*** Mez in DC. Monogr. Phan. 9: 518. 1896.
MINAS GERAIS: Belo Horizonte, *Mello Barreto* 4085 (R). Serra da Cachoeira do Campo, *Schwacke* 8948 (B, type, F neg. 11447).
MATO GROSSO: Chapada, *Hoehne in Rondon* 4545–4550 (R). Aricá, Cabeça de Boi (near Cuiabá), *Hoehne in Rondon* 3545–3547 (R, US neg. 3601).

51. ***Dyckia maracasensis*** Ule, Bot. Jahrb. 42: 197. 1908.
BAÍA: Maracás, *Foster* 2459 (US); *Ule* 7019 (B, type, F neg. 11439).

52. ***Dyckia uleana*** Mez in DC. Monogr. Phan. 9: 517. 1896.
GOIÁS: Mossamedes, *Ule* 510 (R, US neg. 3604); *Ule* 3134 (Type. In hb. Taubert according to Mez, in Manaus according to Ule).

53. ***Dyckia sellowiana*** Mez in DC. Monogr. Phan. 9: 520. 1896.
RIO GRANDE DO SUL (?): *Sellow* Bromel. 52 (P, type, GH neg. 3005).

54. ***Dyckia weddelliana*** Baker, Handb. Bromel. 132. 1889. FIGURE 20.
BRAZIL: *Weddell* 2584 (P, type, GH neg. 3001).
MINAS GERIAS: Mun. Ituiutaba: Santa Terezinha, *Macedo* 1673 (US); 2200 (US).

55. ***Dyckia racemosa*** Baker, Handb. Bromel. 132. 1889.
GOIÁS: Arraias, *Gardner* 4015 (K, type, K neg.).

10. *Navia* Mart. ex Schult. f.

Navia Mart. ex Schult. f. in R. & S. Syst. 7, pt. 2: p. lxv, 1195. 1830. The name proposed for conservation, cf. Arquiv. Bot. Estado São Paulo n. ser. 2: 197. 1952.

Mountains and hills along the northern rim of the Amazon Basin in Colombia, Venezuela, British Guiana, and Surinam.

1. Inflorescence elongate, interrupted..... 1. **N. caulescens**
1. Inflorescence densely capitate or glomerate.
2. Scape present, slender, covered by the subentire leaves; sepals 10 mm. long; petals yellow..... 2. **N. myriantha**
2. Scape lacking; inflorescence sessile in the center of the terminal leaves.
3. Sepals 50 mm. long; leaves entire with blades 23 mm. wide; petals rose-purple. (Fig. 21.)..... 3. **N. lopezii**
3. Sepals 4–19 mm. long; leaves serrulate with blades 6–15 mm. wide.
4. Inflorescence subglobose; leaf-blades flat, uniform.

5. Leaf-blades 6 mm. wide; sepals 4 mm. long..... 4. **N. acaulis**
5. Leaf-blades 15 mm. wide; sepals 19 mm. long... 5. **N. angustifolia**

4. Inflorescence subdigitate from numerous short spikes; leaf-blades with crisped margins and strongly marked median channel; sepals 8 mm. long..... 6. **N. crispa**

1. ***N. caulescens*** Mart. ex Schult. f. in R. & S. Syst. 7, pt. 2: 1195. 1830.
BRAZIL: Probable, but not yet recorded.
COLOMBIA: Serra de Araracoara, *Martius* (M, type). Cerro de Cupati, middle Rio Japura, *Ducke* (MG, US); *Schultes* 5859 (US).

2. ***Navia myriantha*** L. B. Smith ex R. E. Schultes, Bot. Mus. Leafl. Harvard 15: 41. 1951.
AMAZONAS: Serra Dimití, upper Rio Negro, *R. E. Schultes & F. López* 9955 (US, type).

3. ***Navia lopezii*** L. B. Smith ex R. E. Schultes, Bot. Mus. Leafl. Harvard 15: 40. 1951. FIGURE 21.
AMAZONAS: Serra Dimití, upper Rio Negro, *R. E. Schultes & F. López* 9956 (US, type).
ALSO: VENEZUELA.

4. ***Navia acaulis*** Mart. ex Schult. f. in R. & S. Syst. 7, pt. 2: 1196. 1830.
BRAZIL: Probable, but not yet recorded.
COLOMBIA: Serra de Araracoara, upper Rio Japura, *Martius* (M, type).

5. ***Navia angustifolia*** (Baker) Mez in DC. Monogr. Phan. 9: 553. 1896.
Cryptanthus angustifolius Baker, Handb. Bromel. 15. 1889.
BRAZIL: Probable, but not yet recorded.
BRITISH GUIANA: Marima (Maringma), *Appun* 1055 (K, type, GH neg. 1373).

6. ***Navia crispa*** L. B. Smith, Phytologia 4: 378, *pl. 1, figs. 1–3.* 1953.
AMAZONAS: Rocky ground at foot of serra, Tunui, Rio Içana, *Pires* 725 (IAN, US).
ALSO: VENEZUELA.

11. *Tillandsia* L.

Tillandsia L. Sp. Pl. 286. 1753.

Southeastern United States to northern Argentina and Chile.

1. Stamens equaling the petals or shorter.
2. Sepals symmetric, or if slightly asymmetric then ovate or lanceolate and broadest below the middle.
3. Stamens appearing in the throat of the corolla; style slender, much longer than the ovary.
4. Filaments straight; flowers distichous in all Brazilian species. (Fig. 23.)
5. Stamens only a little shorter than the narrow suberect entire petal-blades. ..... Subgenus **Allardtia**
6. Inflorescence 3 dm. long or more, laxly paniculate; species of northern and northwestern Brazil.
7. Leaf-blades ligulate, broadly acute; spikes not over 9 cm. long; floral bracts imbricate, carinate, 2 cm. long..... 1. **T. duidae**

7. Leaf-blades narrowly triangular, acuminate; spikes elongate.
8. Floral bracts imbricate, 2 cm. long; spikes to 15 cm. long in the Brazilian variety of the species..... 2. **T. elongata**
8. Floral bracts not imbricate, much less than twice the length of the internodes, 5 cm. long; lateral spikes to 55 cm. long. (Fig. 22.)..... 3. **T. adpressiflora**

6. Inflorescence less than 3 dm. long, densely to laxly paniculate or simple; floral bracts imbricate.
9. Inflorescences numerous in the leaf-axils, always simple; leaf-blades ligulate, broadly acute or subobtuse; floral bracts imbricate, exceeding the 10–15 mm. long sepals. 4. **T. complanata**
9. Inflorescence single, terminal, simple or compound; leaf-blades narrowly triangular, acuminate.
10. Primary bracts conspicuous, the lower ones nearly or quite equaling the axillary spikes; inflorescence very dense; leaf-blades 30–40 mm. wide; floral bracts carinate; sepals 18–20 m. long, much connate posteriorly... 5. **T. turneri**
10. Primary bracts much shorter than the axillary spikes or else the inflorescence simple; leaf-blades 5–20 mm. wide.
11. Leaves covered with conspicuous spreading scales especially along the margins; floral bracts 20–25 mm. long, nearly or quite glabrous, ecarinate..... 6. **T. lorentziana**
11. Leaves covered with appressed or subappressed scales; floral bracts 11–20 mm. long, usually densely lepidote.
12. Plant stemless; inflorescence compound, fan-shaped with all the spikes in one plane; leaf-blades 6–20 mm. wide; floral bracts ecarinate. (Fig. 23.) 7. **T. didisticha**
12. Plant with a stem up to 14 cm. long; inflorescence simple; leaf-blades 5 mm. wide..... 8. **T. dura**

5. Stamens barely exceeding the claws of the petals; petal-blades spreading, broad, crenate-serrate; inflorescence simple; sepals to 42 mm. long in the Brazilian species..... **Subgenus Aërobia** 9. **T. xiphioides**

4. Filaments more or less transversely plicate or widened toward their apices; inflorescence dense, often simple with the flowers in more than 2 ranks; leaf-blades narrowly triangular or sometimes linear. (Figs. 24, 25.)..... **Subgenus Anoplophytum**
13. Inflorescence compound; flowers in 2 ranks on the spikes.
14. Floral bracts densely imbricate and concealing the rhachis, exceeding the 10–14 mm. long sepals; leaf-blades narrowly triangular, 15–20 mm. wide, coarsely cinereous-lepidote. 10. **T. gardneri**
14. Floral bracts separate and disclosing almost the whole rhachis.
15. Leaf-scales coarse, spreading; leaves 9 cm. long, 10–15 mm. wide, without a distinct sheath; sepals 16 mm. long, the posterior ones connate for 10 mm..... 11. **T. brachyphylla**
15. Leaf-scales appressed; leaves about 10–20 cm. long; sepals 12–15 mm. long, the posterior ones short-connate.

16. Leaf-sheaths not distinct from the narrowly triangular blades; floral bracts shorter than the sepals. (Fig. 24.) 12. **T. geminiflora**

16. Leaf-sheaths distinct from the linear blades; floral bracts about equaling the sepals..... 13. **T. globosa**

13. Inflorescence simple; flowers usually in more than 2 ranks (only 2 in varieties of *T. pulchella* and *T. stricta*).

17. Sepals free or equally short-connate; plants generally stemless or short-caulescent (sometimes long-caulescent in *T. pohliana*).

18. Sepals glabrous, lanceolate or lance-ovate.

19. Leaves covered with coarse spreading scales, 3–4 cm. long. 14. **T. sprengeliana**

19. Leaves covered with appressed scales, 6–18 cm. long.

20. Scape very short, hidden by the leaves; leaves rigid, curved and often secund, acuminate but subpungent. 15. **T. rosea**

20. Scape evident; leaves flexible, not much curved, filiform-acuminate. (Fig. 25.)..... 16. **T. stricta**

18. Sepals lepidote.

21. The sepals coriaceous, thick, suborbicular... 17. **T. pohliana**

21. The sepals membranaceous; lance-ovate. 18. **T. meridionalis**

17. Sepals much more highly connate posteriorly than anteriorly; plants in general strongly caulescent.

22. Leaf-blades slender (about 20 times as long as wide), or if robust then strongly secund, rather flexible; inflorescence few-flowered; petals white to pale blue.

23. Scape exceeding the short stout strongly secund leaves; petals to 30 mm. long..... 19. **T. araujei**

23. Scape usually shorter than the slender leaves; petals not over 20 mm. long..... 20. **T. pulchella**

22. Leaf-blades stouter (about 10 times as long as wide), scarcely if at all secund, 5–13 mm. wide, rigid; inflorescence 5–20-flowered; petals usually dark blue, 17–27 mm. long. 21. **T. aëranthos**

3. Stamens deeply included; style short and stout; leaf-blades narrowly triangular or linear in the Brazilian species. (Figs. 27, 28.)

24. Petal-blades broad, conspicuous; sepals 10–30 mm. long in the Brazilian species. (Fig. 27.)..... **Subgenus Phytarrhiza**

25. Scape completely covered by its bracts; leaves in more than 2 ranks.

26. Floral bracts 20–40 mm. long; inflorescence simple; plant stemless.

27. Flowers imbricate at and after anthesis.

28. Floral bracts coriaceous, glabrous, to 4 cm. long; inflorescence elliptic, 55 mm. wide; leaf-sheaths red-striate; leaf-blades 7–12 mm. wide. (Fig. 26.)..... 22. **T. anceps**

28. Floral bracts membranaceous, lepidote, about 2 cm. long; inflorescence narrowly lanceolate, 6–10 mm. wide; leaf-sheaths concolorous; leaf-blades 1–2 mm. wide. 23. **T. linearis**

27. Flowers spreading, not imbricate at anthesis; floral bracts coriaceous or subcoriaceous, 17 mm. long; rhachis alate-angled. ..... 24. **T. monadelpha**

26. Floral bracts not more than 12 mm. long; inflorescence usually compound; plant usually caulescent.

29. Leaf-scales subappressed; leaf-blades stout, spirally twisted; inflorescence much branched..... 25. **T. decomposita**

29. Leaf-scales spreading; leaf-blades slender, usually twisted only near their apices; inflorescence few-branched or even simple. (Fig. 27.)..... 26. **T. streptocarpa**

25. Scape naked or with 1 or 2 bracts which cover only a small part of it; leaves in 2 ranks.

30. Petals bright yellow; floral bracts to 20 mm. long, about equaling the sepals; leaf-blades 2–5 mm. in diameter, covered with narrow retrorse scales..... 27. **T. crocata**

30. Petals blue or purple; floral bracts 9 mm. long, much shorter than the sepals; leaf-blades 1–1.5 mm. in diameter, covered with broad subappressed scales; sepals 12.5 mm. long (distinction from *T. recurvata* in fruit)..... 28. **T. mallemontii**

24. Petal-blades narrow and inconspicuous; sepals 6–9 mm. long in the Brazilian species; inflorescence almost always simple; small plants with the appearance of coarse mosses. (Fig. 28.)

Subgenus Diaphoranthema

31. Leaves in many ranks; scape evident, covered with bracts.

32. Spike lax with a geniculate axis, to 4 cm. long and 16-flowered; leaves 2–4 cm. long..... 29. **T. loliacea**

32. Spike dense with a straight axis, not more than 17 mm. long, 1–5-flowered; leaves 1 cm. long or rarely to 2 cm. 30. **T. tricholepis**

31. Leaves in 2 ranks; scape largely naked or else absent.

33. Stem usually shorter than the leaves and always covered by them; scape terminal, always evident; sepals not more than 9 mm. long (distinction from *T. mallemontii* in fruit). 31. **T. recurvata**

33. Stem to 8 m. long, exposed between the leaves; scape almost none; flowers solitary on short pseudo-axillary branches. (Fig. 28.) ..... 32. **T. usneoides**

2. Sepals asymmetric, nearly or quite free, broadest near the apex, not over 9 mm. long in the Brazilian species; inflorescence laxly bipinnate in the Brazilian species..... **Subgenus Pseudo-Catopsis**

34. Leaf-blades ligulate, rounded at the apex, usually with dark irregular cross-bands; floral bracts equaling the sepals; spikes dense. 33. **T. triticea**

34. Leaf-blades narrowly triangular, acuminate, concolorous; floral bracts usually shorter than the sepals; spikes lax.

35. Flowers erect or ascending; spikes erect; scape decurved; leaf-blades 8 mm. wide. (Fig. 29.)..... 34. **T. aëris-incola**

35. Flowers spreading; spikes spreading to reflexed; species of northern Brazil.

36. Scape-bracts much shorter than the internodes; primary bracts very short; leaf-blades 6 mm. wide..... 35. **T. jenmanii**
36. Scape-bracts about equaling the internodes; primary bracts about half as long as the spikes; leaf-blades to 20 mm. wide. 36. **T. caribaea**

1. Stamens longer than the petals, exserted; leaf-blades narrowly triangular or linear in the Brazilian species.....**Subgenus Tillandsia**
37. Leaf-sheaths nearly flat, their apices widely separated from the scape; floral bracts coriaceous or subcoriaceous.
38. Leaf-blades narrowly triangular, 10–30 mm. wide at the base; leaf-sheaths broad; floral bracts nearly or quite glabrous.
39. Spikes not more than 12 mm. wide; leaf-sheaths the same color as the blades except for their extreme bases which are pale-ferruginous; inflorescence usually compound..... 37. **T. polystachia**
39. Spikes to 4 cm. wide; leaf-sheaths dark castaneous at least toward the base.
40. Floral bracts pale, coriaceous, even or slightly nerved; sepals lanceolate, acute, connate posteriorly; inflorescence often compound. ..... 38. **T. fasciculata**
40. Floral bracts blackening when dry, probably fleshy in life; sepals elliptic, obtuse, free; inflorescence simple. .... 39. **T. kegeliana**
38. Leaf-blades linear-subulate, very narrow; leaf-sheaths narrow; floral bracts densely lepidote at least when young; sepals connate posteriorly.
41. Inflorescence usually shorter than the leaves, when simple its flowers in 2 ranks, when compound lax at least toward the base. 40. **T. tenuifolia**
41. Inflorescence usually equaling or exceeding the leaves, when simple its flowers in more than 2 ranks, when compound very dense with its bracts massed below it..... 41. **T. juncea**
37. Leaf-sheaths inflated and forming a pseudo-bulb, their apices enclosing the scape or the base of the inflorescence; floral bracts subcoriaceous to subchartaceous.
42. Upper scape-bracts merely apiculate; leaf-blades only curved; sepals free, ecarinate; petals red. (Fig. 30.)..... 42. **T. paraënsis**
42. Upper scape-bracts, or lacking an evident scape the lowest primary bracts, with long foliaceous blades; leaf-blades contorted; sepals more or less connate posteriorly; petals blue or purple.
43. Leaves covered with minute appressed scales; scape short but evident; inflorescence simple or digitate; spikes lanceolate; floral bracts 10–15 mm. long..... 43. **T. bulbosa**
43. Leaves covered with coarse spreading scales; scape not evident; inflorescence usually simple; spikes broad; floral bracts 20–26 mm. long. ..... 44. **T. pruinosa**

Subgenus *Allardtia* (A. Dietr.) Baker

1. ***Tillandsia duidae*** L. B. Smith, Bull. Torrey Bot. Club 58:340, *pl. 26, fig. 3 (1–4)*. 1931.

BRAZIL: Probable, but not yet recorded.

VENEZUELA: Mount Roraima, *Steyermark* 58998 (F, GH).

2. ***Tillandsia elongata*** H. B. K. Nov. Gen. & Sp. 1:293. 1816.

1. Spikes to 40-flowered, very long and slender..... Var. a. **elongata**
1. Spikes to 20-flowered, 15 cm. long, 12 mm. wide..... Var. b. **subimbricata**

2a. ***Tillandsia elongata*** var. ***elongata.***

Not recorded in or near Brazil.

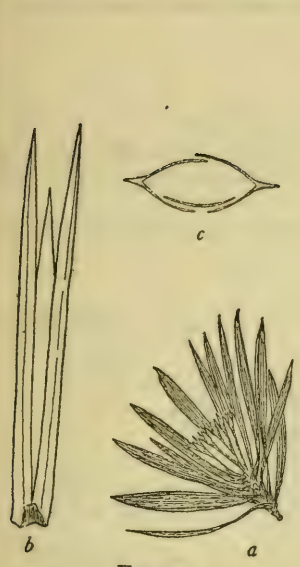

FIG. 21.

FIG. 22.

FIG. 21.—*Navia lopezii: a,* Habit, × 1/10; *b,* sepals, × 1; *c,* diagram of imbrication of sepals.

FIG. 22.—*Tillandsia adpressiflora: a,* Habit, × 1/40; *b,* section of spike, × 1; *c,* sepal, × 1; *d,* seed × 1.

2b. ***Tillandsia elongata*** var. ***subimbricata*** (Baker) L. B. Smith, Journ. Washington Acad. Sci. 43:68. 1953.

Tillandsia subimbricata Baker, Journ. Bot. 25:304. 1887.

Tillandsia orthorhachis Mez & C. F. Baker, Bull. Torrey Bot. Club 30: 435. 1903.

RIO BRANCO: Isla do Ajarani, *J. G. Kuhlmann* 391 (RB).

ALSO: MÉXICO (Yucatan), NICARAGUA, PANAMÁ, CUBA, JAMAICA, TRINIDAD, COLOMBIA.

3. ***Tillandsia adpressiflora*** Mez in DC. Monogr. Phan. 9:661. 1896. FIGURE 22.

AMAZONAS: Rio Juruá-Mirim, *Ule* 5618 (B (F neg. 11473), GH).

ALSO: SURINAM, VENEZUELA, PERÚ.

4. ***Tillandsia complanata*** Benth. Bot. Voy. Sulphur 173. 1846.

RIO BRANCO: Mount Roraima, *Ule* 8560 (MG, K).

ALSO: COSTA RICA and the WEST INDIES to BOLIVIA and BRITISH GUIANA.

5. ***Tillandsia turneri*** Baker, Journ. Bot. 26: 144. May 1888.
Tillandsia rhodocincta Baker, Journ. Bot. 26: 143. May 1888.
Tillandsia cornuaulti André, Énum. Bromél. 8. Dec. 1888.
Guzmania cornuaulti André ex Mez in DC. Monogr. Phan. 9: 925. 1896.
Tillandsia multifolia Mez, Repert. Sp. Nov. Fedde 12: 420. 1913.
Thecophyllum cornuaulti Mez in Engl. Pflanzenreich IV. 32: 423. 1935.
Rio Branco: Mount Roraima, *Ule* 8558 (B, type of *Tillandsia multifolia* Mez (F neg. 11515), K).
Also: British Guiana, Venezuela, Colombia.

6. ***Tillandsia lorentziana*** Griseb. Pl. Lorentz. in Goett. Abh. 19: 271. 1874.
Mato Grosso: Urucum, near Corumbá, *Foster* 1159 (GH).
Paraná: Mun. Ponta Grossa: Vila Velha, *Dusén* 2756 (R); 2810 (S); 7624 (S); 9528 (S); *Foster* 412 (GH, R); *M. Kuhlmann* (SP); *Paech* 5680 (HBR).
Rio Grande do Sul: Quarí, Jarau, *Rambo* (LIL). São Leopoldo, *Eugenio* 2211 (GH); *Rambo* (LIL).
Also: Paraguay, Bolivia, Argentina.

7. ***Tillandsia didisticha*** (E. Morr.) Baker, Journ. Bot. 26: 16. 1888. Figure 23.
Anoplophytum didistichum E. Morr. Belg. Hortic. 31: 164. 1881.
Tillandsia oranensis Baker, Handb. Bromel. 173. 1889.
Tillandsia crassifolia Baker, Handb. Bromel. 174. 1889.
Tillandsia goyazensis Mez, Bot. Jahrb. 30, Beibl. 67: 11. 1901.
Guzmania complanata Wittm. Mededell. Rijks Herb. 29: 92. 1916.
Goiás: Serra da Arruda, near Pireneos, *Glaziou* 22196 (K, isotype of *Tillandsia goyazensis* Mez, GH neg. 2726).
Mato Grosso: *Hoehne* (SP). Corumbá, *Foster* 1056 (GH). São Luiz de Cáceres, *Hoehne in Rondon* 556 (R).

8. ***Tillandsia dura*** Baker, Handb. Bromel. 168. 1889.
Distrito Federal: Morro do Archer, *Brade & Duarte* 18576 (RB). Serra da Carioca, *L. B. Smith* 1280 (BM, F, GH, K, US). Tijuca, *Glaziou* 11689 (P); 16460 (K, type (GH neg. 2633), US); *L. B. Smith* 2126 (B, GH, S).
São Paulo: Alto da Serra, *Smith & King* 1933 (GH). Ribeirão Pires, *Edwall* (GH, SP). São Paulo, *Krieger* 176 (SP). São Vicente, Santos, *Mosén* 3716 (S).
Santa Catarina: Pilões, Palhoça, *Reitz* 4259 (HBR, US); *L. B. Smith* 6207 (R, US); 6215a (R, RB, US).

Subgenus *Aërobia* Mez

9. ***Tillandsia xiphioides*** Ker, Bot. Reg. 2: *pl. 105.* 1816.
Rio Grande do Sul–Santa Catarina: Boundary near Colonia São Pedro, *A. R. Schultz* 767 (US).
Also: Uruguay, Paraguay, Argentina, Bolivia.

Subgenus *Anoplophytum* (Beer) Baker

10. ***Tillandsia gardneri*** Lindl. Bot. Reg. 28: sub *pl. 63.* 1842.
Tillandsia fluminensis Mez in Mart. Fl. Bras. 3, pt. 3: 591. 1894.
Tillandsia regnellii Mez in Mart. Fl. Bras. 3, pt. 3: 592, *pl. 110.* 1894.

Tillandsia cambuquirensis A. Silveira, Floralia Montium 2:27, *pl. 11, fig. 2.* 1931.

Tillandsia venusta A. Silveira, Floralia Montium 2:29, *pl. 12.* 1931.

PIAUÍ: Southern part of state, *Luetzelburg* (! Mez).

CEARÁ: *Alemão e Cysneiros* 1526 in part (R). Serra do Araripe, *Luetzelburg* (! Mez). Barra da Santa Rosa, *Luetzelburg* (! Mez).

PARAÍBA: Campina Grande to Caruaru (in Pernambuco), *Foster* 2423 (US).

BAÍA: Agua Preta, *Foster* 66 (GH). Bom Jesus do Rio de Contas, *Luetzelburg* (! Mez). Jacobina, *Foster* 101 (GH, R). Paramirim, *Luetzelburg* (! Mez).

ESPÍRITO SANTO: (Bananal) *Viana Freire* 49 (R).

MINAS GERAIS: Belo Horizonte, *Foster* 531 (GH). Caldas, *Mosén* 3989 (S); *Regnell* III-1798 (S, US isotypes of *Tillandsia regnellii* Mez). Passo Quatro, Rio Retiro, *Brade & Silva Araujo* 19071 (RB). Mun. Nova Lima: Lagoa Grande, *Williams & Assis* 5790 (GH). Fazenda de Mutuda, *Melo Barreto* 4910 (R). Mun. Santa Barbara: Caraça, *Foster* 687 (GH).

RIO DE JANEIRO: Campos, *Sampaio* 2913 (R); 8502 in part (R). Soberbo to Guapi, *L. B. Smith* 1534 (GH).

DISTRITO FEDERAL: Gavea, *Reitz* 4777 (! Reitz). Praia de Grumari, near Guaratiba, *Smith & Mus. R* 6535 (US, sterile). Jacarepaguá, *Ule* 4050 (R). Recreio de Bandeirantes, *Lutz* 615 (GH). Rio de Janeiro, *Andersson* (S); *Gardner* 134 (K, type, GH neg. 2725); *Widgren* (S). Tijuca, *Lindman* A-45 (S). Restinga da Tijuca, *Machado* (RB).

SÃO PAULO: Caraguatatuba, *Hochne & Gehrt* (SP). Itirapina, *Gehrt* (GH, SP). Santos, *Mosén* 3717 (S). São Vicente, *L. B. Smith* 2095 (B, GH, S).

PARANÁ: Jacareí, *Dusén* 15405 (S).

SANTA CATARINA: Blumenau, *Reitz* 4059 (HBR). Canto Grande, Porto Belo, *Reitz* 3627 (HBR); 3657 (HBR). Itajaí, *Reitz* 4050 (HBR). Corupá, Jaraguá do Sul, *Reitz* 4038 (HBR). Sombrio, Araranguá, *Reitz* C-465 (GH, US).

RIO GRANDE DO SUL: Mun. Torres: Campo Bonito, *Reitz* 4424 (HBR).

ALSO: TRINIDAD, VENEZUELA, COLOMBIA.

11. ***Tillandsia brachyphylla*** Baker, Journ. Bot. 26:16. 1888.

Anoplophytum binotii E. Morr. ex Baker, Handb. Bromel. 200. 1889, nomen in synonymy.

BRAZIL: *Binot* (K, Morren Icones, type of *Anoplophytum binotii* E. Morr.).

RIO DE JANEIRO: Serra dos Orgãos, *Moura* (R, US neg. 4200).

DISTRITO FEDERAL: Gavea, *Frazão Armando* (RB, US); *Glaziou* 8018 (K, type, US neg. 3978); *Smith & Mus. R* 6431 (R, US).

12. ***Tillandsia geminiflora*** Brongn. in Duperrey Voy. Coquille 186. 1829.

1. Scales of the leaves closely appressed..... Var. a. **geminiflora**

1. Scales of the leaves spreading..... Var. b. **incana**

12a. ***Tillandsia geminiflora*** Brongn. var. ***geminiflora.*** FIGURE 24.

ESPÍRITO SANTO: (Bananal), *Viana Freire* 46 (R).

MINAS GERAIS: Caldas, *Mosén* 1945 (S); 4438 (S); *Regnell* I-282-a (S, US); I-282-b (S, US). São Miguel, *Mexia* 5239-a (GH, US). Mun. Conceição do Mato Dentro: Serra do Cipó, *Foster* 616 (GH). Mun. Santa Bárbara: Caraça, *Foster* 717 (GH).

Mato Grosso: Rio Jaurú, *Hoehne in Rondon* 889 (R); 928 (R); 929 (R); 930 (R). Palmeiras, *Lindman* A-2605 (S).

Rio de Janeiro: Nova Friburgo, *Lutz* 1015 (R). Petrópolis, *Foster* 38 (GH). Petrópolis to Raiz da Serra, *L. B. Smith* 1328 (GH). Teresópolis, *Duarte & Pereira* (RB).

Distrito Federal: Morro do Archer, *Brade & Duarte* 18577 (RB). Represa de Camorim, *Peckolt, Freire & Sampaio* (R). Corcovado, *Lindman* A-41 (S); *L. B. Smith* 1262 (B, BA, BM, F, GH, K, S, US). Jacarepaguá, *Hoehne* (SP). Pico do Papagaio, *Mello Filho & Dansereau* 375 (R). Tijuca, *Lindman* A-47 (S); A-51 (S). Vista Chineza, *Saldanha et al.* (R).

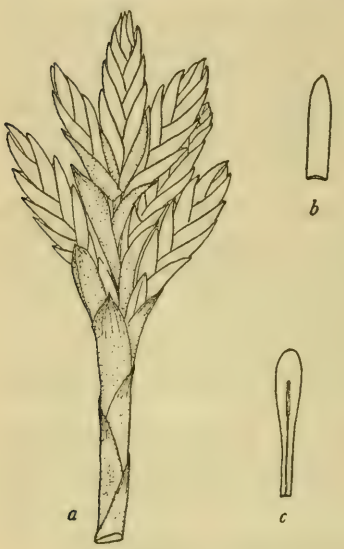

Fig. 23.

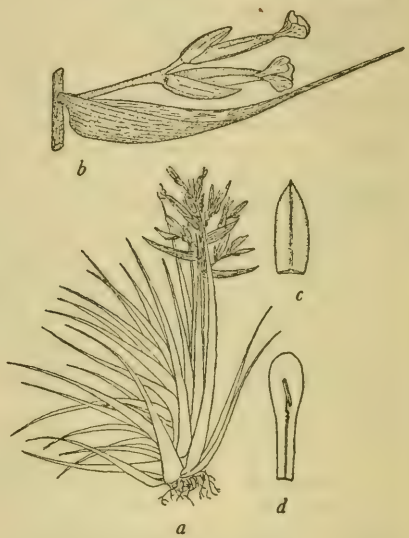

Fig. 24.

Fig. 23.—*Tillandsia didisticha: a,* Inflorescence, × ½; *b,* sepal, × 1; *c,* petal and stamen, × 1.

Fig. 24.—*Tillandsia geminiflora* var. *geminiflora: a,* Habit, × ¼; *b,* primary bract and spike, × 1; *c,* sepal, × 1; *d,* petal and stamen, × 1.

São Paulo: Alto da Serra, *Gehrt* (SP). Atibaia, *Duarte* (SP). Campinas, *Campos Novaes* 1203 (US); *Viegas* (SP). Campos do Jordão, *Hoehne* (SP). Serra de Caracol, *Mosén* 1732 (S). Itú, *Russel* (SP). Santo Amaro, *Krieger* 175 (SP). (Socorro), *Viegas & Zagato* (IAC). Sorocaba, Santos, *Mosén* 2984 (S); 3804 (S). Mun. São Paulo: *Handro* (SP). Butantan, *Hoehne* (GH, SP). Cidade Jardim, *Krug* (SP); *Smith & Kuhlmann* 1813 (GH). Ipiranga, *Luederwaldt* (SP). Jardim Botânico, *Handro* 364 (SP). Pirajussara, *Gehrt* (GH, SP).

Paraná: Curitiba, *Foster* 437-F (GH). Guaratuba, *Reitz* 4240 (HBR). Jaguariaíva, *Dusén* 10787 (S); 13243 (S); 15528 (GH, S, US). Pôrto de Cima, *Dusén* 8447 (S). Saquarema, *Stellfeld* 4261 (US). Mun. Ponta Grossa: Vila Velha, *Foster* 424 (GH); *M. Kuhlmann* (SP).

SANTA CATARINA: *D'Urville* (P, type, GH neg. 3033). Serra do Mirador, Taio, *Reitz* 3965 (HBR). Mun. Araranguá: Meleiro, *Reitz* C-57 (HBR); C-59 (GH, HBR). Sombrio, *Reitz* C-750 (GH, HBR, US); C-760 (HBR, US); 1509 (R). Mun. Brusque: Azambuja, *Reitz* 3028 (HBR, US); 3653 (HBR); 3683 (HBR); 3684 (HBR). Brusque, *Smith & Reitz* 5765 (US). Mun. Chapecó: Dionísio Cerqueira, *Reitz* 4285 (HBR). Mun. Itajaí: Praia Braba, *Reitz* 2306 (HBR). Mun. Jaraguá do Sul: Corupá, *Seidel* 35 (HBR). Mun. Palhoça: Campo de Massiambú, *Reitz* 1034 (! Reitz); 4939 (! Reitz).

RIO GRANDE DO SUL: Pareci Novo, *Sehnem* 1448 (LIL). Pôrto Alegre, *Lindman* A-593 (S); *Rambo* (LIL). São Leopoldo, *Eugenio* 119 (R); 1895 (GH). Mun. Tôrres: Campo Bonito, *Reitz* 4415 (HBR).

ALSO: PARAGUAY, URUGUAY, ARGENTINA.

12b. ***Tillandsia geminiflora*** var. ***incana*** (Wawra) Mez in Mart. Fl. Bras. 3, pt. 3: 595. 1894.

Tillandsia incana Wawra, Oesterr. Bot. Zeitschr. 30: 223. 1880.

RIO DE JANEIRO: Itatiaia, *Wawra* II-508 (W, type).

ALSO: URUGUAY (! Mez).

13. ***Tillandsia globosa*** Wawra, Oesterr. Bot. Zeitschr. 30: 222. 1880.

1. Inflorescence not more than bipinnate; spikes 2–3-flowered. Var. a. **globosa**

1. Inflorescence tripinnate; some of the spikes 4-flowered..... Var. b. **major**

13a. ***Tillandsia globosa*** var. ***globosa***.

PARAÍBA: Ipanargna, *Foster* 2415 (US).

BAÍA: *Blanchet* 1466 (S).

ESPÍRITO SANTO: *Saint-Hilaire* B²-II-284 (P). Mun. Cachoeira do Itapemirim: *Foster* 162 (GH). Vargem Alta, *Foster* 906 (GH).

RIO DE JANEIRO: Entre Rios, *Wawra* 142-b (W, type); 142-c (W). Mauá, *Ule* 4067 (R).

DISTRITO FEDERAL: Rio de Janeiro, *Gaudichaud* 360 (P); *Wilkes Expedition* (GH, US). Tijuca, *Lindman* A-259 (S).

SÃO PAULO: Bragança Paulista, *Pires* (SP, US). Cubatão, *L. B. Smith* 2036 (GH). São Sebastião, *Handro* 365 (SP, US). Sorocaba, Santos, *Mosén* 2983 (S).

ALSO: VENEZUELA.

13b. ***Tillandsia globosa*** var. ***major*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 114. 1943.

SÃO PAULO: Rio Quilombo, near Santos, *Doering* (SP, type).

14. ***Tillandsia sprengeliana*** Kl. ex Mez in Mart. Fl. Bras. 3, pt. 3: 596. 1894.

Tillandsia brachyphylla Baker, Handb. Bromel. 200. 1889. In part, not as to type.

BRAZIL: *Freyreis* (S).

ESPÍRITO SANTO: Vitória, *Foster* 503 (GH).

RIO DE JANEIRO: *Saint-Hilaire* B² 106 (B, type).

15. ***Tillandsia rosea*** Lindl. Bot. Reg. 16: *pl. 1357*. 1830.

Anoplophytum roseum (Lindl.) Beer, Bromel. 40. 1857.

Tillandsia recurvifolia Hook. Bot. Mag. 87: *pl. 5246*. 1861.

Tillandsia langsdorffii Mez in Mart. Fl. Bras. 3, pt. 3: 598. 1894.
Tillandsia pulchella var. *rosea* (Lindl.) Mez in Mart. Fl. Bras. 3, pt. 3: 603. 1894.

BRAZIL: Cultivated in England (type, not preserved).

RIO DE JANEIRO: *Langsdorff* (LE, type of *Tillandsia langsdorffii* Mez). Teresópolis, *Brade & Pereira* 20062 (RB, US).

16. ***Tillandsia stricta*** Soland. Bot. Mag. 37: *pl. 1529.* 1813.

1. Flowers polystichous..... Var. a. **stricta**
1. Flowers distichous..... Var. b. **disticha**

16a. ***Tillandsia stricta*** var. ***stricta.*** FIGURE 25.

Anoplophytum strictum var. *krameri* André, Rev. Hort. 60: 350. 1888.
Tillandsia krameri Baker, Handb. Bromel. 197. 1889.
Tillandsia meridionalis Baker, Handb. Bromel. 197. 1889. In part, not as to type.
Tillandsia stricta var. *krameri* Mez in Mart. Fl. Bras. 3, pt. 3: 600. 1894.

BRAZIL: *Arduino* 10 (LINN, GH neg. 2642); *Widgren* 1079 (S); cultivated (LG, type of *Tillandsia krameri* Baker; K, Morren Icon.).

BAÍA: Agua Preta, *Bondar* (SP); *Foster* 78 (GH, R). Salvador, *Torrend* (FFBahia).

ESPÍRITO SANTO: Leopoldina, *Luetzelburg* (! Mez). Linhares, *Foster* 785 (GH). Santa Teresa, *Foster* 307 (GH). Vitória, *Foster* 202 (GH).

MINAS GERAIS: *Mosén* 1733 (S). Caldas, *Regnell* I-282-c in part (F, S); I-282-d in part (S). Caldas to Serra de Caracol, *Mosén* 4439 (S). Passa Quatro, *Sampaio* 6192 (R); 6193 (R). Sitio, *Sampaio* 248 (R). Vaccaria to Palacios, Serra do Cipó, *Foster* 633 (GH); 634 (GH). Mun. Caete: Serra Piedade, *Foster* 672 (GH). Mun. Jaboticatubas: Chapeu de Sol, Serra do Cipó, *Smith & Mus. R* 7064 (US). Mun. Nova Lima: Serra da Mutuca, *Williams & Assis* 6201 (GH, US). Mun. Sêrro: Bôca da Mata, *Williams & Assis* 7939 (GH).

RIO DE JANEIRO: Angra dos Reis, *M. Kuhlmann* 2651 (SP); *Luetzelburg* (! Mez). Atafona, *Sampaio* (R); 8046 (R); 8061 (R). Campos, *Sampaio* (R); 7803 (R); 7957 (R); 7958 (R); 8501 (R). Carmo, bank of Rio Paquequer, *Neves Armond* 126 (R). Iguaba Grande, *Rose & Russell* 20714 (US). Itatiaia, *Dusén* 2161 (S); *Foster* 145 (GH). Ilha de Marambaia, *Mello Filho & Santos* (R). (María), *Mus. R* 12 (NY). Marica, *Vidal* (R). Mauá, *Dusén* 232 (S); *Ule* (R). Restinga de Mauá, *Hemmendorff* 462 (S). Monte Alegre, *Vidal* 138 (R). Niteroi, *Foster* 108 (GH). Rio Paquequer, Serra dos Orgãos, *Brade* 16693 (RB). Soberbo to Guapi, *L. B. Smith* 1535 (F, GH). Suruí, *Foster* 329 (GH, R). Teresópolis, *Vasconcelos & Sampaio* 2523 (R); *Wille* (RB). Mun. Cabo Frio: Cabo Frio, *Neto, Glaziou & Schwacke* (R). Ponta do Gabriel, *Smith & Mus. R* 6651 (R, US). Praia do Pontal, *Smith & Mus. R* 6597 (R, US).

DISTRITO FEDERAL: Campo Grande, *Parker* 1 (R). Serra da Carioca, *Smith & Vieira* 1294 (GH). Corcovado, *Lindman* A-43 (S). Ilha das Flores, *Parodi* (SP). Gavea, *Luetzelburg* (! Mez). Praia de Grumari, near Guaratiba, *Smith & Mus. R* 6537 (R, US); 6538 (R, US). Restinga de Jacarepaguá, *Ule* 4051 (R). Jardim Botânico, *Bailey* 36 (BH); 36-a (BH); 496 (BH); *Lindman* A-233 (S). Quinta da Boa Vista, *Lutz* 1290 (R); *Rente & Eunice* 49 (R); *Sampaio* (R). Ilha do Raimundo, *Vidal*

(R). Riachuelo, *Neves Armond* 291 (R). Rio de Janeiro, *Andersson* (S); *Lutz* (R); *Regnell* 213 (S); *Riedel* 45 (R); *Widgren* (S); *Wilkes Expedition* (GH, US). Praia de Sernambetiba, *Smith & Mus. R* 6824 (US). Tijuca, *Frazão* 52 (RB); *Smith & Brade* 2239 (GH). Tijuca to Jacarepaguá, *Cochran* (R, US). Restinga da Tijuca, *Machado* (RB). Estrada da Vista Chineza, *Occhioni* 42 (RB).

São Paulo: Boracéa, *Lima & da Silva* (SP). Boracéa to Salesópolis, *M. Kuhlmann* 1695 (SP); 2021 (SP). Bragança Paulista, *Duarte* 116 (GH, SP). Campinas, *Campos Novaes* 1203 (GH, SP); *Dedecca* (IAN). Campo Grande, *Loefgren* (GH, SP). Cubatão, *L. B. Smith* 2049 (B, BA, BM, F, GH, K, P, S, US). Santos, *Carvalho* (IAC); *Mosén* 3252 (R); *Regnell* 38 1/64 (S). São Vicente, *L. B. Smith* 2098 (GH). Mun. Amparo: Monte Alegre, *M. Kuhlmann* 262 (SP). Mun. São Paulo: *Handro* (SP). Bosque da Saude, *Hoehne* (SP). Butantã, *Hoehne* (SP). Serra da Cantareira, *Koscinski* 329 (SP). Ipiranga, *Luederwaldt* (SP). Source of Rio Ipiranga, *Hoehne* (SP). Pirajussára, *Gehrt in L. B. Smith* 1823 (GH, S); *Gehrt* (GH, SP). Santo Amaro, *Krieger* 173 (SP). Vila Ema, *Brade* 7202 (SP). Vila Friburgo, *Hauff* 34 (SP).

Paraná: Casino Aú, *Mattos* 4268 (US). Curitiba, *Dusén* 2411 (R); *Foster* g (GH); *Stellfeld* 1544 (US). Rio Marumbi, *Dusén* 14308 (S). Paranaguá, *Tessmann* (US). Serrinha, *Dusén* 7191 (S, US). Tibagi, *Reiss* 6 (GH, US); 55 (GH, US). Mun. Piraquara: Florestal, *Hatschbach* 1161 (US); *Tessmann* (US). Mun. Ponta Grossa: Vila Velha, *Dusén* 2764 (R); *Foster* 411 (GH, R); *M. Kuhlmann* (SP, US).

Santa Catarina: Florianópolis, *Reitz* 3908 (HBR). Itajaí, *Reitz* 3425-a (HBR). Laguna, *Reitz & Klein* 85 (HBR). São Francisco do Sul, *Reitz* 3902 (HBR). (Nova Teutonia), *Plaumann* 593 (RB). Mun. Araranguá: Serra do Pilão, *Reitz* 3425 (HBR). Sombrio, *Reitz* C-464 (GH); 3693 (HBR). Turvo, *Reitz* C-203 (GH, HBR); C-204 (GH, HBR); 828 (R). Mun. Bom Retiro: Figueiredo, *Reitz* 2869 (HBR, US). Mun. Brusque: Azambuja, *Reitz* 3656 (HBR). Brusque, *L. B. Smith* 5792 (US). Mun. Chapecó: Itapiranga, *Reitz* 4798 (! Reitz). Mun. Jaraguá do Sul: Corupá, *Seidel* 33 (! Reitz). Mun. Pôrto Belo: Canto Grande, *Reitz* 3602 (HBR, US); 3602-a (HBR); 3623 in part (HBR); 3628 in part (HBR); 3654 (HBR); 3655 (HBR). Mun São Joaquim: Urubici, *Reitz* 2908 (HBR, US); 2909 (HBR, US).

Rio Grande do Sul: Belem Nova, *Beetle* 1608 (US). Belem Nova, Rio Guaíba, *Palacios & Cuezza* 411 (LIL). Canoas, *Teodoro* 73 (US). Colonia Santo Angelo, *Lindman* A-1033 (S); A-1057 (S). Hamburger Berg, *Lindman* A-575 (S). Nova Wurtemburg, *Bornmueller* 393 (GH). Palmares, near Lagoa dos Patos, *Rambo* (US). Pareci Novo, *Sehnem* 1656 (LIL). Passo Fundo, *Mattos & Laboriou* (RB). Pôrto Alegre, *Lindman* A-341 (S); *Palacios & Cuezza* 659 (LIL); *Rambo* (LIL). São Leopoldo, *Eugenio* 123 (R); 1653 (GH); 1655 (GH). São Salvador, *Eugenio* 3275 (GH). Tôrres, *Vidal* (R). Mun. Rio Pardo, *Jurgens* 267 (US). Mun. Vacaria: Passo do Socorro, *Rambo* (US).

Also: Trinidad, Venezuela, Guiana, Paraguay, Argentina.

16b. ***Tillandsia stricta*** var. ***disticha*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 115. 1943.

Paraná: Mun. Ponta Grossa: Vila Velha, *Foster* 411a (GH, type).

17. ***Tillandsia pohliana*** Mez in Mart. Fl. Bras. 3, pt. 3: 597, *pl. 111.* 1894.

Tillandsia meridionalis sensu Mez in DC. Monogr. Phan. 9: 818. 1896. In part, not Baker.

Tillandsia windhausenii Hassler ex Rojas, Rev. Jard. Bot. & Mus. Hist. Nat. Paraguay 2: 183. 1930. Nomen.

Tillandsia latisepala L. B. Smith, Proc. Amer. Acad. 68: 148, *pl. 1, figs. 6, 7.* 1933.

CEARÁ: Araripe, *Miranda* 1 (IAN).

MINAS GERAIS: Barbacena, *Glaziou* 13242 (P). São Miguel, *Pohl* 3658 (W, type). Mun. Ituiutaba: *Macedo* 511 (US). Santa Terezinha, *Macedo* 1204 (US).

MATO GROSSO: Campo Grande, *Foster* 1095 (GH). Corumbá, *Foster* 1162 (GH).

SÃO PAULO: Campinas, *Trevisan* 2861 (SP); *Trevisan & Viegas* 2862 (SP); 2863 (SP). Mun. Amparo: Monte Alegre, *M. Kuhlmann* 247 (SP).

ALSO: PARAGUAY, ARGENTINA, PERU.

18. ***Tillandsia meridionalis*** Baker, Journ. Bot. 26: 15. 1888.

RIO GRANDE DO SUL: Caxias, *Teodoro* 231 (R, US).

ALSO: PARAGUAY, ARGENTINA.

19. ***Tillandsia araujei*** Mez in Mart. Fl. Bras. 3, pt. 3: 600, *pl. 112, fig. 2.* 1894.

RIO DE JANEIRO (?): *Glaziou* 8019 (P, GH neg. 3020); 15463 (US); 15464 (GH).

DISTRITO FEDERAL: Morro dos Cabritos, *Duarte* 959 (RB). Copacabana, *collector?* (R). Corcovado to Tijuca, *Lutz* 866 (R). Pedra Dois Irmãos, *Rose & Russell* 20241 (US). Gavea, *Hoehne* (SP); *Reitz* 5682 (HBR); *Smith & Mus. R* 6425 (R, US). Praia de Grumari, near Guaratiba, *Smith & Mus. R* 6532 (US, lax shade form, sterile). Jacarepaguá, *Cochran* (R); *Pereira* 622 (RB). Jardim Leblon, *Harshberger* 851 (US). Praia Leblon, *Hoehne* 30 (SP). Avenida Niemeier, *Brade in L. B. Smith* 2169 (GH); *Parker* (R). Pedra Quilombo, *Brade* 10876 (R).

SÃO PAULO: Ilha dos Alcatrazes, Santos, *Loefgren* (SP); *Luederwaldt & Fonseca* (SP).

20. ***Tillandsia pulchella*** Hook. Exot. Fl. 2: *pl. 154.* 1825.

1. Leaf-blades flat near the base, merging gradually into the sheaths, usually equaling or exceeding the simple or few-branched stem.
   2. Plant not distinctly dorsi-ventral; leaves not completely secund, diverging from one another.
      3. Inflorescence shorter than the slender leaves; leaves scarcely or not at all secund.
         4. Flowers polystichous..... Var. a. **pulchella**
         4. Flowers distichous..... Var. b. **disticha**
      3. Inflorescence exceeding the stout usually secund leaves. Var. c. **surinamensis**
   2. Plant distinctly dorsi-ventral; leaves very densely ascending-secund with the blades closely approximate..... Var. d. **saxicola**
1. Leaf-blades involute throughout and thus contrasting sharply with the sheaths, very slender, much shorter than the long branching stem, often spreading. ..... Var. e. **vaginata**

20a. ***Tillandsia pulchella*** var. ***pulchella.***

Tillandsia pulchra Hook. Exot. Fl. 2: sub *pl. 154.* 1825. With the text.
Tillandsia subulata Vell. Fl. Fluminensis 133. 1825; Icon. 3: *pl. 127.* 1835.
? *Tillandsia autumnalis* F. Mueller, Gartenflora 42:737. 1893.
Tillandsia astragaloides Mez in Mart. Fl. Bras. 3, pt. 3:601. 1894.
Tillandsia pulchella var. *rosea* Mez in Mart. Fl. Bras. 3, pt. 3:603. 1894, in part, not as to basonym.
Tillandsia pseudo-stricta Chodat & Vischer, Bull. Soc. Bot. Genève II. 8:263, *figs. 122, 123.* 1916.

BRAZIL: *Sellow* bromel. 87 (P); 91 (P).
PARÁ: Belém, *Archer* 7833 (IAN).
CEARÁ: *Allemão e Cysneiros* 1526 in part (R).
PERNAMBUCO: São Bento, Tapera, *Pickel* 137 (SP).
BAÍA: Maracás, *Foster* 2464 (US).
ESPÍRITO SANTO: (Bananal), *Viana Freire* 50 (R). (Goitacazes), Rio Doce, *J. G. Kuhlmann* 138 (RB).
MINAS GERAIS: *Regnell* I-282-c in part (US).
MATO GROSSO: Cascata do Angelim, Serra do Itapirapuã, *Lindman* A-3523 (S). Guaira, *Cullen* (RB).
RIO DE JANEIRO: Bôa Vista, Rio Paraiba, *Neto, Glaziou & Schwacke* (R). Serra dos Orgãos, *Schreiner* (R). Petrópolis, *Glaziou* 8025 (P). Teresópolis, *Frazão* (RB); *Sampaio* 2538 (R).
DISTRITO FEDERAL: Copacabana, *Glaziou* 2730 (P); Serra da Carioca, Estrada da Sumaré, *Pabst* 10081 (Pabst).
SÃO PAULO: Campinas, *Campos Novaes* 1201 (SP). Campos do Jordão, *Hoehne* (GH, SP). Monte Alegre do Sul, *M. Kuhlmann* 1885 (SP). Santos, *Mosén* 3252 in part (S). Serra Negra, *Hoehne* (SP). Mun. Amparo: Monte Alegre, *Kuhlmann & Kühn* 358 (SP). Mun. São Paulo: *Edwall* (SP). Butantã, *Gehrt* (SP). Vila Ema, *Brade* 7582 (R).
PARANÁ: Linha Esperança to Prudentópolis, *Frenzel* 650 (HBR, Inst. Biol. Pesq. Tec.). Tibagi, *Reiss* 83 (GH, US). Mun. Paranaguá: Vossoroca, *Hatschbach* 2483 (US). Mun. Ponta Grossa: Vila Velha, *Dusén* 7235 (S); 15525 (S); *Hoehne* (SP); *M. Kuhlmann* (SP).
SANTA CATARINA: Mun. Araranguá: Sombrio, *Reitz* C-644 (GH). Mun. Biguaçu: Fachinal, *Reitz* 4101 in part (HBR). Mun. Chapecó: Dionísio Cerqueira, *Reitz* 4595 (HBR). Itapiranga, *Reitz* 4606 (HBR). Rio Peperi-Guaçú, Itapiranga, *Reitz* 4284 (HBR).
RIO GRANDE DO SUL: Santo Angelo, *Lindman* A-1037 (S). São Leopoldo, *Eugenio* 120 (R); 212 (SP); 2611 (GH); 2614 (GH, HBR). "Theewald," *Bornmueller* 709 (GH).
ALSO: WEST INDIES, VENEZUELA, GUIANA, BOLIVIA, PARAGUAY, ARGENTINA.

20b. ***Tillandsia pulchella*** var. ***disticha*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1:114, *pl. 117.* 1943.

DISTRITO FEDERAL: Rio de Janeiro, *Wilkes Expedition* (GH, type, US neg. 4100).

20c. ***Tillandsia pulchella*** var. ***surinamensis*** Mez in Mart. Fl. Bras. 3, pt. 3: 603. 1894.

Tillandsia surinamensis Miq. ex Mez in Mart. Fl. Bras. 3, pt. 3:603. 1894. Nomen, in synon.

Tillandsia firmula Mez in Mart. Fl. Bras. 3, pt. 3: 603. 1894.
Tillandsia pulchella forma *surinamensis* Mez in Luetzelburg, Estudo Bot. Nordéste 3: 104. 1923.

Brazil: *Sellow* bromel. 89 (P).

Piauí: Southern part of state, *Luetzelburg* (! Mez).

Ceará: Aratuba (Coite or Santos Dumont), *Cutler* 8177 (US).

Paraíba: Serra da Aba, *Luetzelburg* (! Mez). Serra d'Olho d'Agua, *Luetzelburg* (! Mez). Serra dos Prazeres, *Luetzelburg* (! Mez).

Baía: Agua Preta, *Foster* 109 (GH, R). Serra das Almas, *Luetzelburg* (! Mez).

Espírito Santo: Santa Teresa, *Foster* 306 (GH).

Minas Gerais: Pedra Branca, Caldas, *Mosén* 3990 (S).

Distrito Federal: Serra da Carioca, *L. B. Smith* 2150 (GH). Corcovado, *Glaziou* 3127 (P, isotype of *Tillandsia firmula* Mez, GH neg. 3012).

São Paulo: *Burchell* 4222 (K); *Sellow* 5877 (B, F neg 11496). Alto da Serra, *Gehrt* (SP). Iguape, Santos, *Hoehne* (SP). Jaraguá, *Brade* 7203 (SP). Ubatuba, *Viegas, Franco & Lima* (IAC). Mun. São Paulo: Cidade Jardim, *Smith & Kuhlmann* 1812 (GH). Santo Amaro, *Krieger* 174 (SP).

Paraná: Alto da Serra, *Foster* 403 (GH, R). Ponta Grossa, *Reitz* 5733 (! Reitz).

Santa Catarina: São Francisco do Sul, *Reitz* 4012 (HBR). Mun. Araranguá: Espigão de Barro, *Reitz* C-606 (GH). Peroba, *Reitz* C-472 (GH). Peroba, Sombrio, *Reitz* 3705-b (HBR). Sombrio, *Reitz* 3763 (HBR, US). Mun. Blumenau: Garcia, *Reitz* 4642 (! Reitz). Mun. Imaruí: Vargem do Cedro, *Reitz* 4530 (HBR). Mun. Jaraguá do Sul: Corupa, *Seidel* 15 (HBR). Mun. Palhoça: Campo de Massiambú, *Reitz & Klein* 335 (! Reitz). Pilões, *L. B. Smith* 6218 (R, US).

Rio Grande do Sul: Morro Sapucaia, *Palacios & Cuezzo* 429 (LIL). Palmares, near Lagoa dos Patos, *Rambo* (US). São Jeronimo, *Schwacke* (R). São Leopoldo, *Eugenio* 126 in part (NY); 213 (SP); 2609 (GH); 2610 (GH). Estação São Salvador, *Sehnem* 2094 (LIL). Mun. Pôrto Alegre: Canoas, *Lindman* A-353 (S). Mun. Tôrres: Campo Bonito, *Reitz* 4416 (HBR).

Also: Guiana, Paraguay, Argentina.

20d. ***Tillandsia pulchella*** var. ***saxicola*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 115, *pl. 118*. 1943.

Distrito Federal: Morro do Archer, *Brade* 10410 (R).

São Paulo: Atibaia, *Foster* 481 (GH); *Ostermeyer* (SP). Pedra Grande, Atibaia, *Gehrt* (GH, type (US neg. 4101), SP). Serra de Itapetinga, *Duarte* (GH, SP).

20e. ***Tillandsia pulchella*** var. ***vaginata*** (Wawra) Castellanos, An. Mus. Nac. Hist. Nat. Buenos Aires 37: 505. 1933.

Tillandsia triflora Vell. Fl. Fluminensis 134. 1825; Icon. 3: *pl. 134*. 1835.
Tillandsia pityphylla Mart. ex Schult. in R. & S. Syst. 7, pt. 2: 1208. 1830.
Tillandsia pulchra var. *vaginata* Wawra, Oesterr. Bot. Zeitschr. 30: 224. 1880.
Anoplophytum amoenum E. Morr. Belg. Hortic. 33: 265, *pl. 17*. 1883.
Anoplophytum brachypodium E. Morr. ex Baker, Handb. Bromel. 196. 1889. Nomen.

Tillandsia pulchella var. *pityphylla* Mez in Mart. Fl. Bras. 3, pt. 3: 603. 1894.

Tillandsia amoena Mez in Engl. Pflanzenreich IV. 32: 451. 1935. Not Lodd. 1818.

Tillandsia cyanescens Mez in Engl. Pflanzenreich IV. 32: 563. 1935.

Tillandsia brachypodia Mez in Engl. Pflanzenreich IV. 32: 564. 1935.

BRAZIL: *Sellow* (S); bromel. 83 (P).

PIAUÍ: Southern part of state, *Luetzelburg* (! Mez).

RIO GRANDE DO NORTE: Serra do Martins, *Luetzelburg* (! Mez).

PARAÍBA: Serra Branca, *Luetzelburg* (! Mez).

BAÍA: Serra das Almas, *Luetzelburg* (! Mez). Serra dos Veados, *Luetzelburg* (! Mez, erroneously listed as "Goiás").

ESPÍRITO SANTO: Mun. Cachoeira de Itapemirim: Vargem Alta, *Foster* 924 (GH).

MINAS GERAIS: Sitio, near Barbacena, *Sampaio* 342 (R). Caldas, *Hoehne* (GH, SP). Pedra Branca, Caldas, *Regnell* I-282-d in part (S). Serra de Caldas, *Mosén* 1734 (S). Rio Verde, Caldas, *Mosén* 4440 (S); *Regnell* III-1250 (S, US). Serra de Caracol, *Mosén* 1735 (S). Coronel Pacheco, *Heringer* 1007 (SP). Juiz de Fora, *Wawra* II-212 (W, type). Sete Lagoas, *Occhioni* (RB). Mun. Betim: Contagem, *Assis & Morreira in Williams* 8222 (GH, US).

RIO DE JANEIRO: Bôa Vista, Rio Paraiba do Sul, *Glaziou* (P). Restinga de Mauá, *Hemmendorff* 464 (S). Nova Friburgo, *Glaziou* 13257 (GH, P, US). Teresópolis, *Bessa & Sampaio* 2521 (R); *Sampaio* 2521-a (R); 2652 (R).

DISTRITO FEDERAL: Ilha do Ribeiro, Km. 21, Jacarepaguá, *Pereira* 101 (RB). São Cristovão, *Glaziou* 13239 (P). Tijuca, Excelsior, *Lutz* 1442 (R).

SÃO PAULO: Atibaia, *Duarte* (GH, SP). Campinas, *Campos Novaes* (SP, US). Campos do Jordão, *Eugenio* 3851 (GH). Iperó, *W. Hoehne & Gehrt* (SP). Itú, *Russel* (SP). (Ribeirão da Lagoa), *Edwall* (SP). Serra do Mar, *Edwall* (GH, SP). Rio Tijuca, *Foster* 471 (GH). Una, *Foster* 387 (GH, R). Mun. Iguape: Morro das Pedras, *Brade* 7905 (R). Mun. São Paulo: Bosque da Saude, *Hoehne* (SP). Butantã *Hoehne* (GH, SP). Ipiranga, *Luederwaldt* (GH, SP). Pirajussára, *Gehrt* (GH, SP).

PARANÁ: Itaperuçú, *Dusén* 7112 (S). Jaguariaíva, *Dusén* (S). Palmeiras, *M. Kuhlmann* (GH, SP). Roça Nova, *Dusén* 10274 (S).

ALSO: WEST INDIES, VENEZUELA, PARAGUAY, ARGENTINA.

21. ***Tillandsia aëranthos*** (Loisel.) L. B. Smith, Lilloa 9: 200. 1943.

Pourretia aëranthos Loisel. in Mordant de Launay, Herb. Gen. Amat. 5: *pl. 304.* 1821.

Tillandsia dianthoidea Rossi, Cat. Modoet. 79, *pl. 1.* 1825.

Tillandsia bicolor Brongn. in Duperrey, Voy. Coquille Bot. 185, *pl. 36.* 1829.

Tillandsia microxiphion Baker, Bot. Mag. 119: *pl. 7320.* 1893.

SANTA CATARINA: *D'Urville* (P, type of *Tillandsia bicolor* Brongn., GH neg. 3019). Laguna, *Dusén* 8412 (US). Mun. Araranguá: Sombrio, *Reitz* C-104 (HBR).

RIO GRANDE DO SUL: *Araujo* 48 (R). Osorio, *Rambo* (HBR, US). Pelotas, *Lindman* A-679 1/2 (S). Pôrto Alegre, *Lindman* A-253 (S); *Rambo* (LIL). Santa Maria, *Harshberger* 980 (US). São Leopoldo, *Eugenio*

122 (R); 1611 (GH); 1656 (GH); 1658 (GH); 1659 (GH); 1661 (GH); 2789 (HBR); *Fridericks in Eugenio* 3172 (GH); *Heinz* (LIL); *Reitz* (HBR). Viera, near Rio Grande, *Archer* 4304 (SP, US).

ALSO: URUGUAY, ARGENTINA, PARAGUAY.

Subgenus *Phytarrhiza* (De Vis.) Baker

22. ***Tillandsia anceps*** Lodd. Bot. Cab. 8: *pl. 771.* 1823. FIGURE 26.

PARÁ: Rio Guamá, *Pires & Black* 1553 (IAN); *Smith, Pires & Black* 7122

FIG. 25.

FIG. 26.

FIG. 25.—*Tillandsia stricta* var. *stricta: a,* Habit (after Botanical Magazine), × ½; *b,* flower, × 1; *c,* petal and stamen, × 1.

FIG. 26.—*Tillandsia anceps: a,* Habit (after Botanical Cabinet), × ½; *b,* sepals and capsule, × 1.

(US). Belém, *Archer* 7832 (IAN, US); *Museu Goeldi* (MG); *Pires* 1937 (IAN).

ALSO: CENTRAL AMERICA, TRINIDAD, NORTHERN SOUTH AMERICA.

23. ***Tillandsia linearis*** Vell. Fl. Fluminensis 133. 1825; Icon. 3: *pl. 128.* 1835.
Tillandsia selloa C. Koch, Ind. Sem. Hort. Berol. 1873, App.: 7. 1874.
Tillandsia setacea sensu Baker, Handb. Bromel. 175. 1889. In part, not Sw.

GOIÁS: Serra dos Veadeiros, *Glaziou* 22197 (P).

RIO DE JANEIRO: Serra de Nova Friburgo, *Saldanha in Schwacke* 4586 (! Mez).

SÃO PAULO: Cotia, *M. Kuhlmann* (SP). Paiol do Meio, *Gehrt* (SP). São Bernardo, *Brade* 6744 (SP). Una, *Foster* 384 (GH, R). Mun. São Paulo: Santo Amaro, *Edwall* (SP). Butantã, *Gehrt* (SP); *Hoehne* 823 (SP).

PARANÁ: Curitiba, *Galvão in Saldanha* 8839 (R); *Sellow* 4684 (GH). Curitiba to Paranaguá, km. 29, *Tessmann* (Paran., US), Itaperuçu, *Dusén* 7397 (BM, S, US). Jacareí, *Dusén* 6816 (S); 15555 (GH, S). Pinhaes, *Dusén* 11592 (S); 15852 (GH, S, US). Mun. Piraquara: Campininha, *Hatschbach* 2720 (US). Mun. Ponta Grossa: Itaiacóca, *Dusén* 4240 (R, S).

24. ***Tillandsia monadelpha*** (E. Morr.) Baker, Journ. Bot. 25:281. 1887.
Phytarrhiza monadelpha E. Morr. Belg. Hort. 32:168, *pl. 7.* 1882.

AMAPÁ: Rio Oiapoque, *Fróes* 25711 (IAN).

PARÁ: Belém, Estrada de Ferro Bragança, Santa Isabel, *Goeldi staff* (MG).

ALSO: CENTRAL AMERICA, TRINIDAD, NORTHERN SOUTH AMERICA.

25. ***Tillandsia decomposita*** Baker, Handb. Bromel. 168. 1889.
Tillandsia weddellii Baker, Handb. Bromel. 181. 1889.
Tillandsia tomentosa N. E. Brown, Trans. Proc. Bot. Soc. Edinburgh 20: 73. 1894.

MATO GROSSO: Camizão, *Foster* 1088 (GH). Corumbá, *Hoehne in Rondon* 3560 (R).

ALSO: BOLIVIA, PARAGUAY, ARGENTINA.

26. ***Tillandsia streptocarpa*** Baker, Journ. Bot. 25:241. 1887. FIGURE 27.
Tillandsia tricholepis Baker, Journ. Bot. 25:234. 1887. Not Baker 1878.
Tillandsia bakeriana Britten, Journ. Bot. 26:170. 1888.
? *Tillandsia retrorsa* A. Silveira, Floralia Montium 2:25, *pl. 10.* 1931.
? *Tillandsia grao-mogolensis* A. Silveira, Floralia Montium 2:26, *pl. 1, pl. 11, fig. 1.* 1931.

PIAUÍ: Paranaguá *Luetzelburg* (! Mez).

PARAÍBA: Campina Grande to Caruarú (in Pernambuco), *Foster* 2422 (US). Ipanargna, Campina Grande, *Foster* 2409 (US).

PERNAMBUCO: Caruarú, *Pickel* 4243 (IPA).

BAÍA: *Luetzelburg* 12412 (NY). Bom Jesus de Lapa, *Campos Porto* 2482 (RB); *Zehntner* 569 (RB). Catuni, Rio São Francisco, *Campos Porto* 2342 (RB). Itumirim, *Campos Porto* (RB). Jacobina, *Foster* 96 (GH, R). Joazeiro, *Rose & Russell* 19774 (US). Queimada, *Pires* 3451 (IAN).

MINAS GERAIS: *Saint-Hilaire* B1-1847 (P). Beribéri, *Glaziou* 19917 (P). Serra de Caracol, *Mosén* 4442 (S). Mun. Ituiutaba: São Vicente, *Macedo* 2714 (US).

GOIÁS: Alto da Serra dos Pireneos, *Glaziou* 22195 (P). Vargem Grande, upper Rio Tocantins, *Ule* 224 (R).

MATO GROSSO: Corumbá, *Foster* 1058 (GH); 1065 (GH, US).

RIO DE JANEIRO: Serra dos Orgãos, *Luetzelburg* (! Mez).

SÃO PAULO: Cultivated, *Hoehne* (GH, SP). Atibaia, *Foster* 478 (GH, R); *Gehrt* (SP). Cachoeira do Maribondo, *Gehrt* (SP). Campinas, *Viegas & Trevisan* (IAC). Morro Pelado, Itirapina, *Derby* (SP). Mun. Tanabi: Ilha Cachoeira dos Indios, *Gehrt* (SP).

PARANÁ: Mun. Ponta Grossa: Vila Velha, *Dusén* 2755 (R, S); 2811 (GH, R, S); 7643 (S, US); 9527 (S); 16123 (GH, S, US); *Foster* 416 (GH, R); *Tessmann* (US).

RIO GRANDE DO SUL: *Lindman* (S).

ALSO: PARAGUAY, ARGENTINA, BOLIVIA, PERÚ.

27. ***Tillandsia crocata*** (E. Morr.) Baker, Journ. Bot. 25:214. 1887.
Phytarrhiza crocata E. Morr. Belg. Hortic. 30:87. 1880.
Tillandsia mandonii E. Morr. ex Mez in DC. Monogr. Phan. 9:871. 1896.

BRAZIL: *Lietze* (K, type, as Morren Icon.).

RIO DE JANEIRO: Itatiaia, *Moreira* 5 (R).

PARANÁ: Mun. Ponta Grossa: Vila Velha, *Dusén* 4284 (R, S); 7628 (NY, S); 7642 (S); 9238 (GH, S, US); *Foster* 414 (GH, R); *Gonçalves* (SP, US); *Tessmann* (Paran., US).

RIO GRANDE DO SUL: Mouth of Rio Jacuí, *Tweedie* 427 (K, US neg. 3971). Pôrto Alegre, *Lindman* (S). São Leopoldo, *Rambo* (LIL).

28. ***Tillandsia mallemontii*** Glaziou ex Mez in Mart. Fl. Bras. 3, pt. 3:608, *pl. 114, fig. 1.* 1894.
Tillandsia linearis sensu Baker, Journ. Bot. 25:234. 1887. Not Vell. 1825.

PIAUÍ: Serra do Brejo, *Luetzelburg* (! Mez).

RIO GRANDE DO NORTE: Jardim do Seridó, *Luetzelburg* (! Mez). Serra do Martins, *Luetzelburg* (! Mez).

BAÍA: Serra de Chuquê, northeastern Baía, *Luetzelburg* (! Mez).

RIO DE JANEIRO: Alto de Macaé, near Nova Friburgo, *Glaziou* 18563 (K (US neg. 3973), US).

DISTRITO FEDERAL: Cultivated, São Cristovão, *Lindman* A-35 (S); *Ule* 1313 in part (R). Restinga de Grumari, *Freire* 609 (R); *Smith & Mus. R* 6534 (R, US). Tijuca, *Glaziou* 14345 (B, type, K).

SÃO PAULO: *Saint-Hilaire* C²-1451 (P).

PARANÁ: Jaguariaíva, *Dusén* 10071 (S). Pôrto Amazonas, *Langs in Dusén* 9530 (S, US). Mun. Lapa: Engenheiro Blei, *Hatschbach* 1201 (US). Mun. Ponta Grossa: Vila Velha, *Dusén* 4107 (R); *Foster* 413 (GH, R); *M. Kuhlmann* (SP).

SANTA CATARINA: Tuberão, *Ule* 1313 in part (GH). Mun. Araranguá: Turvo, *Reitz* C-399 (GH); 876 (R). Mun. Florianópolis: Florianópolis, *Reitz* 3903 (HBR). Rio Tavares, *Reitz* 4593 (HBR); *Smith & Reitz* 6194 (R, RB, US). Mun. Jaraguá do Sul: Corupá, *Reitz* 4283 (HBR); *Seidel* 16 (HBR).

RIO GRANDE DO SUL: Cachoeira to Colonia Santo Angelo, *Lindman* A-1007 (S). Morro Grande, near Osório, *Rambo* (US). Lagoa de Pinguela, near Osório, *Pabst* 10162 (RB). Pelotas, *Parcus* (Montevideo). Pôrto Alegre, *Rambo* (LIL). Lagoa dos Quadros, *Rambo* (HBR, US). São Leopoldo, *Rambo* (LIL). São Salvador, *Eugenio* 2210 (GH). Mun. Tôrres: Campo Bonito, *Reitz* 4413 (HBR).

Subgenus *Diaphoranthema* (Beer) Baker

29. ***Tillandsia loliacea*** Mart. ex Schult. in R. & S. Syst. 7, pt. 2: 1204. 1830.
Tillandsia undulata Baker, Journ. Bot. 16:240. 1878.
Tillandsia quadriflora Baker, Handb. Bromel. 163. 1889. In part.
Tillandsia atrichoides S. Moore, Trans. Linn. Soc. Bot. II. 4:491. 1895.

PIAUÍ: Guaribas, *Luetzelburg* (! Mez). Colonia e Manga, *Luetzelburg* (! Mez).

CEARÁ: 20 km. west of Canindé, *Cutler* 8430 (US). Cariri, near Imbuzeiro, *Loefgren* 496 (R).

PARAÍBA: Campina Grande, *Wright* 4338 (GH). Passagem, *Luetzelburg* (! Mez).
BAÍA: Itumirim, *Campos Porto* (RB). Jacobina, *Foster* 95 (GH, R). Lenções, *Luetzelburg* (! Mez). Monte Santo, near Joazeiro, *Martius* (M, type).
MINAS GERAIS: *Glaziou* 13241 (P). Conselheiro Matta-Rodeador, *Brade* (RB).
MATO GROSSO: Corumbá, *Hoehne in Rondon* 3556 (R); 3557 (R); 3558 (R); 3559 (R); *Robert* 791 (BM). Corumba to Ladario, *Moore* 1046 (BM, type of *Tillandsia atrichoides* S. Moore, US neg. 3991). Diamantino, *Lindman* b (S).
SÃO PAULO: Descalvado, *Foster* 500 (GH); *Gehrt* (SP).
ALSO: BOLIVIA, PARAGUAY, ARGENTINA.

30. ***Tillandsia tricholepis*** Baker, Journ. Bot. 16:237. 1878.
Tillandsia bryoides Griseb. Goett. Abh. 24:334. 1879. In part.
Tillandsia polytrichoides E. Morr. Belg. Hortic. 30:240. 1880.
CEARÁ: *Allemão* CLXXI in part (R); *Allemão e Cysneiros* 1525 (R); 1526 (R); *Saldanha hb.* 8102 (R). West of Canindé 20 km., *Cutler* 8431 (US).
MINAS GERAIS: Conselheiro Matta-Rodeador, *Brade* 13497 (RB).
RIO DE JANEIRO: Paraiba do Sul, *M. Kuhlmann* (SP). Petrópolis, *Luetzelburg* 911 (M).
DISTRITO FEDERAL: Campo Grande, *Passareli* 7 (R). Praia de Grumari, near Guaratiba, *Smith & Mus. R* 6533 (R, US). Jardim Botânico, *Brade* 20620 (RB); *Swingle* (US). Parque da Bôa Vista, *Diogo* 790 (R). Quinta, *Glaziou* 3124 (P). Ilha do Raimundo, *Vidal* (R). Rio de Janeiro, *Foster* 1175 (GH). São Cristovão, *Brade in L. B. Smith* 2168 (GH); *Lindman* A-37 (S). Restinga da Tijuca, *Machado* (RB).
RIO GRANDE DO SUL: São Leopoldo, *Eugenio* 121 (R); 444 (NY); 1896 (GH).
ALSO: BOLIVIA, PARAGUAY, ARGENTINA.

31. ***Tillandsia recurvata*** (L.) L. Sp. Pl. ed. 2. 410. 1762.
Renealmia recurvata L. Sp. Pl. 287. 1753. Excluding var. β.
Diaphoranthema recurvata Beer, Bromel. 156. 1857.
PARÁ: Cachoeira Grande, Rio Cumina, *Sampaio* 5478 (R). Cachoeira da Zoáda, Rio Cumina, *Sampaio* 5399 (R).
PIAUÍ: São João do Piauí, *Luetzelburg* (! Mez).
CEARÁ: Arará, north of Araripe, *Cutler* 8409 (US). West of Canindé 20 km., *Cutler* 8429 (US). Mun. Maranguape: Sitio Agua Verde, north of Palmeiras, *Cutler* 8242 (US).
PERNAMBUCO: *Pickel* (SP). Russinha, *Pickel* 138 (GH).
ALAGÓAS: Cachoeira de Paulo Affonso, *Chase* 7809 (US).
BAÍA: Serra das Almas, *Luetzelburg* (! Mez). Serra da Chuquê, *Luetzelburg* (! Mez). Itumirim, *Campos Porto* (RB). Jacobina, *Foster* 92 (GH, R); 93 (GH, R); 94 (GH, R). Mun. Sento Se: Uauá, *Schery* 567 (GH).
MINAS GERAIS: Serra de Caracol *Mosén* 1736 (S); 1737 (S); 4441 (S). Coronel Pacheco, *Heringer* 910 (SP). Lagoa Santa, *Hoehne in Rondon* 6418 (R); 6419 (R); *Warming* (C). Lavras, *Black* 2084-B (RB). Paraisópolis, *Hoehne* (SP). Sabará, *Hoehne in Rondon* 6891 (R); 6892 (R). Mun. Jaboticatubas: Serra do Cipó, *Foster* 632 (GH). Chapeu de Sol, Serra do Cipó, *Smith & Mus. R* 7004 (R, US). Mun. Santa Luzia: Nova Granja, *Williams & Assis* 6761 (GH, R, US).
RIO DE JANEIRO: Barra do Piraí, *Hoehne & Gehrt* (SP). Serra da Estrella, *Luetzelburg* (! Mez). (Pedra do Rio), *Viana Freire* 33 (R). Serra dos

Orgãos, *Luetzelburg* (! Mez). Mun. Petrópolis: Carangola, *Goés & Constantino* 635 (RB, US).

São Paulo: Atibaia, *Foster* 479 (GH, R); *Lindberg* 563 (S). Campinas, *Aloisi* (IAC); *Campos Novaes* 1200 (US); *Mosén* 375 (S); *Severin* 39 (US). Carioba, *M. Kuhlmann* 862 (SP). Conchas, *Gehrt* (SP). Cotia to Una, *Foster* 385 (GH, R). Itapira, *Hoehne* (GH, SP). Monte Alegre do Sul, Rio Camanducaia, *M. Kuhlmann* 141 (SP). Monte Alegre do Sul, *Kuhlmann & Kühn* 1818 (SP). Serra Negra, *Hoehne* (GH, SP). Mun. Itirapina: Morro Pelado, *Derby* (SP). Mun. São Paulo: Pirajussára, *Gehrt* (GH, SP). São Paulo, *Loefgren* (GH, SP).

Paraná: Pôrto Amazonas, *Dusén* 9530 (NY). Tibagi, *Reiss* (GH). Mun. Ponta Grossa: Vila Velha, *Dusén* 2763 (R).

Rio Grande do Sul: Colonia Santo Angelo, *Lindman* A-915-b (S). Piratiní, *Lindman* A-915 (S). Pôrto Alegre, *Lindman* A-255 (S); A-1631-a (S); *Rambo* (LIL). Santa Maria, *Lindman* A-1631-b (S). São Leopoldo, *Eugenio* 128 (NY); 2527 (GH). Mun. Quarai: Jarau, *Rambo* (LIL).

Also: Southern United States to Argentina and Chile.

32. ***Tillandsia usneoides*** (L.) L. Sp. Pl. ed. 2. 411. 1762. Figure 28.
Renealmia usneoides L. Sp. Pl. 287. 1753.
Dendropogon usneoides Raf. Fl. Tellur. 4:25. 1838.
Strepsia usneoides Steud. Nomencl. ed. 2. 2:645. 1841.

Brazil: *Blanchet* (BM); *Bowie & Cunningham* (BM); 45 (BM); *Freyreis* (S); *Martius* 463 (MO, NY); *Richard* (S); *Riedel* (BM).

Pará: São Miguel do Guamá, Rio Guamá, *Dias* 11 (IAN, US).

Pará–Maranhão: Rio Gurupi, *F. Lima* (MG).

Piauí: São João do Piauí, *Luetzelburg* (! Mez).

Ceará: *Allemão* CLXXI in part (R); *Allemão e Cysneiros* 1524 (R); *Neves Armond* (R). Aratuba (Coite or Santos Dumont), *Cutler* 8176 (US).

Paraíba: Campina Grande, *Wright* 50 (GH).

Pernambuco: (Jaqueira), *Ridley, Lea & Ramage* (BM).

Alagoas–Sergipe: Lower Rio São Francisco, *Luetzelburg* (! Mez).

Baía: *Glocker* 198 (S). Agua Preta, *Foster* 110 (GH, R). Serra do Chuquê, *Luetzelburg* (! Mez). Iguaçu, *Campos Porto* (RB). Itatinga to Bom Gosto, *Fróes* 19973 (IAN, US). Serra do Itubira, *Luetzelburg* (! Mez). Machado Portela, *Rose & Russell* 19985 (US).

Espírito Santo: Rio São Gabriel, northern Rio Doce, *Vieira* 23 (RB). Mun. Vitória: Araguai, *Foster* (GH).

Minas Gerais: Caldas, *Regnell* III-1251 (F, GH, R, S, US). Lagoa Santa, *Hoehne in Rondon* 6353 (R). Passa Quatro, *Sampaio* 6224 (R). Sitio, *Sampaio* 154 (R). Turvo, *Hoehne & Gehrt* (GH, SP). Mun. Diamantina: Mato do Izidoro, *Baptista in Williams* 6985-a (GH). Mun. Santa Luzia: Capão, Serra do Cipó, *Oliveira* (IAN).

Rio de Janeiro: Campos, *Sampaio* 8262 (R). Serra da Estrella, *Luetzelburg* (! Mez). Niteroi, *Smith & Brade* 2328 (GH). Serra dos Orgãos, *Luetzelburg* (! Mez). Teresópolis, *Brade* 9225 (R); *Sampaio* 2211 (R).

Distrito Federal: Campo Grande, *Parker* (R). Praia de Grumari, near Guaratiba, *Smith & Mus. R* 6531 (R, US). Jardim Botânico, *Sampaio* (R). Rio de Janeiro, *Andersson* (S); *Forsett* 93 (S); *Mosén* 2622 (S); *Saldanha hb.* (R); *Widgren* (S); 462 (S, US); *Wilkes Expedition* (US). Restinga da Tijuca, *Machado* (RB).

São Paulo: Ilha dos Alcatrazes, Santos, *Luederwaldt & Fonseca* (GH, SP). Campinas, *Santoro* (IAC). Cubatão, *L. B. Smith* 2041 (GH). Itú, *Russel* (SP). Piquete, *Robert* (BM). Piracicaba, *Puttemans* (SP). Mun. São Paulo: *M. Kuhlmann* 2704 (SP). Butantã, *Hoehne* (GH, SP). Cidade Jardim, *Smith & Kuhlmann* 1811 (GH). Mooça, *Brade* (SP); 6310 (S); 6311 (S).

Fig. 27.

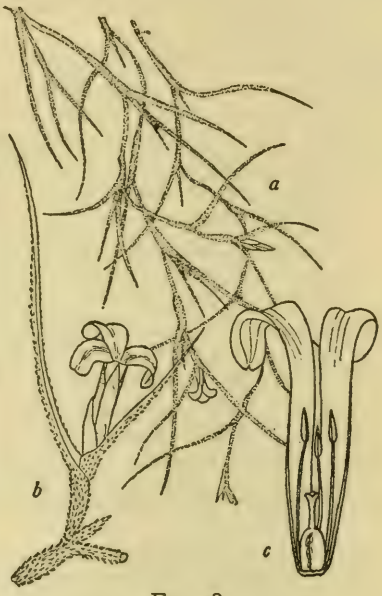

Fig. 28.

Fig. 27.—*Tillandsia streptocarpa: a,* Habit, ×⅕; *b,* inflorescence, ×1; *c,* petal, stamen, and pistil, ×1. (All after Flora Brasiliensis.)

Fig. 28.—*Tillandsia usneoides: a,* Habit, ×½; *b,* flower, leaves, and section of stem, ×2.5; *c,* petals, stamens, and pistil, ×5. (All after Botanical Magazine.)

Paraná: Restinga Secca, R. R. Station, *Dusén* 3130 (R, S). Serrinha, *Dusén* 17673 (BM, GH, S, US). Tibagi, *Reiss* 16 (GH, US).

Santa Catarina: *Gaudichaud* 134 (GH); *Macrae* (BM). Laguna, *Reitz & Klein* 86 (HBR). Pôrto União, *Dionysio* 7 (SP). São Francisco do Sul, *Reitz* 3795 (HBR). Mun. Araramguá: Meleiro, *Reitz* C-13 (GH, HBR). Mun. Florianópolis: Armação de Piedade, *Smith & Reitz* 6198 (US).

Rio Grande do Sul: Bom Jesús, *Rambo* (SP). Canoas, *Teodoro 72* (US). Rio Guaíba, Belém Nova, *Palacios & Cuezzo* 391 (LIL). Morro Sapucaia, *Palacios & Cuezzo* 535 (LIL). Pinhal, *Palacios & Cuezzo* 2334 (LIL). Pôrto Alegre, *Lindman* A-469 (S); *Palacios & Cuezzo* 636 (LIL). São Leopoldo, *Reitz* (HBR). Mun. São Francisco de Paula: Tainhas, *Rambo* (HBR).

Also: Southeastern United States to Argentina and Chile.

Subgenus *Pseudo-Catopsis* Baker

33. ***Tillandsia triticea*** Burchell ex Baker, Journ. Bot. 26: 42. 1888.
Tillandsia parkeri Baker, Journ. Bot. 26: 42. 1888.
Tillandsia viridis Baker, Handb. Bromel. 204. 1889.
Vriesia luschnathii Mez in Mart. Fl. Bras. 3, pt. 3: 555, *pl. 103.* 1894.

BAÍA: Rio Grungogi, *Curran* 137 (US).

ESPÍRITO SANTO: Campinas to Vitória, *Foster* 204 (GH). Santa Teresa, *Foster* 275 (GH, R).

RIO DE JANEIRO: Petrópolis, *Glaziou* 16465 (P).

SÃO PAULO: Alto da Serra, *Edwall* (SP); *Foster* 370 (GH); 371 (GH, R); *Gehrt* (SP); *Smith, Hoehne & Kuhlmann* 1827 (GH). Santos, *Burchell* 3217 (K, type, US neg. 3980); *Mosén* 3494 (S).

PARANÁ: Guaratuba, *Reitz* 4274 (HBR); *Smith & Reitz* 5747 (R, RB, US). Jacareí, *Dusén* 14694 (S); 14755 (S); 17070 (GH). Joinvile-Curitiba road near Santa Catarina line, *Reitz* 3892 (HBR); *Reitz* 5756 (! Reitz). Morrêtes to Antonina, *Dusén* 15472 (S, US). Paranaguá, *Dusén* 9796 (S); *Foster* 448 (GH); *Handro* (SP). Pôrto de Cima, *Dusén* 6975 (S); 14605 (S). Serra do Mar, Volta Grande, *Dusén* 12034-A (S); 12035 (S).

SANTA CATARINA: Joinvile, *Reitz* 3716 (HBR). Mun. Brusque: Brusque, *Reitz* 3818 (HBR); 3949 (HBR, US). Morro da Bateia, *Reitz* 3595 (HBR). Morro Spitzkopf, *Reitz* 3462 (HBR, US). Mun. Jaraguá do Sul: Corupá, *Reitz* 4130 (HBR); 4229 (HBR); *Seidel* 1 (HBR); 10 (HBR). Mun. Palhoça: Pilões, *L. B. Smith* 6222 (R, US).

ALSO: BRITISH GUIANA, TRINIDAD, COLOMBIA, BOLIVIA, PERÚ.

34. ***Tillandsia aëris-incola*** (Mez) Mez in DC. Monogr. Phan. 9: 759. 1896. FIGURE 29.
Catopsis maculata E. Morr. ex Baker, Handb. Bromel. 155. 1889. Not *Tillandsia maculata* R. & P. 1802.
Vriesia? aerisincola Mez in Mart. Fl. Bras. 3, pt. 3: 555. 1894.
Catopsis deflexa Ule, Bericht. Deutsch. Bot. Gesellsch. 18: 323, *pl. 10, figs. 1–6.* 1900.

ESPÍRITO SANTO: Santa Teresa, *Foster* 274 (GH, R).

MINAS GERAIS: Pico da Piedade, near Belo Horizonte, *Foster* 580 (GH).

RIO DE JANEIRO: Nova Friburgo, *Ule* 4957 (B, F neg. 11474, type of *Catopsis deflexa* Ule). Petrópolis, *Foster* 39 (GH). Teresópolis, *Frazão* (RB).

DISTRITO FEDERAL: Rio de Janeiro, *Binot* (LG, GH neg. 2935); *Wilkes Expedition* (GH).

SÃO PAULO: Alto da Serra, *Dusén* 18118 (S); *Foster* 274-A (GH); *Hoehne & Gehrt* (SP); *L. B. Smith* 2018 (GH, US); *Smith, Hoehne & Kuhlmann* 1828 (F, GH). São Paulo, *Ostermeyer* (SP).

PARANÁ: Curitiba-Joinvile road near the Santa Catarina line, *Reitz* 4004 (HBR).

SANTA CATARINA: Mun. Brusque: Morro da Bateia, *Reitz* 3816 (HBR); 3947 (HBR, US). Morro Spitzkopf, *Reitz* 2299 (HBR, US). Mun. Jaraguá do Sul: Corupá, *Reitz* 4225 (HBR).

ALSO: COLOMBIA.

35. ***Tillandsia jenmanii*** Baker, Journ. Bot. 25: 345. 1887.

BRAZIL: Probable, but not yet recorded.

BRITISH GUIANA: Kaieteur, *Jenman* 848 (K, type (GH neg. 1632), BRG).

36. ***Tillandsia caribaea*** L. B. Smith, Proc. Amer. Acad. 70: 155. Sept. 1935.
Tillandsia parviflora sensu Griseb. Nachr. Ges. Wiss. Goett. for 1864: 16. 1865. Not R. & P. 1802.
Catopsis fendleri Baker, Journ. Bot. 25: 175. 1887.
Tillandsia fendleri Mez in DC. Monogr. Phan. 9: 741. 1896. Not Griseb. 1865.
Tillandsia ferruginascens Mez in Engl. Pflanzenreich IV. 32: 500. Oct. 1935.
Rio Branco: Mount Roraima, *Steyermark* 59005 (F, GH).
Also: Cuba, Hispaniola, Venezuela.

Subgenus *Tillandsia*

(Subgenus *Platystachys* (Beer) Baker)

37. ***Tillandsia polystachia*** (L.) L. Sp. Pl. ed. 2. 410. 1762.
Renealmia polystachia L. Sp. Pl. 286. 1753.
Tillandsia angustifolia Sw. Prodr. 57. 1788.
Tillandsia parvispica Baker, Journ. Bot. 25: 244. 1887.
Acre: (Seringal São Francisco), *Ule* 9161 (MG).
Ceará: Cacimba Nova, *Loefgren* 794 (R); 795 (R). Maracanú, near Fortaleza, *Dahlgren* 838 (F).
Paraíba: Ipanargna, Campina Grande to Mata Luiz de Melo, *Foster* 2412 (US).
Baía: Jacobina, *Foster* 97 (GH). Milagres to Maracás, *Foster* 2443 (US).
Minas Gerais: Serra do Picú, *Glaziou* 13258 (P); 16452 (P). Viçosa, *J. G. Kuhlmann* (RB).
Mato Grosso: Campo Grande, *Foster* 1140 (GH). "Humaïtá," Rio dos Bugres, *Lindman* A-3199 (S).
Rio de Janeiro: Paraíba do Sul, *M. Kuhlmann* (SP).
Distrito Federal: Cultivated?, São Cristovão, *Lindman* A-29 (S).
Also: México and the West Indies to Bolivia.

38. ***Tillandsia fasciculata*** Sw. Prodr. 56. 1788. var. ***fasciculata.***
Vriesia glaucophylla Hook. Bot. Mag. 74: *pl. 4415.* 1848.
Tillandsia glaucophylla Baker, Journ. Bot. 25: 243. 1887.
Tillandsia pungens Mez in DC. Monogr. Phan. 9: 684. 1896.
Amapá: Mun. Macapá: Igarapé do Lago, *Fróes & Black* 27527 (IAN).
Pará: Pico Ricardo Franco, *Sampaio* 5872 (R).
Also: Florida, México, and the West Indies to Colombia and Guiana.

39. ***Tillandsia kegeliana*** Mez in DC. Monogr. Phan. 9: 725. 1896.
Pernambuco: Vitória, *Pickel* 3783 (IPA, US neg. 4229).
Also: Panamá, Colombia, Surinam.

40. ***Tillandsia tenuifolia*** L. Sp. Pl. ed. 2. 410. 1762.
Renealmia recurvata β L. Sp. Pl. 287. 1753.
Pará: Belém, *Poeppig* (P, GH neg. 3043).
Also: Southern United States, West Indies, México, Northern Central America, Venezuela.

41. ***Tillandsia juncea*** (R. & P.) Poir. in Lam. Encycl. Suppl. 5: 309. 1817.
Bonapartea juncea R. & P. Fl. Peruv. 3: 38, *pl. 262.* 1802.
Tillandsia setacea sensu Baker, Journ. Bot. 25: 241. 1887.
BAÍA: (Calderão), Rio das Contas, *Ule* 7048 (cf. Mez in Engl. Pflanzenreich IV. 32: 465. 1935).
ALSO: WEST INDIES, SOUTHERN MÉXICO to PERÚ and BOLIVIA.

42. ***Tillandsia paraënsis*** Mez in Mart. Fl. Bras. 3, pt. 3: 586, *pl. 109.* 1894. FIGURE 30.
Tillandsia boliviensis Baker, Mem. Torrey Bot. Club 4: 267. 1895. In part, not as to type.
Vriesia sanctae-crucis S. Moore, Trans. Linn. Soc. Bot. II. 4: 491. 1895.
Tillandsia sanctae-crucis S. Moore ex Mez in DC. Monogr. Phan. 9: 710. 1896.
Tillandsia juruana Ule, Verh. Bot. Ver. Brand. 48: 143. 1907.
AMAZONAS: Humaitá, near Livramento, *Krukoff* 6774 (NY). Jurua Mirim, *Ule* 5734 (B, type of *Tillandsia juruana* Ule, F neg. 11508). Panuré, Rio Uaupes, *Pires* 1087 (IAN); 1100 (IAN); 1101 (IAN). Serra de Tunuí, Rio Negro, *Black* 48–2689 (IAN).
ACRE: Rio Macauã and Rio Iaco, ca. 9° 20′ S. lat., 69° W. long., *Krukoff* 5499 (F, GH, MICH, MO, NY). (Seringal São Francisco), *Ule* 9162 (MG).
PARÁ: *Sieber* 68 (BR, type). Rio Mapuera, *Pires & Silva* 4188 (IAN, US). Cachoeira da Zoáda, Rio Cuminá, *Sampaio* 5409 (R).
MATO GROSSO: Buritizinho, Mount Itapirapuã, *Lindman* A-3379 (S). Rio Juruena, *Hoehne in Rondon* 5162 (R); 5163 (R). Santa Cruz, *Moore* 361 (BM, type of *Vriesia sanctae-crucis* S. Moore). Utiariti, *Hoehne in Rondon* 2032 (R).
ALSO: COLOMBIA, PERÚ, BOLIVIA.

43. ***Tillandsia bulbosa*** Hook. Exot. Fl. 3: *pl. 173.* 1826.
BRAZIL: *Blanchet* 1467 (BM).
AMAZONAS: Rio Japurá, *Martius* (! Mez).
RIO BRANCO: Cujubim, *Luetzelburg* 21394 (R).
AMAPÁ: Rio Oiapoque, *Fróes* 25927 (IAN); 26758 (IAN); *Luetzelburg* 20359 (R).
PARÁ: Approagas, Rio Capim, *Huber* (MG). Belém, *Archer* 7828 (IAN, US); *Drouet* 1946 (GH); *Pires & Black* 1520 (IAN). Rio Irituia, *C. F. Baker* 441 (MG). Ilha do Mosqueiro, Belém, *Killip & Smith* 30477 (US); 30553 (US).
PERNAMBUCO: Iguaraçú, *Ridley, Lea & Ramage* (BM).
BAÍA: Agua Preta, *Foster 72* (GH, R).
ALSO: SOUTHERN MÉXICO and the WEST INDIES to COLOMBIA and GUIANA.

44. ***Tillandsia pruinosa*** Sw. Fl. Ind. Occ. 1: 594. 1797.
BRAZIL: *Glaziou* 15462 (P).
ESPÍRITO SANTO: Vitória, *Foster* 205 (GH, R).
RIO DE JANEIRO: Cantagallo, *Glaziou* 16461 (P). Mauá, *Ule* 4052 (R).
ALSO: FLORIDA, SOUTHERN MÉXICO, and the WEST INDIES to ECUADOR and VENEZUELA.

12. *Vriesia* Lindl.

Vriesia Lindl. Bot. Reg. 29: *pl. 10.* 1843, nomen conservandum.

The original spelling *"Vriesia"* is used here because obviously it was so intended by Lindley where he published it consistently in four different places in the original description. It would appear that this was an intentional latinization of a personal name. Unfortunately the

FIG. 29.

FIG. 30.

FIG. 29.—*Tillandsia aëris-incola: a,* Habit, × ⅙; *b,* branch of inflorescence, × 1; *c,* sepal, × 1.

FIG. 30.—*Tillandsia paraënsis: a,* Habit (after Flora Brasiliensis), × ¼; *b,* sepal, × 1.

spelling *"Vriesea"* was employed in conserving the generic name against the earlier *Hexalepis* Rafinesque. This name should be corrected to *"Vriesia"* in future lists.

México and the West Indies to Argentina.

1. Apical appendage of the seed minute or lacking; petals firm and remaining more or less in position after anthesis.
Subgenus Vriesia (Species 1–95)

1. Apical appendage of the seed well developed: petals soon flaccid and pendent. ..... **Subgenus Alcantarea** (Species 96–100)

It has not been possible to follow Mez's division of the subgenus *Vriesia* (*Euvriesia*) into sections based on the relative length of the petals and stamens, because these parts are unknown in so many species. Furthermore, in a large

number of the species where these parts have been examined, the stamens are not consistently or clearly longer or shorter than the petals. This is particularly the case in several of the commoner species with compound inflorescences. Consequently it seems best to construct a key that is artificial insofar as is necessary to give it maximum efficiency. This key is divided into a number of subkeys to make it less unwieldy and to save it from extreme indentation.

Conspectus of subkeys

1. Flowers in exactly 2 ranks (fig. 32), but sometimes twisted until secund. (Fig. 36.)
   2. Inflorescence compound.
      3. Flowers not secund. (Fig. 32.)
         4. Upper scape-bracts equaling or exceeding the internodes. **Subkey A**
         4. Upper scape-bracts shorter than the internodes..... **Subkey B**
      3. Flowers secund at anthesis and after; the floral bracts often secund as well. (Fig. 36.)..... **Subkey C**
   2. Inflorescence simple.
      5. Flowers not secund except sometimes insofar as the petals are exserted from the bracts on one side.
         6. Scape straight or ascending; inflorescence erect.
            7. Flowers all erect, either imbricate or appressed to the rhachis. (Figs. 41, 42.)..... **Subkey D**
            7. Flowers (at least the lower ones) not imbricate, spreading or divergent with evident space between them. (Fig. 43.).. **Subkey E**
         6. Scape decurved; inflorescence pendulous. (Fig. 47.)..... **Subkey F**
      5. Flowers secund at anthesis and after; the floral bracts often secund as well. ..... **Subkey G**
1. Flowers in more than 2 ranks; inflorescence simple or few-branched; leaf-blades very narrowly triangular, acuminate. (Fig. 48.)..... **Subkey H**

SUBKEY A

1. Flowers all erect and contiguous at anthesis.
   2. Sterile bracts of the branches remote; floral bracts fleshy, black. 1. **V. funebris**
   2. Sterile bracts of the branches imbricate or lacking; floral bracts coriaceous or subcoriaceous, lighter.
      3. Floral bracts shorter than the sepals.
         4. Primary bracts shorter than the elongate sterile bases of the branches; floral bracts obtusely carinate, 35 mm. long..... 2. **V. gravisiana**
         4. Primary bract equaling the short sterile base of the lateral branch; floral bracts ecarinate, less than 25 mm. long..... 3. **V. sincorana**
      3. Floral bracts equaling or exceeding the sepals.
         5. Rhachis alate; floral bracts glabrous, narrow, even; Amazonian species. ..... 4. **V. rubra**
         5. Rhachis merely angled; floral bracts more or less lepidote, broad, strongly incurved.
            6. Branches 8–14-flowered with one or no sterile bracts at the base; floral bracts sparsely lepidote toward the apex, 27–32 mm. long. 5. **V. schwackeana**

6. Branches 6–8 flowered with 1–5 sterile bracts at the base; floral bracts sparsely lepidote throughout, 35 mm. long. 6. **V. pinottii**

1. Flowers (or at least the lower ones) divergent or spreading and not touching one another at anthesis. (Figs. 31–34.)

7. Leaf-blades very narrowly triangular or linear, acuminate, 15 mm. wide.

8. Primary bracts much shorter than the spreading branches of the broad lax inflorescence; floral bracts 18–25 mm. long, about equaling the sepals. ..... 7. **V. lubbersii**

8. Primary bracts much exceeding the short strict branches of the slenderly cylindric inflorescence; floral bracts 8–10 mm. long, one-half or one-third as long as the sepals..... 8. **V. drepanocarpa**

7. Leaf-blades ligulate, broadly acute or rounded, or if acuminate then much more than 15 mm. wide.

9. Floral bracts 7–17 mm. long, suborbicular or even broader than long, about half as long as the sepals.

10. Inflorescence tripinnate with its lower branches divided and recurving; floral bracts 7 mm. long..... 9. **V. leptantha**

10. Inflorescence bipinnate with all its branches simple; floral bracts 10–17 mm. long.

11. Scape decurved; inflorescence pendulous... 10. **V. billbergioides**

11. Scape straight; inflorescence erect.

12. Inflorescence lax, broad..... 11. **V. rodigasiana**

12. Inflorescence dense, slenderly cylindric..... 12. **V. thyrsoidea**

9. Floral bracts 20–40 mm. long, usually longer than wide.

13. Branches of the inflorescence slender, about 2 mm. in diameter.

14. Floral bracts strongly incurved and carinate.

15. Sepals exceeding the coriaceous floral bracts, 20–30 mm. long; inflorescence dense, narrow; lower primary bracts nearly equaling the branches, subfoliaceous. (Fig. 32.).. 13. **V. sceptrum**

15. Sepals shorter than the floral bracts; inflorescence lax, broad; primary bracts all much shorter than the branches.

16. Sterile bases of the branches short, naked or with a single bract. ..... 5. **V. schwackeana**

16. Sterile bases of the branches elongate with several bracts. 14. **V. brusquensis**

14. Floral bracts nearly or quite straight toward the apex, often ecarinate.

17. Leaves acuminate.

18. Scape-bracts apiculate, the upper ones much reduced; stamens equaling or exceeding the petals..... 15. **V. neoglutinosa**

18. Scape-bracts acuminate, all large and subfoliaceous; stamens included. ..... 16. **V. altodaserrae**

17. Leaves more or less rounded and apiculate.

19. Sepals acute; leaf-sheaths purple.

20. Sterile bases of the branches bracteate..... 17. **V. muelleri**

20. Sterile bases of the branches naked..... 18. **V. haematina**

19. Sepals obtuse; leaf-sheaths pale green throughout or castaneous toward the base, sometimes red-spotted.

21. Leaf-blades densely cinereous-lepidote... 19. **V. saundersii**

21. Leaf-blades green, soon glabrous.
22. Floral bracts sharply carinate for most of their length, about 4 times as long as the internodes.
20. **V. monacorum**
22. Floral bracts slightly if at all carinate, mostly much less than 4 times as long as the internodes.
23. Primary bracts exceeding the short bracteate or naked sterile bases of the branches. (Fig. 33.)
21. **V. friburgensis**
23. Primary bracts shorter than the long bracteate sterile bases of the branches. (Fig. 34.)... 22. **V. procera**
13. Branches of the inflorescence stout; floral bracts only about half as long as the sepals; leaves acute to acuminate.
24. Floral bracts very broadly acute to obtuse or truncate, usually ecarinate.
25. Rhachis merely flexuous; flowers suberect. (Fig. 35.)
23. **V. gigantea**
25. Rhachis geniculate; flowers spreading.
26. Inflorescence narrow, many-branched; floral bracts mostly straight along the apical half..... 96. **V. geniculata**
26. Inflorescence ample with few and elongate branches; floral bracts gibbous near the middle..... 97. **V. extensa**
24. Floral bracts acute, carinate.
27. Rhachis scarcely if at all geniculate; floral bracts not more than twice as long as the internodes at anthesis..... 98. **V. regina**
27. Rhachis strongly geniculate; floral bracts more than twice as long as the internodes..... 99. **V. brasiliana**

SUBKEY B

1. Inflorescence subcorymbose, only 45 mm. long, its primary bracts involucrate below it; sepals 22 mm. long, much exceeding the floral bracts.
24. **V. paradoxa**
1. Inflorescence elongate, much exceeding its primary bracts.
2. Scape decurved; inflorescence pendulous; floral bracts suborbicular to broadly ovate, much shorter than the sepals, membranaceous.
3. Axis of the inflorescence geniculate; leaves broadly rounded.
10. **V. billbergioides**
3. Axis of the inflorescence nearly straight; leaves subobtuse.
25. **V. languida**
2. Scape straight or ascending; inflorescence erect.
4. Primary bracts much exceeding the short naked sterile bases of the branches; plants 3–8.5 dm. high.
5. Floral bracts about equaling the sepals, 28 mm. long, 2 to 3 times as long as the internodes; branches spreading lax... 26. **V. triligulata**
5. Floral bracts much shorter than the sepals, 10–17 mm. long.
6. Leaf-blades spotted; bracts and sepals castaneous; inflorescence dense, its branches erect..... 27. **V. maculosa**
6. Leaf-blades concolorous, green; bracts and sepals yellow; inflorescence lax, its branches spreading. (Fig. 31.)
11. **V. rodigasiana**

4. Primary bracts shorter than the long, usually bracteate, sterile bases of the branches; plants 5–20 dm. high.
7. Floral bracts about equaling the internodes or slightly more; branches usually spreading.
8. Leaves acuminate; stamens exserted..... 15. **V. neoglutinosa**
8. Leaves broadly acute or rounded and apiculate; stamens included. **22. V. procera**
7. Floral bracts much exceeding the internodes; branches erect or ascending.
9. Floral bracts sharply carinate; branches subequal... 28. **V. stricta**
9. Floral bracts ecarinate; the terminal branch much larger and with a longer sterile base than the lateral ones..... 29. **V. minarum**

SUBKEY C

1. Floral bracts black from the first, fleshy; branches of the inflorescence with elongate sterile bases bearing many remote bracts. (*V. funebris,* no. 1, is accounted for here because its flowers are known in a very young stage only and might become secund at maturity).
1. Floral bracts pale or at most dark castaneous, never black or fleshy.
2. Scape-bracts (or at least the upper ones) shorter than the internodes.
3. Sterile base of the branch much longer than the fertile part; rhachis less than 2 mm. thick; inflorescence very lax; floral bracts ovate, half as long as the sepals, membranaceous; sepals 15 mm. long, narrow, carinate. ..... 30. **V. sparsiflora**
3. Sterile base of the branch relatively short; rhachis stout; inflorescence dense; floral bracts very broad; sepals ecarinate.
4. Leaf-sheaths dark castaneous; scape-bracts half as long as the internodes; sepals 24 mm. long..... 31. **V. crassa**
4. Leaf-sheaths pale; scape-bracts only a little shorter than the internodes; sepals 22 mm. long..... 32. **V. densiflora**
2. Scape-bracts equaling or exceeding all of the internodes.
5. Branches laxly flowered; floral bracts distinctly less than twice as long as the internodes.
6. Branches of the inflorescence very slender, at most barely exceeding 2 mm. in diameter; floral bracts membranaceous.
7. Floral bracts much shorter than the sepals; inflorescence much branched.
8. Branches to 50 cm. long, many-flowered; floral bracts ovate, acute; sepals acute, 25 mm. long. (Fig. 36.) **33. V. philippocoburgii**
8. Branches 8–12 cm. long, few-flowered; floral bracts ovate to semi-orbicular, obtuse; sepals obtuse, 13 mm. long. **9. V. leptantha**
7. Floral bracts about equaling the 23 mm. long sepals, broadly elliptic, acute; inflorescence few-branched.....34. **V. delicatula**
6. Branches of the inflorescence stout, much more than 2 mm. in diameter; floral bracts coriaceous, much exceeded by the sepals.
9. Sepals acute.

10. Primary bracts with distinct elongate blades; inflorescence much branched.
11. Floral bracts ovate, loosely and incompletely sheathing the base of the flower, becoming slightly if at all secund, sulcate when dry with a broad thin margin; sepals oblong, to 37 mm. long, about 3 times as long as broad. (Fig. 35.) 23. **V. gigantea**
11. Floral bracts suborbicular, tightly and completely sheathing the base of the flower, becoming secund, even; sepals lance-ovate, 30 mm. long, about twice as long as broad. 35. **V. morrenii**
10. Primary bracts bladeless, inconspicuous; inflorescence few-branched; sepals 26 mm. long..... 36. **V. ruschii**
9. Sepals obtuse.
12. Floral bracts 32 mm. long, about twice as long as the internodes; sepals elliptic. (Fig. 37.)..... 37. **V. hoehneana**
12. Floral bracts 25 mm. long, about equaling the internodes; sepals broadly elliptic. (Fig. 38.)..... 38. **V. amazonica**

5. Branches densely flowered; floral bracts twice as long as the internodes or longer.
13. Floral bracts drying dark castaneous except for the apex or the margins.
14. Sepals acute; floral bracts broadly ovate, acute, pale and slightly rugulose near the apex, 3–8 cm. long, usually much exceeding the sepals..... 39. **V. longicaulis**
14. Sepals obtuse; floral bracts suborbicular with narrow pale margins, 2–3 cm. long, usually shorter than the sepals... 40. **V. itatiaiae**
13. Floral bracts usually green or yellow, sometimes red or pale brown, but always pale on drying.
15. Sepals much exceeded by the sharply carinate laterally compressed floral bracts, 20 mm. long, 8 mm. wide..... 14. **V. brusquensis**
15. Sepals always somewhat exserted above the floral bracts.
16. Inflorescence few-branched, the terminal branch with an elongate sterile base almost completely covered by bracts.
17. Sepals up to 35 mm. long; floral bracts barely twice as long as the internodes; plant generally 2 m. or taller. (Fig. 37.) 37. **V. hoehneana**
17. Sepals 20–27 mm. long; floral bracts 2.5 to 3.5 times as long as the internodes; plant 6–12 dm. tall.... 41. **V. longiscapa**
16. Inflorescence many-branched, the terminal branch not much different from the others.
18. Leaves ornamented with dark purple irregular transverse bands; floral bracts broadly ovate, carinate; sepals narrowly elliptic, 25 mm. long, much exserted. (Fig. 39.) 42. **V. hieroglyphica**
18. Leaves without purple bands but sometimes with narrow dark green lines.
19. Flowers downwardly secund.
20. Branches 4–8-flowered, short, very slender; sepals 20 mm. long.

21. Sepals barely exceeding the floral bracts; branches eprophyllate. ..... 43. **V. penduliflora**
21. Sepals about twice as long as the floral bracts; branches prophyllate. (Fig. 40.).... 44. **V. segadas-viannae**
20. Branches many-flowered, elongate, rather stout; sepals 28–34 mm. long.
22. Floral bracts 3 to 4 times as long as the internodes, remaining imbricate, obtusely carinate; leaf-blades concolorous. ..... 45. **V. hydrophora**
22. Floral bracts scarcely more than twice as long as the internodes, faintly or not at all carinate; leaf-blades marked with dark green cross-lines.
46. **V. pastuchoffiana**
19. Flowers upwardly secund; leaves acuminate; sepals 35–40 mm. long.
23. Rhachis strongly geniculate; only a few flowers secund.
99. **V. brasiliana**
23. Rhachis merely flexuous; all the flowers secund.
100. **V. imperialis**

SUBKEY D

1. Leaf-blades narrowly triangular, acuminate; floral bracts sparsely lepidote.
2. Floral bracts carinate, 30 mm. long, distinctly exceeding the sepals.
47. **V. biguassuensis**
2. Floral bracts not carinate, 25 mm. long, about equaling the sepals.
48. **V. triangularis**
1. Leaf-blades ligulate, abruptly acute or rounded and apiculate.
3. Sepals (or at least the lowest ones) exceeding the very broad floral bracts, 34–40 mm. long.
4. Inflorescence many-flowered, to 27 cm. long, exceeding the leaves; floral bracts scarcely or not at all carinate..... 49. **V. gradata**
4. Inflorescence few-flowered, 6–12 cm. long, about equaling the leaves; floral bracts sharply carinate..... 50. **V. modesta**
3. Sepals equaling the floral bracts or shorter.
5. Inflorescence lax; flowers erect and appressed to the rhachis; floral bracts to 45 mm. long, scarcely twice as long as the internodes, equaling the sepals, obtuse, ecarinate, strongly nerved..... 51. **V. pauciflora**
5. Inflorescence dense or subdense; flowers imbricate; floral bracts much more than twice as long as the internodes.
6. Floral bracts dark castaneous except near the apex, slightly and obtusely carinate, 3–8 cm. long..... 39. **V. longicaulis**
6. Floral bracts pale or brightly colored, green, yellow, or red.
7. Apical half of the floral bract spreading and not imbricate even before anthesis; keel of the floral bracts straight or concave toward the base, convex toward the apex; inflorescence broadly rounded at the apex. (Fig. 41.)
8. Floral bracts acuminate, 60–70 mm. long.
52. **V. erythrodactylon**
8. Floral bracts broadly acute, about 45 mm. long.
53. **V. heliconioides**

7. Apical half (as well as the remainder) of the floral bract imbricate until after anthesis; keel of the floral bracts evenly convex; inflorescence usually acute. (Fig. 42.)
   9. Floral bracts densely lepidote with appressed cinereous scales, 45 mm. long, sharply carinate; flowers malodorous.
      54. **V. vulpinoidea**
   9. Floral bracts glabrous or very sparsely and obscurely lepidote.
      10. Margins of the floral bracts with a strong almost semicircular curve; sepals broadly convex.
         11. Inflorescence subterete; floral bracts slightly and obtusely carinate near the apex, inflated, rose, to 42 mm. long.
            55. **V. rhodostachys**
         11. Inflorescence strongly complanate; floral bracts sharply carinate.
            12. Floral bracts with obtusely angled margins, bright red with broad yellow margins, 45–60 mm. long; inflorescence oblong to linear, 15–40 cm. long.
               56. **V. incurvata**
            12. Floral bracts with evenly curved margins, 40–50 mm. long; inflorescence usually lanceolate or elliptic.
               13. Inflorescence very dense; each floral bract more than half covered by the one below it, red with yellow or green margins, its keel slightly curved.
                  57. **V. inflata**
               13. Inflorescence subdense; each floral bract less than half covered by the one below it, orange, its keel strongly curved. ..... 58. **V. petropolitana**
      10. Margins of the floral bracts lightly curved. (Fig. 42.)
         14. Floral bracts 6–8 cm. long, 2 to 3 times as long as the broadly convex sepals, wholly red or green..... 59. **V. splendens**
         14. Floral bracts not over 5 cm. long, about twice as long as the carinate sepals at most, mostly bicolorous.
            15. Inflorescence subquadrate, almost as broad as long; scape very slender. (Fig. 42.)..... 60. **V. carinata**
            15. Inflorescence much longer than broad; scape stouter.
               16. The inflorescence much exceeding the leaves, 16–26 cm. long, much more than 3 times as long as broad; floral bracts 45–50 mm. long; sepals narrowly elliptic, obtuse or emarginate..... 61. **V. duvaliana**
               16. The inflorescence barely or not exceeding the leaves, 11 cm. long, much less than 3 times as long as broad; floral bracts 40 mm. long; sepals lance-ovate, acute.
                  62. **V. paraïbica**

SUBKEY E

1. Leaf-blades narrowly triangular, acuminate.
   2. Rhachis less than 2 mm. in diameter; flowers slender, spreading; floral bracts 18–25 mm. long, about equaling the sepals, membranaceous.
      7. **V. lubbersii**

2. Rhachis 6–7 mm. in diameter; flowers stout, suberect; floral bracts 20 mm. long, much shorter than the sepals, fleshy-coriaceous.
63. **V. goniorachis**

1. Leaf-blades linear, ligulate, or lance-triangular.
3. Flowers merely divergent at anthesis; upper scape-bracts shorter than the internodes; floral bracts much shorter than the sepals.
4. Pedicels slender, 8 mm. long; sepals subacute, 25–30 mm. long.
64. **V. amethystina**
4. Pedicels very short; sepals obtuse, 16–18 mm. long.
5. Leaf-blades lance-triangular, almost the same length as the sheaths, 35 mm. wide..... 65. **V. lancifolia**
5. Leaf-blades linear, several times longer than the sheaths, 13 mm. wide.
66. **V. parviflora**
3. Flowers spreading to reflexed at anthesis.
6. Floral bracts with truncate bases, usually bright red or yellow, sometimes pale green.
7. The floral bracts from about the same length as the internodes to twice as long, from slightly shorter than the sepals to equaling them; rhachis slender, flexuous, its internodes more or less curved; inflorescence few-flowered. (Fig. 43.)
8. Sepals 35–40 mm. long; floral bracts about twice as long as the internodes; scape-bracts all imbricate; stamens exserted.
67. **V. psittacina**
8. Sepals to 25 mm. long; floral bracts about equaling the internodes; scape-bracts nearly all shorter than the internodes in this variety with a simple inflorescence; stamens included.... 22. **V. procera**
7. The floral bracts mostly 3 times as long as the internodes or more; rhachis stout, straight or geniculate with straight internodes; inflorescence usually many-flowered. (Fig. 44.)
9. Floral bracts recurved toward the apex and with undulate margins, ample, to 55 mm. long, enfolding and exceeding the sepals.
68. **V. recurvata**
9. Floral bracts straight or slightly incurved toward the apex.
10. The floral bracts sharply carinate, the keel incurved toward the apex, nerved; sepals 20–30 mm. long..... 69. **V. morreniana**
10. The floral bracts slightly if at all carinate, the keel nearly straight; sepals 30–40 mm. long.
11. Sepals exserted; floral bracts suborbicular, rather thin, only the lowest spreading and not imbricate..... 49. **V. gradata**
11. Sepals included; floral bracts narrower, coriaceous, all spreading with age. (Fig. 44.)..... 70. **V. ensiformis**
6. Floral bracts with decurrent auricles at base, usually dull green; stamens included so far as known.
12. Sepals 45 mm. long, narrow, much exserted; floral bracts recurved toward the apex, acute, subchartaceous; leaves densely marked with spots or lines or both together..... 71. **V. fenestralis**
12. Sepals 20–33 mm. long; floral bracts from nearly straight to incurved.
13. Floral bracts coriaceous, smooth and even when dry, not at all fleshy.

14. The floral bracts dark castaneous with pale margins, from slightly shorter to slightly longer than the sepals. 72. **V. atra**

14. The floral bracts wholly dull green or with dark margins.

15. Sepals very broad, distinctly less than half exserted from the floral bracts if at all; plants robust.

16. Scape-bracts imbricate; leaves concolorous or transversely marked with dark irregular green lines; flowers spreading at anthesis; sepals broadly ovate, acute or subacute. (Fig. 45.) ..... 73. **V. jonghii**

16. Scape-bracts shorter than the upper internodes; leaves transversely marked with purple lines; flowers reflexed at anthesis; sepals broadly elliptic, obtuse... 74. **V. fosteriana**

15. Sepals narrowly elliptic or suboblong, much longer than broad, about half exserted; flowers usually reflexed at anthesis. (Fig. 46.)..... 75. **V. platynema**

13. Floral bracts fleshy or subchartaceous, becoming rugose or nerved when dry; sepals mostly much exserted from the floral bracts.

17. The floral bracts fleshy, becoming rugose when dry; rhachis stout.

18. Sepals acute, to 35 mm. long; floral bracts obtusely carinate. 76. **V. wawranea**

18. Sepals subobtuse, 25–44 mm. long; floral bracts convex, ecarinate.

19. Inflorescence covered with a strongly glutinous material; floral bracts broadly ovate, imbricate before anthesis, usually with dark margins..... 77. **V. bituminosa**

19. Inflorescence dry; floral bracts elliptic, never imbricate, concolorous. ..... 78. **V. regnellii**

17. The floral bracts subchartaceous, becoming nerved when dry; rhachis slender; sepals 22 mm. long, obtuse; upper scape-bracts slightly shorter than the internodes..... 29. **V. minarum**

SUBKEY F

1. Leaf-blades marked on the upper or both sides with dark spots, broadly rounded; floral bracts farinaceous, 30–40 mm. long.

2. Floral bracts imbricate and concealing the rhachis, broader than long, equaling the sepals..... 79. **V. pardalina**

2. Floral bracts enfolding the spreading flowers and thus exposing the rhachis, broadly ovate, equaling or shorter than the sepals..... 80. **V. guttata**

1. Leaf-blades concolorous, pale green.

3. Floral bracts imbricate and concealing the rhachis, 50–55 mm. long, exceeding the sepals..... 81. **V. obliqua**

3. Floral bracts spreading and exposing the rhachis at anthesis.

4. The floral bracts laterally compressed, sharply carinate, incurved, to 40 mm. long, slightly shorter than the sepals..... 82. **V. retroflexa**

4. The floral bracts not compressed, slightly if at all carinate, usually much shorter than the sepals; pedicels slender, 8–20 mm. long.

5. Floral bracts much more than half as wide as long, 35–45 mm. long, their margins much overlapping behind the sepals... 83. **V. simplex**

5. Floral bracts not more than half as wide as long, not over 35 mm. long, their margins overlapping little if at all. (Fig. 47.)
84. **V. scalaris**

SUBKEY G

1. Inflorescence dense; floral bracts more than twice as long as the internodes.
2. Floral bracts strongly compressed, sharply carinate, bright red with green margins, thin, 34 mm. long, about equaling the carinate sepals.
85. **V. interrogatoria**
2. Floral bracts not compressed, obtusely if at all carinate, green or castaneous, usually coriaceous.
3. Scape-bracts shorter than the internodes; floral bracts 35 mm. long, exceeded by the sepals, castaneous, sublustrous... 86. **V. clausseniana**
3. Scape-bracts exceeding the internodes.
4. Floral bracts castaneous and coriaceous except for the rugulose pale thin apical third, 3–8 cm. long, usually much exceeding the sepals.
39. **V. longicaulis**
4. Floral bracts green or stramineous, mostly uniform.
5. The floral bracts obtusely carinate; leaves broadly acute or rounded and apiculate.
6. Sepals 20–27 mm. long; floral bracts 2.5 to 3.5 times as long as the internodes; plants 6–12 dm. high..... 41. **V. longiscapa**
6. Sepals 34 mm. long; floral bracts barely twice as long as the internodes; plant usually 2 m. high or more.
37. **V. hoehneana**
5. The floral bracts ecarinate, evenly convex.
7. Leaves acuminate; floral bracts becoming secund with the flowers; sepals 15–20 mm. long..... 87. **V. viridiflora**
7. Leaves broadly rounded and apiculate; floral bracts never secund; sepals to 24 mm. long..... 88. **V. unilateralis**
1. Inflorescence lax; floral bracts distinctly less than twice as long as the internodes.
8. Scape-bracts (or at least the upper ones) shorter than the internodes; sepals 25–28 mm. long, much exserted, elliptic, obtuse.
9. Leaf-blades narrowly triangular, acuminate; floral bracts obtuse, ecarinate. ..... 89. **V. brassicoides**
9. Leaf-blades ligulate, broadly rounded and apiculate; floral bracts acute, carinate. ..... 90. **V. platzmannii**
8. Scape-bracts all imbricate.
10. Leaf-blades narrowly triangular, long-acuminate, not over 30 mm. wide; floral bracts lepidote, 24 mm. long, much exceeded by the sepals.
91. **V. oligantha**
10. Leaf-blades ligulate, acute or rounded and apiculate or sometimes short-acuminate, 15–80 mm. wide.
11. Plants less than 1 m. high; scape slender; floral bracts ecarinate.
12. Floral bracts to 35 mm. long, nearly twice as long as the internodes; leaf-blades concolorous; sepals 24 mm. long.
88. **V. unilateralis**
12. Floral bracts 18 mm. long, barely exceeding the internodes; leaf-blades dark-spotted; sepals 18 mm. long..... 92. **V. racinae**

11. Plants 1–2 m. or higher; scape stout; floral bracts obtusely carinate toward the apex.
13. Floral bracts 32 mm. long, about twice as long as the internodes; sepals elliptic. (Fig. 37.) ..... 37. **V. hoehneana**
13. Floral bracts 25 mm. long, about equaling the internodes; sepals very broadly elliptic. (Fig. 38.) ..... 38. **V. amazonica**

SUBKEY H

1. Scape-bracts all bearing recurved elongate blades; inflorescence simple, dense, few-flowered, 4–9 cm. long ..... 93. **V. poenulata**
1. Scape-bracts bearing erect blades, those of the upper ones very short.
2. Inflorescence dense except at base; flowers in about 4 ranks, mostly suberect; floral bracts inflated ..... 94. **V. flammea**
2. Inflorescence or its branches lax; flowers in slightly more than 2 ranks, all divergent or spreading at anthesis; floral bracts closely enfolding the sepals. (Fig. 48.) ..... 95. **V. corcovadensis**

Subgenus *Vriesia*

(Subgenus *Euvriesia* Mez)

(Subgenus *Cylindrostachys* (Wittm.) Harms)

1. ***Vriesia funebris*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 117, *pl. 122.* 1943.

Espírito Santo: Cuibiça, *Foster* 896 (GH, type, US neg. 4079).

2. ***Vriesia gravisiana*** Wittm. Gartenflora 39: 494, *figs. 81, 82.* 1890.

Brazil: Cultivated, *Atkinson* 104 (GH).

3. ***Vriesia sincorana*** Mez, Repert. Sp. Nov. Fedde 12: 418. 1913.

Baía: Serra do Sincorá, *Ule* 7131 (B, type, F neg. 11470).

4. ***Vriesia rubra*** (R. & P.) Beer, Bromel. 98. 1857.
Tillandsia rubra R. & P. Fl. Peruv. 3: 40, *pl. 266.* 1802.
Vriesia albiflora Ule, Verh. Bot. Ver. Brand. 48: 141. 1907.
Tillandsia rhododactyla Mez, Repert. Sp. Nov. Fedde 16: 76. 1919.

Acre: Rio Juruá-Mirim, *Ule* 5615 (MG, type collection of *Vriesia albiflora* Ule).

Also: Trinidad, British Guiana, Colombia, Perú.

5. ***Vriesia schwackeana*** Mez in DC. Monogr. Phan. 9: 590. 1896.

Brazil: Cultivated, *Foster* (US); 511 (GH).

Minas Gerais: Ouro Preto, *Schwacke* 9209 (B, type, F neg. 11469).

São Paulo: Mun. São Paulo: Parque do Estado, *Hoehne* (SP). Pirajussára, *Gehrt* (SP).

6. ***Vriesia pinottii*** Reitz, Anais Bot. Herb. Barbosa Rodrigues 4: 12, *pl. 3.* 1952.

Paraná: Guaratuba, *Reitz* 4023 (HBR, type); 5683 (! Reitz).

7. ***Vriesia lubbersii*** (Baker) E. Morr. ex Mez in Mart. Fl. Bras. 3, pt. 3: 533, *pl. 99.* 1894.
Tillandsia lubbersii Baker, Handb. Bromel. 219. 1889.

Brazil: Cultivated, *Binot* (LG, basis of Morren Icon.?); *E. Morren* Icon. (K, type).

Espírito Santo: Santa Teresa, *Foster* 256 (GH, R, US); 256-A (GH).
Minas Gerais: [Caldas], *Regnell* (R, S).
Rio de Janeiro: Serra dos Orgãos, *Burchell* 2354 (! Mez).
Distrito Federal: Pão de Assucar, *Schenck* 3083 (! Mez).
São Paulo: Monte Alegre, Amparo, *M. Kuhlmann* 346 (SP).
Santa Catarina: Blumenau, *Reitz* (HBR), 4280 (HBR).

8. ***Vriesia drepanocarpa*** (Baker) Mez in DC. Monogr. Phan. 9: 581. 1896.
Tillandsia drepanocarpa Baker, Journ. Bot. 26: 41. 1888.
Vriesia dusenii L. B. Smith, Contr. Gray Herb. 98: 17, *pl. 5, figs. 3, 4.* 1932.
Espírito Santo: Santa Teresa, *Foster* 797 (GH).
São Paulo: *Burchell* 3596 (K, type, US neg. 3979). São Paulo, *Hoehne* (GH, SP).
Paraná: Guaratuba, *Reitz* 4269 (HBR). Jacareí, *Dusén* 10712-B (S, type of *Vriesia dusenii* L. B. Smith).
Santa Catarina: Joinvile, *Reitz* 3758-k (! Reitz). Mun. Brusque: Morro Santa Luzia, *Reitz* 3703 (HBR); 3759 (! Reitz); 4009 (HBR, US). Mun. Jaraguá do Sul: Corupá, *Seidel* 4 (HBR).

9. ***Vriesia leptantha*** Harms, Notizblatt 12: 532. 1935.
Rio de Janeiro: Pedra da Republica, Santo Antonio de Imbé, *Brade & Santos Lima* 11586 (B, type; R). Alto da Republica, Santa Maria Madalena, *Santos Lima & Brade* 14179 (RB, US neg. 4202).

10. ***Vriesia billbergioides*** E. Morr. ex Mez in Mart. Fl. Bras. 3, pt. 3: 534, *pl. 100.* 1894.
1. Scape-bracts imbricate..... Var. a. **billbergioides**
1. Scape-bracts shorter than the internodes..... Var. b. **subnuda**

10a. ***Vriesia billbergioides*** var. ***billbergioides.***
Minas Gerais: Serra da Caparao, *Brade* 17124 (RB).
Rio de Janeiro: Serra dos Orgãos, *Glaziou* 2837 (P); 3630 (BR, isotype, GH neg. 2801); *Ule* (R); 4141 (R). Petrópolis, *Glaziou* 16466-a (P). Teresópolis, *Foster* 994 (GH). Guaraní, Teresópolis, *Brade* 9320 (R).
São Paulo: Serra da Bocaina, *Brade* 21151 (RB).

10b. ***Vriesia billbergioides*** var. ***subnuda*** L. B. Smith, Arquiv. Jard. Bot. Rio de Janeiro 10: 147. 1951.
Rio de Janeiro: Pedra S. João, Serra dos Orgãos, *Brade* 16660 (US, type; RB).

11. ***Vriesia rodigasiana*** E. Morr. Ill. Hortic. 29: 171, *pl. 467.* 1882. Figure 31.
Tillandsia rodigasiana Baker, Journ. Bot. 26: 138. 1888.
Tillandsia tweedieana Baker, Journ. Bot. 26: 138. 1888.
Tillandsia citrina Baker, Handb. Bromel. 224. 1889.
Vriesia vitellina F. Mueller, Gartenflora 42: 738. 1893.
Vriesia tweedieana F. Mueller, Gartenflora 42: 738. 1893.
Brazil: Cultivated, *E. Morren* (LG, type?).
Ceará: Bico Alto, Serra da Baturité, *Ducke* (MG).
Distrito Federal: Rio de Janeiro, *Glaziou* 15465 (P); *Tweedie* 1342 (K, type of *Tillandsia tweedieana* Baker, US neg. 4027).
São Paulo: Cubatão, *L. B. Smith* 2048 (B, F, GH, S). Rio Quilombo, *Doering* (SP). Santos, *Regnell* I-38 1/32 in part (S). Bertioga, Santos, *Hoehne & Gehrt* (SP). Rio Buturoca, Santos, *Mosén* 3709 (S).

PARANÁ: Caiobá, *Foster* 427 (GH, R); 429 (GH, R). Ipiranga, Serra do Mar, *Dusén* 14736 (GH, S, US). Jacareí, *Dusén* (S, US). Morro Grande, *M. Kuhlmann* (SP). Paranaguá, *Dusén* 9798 (S). Porto Dom Pedro II, *Dusén* 9875 (S). Mun. Morrêtes: Rio Mãe Catira, *Hatschbach* 2012 (US). Morrêtes, *Dusén* 4357 (R, S).

SANTA CATARINA: Brusque, *Foster* 2502 (US); *Reitz* 3102 (HBR); 3570 (HBR); 3600 (HBR); 4161 (HBR). Mun. Araranguá: Maracajá, *Reitz* C-539 (GH, HBR). Peroba, *Reitz* C-478 (GH, HBR). Sanga da Anta, *Reitz* C-1020 (HBR). Mun. Biguaçú: Fachinal, *Reitz* C-934 (GH, HBR). Mun. Blumenau: Garcia, *Smith & Reitz* 6298 (R, US). Mun. Jaraguá do Sul: Corupá, *Seidel* 20 (HBR); 22 (HBR).

12. ***Vriesia thyrsoidea*** Mez in Mart. Fl. Bras. 3, pt. 3: 556. 1894.

RIO DE JANEIRO: Petrópolis, *Glaziou* 16472 (US, isotype). Campo das Antas, Teresópolis, *Emygdio, Pessoa & Gomes* (R (US neg. 4198), US).

FIG. 31.

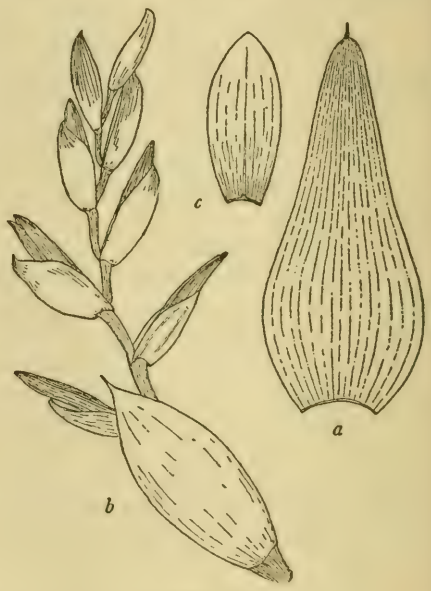

FIG. 32.

FIG. 31.—*Vriesia rodigasiana: a,* Leaf, × ¼; *b,* scape and inflorescence, × ¼; *c,* floral bract and flower, × 1.

FIG. 32.—*Vriesia sceptrum: a,* Lower primary bract, × ½; *b,* spike, × ½; *c,* sepal, × 1.

13. ***Vriesia sceptrum*** Mez in DC. Monogr. Phan. 9: 606. 1896. FIGURE 32.

MINAS GERAIS: Caldas, *Mosén* 4437 (S); *Regnell* III-1254 in part (US, type; S).

RIO DE JANEIRO: Itatiaia, *Foster* 117 (GH); 1036 (US); *L. B. Smith* 1781 (GH); 1782 (GH).

SÃO PAULO: Campos do Jordão, *Eugenio* 3443 (GH); *M. Kuhlmann* (SP); 2201 (SP).

14. ***Vriesia brusquensis*** Reitz, Anais Bot. Herb. Barbosa Rodrigues 4: 10, *pl. 2.* 1952.

Santa Catarina: Blumenau, *Reitz* 4539 (HBR). Mun. Brusque: Azambuja, *Reitz* 3624 in part (HBR, type, US neg. 3600). Mun. Itajaí: Luiz Alves, *Reitz* 4677 (! Reitz).

15. ***Vriesia neoglutinosa*** Mez, Engl. Pflanzenreich IV. *32*: 636. 1935.
Tillandsia glutinosa Mart. ex Schult. in R. & S. Syst. 7, pt. 2: 1225. 1830.
Vriesia glutinosa Wawra, It. Sax.-Cob. 167. 1883. Not Lindl. 1856.

Rio de Janeiro: Mun. Cabo Frio: Praia do Pontal, Cabo Frio, *Smith & Mus. R* 6598 (R, US).

Distrito Federal: Botafogo, *Martius* (M, type). Pedra Dois Irmãos, *L. B. Smith* 2145 (GH, S). Restinga da Itapeba, Recreio dos Bandeirantes, *Lutz* 616 (GH, R, US). Rio de Janeiro, *Foster* 1143 (GH); *Widgren* (S). Praia de Sernambetiba, *Smith & Mus. R* 6823 (R, US), 6830 (R, US).

São Paulo: Mun. São Paulo: Florestal, *Foster* 345 (GH, R).

Paraná: Caiobá, *Foster* 444 (GH, US); *M. Kuhlmann* (GH, SP). Jacareí *Dusén* (S, US); 9562 (S, US); 17040 (S, US); 17040-B (S, US).

Santa Catarina: Mun. Brusque: Azambuja, *Reitz* Icon. (HBR).

16. ***Vriesia altodaserrae*** L. B. Smith, Contr. Gray Herb. 98: 16, *pl. 5, figs. 1, 2.* 1932.

São Paulo: Alto da Serra, *Foster* 358 (GH, US); *Hoehne* (SP); *L. B. Smith* 1875 (GH, type); 1926 (GH, US). Boracéa, *Ramalho* (SP). São Vicente, Santos, *Mosén* 3197 (S).

Paraná: Banhado, *Dusén* 9537 (S); 17496 (S, US). Guaratuba, *Reitz* 4273 (HBR). Estação Marumbi, Serra do Mar, *Frenzel* (Inst. Biol. Pesq. Tec.); 497 (HBR). Ipiranga, *Dusén* 14414 (S, US).

Santa Catarina: Blumenau, *Reitz* 4652 (HBR); *Smith & Reitz* 6280 (R, US). Brusque, *Reitz* 3591 (HBR, US), 4079 (HBR). Mun. Jaraguá: Corupá, *Reitz* 4230 (HBR). Campo Alegre, *Reitz* 3718 (HBR). Imaruí, *Reitz* 4531 (HBR).

17. ***Vriesia muelleri*** Mez, Bot. Jahrb. 30, Beibl. 67: 7. 1901.

Paraná: Guaratuba, *Inst. Malariologia in Reitz* 3598 (! Reitz).

Santa Catarina: Blumenau, *F. Mueller* (B, type).

I have seen no complete material of this species, but from the description it would seem possible that it is a hybrid of *Vriesia philippocoburgii* with *V. procera* or *V. friburgensis,* the former accounting for the acute sepals and the latter for the non-secund flowers.

18. ***Vriesia haematina*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 117, *pl. 123.* 1943.

Rio de Janeiro: Teresópolis, *Foster* 1013 (GH, type, US neg. 4076, 4077).

19. ***Vriesia saundersii*** (Carr.) E. Morr. ex Mez in Mart. Fl. Bras. 3, pt. 3: 540. 1894.
Encholirion saundersii Carr. Rev. Hortic. 44: 300. 1872.
Tillandsia saundersii C. Koch, Ind. Sem. Hort. Berol. for 1873, App. 4: 6. 1874.
Vriesia botafogensis Mez in Mart. Fl. Bras. 3, pt. 3: 536. 1894.

Brazil: Cultivated, *Atkinson* 116 (GH); *Foster* (GH); *Dallière* (LG).

Rio de Janeiro: Niteroi, *Foster* 106 (GH).

Distrito Federal: Barra da Tijuca, *Reitz* 3910 (HBR). Botafogo, *Glaziou* 16466 (B, type of *Vriesia botafogensis* Mez; K, US neg. 4026).

20. ***Vriesia monacorum*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 119, *pl. 127.* 1943.

Minas Gerais: Mun. Santa Barbara: Mosteiro de Caraça, *Foster* 693 (GH, type; US).

21. ***Vriesia friburgensis*** Mez in Mart. Fl. Bras. 3, pt. 3: 537. 1894.

1. Branches erect or suberect, inflorescence distinctly longer than broad.
   2. Floral bracts all ecarinate, to 35 mm. long; flowers all spreading. Var. a. **friburgensis**
   2. Upper floral bracts carinate, about 25 mm. long; upper flowers often imbricate. ..... Var. b. **paludosa**
1. Branches spreading to arching-recurved, lax; flowers spreading. Var. c. **tucumanensis**

Field studies show that the species is highly variable, even a single colony having some individuals wholly lacking prophyllae on the branches and others having them on nearly every branch. The same individual may have both carinate and ecarinate floral bracts.

21a. ***Vriesia friburgensis*** var. ***friburgensis.***

Vriesia tweedieana sensu F. Mueller, Gartenflora 42: 738. 1893, in part.

Rio de Janeiro: Nova Friburgo, *Glaziou* 16467 (K (US neg. 4028), P, isotypes).

Paraná: Jacareí, *Dusén* (S, US). Serra São Luiz, *M. Kuhlmann* (SP). Mun. Piraquara: Campininha, *Hatschbach* 1857 (US).

Rio Grande do Sul: Cascata, Serra dos Tapes, *Lindman* A-779 (S). São Salvador, *Eugenio* 124 (R).

21b. ***Vriesia friburgensis*** var. ***paludosa*** (L. B. Smith) L. B. Smith, Anais Bot. Herb. Barbosa Rodrigues 4: 68. 1952. Figure 33.

Vriesia paludosa L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 119, *pl. 128.* 1943.

Vriesia saundersii sensu L. B. Smith, Anais Bot. Herb. Barbosa Rodrigues 2: 26, 54. 1950, non E. Morr.

São Paulo: Apiaí, *M. Kuhlmann* (SP). Cotia to Una, *Foster* 383 (GH). Guapiára, *M. Kuhlmann* (SP). São Paulo to Curitiba, km. 279, *Foster* 394 (GH).

Paraná: Curitiba, *Foster* 459 (GH, type; R). Curitiba to Paranaguá, *Reitz* 5763 (! Reitz). São Luiz, *Foster* 410 (GH).

Santa Catarina: *Foster* 2517 (US). Blumenau, *Reitz* 3590 (HBR). Campo Alegre, *Reitz* 3906 (HBR). Laguna, *Reitz & Klein* 93 (HBR). São Francisco do Sul, *Reitz* 3907 (HBR). Ribeirão Grande, Taió, *Reitz* 3993 (HBR). Serra do Mirador, Taió, *Reitz* 3958 (HBR, US). Mun. Araranguá: Curralinhos, *Reitz* C-900 (GH, HBR). Sombrio, *Reitz* C-400 (GH, HBR). Mun. Brusque: Spitzkopf, *Reitz* 2303 (HBR, US). Mun. Florianópolis: Canavieiras, *Reitz* 4265 (HBR). Mun. Itajaí: Praia Braba, *Reitz* 2296 (HBR, US); 3871 (HBR); 3872 (HBR, prophyllate); 3873 (HBR, US, eprophyllate); 3905 (HBR, US); 4103 (HBR, US); 4104 (HBR, US); *Reitz & Foster* 2296 (HBR); *Smith & Reitz* 6089 (R, RB, US).

Mun. Palhoça: Campo do Massiambú, *Reitz* 4985 (! Reitz). Mun. Pôrto Belo: Canto Grande, *Reitz* (HBR, US); 3641 (HBR).

Rio Grande do Sul: Morro Sapucaia, São Leopoldo, *Eugenio* 127 (R); 2212 (GH, HBR). Mun. Tôrres: Campo Bonito, *Reitz* 4412 (HBR); 4441 (HBR); *Smith & Reitz* 5834 (US).

21c. ***Vriesia friburgensis*** var. ***tucumanensis*** (Mez) L. B. Smith, Anais Bot. Herb. Barbosa Rodrigues 4:68. 1952.

Vriesia tucumanensis Mez in DC. Monogr. Phan. 9:585. 1896.
Vriesia caldasiana Mez in DC. Monogr. Phan. 9:607. 1896.
Vriesia argentinensis Spegazzini, Physis 3:158. 1917.
Vriesia glutinosa Wawra var. *viridis* Hassler, Ann. Conserv. & Jard. Bot. Genève 20:319. 1919.

Minas Gerais: Caldas, *Henschen in Regnell* III-1254 (US); *Mosén* 4436 (S); *Regnell* II-286 in part (S). Pouso Alegre, *Hoehne* (GH, SP).

São Paulo: Campinas, *Viegas* (IAC). São Paulo, *Foster* 347 (GH, R); *Hoehne* (SP).

Paraná: Barracão, *Reitz* 4278 (! Reitz). Ipiranga, *Dusén* 3552 (R). Morrêtes, *Dusén* 4357 (R). Ponta Grossa, *Dusén* 2699 (S).

Santa Catarina: Mun. Chapecó: Dionísio Cerqueira, *Reitz* 4281 (! Reitz). Mun. Itajaí: Praia Braba, *Reitz* 4102 (HBR, US).

Rio Grande do Sul: São Salvador, *Eugenio* 2213 (GH). Silveira Martins, Val Veneta, *Lindman* A-1331 (S).

22. ***Vriesia procera*** (Mart. ex Schult.) Wittm. Bot. Jahrb. 13, Beibl. 29:21. 1891.

1. Inflorescence amply paniculate; scape-bracts imbricate.
  2. Floral bracts even, subcoriaceous, equaling the sepals or slightly shorter; branches divergent to spreading, not twisted.
    3. Floral bracts green..... Var. a. **procera**
    3. Floral bracts red with yellow apices..... Var. b. **rubra**
  2. Floral bracts nerved, membranaceous, much shorter than the sepals; branches spreading to recurving, often twisted so that the flowers are secund..... Var. c. **tenuis**
1. Inflorescence simple or subsimple; scape-bracts nearly all shorter than the internodes; some of the floral bracts incurved..... Var. d. **debilis**

22a. ***Vriesia procera*** var. ***procera***. Figure 34.

Tillandsia procera Mart. ex Schult. in R. & S. Syst. 7, pt. 2:1224. 1830.
Vriesia gracilis Gaud. Atl. Voy. Bonite. *pl. 67*. 1846.
Tillandsia gracilis Griseb. Nachr. Ges. Wiss. Goett. for **1864**:17. 1865.
Tillandsia erectiflora Baker, Journ. Bot. 25:346. 1887.
Vriesia catharinensis F. Mueller, Gartenflora 42:738. 1893.
Vriesia procera var. *gracilis* Mez in Mart. Fl. Bras. 3, pt. 3:540. 1894.
Tillandsia viscidula Britton, Bull. Torrey Bot. Club 48:328. 1922.

Brazil: *Boog* (K, type of *Tillandsia erectiflora* Baker, GH neg. 1630).

Piauí: *Luetzelburg* (! Mez).

Ceará: *Luetzelburg* (! Mez).

Paraíba: Areia, *Vasconcellos* 150 (RB). Campina Grande, *Foster* 2407 (US).

Pernambuco: Iguaraçu, *Ridley & Ramage* (! Mez). Palmares, Santa Teresinha, *Pickel* 3436 (IPA).

Baía: Agua Preta, *Foster* 67 (GH, R). Rio Itaipé, *Martius* (M, type). Maracás, *Ule* 7018 (! Mez). Milagres to Maracás, *Foster* 2442 (US).

Espírito Santo: Vitória, *Foster* 185 (GH).

Rio de Janeiro: Suruí, *Foster* 326 (GH, R). Teresópolis, *Sampaio* 3366 (R).

Distrito Federal: Baixada Fluminense, *Lutz* 1340 (R). Praia de Grumari, near Guaratiba, *Smith & Mus. R* 6536 (R, US). Restinga Recreio dos Bandeirantes, *Lutz* 1454 (GH). Rio de Janeiro, *Foster* 494 (GH); *Gaudichaud* 365 (P, type of *Vriesia gracilis* Gaud., GH neg. 3046); 369 in part (P).

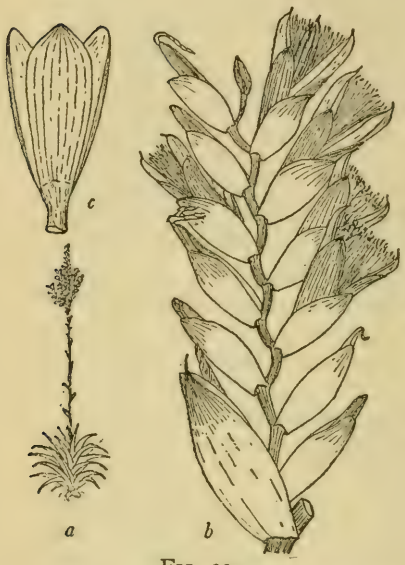

Fig. 33.

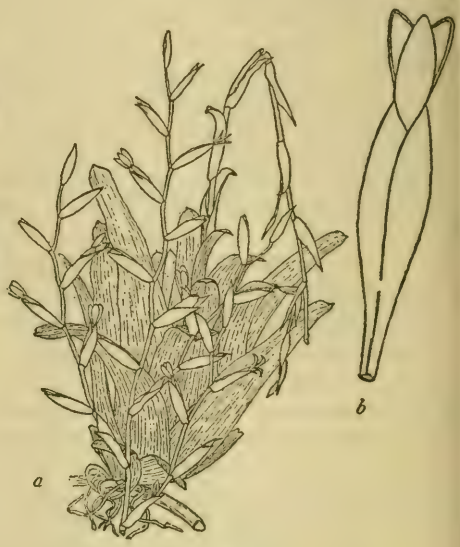

Fig. 34.

Fig. 33.—*Vriesia friburgensis* var. *paludosa*: *a*, Habit, × 1/50; *b*, primary bract and spike, × ½; *c*, sepals, × 1.

Fig. 34.—*Vriesia procera* var. *procera*: *a*, Habit, × ¼; *b*, flower, × 1. (Both after Gaudichaud.)

São Paulo: Santos, *Regnell* I-38 1/32 in part (S). São Vicente, Santos, *Mosén* 3710 (S).

Paraná: Caiobá, *Foster* 436 (GH); 501 (GH). Guaratuba, *Reitz* 4275 (HBR); *Smith & Reitz* 5725 (R, US). Jacareí, *Dusén* 15481 (GH, S); 15835 (S).

Santa Catarina: Blumenau, *F. Mueller* (! Mez); *Reitz* 3654-a (! Reitz). Canto Grande, Pôrto Belo, *Reitz* 3619 (HBR, US). Joinvile, *Reitz* 3909 (HBR). Laguna, *Reitz & Klein* 95 (HBR); *Smith & Reitz* 5946 (US). Mun. Florianópolis: Cacupé, *Reitz* 3520 (HBR). Mun. Palhoça: Campo de Massiambú, *Reitz & Klein* 858 (! Reitz).

Also: Trinidad, Guiana, Argentina.

22b. ***Vriesia procera*** var. ***rubra*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 2: 197. 1952.

Espírito Santo: Itapemirim, *Foster* 166 (US, type, GH).

22c. ***Vriesia procera*** var. ***tenuis*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 121. 1943.

Tillandsia gracilis Ule, Bericht. Deutsch. Bot. Gesselsch. 18: 325, *pl. 10, figs. 7–11.* 1900.

Tillandsia ernestii Mez, Engl. Pflanzenreich IV. 32: 636. 1935.

Rio de Janeiro: Nova Friburgo, *Ule* 4959 (B, type of *Tillandsia gracilis* Ule).

Distrito Federal: Rio de Janeiro, *Burchell* 2354 (K, US neg. 4129).

São Paulo: Mun. São Paulo: Florestal, *Foster* 352 (GH, R). Pirajussára, *Gehrt* (SP); *Gehrt in L. B. Smith* 1820 (GH, type). Santo Amaro, *Roth* (SP). São Paulo, *Gehrt* (GH); *Loefgren* 2942 (SP).

22d. ***Vriesia procera*** var. ***debilis*** Mez in Mart. Fl. Bras. 3, pt. 3: 540. 1894.

Espírito Santo: (Bananal), *Vianna Freire* 47 (R, US).

Distrito Federal: Restinga da Lagoa Freitas, *Ule* 4047 (! Mez). Rio de Janeiro, *Mikan* (W, type).

Brazil: *Jardim Botanico Rio* 599 (RB, US neg. 3262).

23. ***Vriesia gigantea*** Gaud. Atl. Voy. Bonite *pl. 70* (except the base of the inflorescence erroneously shown as simple). 1846. Figure 35.

Tillandsia gigantea Griseb. Fl. Brit. West Ind. 597. 1864.

Tillandsia tessellata Linden, Catal. 9. 1873.

Vriesia tessellata E. Morr. Belg. Hortic. 32: 381, *pls. 14–16.* 1882.

Tillandsia reticulata Baker, Gard. Chron. ser. 3. 1: 140. 1887.

Vriesia reticulata Mez in Mart. Fl. Bras. 3, pt. 3: 557. 1894.

Vriesia mosenii Mez in Mart. Fl. Bras. 3, pt. 3: 558. 1894.

Brazil: *Dusén* (GH). Cultivated, *Hort. Makoy* (LG).

Espírito Santo: Mun. Collatina: Linhares, *Foster* 788 (GH, US). Monte Claro, *Foster* 230 (GH, R).

Rio de Janeiro: Cantagallo, *Glaziou* 15467 (P). Old road below Petrópolis, *Smith & Mus. R* 6499 (R, US).

São Paulo: Santos, *Mosén* 3247 (S). São Vicente, Santos, *L. B. Smith* 2100 (GH, S). Mun. São Paulo: *Hoehne* (GH, SP). Florestal, *Foster* 346 (GH, R, US).

Paraná: Caiobá, *Foster* 431 (GH, US); *M. Kuhlmann* (SP, US). Guaratuba, *Reitz* 4244 (HBR); *Smith & Reitz* 5729 (R, RB, US). Jacareí, *Dusén* 11763 (GH, S, US).

Santa Catarina: Itajaí, *Reitz* 4242 (HBR). Laguna, *Reitz & Klein* 96 (HBR). Serra do Mirador, Taió, *Reitz* 3964 (! Reitz). Mun. Araquari: Itajuba, *Reitz* 4243 (HBR). Mun. Araranguá: Sombrio, *Reitz* C-1009 (GH, HBR); 4664 (HBR). Mun. Blumenau: Blumenau, Reitz 4246 (HBR). Garcia, Reitz 4648 (HBR); *Smith & Reitz* 6301 (R, US). Mun. Brusque: Azambuja, *Reitz* 3531 (HBR). Brusque, *Reitz* 3593 (HBR). Mun. Florianópolis: Ponta Grossa, *Reitz* 4366 (HBR). Ilha de Santa Catarina, *Gaudichaud* 127 (P, type (GH neg. 3028), B (F neg. 11467)). Mun. Jaraguá do Sul: Corupá, *Reitz* 4245 (HBR); *Seidel* 17 (! Reitz). Mun. Palhoça: Campo de Massiambú, *Reitz* 4957 (! Reitz).

Rio Grande do Sul: Cultivated, *Bull* (K, type of *Tillandsia reticulata* Baker, GH neg. 2657). Esteio, *Rambo* (US). Lagoa dos Quadros near Tôrres, *Rambo* (US). São Leopoldo, *Eugenio* 126 in part (R). São Salvador, *Eugenio* 2235 (GH). Mun. Pôrto Alegre: Gloria, *Orth* (SP).

24. ***Vriesia paradoxa*** Mez in DC. Monogr. Phan. 9: 604. 1896.

Baía: *Luschnath* (B, type).

25. ***Vriesia languida*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 118, *pl. 125, fig. 1.* 1943.

Espírito Santo: Santa Teresa, *Foster* 301 (GH, type, US neg. 4075); 845 (GH).

26. ***Vriesia triligulata*** Mez in Mart. Fl. Bras. 3, pt. 3: 541. 1894.

Rio de Janeiro: Serra dos Orgãos, *Glaziou* 16469 (B, type, F neg. 11471).

27. ***Vriesia maculosa*** Mez, Repert. Sp. Nov. Fedde 12: 418. 1913.

Baía: Serra de Sincorá, *Ule* 7120 (B, type, F neg. 11465).

28. ***Vriesia stricta*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 122, *pl. 133.* 1943.

Minas Gerais: Mun. Jaboticatubas: Serra do Cipó, *Foster* 622 (GH, type (US neg. 3544), US).

29. ***Vriesia minarum*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 118, *pl. 126.* 1943.

Minas Gerais: Mun. Caeté: Pico de Piedade, *Foster* 564 (GH, type, US neg. 4064, 4065).

30. ***Vriesia sparsiflora*** L. B. Smith, Contr. Gray Herb. 95: 48, *pl. 10, figs. 1, 2.* 1931.

São Paulo: Alto da Serra, *Hoehne* (SP, type).

31. ***Vriesia crassa*** Mez in Mart. Fl. Bras. 3, pt. 3: 566, *pl. 104.* 1894.

Minas Gerais: Serra do Cipó, *Duarte* 2105 (RB, US). Mun. Caeté: Serra Piedade, *Foster* 596 (GH, US).

Rio de Janeiro: Nova Friburgo, *Glaziou* 13261 (K, type, US neg. 4131). Mun. Santa Maria Madalena: Desengano, *Santos Lima & Brade* 13248 (RB).

32. ***Vriesia densiflora*** Mez in Mart. Fl. Bras. 3, pt. 3: 567. 1894.

Brazil: *Glaziou* 15672b (B, type, F neg. 11462).

33. ***Vriesia philippocoburgii*** Wawra, Oesterr. Bot. Zeitschr. 30: 219. 1880.

1. Plants without elongate rhizomes; leaf-blades 5–8 cm. wide.
Var. a. **philippocoburgii**

1. Plants with elongate rhizomes; leaf-blades much narrower.
Var. b. **vagans**

33a. ***Vriesia philippocoburgii*** var. ***philippocoburgii.*** Figure 36.
Tillandsia philippocoburgii Baker, Journ. Bot. 26: 138. 1888.

Brazil: *Dusén* 58/85 (S).

Rio de Janeiro: Petrópolis, *Foster* 36 (GH, R); *Glaziou* 16473 (P); *Wawra* II-1 (W, type). Petrópolis to Raiz da Serra, *L. B. Smith* 1324 (GH); *Smith & Mus. R* 6497 (R, US). Soberbo to Guapi, Serra dos Orgãos, *L. B. Smith* 1526 (GH). Teodoro de Oliveira to Nova Friburgo, *Smith & Mus. R* 7111 (R, US). Teresópolis, *Sampaio* (R).

Distrito Federal: Morro Queimado, *Duarte & Pereira* (RB). Tijuca, *Glaziou* 8017 (P); *Lutz* 1270 (R). Tijuca-Excelsior, *Lutz* 1447 (R).

São Paulo: Alto da Serra, *Foster* 375 (GH, R). Santos, *Mosén* 3248 (C, R, S). Rio Buturoca, Santos, *Mosén* 3492 (S). Ramal Mairink to Santos, *Lamber* (GH, SP). São Paulo to Curitiba, km. 279 (near Apiai), *Foster* 398 (GH).

PARANÁ: Guaratuba, *Smith & Reitz* 5726 (R, US). Jacareí, *Dusén* (S); 9821 (S, US); 17704 (S). Matinhos, *M. Kuhlmann* (SP). Paranaguá, *Foster* 443 (GH). Pôrto de União, *Dusén* 16121 (S).

SANTA CATARINA: Blumenau, *F. Mueller* (! Mez); *Schenck* 658 (! Mez). Brusque, *Reitz* 3592 (HBR). Rio Itajaí, *Ule* 545 (! Mez). Mun. Araranguá: Sanga da Anta, *Reitz* C-1019 (GH, HBR). Sombrio, *Reitz* C-495 (GH, HBR); C-1034 (HBR). Mun. Bom Retiro: Campo dos Padres,

FIG. 35.

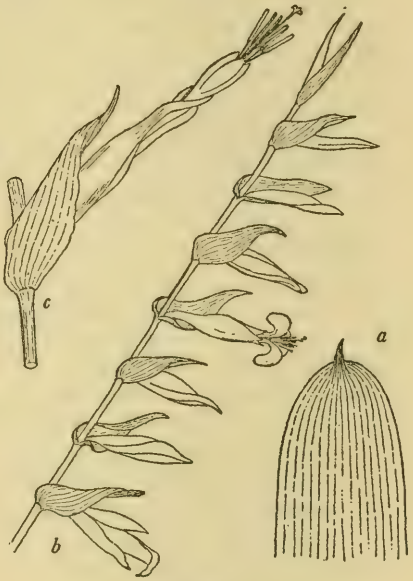

FIG. 36.

FIG. 35.—*Vriesia gigantea:* *a*, Habit (after Belgique Horticole), × 1/40; *b*, section of spike, × 1; *c*, sepal, × 1.

FIG. 36.—*Vriesia philippocoburgii* var. *philippocoburgii:* *a*, Apex of leaf, × ½; *b*, branch, × ½; *c*, floral bract and flower, × 1. (All after Wawra.)

Reitz 2634 (HBR). Mun. Canoinhas: Papanduva, *Reitz* 3981 (HBR). Mun. Florianópolis: Cacupé, *Inst. Malariologia* (HBR). Desterro [Florianópolis], *Schenck* 235 (! Mez). Mun. Palhoça: Campo de Massiambú, *Reitz* 4958 (! Reitz). Mun. São Joaquim: Rio das Contas, *Reitz* 3316 (HBR).

33b. ***Vriesia philippocoburgii*** var. ***vagans*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 121, *pl. 131.* 1943.

MINAS GERAIS: Mun. Jaboticatubas: Vaccaria to Palacio, Serra do Cipó, *Foster* 635 (GH).

RIO DE JANEIRO: Itatiaia, *Foster* 114 (GH, R). Petrópolis, *Foster* 35 (GH); 339 (GH). Teresópolis, *Sampaio* 2421 (R).

DISTRITO FEDERAL: Rio de Janeiro, *Reitz* 4277 (HBR).

São Paulo: Guapiára, *M. Kuhlmann* (SP, US). São Paulo to Curitiba, km. 279 (near Apiai), *Foster* 399 (GH, US).

Paraná: Guaratuba, *Reitz* 4251 (HBR); 4374 (HBR). Jacareí, *Dusén* 17195 (GH, SP, S).

Santa Catarina: Mun. Biguaçú: Fachinal, *Reitz* C-952 (HBR). Mun. Brusque: Azambuja, *Smith & Reitz* 6142 (R, US). Brusque, *L. B. Smith* 5673 (R, US). Ribeirão do Ouro, *Reitz* 3636 (HBR). Mun. Palhoça: Paulo Lopes, *Reitz & Klein* 102 (HBR).

Rio Grande do Sul: Lagoa dos Quadros near Tôrres, *Rambo* (US).

33c. × ***Vriesia philippocoburgii*** × *?*

Rio de Janeiro: Old road below Petrópolis, *Smith & Mus. R* 6457 (R, US). Serra do Imbé, Pedra da Republica, *Brade & Santos Lima* 11587 (R).

Santa Catarina: Blumenau, *Reitz* 3654-a (HBR, with *V. rodigasiana?*). Mun. Bom Retiro: Morro da Igreja, *Reitz* 2970 (HBR, US).

Rio Grande do Sul: Mun. São Francisco de Paula: Taimbé, *Rambo* (US).

34. ***Vriesia delicatula*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 58, *pl. 76.* 1941.

Espírito Santo: Santa Teresa, *Foster* 295 (GH, type; R).

35. ***Vriesia morrenii*** Wawra, Oesterr. Bot. Zeitschr. 30: 219. 1880.
Vriesia morenii var. *disticha* Wawra, Oesterr. Bot. Zeitschr. 30: 220. 1880.
Tillandsia morrenii Baker, Journ. Bot. 26: 139. 1888.

Espírito Santo: Santa Teresa, *Foster* 280 (R).

Minas Gerais: Araponga, *Bailey* 1097 (BH).

Rio de Janeiro: Parque Nacional, Serra dos Orgãos, *Smith & Brade* 5643 (US). Itatiaia, *Brade* 20185 (RB). Petrópolis, *Wawra* II-72 (W, type). Teresópolis, *Wawra* II-350 (W).

36. ***Vriesia ruschii*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 59, *pl. 78.* 1941.

Espírito Santo: Santa Teresa, *Foster & Ruschi* 311 (GH, type (US neg. 4067), R); 799 (GH).

37. ***Vriesia hoehneana*** L. B. Smith, Proc. Amer. Acad. 68: 150, *pl. 1, figs. 11–13.* 1933. Figure 37.
Vriesia tessellata sensu Hoehne, Album da Secção de Botanica do Museu Paulista 97, *fig.* 1925. Not E. Morr.

São Paulo: Alto da Serra, *Foster* 369 (GH); *Hoehne* (GH, SP); *Hoehne & Gehrt* (SP); *L. B. Smith* 1945 (GH, type; US). Campo Grande, *Hoehne* (GH, SP).

38. ***Vriesia amazonica*** (Baker) Mez in Mart. Fl. Bras. 3, pt. 3: 554. 1894. Figure 38.
Tillandsia gigantea Mart. ex Schult. in R. & S. Syst. 7, pt. 2: 1224. 1830.
Tillandsia amazonica Baker, Journ. Bot. 26: 108. 1888.
Vriesia gigantea Mez in Mart. Fl. Bras. 3, pt. 3: 566. 1894. Not Gaud. 1846.

Amazonas: Rio Negro, *Martius* (M, type of *Tillandsia gigantea* Mart., F neg. 18751).

Pará: Belém, *Burchell* 9440 (K, type, GH neg. 2658); cultivated, *Huber* 2903 (MG). Rio Guamá, Belém, *Smith, Pires & Black* 7120 (US).

MATO GROSSO: Cascata do Angelim, Serra do Itapirapuã, *Lindman* A-3517 (S).
ALSO: GUIANA, TRINIDAD.

39. ***Vriesia longicaulis*** (Baker) Mez in Mart. Fl. Bras. 3, pt. 3: 542. 1894.
Tillandsia longicaulis Baker, Journ. Bot. 26: 80. 1888.
Vriesia longicaulis var. *secunda* Mez in Mart. Fl. Bras. 3, pt. 3: 543. 1894.
ESPÍRITO SANTO: Santa Teresa, *Foster* 111-A (GH); 833 (GH). Mun. Castelo: Forno Grande, *Brade* 19854 (RB, US neg. 3347).
MINAS GERAIS: Vaccaria, Serra do Cipó, *Foster* 604 (GH).

FIG. 37.

FIG. 38.

FIG. 37.—*Vriesia hoehneana*: *a*, Habit, × 1/40; *b*, section of spike, × ½; *c*, sepal, × 1.
FIG. 38.—*Vriesia amazonica*: *a*, Habit, × 1/40; *b*, section of spike, × ½; *c*, sepal, × 1.

RIO DE JANEIRO: Itatiaia, *Foster* 111 (GH, R). Serra dos Orgãos, *Wawra* II-359 (W, type of *Vriesia longicaulis* var. *secunda* Mez). Petrópolis, *Foster* 506 (GH). Morro do Retiro, near Petrópolis, *Glaziou* 8988 (K, type, US neg. 3986). Teresópolis, *Foster* 978 (GH, US); 1026 (GH).
SÃO PAULO: Serra da Bocaina, *Brade* 21152 (RB).
SANTA CATARINA: Mun. Itajaí: Morro do Baú, *Reitz* 4185 (HBR); 5179 (! Reitz).

40. ***Vriesia itatiaiae*** Wawra, Oesterr. Bot. Zeitschr. 30: 221. 1880.
Tillandsia itatiaiae Baker, Journ. Bot. 26: 110. 1888.
Vriesia schenckiana Wittm. Bot. Jahrb. 13, Beibl. 29: 20. 1891.
RIO DE JANEIRO: Alto dos Orgãos, near Petrópolis, *Glaziou* 3631 (P); 4264 (P); 16470 (P). Itatiaia, *Dusén* 2199 (S); *Foster* 115 (GH, R); *Luederwaldt* (SP, GH neg. 7108); *L. B. Smith* 1502 (GH); 1703 (B, BA, BM,

F, GH, K, P, S, US); 1738 (GH); *Ule* 289 (R); *Wawra* II-463 (W, type).

41. ***Vriesia longiscapa*** Ule, Bericht. Deutsch. Bot. Gesellsch. 18: 323. 1900.
Espírito Santo: Santa Teresa, *Foster* 259 (GH, R).
Rio de Janeiro: Meio da Serra, *L. B. Smith & Brade* 2293 (GH). Nova Friburgo, *Ule* 4956 (B, type, F neg. 11464). Petrópolis, *Foster* 338 (GH, R). Teresópolis, *Foster* 979 (GH).
Distrito Federal: Rio de Janeiro, *Wilkes Expedition* (GH).

42. ***Vriesia hieroglyphica*** (Carr.) E. Morr. Ill. Hortic. 31: 41, *pl. 514.* 1884. Figure 39.
Massangea hieroglyphica Carr. Rev. Hortic. 50: 175, *figs. 33, 34.* 1878.
Tillandsia hieroglyphica Baker, Journ. Bot. 26: 110. 1888.
Brazil: Cultivated, *Liége* (LG).
Espírito Santo: Santa Teresa, *Foster* 300 (GH, R, US).
Rio de Janeiro: Alto Macaé near Petrópolis, *Glaziou* 16468 (P).
Distrito Federal: Quinta, cultivated, *Glaziou* 14343 (P).
São Paulo: Alto da Serra, *Hoehne* (GH, SP); *L. B. Smith* 2019 (B, GH, S). Ramal Mairink to Santos, *Lamber* (SP).
Paraná: Rio do Meio, *Dusén* (S).

43. ***Vriesia penduliflora*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 120, *pl. 129.* 1943.
Rio de Janeiro: Itatiaia, *Foster* 135 (GH, type, US neg. 4072).

44. ***Vriesia segadas-viannae*** L. B. Smith, p. 35, fig. 40.
Minas Gerais: Mun. Jaboticatubas: Palacio, Serra do Cipó, *Smith & Mus. R* 6755 (US, type).

45. ***Vriesia hydrophora*** Ule, Arch. Mus. Nac. Rio de Janeiro 10: 189. 1899; Bericht. Deutsch. Bot. Gesellsch. 17: 2. 1899.
Rio de Janeiro: Nova Friburgo, *Ule* 4652 (B, type, F neg. 11463). Serra Cavallo, Teresópolis, *Brade* 9849 (R, US).

46. ***Vriesia pastuchoffiana*** Glaziou ex Mez in Mart. Fl. Bras. 3, pt. 3: 564. 1894.
Distrito Federal: Morro Queimado, *Glaziou* 11684 (B, type; C (F neg. 22338), NY). Quinta, *Glaziou* (GH).

47. ***Vriesia biguassuensis*** Reitz, Anais Bot. Herb. Barbosa Rodrigues 4: 8, *pl. 1.* 1952.
Santa Catarina: Mun. Biguaçú: Fachinal, *Reitz* 4134 (HBR, type).

48. ***Vriesia triangularis*** Reitz, Anais Bot. Herb. Barbosa Rodrigues 4: 15, *pl. 4.* 1952.
Santa Catarina: Mun. Imaruí: Vargem do Cedro, *Reitz* 4279 (HBR, type).

49. ***Vriesia gradata*** (Baker) Mez in Mart. Fl. Bras. 3, pt. 3: 523. 1894.
Tillandsia gradata Baker, Journ. Bot. 26: 105. 1888.
Rio de Janeiro: Itatiaia, *Ferreira* 1799 (GH). Petrópolis, *Glaziou* 15473 (K, type (US neg. 3984), C (F neg. 22336)).
São Paulo: Santos, *Mosén* 3712 (S).

50. ***Vriesia modesta*** Mez, Bot. Jahrb. 30, Beibl. 67: 7. 1901.
Espírito Santo: Santa Teresa, *Foster* 302 (GH).

MINAS GERAIS: Serra da Mantiqueira, *Magelhaes* 1020 (B, type, F neg. 11466).
RIO DE JANEIRO: Santa Maria Madalena, *Voll* (RB, US neg. 3261).

51. ***Vriesia pauciflora*** Mez, Repert. Sp. Nov. Fedde 16:72. 1919.
DISTRITO FEDERAL: Tijuca, Rio de Janeiro, *Ule* 4048 (B, type).

52. ***Vriesia erythrodactylon*** E. Morr. ex Mez in DC. Monogr. Phan. 9:569. 1896. FIGURE 41.
Vriesia psittacina var. *erythrodactylon* E. Morr. Belg. Hortic. 32:287. 1882.
In the Pflanzenreich (IV. 32:373. 1935), Mez assigned *Vriesia decipiens*

FIG. 39.

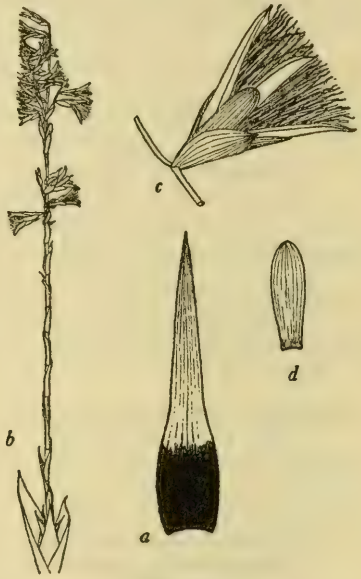

FIG. 40.

FIG. 39.—*Vriesia hieroglyphica: a,* Apex of leaf, × ¼; *b,* spike, × ¼; *c,* petal and stamens, × 1.
FIG. 40.—*Vriesia segadas-viannae: a,* Leaf, × 1/10; *b,* scape and inflorescence, × 1/10; *c,* flower and capsule, × ½; *d,* sepal, × ½.

F. Mueller (Gartenflora 42:737. 1893) to the synonymy of *V. erythrodactylon* although its valid publication clearly has priority. However, as the description is inadequate and all evidence apparently lost, it seems best to consider *V. decipiens* a nomen dubium.
ESPÍRITO SANTO: Santa Teresa, *Foster* 273 (GH, R).
RIO DE JANEIRO: Serra dos Orgãos, *Miers* 4080 (BM, US neg. 3988).
SÃO PAULO: Alto da Serra, *Foster* 363 (GH, R); *Lemos* (GH, SP); *L. B. Smith* 1923 (GH); *Smith, Hoehne & Kuhlmann* 1830 (GH, S). Ramal Mairink to Santos, *Lamber* (GH, SP). Sorocaba, Santos, *Mosén* 3493 (S).
PARANÁ: Rio Demora, Antonina, *Dusén* 14696 (GH, S). Guaratuba, *Reitz* 4250 (HBR); *Smith & Reitz* 5728 (R, US). Ipiranga, Serra do Mar, *Dusén* 3973 (R, S). Desvio Ipiranga, Serra do Mar, *Dusén* 9561 (S, US).

Jacareí, *Dusén* 15557 (S, US); 16105 (S). Volta Grande, Serra do Mar, *Dusén* 14531 (S).

SANTA CATARINA: Joinvile, *Reitz* 3715 (HBR). São Francisco do Sul, *Reitz* 3758-f (HBR). Mun. Araranguá: Timbe, *Reitz* C-414 (GH, HBR). Mun. Biguaçú: Fachinal, *Reitz* C-987 (HBR). Mun. Blumenau: Spitzkopf, *Reitz* 4657 (HBR). Mun. Brusque: Santa Luzia, *Reitz* 3596 (HBR); 3597 (HBR). Mun. Itajaí: Morro do Baú, *Reitz* C-2070 (HBR, US). Mun. Jaraguá do Sul: Corupá, *Seidel* 8 (HBR). Mun. Orleães: Rio Mirador, *Reitz* 3381 (HBR). Mun. Palhoça: Pilões, *L. B. Smith* 6212 (R, US).

52a. × ***Vriesia erythrodactylon* × *incurvata.***

SÃO PAULO: Alto da Serra, *Foster* 374 (GH, R).

53. ***Vriesia heliconioides*** (H. B. K.) Hook. ex Walp. Ann. Bot. 3: 623. 1852.
Tillandsia heliconioides H. B. K. Nov. Gen. & Sp. 1: 293. 1816.
Tillandsia disticha Willd. ex Schult. in R. & S. Syst. 7, pt. 2: 1226. 1830. In synonymy, not *Renealmia disticha* L. 1759.
Vriesia disticha Kuntze, Rev. Gen. 3, pt. 2: 304. 1898.
Guzmania obtusa Rusby, Mem. N. Y. Bot. Gard. 7: 212. 1927.

MATO GROSSO: Angelim, *Lindman* A-3329 (S).

ALSO: GUATEMALA to PANAMÁ, COLOMBIA, PERÚ, BOLIVIA.

54. ***Vriesia vulpinoidea*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 122, *pl. 134.* 1943.

SÃO PAULO: Estação Florestal, São Paulo, *Foster* 356 (GH, type (US neg. 4068), R).

55. ***Vriesia rhodostachys*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 121, *pl. 132.* 1943.

ESPÍRITO SANTO: Santa Teresa, *Foster* 807 (GH, type, US neg. 4066).

56. ***Vriesia incurvata*** Gaud. Atl. Voy. Bonite *pl. 68.* 1846.
Tillandsia incurvata Baker, Journ. Bot. 26: 49. 1888.
Vriesia rostrum-aquilae Mez in Mart. Fl. Bras. 3, pt. 3: 518, *pl. 107.* 1894.
Vriesia duvaliana sensu Alexander, Addisonia 19: 47, *pl. 632.* 1936. Not E. Morr.

BRAZIL: *D'Urville* (P); *Gaudichaud* 120 (P, type, GH neg. 3018); *Sellow* bromel. 67 (P).

SÃO PAULO: Alto da Serra, *Foster* 381 (GH); *L. B. Smith* 2111 (F, GH, S). Boracéa, *Blanco* (GH, IAC). Boracéa to Salesópolis, *M. Kuhlmann* 2340 (SP); *Kuhlmann & Kühn* 1763 (SP). Rio Buturoca, Santos, *Mosén* 2981 (S). Cidade Jardim, *Smith & Kuhlmann* 1817-a (GH). Headwaters of the Rio Cotia, *Gehrt* (GH, SP). Paiol do Meio, *Gehrt* (GH, SP). Ramal Mairink to Santos, *Lamber* (GH, SP). Santos, *Foster* 1041 (GH). São Bento, *Burchell* 3488 (BR, type of *Vriesia rostrum-aquilae* Mez, GH neg. 2799). São Paulo, *Handro* (SP). São Paulo to Curitiba, km. 279, (near Apiai), *Foster* 381-A (GH, R). Ubatuba, *Viegas, Franco & Lima* (GH, IAC).

PARANÁ: Alexandra, *Dusén* 9016 (S). Curitiba to Joinvile near the Santa Catarina line, *Reitz* 3887 (HBR); 5755 (! Reitz). Curitiba to Morrêtes, *M. Kuhlmann* (SP, US). East of Curitiba, *Foster* 418 (GH, R). Rio Demora, Antonina, *Dusén* 14691 (S). Ipiranga, *Dusén* 3569 (GH, R).

Jacareí, *Dusén* (S); 8117 in part (GH, S). Monte Alegre, Serra do Mar, *Dusén* 14089 (S). Morrêtes, *Dusén* 14421 (S, US). Volta Grande, Serra do Mar, *Dusén* 14529 (GH, S).

SANTA CATARINA: Ribeirão Grande, Taió, *Reitz* 3995 (HBR, sterile). Mun. Araranguá: Araranguá, *Rambo* (LIL). Meleiro, *Reitz* C-1 (GH, HBR). Peroba, *Reitz* C-473 (GH, HBR). Sombrio, *Reitz* C-1033 (HBR). Timbe, *Reitz* C-420 (HBR). Turvo, *Reitz* C-52 (HBR). Mun. Brusque: Azambuja, *Reitz* C-1834 (HBR, US). Brusque, *Smith & Veloso* 5659 (R, RB, US). Mun. Florianópolis: Ribeirão da Ilha, *Reitz* 3927 (HBR). Sertão da Lagoa, *Rohr* 636 (LIL). Mun. Itajaí: Morro do Baú, *Reitz* 2065 (HBR, US). Mun. São Francisco do Sul: Pôrto das Canoas, *Smith & Reitz* 5699 (US). São Francisco do Sul, *Reitz* 3894 (HBR).

57. ***Vriesia inflata*** (Wawra) Wawra, It. Sax.-Cob. 161. 1883.

Vriesia carinata var. *inflata* Wawra, Oesterr. Bot. Zeitschr. 30: 183. 1880.

Tillandsia inflata Baker, Bot. Mag. 112: *pl. 6882.* 1886. As to basonym.

Vriesia incurvata var. *inflata* Mez in Mart. Fl. Bras. 3, pt. 3: 522. 1894.

ESPÍRITO SANTO: Domingos Martins, *Foster* 237 (GH).

RIO DE JANEIRO: Petrópolis, *Sampaio* 7793 (R).

DISTRITO FEDERAL: Bico do Papagaio, *Ule* 4046 (R). Gavea, *Smith & Mus. R* 6426 (R, US). Tijuca, *Wawra* II-219-a (W, type).

SÃO PAULO: Alto da Serra, *Foster* 380 (GH, R, US); *Hoehne* (GH, SP); *L. B. Smith* 2110 (GH, S); *Smith, Hoehne & Kuhlmann* 1832-a (GH). Boracéa to Salesópolis, *Blanco* (GH, IAC); *Kuhlmann & Kühn* 1764 (SP).

PARANÁ: Alto da Serra, Serra do Mar, *Tessmann* (Paran., US). Monte Alegre, Serra do Mar, *Dusén* (S).

58. ***Vriesia petropolitana*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 120, *pl. 130.* 1943.

Vriesia incurvata sensu E. Morr. Belg. Hortic. 32: 52, *pl. 2.* 1882. Not Gaud. 1846.

Tillandsia inflata Baker, Bot. Mag. 112: *pl. 6882.* 1886. As to material and plate but not as to basonym of Wawra.

ESPÍRITO SANTO: Santa Teresa, *Foster* 1214 (GH); 1248 (GH). Vargem Alta, Morro do Sal, *Foster* 952 (GH). Pôrto Novo, *Frambach* (F).

MINAS GERAIS: Itabira do Campo, *Matos* (R, US).

RIO DE JANEIRO: Parque Nacional Serra dos Orgãos, Teresópolis, *Smith & Brade* 5645 (US). Petrópolis, *Foster* 32 (GH, type (US neg. 4073), R); 40 (GH, R). Teresópolis, *Brade* 9680 (R); *Sampaio* 2149 (R).

59. ***Vriesia splendens*** (Brongn.) Lem. Fl. des Serres 6, Misc.: 162, *fig.* 1850–51.

1. Leaf-blades with broad dark irregular cross-bands..... Var. a. **splendens**
1. Leaf-blades concolorous ..... Var. b. **longibracteata**

59a. ***Vriesia splendens*** var. ***splendens.***

Tillandsia splendens Brongn. Ann. Fl. Pomone 18: 311. 1845.

Vriesia speciosa Hook. Bot. Mag. 74: *pl. 4382.* 1848.

BRAZIL: Probable, but not yet recorded.

BRITISH GUIANA: Kaieteur, *Maguire & Fanshawe* 23331 (GH, NY).

59b. ***Vriesia splendens*** var. ***longibracteata*** (Baker) L. B. Smith, p. 126.

Tillandsia longibracteata Baker, Journ. Bot. 26: 81. 1888.

Vriesia longibracteata (Baker) Mez in DC. Monogr. Phan. 9: 568. 1896.

BRAZIL: Probable, but not yet recorded.

BRITISH GUIANA: Kaieteur, *Appun* (BM).

60. ***Vriesia carinata*** Wawra, Oesterr. Bot. Zeitschr. 12: 349. 1862. FIGURE 42.

Vriesia brachystachys Regel, Gartenflora 15: 258, *pl. 518.* 1866.

Vriesia psittacina var. *brachystachys* E. Morr. Belg. Hortic. 20: 161. 1870.

Vriesia psittacina var. *carinata* E. Morr. Belg. Hortic. 32: 287, *pls. 10–12, fig. 1.* 1882.

Tillandsia carinata Baker, Journ. Bot. 26: 49. 1888.

Tillandsia psittacina sensu E. Morton, Brazil Fl. 2: *pl. 43.* 1893.

ESPÍRITO SANTO: Rio Jucu, *Foster* 209 (GH). Santa Teresa, *Foster* 804 (GH); 1215 (GH, US). Mun. Cachoeira de Itapemirim: Pedra Branca, *Brade* 19373 (RB, US).

RIO DE JANEIRO: Petrópolis, *Foster* 34 (GH, R, US); *Glaziou* 8026 (P). Serra da Estrella, Petrópolis, *Diogo* 700 (R). Teresópolis, *Bailey* 1245 (BH); *Sampaio* 1848 (R).

DISTRITO FEDERAL: Morro Queimado, *Occhioni* 45 (RB). Rio de Janeiro, *Wilkes Expedition* (GH).

SÃO PAULO: Florestal, *Foster* 353 (GH). Jaraguá, *Gehrt* (SP). Monte Alegre, Amparo, *Kuhlmann & Kühn* 1039 (SP). Ribeirão Pires, *Edwall* (GH, SP). Santos, *Mosén* 3715 (R). São Paulo, *Sellow* bromel. 66 (P). Serra Negra, *Hoehne* (SP).

PARANÁ: Alexandra, *Dusén* 8086 (S, US). North of Caiobá 30 km., *Foster* 428 (GH, R). Curitiba to Joinvile near the Santa Catarina line, *Reitz* 4137 (HBR); 5757 (HBR, US). Jacareí, *Dusén* 15221 (S, US); 15404 (GH, S); 15541 (S); 17073 (S). Matinhos, *M. Kuhlmann* (SP). Morrêtes, *Dusén* 4358 (R, S). Pôrto de Cima, *Jönsson in Dusén* 810-a (GH, S). Pôrto Dom Pedro II, *Dusén* 9876 (S). Serra da Prata, *Dusén* 15306 (S). Volta Grande, Serra do Mar, *Dusén* (S).

SANTA CATARINA: *D'Urville* (P) Blumenau, *Schwacke* 57 (R). Ribeirão Grande, Taió, *Reitz* 3996 (HBR, sterile). Mun. Araquari: Barra do Sul, *Reitz & Klein* 921 (! Reitz). Mun. Araranguá: Maracajá, *Reitz* C-601 (GH, HBR). Meleiro, *Reitz* C-28 (GH, HBR). Sombrio, *Reitz* C-484 (HBR). Turvo, *Reitz* C-565 (HBR). Mun. Brusque: Azambuja, *Reitz* C-1831 (HBR, US); 2387 (R); 4046 (HBR). Mun. Jaraguá do Sul: Corupá, *Seidel* 2 (HBR); 23 (HBR). Mun. Palhoça: Pilões, *L. B. Smith* 6206 (R, RB, US).

RIO GRANDE DO SUL: Tôrres, *Golland in Lindman* (S).

60a. × ***Vriesia carinata*** × ***ensiformis.***

ESPÍRITO SANTO: Vitória, *Foster* 213 (GH, R).

RIO DE JANEIRO: Petrópolis, *Foster* 336 (GH, R).

60b. × ***Vriesia carinata*** × ***incurvata.***

PARANÁ: Caiobá, *Foster* 438 (GH).

SANTA CATARINA: Mun. Blumenau: Spitzkopf, *Reitz* 4659 (HBR).

60c. × ***Vriesia carinata*** × ***inflata.***

SÃO PAULO: Campos da Bocainha, *Loefgren & Edwall* (SP).

60d. × ***Vriesia carinata*** × ***scalaris*** or ***simplex.***
ESPÍRITO SANTO: Santa Teresa, *Foster* 1177 (GH).

60e. × ***Vriesia carinata*** ×? (species with laxer inflorescence).
SANTA CATARINA: Mun. Palhoça: Pilões, *L. B. Smith* 6208 (US).

Vriesia carinata is probably the most prolific producer of hybrids in the genus. For further crosses see under *V. morreniana.*

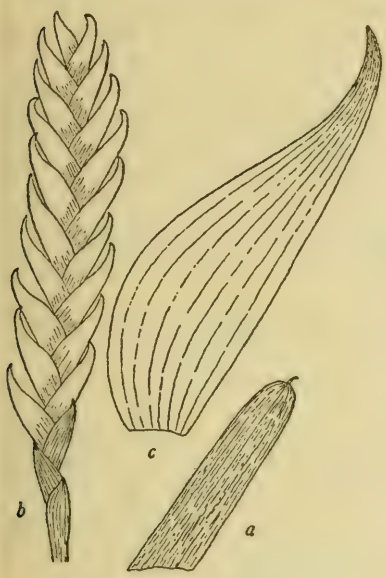

FIG. 41.

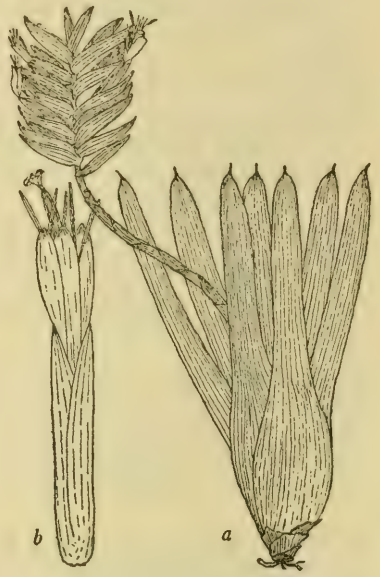

FIG. 42.

FIG. 41.—*Vriesia erythrodactylon: a,* Leaf-blade, × ¼; *b,* inflorescence, × ¼; *c,* floral bract, × 1.
FIG. 42.—*Vriesia carinata: a,* Habit, × ¼; *b,* flower, × 1.

61. ***Vriesia duvaliana*** E. Morr. Belg. Hortic. 34: 105, *pls. 7, 8.* 1884.
Vriesia psittacina var. *duvaliana* André, Rev. Hortic. 56: 559. 1884.
Tillandsia duvaliana Baker, Journ. Bot. 26: 48. 1888.
BRAZIL: *Pohl* (! Mez).
RIO DE JANEIRO: Petrópolis (?), cultivated *Binot* (LG, type). Suruí, *Foster* 327 (GH, R).

62. ***Vriesia paraïbica*** Wawra, It. Sax.-Cob. 160, *pl. 33, fig. B, pl. 36, fig. B.* 1883.
Vriesia carinata var. *constricta* Wawra, Oesterr. Bot. Zeitschr. 30: 183. 1880.
Tillandsia paraibica Baker, Journ. Bot. 26: 82. 1888. As "parabaica."
Tillandsia carinata var. *constricta* Baker, Handb. Bromel. 212. 1889.
MINAS GERAIS: Castelnovo, *Riedel* (! Mez). Juiz da Fora, *Wawra* II-184 (W, type). Villa do Principe, near Guarhães, *Saint-Hilaire* (! Mez).

63. ***Vriesia goniorachis*** (Baker) Mez in Mart. Fl. Bras. 3, pt. 3: 545. 1894.
Tillandsia goniorachis Baker, Journ. Bot. 25: 303. 1887.

DISTRITO FEDERAL: Gavea, *Smith & Mus. R* 6430 (R, US). ? Pedra do Ilheu, Andaraí Grande, near Rio de Janeiro, *Glaziou* 15471 (K, type (US neg. 3975) GH, P; C (F neg. 22335)). Pão d'Assucar, *Glaziou* 16462 (! Mez). Tijuca, *Ule* (! Mez).

64. ***Vriesia amethystina*** E. Morr. Belg. Hortic. 34: 330, *pls. 15, 16.* 1884.
Tillandsia amethystina Baker, Journ. Bot. 26: 104. 1888.

BRAZIL: Cultivated, *Kew* (K, GH neg. 2656); cultivated, *E. Morren* (LG, type).

ESPÍRITO SANTO: Collatina, *Foster* 219 (GH). Itapemirim, *Foster* 149 (GH).

65. ***Vriesia lancifolia*** (Baker) L. B. Smith, Lilloa 6: 386, *pl. 2, figs. 3, 4.* 1941.
Tillandsia lancifolia Baker, Handb. Bromel. 202. 1889.
Vriesia platzmannii Mez in Mart. Fl. Bras. 3, pt. 3: 546. 1894. In part, not as to type.

BAÍA: (Igreja Velha) *Blanchet* 3458 (BM, type (US neg. 4004), MO, US).

66. ***Vriesia parviflora*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 119, *pl. 125, fig. 2.* 1943.

ESPÍRITO SANTO: Santa Teresa, *Foster* 289 (GH); 839 (GH, type, US neg. 4074).

67. ***Vriesia psittacina*** (Hook.) Lindl. Bot. Reg. 29: *pl. 10.* 1843.

1. Floral bracts red or red and yellow, ecarinate.
   2. Floral bracts red with yellow apices..... Var. a. **psittacina**
   2. Floral bracts wholly red..... Var. b. **rubro-bracteata**
1. Floral bracts wholly green, some of them more or less carinate. Var. c. **decolor**

67a. ***Vriesia psittacina*** var. ***psittacina.*** FIGURE 43.
Tillandsia psittacina Hook. Bot. Mag. 55: *pl. 2841.* 1828.

BAÍA: *Blanchet* 2293 (! Mez).

ESPÍRITO SANTO: Mun. Cachoeiro de Itapemirim: Vargem Alta, *Brade* 19963 (RB, US).

RIO DE JANEIRO: Niteroi, *Foster* 1033 (GH). Serra dos Orgãos, *Wilkes Expedition* (US). Petrópolis, *Sampaio 7623* (R). Old road below Petrópolis, *Smith & Mus. R* 6456 (R, US).

DISTRITO FEDERAL: Alto da Boa Vista, *Reitz* 3916 (HBR). Corcovado, *Lindman* A-39 (S). Gavea, *Smith & Mus. R* 6433 (R, US). Quinta da Bôa Vista, *Glaziou* 16464 in part (P). Rio de Janeiro, *Weddell* 673 (P). Sumare, Serra da Carioca, *Smith & Vieira* 1296 (GH).

67b. ***Vriesia psittacina*** var. ***rubro-bracteata*** Hook. Bot. Mag. 85: *pl. 5108.* 1859.

BRAZIL: Known only from cultivation. No material preserved.

67c. ***Vriesia psittacina*** var. ***decolor*** Wawra, Oesterr. Bot. Zeitschr. 30: 183. 1880.

RIO DE JANEIRO: Cantagallo, *Wawra* II-226 (W, type).

RIO GRANDE DO SUL: Pôrto Alegre, *Eugenio* 445 (NY). Morro da Policia, Pôrto Alegre, *Eugenio* 2488 (GH); *Palacios & Cuezzo* 661 (LIL). Mun. Tôrres: Campo Bonito, *Reitz* 4747 (! Reitz); 5001 (! Reitz).

ALSO: PARAGUAY.

68. ***Vriesia recurvata*** Gaud. Atl. Voy. Bonite *pl. 69.* 1843.
Tillandsia recurvata Baker, Journ. Bot. 26: 106. 1888. Not L. 1762.
Tillandsia decurvata Baker, Handb. Bromel. 216. 1889.
BAÍA: *Blanchet* (BM).
DISTRITO FEDERAL: Rio de Janeiro, *Gaudichaud* (P, type, GH neg. 3044).

69. × ***Vriesia morreniana*** Hort. ex E. Morr. Belg. Hortic. 32: 289. 1882.
× *Vriesia psittacina* × *brachystachys* E. Morr. Belg. Hortic. 29: 300. 1879.
Vriesia psittacina var. *morreniana* E. Morr. Belg. Hortic. 32: 287, *pls. 10–12, fig. 3.* 1882.
× *Vriesia carinata* × *psittacina* Mez in Mart. Fl. Bras. 3, pt. 3: 528. 1894.
The type of *Vriesia morreniana* was produced by an artificial cross between *V. carinata* and *V. psittacina.* However, it is probable that the second parent is sometimes another species, because *V. carinata* is so dominant that the elongation of the rhachis is about the only observable effect of the other species. Also *V. morreniana* occurs in regions where *V. psittacina* is not recorded.
BRAZIL: Cultivated, *E. Morren* (LG, type).
MINAS GERAIS: Rio Retiro, Passa Quatro, *Brade & Silva Araujo* 1900 (RB, US).
RIO DE JANEIRO: Itatiaia, *Foster* 113 (GH, R); *Ule* 302 (R).
SÃO PAULO: Atibaia, *Foster* 472 (GH, R); 474 (GH). Serra da Bocaina, *Brade* 20983 (RB, US). Headwaters of Rio Cotia, *Gehrt* (GH, SP) Invernada do Pinhal, *Loefgren & Edwall* (SP). Fonte Sanitaria, *Foster* 391-A (GH). Rio Tijuca, *Foster* 462 (GH, R). Rio Tijuco, Apiai, *M. Kuhlmann* (SP). Una to Piedade, *M. Kuhlmann* (SP). Mun. São Paulo: Cidade Jardim, *Smith & Kuhlmann* 1815 (GH, S); 1816 (GH). Florestal, *Foster* 355 (GH, R); 391 (GH, R, US). Pirajussára, *Gehrt* (SP); *Ostermeyer* (SP). São Paulo, *Handro* (SP).
PARANÁ: Curitiba to Joinvile near the Santa Catarina line, *Reitz* 4136 (HBR); 5740 (HBR, US). Jacareí, *Dusén* 6765 (S, US). Pôrto da Cima, *Jönsson in Dusén* 811-A (S). Roça Nova, *Dusén* 8137 (S). Volta Grande, *Dusén* 12060 (S). Mun. Piraquara: Base of Morro Anhangava, *Hatschbach* 987 (US).
SANTA CATARINA: Blumenau, *Reitz* 4135 (HBR).

70. ***Vriesia ensiformis*** (Vell.) Beer, Bromel. 92. 1857.
1. Floral bracts coriaceous throughout.
2. Floral bracts bright red..... Var. a. **ensiformis**
2. Floral bracts yellow with green apices..... Var. b. **warmingii**
1. Floral bracts with red coriaceous bases and soft yellow apices that soon disintegrate. ..... Var. c. **bicolor**

70a. ***Vriesia ensiformis*** var. ***ensiformis.*** FIGURE 44.
Tillandsia ensiformis Vell. Fl. Fluminensis 133. 1825; Icon. 3: *pl. 129.* 1835.
Vriesia conferta Gaud. Atl. Voy. Bonite *pl. 65.* 1843.
Vriesia conferta var. *recurvata* Wawra, Oesterr. Bot. Zeitschr. 30: 184. 1880. In part, as to Wawra collections.
Tillandsia selloana Baker, Journ. Bot. 26: 104. 1888.
Tillandsia heterostachys Baker, Journ. Bot. 26: 106. 1888.
Vriesia selloana Mez in Mart. Fl. Bras. 3, pt. 3: 547. 1894.
BRAZIL: *Glaziou* 13263 (P). *Sellow* bromel. 63 (P).
BAÍA: Bom Gosto to Olivença, *Fróes* 19938 (IAN, NY); 19939 (IAN, NY).

Espírito Santo: Santa Teresa, *Foster* 143-A (GH); 1249 (GH, US). Vitória, *Foster* D (GH).

Minas Gerais: Coronel Pacheco, *Heringer* 1165 (SP). Mun. Antonio Dias: Parque Nacional, *Foster* 762 (GH).

Rio de Janeiro: Entre Rios, *Wawra* II-126-a (W); II-126-b (W). Itatiaia, *Foster* 143 (GH, R); 144 (GH); 146 (GH, R).

Distrito Federal: Serra da Bica, *Ule* 4615 (R). Quinta, *Glaziou* 16463 (P). Rio de Janeiro, *Gaudichaud* 366 (P, type of *Vriesia conferta* Gaud., GH neg. 3014).

Fig. 43.

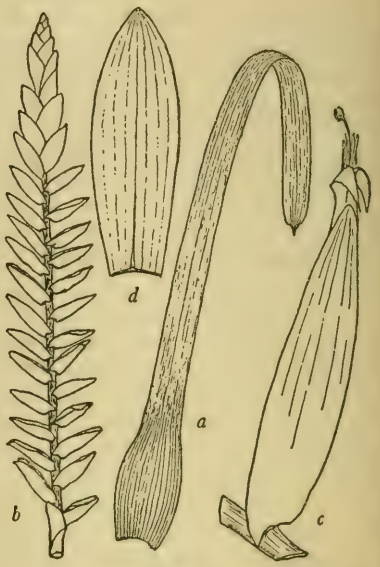

Fig. 44.

Fig. 43.—*Vriesia psittacina* var. *psittacina:* *a,* Apex of leaf, × ¼; *b,* inflorescence, × ¼; *c,* floral bract and flower, × 1.

Fig. 44.—*Vriesia ensiformis* var. *ensiformis:* *a,* Leaf, × ⅛; *b,* inflorescence, × ⅛; *c,* floral bract and flower, × 1; *d,* sepal, × 1.

São Paulo: Alto da Serra, *Mosén* 3251 (S). Serra da Bocaina, *Castellanos* (GH). Cubatão, *L. B. Smith* 2044 (GH). Raiz da Serra, *Hemmendorff* (SP). Mun. São Paulo: Cidade Jardim, *Smith & Kuhlmann* 1817-b (B, GH, S). Ipiranga, *Luederwaldt* (SP).

Paraná: Alexandra, *Dusén* 9015 (S, US). Caiobá, *Foster* 426 (GH). Jacareí, *Dusén* 17028 (S); 18008-a (GH, S). Morrêtes, *Dusén* 4347 (R).

Santa Catarina: Blumenau, *Reitz* 3659 (HBR); 3674 (HBR); *Inst. Malariologia in Reitz* 3659 (HBR). São Francisco do Sul, *Reitz* 3680 (HBR); 3883 (HBR). Mun. Araquari: Itapocu, *Smith & Reitz* 5760 (R, RB, US). Mun. Florianópolis: Barra do Sul, *Reitz & Klein* 920 (! Reitz). Mun. Indaial: Encano, *Reitz* 3989 (HBR). Mun. Jaraguá do Sul: Corupá, *Seidel* 9 (HBR).

70b. ***Vriesia ensiformis*** var. ***warmingii*** (E. Morr.) L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 116. 1943.

Vriesia warmingii E. Morr. in Belg. Hortic. 34: 260, *pls. 12, 13.* 1884.

Tillandsia warmingii Baker, Journ. Bot. 26: 104. 1888.

BRAZIL: Cultivated in Liége, Belgium, *E. Morren* (LG, type).

70c. ***Vriesia ensiformis*** var. ***bicolor*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 116. 1943.

SÃO PAULO: Alto da Serra, *Foster* 362 (GH, R); *Hoehne* (SP, type; GH); *M. Kuhlmann* (SP); *Smith, Hoehne & Kuhlmann* 1831 (GH). Ipiranga, *Luederwaldt* (SP). São Caetano, *J. G. Kuhlmann* (RB). São Vicente, Santos, *Gehrt* (GH, SP).

70d. ***Vriesia ensiformis*** × ***incurvata.***

SANTA CATARINA: São Francisco do Sul, *Reitz* 4248 (! Reitz).

71. ***Vriesia fenestralis*** Linden & André, Ill. Hortic. 22: 124, *pl. 215.* 1875.

Tillandsia fenestralis Hook. f. Bot. Mag. 112: *pl. 6898.* 1886.

Vriesia hamata L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 59, *pl. 77.* 1941.

ESPÍRITO SANTO: Santa Teresa, *Foster* 247 (GH, type of *Vriesia hamata* L. B. Smith; R).

DISTRITO FEDERAL: Barra da Tijuca, *Reitz* 4203 (HBR).

PARANÁ: Cultivated, *E. Morren* (LG, type?).

72. ***Vriesia atra*** Mez in Mart. Fl. Bras. 3, pt. 3: 543, *pl. 101.* 1894.

RIO DE JANEIRO: Petrópolis, *Glaziou* 8989 (B, type). Teresópolis, *Foster* 993 (GH, US); 1017 (GH, US).

73. ***Vriesia jonghii*** (Libon ex C. Koch) E. Morr. Belg. Hortic. 28: 257. 1878. FIGURE 45.

Encholirion jonghii Libon ex C. Koch, Allg. Gartenz. 22. 1857.

Tillandsia jonghei C. Koch, Wochenschr. 11: 91. 1868.

Vriesia gamba F. Mueller, Flora 83: 460. 1897.

BRAZIL: Cultivated (LG, type?).

ESPÍRITO SANTO: Araguai, *Foster* 171 (GH, R, US).

DISTRITO FEDERAL: Serra da Carioca, *L. B. Smith* 1281 (GH).

SÃO PAULO: Alto da Serra, *Foster* 365 (GH); *L. B. Smith* 1951 (GH). Rio Buturoca, Santos, *Mosén* 3250 in part (S).

PARANÁ: Curitiba to Joinvile near the Santa Catarina line, *Reitz* 3888 (HBR). Guaratuba, *Reitz* 4270 (HBR); 4666 (HBR); *Smith & Reitz* 5731 (US). Jacareí, *Dusén* 8133 (S); 17019 (GH, S, US). Paranaguá toward Curitiba 30 km., *Foster* 425 (GH). Pôrto Dom Pedro II, *Dusén* 8133-A (S, US); 9870 (S).

SANTA CATARINA: Brusque, *Reitz* (HBR, US); 3644 (HBR). Mun. São Francisco do Sul: Pôrto das Canoas, *Smith & Reitz* 5701 (US).

74. ***Vriesia fosteriana*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 116, *pl. 121.* 1943.

ESPÍRITO SANTO: Mun. Cachoeiro de Itapemirim: Vargem Alta, Morro do Sal, *Foster* 947 (GH, type; US).

75. ***Vriesia platynema*** Gaud. Atl. Voy. Bonite *pl. 66.* 1843.

1. Leaf-blades essentially concolorous.
   2. Leaves rounded and apiculate.
      3. Sepals obtuse.

4. Scape stout; rhachis 5 mm. in diameter or more.
5. Floral bracts red..... Var. a. **platynema**
5. Floral bracts yellow..... Var. b. **flava**
4. Scape slender; rhachis scarcely more than 2 mm. in diameter. Var. c. **gracilior**
3. Sepals acute..... Var. d. **libonii**
2. Leaves acuminate..... Var. e. **rosea**
1. Leaf-blades not concolorous.
6. Leaf-blades pale-striate..... Var. f. **striata**
6. Leaf-blades red-violet beneath, green above, pale striate near the apex. Var. g. **variegata**

75a. ***Vriesia platynema*** var. ***platynema***. FIGURE 46.

Tillandsia platynema Griseb. Nachr. Ges. Wiss. Goett. for 1864: 19. 1865.
Vriesia corallina Regel, Gartenflora 19: 354, *pl. 671.* 1870.
Encholirium corallinum Linden ex André, Ill. Hortic. 18: 136, *pl. 70.* 1871.
Tillandsia corallina C. Koch, Ind. Sem. Hort. Berol. for 1873, App. 4: 5. 1874.

CEARÁ: (Bico Alto), Serra de Baturite, *Ducke* (MG).

DISTRITO FEDERAL: Rio de Janeiro, *Gaudichaud* (P, type, GH neg. 3025). Morro Queimado, *Occhioni* 43 (RB). Tijuca, *Foster* 321 (GH, R). Tijuca, Excelsior, *Lutz* 1443 (R).

SÃO PAULO: Alto da Serra, *Foster* 364 (GH); *Gehrt* (SP); *L. B. Smith* 1952 (GH). Monte Alegre, *M. Kuhlmann* 409 (SP). Santos, *Mosén* 3250 in part (US). Ilha dos Alcatrazes, Santos, *Luederwaldt & Fonseca* (SP). Piaçaguera, Santos, *J. G. Kuhlmann* (RB). Ramal Mairink to Santos, *Lamber* (SP). Sorocaba, Santos, *Mosén* 2985 (S); 3711 (S). São Paulo, *J. G. Kuhlmann* (RB). São Paulo to Curitiba km. 279, *Foster* 395 (GH).

PARANÁ: Campo Largo, *Foster* 407 (GH). Curitiba, *Dusén* 17453 (GH, S). Ipiranga, *Dusén* 3553 in part (R); 9006 (S, US); 14381 (S, US). Jacareí, *Dusén* 9009 (S); 17452 (GH, S). Coast 30 km. from Paranaguá, *Foster* 422 (GH). Serra São Luiz, *M. Kuhlmann* (SP). Mun. Ponta Grossa: Ponta Grossa, *Foster* 2528 (R, US). Vila Velha, *Foster* 415 (GH).

SANTA CATARINA: Estrada Dona Francisca, Joinvile, *Reitz* 3724 (HBR). Ribeirão Grande, Taió, *Reitz* 3991 (HBR). Mun. Araranguá: Garuva, *Reitz* C-778 (GH, HBR). Mun. Biguaçú: Fachinal, *Reitz* C-950 (GH); 1399 (R). Mun. Brusque: Ribeirão do Ouro, *Reitz* 3637 (HBR). Mun. Chapecó: Itapiranga, Rio Peperí-Gauçú, *Reitz* 3859 (HBR). Mun. Florianópolis: Ribeirão da Ilha, *Reitz* 3925 (HBR). Rio Tavares, *Smith & Reitz* 6187 (R, US). Mun. Itajaí: Morro do Baú, *Reitz* C-2075 (HBR, US). Mun. Orleães: Rio Mirador, *Reitz* 3377 (HBR).

RIO GRANDE DO SUL: São Salvador, *Eugenio* 2160 (GH). Silveira Martins, *Lindman* A-1373 (S). Mun. Pôrto Alegre: Belém, *Golland in Lindman* (S). Mun. São Francisco de Paula: Taimbé, *Rambo* (US).

ALSO: MÉXICO, WEST INDIES, VENEZUELA.

75b. ***Vriesia platynema*** var. ***flava*** Reitz, Anais Bot. Herb. Barbosa Rodrigues 4: 15. 1952.

SANTA CATARINA: Morro do Baú, Itajaí, *Reitz* 4665 (HBR, type).

75c. ***Vriesia platynema*** var. ***gracilior*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 121. 1943.

ESPÍRITO SANTO: Santa Teresa, *Foster* 267 (GH, type (US neg. 4082), R).

75d. ***Vriesia platynema*** var. ***libonii*** Mez in Mart. Fl. Bras. 3, pt. 3: 553. 1894.
BRAZIL: Cultivated (LG, type).

75e. ***Vriesia platynema*** var. ***rosea*** (Hort. ex Antoine) Mez in Mart. Fl. Bras. 3, pt. 3: 552. 1894.
Encholirion roseum Hort. ex Antoine, Phyto-Iconogr. 26. 1884.
BRAZIL: Cultivated (LG, type).

FIG. 45.

FIG. 46.

FIG. 45.—*Vriesia jonghii: a,* Habit, × 1/20; *b,* flower, × 1; *c,* petal and stamen, × 1; *d,* stamen, × 1. (All after Belgique Horticole.)
FIG. 46.—*Vriesia platynema* var. *platynema: a,* Leaf-blade, × ¼; *b,* inflorescence, × ⅛; *c,* floral bract and flower, × 1. (All after Gaudichaud.)

75f. ***Vriesia platynema*** var. ***striata*** (Wittm.) Wittm. ex Mez in Mart. Fl. Bras. 3, pt. 3: 553. 1894.
Vriesia corallina var. *striata* Wittm. Bot. Jahrb. 13, Beibl. 29: 6. 1891.
SANTA CATARINA: Joinvile to São Bento, *Schimper* 265 (Herb.?, type).

75g. ***Vriesia platynema*** var. ***variegata*** (Guillon) Reitz, Anais Bot. Herb. Barbosa Rodrigues 4: 15. 1952.
Encholirion roseum variegatum Guillon, Rev. Hortic. 55: 470. 1883.
PARANÁ: Curitiba to Paranaguá, *Reitz* 5765 (! Reitz).

76. ***Vriesia wawranea*** Antoine, Phyto-Iconogr. 1, *pls. 1, 2.* 1884.
Tillandsia wawranea Baker, Journ. Bot. 26: 105. 1888.
BRAZIL: Described from living material, none now remaining.
RIO DE JANEIRO: Petrópolis, *Glaziou* 14342 (K, US neg. 3983).

77. ***Vriesia bituminosa*** Wawra, Oesterr. Bot. Zeitschr. 12: 347. 1862.
Tillandsia platynema sensu Baker, Journ. Bot. 26: 106. 1888. In part.
Vriesia platynema sensu Wittm. Bot. Jahrb. 13, Beibl. 29: 21. 1891.

BRAZIL: *Foster* 37 (R).

BAÍA: Ilheus, *Wawra & Maly* (! Mez).

MINAS GERAIS: Mun. Caeté: Pico de Piedade, *Foster* 565 (GH).

RIO DE JANEIRO: Itatiaia, *L. B. Smith* 1625 (B, F, GH, S). Serra dos Orgãos, *Burchell* 2321 (K, US neg. 3982). Petrópolis, *Glaziou* 15466 (P); *Wawra* II-25 (W, type). Teresópolis, *Bailey* 1248 (BH, GH); *L. B. Smith* 1519 (GH).

SÃO PAULO: Serra da Bocaina, *Brade* 21153 (RB, US). Campos do Jordão, *Eugenio* 3370 (GH). Umuarama, Campos do Jordão, *M. Kuhlmann* (SP). Monte Alegre, Amparo, *Kuhlmann & Kühn* 409 (SP). São Paulo, *Doering* (SP); *Loefgren* (SP); cultivated, *Hoehne* (GH, SP).

78. ***Vriesia regnellii*** Mez in Mart. Fl. Bras. 3, pt. 3: 548, *pl. 102.* 1894.

MINAS GERAIS: Mun. Antonio Dias, *Foster* 731 (GH). Caldas, *Regnell* III-1799 (B, type; US).

79. ***Vriesia pardalina*** Mez in Mart. Fl. Bras. 3, pt. 3: 523. 1894.

MINAS GERAIS: Sapucai Mirim, *M. Kuhlmann* 2604 (SP). Serra do Cipó, *Duarte* 2233 (RB, US). Serra da Piedade, *Schwacke* (! Mez); *Warming* (! Mez). Pico da Piedade, Belo Horizonte, *Foster* 586 (GH).

RIO DE JANEIRO: Petrópolis, *Lutz* 1251 (R).

DISTRITO FEDERAL (?): Morro de São Vicente, *Glaziou* 15474 (B, type, F neg. 11468).

80. ***Vriesia guttata*** Linden & André, Ill. Hortic. 22: 43, *pl. 200.* 1875.
Tillandsia guttata Baker, Journ. Bot. 26: 108. 1888.
Tillandsia duvaliana Baker, Handb. Bromel. 212. 1889. In part.

MINAS GERAIS: Serra da Piedade, *Barreto* (SP).

RIO DE JANEIRO: Itatiaia, *Brade* 17477 (RB); *Foster* 134 (GH). Morin, Petrópolis *Glaziou* 14344 (P). Teresópolis, *Foster* 999 (GH, US). Pedra do Frade, Teresópolis, *Brade* 10409 (R).

SÃO PAULO: Alto da Serra, *Foster* 134-A (GH). Campo Grande, *Pires* (SP). Guapiara, *M. Kuhlmann* (SP, US). São Paulo, *Ostermeyer* (SP). São Paulo to Curitiba km. 279, *Foster* 393 (GH, R).

PARANÁ: Carvalho, *Dusén* 9014 (S, US). Desvio Ipiranga, Serra do Mar, *Dusén* (S, US); 3570 (R).

SANTA CATARINA: Estrada Dona Francisca, Joinvile, *Reitz* 3714 (HBR). Serra do Mirador, Taió, *Reitz* 3956 (! Reitz). Mun. Araranguá: Serra da Pedra, *Reitz* C-316 (GH, HBR). Mun. Biguaçú: Fachinal, *Reitz* C-930 (GH, HBR). Mun. Brusque: Morro do Spitzkopf, *Reitz* 2304 (! Reitz); 3461 (HBR); 3900 (HBR). Mun. Orleães: Rio Mirador, *Reitz* 3429 (HBR).

80a. × ***Vriesia guttata*** ×?

SÃO PAULO: São Paulo, *Loefgren* (SP, GH neg. 7127, atypical, scape short and only slightly curved).

81. × ***Vriesia obliqua*** Quintus ex Wittm. Gartenflora 41: 201, *pl. 1369.* 1892.

BRAZIL: Described from cultivation. No herbarium material preserved apparently.

82. × ***Vriesia retroflexa*** E. Morr. Belg. Hortic. 34: 185, *pl. 10.* 1884.
× *Vriesia psittacina* × *simplex* Mez in Mart. Fl. Bras. 3, pt. 3: 525. 1894.
× *Vriesia psittacina* × *scalaris* E. Morr. ex Mez in DC. Monogr. Phan. 9: 578. 1896.

São Paulo: Mun. São Paulo: Florestal, *Foster* 354-a (GH).

83. ***Vriesia simplex*** (Vell.) Beer, Bromel. 97. 1857.
Tillandsia simplex Vell. Fl. Fluminensis 133. 1825; Icon. 3: *pl. 130.* 1835.
Vriesia scalaris sensu Antoine, Phyto-Iconogr. 30, *pl. 19.* 1884. Not E. Morr. 1879.

Espírito Santo: Santa Teresa, *Foster* 296 (GH, R).

Rio de Janeiro: Serra dos Orgãos, *Wilkes Expedition* (GH). Barreira, Serra dos Orgãos, *Duarte & Pereira* (RB).

São Paulo: Mun. São Paulo: Cidade Jardim, *Gehrt & Kuhlmann* (SP); *Smith & Kuhlmann* 1818 (GH). Florestal, *Foster* 354 (GH, R). Parque Jabaquára, *Hoehne* (GH, SP). Pinheiros, *Edwall* (GH, SP).

Also: Trinidad, Colombia.

84. ***Vriesia scalaris*** E. Morr. Belg. Hortic. 29: 301. 1879. Figure 47.
Tillandsia scalaris Baker, Journ. Bot. 26: 108. 1888.

Espírito Santo: Collatina, *Foster* 227 (GH). Santa Teresa, *Foster* 297 (GH, US); 298 (GH). Mun. Cachoeiro de Itapemirim: Vargem Alta, *Brade* 19965 (RB, US neg. 3351).

Minas Gerais: Mun. Antônio Dias: Coronel Fabriciano, *Foster* 734 (US).

Distrito Federal: Tijuca, *L. B. Smith & Brade* 2238 (GH).

Santa Catarina: Blumenau, *Reitz* (HBR); 3623 in part (HBR); 3673 (HBR). Brusque, *Reitz* 3817 (HBR); *L. B. Smith* 5770 (US). Mun. Florianópolis: Ribeirão da Ilha, *Reitz* 3923 (HBR). Santo Antonio, *Reitz* 3921 (HBR).

85. ***Vriesia interrogatoria*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 117, *pl. 124.* 1943.

Rio de Janeiro: Itatiaia, *Foster* 1039 (GH, type, US neg. 4071).

86. ***Vriesia clausseniana*** (Baker) Mez in Mart. Fl. Bras. 3, pt. 3: 545. 1894.
Tillandsia clausseniana Baker, Handb. Bromel. 213. 1889.

Minas Gerais: Mun. Santa Barbara: Caraça, *Claussen* (P, type, GH neg. 3017); *Foster* 688 (GH).

87. ***Vriesia viridiflora*** (Regel) Wittm. ex Mez, Engl. Pflanzenreich IV. 32: 387. 1935.
Pitcairnia viridiflora Regel, Ind. Sem. Hort. Petrop. for 1866: 81. 1867.
Vriesia viminalis E. Morr. Belg. Hortic. 28: 257, *pls. 14, 15.* 1878.
Tillandsia viminalis Hemsl. Biol. Centr.-Am. Bot. 3: 323. 1884.

Brazil: Probable, but not yet recorded.

British Guiana: Kaieteur, *Maguire & Fanshawe* 23332 (GH, NY).

88. ***Vriesia unilateralis*** (Baker) Mez in Mart. Fl. Bras. 3, pt. 3: 545. 1894.
Tillandsia unilateralis Baker, Journ. Bot. 26: 105. 1888.

Espírito Santo: Vargem Alto, Morro do Sal, *Foster* 950 (GH).

Rio de Janeiro: Teresópolis, *Sampaio* 2493 (R).

São Paulo: Campina Grande, *Handro* 415 (SP, US). São Bento, near Santos, *Burchell* 3347 (K, type, US neg. 3985).

PARANÁ: Curitiba to Joinvile near the Santa Catarina line, *Reitz* 3876 (HBR). Ipiranga and Volta Grande, *Dusén* 3566 (R). Pôrto de Cima, Serra do Mar, *Dusén* 16663 (S, US).

SANTA CATARINA: Blumenau, *F. Mueller* (! Mez). Spitzkopf, Blumenau, *Reitz* 4650 (HBR); *Smith & Reitz* 6294 (US). Estrada Dona Francisca, Joinvile, *Reitz* 3725 (HBR, US).

89. ***Vriesia brassicoides*** (Baker) Mez in DC. Monogr. Phan. 9: 598. 1896.
Tillandsia brassicoides Baker, Journ. Bot. 26: 12. 1888.

DISTRITO FEDERAL: Corcovado, *Burchell* 1393 (K, type, US neg. 3976).

90. ***Vriesia platzmannii*** E. Morr. Belg. Hortic. 25: 349, *pl. 23.* 1875.
Tillandsia platzmannii Baker, Journ. Bot. 26: 104. 1888.

PARANÁ: Guaratuba, *Reitz* 3630 (HBR); 4271 (HBR); *Smith & Reitz* 5745 (R, US). Paranaguá, *Foster* 445 (GH); *M. Kuhlmann* (SP).

SANTA CATARINA: São Francisco do Sul, *Reitz* 3705 (HBR). Mun. Araranguá: Ilhas, *Reitz* C-253 (GH (US neg. 4081), HBR). Sombrio, *Reitz* C-901 (HBR). Mun. Palhoça: Campo de Massiambú, *Reitz* 4839 (! Reitz); 4967 (! Reitz). Palhoça, *Reitz* 5518 (! Reitz).

91. ***Vriesia oligantha*** (Baker) Mez in Mart. Fl. Bras. 3, pt. 3: 544. 1894.
Tillandsia oligantha Baker, Journ. Bot. 25: 345. 1887.

MINAS GERAIS: Ouro Preto, *Glaziou* 15472 (K, type (US neg. 3987), C); *Schenck* 3507 (! Mez). Serra de Capanema, *Schwacke* 9315 (! Mez). Serra de Cipó, *Duarte* 1982 (RB, US); *Foster* 621 (GH). Mun. Jobotica-tubas: Serra do Cipó, 5 km. north of Chapeu de Sol, *Smith & Mus. R* 6696 (R, US).

92. ***Vriesia racinae*** L. B. Smith, Lilloa 6: 387, 413, *pl. 3, figs. 5, 6.* 1941.

ESPÍRITO SANTO: Santa Teresa, *Foster* 270 (GH, type, US neg. 3935).

93. ***Vriesia poenulata*** (Baker) E. Morr. ex Mez in Mart. Fl. Bras. 3, pt. 3: 573, *pl. 106.* 1894.
Tillandsia glaziovii E. Morr. ex Baker, Handb. Bromel. 229. 1889.
Tillandsia poenulata Baker, Handb. Bromel. 230. 1889.

BRAZIL: Cultivated (K, Morren Icon., type).

ESPÍRITO SANTO: Santa Teresa, *Foster* 268 (GH, R).

RIO DE JANEIRO: Serra dos Orgãos, *Glaziou* 3627 (BR (GH neg. 2800), P).

DISTRITO FEDERAL: Morro do Archer, *Brade* 10414 (R); *Brade & Duarte* 18588 (RB). Morro Queimado, *Occhioni* 44 (RB); 46 (RB).

94. ***Vriesia flammea*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 59, *pl. 79.* 1941.

SÃO PAULO: Rio Quilombo, *Doering* (SP). Rio Buturoca, Santos, *Mosén* 2982 (S). São Vicente, Santos, *Gehrt* (SP).

PARANÁ: Jacareí, *Dusén* 9012 (S, US); 17486 (GH, type; S, SP). Mun. Paranaguá: Caiobá, *Foster* 430 (GH, R).

SANTA CATARINA: Blumenau, *F. Mueller* (K, US neg. 4137); *Reitz* 3877 (HBR); 3899 (HBR). Joinvile, *Reitz* 3832 (HBR). Mun. Araranguá: Meleiro, *Reitz* C-36 (GH, HBR). Sombrio, *Reitz* C-907 (HBR, US); 1368 (R). Timbe, *Reitz* C-416 (HBR). Mun. Biguaçu: Fachinal, C-935 (HBR). Mun. Brusque: Azambuja, *Smith & Reitz* 6046 (R, RB, US). Brusque, *Smith & Reitz* 5661 (US). Morro Spitzkopf, *Reitz* 3454 (HBR). Mun. Jaraguá do Sul: Corupá, *Seidel in Reitz* 4154 (HBR). Mun.

Palhoça: Campo de Massiambú, *Reitz* 5033 (! Reitz). Pilões, *L. B. Smith* 6209 (US).

95. ***Vriesia corcovadensis*** (Britten) Mez in Mart. Fl. Bras. 3, pt. 3: 532. 1894. FIGURE 48.

Tillandsia ventricosa Wawra, Oesterr. Bot. Zeitschr. 30: 222. 1880. Not Griseb. 1865.

Tillandsia corcovadensis Britten, Journ. Bot. 26: 172. 1888.

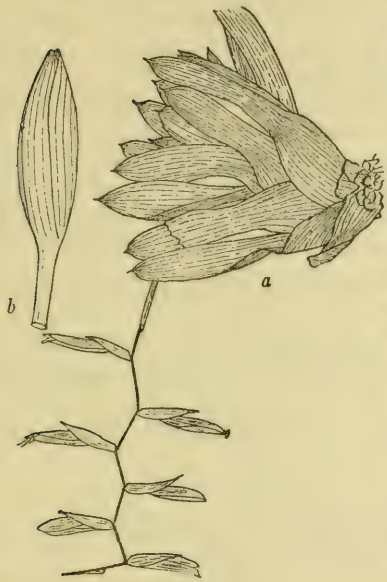

FIG. 47.

FIG. 48.

FIG. 47.—*Vriesia scalaris:* *a*, Habit, × ¼; *b*, sepals, × 1.

FIG. 48.—*Vriesia corcovadensis:* *a*, Habit, × 1/10; *b*, flower × 1; *c*, sepals, × 1.

Tillandsia oligantha Baker, Handb. Bromel. 215. 1889. In part, not as to type.

Vriesia rubida E. Morr. ex Mez in Mart. Fl. Bras. 3, pt. 3: 574. 1894.

Vriesia ventricosa Mez in DC. Monogr. Phan. 9: 583. 1896.

BRAZIL: Cultivated, *E. Morren* (LG, type of *Vriesia rubida* E. Morr.); *Widgren* 1077 (S).

DISTRITO FEDERAL: Serra da Carioca, *Brade* 11345 (R). Corcovado, *Glaziou* 11683 (C (F neg. 22333), K (US neg. 3977)). Estrada Dona Castorina, *L. B. Smith* 1364 (GH). Gavea, *Smith & Mus. R* 6432 (R, US). Represa dos Macacos, *Pereira* 650 (RB, US). Matas do Pae Ricardo, *Occhioni* 41 (RB, US neg. 3263). Morro Queimado, *Brade* 11273 (R). Tijuca, *Lutz* 1452 (GH); *L. B. Smith* 2128 (GH); *Ule* 4128 (R); *Wawra* II-224 (W, type).

SANTA CATARINA: Blumenau, *Reitz* 4676 (HBR).

Subgenus *Alcantarea* E. Morr. ex Mez

96. ***Vriesia geniculata*** (Wawra) Wawra, It. Max. 156, *pl. 25* (except the serrate leaves). 1866.

Platystachys geniculata Wawra, Oesterr. Bot. Zeitschr. 12: 345. 1862.

Vriesia gigantea sensu Lem. Ill. Hortic. 14: *pl. 516.* 1867. Not as to description.

Vriesia glaziouana Lem. Ill. Hortic. 14, Misc.: 43, *fig. 2.* 1867.

Vriesia regina sensu Gard. Chron. nov. ser. 3: 234, *fig. 41.* 1875.

Tillandsia regina sensu Baker, Journ. Bot. 26: 139. 1888. In part.

Vriesia vasta Mez in Mart. Fl. Bras. 3, pt. 3: 572. 1894.

Minas Gerais: Itabira do Campo, *Melo Matos* (R).

Rio de Janeiro: Petrópolis to Raiz da Serra, *L. B. Smith* 1326 (GH). Santa Maria Madalena, *Santos Lima & Brade* 14178 (RB, US).

Distrito Federal: Cultivated, Jardim Botânico, *Dionysio* (RB, US neg. 3266); *J. G. Kuhlmann* 6179 (RB). Rio de Janeiro, *Wilkes Expedition* (GH). São Cristovão, *Glaziou* 15468 (B, type of *Vriesia vasta* Mez; C (F neg. 22340), K (US neg. 4130), US). Tijuca, *Glaziou,* 8016 (K, US neg. 4134).

97. ***Vriesia extensa*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 116, *pl. 120.* 1943.

Vriesia regina sensu Wittm. Gartenflora 40: 160, *fig. 46, 47.* 1891.

Espírito Santo: Cachoeiro do Itapemirim, *Foster* 163 (GH, type, US neg. 4080).

Rio de Janeiro–Minas Gerais: (Serra do Picu), cultivated (Herb.?, *Vriesia regina* sensu Wittm.).

98. ***Vriesia regina*** (Vell.) Beer, Bromel. 97. 1857.

Tillandsia regina Vell. Fl. Fluminensis 136. 1825; Icon. 3: *pl. 142.* 1835.

Tillandsia blokii Hemsl. Bot. Mag. 134: *pl. 8192.* 1908.

Alcantarea regina Harms, Engl. & Prantl, Pflanzenfam. ed. 2. 15a: 126. 1930.

Vriesia blokii Mez, Engl. Pflanzenreich IV. 32: 405. 1935.

Brazil: *Tillandsia blokii* was described from cultivated material of unknown origin.

Rio de Janeiro: "Pharmacopolis" (Parati) given in original description, no material known.

Distrito Federal: Cliff by western end of Praia Sernambetiba, *Smith & Mus. R* 6829 (R, US).

99. ***Vriesia brasiliana*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 115, *pl. 119.* 1943.

Vriesia regina sensu Mez in Mart. Fl. Bras. 3, pt. 3: 569. 1894. In part.

Rio de Janeiro: Meio da Serra, *L. B. Smith & Brade* 2295 (GH, type, US neg. 3959). Teresópolis, *Glaziou* 11685 (GH, K, US neg. 4133).

100. ***Vriesia imperialis*** Carr. Rev. Hortic. 60: 58. 1888.

Vriesia gigantea sensu Lem. Ill. Hortic. 14: sub *pl. 516.* 1867. As to description, not as to plate. Not Gaud. Also as to Misc. 43, *fig. 1.*

Vriesia glaziouiana Carr. Rev. Hortic. 53: 50, *fig. 15, pl.* 1881.

Tillandsia regina sensu Baker, Handb. Bromel. 227. 1889. In part.
Alcantarea imperialis Harms. Engl. & Prantl, Pflanzenfam. ed. 2. 15a: 126. 1930.

BRAZIL: Cultivated, *Manda* (GH).

RIO DE JANEIRO: Serra dos Orgãos, *Glaziou* 13262 (US); 15469 (K, US neg. 4132). Parque Nacional, Serra dos Orgãos, *Smith & Brade* 5653 (US).

13. *Guzmania* R. & P.

Guzmania R. & P. Fl. Peruv. 3:37, *pl. 261.* 1802.

A genus predominantly of the Andean rain forest with a few species in Central America, the West Indies, Venezuela, Guiana, and northern and western Brazil.

1. Bracts below the inflorescence inconspicuous, not forming an involucre.
   2. Floral bracts distinctly shorter than the sepals.
      3. Inflorescence lax and with laxly flowered branches or rarely simple, nearly 2 dm. long; sepals lanceolate, mucronulate, 20–25 mm. long; leaf-blades concolorous, green..... 1. **G. brasiliensis**
      3. Inflorescence densely digitate with dense spikes 4 cm. long; sepals elliptic, obtuse, 15 mm. long; leaf-blades ornamented with dark purple cross-bands..... 2. **G. vittata**
   2. Floral bracts equaling or exceeding the sepals.
      4. Inflorescence compound, lax, its dense ellipsoid spikes fertile throughout; floral bracts coriaceous, broadly elliptic, obtuse, concolorous; sepals elliptic, acute, 15 mm. long..... 3. **G. pleiosticha**
      4. Inflorescence simple, cylindric, sterile toward the apex; floral bracts membranaceous, ovate, acute, the fertile ones conspicuously brown-striped; sepals obovate, broadly obtuse, 18 mm. long. 4. **G. monostachia**
1. Bracts below the simple corymbiform inflorescence forming a showy involucre that overtops the flowers; sepals free, linear or linear-oblong.
   5. Leaf-blades 30–40 mm. wide; floral bracts strongly cucullate. 5. **G. lingulata**
   5. Leaf-blades not more than 25 mm. wide; floral bracts slightly or not at all cucullate. (Fig. 49.)..... 6. **G. minor**

1. ***Guzmania brasiliensis*** Ule, Verh. Bot. Ver. Brand. 48:147. 1907.
Schlumbergeria brasiliensis Harms, Engl. & Prantl, Pflanzenfam. ed. 2. 15a:129. 1930.

AMAZONAS: Manaus, *Ule* 5427 (B, type, (F neg. 11543), MG). Taraquá, Rio Uaupés, *Pires* 1004 (IAN). São Marcelino, opposite Rio Xié, Cocui to Rio Içana, Rio Negro, *Schultes & López* 9567 (US).

ALSO: COLOMBIA.

2. ***Guzmania vittata*** (Mart. ex Schult.) Mez in DC. Monogr. Phan. 9:946. 1896.
Bonapartea vittata Mart. ex Schult. in R. & S. Syst. 7, pt. 2:1198. 1830.
Caraguata vittata Baker, Handb. Bromel. 146. 1889.

AMAZONAS: Muguentaua, Rio Tefé, *Fróes* 26288 (IAN).

ALSO: COLOMBIA.

3. ***Guzmania pleiosticha*** (Griseb.) Mez in DC. Monogr. Phan. 9: 930. 1896.
Tillandsia pleiosticha Griseb. Nachr. Ges. Wiss. Goett. for 1864: 19. 1865.
Guzmania altsonii L. B. Smith, Contr. Gray Herb. 89: 7, 78, *pl. 1, fig. 1.* 1930.

BRAZIL: Probable, but not yet recorded.

BRITISH GUIANA: Kaieteur, *Maguire & Fanshawe* 23410 (GH, NY).

4. ***Guzmania monostachia*** (L.) Rusby ex Mez in DC. Monogr. Phan. 9: 905. 1896.
Renealmia monostachia L. Sp. Pl. 287. 1753.
Guzmania tricolor R. & P. Fl. Peruv. 3: 38, *pl. 261.* 1802.

CEARÁ: (Riacho do Capim), *Huber* (MG). Serra de Baturité, *Ducke* (MG).

ALSO: SOUTHERN FLORIDA, WEST INDIES and NICARAGUA to VENEZUELA and BOLIVIA.

5. ***Guzmania lingulata*** (L.) Mez in DC. Monogr. Phan. 9: 899. 1896.
Tillandsia lingulata L. Sp. Pl. 286. 1753.
Caraguata lingulata Lindl. Bot. Reg. 13: sub *pl. 1068.* 1827.

PARÁ: Belém, *Archer* 7974 (IAN, US).

MATO GROSSO: Capão Sêco, *Lindman* A-2359 (S).

ALSO: CENTRAL AMERICA and the WEST INDIES to GUIANA and BOLIVIA.

6. ***Guzmania minor*** Mez in DC. Monogr. Phan. 9: 901. 1896. FIGURE 49.

AMAPÁ: Igarapé Nataia, Rio Oiapoque, *Fróes* 25879 (IAN).

PARÁ: Belém, *Archer* 7831 (IAN). Aurá, Belém, *Pires & Ledoux* 3202 (IAN); *L. B. Smith* 7123 (US). Tapana, Belém, *Killip & Smith* 30349 (US). Utinga, Belém, *Pires* 1938 (IAN).

BAÍA: Agua Preta, *Foster* 49 (GH).

ALSO: NICARAGUA, COSTA RICA, PANAMÁ, COLOMBIA, and a variety in ECUADOR.

14. *Catopsis* Griseb.

Catopsis Griseb. Fl. Brit. West Ind. 599. 1864.

West Indies and southern México to Perú.

1. Sepals to 12 mm. long; lower scape-bracts imbricate; flowering plant 4–9 dm. high; leaves acute. (Fig. 50.) ..... 1. **C. berteroniana**
1. Sepals 7–8 mm. long; scape-bracts all shorter than the internodes; flowering plant 1–3 dm. high; leaves rounded and apiculate..... 2. **C. sessiliflora**

1. ***Catopsis berteroniana*** (Schult.) Mez in DC. Monogr. Phan. 9: 621. 1896. FIGURE 50.
Tillandsia berteroniana Schult. in R. & S. Syst. 7, pt. 2: 1221. 1830.
Catopsis mosenii Mez in DC. Monogr. Phan. 9: 622. 1896.

SÃO PAULO: Caraguatatuba, *Foster* 502 (GH); *Hoehne & Gehrt* (SP). Rio Buturoca, Santos, *Mosén* 3495 (R, S). Iguapé, Santos, *Hoehne* (SP).

PARANÁ: Guaratuba, *Inst. Malariologia* (! Reitz); *Reitz* 4239 (HBR); *L. B. Smith* 5732 (R, US). Jacareí, *Dusén* (S); 17027 (S). Paranaguá, *Dusén* 9799 (S); *Foster* 446 (GH); *M. Kuhlmann* (SP).

SANTA CATARINA: Joinvile, *Reitz* 3762 (HBR).

ALSO: FLORIDA, GREATER ANTILLES, CENTRAL AMERICA, VENEZUELA, TRINIDAD, BRITISH GUIANA.

2. ***Catopsis sessiliflora*** (R. & P.) Mez in DC. Monogr. Phan. 9: 625. 1896.
Tillandsia sessiliflora R. & P. Fl. Peruv. 3: 42, *pl. 271, fig. b.* 1802.
Catopsis nutans sensu Baker, Journ. Bot. 25: 176. 1887.
Catopsis nutans var. *erecta* Wittm. Bot. Jahrb. 11: 71. 1889.
Catopsis modesta F. Mueller, Gartenflora 42: 717. 1893.

PARÁ: Belém, *Burchell* 9394 (! Mez); *Martius* (! Mez); *Spruce* 112 (! Mez); *L. B. Smith* 7121 (US).

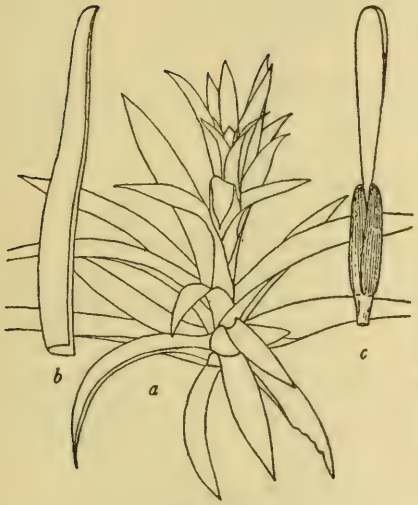

FIG. 49.

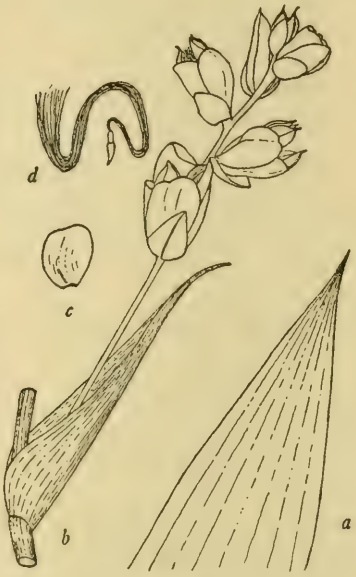

FIG. 50.

FIG. 49.—*Guzmania minor: a,* Habit, × ⅙; *b,* floral bract, × 1; *c,* flower, × 1.
FIG. 50.—*Catopsis berteroniana: a,* Apex of leaf, × 1; *b,* branch of inflorescence, × 1; *c,* sepal, × 1; *d,* seed, × 1.

BAÍA: Agua Preta, *Foster* 54 (GH, R).
SÃO PAULO: Santos, *Mosén* 3496 (S).
PARANÁ: Guaratuba, *L. B. Smith* 5727 (R, US). Paranaguá, *Foster* 447 (GH, R); *M. Kuhlmann* (SP). Jacareí, *Dusén* 6574 (S); 14697 (S).
SANTA CATARINA: Blumenau, *Reitz* 3625 in part (HBR). Brusque, *Reitz* 3688 (HBR). Joinvile, *Reitz* 4160 (HBR). Parati, *Hoehne* (SP). São Francisco do Sul, *Reitz* 3764 (HBR). Mun. Araranguá: Sombrio, *Reitz* C-1075 (GH, HBR).
ALSO: WEST INDIES and SOUTHERN MÉXICO to PERÚ.

15. *Fernseea* Baker

Fernseea Baker, Handb. Bromel. 19. 1889.

A monotypic Brazilian endemic.

1. ***Fernseea itatiaiae*** (Wawra) Baker, Handb. Bromel. 20. 1889. FIGURE 51.
Bromelia itatiaiae Wawra, Oesterr. Bot. Zeitschr. 30: 114. 1880.
Aechmea stenophylla Baker, Handb. Bromel. 64. 1889.

MINAS GERAIS: Mun. Passa Quatro: Pico Itaguaré, *Brade* (! A. C. Brade, Rodriguesia 11 & 12: 140. 1949).

RIO DE JANEIRO: Itatiaia, *Brade* (RB); 12725 (GH); 20216 (RB); *Dusén* 537 (R); *Foster* 116 (GH, R); *Gaunelle* (G); *Ginzberger & Zerny* 57 (F, WU); *Glaziou* 5464 (P); *Hemmendorff* (LIL); 558 (R); *Luederwaldt* (SP); *L. B. Smith* 1480 (B, BA, BM, F, GH, K, P, S, US); *Tamandare & Brade* 6379 (S); *Toledo & Brade* 730 (RB); *Ule* 291 (R); 291-A (R); *Wawra* II-442 (W, type).

16. *Araeococcus* Brongn.

Araeococcus Brongn. Ann. Sci. Nat. II. 15: 370. 1841.

Costa Rica, Tobago, Trinidad, Guiana, Venezuela.

1. Flowers sessile.
2. Branches of the inflorescence spreading, much divided, geniculate. **1. A. micranthus**
2. Branches of the inflorescence ascending, simple or slightly divided, slightly flexuous..... **2. A. goeldianus**

1. Flowers slenderly pedicellate.
3. Blades of the inner leaves linear-triangular, caudate-acuminate, serrulate. **3. A. flagellifolius**
3. Blades of all the leaves ligulate, acute, entire..... **4. A. parviflorus**

1. ***Araeococcus micranthus*** Brongn. Ann. Sci. Nat. II. 15: 370. 1841.

AMAZONAS: Manaus, *Ule* 5423 (MG); 8824 (MG). São Raimundo, Manaus, *Luetzelburg* 22098 (M). Maués, *Pires* 121 (IAN). Mun. Humaitá: Livramento, *Krukoff* 6952 (GH). Rio Livramento to Rio Ipixuna, *Krukoff* 7156 (GH, NY).

ACRE: Rio Macauã on the Rio Iaco, *Krukoff* 5810 (NY).

AMAPÁ: Oiapoque, *Black* 49–8386 (IAN). Igarapé Pontamarrí, Oiapoque, *Fróes* 26003 (IAN).

PARÁ: Belém, *Museu Goeldi staff* (MG). Taperinha, near Santarém, *Ginzberger & Zerny* 391 (F).

MATO GROSSO: Utiariti, Rio Papagaio, *Hoehne in Rondon* 2026 (R).

ALSO: TOBAGO, TRINIDAD, GUIANA.

2. ***Araeococcus goeldianus*** L. B. Smith, p. 20, fig. 52.

AMAPÁ: Cunani, *Huber* 983 (MG, type).

3. ***Araeococcus flagellifolius*** Harms, Notizblatt 10: 784. 1929.

AMAZONAS: (Rio Apauu), region of Rio Negro, *Huebner* 58? (B, type, F neg. 11300).

ALSO: VENEZUELA, COLOMBIA.

4. ***Araeococcus parviflorus*** (Mart.) Lindm. Svensk. Akad. Handl. 24, no. 8: 12. 1891.

Billbergia parviflora Mart. ex Schult. in R. & S. Syst. 7, pt. 2: 1270. 1830.
Lamprococcus chlorocarpus Wawra, It. Max. 162, *pl. 28*. 1866.
Aechmea parviflora Baker, Journ. Bot. 17: 167. 1879.

BAÍA: Almada, *Martius* (M, type). Ilheus, *Wawra & Maly* I-232 (! Mez). Rio Grungogi, *Curran* 216 (GH, US). Salvador, *Foster* 2432 (US).

RIO DE JANEIRO (?): Esperança, *Riedel* (! Mez; locality doubtful, more likely from Ilheus).

FIG. 51.

FIG. 52.

FIG. 51.—*Fernseea itatiaiae: a,* Leaf, × ½; *b,* inflorescence, × ½; *c,* flower, × 2. (All after Flora Brasiliensis.)

FIG. 52.—*Araeococcus goeldianus: a,* Habit, × 1/10; *b,* section of spike, × 1; *c,* sepal, × 5.

17. *Streptocalyx* Beer

Streptocalyx Beer, Flora 37: 348. 1854.

French Guiana, Colombia, Ecuador, Perú, Bolivia.

1. Inflorescence amply tripinnate; spikes very laxly 1–7-flowered; rhachis very slender; sepals 8–13 mm. long including the 3 mm. long mucro; pollen-grains with 4 pores; ovules caudate-appendaged. (Fig. 53.)
1. S. floribundus

1. Inflorescence bipinnate or rarely somewhat tripinnate at the base.
2. Floral bracts serrulate; sepals often serrulate as well, 14–20 mm. long, slightly exceeding the floral bracts; scape short; inflorescence not much

longer than broad, dense and sunk in the center of the leaf-rosette. **2. S. longifolius**

2. Floral bracts entire.
3. Flowers fasciculate on abbreviated branches; floral bracts broadly ovate, apiculate, exceeding the ovary; sepals 16–22 mm. long... **3. S. poitaei**
3. Flowers spicate on distinct branches.
4. Spikes distichous-flowered; sepals 16–19 mm. long.
5. Floral bracts reniform, apiculate, much shorter than the ovary. (Fig. 54.)..... **4. S. poeppigii**
5. Floral bracts ovate, acuminate, equaling or exceeding the ovary.
6. Inflorescence pyramidal, subsessile in the center of the leaf-rosette. **5. S. fuerstenburgii**
6. Inflorescence cylindric, distinctly scapose..... **6. S. williamsii**
4. Spikes polystichous-flowered.
7. Inflorescence densely lanate; sepals much connate, 7 mm. long exclusive of the stout mucro..... **7. S. lanatus**
7. Inflorescence sparsely furfuraceous, soon glabrous; sepals free, 8 mm. long, merely apiculate..... **8. S. curranii**

1. ***Streptocalyx floribundus*** (Mart. ex Schult.) Mez in Mart. Fl. Bras. 3, pt. 3: 284. 1892. FIGURE 53.

Aechmea floribunda Mart. ex Schult. in R. & S. Syst. 7, pt. 2: 1271. 1830.
Pironneava platynema Gaud. Atl. Voy. Bonite *pl. 64.* 1843.
Aechmea platynema Baker, Journ. Bot. 17: 166. 1879.
Pironneava floribunda Wittm. Bot. Jahrb. 13, Beibl. 29: 14. 1891.

BRAZIL: *Foster* 378 (R).

ESPÍRITO SANTO: Vitória, *Foster* 200 (GH, R, US). Mun. Collatina: Monte Claro, *Foster* 223 (GH).

RIO DE JANEIRO: Caxias, *Passareli* (R). Mauá, *Hemmendorff* 440 (R, S). Niteroi, *Smith & Brade* 2348 (B, BA, BM, F, GH, K, P, S, US). Pôrto da Caixa, *Brade* 15025 (RB, US). Restinga da Piratininga, *J. G. Kuhlmann* (RB). Suruí, *Foster* 328 (GH).

DISTRITO FEDERAL: Morro da Babilonia, *Hoehne* (GH, SP). Copacabana, *Ule* 4053-A (R). Corcovado, *Duarte* (RB). Rio de Janeiro, *Burchell* 76-a (GH); *Glaziou* 8027 (BM, S); *Hombron* (P); *Martius* (M, type, F neg. 18762); *Miers* 3211 (BM); *Mosén* 4662 (S); *Ule* 4053 (R). São Cristovão, *Glaziou* 5465 (P).

2. ***Streptocalyx longifolius*** (Rudge) Baker, Handb. Bromel. 31. 1889.

Bromelia longifolia Rudge, Guyan. 1: 31, *pl. 49.* 1805.
Streptocalyx angustifolius Mez in Mart. Fl. Bras. 3, pt. 3: 283, *pl. 62.* 1892.

AMAZONAS: Ega (Tefé), *Poeppig* 2599 (W, type of *Streptocalyx angustifolius* Mez). Cachoeirinha, Manaus, *Luetzelburg* 22106 (GH, M, R). Rio Negro, Manaus, *Ule* 5280 (MG).

ALSO: COLOMBIA, PERÚ.

3. ***Streptocalyx poitaei*** Baker, Handb. Bromel. 31. 1889.

Streptocalyx tessmannii Harms, Notizblatt 9: 1151. 1927.

AMAZONAS: (Boa Sorte), Rio Jurua, *J. G. Kuhlmann* 1587 (RB).

ALSO: PERÚ, COLOMBIA, FRENCH GUIANA.

4. ***Streptocalyx poeppigii*** Beer, Bromel. 141. 1857. FIGURE 54.
Lamprococcus vallerandii Carr. Rev. Hortic. 49: 129, *fig. 23, 24, pl.* 1877.
Streptocalyx vallerandii E. Morr. Belg. Hortic. 33: 13, *pl. 1, 2.* 1883.
Streptocalyx juruanus Ule, Verh. Bot. Ver. Brand. 48: 133. 1907.

AMAZONAS: Ipanoré to Rio Negro on Rio Uaupés, *Schultes & López* 9148 (US); 9150 (IAN, US). Juruá-Mirim, upper Rio Juruá, *Ule* 5616 (B). Manaus, *Killip & Smith* 30166 (US); *Tate* 48 (NY). Marari, *Ule* 5366-a (B, F neg. 11291). Mun. Humaïtá: Tres Casas, *Krukoff* 6275 (GH, NY).

FIG. 53.

FIG. 54.

FIG. 53.—*Streptocalyx floribundus: a,* Branch of inflorescence, × 1/8; *b,* spike, × 1; *c,* flower, × 1; *d,* sepal, × 1; *e,* petal and stamen, × 1.

FIG. 54.—*Streptocalyx poeppigii: a,* Primary bract and spike, × 1; *b,* flower, × 1; *c,* sepal, × 1; *d,* petal and stamen, × 1.

PARÁ: Cultivated, *Chantin* (LG, ? type of *Lamprococcus vallerandii* Carr.). Rio Cuminá, Varadouro, Pirarara, *Sampaio* 5250 (R).

ALSO: COLOMBIA, PERÚ, BOLIVIA.

5. ***Streptocalyx fuerstenbergii*** (E. Morr. & Wittm.) E. Morr. Belg. Hortic. 33: 16. 1883.
Aechmea fuerstenbergii E. Morr. & Wittm. Belg. Hortic. 29: 42, *pl. 2.* 1879.

BAÍA: Cultivated, *Kirchhoff* (LG, type). Serra das Almas, *Luetzelburg* (! Mez). Upper Rio de Contas, *Luetzelburg* (! Mez). Upper Rio Preto, northwestern Baía, *Luetzelburg* (! Mez).

6. ***Streptocalyx williamsii*** L. B. Smith, Contr. Gray Herb. 98: 14, *pl. 4, fig. 7.* 1932.

AMAZONAS: Mouth of Rio Içana, *Schultes & López* 9785 (US). São Paulo de Olivença, *Krukoff* 8597 (NY).

ALSO: PERÚ.

7. ***Streptocalyx lanatus*** L. B. Smith, Contr. Gray Herb. 95: 45, *pl. 11, figs. 4, 5.* 1931.

BAÍA: Rio Grungogi, *Curran* 138 (US, type).

8. **Streptocalyx curranii** L. B. Smith, Contr. Gray Herb. 95: 44, *pl. 11, figs. 7–9.* 1931.

BAÍA: Rio Grungogi, *Curran* 143 (US, type). Agua Preta, *Foster* 51 (GH).

18. *Neoregelia* L. B. Smith

Neoregelia L. B. Smith, Contr. Gray Herb. 104: 78. 1934.

Largely natives of eastern Brazil with a few Amazonian and one species extending into eastern Colombia and Peru.

1. Inflorescence compound.
   2. Petals free; axes glabrous; leaves thick, coriaceous.
      3. Inflorescence many-flowered, 6–8 cm. in diameter; leaf-spines 5–7 mm. long; sepals 21–26 mm. long..... 1. **N. eleutheropetala**
      3. Inflorescence 5–15-flowered, 3 cm. in diameter; leaf-spines 2 mm. long; sepals 12 mm. long..... 2. **N. myrmecophila**
   2. Petals connate at base; axes ferruginous-lepidote; leaves not coriaceous; floral bracts about equaling the sepals, serrulate; sepals 15 mm. long. 3. **N. fosteriana**

1. Inflorescence simple; petals connate at base so far as known.
   4. Inner leaves of the rosette bright red.
      5. Leaves marked with strong transverse bands on the underside and with a red spot at the apex; sepals uncinate, strongly asymmetric, 18–23 mm. long..... 4. **N. spectabilis**
      5. Leaves concolorous or rarely with longitudinal bands; sepals straight.
         6. Underside of the leaves covered with coarse appressed cinereous scales; sepals acute or acuminate.
            7. Leaf-blades about 15 mm. wide; floral bracts serrulate. 5. **N. pineliana**
            7. Leaf-blades to 40 mm. wide; floral bracts entire.
               8. Sepals 37 mm. long; (? inner leaves red). (28. **N. macrosepala**)
               8. Sepals 24–27 mm. long.
                  9. Pedicels 5 mm. long, exceeding the inner floral bracts. 6. **N. princeps**
                  9. Pedicels to 15 mm. long, shorter than the floral bracts. 7. **N. farinosa**
         6. Underside of the leaves bearing minute inconspicuous scales; floral bracts entire.
            10. Pedicels 10–20 mm. long; sepals to 34 mm. long; scape elongate; rosette tubular..... 8. **N. bahiana**
            10. Pedicels shorter; scape short.
               11. Inflorescence few-flowered.
                  12. Leaf-blades concolorous; floral bracts about equaling the sepals; sepals very short-connate..... 9. **N. olens**
                  12. Leaf-blades bearing a red spot at the apex; floral bracts about equaling the ovary; sepals connate for more than a third of their length..... 10. **N. indecora**

11. Inflorescence many-flowered, hemispherical.
13. Leaves strongly serrulate; sepals 21–28 mm. long, connate for about one-fourth of their length, obtuse.... 11. **N. carolinae**
13. Leaves subentire; sepals 19 mm. long, connate for more than half their length, acute..... 12. **N. compacta**

4. Inner leaves like the outer, green or purplish.
14. Sepals 13–18 mm. long; flowers about 30 mm. long or less; plants small.
15. Leaves entire or subentire, to 35 mm. wide; sepals obtuse, 15–18 mm. long. (Fig. 55.)..... 13. **N. laevis**
15. Leaves distinctly serrulate, narrower.
16. The leaves rarely over 15 cm. long, forming a cylindric or ellipsoid tank constricted at the apex.
17. Sepals acute or acuminate, subsymmetric, 15 mm. long; petal-blades with broad dark blue margins..... 14. **N. ampullacea**
17. Sepals obtuse, strongly asymmetric, 12 mm. long; petal-blades wholly white. (Fig. 56.)..... 15. **N. hoehneana**
16. The leaves larger; tank more infundibuliform.
18. Leaves densely appressed-lepidote on both sides; pedicels 13–14 mm. long; sepals 14–15 mm. long.
19. Sepals nearly free, strongly asymmetric, the apex extending 3 mm. above the wings; leaves 22 cm. long. (Fig. 57.) 16. **N. leprosa**
19. Sepals connate for 3 mm., subsymmetric, apiculate; leaves 36 cm. long. (Fig. 58.)..... 17. **N. fluminensis**
18. Leaves minutely lepidote beneath or glabrous.
20. Pedicels 20 mm. long; sepals connate for 1.5 mm., much exceeding the floral bracts; leaves 4 cm. wide. 18. **N. macahensis**
20. Pedicels 5–10 mm. long.
21. Leaves strongly sulcate beneath with the scales wholly within the grooves, usually acuminate and cuspidate. 19. **N. cyanea**
21. Leaves nearly or quite even beneath, broadly acute or rounded.
22. Blades of the leaves wholly green with sparse inconspicuous scales; floral bracts slightly exceeding the ovary, obscurely serrulate toward the apex; petals white. 20. **N. albiflora**
22. Blades of the leaves bicolorous, densely pale-lepidote beneath; floral bracts equaling the mid-point of the sepals or higher.
23. Leaf-blades marked beneath with transverse bands; petals violet..... 21. **N. tristis**
23. Leaf-blades without bands but sometimes spotted; petals white..... 22. **N. sarmentosa**

14. Sepals 19–37 mm. long; flowers 40 mm. long or more; plants generally large.
24. Leaf-sheaths concolorous.
25. Blades of the leaves concolorous on each side or with a few spots.

26. Leaf-sheaths dark brown; sepals 33–34 mm. long, slightly to one-fourth exserted above the floral bracts.
27. Blades of the leaves 55 mm. wide, truncate with a soft apiculus that rapidly disintegrates; sepals free... 25. **N. leucophoea**
27. Blades of the leaves 30 mm. wide, acute with a persistent terminal subulus 5 mm. long; sepals connate for 5 mm. 24. **N. uleana**

26. Leaf-sheaths green or purplish.
28. Leaves subentire.
29. Blades of the leaves 75 mm. wide, green; petals white. 25. **N. johannis**
29. Blades of the leaves not more than 45 mm. wide.
30. Pedicels 5 mm. long; leaves wholly green; sepals slightly exserted; petals unknown. (Fig. 60.) 26. **N. kuhlmannii**
30. Pedicels elongate; leaves violet-tinged throughout; sepals half exserted; petals violet..... 27. **N. coriacea**
28. Leaves distinctly serrulate or serrate.
31. Scales of the leaves coarse and conspicuous.
32. Sepals 27 mm. long; pedicels to 15 mm. long. (7. **N. farinosa**)
32. Sepals 35–37 mm. long; pedicels to 30 mm. long. (Fig. 61.)..... 28. **N. macrosepala**
31. Scales of the leaves minute, completely covering the underside of the leaf.
33. Inflorescence few-flowered, about 2 cm. in diameter; leaf-blades only 23 mm. wide; sepals subsymmetric, lanceolate, acute. (Fig. 62.)..... 29. **N. oligantha**
33. Inflorescence many-flowered, ample.
34. Spines of the leaves red; sepals acute, straight; floral bracts cucullate. (Fig. 63.)..... 30. **N. cruenta**
34. Spines of the leaves dark, almost black; sepals subulate-acuminate, more or less uncinate; floral bracts straight. (Fig. 64.)..... 31. **N. concentrica**

25. Blades of the leaves cross-banded above or beneath.
35. Inflorescence few-flowered.
36. Leaf-blades with irregular purple bands on both sides, two to three times as long as the sheaths, 20–30 mm. wide; pedicels 13 mm. long; sepals symmetric, acute, 26 mm. long; inflorescence about 15-flowered; floral bracts barely exceeding the ovary, serrulate..... 32. **N. zonata**
36. Leaf-blades with regular fine white bands, little or no longer than the sheaths; pedicels 20–25 mm. long; sepals 20–23 mm. long.
37. Floral bracts shorter than the pedicels; leaf-sheaths dark purple above; leaf-blades 35 mm. wide; sepals acuminate. (Fig. 65.)..... 33. **N. pauciflora**
37. Floral bracts nearly equaling the sepals; leaf-sheaths only a little darker than the blades; leaf-blades 50 mm. wide; sepals involute-subulate. (Fig. 66.) 34. **N. melanodonta**

35. Inflorescence many-flowered; leaf-blades 5–7 cm. wide, banded beneath.
38. Leaf-spines more than 7 mm. long; sepals 37 mm. long; floral bracts about equaling the center of the sepals; petals white. 35. **N. carcharodon**
38. Leaf-spines not more than 3 mm. long; sepals smaller.
39. Floral bracts about equaling the center of the sepals; pedicels 12 mm. long; petals pale red..... 36. **N. makoyana**
39. Floral bracts equaling or exceeding the sepals.
40. Petals violet; floral bracts rounded, cucullate; sepals acute. 30. **N. cruenta**
40. Petals white; floral bracts acute; sepals involute-subulate. 37. **N. binotii**
24. Leaf-sheaths with pale spots; pedicels 10–15 mm. long; sepals acuminate; 20 mm. long..... 38. **N. marmorata**

1. ***Neoregelia eleutheropetala*** (Ule) L. B. Smith, Contr. Gray Herb. 104: 78. 1934.
Nidularium eleutheropetalum Ule, Verh. Bot. Ver. Brand. 48: 131. 1907.
Aregelia eleutheropetala Mez ex L. B. Smith, Contr. Gray Herb. 98: 5, *pl. 1, figs. 4–6.* 1932.
AMAZONAS: Marari, lower Rio Juruá, *Ule* 5364 (B, type).
ALSO: COLOMBIA, PERÚ.

2. ***Neoregelia myrmecophila*** (Ule) L. B. Smith, p. 30.
Nidularium myrmecophilum Ule, Verh. Bot. Ver. Brand. 48: 132. 1907.
Aregelia myrmecophila Mez, Engl. Pflanzenreich IV. 32: 52. 1934.
BRAZIL: *Ule* (MG).
AMAZONAS: Marari, lower Rio Juruá, *Ule* 5362 (B, F neg. 11263); 5365 (B, F neg. 11264).

3. ***Neoregelia fosteriana*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 2: 120, *pl. 50.* 1950.
RIO DE JANEIRO: Itatiaia, *Brade* 14553 (RB); *Foster* 119 (GH, R); 122 in part (GH, R); 123 (GH, type (US neg. 4085), US).

4. ***Neoregelia spectabilis*** (Moore) L. B. Smith, Contr. Gray Herb. 104: 79. 1934.
Nidularium spectabile Moore, Gard. Chron. 8. 1873.
Karatas spectabilis Antoine, Phyto-Iconogr. *pl. 33.* 1884.
Regelia spectabilis Lindm. Oefvers. Vet. Akad. Förhandl. 47: 543. 1890.
Aregelia spectabilis Mez in DC. Monogr. Phan. 9: 70. 1896.
BRAZIL: Cultivated, *Foster* 1231 (US); *Harvard Botanical Garden* (GH).
RIO DE JANEIRO: Mauá, *Ule* 4133 (R). Suruí, *Foster* 325 (GH).

5. ***Neoregelia pineliana*** (Lem.) L. B. Smith, Contr. Gray Herb. 114: 5. 1936.
Nidularium pinelianum Lem. Ill. Hortic. 7: 71. 1860.
Karatas morreniana Antoine, Phyto-Iconogr. *pl. 35.* 1884.
Regelia morreniana Lindm. Oefvers. Vet. Akad. Förhandl. 47: 543. 1890.
Aregelia morreniana Mez in DC. Monogr. Phan. 9: 72. 1896.
Neoregelia morreniana L. B. Smith, Contr. Gray Herb. 104: 79. 1934.
Aregelia pineliana Mez, Engl. Pflanzenreich IV. 32: 40, *fig. 12.* 1934.
BRAZIL: Cultivated, *Makoy* (LG, GH neg. 2933). Unpublished plate, *E. Morren* (K, GH neg. 1375).

6. ***Neoregelia princeps*** (Baker) L. B. Smith, Contr. Gray Herb. 114: 5. 1936.
1. Outer bracts of the inflorescence smaller than the inner leaves, bracteiform. Var. a. **princeps**
1. Outer bracts of the inflorescence enlarged and foliaceous but bright red. Var. b. **phyllanthidea**

6a. ***Neoregelia princeps*** var. ***princeps.***

Karatas meyendorffii Antoine, Phyto-Iconogr. 54, *pl. 32.* 1884. In part, not as to basonym.

Karatas princeps Baker, Handb. Bromel. 10. 1889.

Regelia princeps Lindm. Oefvers. Vet. Akad. Förhandl. 47: 543. 1890.

Aregelia princeps Mez in DC. Monogr. Phan. 9: 75. 1896.

BRAZIL: Cultivated, *Jard. Bot. Liége* (LG); *E. Morren* (LG).

RIO DE JANEIRO: Teresópolis, *Glaziou* 16446 (! Mez); Nova Friburgo, *Ule* 4961 (! Mez).

SANTA CATARINA: *D'Urville* (! Mez).

6b. ***Neoregelia princeps*** var. ***phyllanthidea*** (Mez) L. B. Smith, p. 31.

Aregelia princeps var. *phyllanthidea* Mez in DC. Monogr. Phan. 9: 76. 1896.

BRAZIL: Described from cultivation, no surviving material known.

7. ***Neoregelia farinosa*** (Ule) L. B. Smith, Contr. Gray Herb. 124: 9. 1939.

Nidularium farinosum Ule, Bericht. Deutsch. Bot. Gesselsch. 18: 319. 1900.

Aregelia farinosa Mez, Engl. Pflanzenreich IV. 32: 42. 1934.

ESPÍRITO SANTO: *Foster* B (GH, R). Santa Teresa, *Foster* 1183 (GH). Vargem Alta, Morro do Sal, *Foster* 928 (GH). Vitória, *Foster* 201 (GH, R, US).

RIO DE JANEIRO: Nova Friburgo, *Ule* 4961 (B, type).

8. ***Neoregelia bahiana*** (Ule) L. B. Smith, Proc. Amer. Acad. 70: 152. 1935.
1. All or at least the inner leaves red on the upper surface..... Var. a. **bahiana**
1. All the leaves completely green..... Var. b. **viridis**

8a. ***Neoregelia bahiana*** var. ***bahiana.***

Nidularium bahianum Ule, Bot. Jahrb. 42: 195. 1908.

Aregelia bahiana Mez, Engl. Pflanzenreich IV. 32: 42. 1934.

BAÍA: Serra do Sincorá, *Ule* 7105 (B, type, F neg. 11256).

MINAS GERAIS: Serra da Piedade, *Schwacke* (! Mez). Mun. Santa Barbara: Caraça, *Foster* 684 (GH).

SÃO PAULO: Alto da Serra, *Hoehne* (SP).

8b. ***Neoregelia bahiana*** var. ***viridis*** L. B. Smith, p. 27.

MINAS GERAIS: Serra da Piedade, near Belo Horizonte, *Foster* 573 (GH, type, US neg. 4273).

9. ***Neoregelia olens*** (Hook. f.) L. B. Smith, Contr. Gray Herb. 124: 10. 1939.

Billbergia olens Hook. f. Bot. Mag. 91: *pl. 5502.* 1865.

Karatas olens Nicholson, Dict. Gard. 2: 216. 1885.

Aregelia olens Mez, Engl. Pflanzenreich IV. 32: 42. 1934.

BRAZIL: Described from cultivated plants. No material known to survive.

10. ***Neoregelia indecora*** (Mez) L. B. Smith, Contr. Gray Herb. 124: 9. 1939.

Aregelia indecora Mez, Repert. Sp. Nov. Fedde 16: 3. 1919.

DISTRITO FEDERAL: Copacabana, *Ule* 4134 (B, type).

11. ***Neoregelia carolinae*** (Beer) L. B. Smith, Contr. Gray Herb. 124: 9. 1939.
1. Leaf-blades not striped..... Var. a. **carolinae**
1. Leaf-blades longitudinally striped white, rose, and green... Var. b. **tricolor**

11a. ***Neoregelia carolinae*** var. ***carolinae.***
Bromelia carolinae Beer, Bromel. 29. 1857.
Billbergia meyendorffii Regel, Bot. Zeitung 15: 713. 1857.
Nidularium meyendorffii Regel, Gartenflora 8: 266. 1859.
Karatas carolinae Antoine, Phyto-Iconogr. 52, *pl. 31.* 1884.
Bromelia rhodocincta Brongn. ex Baker, Handb. Bromel. 11. 1889 (! Mez).
Regelia meyendorffii Ind. Kew. 4: 694. 1895.
Aregelia carolinae Mez in DC. Monogr. Phan. 9: 74. 1896.
Aregelia marechalii Mez, Engl. Pflanzenreich IV. 32: 43. 1934.
BRAZIL: Cultivated, *Hort. Bot. Petrograd* (GH).
RIO DE JANEIRO: Mauá, *Ule* 4132 (R). Old road below Petrópolis, *Smith & Mus. R* 6458 (US). Suruí, *Foster* 31-A (GH (US neg. 3943), R). Barreira, Teresópolis, *Duarte & Pereira* (RB). Serra de Cavallo, Teresópolis, *Brade* 9845 (R, US).
DISTRITO FEDERAL: Barra da Tijuca, *Reitz* 4742 (HBR).

11b. ***Neoregelia carolinae*** var. ***tricolor*** M. B. Foster, Bromel. Soc. Bull. 3: 29. 1953.
BRAZIL: Cultivated, *Foster* 2831 (US, type).

12. ***Neoregelia compacta*** (Mez) L. B. Smith, Contr. Gray Herb. 124: 9. 1939.
Nidularium compactum Mez in Mart. Fl. Bras. 3, pt. 3: 235. 1891.
Nidularium purpureum sensu Wittm. Bot. Jahrb. 13, Beibl. 29: 10. 1891. In part.
Aregelia compacta Mez in DC. Monogr. Phan. 9: 73. 1896.
RIO DE JANEIRO: Restinga de Mauá, *Schenck* 2090 (! Mez); *Ule* 4038 (R, US). Troxal (near Magé?), *Lhotsky* (G, F neg. 8481).

13. ***Neoregelia laevis*** (Mez) L. B. Smith, Contr. Gray Herb. 104: 78. 1934. FIGURE 55.
Aregelia laevis Mez, Ind. Sem. Hort. Regimont. for 1912: 8. 1912; Repert. Sp. Nov. Fedde 12: 411. 1913.
BRAZIL: Cultivated in Berlin, *Strauss* (B, F neg. 11260).
PARANÁ: Caiobá, *Foster* 440 (GH). Guaratuba, *Reitz* 4241 (HBR); *Smith & Reitz* 5733 (US). Jacareí, *Dusén* 15519 (GH, S); 15536 (S).
SANTA CATARINA: Cultivated in Koenigsberg, Germany, *F. Mueller* (type). São Francisco do Sul, *Reitz* 3697 (HBR); 3730 (HBR); 3895 (HBR); 4008 (HBR). Mun. Biguaçú: Fachinal, *Reitz* 4099 (HBR). Mun. Brusque: Azambuja, *Reitz & Foster* 2297 (HBR). Mun. Florianópolis: Cacupé, *Inst. Malariologia* (HBR). Florianópolis, *Hoehne* (SP). Mun. Itajaí: Praia Braba, *Reitz* 2294 (HBR, US); *Smith & Reitz* 6090 (US).
RIO GRANDE DO SUL (?): Cultivated, Pôrto Alegre, *Lindman* A-799 (S).

14. ***Neoregelia ampullacea*** (E. Morr.) L. B. Smith, Contr. Gray Herb. 104: 78. 1934.
Nidularium ampullaceum E. Morr. Belg. Hortic. 30: 242. 1880.
Karatas ampullacea Baker, Handb. Bromel. 7. 1889.
Regelia ampullacea Lindm. Oefvers. Vet. Akad. Förhandl. 47: 543. 1890.
Aregelia ampullacea Mez in DC. Monogr. Phan. 9: 64. 1896.

Espírito Santo: Vitória, *Foster* 198 (GH, R, US). Mun. Collatina: Monte Claro, *Foster* 218 (GH, R, US).
Rio de Janeiro: Petrópolis, *Glaziou* 12231 (K, GH neg. 2730).
Distrito Federal: Cultivated, Hort. Museu Nacional, *Ule* (R).

15. ***Neoregelia hoehneana*** L. B. Smith, p. 28, fig. 56.
São Paulo: Caraguatatuba, *Gehrt* (SP, type, US neg. 4251).

16. ***Neoregelia leprosa*** L. B. Smith, p. 29, fig. 57.
Minas Gerais: Serra do Cipó, *Foster* 656 (GH, type).

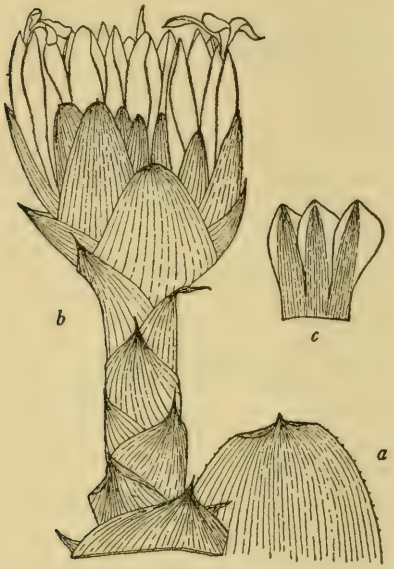

Fig. 55.

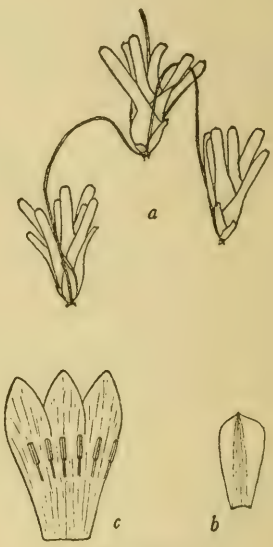

Fig. 56.

Fig. 55.—*Neoregelia laevis: a,* Apex of leaf, × 1; *b,* inflorescence, × 1; *c,* sepals, × 1.
Fig. 56.—*Neoregelia hoehneana: a,* Habit, × 1/10; *b,* sepal, × 1; *c,* petals, × 1.

17. ***Neoregelia fluminensis*** L. B. Smith, p. 27, fig. 58.
Rio de Janeiro: Teresópolis, *Foster* 982 (GH, type, US neg. 4272).

18. ***Neoregelia macahensis*** (Ule) L. B. Smith, Contr. Gray Herb. 124: 9. 1939.
Nidularium macahense Ule, Bericht. Deutsch. Bot. Gesellsch. 18: 318. 1900.
Aregelia macahensis Mez, Engl. Pflanzenreich IV. 32: 45. 1934.
Rio de Janeiro: Nova Friburgo, *Ule* 4960 (B, type, F neg. 11261).

19. ***Neoregelia cyanea*** (Beer) L. B. Smith, Contr. Gray Herb. 124: 9. 1939.
Hoplophytum cyaneum Beer, Bromel. 131. 1857.
Bromelia denticulata C. Koch, Wochenschr. 2: 151. 1859.
Nidularium denticulatum Regel, Gartenflora 19: 268. 1870.

Karatas denticulata Baker, Handb. Bromel. 4. 1889.
Regelia denticulata Lindm. Oefvers. Vet. Akad. Förhandl. 47: 542. 1890.
Aregelia cyanea Mez in DC. Monogr. Phan. 9: 67. 1896.

BRAZIL: Cultivated, *Atkinson* 94 (GH); *Bot. Gard. Berlin* (B, F neg. 11258); *Reitz* 5685 (HBR, US).

MINAS GERAIS: Bocaiú, Pomba, *Heringer* 2548 (SP). Mun. Antônio Dias: Coronel Fabriciana, *Foster* 732 (GH, US).

20. ***Neoregelia albiflora*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 109, *pl. 113.* 1943.

ESPÍRITO SANTO: Santa Teresa, *Foster* 309 (GH, type, US neg. 3945).

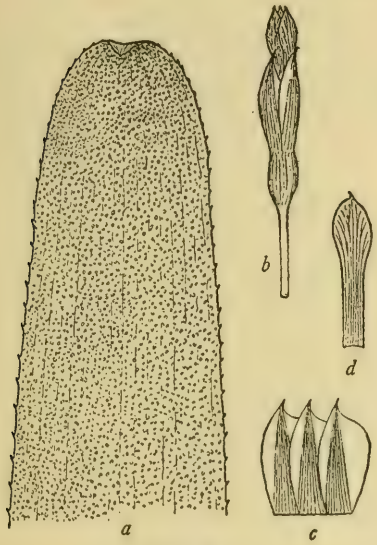

FIG. 57.

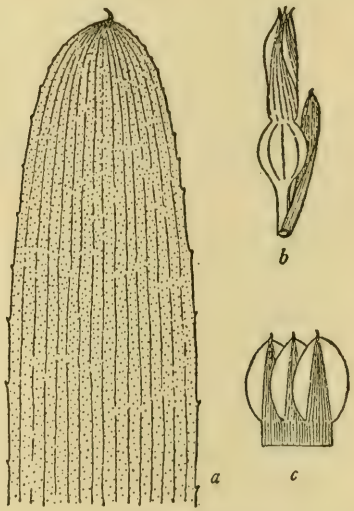

FIG. 58.

FIG. 57.—*Neoregelia leprosa: a,* Apex of leaf, × 1; *b,* flower, × 1; *c,* sepals, × 1; *d,* petal, × 1.

FIG. 58.—*Neoregelia fluminensis: a,* Apex of leaf, × 1; *b,* floral bract and flower, × 1; *c,* sepals, × 1.

21. ***Neoregelia tristis*** (Beer) L. B. Smith, Proc. Amer. Acad. 70: 153. 1935.
Bromelia tristis Beer, Bromel. 30. 1857.
Nidularium triste Regel, Gartenflora 15: 356. 1866.
Nidularium cyaneum Linden & André, Ill. Hortic. 20: 184. 1873. Not Hort. Berol.
Karatas tristis Baker, Handb. Bromel. 5. 1889.
Karatas cyanea Baker, Handb. Bromel. 5. 1889.
Regelia tristis Lindm. Oefvers. Vet. Akad. Förhandl. 47: 542. 1890.
Aregelia tristis Mez in DC. Monogr. Phan. 9: 68. 1896.
Aregelia elegans Mez in DC. Monogr. Phan. 9: 69. 1896.

BRAZIL: Cultivated, *Atkinson* 18 (GH); *E. Morren* (LG, type of *Aregelia elegans* Mez); *Strauss* (B, F neg. 11266).

Espírito Santo: Santa Teresa, *Foster* 255 (GH); 257 in part (GH). Vargem Alta, *Foster* 929 in part (GH).

Rio de Janeiro: Serra da Estrela, *Diogo* 717 (R). Itatiaia, *Foster* 139 (GH). Petrópolis, *Foster* 21 (GH); *Glaziou* 12232 (! Mez). Teresópolis, *Foster* 981 (GH). Parque Nacional Serra dos Orgãos, Teresópolis, *Smith & Brade* 5644 (US).

22. ***Neoregelia sarmentosa*** (Regel) L. B. Smith, Contr. Gray Herb. 104: 79. 1934.

1. Leaf-blades concolorous..... Var. a. **sarmentosa**
1. Leaf-blades marked with large pale spots..... Var. b. **chlorosticta**

22a. ***Neoregelia sarmentosa*** var. ***sarmentosa.***

Nidularium sarmentosum Regel, Gartenflora 19: 268. 1870.
Nidularium denticulatum var. *simplex* Wawra, Oester. Bot. Zeitschr. 30: 112. 1880; Bull. Fédér. Soc. Hortic. Belg. 35. 1880.
Karatas sarmentosa Baker, Handb. Bromel. 5. 1889.
Regelia sarmentosa Lindm. Oefvers. Vet. Akad. Förhandl. 47: 542. 1890.
Aregelia sarmentosa Mez in DC. Monogr. Phan. 9: 66. 1896.

Brazil: Cultivated (B, F neg. 11265).

Espírito Santo: Cuibiça, *Foster* 900 (GH, US). Santa Teresa, *Foster* 1229 (GH).

Distrito Federal: Restinga de Copacabana, *Ule* 4134 (R). Pedra Dois Irmãos, *L. B. Smith* 1358 (B, BA, BM, F, GH, K, P, S, US).

São Paulo: São Paulo, *Glaziou* 16448-a (B).

22b. ***Neoregelia sarmentosa*** var. ***chlorosticta*** (Baker) L. B. Smith, Contr. Gray Herb. 104: 79. 1934.

Karatas chlorosticta Baker, Handb. Bromel. 7. 1889.
Regelia chlorosticta Lindm. Oefvers. Vet. Akad. Förhandl. 47: 543. 1890.
Aregelia chlorosticta Mez in DC. Monogr. Phan. 9: 65. 1896.

Rio de Janeiro: *Dusén* (S). Itatiaia, *Foster* 129 (GH, R). Monte Serrat, Itatiaia, *Dusén* 2196 (S). Teresópolis, *Foster* 1012 (GH).

23. ***Neoregelia leucophoea*** (Baker) L. B. Smith, Contr. Gray Herb. 124: 9. 1939.

Karatas leucophoea Baker, Handb. Bromel. 7. 1889.
Aregelia leucophoea Mez in DC. Monogr. Phan. 9: 77. 1896.

Brazil: Cultivated, *E. Morren* (GH, US neg. 3944).

24. ***Neoregelia uleana*** L. B. Smith, p. 31, fig. 59.

Brazil: Cultivated, *Ule* (R, type, US neg. 4255).

25. ***Neoregelia johannis*** (Carr.) L. B. Smith, p. 28.

Nidularium johannis Carr. Rev. Hortic. 56: 432. 1884.
Karatas johannis Baker, Handb. Bromel. 11. 1889.
Regelia johannis Lindm. Oefvers. Vet. Akad. Förhandl. 47: 543. 1890.
Aregelia johannis Mez in DC. Monogr. Phan. 9: 84. 1896.

Brazil: Described from cultivation, no material known to survive.

26. ***Neoregelia kuhlmannii*** L. B. Smith, p. 28, fig. 60.

Rio de Janeiro: Angra dos Reis, *M. Kuhlmann* 2652 (SP, type, US neg. 4252).

27. ***Neoregelia coriacea*** (Antoine) L. B. Smith, p. 27.

Karatas coriacea Antoine, Phyto-Iconogr. 51, *pl. 30, fig. 1.* 1884.

Regelia coriacea Lindm. Oefvers. Vet. Akad. Förhandl. 47: 543. 1890.
Aregelia coriacea Mez in DC. Monogr. Phan. 9: 77. 1896.

BRAZIL: Cultivated at Schönbrun and Paris (! Mez in 1934); cultivated in Rio de Janeiro, *Ule* (R, US neg. 4257).

28. ***Neoregelia macrosepala*** L. B. Smith, p. 29, fig. 61.

ESPÍRITO SANTO: Cachoeira de Itapemirim, *Foster* 968 (GH, type; US). Vargem Alta, *Foster* 929 in part (GH).

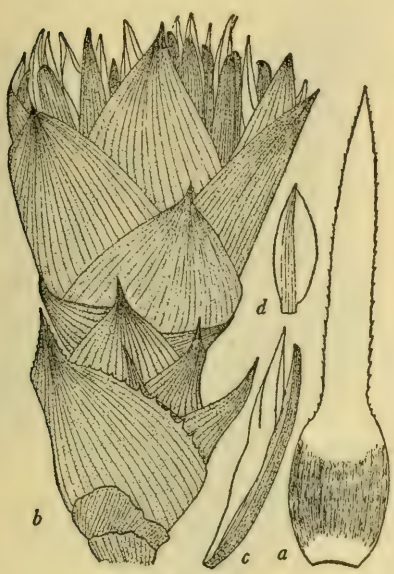

FIG. 59.

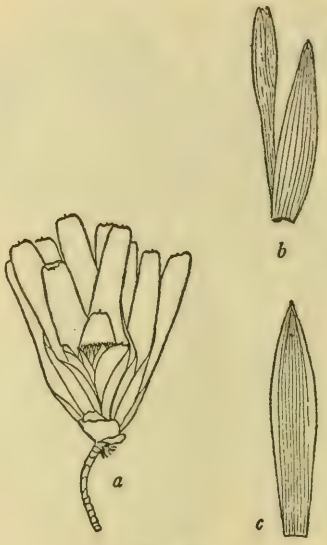

FIG. 60.

FIG. 59.—*Neoregelia uleana: a*, Leaf, × ¼; *b*, inflorescence, × ½; *c*, floral bract and flower, × ½; *d*, sepal, × ½.

FIG. 60.—*Neoregelia kuhlmannii: a*, Habit, × 1/10; *b*, floral bract and flower, × ½; *c*, sepal, × 1.

29. ***Neoregelia oligantha*** L. B. Smith, p. 30, fig. 62.

MINAS GERAIS: Mun. Antônio Dias: Parque Nacional, Ipatinga on the Rio Doce, *Foster* 742 (GH, type, US neg. 4271).

30. ***Neoregelia cruenta*** (R. Graham) L. B. Smith, Contr. Gray Herb. 124: 9. 1939. FIGURE 63.

Bromelia cruenta R. Graham, Edinburg Phil. Journ. 174. 1828.
Nidularium cruentum Regel, Gartenflora 8: 267. 1859.
Nidularium laurentii var. *immaculatum* Regel, Gartenflora 34: 243. 1885.
Karatas cruenta Nicholson, Dict. Gard. 2: 216. 1885.
Regelia cruenta Lindm. Oefvers. Vet. Akad. Förhandl. 47: 543. 1890.
Aregelia cruenta Mez in DC. Monogr. Phan. 9: 71. 1896.
Nidularium longebracteatum Mez in Mart. Fl. Bras. 3, pt. 3: 239. 1891.
Aregelia longebracteata Mez in DC. Monogr. Phan. 9: 79. 1896.

Aregelia rubrospinosa Mez, Repert. Sp. Nov. Fedde 12: 412. 1913.
Neoregelia rubrospinosa L. B. Smith, Contr. Gray Herb. 124: 10. 1939.
Neoregelia longebracteata L. B. Smith, Contr. Gray Herb. 124: 9. 1939.

Rio de Janeiro: *Foster* 8 (GH); *Rudio* 103 (LE, type of *Nidularium longebracteatum* Mez). Angra dos Reis, *M. Kuhlmann* 2683 (SP).

Distrito Federal: Praia do Arpoador, *Glaziou* 8501 (! Mez). Recreio dos Bandeirantes, *Lutz* 598 (GH, R). Restinga de Copacabana, *Glaziou* 8501-b (S). Praia da Gavea, *L. B. Smith* 2179 (GH, K, US). Restinga de

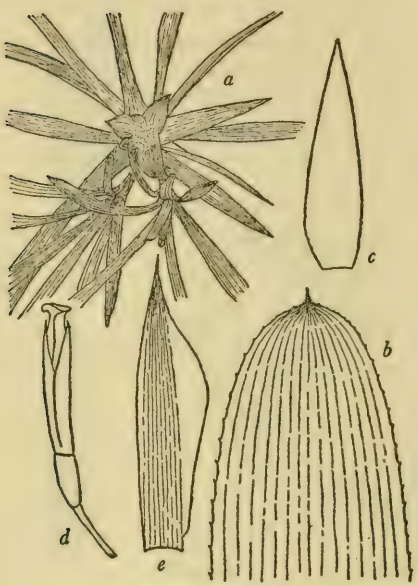

Fig. 61.

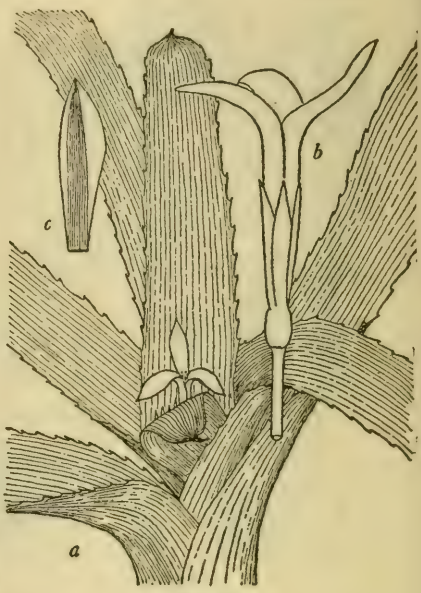

Fig. 62.

Fig. 61.—*Neoregelia macrosepala: a,* Habit (after M. B. Foster), × ca. ½; *b,* apex of leaf, × 1; *c,* floral bract, × ½; *d,* flower, × ½; *e,* sepal, × 1.
Fig. 62.—*Neoregelia oligantha: a,* Habit, × ½; *b,* flower, × 1; *c,* sepal, × 1. (*a* and *b* after M. B. Foster.)

Jacarepaguá, *Ule* (R, US). Lagoa Marapendi, *Brade & Apparicio* 20584 (RB). Praia de Sernambetiba, *Smith & Mus. R* 6814 (R, US), 6815 (R, US), 6816 (R, US), 6817 (R, US), 6828 (R, US). Barra da Tijuca, *J. G. Kuhlmann* 6036 (RB, US); *Inst. de Malária* 4 (HBR).

São Paulo: Cubatão, *L. B. Smith* 2047 (GH). Casqueiro, Santos, *Gehrt* (SP).

31. ***Neoregelia concentrica*** (Vell.) L. B. Smith, Contr. Gray Herb. 104: 78. 1934. Figure 64.

Tillandsia concentrica Vell. Fl. Fluminensis 134. 1825; Icon. 3: *pl. 133.* 1835.

Nidularium laurentii Regel, Ind. Sem. Hort. Petrop. for 1866. 80. 1867.
Nidularium acanthocrater E. Morr. Belg. Hortic. 34: 140, *pl. 9.* 1884.
Karatas laurentii Antoine, Phyto-Iconogr. 48, *pl. 28.* 1884.

Karatas acanthocrater Antoine, Phyto-Iconogr. 49, *pls. 29, 30, fig. 2.* 1884.
Regelia acanthocrater Lindm. Oefvers. Vet. Akad. Förhandl. 47: 543. 1890.
Regelia laurentii Lindm. Oefvers. Vet. Akad. Förhandl. 47: 543. 1890.
Nidularium concentricum Mez in Mart. Fl. Bras. 3, pt. 3: 239. 1891.
Aregelia laurentii Mez in DC. Monogr. Phan. 9: 80. 1896.
Aregelia concentrica Mez in DC. Monogr. Phan. 9: 81. 1896.

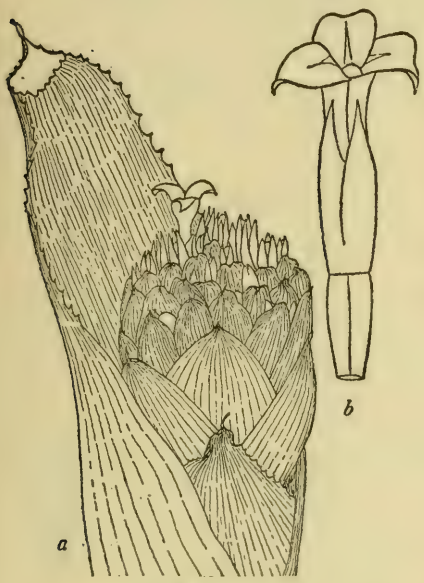

FIG. 63.

FIG. 64.

FIG. 63.—*Neoregelia cruenta: a,* Inner leaf and inflorescence, × ½; *b,* flower without pedicel, × 1. (Both after Botanical Magazine.)
FIG. 64.—*Neoregelia concentrica: a,* Apex of leaf, × ½; *b,* inflorescence, × ½; *c,* floral bract and flower, × 1.

RIO DE JANEIRO: Old road below Petrópolis, *Smith & Mus. R* 6492 (R, US). Serra dos Orgãos, *Ule* 1985 (R). Soberbo to Guapi, Serra dos Orgãos, *L. B. Smith* 1533 (B, F, GH, S). Teresópolis, *Sampaio* 2067 (R). Barreira to Teresópolis, *Pereira & Duarte* 1591 (RB, US).
DISTRITO FEDERAL: Cultivated, *Ule* (R). Restinga de Copacabana, *Glaziou* 15495 (BR, GH neg. 2798).

32. ***Neoregelia zonata*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 2: 120, *pl. 51.* 1950.
ESPÍRITO SANTO: Vitória, *Foster* 197 (GH, type (US neg. 4084), R, US).

33. ***Neoregelia pauciflora*** L. B. Smith, p. 31, fig. 65.
ESPÍRITO SANTO: Santa Teresa, *Foster* 265 (GH, type, US neg. 4270).

34. ***Neoregelia melanodonta*** L. B. Smith, p. 30, fig. 66.
ESPÍRITO SANTO: Cuibiça, *Foster* 897 (US, type).

35. ***Neoregelia carcharodon*** (Baker) L. B. Smith, Proc. Amer. Acad. 70: 152. 1935.

Karatas carcharodon Baker, Handb. Bromel. 12. 1889.

Aregelia carcharodon Mez in DC. Monogr. Phan. 9:78. 1896.

BRAZIL: Cultivated, *E. Morren* (LG, type ?).

ESPÍRITO SANTO: Itapemirim, *Foster* 155 (GH). Santa Teresa, *Foster* 245 (GH, R). Vitória, *Foster* 181 (GH, R, US).

DISTRITO FEDERAL: São Cristovão, *Glaziou* 15494 (B (F neg. 11257), K).

FIG. 65.

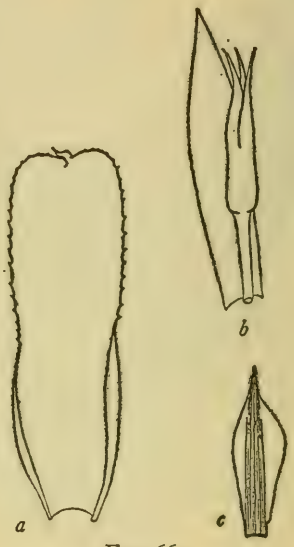

FIG. 66.

FIG. 65.—*Neoregelia pauciflora: a,* Leaf, × ½; *b,* flower, × 1; *c,* sepal, × 1.

FIG. 66.—*Neoregelia melanodonta: a,* Leaf, × ¼; *b,* floral bract and flower, × 1; *c,* sepal, × 1.

36. ***Neoregelia makoyana*** (Regel) L. B. Smith, Contr. Gray Herb. 124: 10. 1939.

Nidularium makoyanum Regel, Gartenflora 36: 656. 1887.

Karatas makoyana Baker, Handb. Bromel. 11. 1889.

Nidularium sanguinarium Hort. ex Baker, Handb. Bromel. 12. 1889 (! Mez).

Regelia makoyana Lindm. Oefvers. Vet. Akad. Förhandl. 47: 543. 1890.

Aregelia makoyana Mez, Engl. Pflanzenreich IV. 32: 50. 1934.

BRAZIL: Cultivated in Paris (! Mez in 1934).

37. ***Neoregelia binotii*** (Antoine) L. B. Smith, Contr. Gray Herb. 114: 5. 1936.

Karatas binotii Antoine, Phyto-Iconogr. *pl. 34.* 1884.

Regelia binotii Lindm. Oefvers. Vet. Akad. Förhandl. 47: 543. 1890.

Aregelia binotii Mez in DC. Monogr. Phan. 9: 82. 1896.

BRAZIL: Cultivated, Botanic Garden, Liége (LG, GH neg. 2920).
SÃO PAULO: Santos, *Foster* 485 (GH, US). Monte Japui, São Vicente, *L. B. Smith* 2097 (GH).

38. ***Neoregelia marmorata*** (Baker) L. B. Smith, Contr. Gray Herb. 124: 10. 1939.
Nidularium laurentii var. *elatius* Regel, Gartenflora 34: 243. 1885.
Karatas marmorata Baker, Handb. Bromel. 11. 1889.
Aregelia marmorata Mez in DC. Monogr. Phan. 9: 76. 1896.
SÃO PAULO: São Paulo, *Ostermeyer* (SP). Apiai, São Paulo to Curitiba, km. 279, *Foster* 397 (GH). Guapiara, São Paulo to Curitiba, km. 281, *M. Kuhlmann* (SP, US).
PARANÁ: Caiobá, *Foster* 449 (GH, US).

19. *Cryptanthus* Otto & Dietr.

Cryptanthus Otto & Dietr. Allg. Gartenzeit. 4: 297. 1836.

Endemic to eastern Brazil.

1. Leaves not noticeably constricted between the blade and the sheath; ovules usually numerous. (Fig. 67.)
2. Caudex elongate; sepals 10–12 mm. long.
3. The imbricate leaf-sheaths making the caudex appear 8–12 mm. in diameter; leaves 15 cm. long; leaf-blades 7–12 mm. wide; sepals connate almost to the middle..... 1. **C. glaziovii**
3. The imbricate leaf-sheaths making the caudex appear 10–15 mm. in diameter; leaves to 40 cm. long; leaf-blades 12–20 mm. wide; sepals connate at the base..... 2. **C. bahianus**
2. Caudex very short.
4. Petals orange-yellow; floral bracts linear, about equaling the sepals; sepals 13 mm. long, unequally connate for 4 to 5 mm.; leaves 35 cm. long, the blades 12 mm. wide. (Fig. 67.)..... 3. **C. duartei**
4. Petals white; floral bracts broad, much exceeded by the sepals.
5. Leaves 7–20 cm. long with spines 8–10 mm. long, the blades 8–10 mm. wide; sepals 6–7 mm. long..... 4. **C. schwackeanus**
5. Leaves to more than 50 cm. long with spines only 1 mm. long, the blades 15 mm. wide; sepals 12 mm. long..... 5. **C. maritimus**
1. Leaves, or most of them, constricted or petiolate between the blade and the sheath. (Figs. 68–72.)
6. The leaves all alike.
7. Leaf-blades without spots or lines.
8. Upper and lower sides of the leaf-blades contrasting.
9. Leaves brown-lepidote beneath; plants propagating by long naked stolons; floral bracts broadly ovate, slightly shorter than the sepals, lepidote; sepals 10 mm. long, connate for 4 mm., densely pale-lepidote at the apex. (Fig. 68.)..... 6. **C. pseudoscaposus**
9. Leaves white-lepidote beneath; plants without naked stolons.
10. Sepals strongly serrulate, connate for one-third to half of their length; flowers 23 mm. long..... 7. **C. sinuosus**
10. Sepals nearly or quite entire, connate for more than half of their length; flowers 40 mm. long..... 8. **C. acaulis**

8. Upper and lower sides of the leaf-blades alike, green, nearly glabrous; flowers to 41 mm. long; sepals acuminate, more than half connate. 9. **C. bromelioides**

7. Leaf-blades marked with spots or lines on the upper side.

11. Leaf-markings consisting of irregular dark transverse bands.

12. Sepals 19 mm. long, three-fourths connate, the free lobes acuminate, auriculate, entire; leaves relatively thin and flexible. 10. **C. zonatus**

12. Sepals 8 mm. long, connate for 5 mm., the free lobes broadly acute and apiculate, broadest at the base, serrulate; leaves thick and fleshy..... 11. **C. fosterianus**

11. Leaf-markings consisting of regular pale longitudinal bands.

13. Leaves glabrous above, their bands due to pigmentation.

14. Colored band single and median; sepals alate.

15. Leaves white-lepidote beneath; flowers less than 30 mm. long; sepals 11 mm. long..... 12. **C. praetextus**

15. Leaves brown-lepidote beneath; flowers to 51 mm. long; sepals 15 mm. long, connate for 8 mm. (Fig. 69.) 13. **C. minarum**

14. Colored bands two or more; sepals more than half connate.

16. The colored bands numerous and various; flowers to 41 mm. long..... 9. **C. bromelioides**

16. The colored bands two and of the same color; flowers 26 mm. long..... 14. **C. bivittatus**

13. Leaves partially lepidote above, contrasting with glabrous bands, the blades 30 mm. wide; sepals 11 mm. long.

17. Sepals concolorous, the free lobes narrow; leaves scarcely more than 8 cm. long..... 15. **C. lacerdae**

17. Sepals with the free lobes broad and much darker than the tube; leaves 20 cm. long. (Fig. 70.)..... 16. **C. marginatus**

6. The leaves dimorphic.

18. Leaf-blades petiolate and maculate. (Fig. 71.)..... 17. **C. beuckeri**

18. Leaf-blades gradually narrowed at the base but not petiolate, not maculate.

19. The leaf-blades with a pale median stripe above, 25 mm. wide; sepals acute. (Fig. 72.)..... 18. **C. pickelii**

19. The leaf-blades concolorous above.

20. Faces of the leaf of different colors; floral bracts shorter than the ovary; sepals rounded and apiculate; leaf-blades 15–20 mm. wide. 19. **C. incrassatus**

20. Faces of the leaf the same color; floral bracts to 17 mm. long, exceeding the ovary; sepals acuminate; leaf-blades 45 mm. wide. 20. **C. diversifolius**

1. ***Cryptanthus glaziovii*** Mez in Mart. Fl. Bras. 3, pt. 3: 202. 1891.

MINAS GERAIS: Caraça, *Glaziou* 15672a (B, type; P (GH neg. 2946)); *Foster* 706 (GH).

2. ***Cryptanthus bahianus*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 106, *pl. 104.* 1943.

Cryptanthus glaziovii sensu L. B. Smith in Addisonia 20: 9, *pl. 645.* 1937. Not Mez 1891.

BRAZIL: Cultivated, *Foster* 2449 (US).
BAÍA: Jacobina, *Foster* 98 (GH, type). Monte Cruzeiro, *Rose & Russell* 20033 (NY, US).

3. ***Cryptanthus duartei*** L. B. Smith, p. 23, fig. 67.
MINAS GERAIS: Serra do Cipó, *Duarte* (US, type; RB).

4. ***Cryptanthus schwackeanus*** Mez in Mart. Fl. Bras. 3, pt. 3: 203. 1891.
MINAS GERAIS: Serra de Caraça, *Ule* (R). Pico de Itabira do Campo, *Glaziou* 17823 (P, isotype, GH neg. 2945); *Schwacke* (R). Miguel Burnier, *Hoehne* (GH, SP). Mun. Belo Horizonte: Serra da Piedade, *Foster* 569 (GH). Morro Velho, *Gehrt* (SP, GH neg. 7168). Mun. Ouro Preto: Morro do Cruzeiro, *Macedo* 2731 (US). Ouro Preto, *Pires & Black* 3265 (IAN). Serra do Ouro Preto, *Ule* (R).

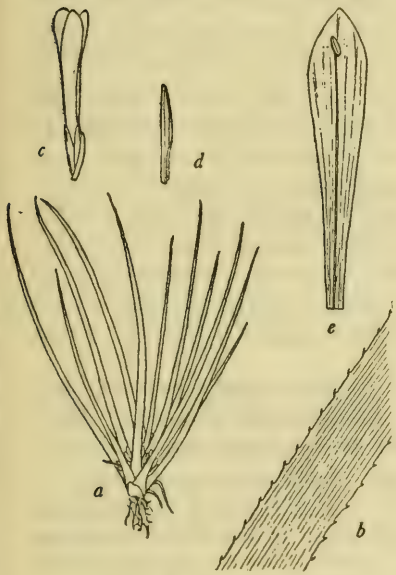

FIG. 67.

FIG. 68.

FIG. 67.—*Cryptanthus duartei: a,* Habit, × ⅛; *b,* section of leaf, × 1; *c,* floral bract and flower, × ½; *d,* sepal, × 1; *e,* petal and stamen, × 1.
FIG. 68.—*Cryptanthus pseudoscaposus: a,* Habit (after M. B. Foster), × ¼; *b,* sepal, × 5.

DISTRITO FEDERAL: Cultivated, *Ule* (R).
SÃO PAULO: Atibaia, *Gehrt* (SP).

5. ***Cryptanthus maritimus*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 106, *pl. 105.* 1943.
ESPÍRITO SANTO: Vitória, *Foster* 179 (GH, type, US neg. 4094); 875 (GH, US).

6. ***Cryptanthus pseudoscaposus*** L. B. Smith, p. 25, fig. 68.
ESPÍRITO SANTO: Domingos Martins to Vitória, *Foster* 208 (GH, type; R, US).

7. ***Cryptanthus sinuosus*** L. B. Smith, p. 26.

Cryptanthus undulatus Otto & Dietr. Allg. Gartenz. 4: 299. 1836. In part. Nomen illegitimum.

RIO DE JANEIRO: *Wawra* (W).

8. ***Cryptanthus acaulis*** (Lindl.) Beer, Bromel. 75. 1857.

1. Leaves green.
   2. The leaves lepidote above..... Var. a. **acaulis**
   2. The leaves glabrous above..... Var. b. **argenteus**
1. Leaves tinged with red..... Var. c. **ruber**

8a. ***Cryptanthus acaulis*** var. ***acaulis***

Tillandsia acaulis Lindl. Bot. Reg. 14: *pl. 1157.* 1828.

Cryptanthus acaulis var. *genuinus* Mez in DC. Monogr. Phan. 9: 54. 1896.

Cryptanthus pumilus Hort. ex Gentil, Pl. Cult. Serres Brux. 55. 1907. (! Mez).

BRAZIL: Cultivated, *Foster* (GH); *Hort. Petrograd* (GH); *Reitz* 4796 (HBR).

DISTRITO FEDERAL: *Glaziou* 9323 (K, GH neg. 2683). Gavea, *Reitz* 4680 (HBR). Quinta, *Glaziou* 16450 (P). Barra da Tijuca, *Reitz* 4797 (! Reitz).

8b. ***Cryptanthus acaulis*** var. ***argenteus*** Beer, Bromel. 75. 1857.

Cryptanthus discolor Otto & Dietr. Allg. Gartenz. 4: 299. 1836.

Cryptanthus acaulis var. *discolor* Mez in DC. Monogr. Phan. 9: 55. 1896.

BRAZIL: Cultivated, *Reitz* 4796 (HBR, US).

8c. ***Cryptanthus acaulis*** var. ***ruber*** Hort. ex Beer, Bromel. 76. 1857.

Cryptanthus acaulis var. *purpureus* Baker, Saund. Ref. Bot. 4: *pl. 287.* 1871.

Cryptanthus undulatus var. *ruber* Beer ex Baker, Handb. Bromel. 15. 1889.

Cryptanthus undulatus var. *purpureus* Baker, Handb. Bromel. 15. 1889.

BRAZIL: Described from cultivation, no herbarium material known.

9. ***Cryptanthus bromelioides*** Otto & Dietr. Allg. Gartenz. 4: 298. 1836.

1. Leaves concolorous..... Var. a. **bromelioides**
1. Leaves marked with multiple longitudinal bands of red, white, and green. Var. b. **tricolor**

9a. ***Cryptanthus bromelioides*** var. ***bromelioides***

Cryptanthus acaulis var. *bromelioides* Mez in DC. Monogr. Phan. 9: 55. 1896.

Cryptanthus carnosus Mez, Repert. Sp. Nov. Fedde 16: 2. 1919.

BRAZIL: Cultivated, *Bot Gard. Berlin* (B, type of *Cryptanthus carnosus* Mez).

ESPÍRITO SANTO: Vitória, *Foster* 172 (GH).

DISTRITO FEDERAL: Dois Irmãos, *Duarte* 176 (RB, US neg. 3264).

9b. ***Cryptanthus bromelioides*** var. ***tricolor*** M. B. Foster, Bromel. Soc. Bull. 3: 30. 1953.

BRAZIL: Cultivated, *Foster* 2832 (US, type).

10. ***Cryptanthus zonatus*** (Vis.) Beer, Bromel. 76. 1857.

1. Leaf-blades green or appearing white from the covering of scales.
   2. Leaf-blades densely pale-lepidote beneath, appearing white. Forma a. **zonatus**

2. Leaf-blades glabrous beneath, appearing green..... Forma b. **viridis**
1. Leaf-blades strongly tinged with red..... Forma c. **fusca**

10a. ***Cryptanthus zonatus*** forma ***zonatus***
Pholidophyllum zonatum Vis. Ind. Sem. Hort. Patav. 4. 1847.
BRAZIL: Cultivated, *Foster* (GH, US).
PERNAMBUCO: Berberibe (near Recife), *Ridley, Lea & Ramage* (BM). Cultivated in Rio de Janeiro, *Glaziou* 20523a (P, GH neg. 2944).

10b. ***Cryptanthus zonatus*** forma ***viridis*** Hort. ex Mez, Engl. Pflanzenreich IV. 32: 19. 1934.
BRAZIL: Described from cultivation.

10c. ***Cryptanthus zonatus*** forma ***fuscus*** Mez in DC. Monogr. Phan. 9: 58. 1896.
Pholidophyllum zonatum var. *fuscum* Vis. Ind. Sem. Hort. Patav. 4. 1847.
BRAZIL: Described from cultivation.

11. ***Cryptanthus fosterianus*** L. B. Smith, Bromel. Soc. Bull. 2: 63. 1952.
PERNAMBUCO: Mata Camocim, São Bento, *Pickel* 3941 (IPA). Serra Negra near the Paraíba line, *Foster* 2431 (US, type).

12. ***Cryptanthus praetextus*** E. Morr. ex Baker, Handb. Bromel. 16. 1889.
BRAZIL: Described from cultivation.
ESPÍRITO SANTO: Domingos Martins, *Foster* 236 (GH, R). (Fazenda de Santa Adelaide), Rio Doce, *J. G. Kuhlmann* 6629 (RB).

13. ***Cryptanthus minarum*** L. B. Smith, p. 24, fig. 69.
MINAS GERAIS: Itabira do Campo, *Melo Matos* (R, type, US neg. 4256).

14. ***Cryptanthus bivittatus*** (Hook.) Regel, Ind. Sem. Hort. Petrop. for 1864. 15. 1865.
1. Leaves green except for the pale stripes of color..... Var. a. **bivittatus**
1. Leaves suffused with red in addition to the stripes... Var. b. **atropurpureus**

14a. ***Cryptanthus bivittatus*** var. ***bivittatus***
Billbergia bivittata Hook. Bot. Mag. 87: *pl. 5270.* 1861.
Cryptanthus bivittatus var. *luddemannii* Baker, Handb. Bromel. 16. 1889.
Cryptanthus bivittatus var. *moënsis* Hort. in Cat. Brom. Hort. Lugd.-Bat. 1894; Mez in DC. Monogr. Phan. 9: 57. 1896.
Cryptanthus moensi Hort. ex Gentil, Pl. Cult. Serres Brux. 66. 1907.
BRAZIL: Cultivated, *Atkinson* 60 (GH, US); *Foster* 1192 (GH).

14b. ***Cryptanthus bivittatus*** var. ***atropurpureus*** Mez in Engl. Pflanzenreich IV. 32: 18. 1934.
BRAZIL: Described from cultivation.

15. ***Cryptanthus lacerdae*** Antoine, Wien. Ill. Garten-Zeit. 7: 254. 1882.
BRAZIL: Cultivated, *Foster* 1176 (GH, US).

16. ***Cryptanthus marginatus*** L. B. Smith, p. 24, fig. 70.
ESPÍRITO SANTO: Santa Teresa, *Foster* 243 (GH, type, US neg. 4268).

17. ***Cryptanthus beuckeri*** E. Morr. Belg. Hortic. 30: 241. 1880. FIGURE 71.
BRAZIL: Cultivated, *Atkinson* 99 (GH, US); *E. Morren* (LG, type ?).

18. ***Cryptanthus pickelii*** L. B. Smith, p. 25, fig. 72.
PERNAMBUCO: Mun. São Lourenço da Mata: Toró, Escola de São Bento, near Tapera, *Pickel* 909 in part (IPA, type, US neg. 4230). Mata do Corrego da Bexiga, Escola de São Bento, *Pickel* 909 in part (IPA, US neg. 4232).

19. ***Cryptanthus incrassatus*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 2: 119, *pl. 49.* 1950.

Espírito Santo: Vitória, *Foster* 172 (GH, type US neg. 3278, 3279).

20. ***Cryptanthus diversifolius*** Beer, Bromel. 76. 1857.

Cryptanthus suaveolens E. Morr. ex Baker, Handb. Bromel. 15. 1889.

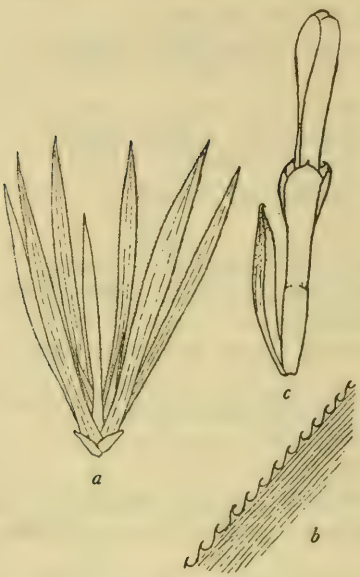

Fig. 69.

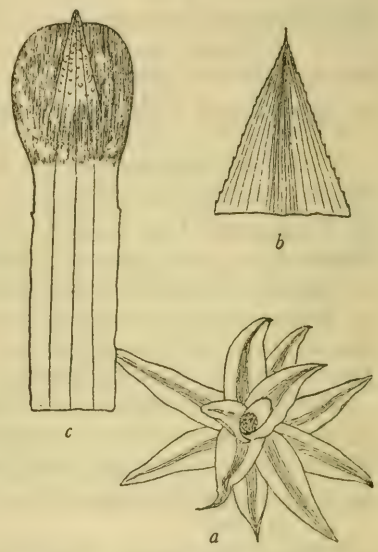

Fig. 70

Fig. 69.—*Cryptanthus minarum: a,* Habit, × 1/10; *b,* section of leaf, × 1; *c,* floral bract and flower, × 1.

Fig. 70.—*Cryptanthus marginatus: a,* Habit (after M. B. Foster), × ⅛; *b,* apex of leaf, × 1; *c,* sepal, × 5.

Cryptanthus acaulis var. *diversifolius* Mez in DC. Monogr. Phan. 9: 55. 1896.

Brazil: Described from cultivation. Still widely grown according to Mez in 1934.

20. *Nidularium* Lem.

Nidularium Lem. Jard. Fleur. 4, Misc.: 60. 1854.

Endemic to eastern Brazil.

Classification of herbarium specimens is difficult and uncertain, and a study of copious living material is necessary to an understanding of the species.

1. Petal-blades spreading, acute; inflorescence ferruginous-lanate; sepals 10–14 mm. long, connate for 2–3 mm. (Fig. 73.)

2. Floral bracts serrulate; petals short-connate; outer bracts of the inflorescence small and inconspicuous, not forming a notable involucre. (Fig. 73.) ..... 1. **N. burchellii**

2. Floral bracts entire; petals connate for half their length; outer bracts of the inflorescence forming an evident involucre..... 2. **N. microps**

1. Petal-blades erect, obtuse; inflorescence appressed-lepidote to glabrous. (Fig. 75.)

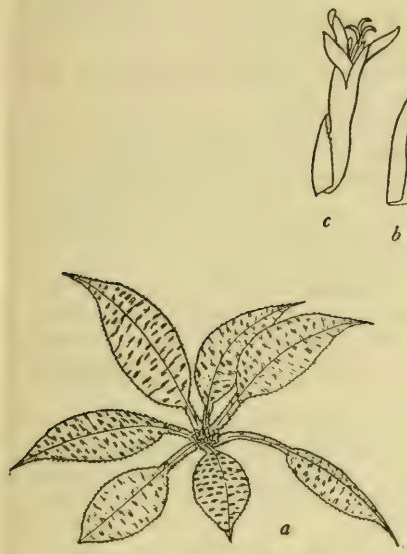

FIG. 71.

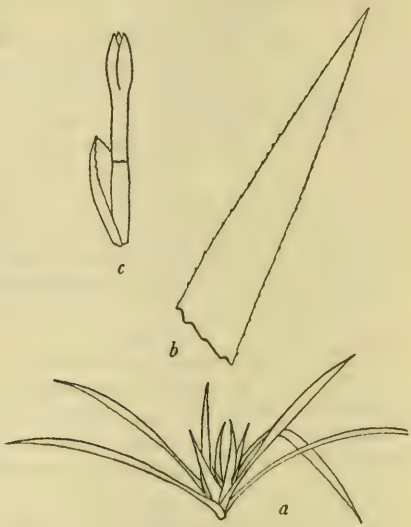

FIG. 72.

FIG. 71.—*Cryptanthus beuckeri:* *a*, Habit, × ¼; *b*, floral bract, × 1; *c*, flower, × 1. (*b* and *c* after Belgique Horticole.)

FIG. 72.—*Cryptanthus pickelii:* *a*, Habit, × 1/10; *b*, apex of leaf, × 1; *c*, floral bract and flower, × 1.

3. Flowers short-spicate, 20 mm. long; petals yellow; floral bracts ovate, acute, equaling the ovary; sepals 7 mm. long, half connate. 3. **N. loeseneri**

3. Flowers fasciculate; petals never yellow.

4. Scape naked for most of its length, slender; flowers 25–28 mm. long; sepals 12–15 mm. long, connate for 5 mm..... 4. **N. billbergioides**

4. Scape when evident completely covered by its bracts.

5. Inflorescence nidular, sunk in the center of the leaf-rosette; scape equaling the leaf-sheaths or shorter.

6. Leaf-spines 1.5–4 mm. long; leaf-blades acute, narrowed toward the base, only 1–2 times as long as the sheaths; sepals mucronulate, 20–24 mm. long; petals blue..... 5. **N. fulgens**

6. Leaf-spines not more than 1 mm. long.

7. Floral bracts entire.

8. Petals white; flowers 50–65 mm. long; sepals 22–29 mm. long. (Fig. 75.)..... 6. **N. innocentii**

8. Petals red; flowers 30–40 mm. long; sepals 18 mm. long. 7. **N. rutilans**

7. Floral bracts serrulate; flowers 45–55 mm. long; sepals 20–22 mm. long.

9. Leaf-blades acute, 3–4 cm. wide; petal-blades rose or white. 8. **N. purpureum**

9. Leaf-blades broadly rounded and apiculate, 4–6 cm. wide; petal-blades red..... 9. **N. regelioides**

5. Inflorescence raised above the leaf-rosette; scape exceeding the leaf-sheaths.

10. Blades of the primary bracts short and inconspicuous, giving the inflorescence a capitate form. (Fig. 76.)

11. Floral bracts densely serrulate; leaf-blades 2–4 cm. wide.

12. Sepals 16 mm. long, connate for about half their length, the free lobes ovate, mucronulate; leaves broadly acute and apiculate. (Fig. 76.)..... 10. **N. itatiaiae**

12. Sepals 26–28 mm. long, connate for about a third of their length, the free lobes acute or acuminate.

13. Sepals acuminate; inflorescence many-flowered; leaves acute and caudate-acuminate..... 11. **N. longiflorum**

13. Sepals acute; inflorescence few-flowered; leaves broadly acute..... 12. **N. pauciflorum**

11. Floral bracts entire.

14. Sepals mucronulate, about 11 mm. long, connate for 3 mm.; flowers 33 mm. long; petal-blades blue; leaf-blades 18–25 mm. wide..... 13. **N. antoineanum**

14. Sepals not mucronulate, acute or acuminate, 15–27 mm. long; leaf-blades 30–35 mm. wide.

15. Petal-blades white; sepals 15 mm. long, very short-connate, half exserted above the floral bracts; flowers 37 mm. long. 14. **N. neglectum**

15. Petal-blades blue or purple; sepals 22–27 mm. long, connate for 4–5 mm., more than half exserted above the floral bracts.

16. Sepals broadly acute, 27 mm. long; flowers to 48 mm. long. 15. **N. ferdinando-coburgii**

16. Sepals filiform-acuminate, 22 mm. long; flowers to 40 mm. long..... 16. **N. wettsteinii**

10. Blades of the primary bracts long,narrow, and conspicuous, giving the inflorescence a stellate form. (Fig. 77.)

17. Leaves broadly acute or rounded and apiculate; floral bracts serrulate.

18. Sepals broadly acute or obtuse, mucronulate or apiculate, connate for 7–8 mm.

19. Leaves 1 m. long, the blades 50–60 mm. wide; sepals 23 mm. long; petal-blades pale blue..... 17. **N. terminale**

19. Leaves to 33 cm. long, the blades 25 mm. wide; sepals 18 mm. long; petals unknown. (Fig. 77.) 18. **N. apiculatum**

18. Sepals acuminate, 20 mm. long, connate for 3–4 mm.; petal-blades blue..... 19. **N. utriculosum**

17. Leaves acuminate.
20. Blades of the leaves much narrowed toward the base.
21. Petal-blades white; leaves red-purple, caudate-acuminate, the blades 25–35 mm. wide..... 20. **N. rubens**
21. Petal-blades blue; leaves green, not caudate, the blades 8–27 mm. wide..... 21. **N. scheremetiewii**
20. Blades of the leaves little if at all narrowed toward the base, 20–32 mm. wide; petal-blades blue..... 22. **N. procerum**

1. ***Nidularium burchellii*** Mez in DC. Monogr. Phan. 9: 101. 1896. FIGURE 73.
Aechmea burchellii Baker, Journ. Bot. 17: 231. 1879.
Cryptanthus emergens Lindm. Svensk. Akad. Handl. 24: no. 8: 19, *pl. 2, figs. 1–12.* 1891.
Nidularium pubisepalum. Mez in Mart. Fl. Bras. 3, pt. 3: 621. 1894.
Nidularium emergens Mez in Mart. Fl. Bras. 3, pt. 3: 621. 1894.
Aregelia burchellii Mez, Engl. Pflanzenreich IV. 32: 51. 1934.
ESPÍRITO SANTO: Santa Teresa, *Foster* 1182 (GH, US).
SÃO PAULO: Alto da Serra, *Luederwaldt* (SP). Boracéa to Salesópolis, *M. Kuhlmann & Kühn* 1765 (SP); 2343 (SP). Cubatão, near Santos, *Burchell* 3487 (K, type, GH neg. 2685). (Piaçaguera), *Loefgren* (SP). Santos, *Foster* 484 (GH); *Foster & Gehrt* (GH); *Loefgren* (SP); *Mosén* 2979 (S).

2. ***Nidularium microps*** E. Morr. ex Mez in Mart. Fl. Bras. 3, pt. 3: 218. 1891.
1. Primary bracts dark purple.
2. Leaves green..... Var. a. **microps**
2. Leaves tinged with purple..... Var. b. **bicense**
1. Primary bracts pale..... Var. c. **pallidum**

2a. ***Nidularium microps*** var. ***microps***
Nidularium microcephalum Ule, Bericht. Deutsch. Bot. Gesellsch. 17: 4. 1899.
Aregelia microps Mez, Engl. Pflanzenreich IV. 32: 51, *fig. 14.* 1934.
BRAZIL: Cultivated, *E. Morren* (LG, type, GH neg. 2934).
RIO DE JANEIRO: [Nova] Friburgo, *J. G. Kuhlmann* (RB).
DISTRITO FEDERAL: Corcovado, *L. B. Smith* 1218 (GH); *Smith & Vieira* 1383 (B, F, GH, US). Fabrica das Chitas, Rio de Janeiro, *Schwacke* (R). Paineiras to Jardim Botanico, *L. B. Smith* 1400 (GH, S). Tijuca, *Ule* 4037 in part (B, type of *Nidularium microcephalum* Ule (F neg. 11262), R).

2b. ***Nidularium microps*** var. ***bicense*** (Ule) L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 57. 1941.
Nidularium microcephalum var. *bicensis* Ule, Bericht. Deutsch. Bot. Gesellsch. 17: 5. 1899.
DISTRITO FEDERAL: Serra da Bica, *Ule* (B, type).

2c. ***Nidularium microps*** var. ***pallidum*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 57. 1941.
RIO DE JANEIRO: Serra dos Orgãos, *Brade* 12084 (GH, type; R).

3. ***Nidularium loeseneri*** Mez, Repert. Sp. Nov. Fedde 16: 5. 1919.
Aechmea loesenera Hort. ex Gentil, Pl. Cult. Jard. Bot. Brux. 9. 1907. Nomen.
BRAZIL: Cultivated, *Strauss* (B, type, F neg. 11272, 11281).

4. ***Nidularium billbergioides*** (Schult. f.) L. B. Smith, Contr. Gray Herb. 95: 42. 1931. FIGURE 74.

Tillandsia terminalis Vell. Fl. Fluminensis 137. 1825; Icon. 3: *pl. 143.* 1835. Not *Nidularium terminale* Ule 1898.

Hohenbergia billbergioides Schult. f. in R. & S. Syst. 7, pt. 2: 1253. 1830.

Tillandsia citrina Burchell ex Baker, Journ. Bot. 17: 235. 1879.

Aechmea billbergioides Baker, Handb. Bromel. 38. 1889.

Nidularium parviflorum Lindm. Svensk. Akad. Handl. 24: no. 8: 17, *pl. 1, figs. 8–18.* 1891.

FIG. 73.

FIG. 74.

FIG. 73.—*Nidularium burchellii: a,* Scape and inflorescence, × ½; *b,* branch of inflorescence, × 1; *c,* flower, × 1. (All after Lindman.)

FIG. 74.—*Nidularium billbergioides: a,* Habit, × ⅛; *b,* primary bract and branch, × ½; *c,* floral bract and flower, × 1; *d,* sepal, × 1. (*b-d* after Lindman.)

Nidularium bracteatum Mez in Mart. Fl. Bras. 3, pt. 3: 224. 1891. In part, not as to *Tillandsia bracteata* Vell.

Nidularium citrinum Mez, Repert. Sp. Nov. Fedde 17: 113. 1921.

BRAZIL: Cultivated, *Hort. Berlin* (B, *Nidularium citrinum* Mez, F neg. 11269).

BAÍA: Agua Preta, *Foster* 56 (GH). Almada, Ilheus, *Martius* (M, type).

ESPÍRITO SANTO: Guiomar, *Foster* 938 (GH). Mun. Collatina: Monte Claro, *Foster* 216 (GH, R).

RIO DE JANEIRO: Suruí, *Foster* 216-A (GH, R).

DISTRITO FEDERAL: Cultivated, *Ule* 4035-A (R). Serra da Bica, near Cascadura, *Glaziou* 15488 (P). Gruta Paulo e Virginia, *Rente* 14 (R); *Rosa* 102 (R). Pedra Bonita, *Brade* 11913 (GH, R). Quinta, *Glaziou* 16441 (P). Tijuca, *Glaziou* 2734 (P). Floresta da Tijuca, *Ule* 4035 (R).

São Paulo: Alto da Serra, *Foster* 372 (GH, R). Cubatão, Santos, *Loefgren* (GH, SP). Sorocaba, Santos, *Mosén* 3253 (S, type of *Nidularium parviflorum* Lindm.). São João dos Barreiros, *Loefgren & Edwall* (SP, GH neg. 7145). Tremembe, *Doering* (SP).

Santa Catarina: Blumenau, *Inst. Malariologia* (HBR); *Reitz* (HBR); 3625 in part (HBR); 3819 (HBR, US). Joinvile, *Reitz* 3758-j (HBR). São Francisco do Sul, *Reitz* 3758 (HBR, US); 3893 (HBR); 3990 (HBR, US). Mun. Araquari: Itapocu, *Reitz* 4368 (HBR); *Smith & Reitz* 5761 (R, RB, US). Mun. Florianópolis: Rio Tavares, *Reitz* 4550 (HBR); *Smith & Reitz* 6184 (R, US). Mun. Itajaí: Rio Canoas, Luiz Alves, *Reitz* 5166 (! Reitz).

5. ***Nidularium fulgens*** Lem. Jard. Fleur. 4, Misc.: 60, *pl. 411.* 1854.
Karatas fulgens Antoine, Phyto-Iconogr. 41, *pl. 24.* 1884.
Nidularium rosulatum Ule, Bericht. Deutsch. Bot. Gesellsch. 18: 320. 1900.

Brazil: Cultivated, *Atkinson* 48 (MT); *Foster* (US).

Minas Gerais: Caraça, *Foster* 697 (GH, US).

Rio de Janeiro: Alto da Serra to Meio da Serra, *L. B. Smith* 2123 (F, GH (US neg. 3946)). Restinga de Mauá, *Ule* 4867 (B, type of *Nidularium rosulatum* Ule, F neg. 11277). Petrópolis, *Foster* 19 (GH, R); *Glaziou* 15489 (P). Petrópolis to Raiz da Serra, *L. B. Smith* 1327 (B, GH, S). Serra da Estrela, Petrópolis, *Diogo* 664 (R). Teresópolis, *Bailey* 1293 (BH).

São Paulo: Florestal, *Foster* 343 (GH, US). Rio Tijuco, *Foster* 470 (GH, R); *M. Kuhlmann* (SP).

Paraná: Alto da Serra, *Foster* 402 (GH).

6. ***Nidularium innocentii*** Lem. Ill. Hortic. 2, Misc.: 13. 1855.

1. Leaves dark red beneath or on both sides; primary bracts red or with the apex green..... Var. a. **innocentii**
1. Leaves, or at least their blades, green.
2. Primary bracts wholly or mostly red-purple.
3. Leaf-blades wholly green..... Var. b. **wittmackianum**
3. Leaf-blades marked with longitudinal white lines..... Var. c. **striatum**
2. Primary bracts red near the apex and green elsewhere.
4. Leaf-blades with numerous longitudinal white lines... Var. d. **lineatum**
4. Leaf-blades with a single large median white stripe... Var. e. **paxianum**

6a. ***Nidularium innocentii*** var. ***innocentii.*** Figure 75.
Karatas innocentii Antoine, Phyto-Iconogr. 44, *pl. 26.* 1884.
Regelia innocentii Ind. Kew 4: 694. 1895.

Brazil: Cultivated, *Foster* 1227 (GH).

Espírito Santo: Santa Teresa, *Foster* 303 (GH).

Rio de Janeiro: Serra dos Orgãos, *Ule* (R). Teresópolis, *Sampaio* 1725 (R); *L. B. Smith* 1520 (GH); *Ule* 4130 (R); *Velloso* (R).

Distrito Federal: Rio de Janeiro, *Reitz* 4804 (! Reitz).

São Paulo: Alto da Serra, *Foster* 366 (GH, R); *Hoehne* (SP, US); *L. B. Smith* 1924 (GH); 1970 (BM, GH). Ipiranga, *Luederwaldt* (GH, SP). Patrimônio, *Kuhlmann & Lemos* (SP).

Paraná: Ipiranga, *Dusén* 3554 (R); 17340 (S). Pôrto de Cima, *Dusén* 7002 (S).

Santa Catarina: Mun. Biguaçú: Fachinal, *Reitz* C-939 (HBR). Mun. São Francisco do Sul; Pôrto das Canoas, *Smith & Reitz* 5700 (R, US).

6b. ***Nidularium innocentii*** var. ***wittmackianum*** (Harms) L. B. Smith, Anais Bot. Herb. Barbosa Rodrigues 4:34. 1952.

Nidularium wittmackianum Harms, Notizblatt 10:220. 1928.

BRAZIL: Cultivated, *Hort. Berlin* (B, type, F neg. 11283).

SÃO PAULO: Alto da Serra, *Foster* 368 (GH, R). Rio Cotia headwaters, *Gehrt* (GH, SP). Cubatão, *L. B. Smith* 2046 (GH). Mun. São Paulo: Florestal, *Foster* 344 (GH, R, US).

PARANÁ: Curitiba to Joinvile (Santa Catarina), *Inst de Malária* (HBR). Curitiba to Paranaguá, *Reitz* 5739 (HBR, US). Serra do Mar, Volta Grande, *Dusén* 17206 (GH, S).

6c. ***Nidularium innocentii*** var. ***striatum*** Wittm. Gartenflora 37:422. 1888.

Nidularium striatum Hort. Bull. Cat. 1890.

BRAZIL: Described from cultivation. No material seen.

6d. ***Nidularium innocentii*** var. ***lineatum*** (Mez) L. B. Smith, p. 32.

Nidularium lineatum Mez, Repert. Sp. Nov. Fedde 12:412. 1913.

BRAZIL: Cultivated, *Hort. Koenigsberg* (B, type, F neg. 11271).

6e. ***Nidularium innocentii*** var. ***paxianum*** (Mez) L. B. Smith, Anais Bot. Herb. Barbosa Rodrigues 2:14. 1950.

Nidularium paxianum Mez, Gartenflora 44:297, *pl. 1415*. 1895.

SÃO PAULO: Alto da Serra, *Foster* 367 (GH, R); *L. B. Smith* 1842 (B, F, GH, K, US). Embú-Guassú, Serra do Mar, *Pires* (SP). São Paulo, *Ostermeyer* (SP).

PARANÁ: Alto da Serra do Mar, km. 48 from Curitiba, *Tessmann* (US). Curitiba, *Foster* 420 (GH, R). Curitiba to Joinvile near the Santa Catarina line, *Inst. Maláriologia* (! Reitz); *Reitz* 3758-a (HBR). Curitiba to Morrêtes, *M. Kuhlmann* (SP, US). Curitiba to Paranaguá, *Reitz* 5738 (! Reitz). Jacareí, *Dusén* 11428 (GH, S); 17076 (GH, S). Paranaguá, *Tessmann* (US). Pôrto da Cima, *Dusén* 14311 (S, US).

SANTA CATARINA: Cultivated, *H. Strauss* (B, type, F neg. 11280). Orleães, *Reitz* 1758 (HBR, US). Mun. Araquari: Itajubá, *Reitz* 3758-i (HBR). Mun. Araranguá: Maracanã, *Reitz* C-477 (GH, HBR, US). Mun. Biguaçú: Fachinal, *Reitz* 4083 (HBR). Mun. Brusque: Azambuja, *Reitz* C-1832 (HBR, US); 3571 (HBR, US). Brusque, *Reitz* 3182 (HBR); 3632 (HBR); *L. B. Smith* 5660 (R, RB, US). Mata São Pedro, *Reitz* (! Reitz). Mun. Itajaí: Rio Canoas, Luiz Alves, *Reitz* 5157 (! Reitz). Mun. Jaraguá do Sul: Corupá, *Seidel* 11 (HBR).

7. ***Nidularium rutilans*** E. Morr. Belg. Hortic. 35:81. 1885.

Karatas rutilans Baker, Handb. Bromel. 9. 1889.

BRAZIL: Cultivated, *Loefgren* (SP).

RIO DE JANEIRO: Itatiaia, *Brade* 15725 (RB, US); 17506 (RB). Petrópolis, *Glaziou* 16444 (B, F neg. 11279).

8. ***Nidularium purpureum*** Beer, Bromel. 75. 1857.

1. Petals rose toward the apex..... Var. a. **purpureum**
1. Petals wholly white..... Var. b. **albiflorum**

8a. ***Nidularium purpureum*** var. ***purpureum***

Karatas purpurea Antoine, Phyto-Iconogr. 42, *pl. 25*. 1884.

BRAZIL: Cultivated, *Hort. Berlin* (B, F neg. 11275).

ESPÍRITO SANTO: Santa Teresa, *Foster* 263 (GH, R).

Rio de Janeiro: Valério, Serra de Friburgo, *J. G. Kuhlmann* (RB).
Distrito Federal: Copacabana, *Glaziou* 15493 (B, F neg. 11275). Gavea, *Smith & Mus. R* 6454 (R, US). Tijuca, *Brade* 10413 (R).
São Paulo: Mogi das Cruzes, *Foster* 1232 (GH). Sorocaba, Santos, *Mosén* 2977 (S). Tremembé, *Everett* (GH).
Paraná: Curitiba, *Foster* 1201 (GH).

8b. ***Nidularium purpureum*** var. ***albiflorum*** L. B. Smith, Contr. Gray Herb. 127: 20. 1939.

Fig. 75.

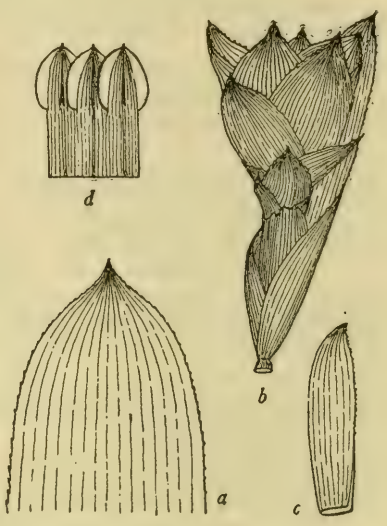

Fig. 76.

Fig. 75.—*Nidularium innocentii* var. *innocentii: a,* Primary bract and young branch, × ½; *b,* floral bract and flower, × 1. (Both after Antoine.)
Fig. 76.—*Nidularium itatiaiae: a,* Apex of leaf, × 1; *b,* inflorescence, × ¼; *c,* floral bract, × 1; *d,* sepals, × 1.

São Paulo: São Paulo, *Doering* (SP, type, GH neg. 3375).

9. ***Nidularium regelioides*** Ule, Bericht. Deutsch. Bot. Gesellsch. 16: 351, *pl. 22, fig. 9.* 1898.
Espírito Santo: Santa Teresa, *Foster* 317 (GH).
Rio de Janeiro: Itatiaia, *Ferreira* 1783 (GH, S); 1800 (B, FM, GH, US); *L. B. Smith* 1442 (GH); 1624 (GH); 1626 (GH); 1775 (GH, NY, US). Nova Friburgo, *Ule* 4666 (B, type); 4672 (B, F neg. 11276). Petrópolis, *Foster* 15 (GH).
São Paulo: Rio Quilombo, *Foster* 489 (GH).

10. ***Nidularium itatiaiae*** L. B. Smith, p. 32, fig. 76.
Rio de Janeiro: Itatiaia, *Foster* 118 (GH, type, US neg. 4264).

11. ***Nidularium longiflorum*** Ule, Bericht. Deutsch. Bot. Gesellsch. 14: 408. 1896.

DISTRITO FEDERAL: Tijuca, *Brade* 10744 (R); *Foster* 324 (GH, US); *Smith & Brade* 2242 (GH); 2243 (GH, S); *Ule* 4036 (B, type (F, neg. 11273), R); 4131-A (R, US).

12. ***Nidularium pauciflorum*** Ule, Bericht. Deutsch. Bot. Gesellsch. 16: 353. 1898.

1. Leaves green..... Var. a. **pauciflorum**
1. Leaves bright red..... Var. b. **sanguineum**

12a. ***Nidularium pauciflorum*** var. ***pauciflorum***

RIO DE JANEIRO: Nova Friburgo, *Ule* 4651 (B, type, F neg. 11274). Old road below Petrópolis, *Smith & Mus. R* 6498 (US).

DISTRITO FEDERAL: Tijuca, *Brade* 10411 (R).

12b. ***Nidularium pauciflorum*** var. ***sanguineum*** Ule, Bericht. Deutsch. Bot. Gesellsch. 16: 353. 1898.

BRAZIL: No material cited but probably from the same place as the typical variety.

13. ***Nidularium antoineanum*** Wawra, Oesterr. Bot. Zeitschr. 30: 113. 1880.
Nidularium antoineanum var. *angustifolium* Wawra, Oesterr. Bot. Zeitschr. 30: 114. 1880.
Karatas antoineana Baker, Handb. Bromel. 6. 1889.

MINAS GERAIS: Serra do Picú, *Glaziou* 13247 (! Mez).

RIO DE JANEIRO: Teresópolis, *Foster* 976 (GH); 998 (GH); *Wawra* II-321a (W, type).

SÃO PAULO: Serra da Bocaina, *Brade* 21154 (RB, US).

14. ***Nidularium neglectum*** (Baker) Hort. Makoy ex Mez in DC. Monogr. Phan. 9: 99. 1896.
Karatas neglecta Baker, Handb. Bromel. 6. 1889.

BRAZIL: Described from cultivation, no material seen.

15. ***Nidularium ferdinando-coburgii*** Wawra, Oesterr. Bot. Zeitschr. 30: 112. 1880.
Karatas ferdinando-coburgii Baker, Handb. Bromel. 6. 1889.

RIO DE JANEIRO: Petrópolis, *Wawra* II-101 (W, type). Teresópolis, *Sampaio* 2066 (R); *Wawra* II-370 (W).

16. ***Nidularium wettsteinii*** Mez, Repert. Sp. Nov. Fedde 16: 4. 1919.

SÃO PAULO: Described from material cultivated in Vienna.

17. ***Nidularium terminale*** Ule, Bericht. Deutsch. Bot. Gesellsch. 16: 348, *pl. 22, figs. 2–5.* 1898.

DISTRITO FEDERAL: Tijuca, *Ule* 4162 (B, type; R).

18. ***Nidularium apiculatum*** L. B. Smith, p. 32.

1. Sepals entire..... Var. a. **apiculatum**
1. Sepals serrulate..... Var. b. **serrulatum**

18a. ***Nidularium apiculatum*** var. ***apiculatum.*** Fig. 77.

RIO DE JANEIRO: Itatiaia, *Foster* 124 (GH, type, US neg. 4265); *Ule* 290 (R).

18b. ***Nidularium apiculatum*** var. ***serrulatum*** L. B. Smith, p. 32.

RIO DE JANEIRO: Itatiaia, *Foster* 121 (GH, type, US neg. 4266).

19. ***Nidularium utriculosum*** Ule, Bericht. Deutsch. Bot. Gesellsch. 16: 347, *pl. 22, fig. 1.* 1898.

ESPÍRITO SANTO: Santa Teresa, *Foster* no. C (GH).
DISTRITO FEDERAL: Copacabana, *Ule* 4163 (B, type (F neg. 11282), R).

20. ***Nidularium rubens*** Mez in Mart. Fl. Bras. 3, pt. 3: 220. 1891.
RIO DE JANEIRO: Serra do Picú, *Glaziou* 13248 (B, type, F neg. 11278).
SÃO PAULO: Alto da Serra, *Foster* 377 (GH, R); *Hoehne* (SP, US); *J. Lemos* 1971 (GH). Boracéa, *Blanco* (SP).

21. ***Nidularium scheremetiewii*** Regel, Ind. Sem. Hort. Petrop. for 1857. 28. 1858; Gartenflora 7: 137, *pl. 224.* 1858.
Karatas scheremetiewii Antoine, Phyto-Iconogr. 46, *pl. 27.* 1884.
Nidularium corcovadense Ule, Bericht. Deutsch. Bot. Gesellsch. 18: 321. 1900.
ESPÍRITO SANTO: Santa Teresa, *Foster* 260 (GH, R); 264 (GH); 1213 (GH).
RIO DE JANEIRO: Barreira, Teresópolis, *Duarte & Pereira* (RB, US).
DISTRITO FEDERAL: Alto da Boa Vista, *Reitz* 3915 (HBR). Corcovado, *Duarte & Paulo* 420 (RB); *Ule* 4131 (R); 4962 (B, type of *Nidularium corcovadense* Ule, F neg. 11270). Estrada Dona Castorina, Jardim Botânico to Alto da Boa Vista, *L. B. Smith* 1373 (GH, S). Paineiras, Corcovado, *L. B. Smith* 1217 (BM, GH, K). Paineiras to Jardim Botânico, *L. B. Smith* 1399 (B, F, GH, S, US). Rio de Janeiro, *Lhotsky* (BM, US neg. 4006).
SANTA CATARINA: Ribeirão Grande, Taió, *Reitz* (HBR, US); 3836 (HBR); 3997 (HBR). Rio Maracujá, Anitápolis, *Reitz* 4538 (HBR). Mun. Biguaçú: Fachinal, *Reitz* 4129 (HBR).

22. ***Nidularium procerum*** Lindm. Svensk. Akad. Handl. 24: no. 8: 16, *pl. 1, figs. 1–7.* 1891.
1. Leaves 4–10 dm. long, the blades 2–5 cm. wide..... Var. **procerum**
1. Leaves up to 4 dm. long, not over 3 cm. wide..... Var. **kermesianum**

22a. ***Nidularium procerum*** var. ***procerum***
Aechmea purpurea Baker, Handb. Bromel. 69. 1889.
Nidularium porphyreum Mez in Mart. Fl. Bras. 3, pt. 3: 219. 1891.
Nidularium affine Mez, Repert. Sp. Nov. Fedde 16: 4. 1919.
Nidularium angustifolium Ule, Bericht. Deutsch. Bot. Gesellsch. 16: 351. 1898.
BRAZIL: Cultivated, *Hort. Dahlem* (B, type of *Nidularium affine* Mez, F neg. 11267); *Sander* (LG, *Nidularium porphyreum* Mez).
ESPÍRITO SANTO: Rio Jucu, Vitória, *Foster* 212 (GH, R). Vargem Alta, *Foster* 927 (GH).
RIO DE JANEIRO: Cultivated, *Ule* 4037 in part (R).
DISTRITO FEDERAL: Serra da Bica, near Cascadura, *Glaziou* 15490 (P, GH neg. 2952); *Ule* 4039 (B, type of *Nidularium angustifolium* Ule, F neg. 11268).
SÃO PAULO: Ramal Mairink to Santos, *Lamber* (GH, SP). Rio Buturoca, Santos, *Mosén* 3706 (S, US). São Vicente, Santos, *Gehrt* (GH, SP).
PARANÁ: Caiobá, *Foster* 419-A (GH, R); *M. Kuhlmann* (SP). Curitiba, *Foster* 419 (GH, R). Near Santa Catarina line, Curitiba to Joinvile, *Reitz* 3889 (! Reitz). Serra, Curitiba to Joinvile, *Inst. Malariologia in Reitz* 3563 (HBR); *Reitz* 5759 (! Reitz). Serra, Curitiba to Morrêtes, *M. Kuhlmann* (SP, US). Jacareí, *Dusén* 17055 (GH, S). Morrêtes, *Dusén* 11933 (S); 14422 (S); 17064 (S). Paranaguá, *Foster* 432 (GH).

SANTA CATARINA: Blumenau, *Inst. Malariologia* (HBR); *Reitz* 3564 (HBR); 4141 (HBR). Joinvile, *Reitz* 3712 (! Reitz). Mun. Araranguá: Peroba, *Reitz* C-471 (GH, US). Mun. Florianópolis: Cacupé, *Inst. Malariologia* (HBR). Rio Tavares, *Smith & Reitz* 6186 (R, US). Mun. Itajaí: Praia Braba, *Foster* 2518 (R, US); *Reitz* 2292 (HBR, US). Mun. São Francisco do Sul: Porto das Canoas, *Smith & Reitz* 5698 (R, RB, US). São Francisco do Sul, *Reitz* 3728 (HBR, US); 3878 (HBR).

22b. ***Nidularium procerum*** var. ***kermesianum*** (Fritz Mueller ex Mez) Reitz, Anais Bot. Herb. Barbosa Rodrigues 4: 18. 1952.

Nidularium kermesianum Fritz Mueller ex Mez, Engl. Pflanzenreich IV. 32: 62. 1934.

PARANÁ: Curitiba to Paranaguá, *Reitz* 5754 (HBR, US).

SANTA CATARINA: Cultivated, *F. Mueller* (B, type). Joinvile, *Reitz* 4667 (HBR). Ribeirão Grande, Taió, *Reitz* 3994 (HBR). Mun. Araquari: Itapocu, *Reitz* 4597 (HBR). Mun. Blumenau: Morro do Cachorro, *Reitz* 4678 (! Reitz). Mun. Brusque: Ribeirão do Ouro, 3626 in part (HBR). Mun. Florianópolis: Ribeirão da Ilha, *Reitz* 3920 (HBR). Mun. Jaraguá do Sul: Corupá, *Seidel* 6 (HBR). Morro do Garrafão, Corupá, *Reitz* 4236 (HBR).

21. *Andrea* Mez

Andrea Mez in DC. Monogr. Phan. 9: 114. 1896.

A monotypic Brazilian endemic.

1. ***Andrea selloana*** (Baker) Mez in DC. Monogr. Phan. 9: 115. 1896. FIGURE 78.

Quesnelia selloana Baker, Handb. Bromel. 87. 1889.

BRAZIL: South-central Brazil, *Sellow* 1414 (B, type, F neg. 11301).

MINAS GERAIS: Serra de Ouro Preto, *Schwacke* 9157 (B, F neg. 11301). Mun. Jaboticatubas: Serra da Cipó, *Foster* 615 (GH).

22. *Bromelia* L.

Bromelia L. Sp. Pl. 285. 1753.

México and the West Indies to Paraguay and Argentina.

1. Scape evident although sometimes short; inflorescence rounded or acute; leaf-blades never petiolate. (Figs. 79, 80.)
   2. Sepals narrowed from near the base, acute or acuminate, carinate, 10–15 mm. long.
      3. Petals to 35 mm. long, twice as long as the sepals; inflorescence cylindric, 15–45 cm. long. (Fig. 79.) ..... 1. **B. laciniosa**
      3. Petals 15–16 mm. long, only a little longer than the sepals.
         4. Sepals acuminate; inflorescence subglobose..... 2. **B. reversacantha**
         4. Sepals broadly acute; inflorescence laxly cylindric.... 3. **B. arenaria**
   2. Sepals narrowed above the middle only, or oblong or spatulate.
      5. Floral bracts and sepals obtusely or not at all carinate, entire; ovaries exceeding the floral bracts; sepals straight.
         6. Branches of the inflorescence and flowers spreading; pedicels 15 mm. long or more; sepals 10 mm. long..... 4. **B. binotii**

6. Branches of the inflorescence and flowers erect or suberect; pedicels not over 10 mm. long; sepals 6–15 mm. long.
   7. Floral bracts 6–10 mm. long; sepals mostly oblong and obtuse; indument of the inflorescence white..... 5. **B. antiacantha**
   7. Floral bracts 15–20 mm. long; sepals elliptic, subacute; indument of the inflorescence ferruginous..... 6. **B. regnellii**
5. Floral bracts and sepals sharply carinate, conduplicate; sepals mostly cucullate.
   8. Branches of the inflorescence spreading; inflorescence sublax, pyramidal..... 7. **B. sylvicola**

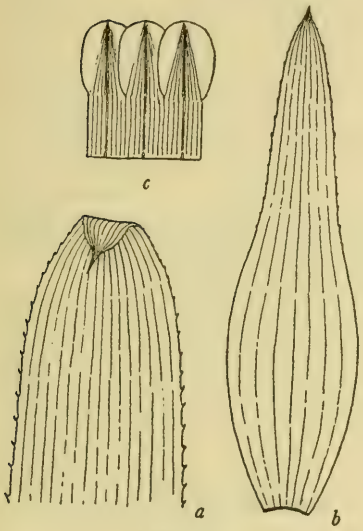

FIG. 77.

FIG. 78.

FIG. 77.—*Nidularium apiculatum* var. *apiculatum:* *a*, Apex of leaf, × 1; *b*, outer bract of inflorescence, × ½; *c*, sepals, × 1.

FIG. 78.—*Andrea selloana:* *a*, Habit, × ⅛; *b*, flower, × 1. (Both after Pflanzenreich.)

8. Branches of the inflorescence erect; inflorescence very dense, cylindric to globose.
   9. Floral bracts not dilated at the apex.
      10. Sepals and floral bracts soon glabrous; filament-tube 10 mm. long; scape and inflorescence elongate..... 8. **B. balansae**
      10. Sepals and floral bracts densely and persistently pale-lepidote; filament-tube 5–6 mm. long.
         11. Floral bracts equaling or exceeding the sepals; inflorescence subcorymbose..... 9. **B. glaziovii**
         11. Floral bracts distinctly exceeded by the sepals.
            12. Inflorescence globose; flowers 50 mm. long; scape not more than 1 dm. long..... 10. **B. lindmanii**

12. Inflorescence ellipsoid or short-cylindric, distinctly longer than broad; flowers 32–39 mm. long; scape elongate. (Fig. 80.) ..... 11. **B. interior**

9. Floral bracts elliptic-dilated at the apex.

13. Sepals elliptic, 12 mm. long..... 12. **B. exigua**

13. Sepals narrowly oblong, to 22 mm. long, serrulate. 13. **B. rondoniana**

1. Scape completely lacking; inflorescence corymbose, sunk in the center of the leaf-rosette. (Fig. 81.)

14. Leaf-blades not at all petiolate.

15. Filament-tube only 3 mm. long; sepals serrulate at the apex, 25–30 mm. long; indument of the inflorescence whitish..... 14. **B. legrellae**

15. Filament-tube 12–20 mm. long or more.

16. Scales of the inflorescence pale, slender and almost filiform; sepals obtuse, 17 mm. long; filament-tube only 12 mm. long. (Fig. 81.) 15. **B. villosa**

16. Scales of the inflorescence dark brown, broad; sepals acute or subacute.

17. Ovary 2 cm. long; sepals 25–27 mm. long..... 16. **B. lagopus**

17. Ovary to 8 cm. long; sepals 30–40 mm. long..... 17. **B. karatas**

14. Leaf-blades (or at least the outer ones) distinctly petiolate; sepals wholly or in greater part exserted above the floral bracts.

18. Petals dark-lepidote, connate for three-fourths of their length; sepals oblong, obtuse, cucullate, 21 mm. long, 7 mm. wide. 18. **B. morreniana**

18. Petals glabrous, short-connate; sepals linear, apiculate, 15 mm. long, 3 mm. wide..... 19. **B. scarlatina**

1. ***Bromelia laciniosa*** Mart. ex Schult. in R. & S. Syst. 7, pt. 2: 1278. 1830. FIGURE 79.

PIAUÍ: Buriti, *Dahlgren* 971 (GH, US). São João do Piauí, *Luetzelburg* (! Mez).

PARAÍBA: Soledade, *Luetzelburg* (! Mez).

BAÍA: Cultivated, *Occhioni* (RB). Jacobina, *Foster* 100 (GH, R). Joazeiro, *Luetzelburg* (! Mez). Machado Portelo, *Rose & Russell* 19904 (NY, US). Queimadas to Vila Nova da Rainha, *Martius* 2228 (M, type, F neg. 8641).

ESPÍRITO SANTO: Cachoeiro do Itapemirim, *Foster* 168 (GH, R). Vitória, *Foster* 195 (GH, R).

2. ***Bromelia reversacantha*** Mez in Mart. Fl. Bras. 3, pt. 3: 198. 1891.

GOIÁS: Rio Bagagem, *Pohl* 2205 (W, type).

3. ***Bromelia arenaria*** Ule, Bot. Jahrb. 42: 194. 1908.

BAÍA: Remanso, *Ule* 7151 (B, type, F neg. 11249).

4. ***Bromelia binotii*** E. Morr. ex Mez in Mart. Fl. Bras. 3, pt. 3: 192. 1891.

ESPÍRITO SANTO: Santa Teresa, *Foster* 857 (GH, US). Mun. Collatina: Collatina, *Foster* 226 (GH, R). Linhares, *Foster* 787 (GH, US).

RIO DE JANEIRO: Cultivated, *Jard. Bot. Liége* (LG, type).

5. ***Bromelia antiacantha*** Bertol. Virid. Bonon. 4. 1824; 4, Misc.: 6, *pl. 1.* 1844. *Bromelia acanga* sensu Willd. Enum. Hort. Berol. 346. 1809. Not. L. 1767. *Bromelia fastuosa* sensu Regel, Gartenflora 15: 1. 1866. Not Lindl. 1821.

Brazil: *Sellow* 3344 (GH, R, US).

Rio de Janeiro: Jurujuba, *Schwacke* (R). Monte Serrat, Itatiaia, *L. B. Smith* 1610 (GH).

Distrito Federal: Corcovado, *Duarte & Paulo* 421 (RB). Lagoa Rodrigo de Freitas, *Ule* 4613 (R). Praia Leblon, *Hoehne* 23 (GH, SP). Rio de Janeiro, *Foster* 497 (GH).

São Paulo: Guarujá, *L. B. Smith* 2031 (GH). Ipiranga, *Lucderwaldt* (SP, GH neg. 7167). Jaraguá, *M. Hoehne* (GH, SP). Lorena, *Delforge* (RB). São Roque, *Everett* (GH). Mun. Campinas: Indaiatuba, *Viegas* (SP).

Paraná: Jaguariaíva, *Dusén* 13286 (S, US).

Santa Catarina: Mafra, *Reitz* 3961 (! Reitz). Mun. Araquari: Itajuba, *Reitz* 3758-h (HBR). Mun. Araranguá: Sombrio, *Reitz* C-1188 (GH); 3897 (HBR). Mun. Criciúma: Sanga do Engenho, *Reitz* C-209 (GH, HBR). Mun. Florianópolis: Rio Vermelho, *Reitz* (HBR, US). Mun. Pôrto Belo: Canto Grande, *Reitz* (HBR).

Rio Grande do Sul: Pôrto Alegre, *Lindman* A-645 (S); *Reineck* (GH). São Leopoldo, *Eugenio* (GH); 129 (R, RB); 132 (NY). Esteio near São Leopoldo, *Rambo* (US).

Also: Uruguay.

6. ***Bromelia regnellii*** Mez in Mart. Fl. Bras. 3, pt. 3: 194, *pl. 53*. 1891.

Bromelia pinguin sensu Lindm. Svensk. Akad. Handl. 24: no. 8: 22, *pl. 8, figs. 1–8*. 1891. Not L. 1753.

Minas Gerais: Caldas, *Regnell* III-285 (S, type; US).

7. ***Bromelia sylvicola*** S. Moore, Trans. Linn. Soc. Bot. II. 4: 490. 1895.

Mato Grosso: Cuiabá, *Lindman* A-2349 (S). Diamantino to Santa Cruz, Rio Paraguai, *S. Moore* 489 (BM, type). Santa Ana da Chapada, *Lindman* A-2357 (S).

8. ***Bromelia balansae*** Mez in Mart. Fl. Bras. 3, pt. 3: 191. 1891.

Bromelia argentina Baker, Kew Bull. 194. 1892. In part, as to the plant from Paraguay.

Bromelia pinguin sensu Morong & Britton, Ann. N. Y. Acad. Sci. 7: 235. 1892. Not L. 1753.

Bromelia serra sensu Mez, Bull. Herb. Boiss. II. 3: 1035. 1903. Not Griseb. 1879.

Bromelia goyazensis Mez, Bot. Jahrb. 30, Beibl. 67: 2. 1901.

Minas Gerais: Contendas, *Saint-Hilaire* (P). Lagoa Santa, *Barreto* 2115 (R).

Goiás: (Meio Ponte), *Glaziou* 22190 (B, type of *Bromelia goyazensis* Mez, F neg. 11252).

Paraná: Jacareí, *Dusén* 14606 (GH, S). Jaguariaíva, *Dusén* 17439 (BM, GH, S, US).

Rio Grande do Sul: Palmeira, *Rambo* (! Rambo).

Also: Paraguay, Argentina.

9. ***Bromelia glaziovii*** Mez, Bot. Jahrb. 30, Beibl. 67: 1. 1901.

Goiás: Campos do Rio Gama, *Glaziou* 22189 (B, type, F neg. 11251; GH).

10. ***Bromelia lindmanii*** Mez in Mart. Fl. Bras. 3, pt. 3: 621. 1894.

Karatas laciniosa Lindm. Svensk. Akad. Handl. 24: no. 8: 18, *pl. 2, figs. 22–25*. 1891. Not *Bromelia lacinosa* Mart. 1830.

MINAS GERAIS: Cultivated, *Handro* 291 (SP, US). Caldas, *Regnell* III-1259 in part (US). Passos to Serra da Ventania, *Regnell* III-1258 in part (S, type; US).
SÃO PAULO: Tanabí, *Gehrt* (SP, US).

11. ***Bromelia interior*** L. B. Smith, p. 23, fig. 80.
GOIÁS: Mun. Goiás: Quintas, *Macedo* 3260 (US, type).

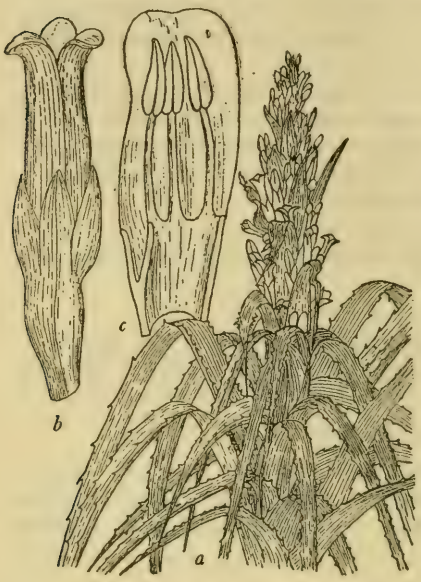

FIG. 79.

FIG. 80.

FIG. 79.—*Bromelia laciniosa: a,* Habit, × 1/6; *b,* flower, × 1.5; *c,* petal and stamens, × 1.5. (All after Antoine.)
FIG. 80.—*Bromelia interior: a,* Inflorescence, × 1/2; *b,* flower, × 1; *c,* sepal, × 1; petals and stamens, × 1.

MATO GROSSO: Aquiduana, Noreste R. R., *Foster* 1075 (GH). Braco, Rio Arinos, *Baldwin* 3103 (GH, US). Campo Grande, *Archer & Gehrt* 168 (SP, US). Coxipó da Ponte to Cuiabá, *Hoehne in Rondon* 4518 (R); *J. G. Kuhlmann* 86 (R).
SÃO PAULO: Itapura, *Foster* 1101 (GH).

12. ***Bromelia exigua*** Mez, Bot. Jahrb. 30, Beibl. 67: 2. 1901.
GOIÁS: Capelinha de Santo Antonio, *Glaziou* 22192 (B, type, F neg. 11250).

13. ***Bromelia rondoniana*** L. B. Smith, Bol. Mus. Nac. Rio de Janeiro nov. ser. no. 15: 1, *pl. 1, figs. a, b.* 1952.
RIO BRANCO: Caruá-açu, Serra da Lua, *Luetzelburg in Rondon* 21278 (R, type (US neg. 4199), M).

14. ***Bromelia legrellae*** (E. Morr.) Mez in Mart. Fl. Bras. 3, pt. 3: 189. 1891.
Karatas legrellae E. Morr. Belg. Hortic. 22: 129, *pls. 11–13.* 1872.
PARÁ: Cultivated from material sent by Linden, *Legrelle* (LG).

15. ***Bromelia villosa*** Mez, Bot. Jahrb. 30, Beibl. 67: 3. 1901. FIGURE 81.
GOIÁS: (Sitio de Baracão to Areias), *Glaziou* 22191 (B, type, F neg. 11255).
MATO GROSSO: Baú, *Lindman* A-2951 (S). Cuiabá, *Lindman* A-2431 (S).

16. ***Bromelia lagopus*** Mez in Mart. Fl. Bras. 3, pt. 3: 188. 1891.
BRAZIL: Cultivated, *E. Morren* (LG, type).
BAÍA: Agua Preta, *Foster* 80 (GH).

17. ***Bromelia karatas*** L. Sp. Pl. 285. 1753.
Karatas plumieri E. Morr. Belg. Hortic. 22: 131. 1872.
MARANHÃO: Ilha de São Luiz, *Fróes* 11967 (NY).
CEARÁ: Cultivated, *Brade* 13989 (RB).
BAÍA: Jacobina, *Foster* 99 (GH).
GOIÁS: *Weddell* 2663 (P, GH neg. 3037).
ALSO: MÉXICO and the WEST INDIES to COLOMBIA.

18. ***Bromelia morreniana*** (Regel) Mez in Mart. Fl. Bras. 3, pt. 3: 186. 1891.
Cryptanthus morrenianus Regel, Gartenflora 37: 157. 1888.
Distiacanthus morrenianus Baker, Handb. Bromel. 14. 1889.
PARÁ: Campos de Ariramba, Rio Jaramacarú, *Ducke* (MG). Cultivated, *E. Morren* (LG, type ?).

19. ***Bromelia scarlatina*** (Hort. ex Herincq) E. Morr. Belg. Hortic. 31: 164. 1881.
Distiacanthus scarlatinus Hort. ex Herincq, Hort. Français 246. 1869.
Disteganthus scarlatinus Nicholson, Dict. Gard. 1: 485. 1885.
Karatas scarlatina Harms, Engl. & Prantl, Pflanzenfam. ed. 2, 15a: 135. 1930.
PARÁ: Cultivated, *Jard. Bot. Liége* (LG, type ?).

23. *Acanthostachys* Kl.

Acanthostachys Kl. in Lk., Kl. & Otto, Ill. Pl. Rar. Hort. Berol. 1: 21, *pl. 9.* 1841.

Monotypic.

1. ***Acanthostachys strobilacea*** (Schult. f.) Kl. in Lk., Kl. & Otto, Ill. Pl. Rar. Hort. Berol. 1: 21, *pl. 9.* 1841. FIGURE 82.
Hohenbergia strobilacea Schult. f. in R. & S. Syst. 7, pt. 2: 1252. 1830.
Acanthostachys exilis Bertoni, An. Cient. Parag. II. no. 4: 301. 1919.
BRAZIL: Cultivated, *Atkinson* 16 (MT). *Borgmayer* (SP); *J. G. Kuhlmann* (HBR); *Saint-Hilaire* B1-1076 (P); *Sellow* bromel. 58-b (P).
ESPÍRITO SANTO: Domingos Martins, *Foster* 240 (GH, R). Itapemirim, *Foster* 167 (GH, R). Vitória, *Foster* 499 (GH).
MINAS GERAIS: Serra de Caracol, *Regnell* III-1260 in part (S). Fazenda do Diamante near Corinto, *Mexia* 5615-a (GH). Coronel Pacheco, *Heringer* 943 (SP). Lapinha, Lagoa Santa, *Hoehne in Rondon* 6660 (R); *Palacios* 3438 (LIL). Paraíba, *Claussen* 361 (P). (Fazenda do Pinhal), *Sellow* 5215 (R). Mun. Belo Horizonte: Belo Horizonte, *Melo Barreto* 2485 (R). Serra de Taquaril, *Oliveira* (IAN). Mun. Leopoldina: Domingos Pisoni, *Melo Barreto* 4424 (US).
RIO DE JANEIRO: Carmo, Vale do Paquequer, *Neves Armond* 318 (R). Formosa to Bananal, *Bowie & Cunningham* (BM).

DISTRITO FEDERAL: Andarí Grande, *Glaziou* 9327 (BM). Caminho da Canoa, Gavea, *Frazão* (RB).

SÃO PAULO: Cabreúva, *Hoehne* (SP). Campinas, *Novaes* 1208 (US). (Heitor Legrú), *G. Gehrt* (GH, SP). Ipiranga, *Luederwaldt* (SP). Itirapina, *G. Gehrt* (GH, SP). Monte Alegre, Amparo, *M. Kuhlmann* 407 (SP). Morro Pellado, *Edwall* (GH, SP). Pinhal, *M. Kuhlmann* 1559 (SP). Piraçununga, *Meira* (SP). Santos, *Mosén* 171 (R). São João de Bôa Vista, *Loefgren & Edwall* (GH, SP); *Mosén* 1731 (S); 4433 (S). São Simão, Casa Branca, *Regnell* III-1260 in part (S).

PARANÁ: Morungava, *Dusén* 16467 (BM, GH, S, US).

ALSO: PARAGUAY, ARGENTINA.

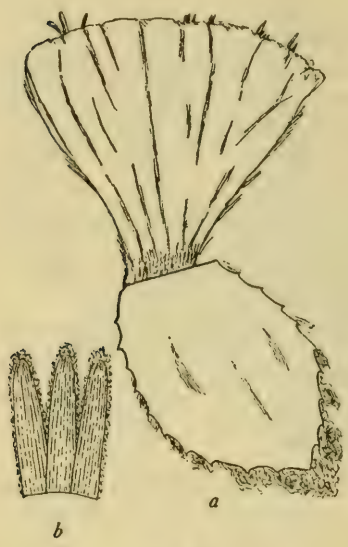

FIG. 81.

FIG. 82.

FIG. 81.—*Bromelia villosa: a,* Inflorescence, × ½; *b,* sepals (ventral side), × 1.

FIG. 82.—*Acanthostachys strobilacea: a,* Scape and inflorescence, × 1/20; *b,* inflorescence, × 1; *c,* flower, × 1; *d,* petal and stamen, × 1; *e,* pistil, × 1.

24. *Orthophytum* Beer

Orthophytum Beer, Flora 37: 347. 1854.
Prantleia Mez in Mart. Fl. Bras. 3, pt. 3: 257. 1891.
Sincoraea Ule, Bot. Jahrb. 42: 191. 1908.
Cryptanthopsis Ule, Bot. Jahrb. 42: 193. 1908.

Endemic to Brazil.

1. Scape lacking or short and hidden by the leaf-sheaths; inflorescence sunk in the center of the leaf-rosette.
   2. Leaf-blades linear, only 5–8 mm. wide.
      3. Sepals lanceolate, acute, 14 mm. long; leaf-blades laxly serrulate, 4–5 cm. long..... 1. **O. amoenum**

3. Sepals narrowly triangular, acuminate, 30 mm. long; leaf-blades densely serrulate, 30 cm. long..... 2. **O. navioides**

2. Leaf-blades narrowly triangular, 11–15 mm. wide, 3–6 cm. long; sepals narrowly triangular, spinose-acuminate, 14 mm. long.... 3. **O. saxicola**

1. Scape evident, well developed.

4. Inflorescence short and compact.

5. Flowers fasciculate; inflorescence capitiform.

6. Primary bracts lanceolate without distinction between sheath and blade; sepals narrowly triangular, spinose-acuminate, 14 mm. long, entire, glabrous or subglabrous..... 3. **O. saxicola**

6. Primary bracts with a large ovate sheath and narrowly triangular caudate-acuminate blade; sepals oblong, acute, 17–20 mm. long, mucronate, serrulate, densely white-lanate apically. 4. **O. mello-barretoi**

5. Flowers spicate; inflorescence digitate; floral bracts straight; sepals 12 mm. long; the posterior ones very broadly alate. (Fig. 83.) 5. **O. rubrum**

4. Inflorescence elongate, lax at least toward the base.

7. Scape-bracts lanceolate, abruptly acuminate; sepals 10 mm. long.

8. Leaf-spines 8 mm. long; sepals lanate toward the apex. 6. **O. leprosum**

8. Leaf-spines 2 mm. long; sepals and all the remainder of the inflorescence glabrous..... 7. **O. glabrum**

7. Scape-bracts linear-triangular, long-caudate.

9. Upper primary bracts with elongate blades; sepals 16–17 mm. long. 8. **O. foliosum**

9. Upper primary bracts with short blades or without distinct blades, scarcely more than twice as long as the spikes.

10. Leaf-scales wholly appressed; inflorescence dense for about half its length; sepals 15 mm. long. (Fig. 84.).. 9. **O. maracasense**

10. Leaf-scales spreading and crisped; inflorescence lax for more than three-fourths of its length; sepals 11 mm. long. (Fig. 85.) 10. **O. disjunctum**

1. ***Orthophytum amoenum*** (Ule) L. B. Smith, p. 33.
Sincoraea amoena Ule, Bot. Jahrb. 42: 191, *fig. 1 A-F.* 1908.
BAÍA: Serra do Sincorá, *Ule* 7106 (B, type).

2. ***Orthophytum navioides*** (L. B. Smith) L. B. Smith, p. 34.
Cryptanthopsis navioides L. B. Smith, Contr. Gray Herb. 129: 31, *pl. 3, figs. 4–6.* 1940.
BAÍA: Jacobina, *Foster* 90 (GH, type; R, US).

3. ***Orthophytum saxicola*** (Ule) L. B. Smith, p. 34.
Cryptanthopsis saxicola Ule, Bot. Jahrb. 42: 193, *fig. 1 G-K.* 1908.
BAÍA: Maracás, *Foster* 2471-A (US); *Ule* 7031 (B, type). Salvador to Milagres, *Foster* 2441 (US).

4. ***Orthophytum mello-barretoi*** L. B. Smith, Bol. Mus. Nac. Rio de Janeiro nov. ser. no. 15: 2, *pl. 1, figs. c-e.* 1952.
MINAS GERAIS: Mun. Jaboticatubas: Serra do Cipó, *Foster* 631 (GH); *Melo Barreto* 2121 (R, type; US); *Pires & Black* 2719 (IAN). Palacio, Serra do Cipó, km. 127, *Melo Barreto* 7665 (R).

5. ***Orthophytum rubrum*** L. B. Smith, p. 34, fig. 83.
BAÍA: Table Rock near Maracás, *Foster* 2444 (US, type).

6. ***Orthophytum leprosum*** (Mez) Mez, in DC. Monogr. Phan. 9: 117. 1896.
Prantleia leprosa Mez in Mart. Fl. Bras. 3, pt. 3: 259, *pl. 58, fig. 2.* 1891.
BRAZIL: *Glaziou* 14035 (K, US neg. 4184).
GOIÁS (?): Cachoeira do Inferno, *Pohl* 5229 (W, type).

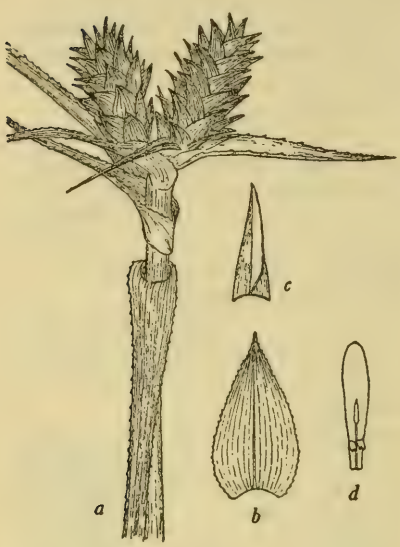

FIG. 83.

FIG. 84.

FIG. 83.—*Orthophytum rubrum: a,* Scape and inflorescence (after M. B. Foster), × ½; *b,* floral bract, × 1; *c,* sepal, × 1; *d,* petal and stamen, × 1.
FIG. 84.—*Orthophytum maracasense: a,* Inflorescence, × ½; *b,* floral bract and flower (after M. B. Foster), × 1; *c,* sepal, × 1.

7. ***Orthophytum glabrum*** (Mez) Mez in DC. Monogr. Phan. 9: 117. 1896.
Prantleia glabra Mez in Mart. Fl. Bras. 3, pt. 3: 258, *pl. 58, fig. 1.* 1891.
MINAS GERAIS: São Miguel, *Pohl* 3436 (BR, type, GH neg. 2792).

8. ***Orthophytum foliosum*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 58, *pl. 74.* 1941.
ESPÍRITO SANTO: *Foster* 2487 (US). Santa Teresa, *Foster* 288 (GH, type; R, US); 881 (GH, US).
MATO GROSSO: Camizão, *Foster* 1079 (GH).

9. ***Orthophytum maracasense*** L. B. Smith, p. 33, fig. 84.
BAÍA: Maracás, *Foster* 2471 (US, type; US neg. 4245).

10. ***Orthophytum disjunctum*** L. B. Smith, p. 33, fig. 85.
PARAÍBA: Queimada to Caruarú (in Pernambuco), *Foster* 2419 (US, type).
PERNAMBUCO: Mun. Quipapa: Engenheiro Pelada, *Silva & Leal* 247 (RB, US).

25. *Canistrum* E. Morr.

Canistrum E. Morr. Belg. Hortic. 23: 257. 1873.

Endemic to Brazil except for one species in Trinidad.

1. Scape completely covered by its entire bracts; pollen-grains with many pores; sepals strongly asymmetric, 15–17 mm. long..... 1. **C. aurantiacum**
1. Scape largely naked; pollen-grains biporate so far as known.
   2. Inflorescence and scape glabrous or inconspicuously appressed-lepidote.
      3. Leaf-spines not more than 3 mm. long; scape long and slender; sepals 16–30 (rarely to 34) mm. long.
         4. Sepals narrowly triangular, subsymmetric, 22–34 mm. long; scape-bracts and primary bracts serrate. (Fig. 86.) 2. **C. cyathiforme**
         4. Sepals strongly asymmetric with a broadly truncate apex, 16 mm. long; scape-bracts and primary bracts entire.... 3. **C. fosterianum**
      3. Leaf-spines to 7 mm. long; scape short and stout so that the inflorescence is but little elevated above the leaf-sheaths; sepals 38 mm. long. 4. **C. giganteum**
   2. Inflorescence and scape densely ferruginous-lanate.
      5. Scape 4 mm. in diameter; inflorescence 6–7 cm. in diameter without the bracts; petals bearing 2 narrow calli..... 5. **C. perplexum**
      5. Scape stout; inflorescence 7–12 cm. in diameter without the bracts; petals bearing 2 fimbriate scales at the base. (Fig. 87.)..... 6. **C. lindenii**

1. ***Canistrum aurantiacum*** E. Morr. Belg. Hortic. 23: 257, *pl. 15.* 1873.
   Aechmea aurantiaca Baker, Journ. Bot. 17: 235. 1879.

Brazil: Cultivated, *E. Morren* (LG, type ?).

Pernambuco: (Dois Irmãos), *Ridley, Lea & Ramage* (BM). Recife, *Foster* 2428 (GH, US).

2. ***Canistrum cyathiforme*** (Vell.) Mez in Mart. Fl. Bras. 3, pt. 3: 252. 1891. Figure 86.
   Tillandsia cyathiformis Vell. Fl. Fluminensis 137. 1825; Icon. 3: *pl. 144.* 1835.
   Karatas regnellii Baker, Handb. Bromel. 10. 1889. In part, not as to type (*Nidularium giganteum*).
   Regelia regnellii Lindm. Oefvers. Vet. Akad. Förhandl. 47: 543. 1890.
   Mosenia sicarius Lindm. Svensk. Akad. Handl. 24: no. 8: 27, *pl. 5, figs. 1–11.* 1891.
   Canistrum regnellii Mez in Mart. Fl. Bras. 3, pt. 3: 252. 1891.
   Canistrum schwackeanum Mez, Bot. Jahrb. 30, Beibl. 67: 4. 1901.

Brazil: *Sellow* (B, F neg. 11304); *Voss* (GH, SP).

Minas Gerais: Pedra Branca, Caldas, *Regnell* III-1259 (B (F neg. 11303), S, US). Corrego Alegre, *Kuhlmann & Gehrt* (GH, SP). Pouso Alegre, *Salvador* (GH, SP).

Rio de Janeiro: Cachoeira do Rancho Frio, Serra dos Orgãos, *Brade* 16627 (RB). Teresópolis, *Foster* 1014 (GH, US).

São Paulo: Alto da Serra, *Hoehne* (GH, SP); *L. B. Smith* 1843 (B, GH, S). Apiai, *M. Kuhlmann* (GH, SP). Campos da Bocaina, *Loefgren & Edwall* (SP, GH neg. 7174). Serra da Bocaina, *Brade* 21150 (RB, US). Campos

do Jordão, *Eugenio* 3346 (GH). Cunha, *Kiehl & Franco* (SP). Sorocaba, Santos, *Mosén* 3705 (S). Mun. Amparo: Monte Alegre, *M. Kuhlmann* 981 (SP). Mun. São Paulo: Cantareira, *Hoehne* (GH, SP). Estação Florestal, *Foster* 340 (GH, R).

PARANÁ: Banhado, Serra do Mar, *Dusén* 15489-b (GH, S, US). Roça Nova, Curitiba, *Dusén* 2318 (R). Jaguariaíva, *Dusén* 11716 (S, US); 14948 (S, US). Mun. Piraquara: Estrada da Graciosa, Alto da Serra, *Hatschbach* 3054 (US).

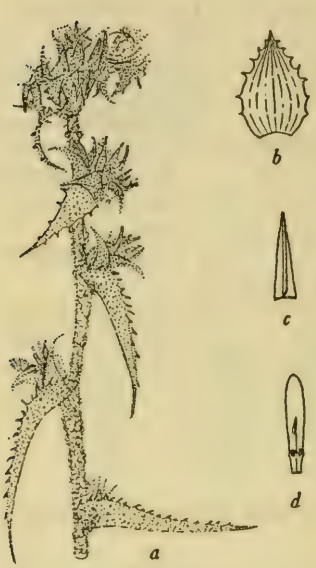

FIG. 85.

FIG. 86.

FIG. 85.—*Orthophytum disjunctum: a,* Inflorescence, × ½; *b,* floral bract, × 1; *c,* sepal, × 1; *d,* petal and stamen, × 1.

FIG. 86.—*Canistrum cyathiforme: a,* Habit, × 1/20; *b,* inflorescence, × ¼; *c,* floral bract and flower, × ½; *d,* sepal, × ½; *e,* petal and stamens, × ½. (All after Lindman.)

3. ***Canistrum fosterianum*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 2: 195, *pl. 62.* 1952.

BAÍA: Salvador, *Foster* 2479 (US, type).

4. ***Canistrum giganteum*** (Baker) L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 2: 118. 1950.

Nidularium giganteum Baker, Journ. Bot. 18: 50. 1880.

Karatas regnellii Baker, Handb. Bromel. 10. 1889. In part, as to type.

Canistrum cyathiforme Mez in Mart. Fl. Bras. 3, pt. 3: 252, *pl. 57.* 1891. In part, as to description and illustration, not as to basonym.

Canistrum ingratum Mez, Bot. Jahrb. 30, Beibl. 67: 3. 1901.

MINAS GERAIS: Passo Quatro, *Zikan* (SP). Serra da Mantiqueira, *Magelhães* 1585 (B, type of *Canistrum ingratum* Mez, F neg. 11302). Serra do Picú, *Glaziou* 11692 (FM, US, isotypes). Mun. Jaboticatubas: Serra do Cipó, *Foster* 609 (GH, US).

Rio de Janeiro: Itatiaia, *Brade* 14051 (RB, US neg. 4204); *Ferreira in L. B. Smith* 1713 (F, GH); *Foster* 128 (GH, R); *L. B. Smith* 1776 (GH).
São Paulo: Serra da Bocaina, *Brade* 21155 (RB, US).

5. ***Canistrum perplexum*** L. B. Smith, Proc. Amer. Acad. 70: 148, *pl. 1, figs. 12–15.* 1935.

São Paulo: Alto da Serra, *Foster* 373 (R); *M. Kuhlmann* (SP, US); *L. B. Smith* 1969 (GH, type). Jard. Bot. São Paulo, *Hoehne* (SP).

6. ***Canistrum lindenii*** (Regel) Mez in Mart. Fl. Bras. 3, pt. 3: 256. 1891.

1. Primary and outer bracts yellowish white to nearly white, sometimes faintly green at apex; inflorescence 100–500-flowered..... Var. a. **lindenii**
2. Inflorescence sunk in the center of the rosette or raised only slightly. Var. a. **lindenii** forma 1. **exiguum**
2. Inflorescence raised 20 cm. or more above the center of the rosette. Var. a. **lindenii** forma 2. **elatum**

1. Primary and outer bracts colored green or rose; inflorescence 50–90-flowered.
3. Primary and outer bracts green..... Var. b. **viride**
4. Inflorescence raised 20 cm. or more above the center of the rosette. Var. b. **viride** forma 1. **magna**
4. Inflorescence sunk in the center of the rosette or raised only slightly. Var. b. **viride** forma 2. **parva**
3. Primary and outer bracts rose to bright red..... Var. c. **roseum**
5. Inflorescence raised 15 cm. or more above the center of the rosette. Var. c. **roseum** forma 1. **procerum**
5. Inflorescence sunk in the center of the rosette or raised only slightly. Var. c. **roseum** forma 2. **humile**

6a. ***Canistrum lindenii*** var. ***lindenii***

6a1. Forma ***exiguum*** Reitz, Anais Bot. Herb. Barbosa Rodrigues 2: 37. 1950.
Nidularium lindenii Regel, Ind. Sem. Hort. Petrop. for **1868**: 78. 1869.
Canistrum eburneum E. Morr. Belg. Hortic. 28: 207. 1878.
Aechmea eburnea Baker, Handb. Bromel. 69. 1889.

Brazil: Cultivated, *Hort. Liége* (LG, type).
Santa Catarina: Mun. Brusque: Brusque, *Reitz* 3646 (HBR); 3849 (HBR, US). Limeira, *Reitz* (HBR). Mun. Florianópolis: Itacorubí, *Smith & Reitz* 6153 (R, US). Mun. Itajaí: Praia Braba, *Smith & Reitz* 6096 (R, RB, US). Mun. Pôrto Belo: Canto Grande, *Reitz* 3620 (HBR); 3620-a (HBR).

6a. ***Canistrum lindenii*** var. ***lindenii***

6a2. Forma ***elatum*** Reitz, Anais Bot. Herb. Barbosa Rodrigues 2: 37. 1950.
Santa Catarina: São Francisco do Sul, *Reitz* 3672 (HBR, type). Mun. Itajaí: Praia Braba, *Reitz* 4482 (HBR).

6b. ***Canistrum lindenii*** var. ***viride*** (E. Morr.) Reitz, Anais Bot. Herb. Barbosa Rodrigues 2: 38. 1950.

6b1. Forma ***magnum*** Reitz, Anais Bot. Herb. Barbosa Rodrigues 4: 19. 1952.
Canistrum viride E. Morr. Catal. 7. 1873, nomen; Belg. Hortic. 24: 376, *pl. 16.* 1874.
Aechmea viridis Baker, Journ. Bot. 17: 235. 1879.
Canistrum lindenii var. *viride* forma *elatum* Reitz, Anais Bot. Herb. Barbosa Rodrigues 2: 38. 1950.

PARANÁ: Ilha das Peças, Baía de Paranaguá, *Hort. Liége* (LG, type).
SANTA CATARINA: Mun. Brusque: Ribeirão do Ouro, *Reitz* (HBR); 3917 (HBR).

6b2. Forma ***parvum*** Reitz, Anais Bot. Herb. Barbosa Rodrigues 4: 19. 1952.
Canistrum lindenii var. *viride* forma *exiguum* Reitz, Anais Bot. Herb. Barbosa Rodrigues 2: 38. 1950.
SANTA CATARINA: Mun. Brusque: Brusque, *Reitz* 3918 (HBR). Ribeirão do Ouro, *Reitz* 3586 (HBR). Mun. Florianópolis: Cacupé, *Inst. Malariologia* (HBR). Ribeirão da Ilha, *Reitz* 3922 (HBR). Mun. Nova Trento: Morro do Bom Socorro, *Reitz* 3647 (HBR); 3914 (HBR). Mun. Palhoça: Garopaba, *Reitz* 3698 (HBR).

6c. ***Canistrum lindenii*** var. ***roseum*** (E. Morr.) L. B. Smith, Anais Bot. Herb. Barbosa Rodrigues 2: 14. 1950.

6c1. Forma ***procerum*** Reitz, Anais Bot. Herb. Barbosa Rodrigues 4: 19. 1952. FIGURE 87.
Canistrum roseum E. Morr. Belg. Hortic. 29: 301. 1879.
Aechmea rosea Baker, Handb. Bromel. 68. 1889.
? *Aechmea fusca* Baker, Handb. Bromel. 69. 1889.
? *Canistrum fuscum* E. Morr. ex Mez in Mart. Fl. Bras. 3, pt. 3: 257. 1891.
? *Canistrum binotii* Mez, Repert. Sp. Nov. Fedde 16: 5. 1919.
Canistrum lindenii var. *roseum* forma *elatum* Reitz, Anais Bot. Herb. Barbosa Rodrigues 2: 38. 1950.
BRAZIL: Cultivated, *Atkinson* 120 (MT); *Comte de Germiny* (LG, type, GH neg. 2932).
ESPÍRITO SANTO: Santa Teresa, *Foster* 292 (GH, R).
RIO DE JANEIRO: Petrópolis, *Foster* 337 (GH, R). Teresópolis, *collector?* (R).
SÃO PAULO: Moinho Velho, *Gehrt* (GH, SP). Sorocaba, Santos, *Mosén* 3803 (S).
PARANÁ: Curitiba to the sea, *Foster* 456 (GH). Jacareí, *Dusén* 15522 (GH, S); 17054 (GH, S). Volta Grande, *Dusén* 12069 (S).
SANTA CATARINA: Blumenau, *Reitz* (HBR). Mun. Biguaçú: Fachinal, *Reitz* 4155 (HBR). Mun. Brusque: Ribeirão do Ouro, *Reitz* (HBR); 3561 in part (HBR, US); 3587 (HBR).

6c2. Forma ***humile*** Reitz, Anais Bot. Herb. Barbosa Rodrigues 4: 19. 1952.
Canistrum lindenii var. *roseum* forma *exiguum* Reitz, Anais Bot. Herb. Barbosa Rodrigues 2: 38. 1950.
SANTA CATARINA: Mun. Araranguá: Sombrio, *Reitz* C-1011 (GH, HBR). Mun. Brusque: Mata Azambuja, *Inst. Malariologia* (HBR). Brusque, Mata São Pedro, *Reitz* 3181 (HBR, US). Mun. Florianópolis: Ribeirão da Ilha, *Reitz* 3833 (HBR); 3928 (HBR).

26. *Wittrockia* Lindm.

Wittrockia Lindm. Svensk. Akad. Handl. 24: no. 8: 15, 20. 1891.

Endemic to Brazil.

1. Petals acute; leaves coriaceous when dry, bearing spines up to 4 mm. long. (Fig. 88.) ..... 1. **W. superba**

1. Petals obtuse; leaves thin, submembranaceous or papyraceous when dry, finely serrulate.
   2. Sepals nearly or quite free.
      3. Inflorescence raised above the leaf-sheaths on a slender scape; leaf-blades 20 mm. wide, green; sepals subsymmetric..... 2. **W. minuta**
      3. Inflorescence sunk in the center of the leaf-rosette; leaf-blades 45 mm. wide; sepals strongly asymmetric..... 3. **W. amazonica**

FIG. 87.

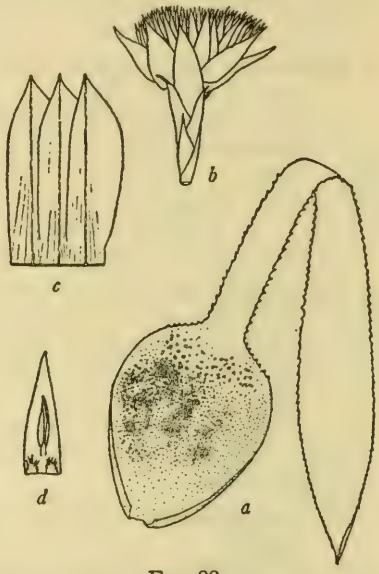

FIG. 88.

FIG. 87.—*Canistrum lindenii* var. *roseum* f. *procerum:* *a*, Habit, × 1/18; *b*, inflorescence, × 1/10; *c*, floral bract and flower, × 1; *d*, sepal, × 1; *e*, petal and stamens, × 1. (All after Belgique Horticole.)

FIG. 88.—*Wittrockia superba:* *a*, Leaf, × 1/8; *b*, inflorescence, × 1/8; *c*, sepals, × 1; *d*, petal and stamen, × 1.

   2. Sepals distinctly connate, subsymmetric.
      4. Inflorescence sunk in the center of the leaf-rosette; leaves dark red, the blades to 6 cm. wide; petals white and green..... 4. **W. smithii**
      4. Inflorescence raised above the leaf-sheaths on a long scape; leaves green, the blades much narrower. (Fig. 90.)
         5. Sepals 28 mm. long; petals yellow at the apex. (Fig. 89.) 5. **W. campos-portoi**
         5. Sepals 12 mm. long; petals blue at the apex. (Fig. 90.) 6. **W. azurea**

1. ***Wittrockia superba*** Lindm. Svensk. Akad. Handl. 24: no. 8:20, *pl. 2 figs. 13–21.* Feb. 1891. FIGURE 88.
   Nidularium karatas sensu Wawra, Oesterr. Bot. Zeitschr. 30:70. 1880 Not Lem. 1854.

Nidularium wawreanum Mez in Mart. Fl. Bras. 3, pt. 3: 245. Nov. 1891.
Canistrum cruentum F. Mueller, Gartenflora 42: 717. 1893.
Canistrum superbum Mez in Mart. Fl. Bras. 3, pt. 3: 620. 1894.
Nidularium superbum Ule, Verh. Bot. Ver. Brand. 48: 149. 1907.

DISTRITO FEDERAL: Tijuca, *Glaziou* 13251 (GH).

SÃO PAULO: Santos, *Foster* 487 (GH); *Mosén* 3704 (S).

PARANÁ: Near Santa Catarina boundary on Joinvile-Curitiba road, *Reitz* 3758-b (HBR).

SANTA CATARINA: Brusque, *Reitz* (HBR). Mun. Araranguá: Sombrio, *Reitz* C-493 (GH, HBR, US).

2. ***Wittrockia minuta*** (Mez) L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 2: 197. 1952.
Nidularium minutum Mez, Repert. Sp. Nov. Fedde 16: 4. 1919.
Canistrum minutum L. B. Smith, Proc. Amer. Acad. 68: 145, *pl. 1, figs. 4, 5.* 1933.

SÃO PAULO: Alto da Serra, *Foster* 359 (GH); *King* (SP); *D. Lemos* (SP, US); *L. B. Smith, Hoehne & Kuhlmann* 1829 (GH, US). Cultivated from material sent from Alto da Serra by Wackett, *Mez* (B, type).

3. ***Wittrockia amazonica*** (Baker) L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 2: 197. 1952.
Karatas amazonica Baker, Gard. Chron. nov. ser. 25: 814. 1886.
Nidularium amazonicum Lindm. Oefvers. Vet. Akad. Förhandl. 47: 541. 1890.
Canistrum amazonicum Mez in Mart. Fl. Bras. 3, pt. 3: 249. 1891.

BRAZIL: Cultivated, *Royal Bot. Gard.* (K, type, GH neg. 2686); *Jard Bot. Liége* (LG).

4. ***Wittrockia smithii*** Reitz, Anais Bot. Herb. Barbosa Rodrigues 4: 19, *pl. 5.* 1952.

PARANÁ: Curitiba to Paranaguá, *Reitz* 5760 (HBR, US).

SANTA CATARINA: Ribeirão Grande, Taió, *Reitz* 4150 (HBR). Mun. Biguaçú: Fachinal, *Reitz* 4207 (HBR, type). Mun. Blumenau: Morro Spitzkopf, *Reitz* 4658 (HBR); *Smith & Reitz* 6282 (US); 6292 (R, US). Mun. Brusque: Ribeirão do Ouro, *Reitz* 3561 in part (HBR, US). Mun. Imaruí: Vargem do Cedro, *Reitz* 4532 (HBR). Mun. Itajaí: Morro do Baú, *Reitz* (HBR, US). Mun. Palhoça: Anitápolis, *Reitz* 4536 (HBR).

5. ***Wittrockia campos-portoi*** L. B. Smith, p. 36, fig. 89.

BRAZIL: Cultivated, *L. B. Smith* (US, type; HBR).

6. ***Wittrockia azurea*** L. B. Smith, p. 36, fig. 90.

MINAS GERAIS: Coronel Pacheco [Agua Limpa], *Heringer* 1536 (SP, type, US neg. 4250).

27. *Hohenbergia* Schult. f.

Hohenbergia Schult. f. in R. & S. Syst. 7, pt. 2: p. lxxi, 1251. 1830.

Guatemala, West Indies, Venezuela.

1. Floral bracts acuminate.
2. Inflorescence bipinnate with the spikes in a dense head, or rarely simple. **1. H. littoralis**

2. Inflorescence amply tripinnate.
   3. Floral bracts 20–30 mm. long; spikes capitate at the ends of the branches; posterior sepals broadly alate-carinate. (Fig. 91.)..... 2. **H. stellata**
   3. Floral bracts 12–18 mm. long; spikes usually separated along the elongate branches.
      4. Sepals and floral bracts serrulate; spikes aggregated in clusters that are mostly broader than long..... 3. **H. brachycephala**

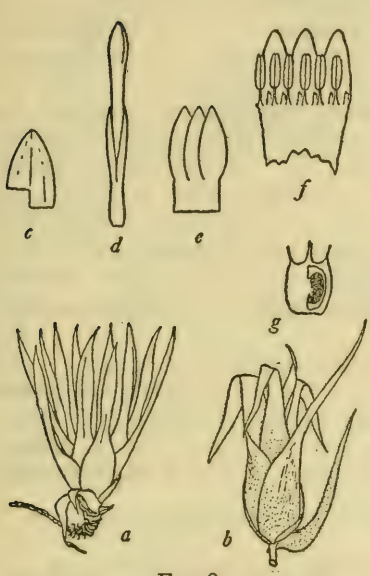

FIG. 89.

FIG. 90.

FIG. 89.—*Wittrockia campos-portoi:* *a*, Habit, × 1/10; *b*, inflorescence × ¼; *c*, floral bract, × 1; *d*, flower × 1; *e*, sepals, × 1; *f*, corolla lobes and stamens, × 1; *g*, longitudinal section of ovary, × 1.

FIG. 90.—*Wittrockia azurea:* *a*, Habit, × ⅛; *b*, floral bract and flower, × 1; *c*, sepal, × 1; *d*, base of petal, × 2; *e*, longitudinal section of ovary, × 1.

   4. Sepals and floral bracts entire.
      5. Spikes broad and spiny because of the spreading floral bracts; mucro of the sepal 2–3.5 mm. long..... 4. **H. horrida**
      5. Spikes smooth and slender because of the erect or suberect floral bracts.
         6. Branches of the inflorescence not more than 20 cm. long. 5. **H. catingae**
         6. Branches of the inflorescence 25–40 cm. long. 6. **H. caruaruensis**

1. Floral bracts broadly acute or obtuse, usually mucronate.
   7. Branches of the inflorescence very short.
      8. Inflorescence densely bipinnate from a few spikes; floral bracts muticous, 20 mm. long..... 7. **H. membranostrobilus**

8. Inflorescence laxly tripinnate, interrupted, the spikes fascicled in the axils of the primary bracts; floral bracts apiculate, pungent, 13 mm. long..... 8. **H. disjuncta**

7. Branches of the inflorescence, or at least the lowest, elongate.

9. Spikes completely glabrous.

10. Sepals 5.5–6 mm. long; spikes cylindrical, many-flowered. (Fig. 92.) 9. **H. salzmannii**

10. Sepals not over 4 mm. long; spikes globose or ellipsoid, few-flowered.

11. Plants to 2.4 m. high; sepals muticous..... 10. **H. blanchetii**

11. Plants less than 5 dm. high; sepals mucronate..... 11. **H. minor**

9. Spikes lanate or flocculose.

12. Indument dark ferruginous; spikes globose, mostly exceeding the secondary bracts; sepals not auricled, 4.5 mm. long, mucronulate. (Fig. 93.)..... 12. **H. augusta**

12. Indument very pale, whitish or yellowish; spikes slender (except *H. eriantha*).

13. Secondary bracts equaling or exceeding the globose spikes; sepals strongly mucronate, 5 mm. long..... 13. **H. eriantha**

13. Secondary bracts shorter than the slender spikes; sepals mucronulate.

14. Floral bracts 8 mm. long, much exceeded by the sepals. 14. **H. ramageana**

14. Floral bracts 11–15 mm. long, equaling or exceeding the sepals.

15. Sepals auricled, 4–5 mm. long..... 15. **H. ridleyi**

15. Sepals not auricled, 6 mm. long..... 16. **H. utriculosa**

1. ***Hohenbergia littoralis*** L. B. Smith, Contr. Gray Herb. 129: 33, *pl. 3, figs. 11–13.* 1940.

BAÍA: Salvador, *Foster* 46 (GH, type (US neg. 4030, 4031), R). Itapoã near Salvador, *L. B. Smith* 7115 (US).

2. ***Hohenbergia stellata*** Schult. f. in R. & S. Syst. 7, pt. 2: 1251. 1830. FIGURE 91.

Aechmea glomerata Hook. f. Bot. Mag. 93: *pl. 5668.* 1867. As to material illustrated.

Aechmea oligosphaera Baker, Handb. Bromel. 48. 1889.

Aechmea longisepala Baker, Handb. Bromel. 48. 1889.

Hohenbergia oligosphaera Mez in DC. Monogr. Phan. 9: 124. 1896.

BRAZIL: Cultivated, *Hennings* (GH).

PIAUÍ: Guaribas, *Luetzelburg* (! Mez). Parnaguá, *Luetzelburg* (! Mez).

BAÍA: *Blanchet* (BM); *Porte* (P, GH neg. 2971). Agua Preta, *Foster* 79 (GH). Milagres to Maracás, *Foster* 2453 (US). Paramirim dos Creoulos, *Luetzelburg* (! Mez). Salvador, *Foster* 41 (GH, R). Rio São Francisco, northeastern Baía, *Luetzelburg* (! Mez). Sincorá, *Martius* (M, type).

ALSO: TOBAGO, TRINIDAD, VENEZUELA.

3. ***Hohenbergia brachycephala*** L. B. Smith, Contr. Gray Herb. 129: 32, *pl. 3, figs. 14–16.* 1940.

BAÍA: Agua Preta, *Foster* 64 in part (R). Rio Grungogi, *Curran* 121 (US, type, US neg. 3515).

4. ***Hohenbergia horrida*** Harms, Notizblatt 12: 525. 1935.
PARAÍBA: Campina Grande to Caruarú (in Pernambuco), *Foster* 2420 (US). Campina Grande to Pocinhos, *Foster* 2416 (US).
PERNAMBUCO: Poção, *Pickel* 3519 (B, type).

5. ***Hohenbergia catingae*** Ule, Bot. Jahrb. 42: 195. 1908.
BRAZIL: Cultivated, *Brade et al.* 19146 (RB, US).

FIG. 91.

FIG. 92.

FIG. 91.—*Hohenbergia stellata: a,* Apex of leaf, × ⅙; *b,* scape and inflorescence, × ⅙; *c,* floral bract and flower, × 1; *d,* petal and stamens, × 1. (All after Pflanzenreich.)

FIG. 92.—*Hohenbergia salzmannii: a,* Upper part of habit, × ca. 1/20; *b,* branch of inflorescence, × 1; *c,* flower, × 1; *d,* sepal, × 1; *e,* longitudinal section of ovary, × 1. (*b* and *c* after Flora Brasiliensis.)

BAÍA: (Caldeirão), Rio das Contas, *Ule* 7042 (B, type, F neg. 11295). Iturassú to Maracás, *Foster* 2456 (US). Jacobina, *Foster* 86 (GH). Milagres to Maracás, *Foster* 2454 (US). Mun. Amargosa: Milagres, *Foster* 2475 (US); 2476 (US). Mun. Geremoabo: *Schery* 494 (GH).

6. ***Hohenbergia caruaruensis*** Harms, Notizblatt 11: 780. 1933.
PERNAMBUCO: Caruarú, *Pickel* 2900 (B, type).

7. ***Hohenbergia membranostrobilus*** Mez in Mart. Fl. Bras. 3, pt. 3: 269. 1891.
RIO DE JANEIRO: (Serra Gonçala), *Glaziou* 8984 (B, type, F neg. 11296).
DISTRITO FEDERAL: Cultivated (?), Quinta, *Glaziou* 18566 (P).

8. ***Hohenbergia disjuncta*** L. B. Smith, Contr. Gray Herb. 129: 33, *pl. 3, fig. 7–10.* 1940.
BAÍA: Agua Preta, *Foster* 64 in part (GH, type (US neg. 4032, 4033), R).

9. ***Hohenbergia salzmannii*** (Baker) E. Morr. ex Mez in Mart. Fl. Bras. 3, pt. 3:271, *pl. 60, fig. 2.* 1891. FIGURE 92.

Aechmea salzmannii Baker, Handb. Bromel. 49. 1889.

Hohenbergia sellowiana Mez in DC. Monogr. Phan. 9:132. 1896.

BRAZIL: *Sellow* bromel. 67 in part (P, type of *Hohenbergia sellowiana* Mez, GH neg. 2972).

BAÍA: Salvador, *Foster* 44 (GH, R); *Lindman* A-63 (S); *Lutz* (GH); *Rose & Russell* 19895 (US); *Smith, Seabra & Leão da Costa* 7113 (US).

10. ***Hohenbergia blanchetii*** (Baker) E. Morr. ex Mez in Mart. Fl. Bras. 3, pt. 3:267. 1891.

Aechmea blanchetii Baker, Handb. Bromel. 49. 1889.

BAÍA: Agua Preta, *Foster* 75 (GH, R). Ilheus, *Blanchet* 2996 (BM, type, US neg. 4022). Rio Grungogi, *Curran* 168 (US); 199 (US).

ESPÍRITO SANTO: Rio Jucú, *Foster* 214 (US).

11. ***Hohenbergia minor*** L. B. Smith, Contr. Gray Herb. 129:34, *pl. 3, figs. 17, 18.* 1940.

BAÍA: Agua Preta, *Foster* 69 (GH). Itapira, *Foster* 69-A (GH, type, US neg. 4034).

12. ***Hohenbergia augusta*** (Vell.) E. Morr. Catal. 9. 1873. FIGURE 93.

Tillandsia augusta Vell. Fl. Fluminensis 135. 1825; Icon. 3: *pl. 135.* 1835.

Pironneava glomerata Gaud. Atl. Voy. Bonite *pl. 63.* 1843.

Aechmea glomerata Hook. Bot. Mag. 93: *pl. 5668.* 1867. As to basonym only.

Aechmea augusta Baker, Journ. Bot. 17:162. 1879.

Aechmea multiceps Baker, Journ. Bot. 18:49. 1880.

Hohenbergia ferruginea Carr. Rev. Hortic. 53:437, *fig. 104.* 1881.

ESPÍRITO SANTO: Vitória, *Foster* 192 (GH).

RIO DE JANEIRO: Niteroi, *Smith & Brade* 2346 (GH).

DISTRITO FEDERAL: Andaraí Grande, *Glaziou* 11681 (P, type of *Aechmea multiceps* Baker, GH neg. 3039). Gavea, *Reitz* 3838 (HBR); *Ule* 4139 (R). Jardim Botânico to Alto da Boa Vista, *L. B. Smith* 1374 (B, BA, BM, F, GH, K, P, S, US). Monte do Cochrane, *L. B. Smith* 1409 (GH, S).

SÃO PAULO: Iguapé, *Loefgren & Edwall* (GH, SP). Prainha, Santos, *Foster* 483 (GH); *Gehrt* (SP, US).

PARANÁ: Caiobá, *Foster* 441 (GH); *M. Kuhlmann* (SP, US).

SANTA CATARINA: *Gaudichaud* 128 (P, type of *Pironneava glomerata* Gaud., GH neg. 3040). Blumenau, *Reitz* 4182 (HBR). Mun. Brusque: Brusque, *Inst. Malariologia* (HBR). Limeira, *Reitz* 3634 (HBR). Mun. Florianópolis: Lagoa de Piri, *Smith & Reitz* 6193 (US). Mun. Itajaí: Canoas, Luiz Alves, *Reitz* 4757 (! Reitz). Mun. Palhoça: Garopaba, *Reitz* 3701 (HBR). Mun. Pôrto Belo: Canto Grande, *Reitz* 3613 (HBR).

13. ***Hohenbergia eriantha*** (Brongn. ex Baker) Mez in Mart. Fl. Bras. 3, pt. 3:269. 1891.

Aechmea eriantha A. Brongn. ex Baker, Handb. Bromel. 47. 1889.

PERNAMBUCO (?): Cultivated, *Jard. Bot. Paris* (P, type, GH neg. 2973).

14. ***Hohenbergia ramageana*** Mez in DC. Monogr. Phan. 9:127. 1896.

PARAÍBA: Areia, *Vasconcelos* 208 (RB, US). João Pessoa [Paraíba do Norte], *Xavier* A (GH).

PERNAMBUCO: Afogadas to Boa Viagem, *Baker & Collins* (GH). (Dois Irmãos), *Ridley & Ramage* (BM, type, US neg. 4021).
SÃO PAULO: Itapecerica da Serra, Rio Embú-Guassú, *Handro* 384 (SP, US).

15. ***Hohenbergia ridleyi*** (Baker) Mez in Mart. Fl. Bras. 3, pt. 3: 266. 1891.
Aechmea ridleyi Baker, Handb. Bromel. 47. 1889.
Hohenbergia pickelii Harms, Notizblatt 10: 785. 1929.
PARAÍBA–PERNAMBUCO: Taboleiro de També [Itambé], *Pickel* 3429 (IPA).
PERNAMBUCO: *Forsett* 55 (S). Iguaraçu, *Ridley & Ramage* (BM, type, US neg. 4020). Tapera, *Pickel* (R); 1921 (B, type of *Hohenbergia pickelii* Harms, F neg. 11298).

16. ***Hohenbergia utriculosa*** Ule, Bot. Jahrb. 42: 196. 1908.
BAÍA: Maracás, *Foster* 2461 (US). Milagres to Maracás, *Foster* 2440 (US). Milagres, *Foster* 2477 (US). Serra do Sincorá, *Ule* 7132 (B, type, F neg. 11299).

28. *Gravisia* Mez

Gravisia Mez in Mart. Fl. Bras. 3, pt. 3: 180. 1891, 299. 1892.

Costa Rica, Jamaica, Tobago, Trinidad, Venezuela, Guiana.

1. Flowers fasciculate on very short branches; floral bracts large.
2. Inflorescence lax, at least toward the base; scape-bracts flat, uniform in texture and all entire; sepals 14 mm. long..... 1. **G. aquilega**
2. Inflorescence dense throughout; scape-bracts with involute much thickened apices, the lower ones serrate; sepals 18 mm. long. 2. **G. capitata**
1. Flowers pinnate on elongate branches; floral bracts minute; sepals 14 mm. long..... 3. **G. constantinii**

1. ***Gravisia aquilega*** (Salisb.) Mez in DC. Monogr. Phan. 9: 173. 1896. FIGURE 94.
Bromelia aquilega Salisb. Parad. Lond. *pl. 40.* 1806.
Bromelia exsudans Lodd. Bot. Cab. 9: *pl. 801.* 1824.
Aechmea aquilega Griseb. Fl. Brit. West Ind. 592. 1864.
Aechmea exsudans Baker, Handb. Bromel. 44. 1889.
Aechmea chrysocoma Baker, Handb. Bromel. 44. 1889.
Aechmea aquilegioides Kuntze, Rev. Gen. 2: 698. 1891.
Gravisia exsudans Mez in Mart. Fl. Bras. 3, pt. 3: 300. 1892.
Gravisia chrysocoma Mez in Mart. Fl. Bras. 3, pt. 3: 301, *pl. 65.* 1892.
BRAZIL: Cultivated, *Devansaye* (LG); *Foster* 60 (GH).
PARÁ: Rio Gurupi, *Lopes* (R). Rio Irituia, *C. F. Baker* 433 (MG).
MARANHÃO: Rio Maracaçume, *Fróes* 1948-a (GH, NY).
CEARÁ: Aratuba [Coite or Santos Dumont], *Cutler* 8178 (US). Serra de Baturité, *Ule* 8993 (B, F neg. 11284). (Cume do Bico), Serra de Baturité, *Ducke* (MG). (Riacho do Capim), *Huber* (MG).
PERNAMBUCO: Afogadas to Boa Viagem, *Baker & Collins* (GH). (Caxagua), *Ridley, Lea & Ramage* (BM). Iguaraçu, *Ramage* (BM).
BAÍA: Ituraçu to Maracás, *Foster* 2457 (US). Jacobina, *Foster* 91 (GH, R). Portoa, *Foster* 84 (GH, R). Salvador, *Foster* 45 (GH). Salvador to Feira, *Foster* 2433 (US). Boca do Rio, Salvador, *Smith, Seabra & Leão da Costa* 7114 (US).
ALSO: COSTA RICA, VENEZUELA, TRINIDAD, TOBAGO, GUIANA.

2. ***Gravisia capitata*** (Schult.) L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 57, *pl. 73, fig. 2.* 1941.
Hohenbergia capitata Schult. in R. & S. Syst. 7, pt. 2: 1252. 1830.
BAÍA: Almada, *Martius* (M, type).
ESPÍRITO SANTO: Santa Teresa, *Foster* 284 (GH, R).

3. ***Gravisia constantinii*** Mez, Repert. Sp. Nov. Fedde 14: 245. 1916.
BRAZIL: Cultivated, *Jard. Bot. Paris* (P, type).

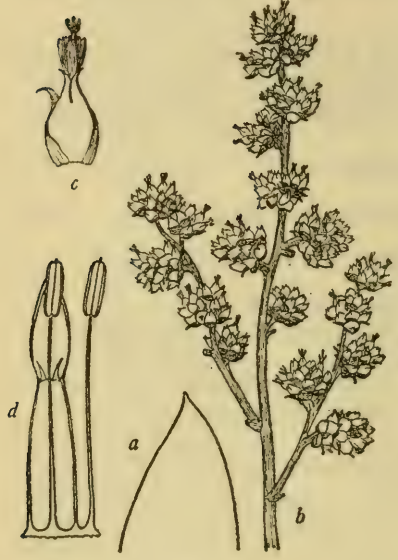

FIG. 93.

FIG. 94.

FIG. 93.—*Hohenbergia augusta: a,* Apex of leaf, × ¼; *b,* inflorescence, × ¼; *c,* floral bract and flower, × 2; *d,* petal and stamens, × 5. (All after Gaudichaud.)

FIG. 94.—*Gravisia aquilega: a,* Apex of leaf, × ¼; *b,* inflorescence, × ½; *c,* sepal, × 2.5; *d,* longitudinal section of ovary, × 2.5. (All after Flora Brasiliensis.)

29. *Aechmea* R. & P.

Aechmea R. & P. Fl. Peruv. Prodr. 47. 1794, nomen conservandum.

México and the West Indies to Argentina.

1. Petal-appendages well developed; inflorescence simple or compound, never perennial.
2. Inflorescence compound, or if simple then lax or cyathiform or the flowers distichous.
3. Sepals unarmed; flowers in more than two ranks.

Subgenus **Lamprococcus**
(Species 1–14)

3. Sepals mucronate or mucronulate, or if unarmed then the flowers distichous.
4. Inflorescence not cyathiform.
5. Floral bracts neither decurrent nor forming pouches around the flowers, distichous or polystichous.
6. Sepals nearly or quite free..... Subgenus **Aechmea** (Species 15–40)
6. Sepals connate for one-third to half their length, their mucros about as long as their free lobes..... Subgenus **Hoplophytum** (Species 41–50)
5. Floral bracts decurrent and forming pouches around the flowers, distichous..... Subgenus **Platyaechmea** (Species 51–54)
4. Inflorescence cyathiform, its bracts or the inner leaves of the rosette forming an involucre about it, compound or simple. Subgenus **Ortgiesia** (Species 55–60)
2. Inflorescence simple, strobilate with the flowers in many ranks, scapose, not at all cyathiform (the bracts massed below the inflorescence in some species but spreading and not forming an involucre).
7. Sepals mucronate or mucronulate; petal-appendages basal or higher. Subgenus **Pothuava** (Species 61–73)
7. Sepals unarmed; appendages usually inserted well above the base of the petal..... Subgenus **Macrochordium** (Species 74–80)
1. Petal-appendages rudimentary or reduced; inflorescence simple or rarely digitate, perennial; flowers strobilate, in many ranks; floral bracts thick and more or less ligneous in the Brazilian species. Subgenus **Purpurospadix** (Species 81–92)

The above definitions of subgenera largely follow Mez's system, but make allowance for a species with a simple inflorescence, *Aechmea contracta,* in subgenus *Platyaechmea.* The subgenus *Ortgiesia* is retained pending further study, although the range of sepal fusion indicates that it might be a more natural disposition of the species to distribute them among the other subgenera. The natural division of the genus is now so involved that the following more or less artificial key is more practical for the purposes of identification.

CONSPECTUS OF SUBKEYS

1. Inflorescence compound..... **Subkey A**
1. Inflorescence simple.
2. Floral bracts serrulate..... **Subkey B**
2. Floral bracts entire.
3. The floral bracts flat, usually thin, nerved..... **Subkey C**
3. The floral bracts navicular, enfolding at least the base of the flower. **Subkey D**

SUBKEY A

1. Floral bracts serrate; flowers in more than two ranks.
   2. Primary bracts foliaceous, spreading; spikes globose, to 15 cm. in diameter; floral bracts thick, recurved; sepals 30 mm. long, free. 81. **Ae. fernandae**
   2. Primary bracts bracteiform, erect and forming an involucre about the inflorescence; spikes longer than broad, small; floral bracts thin, erect.
      3. Margins of the floral bracts decurrent, forming pouches; sepals 9 mm. long; flowers 32 mm. long..... 55. **Ae. hamata**
      3. Margins of the floral bracts free.
         4. Primary bracts shorter than the branches; sepals unarmed, free; flowers 13 mm. long..... 56. **Ae. caesia**
         4. Primary bracts exceeding the branches; sepals mucronulate, connate; flowers 30–35 mm. long..... 57. **Ae. fasciata**
1. Floral bracts entire or at most slightly erose.
   5. Rhachis winged or excavated; floral bracts decurrent and forming pouches; flowers in two ranks. (Fig. 101.)
      6. Scape-bracts all densely imbricate; primary bracts entire, small; floral bracts about equaling the ovary; sepals mucronulate 5–13 mm. long. 51. **Ae. distichantha**
      6. Scape-bracts massed toward the top of the scape but lax below; primary bracts serrulate; leaves concolorous (For species with dark-banded leaves see note under 38. *Ae. chantinii*).
         7. Floral bracts exceeding the ovary; leaf-blades not narrowed toward the base.
            8. Spikes long-stipitate; sepals unarmed, 10–12 mm. long. 52. **Ae. amazonica**
            8. Spikes short-stipitate or sessile; sepals mucronulate, to 7.5 mm. long..... 53. **Ae. tillandsioides**
         7. Floral bracts shorter than the ovary at anthesis; leaf-blades subpetiolate; sepals apiculate, 5–8 mm. long..... 54. **Ae. contracta**
   5. Rhachis more or less angled but never winged nor excavated.
      9. Floral bracts equaling or exceeding the sepals.
         10. Inflorescence lax, tripinnate or more divided.
            11. Floral bracts divergent, not touching one another; sepals 21–24 mm. long..... 16. **Ae. blanchetiana**
            11. Floral bracts imbricate; sepals 17 mm. long... 17. **Ae. fraudulosa**
         10. Inflorescence dense.
            12. Leaf-blades with broad dark purple spots beneath; inflorescence ovoid, 7 cm. long; sepals free, 11 mm. long, mucronulate. 18. **Ae. orlandiana**
            12. Leaf-blades concolorous; inflorescence cylindric or slenderly fusiform, nearly 30 cm. long.
               13. Sepals free, 9 mm. long, unarmed. (Fig. 96.).. 15. **Ae. mutica**
               13. Sepals connate, 23 mm. long including the 5 mm. mucro. 41. **Ae. macrochlamys**
      9. Floral bracts distinctly surpassed by the sepals.
         14. The floral bracts in the form of a cylinder or cup, completely enclosing the base of the ovary. (Fig. 97.)

15. Mucro of the floral bracts 3–5 mm. long; inflorescence fertile throughout; sepals 3–10 mm. long.
16. Spikes very dense; flowers few, subfasciculate; sepals mucronate. (Fig. 97.) ..... 19. **Ae. mertensii**
16. Spikes lax; flowers obviously in two ranks; sepals obscurely mucronulate or unarmed..... 20. **Ae. huebneri**
15. Mucro of the floral bracts to 15 mm. long; inflorescence partly sterile; sepals 16–21 mm. long.
17. Branches at the base of the inflorescence reduced to fascicles of sterile setiform bracts; inflorescence pale-flocculose, soon glabrous..... 21. **Ae. setigera**
17. Branches all bearing a few flowers at their bases, but the upper branches with sterile apices; inflorescence densely ferruginous-flocculose..... 22. **Ae. kuntzeana**
14. The floral bracts narrower, not completely enclosing the base of the ovary.
18. Sepals connate for one-third to half their length, their mucros nearly or quite as long as their free lobes; scape-bracts very thin, soon disintegrating.
19. Inflorescence digitate; spikes few, strobilate, many-flowered. 66. **Ae. calyculata**
19. Inflorescence paniculate; spikes many, lax, few-flowered.
20. Petals white; leaves frequently banded; flowers 15 mm. long; sepals 3.5 mm. long without the 3 mm. mucro. 42. **Ae. candida**
20. Petals colored.
21. The petals yellow; inflorescence densely white-flocculose; branches slender, geniculate; scape-bracts mostly imbricate; flowers 20–25 mm. long..... 43. **Ae. caudata**
21. The petals blue.
22. Inflorescence persistently white-flocculose; branches nearly or quite straight; flowers 20 mm. long. 44. **Ae. coelestis**
22. Inflorescence soon glabrous; branches geniculate.
23. Flowers 17 mm. long; scape-bracts mostly imbricate. 45. **Ae. organensis**
23. Flowers 25 mm. long; scape-bracts mostly remote. 46. **Ae. gracilis**
18. Sepals nearly or quite free, their mucros relatively short.
24. Mucros of the sepals evident without a lens. To p. 197.
25. Flowers imbricate, all touching each other; inflorescence very dense; spikes densely few-flowered; sepals 6 mm. long without the 4 mm. mucro..... 23. **Ae. phanerophlebia**
25. Flowers lax, not touching or only the immature ones.
26. Sepals 12–23 mm. long (unrecorded in *Ae. megalantha* which has petals 35 mm. long); inflorescence amply 3–4-pinnate.
27. Floral bracts 10–12 mm. long, exceeding the ovary. 24. **Ae. eurycorymbus**
27. Floral bracts much shorter than the ovary.
28. The floral bracts setiform from a small triangular base, 2–3 mm. long; inflorescence tomentose-lepidote.

29. Inflorescence dense except toward the base, its axes stout; primary bracts broad; sepals 23 mm. long. 25. **Ae. tomentosa**

29. Inflorescence lax, its axes slender; primary bracts narrow; sepals 12 mm. long. (Fig. 98.) 26. **Ae. stelligera**

28. The floral bracts broad.

30. Petals 25 mm. long; floral bracts 5–8 mm. long. 27. **Ae. werdermannii**

30. Petals 35 mm. long; floral bracts 1–3 mm. long. 28. **Ae. megalantha**

26. Sepals 4–10 mm. long.

31. Spikes 9–20 cm. long; rhachis straight; flowers in more than two ranks. (Fig. 99.)..... 29. **Ae. lingulata**

31. Spikes short; rhachis often flexuous or geniculate.

32. Leaf-blades narrowly triangular; ovary trigonous; sepals 6 mm. long..... 30. **Ae. purpureo-rosea**

32. Leaf-blades ligulate.

33. Floral bracts navicular; rhachis strongly quadrangular; inflorescence bipinnate; sepals 4–5 mm. long. 31. **Ae. angustifolia**

33. Floral bracts nearly flat; rhachis subterete or irregularly angled with the flowers in more than two ranks.

34. Mucro of the floral bract longer than the inconspicuous base; trichomes of the inflorescence linear; sepals 5 mm. long..... 32. **Ae. sprucei**

34. Mucro of the floral bract no longer than the suborbicular base.

35. Ovaries 15 mm. long, minutely verrucose; inflorescence subdense, ovoid, 17 cm. long; floral bracts 4 mm. long; sepals 9–10 mm. long. 33. **Ae. melinonii**

35. Ovaries not more than 10 mm. long, even; inflorescence lax at least at the base; floral bracts from more than half as long to exceeding the ovaries; sepals 5–8 mm. long.

36. Petals nearly 3 times as long as the sepals, blue; sepals 8 mm. long; inflorescence narrowly ovoid, 17 cm. long; lower primary bracts about equaling the branches. 34. **Ae. azurea**

36. Petals only about twice as long as the sepals, yellow (uncertain in *Ae. tocantina*); sepals 5 mm. long without the mucro; inflorescence narrowly cylindric or laxly digitate or pinnate from several long cylindric branches that greatly exceed the primary bracts.

37. Spike-rhachis geniculate; inflorescence cobwebby, becoming glabrous. 35. **Ae. ramosa**

37. Spike-rhachis straight; inflorescence covered with fine appressed stellate trichomes. 36. **Ae. tocantina**

24. Mucro of the sepal lacking or invisible without a lens, sepals sometimes acuminate with a soft apex.

38. Inflorescence amply tripinnate, densely lanate; sepals ovate, soft-acuminate, 11 mm. long..... 37. **Ae. araneosa**

38. Inflorescence not more than bipinnate.

39. Leaf-blades marked with spots or bands; sepals 10 mm. long.

40. Floral bracts minute; leaves two-ranked; inflorescence diffuse..... 1. **Ae. marmorata**

40. Floral bracts exceeding the ovary; leaves in more than two ranks.

41. Scape-bracts imbricate; inflorescence short and dense. 38. **Ae. chantinii**

41. Scape-bracts remote; inflorescence elongate. 39. **Ae. fosteriana**

39. Leaf-blades concolorous.

42. Ovary alate; inflorescence few-flowered; floral bracts large; sepals 8 mm. long, connate for 4 mm. 2. **Ae. brachycaulis**

42. Ovary wingless, terete.

43. Leaf-sheaths erect, forming a slender cylinder, concealing most of the short scape.

44. Floral bracts minute; sepals 7 mm. long. 3. **Ae. corymbosa**

44. Floral bracts to 7 mm. long; sepals 3.5 mm. long. 4. **Ae. brevicollis**

43. Leaf-sheaths divergent, much exceeded by the scape.

45. Floral bracts evident, equaling about the middle of the ovary; scape-bracts red, persistent.

46. Flowers in two ranks; primary bracts narrow; sepals subfree, 4–6 mm. long. 40. **Ae. schultesiana**

46. Flowers in more than two ranks; primary bracts ample; sepals about a third connate, 8 mm. long. 5. **Ae. weilbachii**

45. Floral bracts minute or lacking.

47. Inflorescence simple in its apical half.

48. Flowers distinctly pedicellate; scape-bracts red, ample, enclosing the scape; sepals 4 mm. long (Fig. 95.)..... 6. **Ae. podantha**

48. Flowers sessile; sepals 5–6 mm. long.

49. Ovary even; petal-blades wholly red. 7. **Ae. fulgens**

49. Ovary verrucose; petal-blades with white margins..... 8. **Ae. capixabae**

47. Inflorescence branched throughout.

50. Petals white; sepals 6.5 mm. long. 9. **Ae. corallina**

50. Petals colored; sepals 4 mm. long.
51. Inflorescence longer than broad; petal-blades wholly blue..... 10. **Ae. miniata**
51. Inflorescence about as broad as long; petal-blades blue only at the apex.
11. **Ae. conglomerata**

SUBKEY B

1. Leaf-blades narrowly triangular, acuminate, 4–30 mm. wide; scape not exceeding the leaf-sheaths; sepals to 17 mm. long.
2. Sepals broad, strongly asymmetric, rounded and mucronate; leaf-spines ascending..... 58. **Ae. recurvata**
2. Sepals narrowly lance-triangular, acuminate; leaf-spines recurved.
59. **Ae. pitcairnioides**
1. Leaf-blades ligulate, acuminate to broadly rounded and apiculate, 60–150 mm. wide; scape various.
3. Sepals 25–30 mm. long, narrow, subsymmetric; leaf-blades acuminate, channeled toward the base; species of the Amazon Basin.
4. Leaves and bracts sparsely pale-lepidote to glabrous on the under side.
81. **Ae. fernandae**
4. Leaves densely ferruginous-lepidote on the under side.
82. **Ae. rubiginosa**
3. Sepals 17–20 mm. long, often strongly asymmetric; leaf-blades acute to rounded and apiculate, not channeled; species of eastern Brazil.
5. Scape-bracts laxly if at all imbricate, small, colored; leaf-blades bearing broad white cross-bands..... 57. **Ae. fasciata**
5. Scape-bracts densely imbricate, more or less foliaceous; leaf-blades concolorous.
6. Inflorescence globose to cylindric; scape elongate.
7. Bases of the leaves and scape-bracts green, scarcely different from the blades. (Fig. 102.)..... 61. **Ae. pectinata**
7. Bases of the leaves and scape-bracts dark castaneous to nearly black. (Fig. 109.)..... 83. **Ae. multiflora**
6. Inflorescence depressed-globose; scape very short.
8. Scape-bracts and floral bracts red, drying to dark castaneous; floral bracts coarsely serrate, flat toward the base.... 84. **Ae. depressa**
8. Scape-bracts and floral bracts always green; floral bracts serrulate, their bases enfolding the flowers..... 85. **Ae. saxicola**

SUBKEY C

1. Flowers mostly in two ranks; leaves subpetiolate; floral bracts shorter than the ovary at anthesis; sepals apiculate, 5–8 mm. long... 54. **Ae. contracta**
1. Flowers mostly in more than two ranks.
2. Sepals obtuse or acute with a soft apex, never mucronate nor pungent.
3. Inflorescence lax, its axis plainly visible.
4. Flowers slenderly pedicellate; inflorescence usually pendulous; sepals 9 mm. long; ovary verrucose..... 12. **Ae. racinae**
4. Flowers sessile.
5. Ovary strongly alate; scape-bracts entire; sepals 8 mm. long; floral bracts large..... (2. **Ae. brachycaulis**)

5. Ovary terete; lower scape-bracts serrulate; sepals 4.5 mm. long; floral bracts minute..... 13. **Ae. victoriana**

3. Inflorescence dense, few-flowered, its axis completely hidden by the flowers and floral bracts; sepals 8–9 mm. long.

6. Sepals symmetric; inflorescence subcorymbiform; scape about equaling the leaf-sheaths..... 14. **Ae. mitis**

6. Sepals strongly asymmetric; inflorescence distinctly spicate; scape elongate..... 62. **Ae. turbinocalyx**

2. Sepals mucronate or pungent.

7. Scape-bracts massed below the inflorescence, spreading, ample, thin, red, persistent. (Fig. 103.)..... 63. **Ae. nudicaulis**

7. Scape-bracts about equally distributed along the scape.

8. Inflorescence lax, its axis clearly visible; sepals usually connate for about half their length; scape-bracts narrow, thin, fragile and soon lost. (Fig. 100.)

9. Petals white.

10. Leaves broadly rounded and apiculate, sometimes banded; sepals 3.5 mm. long without the 3 mm. mucro..... 42. **Ae. candida**

10. Leaves abruptly acuminate, densely and evenly cinereous-lepidote beneath; sepals 4 mm. long without the 1 mm. mucro. (Fig. 100.)..... 47. **Ae. bicolor**

9. Petals colored.

11. The petals yellow.[1]

12. Flowers subverticillate; leaves often white-banded beneath; sepals 7 mm. long including the 3 mm. mucro. 48. **Ae. blumenavii**

12. Flowers evenly distributed along the axis or more lax toward the base, but not at all verticillate; leaves not banded; sepals 7–11 mm. long including the long mucro.

13. Sepals connate for one-third to half their length. 43. **Ae. caudata**

13. Sepals short-connate; anthesis beginning in the middle of the inflorescence..... 49. **Ae. kertesziae**

11. The petals blue.

14. Inflorescence very lax, few-flowered, soon glabrous; flowers 25 mm. long; scape-bracts mostly remote... 46. **Ae. gracilis**

14. Inflorescence with its axis slightly exposed, many-flowered.

15. Flowers 20 mm. long; inflorescence stout; floral bracts soft. 64. **Ae. cylindrata**

15. Flowers 15 mm. long; inflorescence slender; floral bracts pungent..... 50. **Ae. gamosepala**

8. Inflorescence dense, all or nearly all of its axis concealed by the flowers and floral bracts.

16. Floral bracts and sepals dark castaneous, coriaceous; flowers strongly complanate; sepals 34 mm. long, wholly covered by the bracts; inflorescence 14 cm. in diameter..... 86. **Ae. conifera**

16. Floral bracts and sepals stramineous or brightly colored; flowers terete or nearly so; sepals not wholly concealed by the bracts.

[1] This group of species centering in Santa Catarina is practically impossible to classify now on the basis of herbarium material. Its further elaboration awaits the conclusion of field studies by Reitz.

17. Leaf-sheaths concealing the inflorescence; sepals to 17 mm. long, much connate; flowers to 38 mm. long..... 58. **Ae. recurvata**
17. Leaf-sheaths surpassed by the inflorescence.
18. Petals blue; floral bracts quickly deciduous; flowers 20 mm. long..... 64. **Ae. cylindrata**
18. Petals yellow; floral bracts persistent.
19. Scape short, barely raising the inflorescence above the leaf-sheaths; flowers 25 mm. long... 60. **Ae. pimenti-velosoi**
19. Scape elongate.
20. Floral bracts subnavicular and enfolding the base of the ovary; mucro about half as long as the calyx-lobe; flowers 20 mm. long..... 65. **Ae. comata**
20. Floral bracts very narrow; mucro almost as long as the calyx-lobe; flowers 17 mm. long.... 66. **Ae. calyculata**

SUBKEY D

1. Sepals mucronulate or pungent.
2. Floral bracts and sepals completely covered with a white woolly indument; inflorescence cylindric, 6 cm. in diameter; sepals 10 mm. long. 87. **Ae. perforata**
2. Floral bracts and sepals clearly visible.
3. The floral bracts thin, strongly nerved.
4. Flowers finally becoming reflexed; floral bracts suborbicular; leaves spinose-acuminate; sepals 14 mm. long, their mucros 3 mm. long. 67. **Ae. squarrosa**
4. Flowers never more than spreading.
5. Floral bracts emarginate; inflorescence with a conspicuous coma of sterile bracts; sepals 9 mm. long, their mucros minute. 68. **Ae. alopecurus**
5. Floral bracts acute to acuminate.
6. Scape-bracts subcoriaceous, persistent, ample, very densely imbricate and wholly concealing the scape; leaves acute or acuminate; petals blue toward the apex; flowers 20–25 mm. long; sepals 8–10 mm. long, lanate at the base..... 69. **Ae. vanhoutteana**
6. Scape-bracts membranaceous, soon disintegrating, narrow, the lower ones laxly imbricate to remote; leaves rounded and apiculate; petals yellow.
7. Inflorescence lax especially toward the base, anthesis beginning in the middle; sepals 7 mm. long exclusive of the 3 mm. mucro. 49. **Ae. kertesziae**
7. Inflorescence dense throughout, its axis completely hidden; sepals 3–5 mm. long exclusive of the 1.5–2 mm. mucro.
8. Lower scape-bracts mostly exceeding the internodes, narrowly triangular..... 65. **Ae. comata**
8. Lower scape-bracts remote, ovate..... 70. **Ae. kleinii**
3. The floral bracts thick, coriaceous or woody.
9. Apices of the floral bracts angled, acuminate, not truly mucronate; sepals 22–27 mm. long.
10. Scape-bracts serrate; floral bracts and sepals punctulate-lepidote. 88. **Ae. sphaerocephala**

10. Scape-bracts entire; floral bracts and sepals completely covered with appressed white scales. (Fig. 110.).... 89. **Ae. leucolepis**

9. Apices of the floral bracts mucronate with terete spines.

11. Sepals 26 mm. long; floral bracts acuminate into an 8–12 mm. mucro; inflorescence green..... 90. **Ae. stephanophora**

11. Sepals not over 17 mm. long.

12. The sepals free.

13. Sepals 4.5 mm. long, the mucro minute; petals yellow. 71. **Ae. pineliana**

13. Sepals 8–17 mm. long.

14. Axis of the inflorescence lanate; floral bracts slightly thickened toward the apex; mucro of the sepals minute. 68. **Ae. alopecurus**

14. Axis of the inflorescence appressed-lepidote; floral bracts much thickened toward the apex.

15. Sepals 8–9 mm. long; scape slender; petals white or greenish..... 72. **Ae. triticina**

15. Sepals 16–17 mm. long; scape stout.

16. Floral bracts and sepals covered with white appressed scales; sepal mucro large, stout; petals blue toward the apex..... 91. **Ae. cariocae**

16. Floral bracts brown-lepidote; sepals glabrous, the delicate mucro 0.5 mm. long; color of petals unknown. 92. **Ae. castanea**

12. The sepals connate; scape-bracts divergent, acuminate into a stout subulus. (Fig. 104.)..... 73. **Ae. ornata**

1. Sepals obtuse to emarginate or acute with a soft point.

17. Floral bracts thin, nerved, about equaling the sepals; scape-bracts erect, equally distributed; sepals 8 mm. long, connate for 2 mm. (Fig. 105.) 74. **Ae. nervata**

17. Floral bracts at least subcoriaceous, not nerved; upper scape-bracts massed beneath the inflorescence, divergent to spreading.

18. Leaves, or at least the outer ones, petiolate, channeled, minutely serrulate; sepals free, 8 mm. long; petals white..... 75. **Ae. alba**

18. Leaves not at all petiolate; sepals connate.

19. Leaf-blades minutely and subdensely serrulate, linear, 4–9 dm. long, 2–4 cm. wide; inflorescence sparsely lanate to appressed-lepidote; floral bracts acute; sepals 11 mm. long, half connate; petals yellow at anthesis.....76. **Ae. lamarchei**

19. Leaf-blades laxly serrate with spines 1–7 mm. long, ligulate to narrowly triangular.

20. Petals lavender to purple at anthesis; leaf-blades all narrowly triangular; sepals 6 mm. long, connate for 2 mm. 77. **Ae. triangularis**

20. Petals yellow at anthesis; leaf-blades ligulate or rarely the outermost narrowly triangular.

21. Floral bracts truncate; sepals 8 mm. long, half connate; inflorescence white-lanate..... 78. **Ae. bromeliifolia**

21. Floral bracts acute or apiculate.
    22. Leaves and scape-bracts spotted with red; sepals 8 mm. long, about half connate; petals appendaged near the middle; inflorescence flocculose. (Fig. 107.)..... 79. **Ae. maculata**
    22. Leaves and scape-bracts concolorous; sepals 12 mm. long, connate for 2 mm.; petals appendaged at the base; inflorescence appressed-lepidote. (Fig. 108.)
80. **Ae. chlorophylla**

Subgenus *Lamprococcus* (Beer) Benth.

1. ***Aechmea marmorata*** (Lem.) Mez in Mart. Fl. Bras. 3, pt. 3: 310, *pl. 66.* 1892.
   Billbergia marmorata Lem. Ill. Hortic. 2: *pl. 48.* 1855.
   Billbergia vittata sensu Baker, Handb. Bromel. 78. 1889. In part, not Brongn.
   Quesnelia effusa Lindm. Svensk. Akad. Handl. 24: no. 8: 26, *pl. 4, figs. 1–6.* 1891.
   Billbergia speciosa sensu Wittm. Bot. Jahrb. 13, Beibl. 29: 11. 1891.

Espírito Santo: Santa Teresa, *Foster* 248 (GH).

Distrito Federal: Cultivated, *Ule* 4692 in part (R). Corcovado, *Glaziou* 8983 (P, US). Morro do Archer, Tijuca, *Brade et al.* 1549 (RB, US). Morro Queimado, *Brade* 11272 (R). Rio de Janeiro, *J. G. Kuhlmann* (RB, US). São Cristovão, *Glaziou* 12233 (F, P); 16429 (P); *Lindman* A-23 (S). Tijuca, *Smith & Brade* 2241 (GH).

São Paulo: Rio Buturoca, Santos, *Mosén* 3491 (S, type of *Quesnelia effusa* Lindm.). Cubatão, Santos, *Gehrt* (GH, SP).

2. ***Aechmea brachycaulis*** Baker, Handb. Bromel. 53. 1889.
   Ronnbergia marantoides L. B. Smith, Contr. Gray Herb. 95: 43, *pl. 11, figs. 1–3.* 1931.

Brazil: Cultivated, unpublished plate by *E. Morren* (K, type).

Baía: Cultivated, *Strauss* (B, F neg. 11308). Agua Preta, *Foster* 77 (GH). Rio Grungogi, *Curran* 142 (US, type of *Ronnbergia marantoides* L. B. Smith).

3. ***Aechmea corymbosa*** (Mart. ex Schult.) Mez in Mart. Fl. Bras. 3, pt. 3: 316. 1892.
   Billbergia corymbosa Mart. ex Schult. in R. & S. Syst. 7, pt. 2: 1268. 1830.

Amazonas: Esperança, *Pires & Black* 915 (IAN). Rio Dimití, upper Rio Negro basin, *Schultes & López* 10008 (US). Tabatinga, near Colombian boundary, *Pires & Black* 1069 (IAN).

Also: Colombia, Perú.

4. ***Aechmea brevicollis*** L. B. Smith, Contr. Gray Herb. 154: 32, *pl. 3, figs. 1, 2.* 1945.

Amazonas: Cocui to Rio Içana on Rio Negro, *Schultes & López* 9538 (US). Rio Içana, Tunuí, *Black* 48-2601 (IAN); *Pires* 766 (IAN). Ipanoré to Rio Negro on Rio Vaupés, *Schultes & Pires* 9154-A (US). Irá-Igarapé to Igarapé Abiú, Rio Taraira, *Schultes & López* 10187 (IAN).

Also: Colombia, Venezuela.

5. ***Aechmea weilbachii*** Didr. Ann. Sci. Nat. IV. 2:375. 1854.
1. Leaves green..... Var. a. **weilbachii**
1. Leaves tinged with purple..... Var. b. **leodiensis**

5a. ***Aechmea weilbachii*** var. ***weilbachii***
Aechmea subinermis Baker, Journ. Bot. 17:228. 1879.
Quesnelia glaziovii Baker, Handb. Bromel. 87. 1889.
BRAZIL: Cultivated, *Barry* (US); *Foster* 508 (GH); *Lindman* A-19 (S). *Reitz* 5677 (HBR).
RIO DE JANEIRO: Mandioca, Serra da Estrella, *Glaziou* 9326 (P).
DISTRITO FEDERAL: Corcovado, *Glaziou* 18567 (P). Cultivated (?), Quinta da Bôa Vista, *Glaziou* 16418 (P); 17285 (P).

5b. ***Aechmea weilbachii*** var. ***leodiensis*** André, Rev. Hortic. 59:31. 1887.
BRAZIL: Described from cultivation. No herbarium material known.

6. ***Aechmea podantha*** L. B. Smith, p. 18, fig. 95.
ESPÍRITO SANTO: Santa Teresa, *Foster* 842 (GH, type, US neg. 4248); 844 (GH, depauperate specimen).

7. ***Aechmea fulgens*** Brongn. Ann. Sci. Nat. II. 15:371. 1841.
1. Leaves green..... Var. a. **fulgens**
1. Leaves red-purple beneath..... Var. b. **discolor**

7a. ***Aechmea fulgens*** var. ***fulgens***
PERNAMBUCO: Cultivated, *Berlin* (US); *Quesnel* (P, type, GH neg. 2956). Escola [São Bento], *Pickel* 1281 in part (IPA). Tapera, *Pickel* 1281 in part (IPA); 2298 (! Mez).

7b. ***Aechmea fulgens*** var. ***discolor*** (C. Morr.) Brongn. ex Baker, Handb. Bromel. 52. 1889.
Aechmea discolor C. Morr. Ann. Soc. Gand 2:175, *pl. 65.* 1846.
PERNAMBUCO: Cultivated, *Atkinson* 11 (BH); 12 (MT); *Foster* 1252 (GH); *Kew* (K, GH neg. 1388); *Quesnel* (P, type).

8. ***Aechmea capixabae*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1:56, *pl. 72.* 1941.
ESPÍRITO SANTO: Santa Teresa, *Foster* 258 (GH, R); 278 (GH, type; R); 843 (GH).

9. ***Aechmea corallina*** (Beer) Brongn. ex Baker, Handb. Bromel. 52. 1889.
Lamprococcus corallinus Beer, Bromel. 106. 1857.
BAÍA: Described from cultivated material sent by Porte, none known to survive.

10. ***Aechmea miniata*** (Beer) Hort. ex Baker, Handb. Bromel. 53. 1889.
1. Leaves green..... Var. a. **miniata**
1. Leaves tinged with red..... Var. b. **discolor**

10a. ***Aechmea miniata*** var. ***miniata***
Lamprococcus miniatus Beer, Bromel. 104. 1857.
BRAZIL: Cultivated, *Atkinson* 10 (MT); *Clover* (MICH); *Foster* IX (GH); *New York Bot. Gard.* (US); *Rivage* (G, F neg. 8558).
BAÍA: *Blanchet* (P). Agua Preta, *Foster* 70 (GH, US). Ilheus, *Blanchet* 2371 (! Mez).

10b. ***Aechmea miniata*** var. ***discolor*** (Beer) Beer ex Baker, Handb. Bromel. 53. 1889.

Lamprococcus miniatus var. *discolor* Beer, Bromel. 104. 1857.

BRAZIL: Cultivated, *Foster* (GH); 1253 (GH); *New York Bot. Gard.* (US).

11. ***Aechmea conglomerata*** Hort. ex Baker Handb. Bromel. 52. 1889.

1. Leaf-blades green on both sides.
   2. Leaves farinose beneath, glabrous above..... Var. a. **conglomerata**
   2. Leaves farinose on both sides..... Var. b. **farinosa**
1. Leaf-blades claret-brown beneath..... Var. c. **discolor**

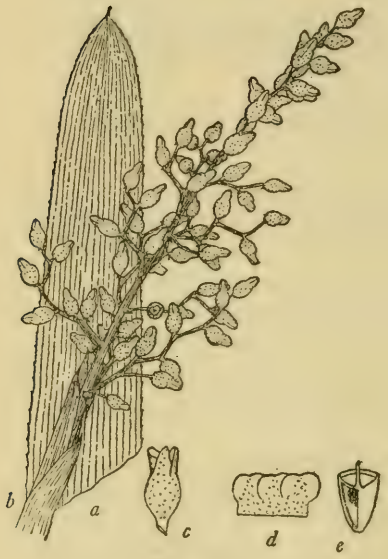

FIG. 95.

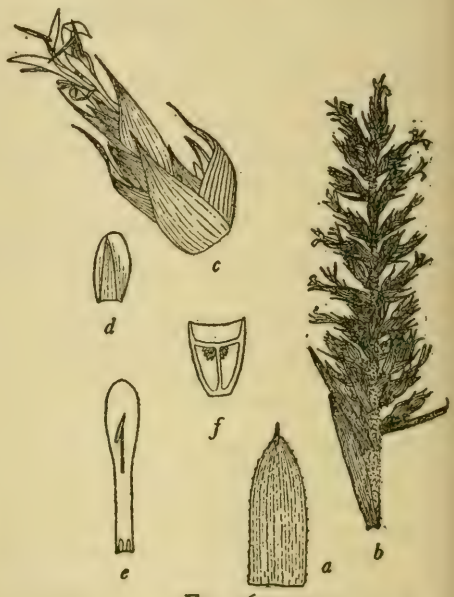

FIG. 96.

FIG. 95.—*Aechmea podantha:* *a*, Leaf-blade, ×½; *b*, inflorescence, ×½; *c*, flower, ×1; *d*, sepals, ×1; *e*, longitudinal section of ovary, ×1.

FIG. 96.—*Aechmea mutica:* *a*, Apex of leaf, ×¼; *b*, inflorescence, ×¼; *c*, branch, ×1; *d*, sepal, ×1; *e*, petal and stamen, ×1; *f*, longitudinal section of ovary, ×2.

11a. ***Aechmea conglomerata*** var. ***conglomerata***

Lamprococcus glomeratus Beer, Bromel. 105. 1857.

Aechmea glomerata Mez in Mart. Fl. Bras. 3, pt. 3: 315. 1892. Not Hook. 1867.

BRAZIL: Cultivated, *Hennings* (B, F neg. 11313).

11b. ***Aechmea conglomerata*** var. ***farinosa*** (Regel) Baker, Handb. Bromel. 53. 1889.

Lamprococcus farinosus Regel, Ind. Sem. Hort. Petrop. for 1868. 79. 1869.

Aechmea glomerata var. *farinosa* Mez in Mart. Fl. Bras. 3, pt. 3: 316. 1892.

BRAZIL: Described from cultivation; no herbarium material seen.

11c. ***Aechmea conglomerata*** var. ***discolor*** Beer ex Baker, Handb. Bromel. 53. 1889.

Lamprococcus glomeratus var. *discolor* Beer, Bromel. 105. 1857. Nomen.

BRAZIL: Described from cultivation; no herbarium material seen.

12. ***Aechmea racinae*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 56, *pl. 71.* 1941.

1. Scape elongate, decurved..... Var. a. **racinae**
1. Scape short, erect..... Var. b. **erecta**

12a. ***Aechmea racinae*** var. ***racinae***

ESPÍRITO SANTO: Guiomar, *Foster* 320 (GH, type; R); 960 (GH, SP). Mun. Cachoeiro de Itapemirim: *Brade* 19370 (RB, US).

12b. ***Aechmea racinae*** var. ***erecta*** L. B. Smith, Arquiv. Jard. Bot. Rio de Janeiro 10: 142. 1950.

ESPÍRITO SANTO: Mun. Cachoeiro de Itapemirim: *Brade* 19415 (RB, type, US neg. 3260).

13. ***Aechmea victoriana*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 57, *pl. 73, fig. 1.* 1941.

ESPÍRITO SANTO: Vitória [Victoria], *Foster* 203 (GH, type; R); 869 (GH, US).

14. ***Aechmea mitis*** (Mart. ex Schult.) L. B. Smith, p. 16.

Billbergia mitis Mart. ex Schult. in R. & S. Syst. 7, pt. 2: 1267. 1830.

BRAZIL: *Martius* (M, type, F neg. 8642).

Subgenus *Aechmea*

(Subgenus *Euaechmea* Mez)

15. ***Aechmea mutica*** L. B. Smith, p. 16, fig. 96.

ESPÍRITO SANTO: Santa Teresa, *Foster* 293 (GH, R, US); 806 (GH, type, US neg. 4259).

16. ***Aechmea blanchetiana*** (Baker) L. B. Smith, p. 13.

Streptocalyx laxiflora Baker, Handb. Bromel. 31. 1889.

Tillandsia blanchetiana Baker, Handb. Bromel. 182. 1889.

Aechmea laxiflora Mez in Mart. Fl. Bras. 3, pt. 3: 335. 1892. Not Benth. 1846.

Aechmea remotiflora Mez in DC. Monogr. Phan. 9: 219. 1896.

BAÍA: *Blanchet* 2274 (BM, type, US neg. 4018). Agua Preta, *Foster* 74 (GH, R). Ilheus, *Foster* 83 (GH).

17. ***Aechmea fraudulosa*** Mez, Engl. Pflanzenreich IV. 32: 636. 1935.

Streptocalyx blanchetii Baker, Handb. Bromel. 32. 1889.

Aechmea blanchetii Mez in Mart. Fl. Bras. 3, pt. 3: 336. 1892. Not Baker 1889.

BAÍA: *Blanchet* (G, F neg. 8485); 1527 (BM, type); *Glocker* (S).

18. ***Aechmea orlandiana*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 55, *pl. 69.* 1941.

ESPÍRITO SANTO: Itapemirim, *Foster* 165 (GH, type (US neg. 3950), R); 970 (GH, US).

19. ***Aechmea mertensii*** (Meyer) Schult. in R. & S. Syst. 7, pt. 2: 1272. 1830. FIGURE 97.

Bromelia mertensii Meyer, Fl. Essequeb. 144. 1818.
Aechmea spicata Mart. ex Schult. in R. & S. Syst. 7, pt. 2: 1273. 1830.
Bromelia thyrsiflora Willd. ex Schult. in R. & S. Syst. 7, pt. 2: 1282. 1830.
Aechmea thyrsiflora Schlecht. Linnaea 18: 437. 1844.
Aechmea mucroniflora Hook. Bot. Mag. 81: *pl. 4832.* 1855.
Aechmea wullschlaegeliana Mez in Mart. Fl. Bras. 3, pt. 3: 330. 1892.
Aechmea humilis Mez in DC. Monogr. Phan. 9: 216. 1896.

This is one of the most variable species in all the Bromeliaceae. The extreme range in the size of the flowers and in the size and density of the inflorescence has caused the proposal of a number of species, yet ampler recent material shows complete intergradation between all extremes.

AMAZONAS: *Xavier* 169 (US). Rio Japura, *Martius* (M, type of *Aechmea spicata* Mart., F neg. 8635). Marari, Rio Juruá, *Ule* 5363 (MG). Manaus, *J. G. Kuhlmann* 295 (RB); *Luetzelburg* 22099 (M); *Krukoff* 7970 (GH, NY); *Tate* 44 (NY). Panuré, Rio Uaupés, *Pires* 1103 (IAN). São Gabriel, Rio Negro, *Melin* 132 (S). São Paulo de Olivença, Palmares, *Krukoff* 8596 (NY). Uanari, Rio Negro, near Uaupés [São Gabriel], *Pires* 800 (IAN). (Terra Preta), Rio Negro, *J. G. Kuhlmann* 1031 (RB). Mun. Humaïta: Livramento, *Krukoff* 6986 (GH, NY).

PARÁ: *Hoffmannsegg* 6313 (B, F neg. 11327). Belém, *Archer* 7841 (IAN, US); *Huber* (MG); *Pires & Black* 671 (GH, IAN); *Smith, Pires & Black* 7119 (US). (Cassipa), Rio Tapajos, *Krukoff* 1268 (NY). Upper Rio Cuminá, *Sampaio in Rondon* 19222 (R). Santa Julia, *J. G. Kuhlmann* 1675 (RB). Rio Tinga, off Rio Cupari, *Black* 47–2031 (IAN). Vigia, *Black* 50–9772 (IAN).

PERNAMBUCO: Aripibú, *Pickel* 3457 (IPA).

MATO GROSSO: Tabajara, upper Rio Machado, *Krukoff* 1488 (NY).

ALSO: TRINIDAD, GUIANA, VENEZUELA, COLOMBIA, PERÚ.

20. ***Aechmea huebneri*** Harms, Notizblatt 10: 581. 1929.

AMAZONAS: Rio Tarumá-Mirim, near Manaus, *Huebner* 51 (B, type, F neg. 11315). Mun. São Paulo de Olivença: Basin of creek Belém, *Krukoff* 8803 (NY).

Krukoff 8803 is definitely tripinnate while the type appears to be bipinnate, although it may be represented by a single long branch.

ALSO: COLOMBIA.

21. ***Aechmea setigera*** Mart. ex Schult. in R. & S. Syst. 7, pt. 2: 1273. 1830.

Aechmea prieureana Baker, Handb. Bromel. 39. 1889.

AMAZONAS: (Caldeirão), Rio Solimões, *Martius* (M, type, F neg. 8636). Riosinho Juruena, Rio Jutai, *Fróes* 21044 (IAN). Rio Tarumá-Mirim, lower Rio Negro, *Ducke* (MG).

RIO BRANCO: Ilha do Ajarani, *J. G. Kuhlmann* 390 (RB, US). (São José do Rio Branco), *Luetzelburg* 21927 (R).

PARÁ: Ilha do Mosqueiro near Belém, *Killip & Smith* 30656 (US).

SÃO PAULO: Cachoeira do Maribondo, *Gehrt* (GH, SP).

ALSO: GUIANA, VENEZUELA, COLOMBIA, PANAMÁ.

22. ***Aechmea kuntzeana*** Mez in DC. Monogr. Phan. 9: 208. 1896; Harms Notizblatt 12: 528. 1935.

Hoiriri kuntzeana Kuntze, Rev. Gen. 3, pt. 2: 303. 1898.

ACRE: (Seringal São Francisco), *Ule* 9165 (! Harms).
ALSO: BOLIVIA.

23. ***Aechmea phanerophlebia*** Baker, Handb. Bromel. 47. 1889.
ESPÍRITO SANTO: Collatina, *Foster* 221 (GH, R). Itapemirim, *Foster* 154 (GH, R). Santa Teresa, *Foster* 221-A (GH, R); 507 (GH).
MINAS GERAIS: Ipatinga, *Foster* 743 (GH).
RIO DE JANEIRO: Alto Macaé, *Glaziou* 17286 (F, G, F neg. 8488). Cantagallo, *Glaziou* 16412 (K, type, GH neg. 2695).
SÃO PAULO: Bocaina, *Brade* 20905 (RB, US); *Glaziou* 16411 (P).

FIG. 97.

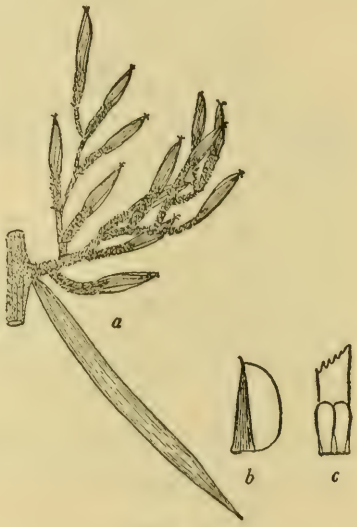

FIG. 98.

FIG. 97.—*Aechmea mertensii: a,* Inflorescence, × ¼; *b,* branch, × 1; *c,* floral bract, × 2; *d,* sepal, × 2; *e,* petal and stamen, × 2.
FIG. 98.—*Aechmea stelligera: a,* Branch of inflorescence, × ½; *b,* sepal, × 1; *c,* base of petal, × 2.

24. ***Aechmea eurycorymbus*** Harms, Notizblatt 12: 528. 1935.
PARAÍBA: *Xavier* B (US). Campina Grande, *Foster* 2408 (US).
PERNAMBUCO: Floresta, *Werdermann* 2931 (B, type).

25. ***Aechmea tomentosa*** Mez in DC. Monogr. Phan. 9: 229. 1896.
PERNAMBUCO: Iguaraçu, *Ramage* (BM, type).

26. ***Aechmea stelligera*** L. B. Smith, p. 18, fig. 98.
PARAÍBA: Areia, *Vasconcellos* (US, type; SP).

27. ***Aechmea werdermannii*** Harms, Notizblatt 12: 529. 1935.
PERNAMBUCO: Floresta, *Werdermann* 2911 (B, type).

28. ***Aechmea megalantha*** Harms, Gartenflora 86: 159, *fig.* 1937.
BRAZIL (?): Described from cultivated material; no herbarium specimen seen.

29. ***Aechmea lingulata*** (L.) Baker, Journ. Bot. 17: 164. 1879.

1. Branches spreading and curved-ascending; subulate apex of the floral bracts much longer than the inconspicuous base..... Var. a. **lingulata**
1. Branches straight, spreading to reflexed.
   2. Sepals about 2 mm. long without the mucro; floral bracts with broadly ovate base about as long as the subulate apex. Var. b. **patentissima**
   2. Sepals 7 mm. long without the mucro; floral bracts with a relatively short mucro..... Var. c. **froesii**

29a. ***Aechmea lingulata*** var. ***lingulata***. FIGURE 99.

Bromelia lingulata L. Sp. Pl. 285. 1753.
Billbergia odora Miq. Linnaea 18: 377. 1844.
Aechmea odora Baker, Journ. Bot. 17: 226. 1879.
Wittmackia lingulata Mez in Mart. Fl. Bras. 3, pt. 3: 275. 1891.
Wittmackia odora Mez in Mart. Fl. Bras. 3, pt. 3: 277. 1891.
Wittmackia glaziovii Mez in DC. Monogr. Phan. 9: 142. 1896.

CEARÁ: Serra de Maranguape, *Ule* 4997 (B, F neg. 11294).
PARAÍBA: Campina Grande, *Foster* 2406 (US).
PERNAMBUCO: (Jaqueira), *Ridley, Lea & Ramage* (BM). Russinha, *Pickel* 3657 (GH, IPA, NY).
BAÍA: Agua Preta, *Foster* 58 (GH, R); 61 (GH, R); 82 (GH, R). Maracás, *Foster* 2468 (US). Milagres to Maracás, *Foster* 2455 (US).
ESPÍRITO SANTO: Monte Claro, *Foster* 225 (GH, US). Mun. Collatina: Linhares, *Foster* 771 (GH, US); 786 (GH).
RIO DE JANEIRO: Cabo Frio, *Ule* (R). Enseada de Imbetiba, Macaé, *Glaziou* 18569 (B, type of *Wittmackia glaziovii* Mez, F neg. 11293).
ALSO: GUIANA, TRINIDAD, LESSER ANTILLES.

29b. ***Aechmea lingulata*** var. ***patentissima*** (Mart. ex Schult.) L. B. Smith, p. 15.

Billbergia patentissima Mart. ex Schult. in R. & S. Syst. 7: pt. 2: 1270. 1830.
Aechmea patentissima Baker, Journ. Bot. 17: 227. 1879.
Wittmackia patentissima Mez in Mart. Fl. Bras. 3, pt. 3: 278, *pl. 61*. 1891.

BAÍA: Almada, *Martius* (M, type).

29c. ***Aechmea lingulata*** var. ***froesii*** L. B. Smith, p. 15.

BAÍA: Colonia Itatinga to Bom Gosto, *Fróes* 19970 (NY, type, US neg. 4249).

30. ***Aechmea purpureo-rosea*** (Hook.) Wawra, Oesterr. Bot. Zeitschr. 30: 148. 1880.

Billbergia purpureo-rosea Hook. Bot. Mag. 61: *pl. 3304*. 1834.
Aechmea suaveolens Knowles & Westcott, Fl. Cab. 3: 177, *pl. 134*. 1840.

BRAZIL: *Freyreis* (S).
RIO DE JANEIRO: Niteroi, *Smith & Brade* 2347 (GH).
DISTRITO FEDERAL: Cultivated, *Ule* (R). Cosme Velho, *Glaziou* 11688 (K, US neg. 4196). Spontaneous, Jardim Botânico, *J. G. Kuhlmann* 6198 (RB). Rio de Janeiro, *Bowie & Cunningham* (BM); *Widgren* 81 (S). Silvestre to Paineiras, *L. B. Smith* 2255 (GH). Tijuca, *Hoehne* (SP). Barra da Tijuca, *Reitz* 4063 (HBR).

31. ***Aechmea angustifolia*** Poepp. & Endl. Nov. Gen. & Sp. 2: 43, *pl. 159.* 1838.
Aechmea cumingii Baker, Journ. Bot. 17: 227. 1879.
Aechmea boliviana Rusby, Bull. N. Y. Bot. Gard. 4: 456. 1907.
Aechmea cylindrica Mez, Repert. Sp. Nov. Fedde 12: 413. 1913.
Aechmea inconspicua Harms, Notizblatt 10: 786. 1929.

AMAZONAS: Rio Castanho on Rio Paduiri, upper Rio Negro Basin, *Cardona* 1388 (US). Mun. Humaitá: Livramento, *Krukoff* 6775 (GH, NY). Tres Casas, Rio Madeira, *Krukoff* 6501 (NY); 6533 (NY, GH).

RIO BRANCO: Jarú, *J. G. Kuhlmann* 155 (RB).

ACRE: Rio Macauã on Rio Iaco, *Krukoff* 5538 (NY, GH). (Seringal Auristella), *Ule* 9164 (B, type of *Aechmea cylindrica* Mez, F neg. 11311).

ALSO: COSTA RICA to PERÚ and BOLIVIA.

32. ***Aechmea sprucei*** Mez in DC. Monogr. Phan. 9: 226. 1896.
Aechmea paniculigera sensu Baker, Handb. Bromel. 40. 1889. In part, not as to type.

AMAZONAS: Taperinha, Santarem, *Ginzberger & Zerny* 392 (F).

PARÁ: *Spruce* 104 (K, type, GH neg. 2696). Approagas, Rio Capim, *Huber* (MG). São Miguel do Guamá, Rio Guamá and Rio Irituia, *Dárdano & Black* 48–3162 (IAN); 48–3195 (IAN). Tomé Assú, Dist. Acará, *Mexia* 6032 (GH, US).

MARANHÃO: *Hesketh* (CGE).

CEARÁ: Aquiraz, *Drouet* 2616 (GH, US).

ALSO: COLOMBIA.

33. ***Aechmea melinonii*** Hook. Bot. Mag. 87: *pl. 5235.* 1861.
Hohenbergia melinonii Baker, Saund. Ref. Bot. 4: sub *pl. 284.* 1871.
Aechmea jenmanii Baker, Journ. Bot. 20: 329. 1882.

AMAPÁ: Cunani, *Huber* 984 (MG).

ALSO: GUIANA.

34. ***Aechmea azurea*** L. B. Smith, Arquiv. Jard. Bot. Rio 10: 141, *fig. 1.* 1950.

ESPÍRITO SANTO: Mun. Castelo: Braço do Sul, *Brade* 19158 (RB, type, US neg. 3256).

35. ***Aechmea ramosa*** Mart. ex Schult. in R. & S. Syst. 7, pt. 2: 1272. 1830.

1. Sepals and ovary green and yellow..... Var. a. **ramosa**
1. Sepals red, ovary white..... Var. b. **festiva**

35a. ***Aechmea ramosa*** var. ***ramosa***
Aechmea platynema Baker, Handb. Bromel. 35. 1889. In part, not as to type.
Aechmea reukartiana Hort. Liége ex C. Chevalier, Rev. Hortic. 108: 109. 1936. In synon.

BRAZIL: Cultivated, *Hort. Liége* (LG, *Aechmea reukartiana* Hort.).

ESPÍRITO SANTO: Campinas to Vitória, *Foster* 207 (GH, R). Guiomar, *Foster* 943 (GH). Itapemirim, *Foster* 150 (GH); 150-A (GH). Santa Teresa, *Foster* 850 (GH, US).

MINAS GERAIS: Mariana, *Martius* 1036 (M, type, F neg. 8638). Paraibana, *Oliveira* (SP). Mun. Antônio Dias: Parque Nacional near Ipatinga, *Foster* 730 (GH, US).

RIO DE JANEIRO: Belém, *Schwacke & Burlamaqui* (R). Imbuí, Niteroi, *Brade* 11058 (R).

DISTRITO FEDERAL: Rio de Janeiro, *Glaziou* 15672 (GH, P). São Cristovão, *Glaziou* 16420 (F).

35b. ***Aechmea ramosa*** var. ***festiva*** L. B. Smith, p. 18.
ESPÍRITO SANTO: Mun. Collatina: Linhares, *Foster* 770 (GH, type, US neg. 4280).

36. ***Aechmea tocantina*** Baker, Handb. Bromel. 39. 1889.
GOIÁS: Rio Tocantins, *Weddell* 2365 (P, type, GH neg. 2365).
MATO GROSSO: Diamantino, *Lindman* A-3425 (S).
ALSO: BOLIVIA.

37. ***Aechmea araneosa*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 53, *pl. 64.* 1941.
ESPÍRITO SANTO: Santa Teresa, *Foster* 241 (GH, type; R); 836 (GH, US).

38. ***Aechmea chantinii*** (Carr.) Baker, Handb. Bromel. 49. 1889.
Billbergia chantinii Carr. Rev. Hortic. 50: 112, *fig. 22.* 1878; 52: 272, *figs. 54–56.* 1880.
AMAZONAS: Described from cultivation.

The first publication of *Aechmea chantinii* was based on sterile material and consequently noted only the handsomely cross-banded leaves. The second included flowering material and gave figures of the inflorescence. From these is indicated a species with lax spikes and flowers in more than two ranks as shown in the foregoing key.

However, there is material now in cultivation purporting to be *Ae. chantinii* but with dense spikes and two-ranked flowers. The floral bracts and winged rhachis form pouches around the flowers, a character not easily verified in the second publication of *Ae. chantinii.*

The present plant has a long history of cultivation and can not be identified with any other species. If the two have a common ancestry, then the type of *Ae. chantinii* may have been a depauperate or injured individual or even a hybrid. In that case the present material is more typical in a genetical sense than is the taxonomic type.

39. ***Aechmea fosteriana*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 54, *pl. 67.* 1941.
ESPÍRITO SANTO: Vitória, *Foster* 177 (GH, type; R); 878 (GH, US).

40. ***Aechmea schultesiana*** Mez in Mart. Fl. Bras. 3, pt. 3: 334. 1892.
Billbergia paniculata Mart. ex Schult. in R. & S. Syst. 7, pt. 2: 1268. 1830. Not *Aechmea paniculata* R. & P. 1802.
Aechmea friedrichsthalii Mez & Donn.-Smith, Bot. Gaz. 19: 263. 1894.
Aechmea inermis Mez, Bull. Herb. Boiss. II. 4: 620. 1904.
AMAZONAS: Rio Japurá, *Martius* (M, type, F neg. 8637).
ALSO: COSTA RICA to VENEZUELA and PERÚ.

Subgenus *Hoplophytum* (Beer) Mez

41. ***Aechmea macrochlamys*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 54, *pl. 68.* 1941.
ESPÍRITO SANTO: Santa Teresa, *Foster* 244 (GH, type; US); 837 (GH, US).

42. ***Aechmea candida*** E. Morr. ex Baker, Handb. Bromel. 41. 1889.
BRAZIL: Cultivated, *Liége* (LG); *Strauss* (B, F neg. 11309). Unpublished plate, *E. Morren* (K, type).

43. *Aechmea caudata* Lindm. Svensk. Akad. Handl. 24: no. 8:29, *pl. 6, figs. 1–9.* Feb. 1891.

1. Leaf-blades concolorous..... Var. a. **caudata**
1. Leaf-blades with broad white longitudinal stripes..... Var. b. **variegata**

43a. *Aechmea caudata* var. ***caudata***

Aechmea platzmannii Wittm. Bot. Jahrb. 13, Beibl. 29:2, 12. Mar. 1891.
Aechmea henningsiana Wittm. Bot. Jahrb. 13, Beibl. 29:12. Mar. 1891.

BRAZIL: *Glaziou* 16414 (P).

ESPÍRITO SANTO: Santa Teresa, *Foster* 290 (GH, R).

SÃO PAULO: Alto da Serra, *Hoehne* (SP). Guarujá, *L. B. Smith* 2030 (B, BA, BM, F, GH, K, S, US). Mogi das Cruzes, *Foster* 490 (GH). Iguapé, Santos, *Hoehne* (SP). Ilha da Queimada Grande, Santos, *Amaral & Domingues* (SP). Ponta de Taipú, Santos, *Mosén* 3242 (S, type). Prainha, Santos, *Foster* 482 (GH, R); *Gehrt* (SP, US). São Vicente, Santos, *Burchell* 3291 (K, US neg. 4197); *L. B. Smith* 2099 (GH, P).

PARANÁ: Caiobá, *Foster* 437 (GH); *M. Kuhlmann* (SP, US). Casa Ipiranga, *Dusén* 15411 (S). Curitiba, *Dusén* 14608 (S). Curitiba to Joinvile near the Santa Catarina line, *Reitz* 3758-c (HBR); 3880 (HBR). Guaratuba, *Reitz* 4276 (HBR). Jacareí, *Dusén* (S); 6636 (S); 15406 (S); 15451-b (S); 15606 (S); 17497 (S). Pôrto de Cima, Serra do Mar, *Dusén* 10333 (GH, S).

SANTA CATARINA: Mun. Araranguá: Meleiro, *Reitz* C-2 (GH, HBR). Serra do Pilão, *Reitz* 3430 (HBR, US). Mun. Brusque: Ribeirão do Ouro, *Reitz* (HBR); 3648 (HBR). Mun. Florianópolis: Campeche (praia), *Reitz* 5085 (! Reitz). Ribeirão da Ilha, *Reitz* 3929 (HBR). Mun. Orleães: Orleães, *Reitz* 1753 (GH, HBR). Serra do Rio do Rastro, *Reitz* 3330 (HBR). Santa Clara, *Reitz* 1746 (HBR, LIL, R, US). Mun. São Francisco do Sul: Pôrto das Canoas, *Smith & Reitz* 5709 (US).

43b. *Aechmea caudata* var. ***variegata*** M. B. Foster, Bromel. Soc. Bull. 3:47. 1953.

BRAZIL: Cultivated, *Foster* 2834 (US, type).

44. *Aechmea coelestis* (C. Koch) E. Morr. Fl. des Serres 21:5, *pl. 2146.* 1875.

Hoplophytum coeleste C. Koch, Ind. Sem. Hort. Berol. for 1856, App.: 6. 1857.

BRAZIL: Cultivated, *André* K-328 (NY); *L. B. Smith* (GH).

ESPÍRITO SANTO: Mun. Cachoeiro de Itapemirim: Vargem Alta, *Brade* 19969 (RB, US neg. 3349).

MINAS GERAIS: *Sellow* 229 (! Mez).

RIO DE JANEIRO: Teresópolis, *Sampaio* 2613 (R).

DISTRITO FEDERAL: Gavea, *Smith & Mus. R* 6434 (R, US). Cultivated, São Cristovão, *Lindman* A-17 (S). Tijuca, *Glaziou* 16416 (P, F neg. 11320); *Smith & Brade* 2185 (GH).

SÃO PAULO: Mato do Governo, Itú, *Gehrt* (GH, SP). Mun. São Paulo: Florestal, *Foster* 468 (GH). Pirajussára, *Gehrt* (SP). São Paulo, *Doering* (SP).

PARANÁ: Curitiba to Paranaguá, *Foster* 505 (GH).

45. ***Aechmea organensis*** Wawra, Oesterr. Bot. Zeitschr. 30: 116. 1880.
Aechmea nudicaulis var. *microdon* Baker, Journ. Bot. 17: 235. 1879.
Aechmea floribunda sensu Baker, Handb. Bromel. 42. 1889. In part, not as to type.

RIO DE JANEIRO: Teresópolis, *Foster* 997 (GH); *Glaziou* 11680 (F).
DISTRITO FEDERAL: Rio de Janeiro, *Reitz* 5673 (HBR, US).

FIG. 99.

FIG. 100.

FIG. 99.—*Aechmea lingulata* var. *lingulata: a,* Apex of leaf, × ⅙; *b,* inflorescence, × ⅙; *c,* flower, × 1; *d,* sepal, × 2; *e,* petal and stamen, × 2. (*a* and *b* after Botanical Magazine.)

FIG. 100.—*Aechmea bicolor: a,* Apex of leaf, × 1; *b,* inflorescence, × 1; *c,* flower, × 1; *d,* sepals, × 2; *e,* petal and stamen, × 2; *f,* longitudinal section of ovary, × 2.

SÃO PAULO: Source of the Rio Cotia, *Gehrt* (GH, SP). Cubatão, *Burchell* 3617 (K, type of *Aechmea nudicaulis* var. *microdon* Baker). São Paulo to Curitiba, km. 379, *Foster* 392 (GH, R); *M. Kuhlmann* (SP).
PARANÁ: Curitiba, *Foster* 457 (GH). Ipiranga, *Dusén* 3541 (R). Morrêtes, *Hoehne* (SP, GH neg. 7169); *M. Kuhlmann* (SP, US). São João, Curitiba to Paranaguá, *Reitz* 5729 (HBR, US); 5753 (! Reitz).
RIO GRANDE DO SUL: Cultivated, Pôrto Alegre, *Golland in Lindman* (S).

46. ***Aechmea gracilis*** Lindm. Svensk. Akad. Handl. 24: no. 8: 30, *pl. 6, figs. 10–16.* 1891.

BRAZIL: Cultivated, *Foster* 451 in part (GH).
SÃO PAULO: Alto da Serra, *Foster* 357 (GH). Iguapé, Santos, *Loefgren & Edwall* (GH, SP). Morro do Curupira, Sorocaba, Santos, *Mosén* 3707 (S, type).

PARANÁ: Pôrto de Cima, Serra do Mar, *Jönsson in Dusén* 813-a (GH, S).
SANTA CATARINA: Mun. Biguaçú: Fachinal, *Reitz* C-951 (GH, HBR).

47. ***Aechmea bicolor*** L. B. Smith, p. 12, fig. 100.
BAÍA: Ituaçú to Jequié, *Foster* 2450 (US, type; US neg. 4242).

48. ***Aechmea blumenavii*** Reitz, Anais Bot. Herb. Barbosa Rodrigues 4:21, *pl. 6.* 1952.
SANTA CATARINA: Mun. Blumenau: Morro Spitzkopf, *Reitz* 4679 (HBR, type). Mun. Brusque: Ribeirão do Ouro, *Reitz* (! Reitz); 3559 (HBR, US); 3559-a (HBR); 3638 (HBR). Mun. Itajaí: Morro do Baú, Luiz Alves, *Reitz* 4743 (! Reitz).

49. ***Aechmea kertesziae*** Reitz, Anais Bot. Herb. Barbosa Rodrigues 4:24, *pl. 7-I.* 1952.
SANTA CATARINA: Canto Grande, Pôrto Belo, *Reitz* 3617 (HBR); 3621 (HBR); 3624-a (HBR); 3628 in part (HBR); 3643 (HBR). Laguna, *Reitz* 4165 (HBR, type); *Smith & Reitz* 5947 (R, US). Mun. Itajaí: Cabeçudas, *Reitz* 3627 (! Reitz); *Smith & Reitz* 6079 (US). Praia Braba, *Reitz & Klein* 1094 (! Reitz).

50. ***Aechmea gamosepala*** Wittm. Bot. Jahrb. 13, Beibl. 29:3, 13. 1891.
Aechmea thyrsigera Spegazzini, Physis 3:45. 1917.
Chevalieria thyrsigera Mez, Engl. Pflanzenreich IV. 32:95. 1934.
SÃO PAULO: São Paulo, *Ostermeyer* (SP).
PARANÁ: Guaratuba, *Frenzel* (Inst. Biol. Pesq. Tec.); *Hoehne* (SP); *Reitz* 4272 (HBR); *Smith & Reitz* 5734 (R, US). Curitiba to Joinvile near Santa Catarina line, *Reitz* 3891 (HBR). Mun. Paranaguá: Caiobá, *Foster* 439 (GH, R); *Hatschbach* 1854 (US); *Tessmann* (US).
SANTA CATARINA: Joinvile, *Reitz* 3726 (HBR); 3881 (HBR). São Francisco do Sul, *Reitz* 3675 (HBR); 3729 (HBR); 3913 (HBR). Mun. Araquari: Barra do Sul, *Reitz & Klein* 508 (! Reitz). Itajuba, *Reitz* 3758-g (HBR). Mun. Araranguá: Sombrio, *Reitz* C-642 (GH, HBR); C-1222 (HBR, US).
RIO GRANDE DO SUL: Torres, *Golland* (S). Mun. São Francisco de Paula: Taimbé, *Rambo* (US).
ALSO: ARGENTINA.

Subgenus *Platyaechmea* Benth. & Hook. f.

51. ***Aechmea distichantha*** Lem. Jard. Fleur. 3: *pl. 269.* 1853.

1. Inflorescence lax or sublax, usually broadly pyramidal; spikes more or less spreading, many-flowered; leaves usually acute or acuminate.
   2. Petals purple or blue..... Var. a. **distichantha**
   2. Petals white..... Var. a. **distichantha** forma **albiflora**
1. Inflorescence dense; spikes erect, few-flowered.
   3. Inflorescence elongate, slenderly cylindric or fusiform; plants large; leaves usually acuminate..... Var. b. **schlumbergeri**
   3. Inflorescence short, ovoid; plants small; leaves usually rounded and apiculate..... Var. c. **glaziovii**

51a. ***Aechmea distichantha*** var. ***distichantha.*** FIGURE 101.
Tillandsia polystachia Vell. Fl. Fluminensis 136. 1825; Icon. 3: *pl. 138.* 1835. Not L. 1762.

Aechmea excavata Baker, Journ. Bot. 17: 134. 1879.
Aechmea brasiliensis Regel, Gartenflora 34: 258, *pl. 1202.* 1885.
Aechmea myriophylla E. Morr. ex Baker, Bot. Mag. 113: *pl. 6939.* 1887.
Quesnelia distichantha Lindm. Svensk. Akad. Handl. 24: no. 8: 25, *pl. 4, figs. 7–10.* 1891.
Aechmea polystachya Mez in Mart. Fl. Bras. 3, pt. 3: 343. 1892.
Aechmea polystachya var. *excavata* Mez in DC. Monogr. Phan. 9: 251. 1896.
Hoiriri polystachya Kuntze, Rev. Gen. 3, pt. 2: 303. 1898.
Aechmea polystachya var. *myriophylla* Hassler, Ann. Conserv. & Jard. Bot. Genève 20: 290. 1919.
Aechmea platyphylla Hassler, Ann. Conserv. & Jard. Bot. Genève 20: 291. 1919.

Material listed under the typical variety is not so homogeneous as under the others because in case of doubt collections have been left there.

Brazil: *Sellow* bromel. 74 (P). Cultivated, *Atkinson* 100 (BH).

Minas Gerais: *Widgren* (S). Serra dos Cabritos, Capivari, Caldas, *Mosén* 1729 (S). Serra do Picu, *Glaziou* 11691 (P); 12236 (P).

Rio de Janeiro: Itatiaia, *Brade* 14052 (RB); *Dusén* (S); 2198 (S).

Distrito Federal: Cascadura, Serra da Bica, *Glaziou* 15481 (P). Quinta, *Glaziou* 16408 (P). Cultivated, Hort. Museu, *Ule* (R).

São Paulo: Alto da Serra, *Luederwaldt* (SP). Campinas, *Franco & Mendes* (SP). Campos da Bocaina, *Glaziou* 11695 (P). Campos do Jordão, *Eugenio* 3442 (GH); *Hoehne* (GH, SP); *Pickel* 5339 (US). Salesópolis, Boracéa, *M. Kuhlmann* 2344 (SP). Santo Amaro, *Krieger* 179 (SP). Santos, *Mendonça* 10 (R). Mun. São Paulo: *Glaziou* 13245 (P). Cidade Jardim, *Smith & Kuhlmann* 1814 (GH). Orchidario, *Foster* 349 (GH, R). Vila Ema, *Brade* 10969 (R).

Paraná: Campo Largo, *Foster* 406 (GH). Curitiba, *Tessmann* (US). Curitiba to Paranaguá, *Reitz* 5764 (HBR, US). Jaguariaíva, *Dusén* 15502 (S, US). Roça Nova, *Dusén* 10273 (GH, S). Serra de São Luiz, *M. Kuhlmann* (GH, SP). Serrinha, *Dusén* 15570 (GH, S). Teixeira Soares, km. 161, *Hertel* 37 (Paran.). Tibagi, *Reiss* 72 (GH, US). Mun. Piraquara: Borda do Campo, *Hatschbach* 2017 (US). Mun. Timoneira: *Braga* 196 (Paran.).

Santa Catarina: Ribeirão Grande, Taió, *Reitz* 3901 (HBR). Serra do Mirador, Taió, *Reitz* 3960 (HBR). Mun. Bom Retiro: Figueiredo, *Reitz* 2897 (HBR, US); 2978 (HBR, US). Mun. Chapecó: Itapiranga, *Reitz* 3825 (HBR).

Rio Grande do Sul: Alto Uruguai, *Golland* (S).

Also: Bolivia, Paraguay, Argentina, Uruguay.

51a. ***Aechmea distichantha*** var. ***distichantha*** forma ***albiflora*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 102. 1943. As var. "typica."

Paraná: Campo Largo, *Foster* 406A (GH, type). Serra São Luiz, *Gonçalves* (SP).

51b. ***Aechmea distichantha*** var. ***schlumbergeri*** E. Morr. ex Mez in Mart. Fl. Bras. 3, pt. 3: 343. 1892.
Chevalieria grandiceps Griseb. Goett. Abh. 24: 329. 1879.
Aechmea grandiceps Mez in Mart. Fl. Bras. 3, pt. 3: 346. 1892.
Aechmea involucrata Rusby, Bull. N. Y. Bot. Gard. 4: 456. 1907.

Aechmea polystachya var. *longifolia* Castellanos, Com. Mus. Nac. Hist. Nat. Buenos Aires 2: 139, *fig. 3.* 1925.

? *Aechmea rubra* A. Silveira, Floralia Montium 2, Add.: 1, *pl. 9c.* 1931.

Aechmea involucrifera Mez, Engl. Pflanzenreich IV. 32: 157. 1934.

BRAZIL: Cultivated, *Hort. Liége* (LG, type).

MINAS GERAIS: Caldas, *Regnell* I-437 (S, US). Poços de Caldas, *Viegas* (SP).

SÃO PAULO: Mun. São Paulo: *Foster* 488 (GH).

ALSO: BOLIVIA, PARAGUAY, ARGENTINA.

51c. ***Aechmea distichantha*** var. ***glaziovii*** (Baker) L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 102. 1943.

Aechmea glaziovii Baker, Journ. Bot. 17: 133. 1879.

Quesnelia wittmackiana Regel, Gartenflora 37: 497, *pl. 1281, fig. 2.* 1888.

Aechmea jucunda E. Morr. ex Baker, Handb. Bromel. 55. 1889.

Aechmea regelii Mez in Mart. Fl. Bras. 3, pt. 3: 339. 1892.

Aechmea wittmackiana Mez in Mart. Fl. Bras. 3, pt. 3: 340. 1892.

Aechmea pulchella E. Morr. ex Mez in Mart. Fl. Bras. 3, pt. 3: 341. 1892.

BRAZIL: Cultivated, *Atkinson* 88 (BH); *Bleu* (LG, GH neg. 2931); *Hort. Liége* (LG, *Aechmea wittmackiana* Mez, *Ae. pulchella* E. Morr.).

MINAS GERAIS: Poços de Caldas, *Viégas* (SP). Sapucaí Mirim, *Kuhlmann* 2606 (SP). Mun. Delfim Moreira: São Francisco dos Campos, *Kuhlmann & Kühn* 2431 (SP).

RIO DE JANEIRO: Itatiaia, *Brade* (RB); 14053 (RB); *Ferreira in L. B. Smith* 1712 (GH); *Foster* 147 (GH, R, US); *Glaziou* 8986 (P, isotype of *Aechmea glaziovii* Baker, GH neg. 2955); *L. B. Smith* 1474 (GH, S); 1662 (GH); 1726 (GH).

SÃO PAULO: Alto da Serra, *Hoehne* (GH, SP); *Luederwaldt* (SP); *L. B. Smith* 1872 (GH); 2109 (GH). Serra da Bocaina, *Duarte & Brade* 21197 (RB, US); *Glaziou & Schwacke* (R). Bananal, Serra da Bocaina, *Brade & Apparicio* 20146 (RB, US). Itapira, *Hoehne* (GH, SP). Mogi das Cruzes, *Pickel* 5089 (SP). São Paulo, *M. Kuhlmann* (SP); *Pickel* 4675 (SP). Mun. Amparo: Monte Alegre, *Kuhlmann & Kühn* 410 (SP). Mun. Atibaia: Pedra Grande, *Gehrt* (SP).

PARANÁ: Mun. Campo Largo: Serra São Luiz de Puruna, *Hatschbach* 1566 (US).

52. ***Aechmea amazonica*** Ule, Verh. Bot. Ver. Brand. 48: 136. 1907.

AMAZONAS: All Ule's herbarium material is from Peru but in his original description he notes seeing the species along the Rio Juruá.

ALSO: COLOMBIA.

53. ***Aechmea tillandsioides*** (Mart. ex Schult.) Baker, Journ. Bot. 17: 134. 1879.

Billbergia tillandsioides Mart. ex Schult. in R. & S. Syst. 7, pt. 2: 1269. 1830.

Aechmea xiphophylla Baker, Handb. Bromel. 63. 1889.

AMAZONAS: Cocui to Rio Içana on the Rio Negro, *Schultes & López* 9568 (IAN, US). Ega [Tefé], *Poeppig* (P). Ilha Vista Alegre, upper Rio Negro, *Baldwin* 3461 (US). Tefé, *Black* 47–1227 (IAN); *Pires* 1301 (IAN). Mun. Humaitá: Rio Madeira, *Krukoff* 7155 (GH).

ACRE (?): São João, *Ule* 6007 (MG).
ALSO: MÉXICO to COLOMBIA and GUIANA.

54. ***Aechmea contracta*** (Mart. ex Schult.) Baker, Journ. Bot. 17:234. 1879.
Billbergia contracta Mart. ex Schult. in R. & S. Syst. 7, pt. 2:1263. 1830.
BRAZIL: Probable, but not yet recorded.
COLOMBIA: Araracoara and Pôrto das Miranhas, *Martius* (M, type, F neg. 8633).

Subgenus *Ortgiesia* (Regel) Mez

55. ***Aechmea hamata*** Mez in Mart. Fl. Bras. 3, pt. 3:347. 1892.
BRAZIL: Cultivated, *Hennings* (B, type, F neg. 11314).

56. ***Aechmea caesia*** E. Morr. ex Baker, Handb. Bromel. 43. 1889.
BRAZIL: Unpublished plate, *E. Morren* (K, type). Cultivated, *Sander* (LG).

57. ***Aechmea fasciata*** (Lindl.) Baker, Journ. Bot. 17:231. 1879.
1. Leaves green..... Var. a. **fasciata**
1. Leaves red-purple..... Var. b. **purpurea**

57a. ***Aechmea fasciata*** var. ***fasciata.***
Billbergia fasciata Lindl. Bot. Reg. 13: *pl. 1130.* 1828.
Billbergia rhodocyanea Lem. Fl. des Serres 3: *pl. 207.* 1847.
Aechmea dealbata E. Morr. ex Baker, Handb. Bromel. 58. 1889.
BRAZIL: *Sellow* bromel. 94 (P). Cultivated, *Hort. Liége* (LG, *Aechmea dealbata* E. Morr.); *Hort. Vratislaw* (GH).
RIO DE JANEIRO: Alto da Serra to Meio da Serra, *L. B. Smith* 1548 (GH, S). Rio Paquequer, Serra dos Orgãos, *Brade* 16484 (RB). Old road below Petrópolis, *Smith & Mus. R* 6459 (R, US). Teodoro de Oliveira to Nova Friburgo, *Smith & Mus. R* 7112 (R, US). Teresópolis, *Bailey* 1295 (BH); *Brade* (R); *Duarte & Pereira* (RB); *Foster* 977 (GH); *Ule* 4137 (R); *Veloso* (R).
DISTRITO FEDERAL: Andaraí Grande, *Glaziou* 11686 (K (US neg. 4194), P). Corcovado, *L. B. Smith* 1396 (GH); *Smith & Vieira* 1384 (B, GH). Paineiras, Corcovado, *J. G. Kuhlmann* 6152 (RB, US). Engenho Novo, *Glaziou* 11677 (P). Gavea, *Reitz* 4474 (HBR). Quinta da Boa Vista, *Glaziou* 16409 (P); 16410 (K, US neg. 4195). Realengo, *Viana Freire* 400 (R). Rio de Janeiro, *Gaudichaud* 123 (P); *Wilkes Expedition* (GH, US). Cultivated, São Cristovão, *Lindman* A-7 (S); A-9 (S); *Ule* (R).

57b. ***Aechmea fasciata*** var. ***purpurea*** (Guillon) Mez, Engl. Pflanzenreich IV. 32:152. 1934.
Billbergia rhodocyanea purpurea Guillon, Rev. Hortic. 55: 453. 1883.
BRAZIL: Described from cultivation, no herbarium material seen.

58. ***Aechmea recurvata*** (Kl.) L. B. Smith, Contr. Gray Herb. 98:5. 1932.
1. Inflorescence completely exserted above the leaf-sheaths; floral bracts serrate..... Var. a. **recurvata**
1. Inflorescence almost or wholly included by the leaf-sheaths.
2. Leaves and bracts strongly serrate..... Var. b. **ortgiesii**
2. Leaves and bracts entire or nearly so..... Var. c. **benrathii**

58a. ***Aechmea recurvata*** var. ***recurvata***
Macrochordium recurvatum Kl. Allg. Gartenz. 24:393. 1856.
Hohenbergia legrelliana Baker, Saund. Ref. Bot. 4: *pl. 285.* 1871.

Ortgiesia tillandsioides β subexserta Regel, Gartenflora 24: 188. 1875.
Aechmea legrelliana Baker, Journ. Bot. 17: 236. 1879.
Ortgiesia legrelliana Baker, Handb. Bromel. 19. 1889.
Aechmea ampullacea Mez in DC. Monogr. Phan. 9: 257. 1896.
Aechmea ampullacea var. *longifolia* Hassler, Ann. Conserv. & Jard. Bot. Genève 20: 293. 1919.

BRAZIL: *Sellow* bromel. 64 (P).

PARANÁ: Morrêtes, *M. Kuhlmann* (SP). Palmas, *Reitz* 4221 (HBR). Pedra Preta, *M. Kuhlmann* (GH, SP). Mun. Prudentópolis: Linha Esperança, *Frenzel* (Inst. Biol. Pesq. Tec.).

SANTA CATARINA: Mun. Biguaçú: Fachinal, *Reitz* C-931 (HBR). Mun. Canoinhas: Papanduva, *Reitz* 4752 (! Reitz). Mun. Itajaí: Praia Braba, *Reitz* (! Reitz). Mun. Porto União: Maratá, *Reitz* 4220 (HBR).

RIO GRANDE DO SUL: Capella, *Eugenio* 447 (NY); 2661 (GH). Cascata de Hermenegilda, Serra dos Tapes, *Lindman* (S). Pôrto Alegre, *Lindman* a in part (S); *Rambo* (LIL). Pôrto Alegre to Canoas, *Lindman* A-411 (S). São Leopoldo, *Eugenio* 1893 (GH, HBR). Toca do Tigre, near Itapoan, *Rambo* (US). Mun. Rio Grande: Cocuruté, *Lindman* b in part (S); A-749 (S).

58b. ***Aechmea recurvata*** var. ***ortgiesii*** (Baker) Reitz, Anais Bot. Herb. Barbosa Rodrigues 4: 29. 1952.
Ortgiesia tillandsioides Regel, Ind. Sem. Hort. Petrop. for 1866: 81. 1867.
Aechmea ortgiesii Baker, Journ. Bot. 17: 236. 1879.
Portea tillandsioides Nicholson, Dict. Gard. 3: 202. 1886.

BRAZIL: Cultivated, *Glaziou* 16448 (P); 16449 (P); 17287 (P).

PARANÁ: *Foster* 454 (GH); Hoehne (GH, SP). Pinhaes, *Dusén* 14609 (S). Piraí, *Dusén* 3028 (R). Mun. Curitiba: Curitiba, *Dusén* 2410 (R, S). Santa Felicidade, *Hatschbach* 1913 (US). Mun. Ponta Grossa: Vila Velha, *Foster* 404 (GH, US neg. 3951, 3952).

SANTA CATARINA: Blumenau, *F. Mueller* (GH). Campo dos Padres, *Reitz* 2593 (HBR, US). Serra do Mirador, Taió, *Reitz* 3955 (HBR); 4751 (! Reitz). Mun. Canoinhas: Papanduva, *Reitz* 3919 (HBR). Mun. Itajaí: Cabeçudas, *Reitz* 3959 (HBR, US). Mun. São Joaquim: Fachinal, Bom Jardim, *Reitz* 3282 (HBR, US).

58c. ***Aechmea recurvata*** var. ***benrathii*** (Mez) Reitz, Anais Bot. Herb. Barbosa Rodrigues 4: 30. 1952.
Aechmea benrathii Mez, Repert. Sp. Nov. Fedde 16: 6. 1919.
? *Aechmea rupestris* F. Mueller ex Ule, Bericht. Deutsch. Bot. Gesellsch. 17: 56. 1899. Nomen.

SANTA CATARINA: Cultivated, *Benrath* (B, type, F neg. 11307). Blumenau, *Schwacke* 55 (R). Brusque, *Reitz* (HBR); 3503 (HBR); 3629 (HBR). Joinvile, *Reitz* (! Reitz). Mun. Araranguá: Sombrio, *Reitz* C-1223 (HBR). Mun. Itajaí: Cabeçudas, *Reitz* 3624 (HBR); *Smith & Reitz* 6082 (R, US). Itajaí, *Reitz* 4754 (! Reitz). Praia Braba, *Reitz* 2295 (HBR, US); *Smith & Reitz* 6097 (US). Mun. Jaraguá do Sul: Corupá, *Seidel in Reitz* 4041 (HBR).

59. ***Aechmea pitcairnioides*** Mez in DC. Monogr. Phan. 9: 258. 1896.

BAÍA: *Blanchet* (G, type, F neg. 8482).

60. ***Aechmea pimenti-velosoi*** Reitz, Anais Bot. Herb. Barbosa Rodrigues 4:26, *pl. 8.* 1952.

1. Ovary white-tomentulose..... Var. a. **pimenti-velosoi**
1. Ovary glabrous, red..... Var. b. **glabra**

60a. ***Aechmea pimenti-velosoi*** var. ***pimenti-velosoi.***

SANTA CATARINA: Mun. Rio do Sul.: Barra do Trombudo, *Reitz* 4051 (HBR, type; US); 4061 (HBR, US); 4184 (HBR).

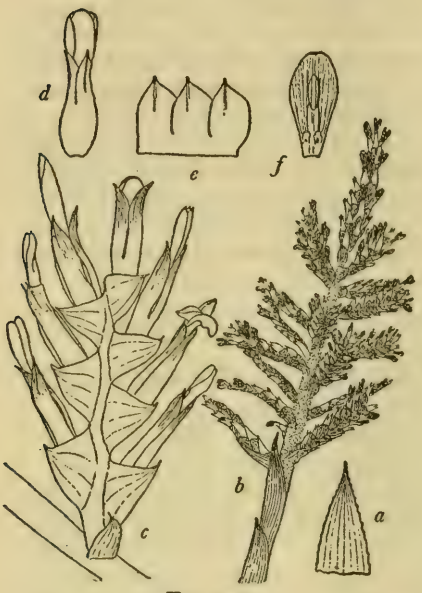

FIG. 101.

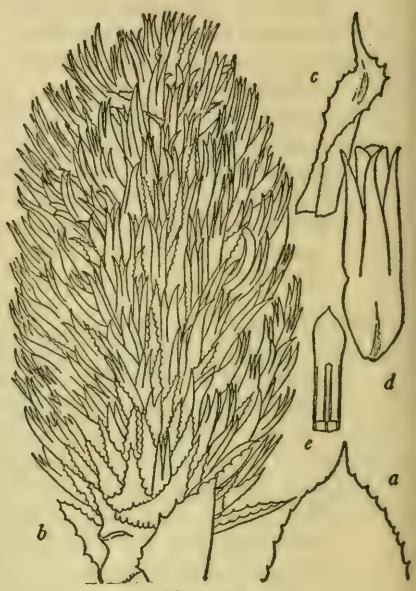

FIG. 102.

FIG. 101.—*Aechmea distichantha* var. *distichantha: a,* Apex of leaf, × ¼; *b,* inflorescence, × ¼; *c,* spike, × 1; *d,* flower, × 1; *e,* sepals, × 1; *f,* petal and stamens, × 1. (*b, d, e,* and *f* after Arquivos de Botânica do Estado de S. Paulo.)

FIG. 102.—*Aechmea pectinata: a,* Apex of leaf, × ½; *b,* inflorescence, × ½; *c,* floral bract, × 1; *d,* flower, × 1; *e,* petal with groove into which filament fits, × 1. (All after Lindman.)

60b. ***Aechmea pimenti-velosoi*** var. ***glabra*** Reitz, Anais Bot. Herb. Barbosa Rodrigues 5:256. 1953.

SANTA CATARINA: Mun. Itajaí: Praia Braba, *Reitz* 5707 (HBR, type); *Reitz & Klein* 753 (! Reitz).

Subgenus *Pothuava* (Gaud.) Benth. & Hook. f.

61. ***Aechmea pectinata*** Baker, Journ. Bot. 17:233. 1879. FIGURE 102.
Chevalieria crocophylla E. Morr. Belg. Hortic. 35:81. 1885.
Aechmea crocophylla Baker, Handb. Bromel. 65. 1889.
Aechmea armata Lindm. Svensk. Akad. Handl. 24: no. 8:33, *pl. 7, figs. 1–13.* 1891.

Rio de Janeiro: Restinga de Mauá, *Ule* 4136 (R). Serra dos Orgãos, *Ule* 1984 (R).

Distrito Federal: Praia de Sernambetiba, *Smith & Mus. R* 6818 (R, US), 6819 (R, US), 6820 (US), 6821 (US). Tijuca, *Glaziou* 15484 (C, G (F neg. 8487)).

São Paulo: Alto da Serra, *Foster* 360 (GH, R); *Hoehne* (GH, SP); *L. B. Smith* 1841 (GH, S). Cubatão, *L. B. Smith* 2045 (GH). Serra de Cubatão, *Burchell* 3594 (K, type, GH neg. 2698). Ramal Mairink to Santos, *Lamber* (GH, SP). Rio Buturoca, Santos, *Mosén* 3244 (S, type of *Aechmea armata* Lindm.). Monte Japui, São Vicente, *L. B. Smith* 2096 (GH).

Paraná: Caiobá, *Foster* 433 (GH, R); *M. Kuhlmann* (SP). Guaratuba, *Inst. Malariologia* (HBR); *Reitz* 4249 (HBR); *Smith & Reitz* 5744 (R, RB, US). Jacareí, *Dusén* 7891 (S); 14607 (GH, S, US). Pôrto Dom Pedro II, *Dusén* 4448 (R, S).

Santa Catarina: Mun. Araquari: Barra do Sul, *Reitz & Klein* 538 (! Reitz). Mun. São Francisco do Sul: Pôrto das Canoas, *Smith & Reitz* 5706 (R, RB, US). São Francisco do Sul, *Reitz* 3681 (! Reitz); 3731 (HBR); 3834 (HBR); 3884 (HBR, US).

62. ***Aechmea turbinocalyx*** Mez in Mart. Fl. Bras. 3, pt. 3: 359. 1892.

Baía: *Blanchet* (G, type, F neg. 8483).

63. ***Aechmea nudicaulis*** (L.) Griseb. Fl. Brit. West Ind. 593. 1864.

1. Floral bracts reniform and minute or lacking..... Var. a. **nudicaulis**
1. Floral bracts triangular, relatively conspicuous.
   2. Petals and sepals yellow..... Var. b. **cuspidata**
   2. Petals red; sepals tinged with red..... Var. c. **aureo-rosea**

63a. ***Aechmea nudicaulis*** var. ***nudicaulis***

Bromelia nudicaulis L. Sp. Pl. 286. 1753.

Not recorded in Brazil.

México, Central America, West Indies, Venezuela.

63b. ***Aechmea nudicaulis*** var. ***cuspidata*** Baker, Journ. Bot. 17: 234. 1879. Figure 103.

Tillandsia uni-spicata Vell. Fl. Fluminensis 132. 1825; Icon. 3: *pl. 124.* 1835.

Pothuava spicata Gaud. Atl. Voy. Bonite *pl. 117.* 1851.

Aechmea sulcata Lindm. Svensk. Akad. Handl. 24: no. 8: 31, *pl. 5, figs. 15–21.* 1891.

Aechmea nudicaulis var. *sulcata* Mez in DC. Monogr. Phan. 9: 269. 1896.

Brazil: *Regnell* 212 (S); *Widgren* 920 (S).

Baía: *Blanchet* 2282 (P).

Espírito Santo: (Bananal), *Viana Freire* 48 (R). Cachoeiro de Itapemirim, *Foster* 973 (GH). Vargem Alta, *Foster* 920 (GH). Vitória, *Foster* 180 (GH); 879 (GH, US). Vitória to Campinas, *Foster* 211 (GH).

Minas Gerais: Caldas, *Mosén* 758 (S); 4429 (S); *Regnell* III-1255 (S, type of *Aechmea sulcata* Lindm.; US); III-1257 (S). Serra de Ouro Preto, *Ule* 341 (R). Pouso Alegre, *Hoehne* (GH, SP). Sapucaí Mirim, *M. Kuhlmann* 2605 (SP).

Rio de Janeiro: Contagallo, *Glaziou* 15482 (P). Itatiaia, *Foster* 126 (GH); 137 (GH, US). Restinga de Mauá, *Ule* (R). Petrópolis, *Goés & Constantino* 1078 (RB). Old road below Petrópolis, *Smith & Mus. R* 6494

(US); 6496 (R, US). Lagoa de Piratininga, *J. G. Kuhlmann* (RB, US). Vila Nova, *Glaziou* 7501 (P). Mun. São João de Barra: Atafona, *Sampaio* 6317 (R); *Santos & Lauro* (R). Barcelos to Atafona, *Smith & Mus. R* 6674 (R, US).

Distrito Federal: Monte do Cochrane, *L. B. Smith* 1349 (GH). Jardim Botânico, *Bailey* 258 (BH). Quinta, *Glaziou* 16407 (P); 16415 (P). Ilha do Raimundo, *Vidal* (R). "Isle aux Rats," Rio Harbor, *Commerson* (P). Recreio dos Bandeirantes, *Foster* 495 (GH); 496 (GH); *Lutz* 858 (R); 1455 (GH); 1456 (GH); *Lutz & Cochrane* (R, US). Rio de Janeiro, *Hoehne* (SP). Restinga de Jacarepaguá, *Ule* (R). Restinga de Sernambetiba, *Silveira & Brade* 15771 (RB); *Smith & Mus. R* 6813 (US), 6826 (R, US), 6831 (US). Tijuca, *Glaziou* 2732 (P). Tijuca, Excelsior, *Lutz* 1441 (R). Restinga da Tijuca, *Machado* (RB).

São Paulo: Alto da Serra, *Smith, Hoehne & Kuhlmann* 1833 (GH). Atibaia, *Foster* 476 (GH, R). Rio Buturoca, Santos, *Mosén* 2978 (S). Cubatão, *L. B. Smith* 2042 (GH). Guarujá, *L. B. Smith* 2029 (B, F, GH, K, S, US). Itanhaém, *L. B. Smith* 2059 (GH). Santos, *Foster* 486 (GH, US). Ramal Mairink to Santos, *Lamber* (SP). Mun. São Paulo: Butantã, *Hoehne* (SP). Santo Amaro, *Krieger* 181 (SP). São Paulo, *Doering* (GH, SP); *Loefgren* (GH, SP); *Ostermeyer* (SP).

Paraná: Caiobá, *Foster* 434 (GH, R); *Gehrt* (SP, US). Curitiba to Joinvile near the Santa Catarina line, *Reitz* 3758-e (HBR). Guaratuba, *Reitz* 4238 (HBR). Jacareí, *Dusén* 9010 (S, US); 15830 (S); 16103 (GH, S, US); 17316 (GH, S, US). Morrêtes, *Dusén* 8594 (S). Mun. Paranaguá: Paranaguá, *Tessmann* (US). Rio Pereque, *Hatschbach* 1998 (US).

Santa Catarina: *Gaudichaud* 131 (P, type of *Pothuava spicata* Gaud.); *D'Urville* (P). Blumenau, *Reitz* 3706 (HBR). Brusque, *Reitz* 3236 (HBR); 3699 (HBR). Laguna, *Reitz & Klein* 94 (HBR). Ribeirão Grande, Taió, *Reitz* 3980 (HBR). São Francisco do Sul, *Reitz* 3654-c (HBR). Mun. Araranguá: Sombrio, *Reitz* C-779 (HBR). Mun. Florianópolis: Rio Vermelho, *Reitz* 4268 (HBR). Trinidade, *Rohr* (LIL). Mun. Itajaí: Praia Braba, *Reitz* 2291 (HBR, US). Mun. Jaraguá do Sul: Corupá, *Seidel* 34 (! Reitz). Mun. Orleães: Rio Mirador, *Reitz* 3370 (HBR). Mun. Palhoça: Campo do Massiambú, *Reitz* 4966 (! Reitz).

Rio Grande do Sul: Lagoa dos Quadros near Tôrres, *Rambo* (HBR, US).

63c. ***Aechmea nudicaulis*** var. ***aureo-rosea*** (Antoine) L. B. Smith, p. 17.

Hoplophytum aureo-roseum Antoine, Wien. Ill. Garten-Zeit. 6: 97, *pl. 1.* 1881.

Aechmea aureo-rosea Baker, Handb. Bromel. 63. 1889.

Brazil: Cultivated, *Ule* 4043 (R).

Minas Gerais: Coronel Pacheco, *Heringer* 1149 (SP). Mun. Nova Lima: Lagoa Grande, *Williams & Assis* 5786-a (GH).

Rio de Janeiro: Alto da Serra to Meio da Serra, *L. B. Smith* 1544 (GH). Carmo, on Rio Paquequer, *Neves Armond* 125 (R). Soberbo to Guapi, Serra dos Orgãos, *L. B. Smith* 1531 (B, GH, S). Suruí, *Foster* 18-A (GH).

Distrito Federal: Ilha d'Agua, Rio Harbor, *Delforge* 3 (RB). Guaratiba, *Smith & Mus. R* 6530 (R, US). Paineiras, Corcovado, *L. B. Smith* 1216 (GH). Rio de Janeiro, *Reitz* 4028 (HBR). Tijuca, *Foster* 322 (GH, R); *Lindman* A-53 (S).

São Paulo: [Alto da] Serra, *Handro* (SP). Buturoca, Santos, *Mosén* 2978 (C (F neg. 22317), S).

64. ***Aechmea cylindrata*** Lindm. Svensk. Akad. Handl. 24: no. 8: 32, *pl. 8, figs. 28–35.* 1891.

Aechmea cylindrata var. *micrantha* Lindm. Svensk. Akad. Handl. 24: no. 8: 32, *pl. 8, figs. 36–40.* 1891.

? *Aechmea hyacinthus* F. Mueller, Gartenflora 42: 717. 1893.

São Paulo: Alto da Serra, *Foster* 382 (GH); *Hoehne* (GH, SP). Boracéa, *Lima & da Silva* (SP). Rio Buturoca, Santos, *Mosén* 2975 (S); 3245 (S, type of *Aechmea cylindrata* var. *micrantha* Lindm.). Salesópolis to Boracéa, *M. Kuhlmann* 2040 (SP). Ribeirão do Tijuco, *M. Kuhlmann* (SP). Rio Tijuco, *Foster* 464 (GH, R).

Paraná: Carvalho, *Dusén* 13154 (S). Curitiba, *Foster* 421 (GH). Curitiba to Paranaguá, *Reitz* 5758 (HBR, US). Ipiranga, Monte Alegre, *Dusén* 3491 (R). Jacareí, *Dusén* 6633 (S); 7890 (S); 9011 (S, US); 14559 (S); 16104 (S); 17196 (S, US); 17317 (S). Morrêtes, *Hoehne* (GH, SP); *M. Kuhlmann* (SP, US). 4 km. from Paranaguá, *Foster* 450 (GH, R, US). Mun. São José dos Pinhaes: Vossoroca, *Hatschbach* 1592 (US).

Santa Catarina: Blumenau, *Reitz* 3670 (HBR). Herval, *Dusén* (S). Mun. Brusque: Morro da Bateia, *Reitz* C-1902 (HBR, US). Morro Spitzkopf, *Reitz* 2252 (HBR, US). Ribeirão do Ouro, *Reitz* 3633 (HBR). Mun. Itajaí: Morro do Baú, *Reitz* C-2063 (HBR, US); 4189 (HBR).

65. ***Aechmea comata*** (Gaud.) Baker, Journ. Bot. 17: 234. 1879.

1. Leaf-blades concolorous..... Var. a. **comata**
1. Leaf-blades yellow-striped..... Var. b. **makoyana**

65a. ***Aechmea comata*** var. ***comata***

Pothuava comata Gaud. Atl. Voy. Bonite *pl. 116.* 1851.

Hoplophytum lindenii E. Morr. Belg. Hortic. 15: 164. 1865.

Aechmea lindenii Baker, Journ. Bot. 17: 233. 1879.

Macrochordium lindenii Wittm. Bot. Jahrb. 13, Beibl. 29: 23. 1891.

Brazil: *Gaudichaud* (P, type). Cultivated, *Atkinson* 92 (BH, MT); *E. Morren* (LG); *Strauss* (B, F neg. 11321).

Santa Catarina: Laguna, *Reitz* 4166 (HBR). Mun. Biguaçú: Fachinal, *Reitz* C-929 (HBR). Mun. Florianópolis: *Rohr* 457 (LIL). Morro das Pedras, *Smith & Reitz* 6204 (R, RB, US). Ponta Grossa, *Reitz* 4260 (HBR). Santo Antonio, *Reitz* 3831 (HBR); 3831-a (HBR); 3933 (HBR, US). São José, *Hoehne* (GH, SP). Mun. Palhoça: Campo do Massiambú, *Reitz & Klein* 1046 (! Reitz). Paulo Lopes, *Reitz* 3704 (HBR); *Reitz & Klein* 39 (HBR). Mun. Pôrto Belo: Canto Grande, *Reitz* 3629 (HBR, US).

Rio Grande do Sul: Tôrres, *Golland in Lindman* (S).

65b. ***Aechmea comata*** var. ***makoyana*** (Mez) L. B. Smith, p. 14.

Aechmea makoyana Hort. Makoy ex Rev. Hortic. 65: 203. 1893. Nomen.

Hoplophytum lineatum Hort. ex Gard. Chron. 1893, pt. 1: 414. 1893.

Aechmea lindenii var. *makoyana* Mez, Engl. Pflanzenreich IV. 32: 159. 1934.

Brazil: Described from cultivation.

66. ***Aechmea calyculata*** (E. Morr.) Baker, Journ. Bot. 17: 232. 1879.
Hoplophytum calyculatum E. Morr. Belg. Hortic. 15: 162, *pl. 11.* 1865.
Aechmea selloana Baker, Handb. Bromel. 60. 1889.
Echinostachys pineliana sensu Wittm. Bot. Jahrb. 13, Beibl. 29: 14. 1891. Not Brongn.

BRAZIL: *Sellow* bromel. 29 (P); bromel. 71 (P); 4008 (B, type of *Aechmea selloana* Baker, F neg. 11323). Cultivated, *Atkinson* 3 (BH); 4 (UC); 9 (BH, MO).

SANTA CATARINA: *Dusén* 11918 (S); *F. Mueller* (K, GH neg. 2700). Cultivated, *Hort. Liége* (LG); *Linden* (LG, type). Blumenau, *Reitz* 3562 (HBR); 3599 (HBR); 3640 (HBR); 3978 (HBR). Ribeirão Grande, Taió, *Reitz* 3992 (HBR). Mun. Chapecó: Itapiranga, *Reitz* 4753 (! Reitz, inflorescence branched). Itapiranga, Rio Peperí-Guaçú, *Reitz* 3859-a (HBR). Mun. Jaraguá do Sul: Corupá, *Seidel* 7 (HBR).

ALSO: ARGENTINA.

67. ***Aechmea squarrosa*** Baker, Handb. Bromel. 63. 1889. Not Journ. Bot. 28: 305. 1890.

RIO DE JANEIRO: Cantagallo, *Glaziou* 15486 (B, isotype, F neg. 11325).

68. ***Aechmea alopecurus*** Mez in Mart. Fl. Bras. 3, pt. 3: 367. 1892.

BRAZIL: *Pohl* 5230 (W, type).

69. ***Aechmea vanhoutteana*** (Van Houtte) Mez in Mart. Fl. Bras. 3, pt. 3: 366. 1892.
Echinostachys vanhoutteana Van Houtte, Catal. 1878.
Quesnelia vanhouttei E. Morr. Belg. Hortic. 31: 163, 350. 1881.
Quesnelia vanhoutteana E. Morr. Belg. Hortic. 31: *pl. 18.* 1881.
Macrochordium vanhoutteanum Wittm. Bot. Jahrb. 13, Beibl. 29: 4. 1891.

RIO DE JANEIRO: Itatiaia, *Foster* 132 (GH, R); 1035 (GH, US); *L. B. Smith* 1443 (B, F, GH, K, S, US).

70. ***Aechmea kleinii*** Reitz, Anais Bot. Herb. Barbosa Rodrigues 5: 254, *pl. 1.* 1954.

SANTA CATARINA: Mun. São José: Serra da Boa Vista, *Reitz* 5388 (! Reitz); 5762 (HBR, US); *Reitz & Klein* 935 (HBR, type).

71. ***Aechmea pineliana*** (Brongn. ex Planch.) Baker, Journ. Bot. 17: 232. 1879.
Echinostachys pineliana Brongn. ex Planch. Hort. Donat. 25. 1854–58.

BRAZIL: Cultivated, *Hort. Kew* (K, GH neg. 2701); *Ule* (R).

ESPÍRITO SANTO: Santa Teresa, *Foster* 262 (GH, US). Mun. Castelo: Braço do Sul, *Brade* 19432 (RB, US).

RIO DE JANEIRO: Cabo Frio, *Glaziou* 13244 (P). Nova Friburgo, *Glaziou* 15487 (P); 19920 (P). Teresópolis, *Sampaio* 3367 (R).

DISTRITO FEDERAL: "Morro-chemado" (? Morro Queimado), *Pinel* (P, type, GH neg. 2953). Quinta, *Glaziou* 16404 (P).

72. ***Aechmea triticina*** Mez in Mart. Fl. Bras. 3, pt. 3: 369. 1892.

1. Apices of the floral bracts surpassed by the sepals; upper scape-bracts entire. Var. a. **triticina**

1. Apices of the floral bracts exceeding the sepals; upper scape-bracts serrulate. Var. b. **capensis**

72a. *Aechmea triticina* var. *triticina*

Espírito Santo: Santa Teresa, *Foster* 281 (GH). Vitória, *Foster* 206 (GH, R). Mun. Cachoeiro de Itapemirim: Vargem Alta, *Foster* 918 (GH, US); 935 (GH, US).

Rio de Janeiro: Palmeiras, *Glaziou* 8985 (B, type, F neg. 11328).

72b. *Aechmea triticina* var. *capensis* L. B. Smith, p. 19.

Rio de Janeiro: Cabo Frio, *Ule* (R, type). Mun. São João da Barra, Barcelos to Atafona, *L. B. Smith & Mus. R* 6673 (US).

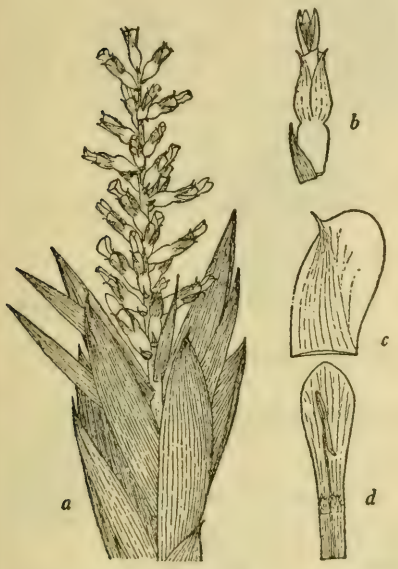

Fig. 103.

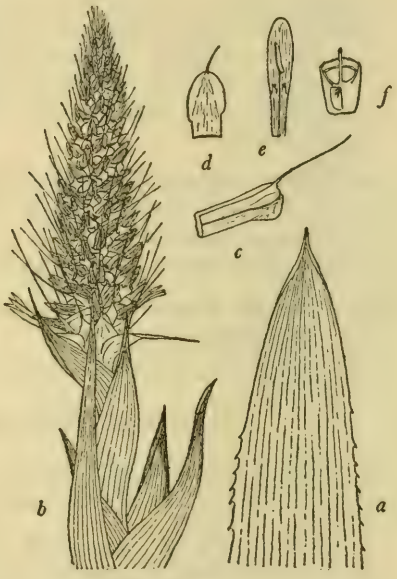

Fig. 104.

Fig. 103.—*Aechmea nudicaulis* var. *cuspidata: a,* Inflorescence, × ½; *b,* floral bract and flower, × 1; *c,* sepal, × 2; *d,* petal and stamen, × 2.

Fig. 104.—*Aechmea ornata* var. *hoehneana: a,* Apex of leaf, × ½; *b,* inflorescence, × ½; *c,* floral bract, × 1; *d,* sepal, × 1; *e,* petal and stamen, × 1; *f,* longitudinal section of ovary, × 1.

73. *Aechmea ornata* (Gaud.) Baker, Journ. Bot. 17: 162. 1879.

1. Leaves concolorous.
   2. Inflorescence to 4 cm. in diameter without the petals; flowers stout; petals usually pale red or rose..... Var. a. **ornata**
   2. Inflorescence about 3 cm. in diameter without the petals; flowers slender; petals blue..... Var. b. **hoehneana**
1. Leaves longitudinally green- and yellow-striped..... Var. c. **nationalis**

73a. *Aechmea ornata* var. *ornata*

Chevalieria ornata Gaud. Atl. Voy. Bonite *pl. 62.* 1843.
Aechmea hystrix E. Morr. Belg. Hortic. 30: 243, *pl. 13.* 1880.
Echinostachys hystrix Wittm. Bot. Jahrb. 13, Beibl. 29: 4. 1891.

BRAZIL: *Gaudichaud* 129 in part (P, type, GH neg. 2975). Cultivated, *E. Morren* Icon. (K, GH neg. 1385).

SÃO PAULO: Guapiara, *M. Kuhlmann* (SP, US). Paiol do Meio, *Foster* 1124 (GH, US). São Paulo to Curitiba, km. 278, *Foster* 396 (GH, R).

PARANÁ: Banhado, Serra do Mar, *Dusén* (S); 14468 (GH, S). Curitiba to Joinvile near Santa Catarina line, *Reitz* 3890 (HBR); 4218 (HBR). Curitiba to Paranaguá, km. 48, *Tessmann* (Paran., US). Ipiranga, Serra do Mar, *Dusén* 3543 (R, S). Mun. Piraquara: Campininha, *Hatschbach* 1160 (US).

SANTA CATARINA: Brusque, *Reitz* 3614 (HBR); 3642 (HBR). Campo Alegre, *Reitz* 3886 (HBR). Laguna, *Reitz* 3898 (HBR); 4188 (HBR); *Reitz & Klein* 101 (HBR). São Francisco do Sul, *Reitz* 3885 (HBR). Mun. Biguaçú: Fachinal, *Reitz* C-928 (GH, HBR). Mun. Florianópolis: Rio Vermelho, *Reitz* 4266 (HBR). Mun. Pôrto Belo: Canto Grande, *Reitz* 3615 (HBR).

73b. ***Aechmea ornata*** var. ***hoehneana*** L. B. Smith, p. 17, fig. 104.

SÃO PAULO: Paiol do Meio, *Gehrt* (GH, type (US neg. 4279); SP). São Bernardo, *Edwall* (SP).

PARANÁ: Mun. Paranaguá: Caiobá, *Foster* 452 (GH).

73c. ***Aechmea ornata*** var. ***nationalis*** Reitz, Anais Bot. Herb. Barbosa Rodrigues 4:30. 1952.

SANTA CATARINA: Morro Baú, Itajaí, *Reitz* 4764 (HBR, type).

Subgenus *Macrochordium* (De Vriese) Baker

74. ***Aechmea nervata*** L. B. Smith, p. 17, fig. 105.

ESPÍRITO SANTO: Vitória, *Foster* 176-A (GH, type, US neg. 4263).

75. ***Aechmea alba*** Mez in Mart. Fl. Bras. 3, pt. 3:375. 1892.

BAÍA: *Blanchet* 2276 (G, type, F neg. 8480).

RIO DE JANEIRO: (Esperança), *Riedel* (! Mez, citation doubtful, probably from Baía).

76. ***Aechmea lamarchei*** Mez in Mart. Fl. Bras. 3, pt. 3:370. 1892.
Macrochordium lamarchei E. Morr. ex Baker, Handb. Bromel. 67. 1889. As "lamarckii."
Aechmea lagenaria Mez in Mart. Fl. Bras. 3, pt. 3:372. 1892.

BRAZIL: Cultivated, *Lamarche* (LG, type); *Strauss* (B, F neg. 11318).

BAÍA: *Blanchet* 1526 (G, isotype of *Aechmea lagenaria* Mez, F neg. 8486).

ESPÍRITO SANTO: Domingos Martins, *Foster* 176 (GH, R). Mun. Cachoeira de Itapemirim: Vargem Alta, Morro de Sal, *Brade* 19414 (RB, US).

MINAS GERAIS: *Saint-Hilaire* C-174 (P). Distrito Carangola, *Mexia* 4316-a (GH, US). Conceição, Belo Horizonte, *Foster* 630 (GH, US). Coronel Pacheco, *Heringer* 1968 (SP). Distrito Ilheu, *Mexia* 4972 (GH, US). Serra do Cipó, *Foster* 637 (GH, US). Viçosa, *Mexia* 4789-a (GH); 4859-a (GH).

77. ***Aechmea triangularis*** L. B. Smith, p. 19, fig. 106.

ESPÍRITO SANTO: Santa Teresa, *Foster* 829 (GH, type, US neg. 4261).

78. ***Aechmea bromeliifolia*** (Rudge) Baker in Benth. & Hook. Gen. Pl. 3: 664. 1883.

Tillandsia bromeliifolia Rudge, Guyan. 32, *pl. 50.* 1807.
Bromelia tinctoria Mart. in Spix & Mart. Reise Bras. 2: 554. 1828.
Macrochordium pulchrum Beer, Bromel. 147. 1857.
Aechmea conspicuiarmata Baker, Handb. Bromel. 67. 1889.
Aechmea macroneottia Baker, Handb. Bromel. 68. 1889.
Aechmea tinctoria Mez in Mart. Fl. Bras. 3, pt. 3: 373, *pl. 73.* 1892.

FIG. 105.

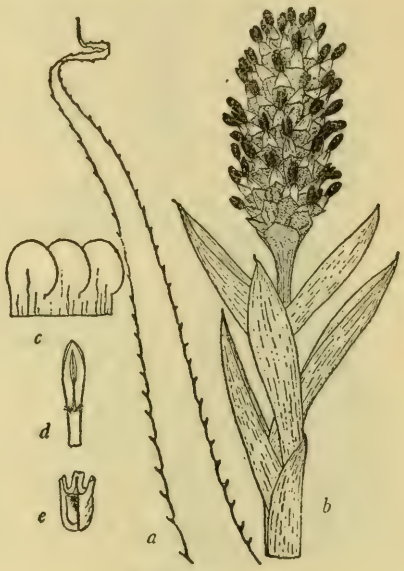

FIG. 106.

FIG. 105.—*Aechmea nervata: a,* Scape and inflorescence, × ½; *b,* sepals, × 1; *c,* base of petal, × 1; *d,* longitudinal section of ovary, × 1.

FIG. 106.—*Aechmea triangularis: a,* Leaf-blade, × ½; *b,* scape and inflorescence, × ½; *c,* sepals, × 1; *d,* petal and stamen, × 1; *e,* longitudinal section of ovary, × 1.

Aechmea pulchra Mez in Mart. Fl. Bras. 3, pt. 3: 374. 1892.
Hoiriri bromeliifolia Kuntze, Rev. Gen. 3, pt. 3: 303. 1898.
Aechmea eriostachya Ule, Bot. Jahrb. 42: 197. 1908.
Aechmea ellipsoidea Rusby, Mem. N. Y. Bot. Gard. 7: 212. 1927.

BRAZIL: *Glaziou* 16405 (P). Goiás to Cuiabá, *Weddell* (P). Cultivated, *Gehrt* (SP); *Ule* (R).

AMAZONAS: Rio Xiborem, *Luetzelburg in Rondon* 22013 (M).

PARÁ: Rio Capim. *Huber* (MG). Upper Rio Cupari between the Xingú and Tapajos, *Krukoff* 1222 (NY).

PIAUÍ: Serra do Brejo, southern Piauí, *Luetzelburg* (! Mez).

CEARÁ: Aurora, southern Ceará, *Luetzelburg* (! Mez).

PARAÍBA: Serra da Viração, *Luetzelburg* (! Mez).

Baía: Bom Jesus de Lapa, Rio São Francisco, *Luetzelburg* (! Mez). Upper Rio de Contas, *Luetzelburg* (! Mez). Serra de Itiuba, *Luetzelburg* (! Mez). Joazeiro, *Luetzelburg* (! Mez). Maracás, *Foster* 2465 (US); *Ule* 7028 (B, type of *Aechmea eriostachya* Ule, F neg. 11312). Toca da Onça *Rose & Russell* 20108 (US).

Minas Gerais: Caldas, *Regnell* III-1726 (B (F neg. 11322), S). Serra do Cipó, *Costa* 34 (R). Conselheiro Matta-Rodeador, *Brade* 13971 (RB). Ouro Branco, *Castellanos* 20585 (GH).

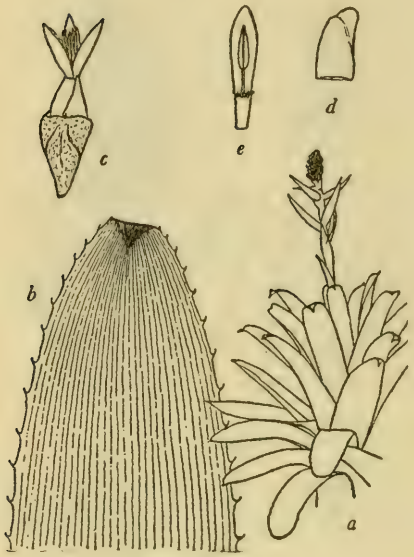

Fig. 107.

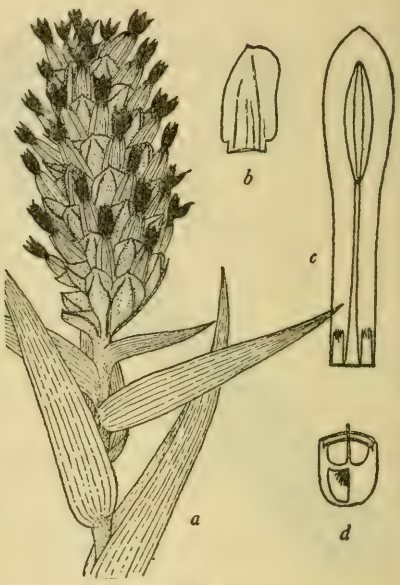

Fig. 108.

Fig. 107.—*Aechmea maculata: a,* Habit (after M. B. Foster), × ⅛; *b,* apex of leaf, × 1; *c,* floral bract and flower, × 1; *d,* sepal, × 1; *e,* petal and stamen, × 1.

Fig. 108.—*Aechmea chlorophylla: a,* Scape and inflorescence, × ½; *b,* sepal, × 1; *c,* petal and stamen, × 2; *d,* longitudinal section of ovary, × 1.

Mato Grosso: Camizão, *Foster* 1090 (GH, US). Guia, *Lindman* A-3521 1/2 (S). São Luiz de Caceres, *Hoehne in Rondon* 383 (R); 439 (R); 4723 (R); 4724 (R).

São Paulo: Campinas, *Mosén* 3929 (S). Pinheiros, *Loefgren* (SP). Rio Tiete, Itapura, *Foster* 1099 (GH, US). Mun. São Paulo: Cidade Jardim, *Smith & Kuhlmann* 1801 (F, GH). Orchidario, *Foster* 342 (GH, R, US). Santo Amaro, *Krieger* 178 (SP). São Paulo, *Kruse* (SP); *Pickel* 4629 (SP).

Paraná: Jaguariaíva, *Dusén* (S); 10779 (S, US); 15446 (S); 16072 (GH, S, US). Serrinha, *Dusén* 7024 (S). Mun. Ponta Grossa: San Luis to Vila Velha, *Foster* 409 (GH, R, US). Vila Velha, *Dusén* 2799 (R); *Gehrt* (SP); *M. Kuhlmann* (SP, US).

Rio Grande do Sul: Caaró near São Luiz, *Rambo* (! Rambo).

Also: Guatemala and British Honduras to Paraguay and Argentina.

79. ***Aechmea maculata*** L. B. Smith, p. 15, fig. 107.
MINAS GERAIS: Cultivated, *Reitz* 4770 (HBR). Pico de Piedade, Belo Horizonte, *Foster* 561 (GH, type, US neg. 4262).

80. ***Aechmea chlorophylla*** L. B. Smith, p. 14, fig. 108.
ESPÍRITO SANTO: Santa Teresa, *Foster* 176-B (GH); 830 (GH, type, US neg. 4260).

Subgenus *Purpurospadix* Mez

81. ***Aechmea fernandae*** (E. Morr.) Baker, Handb. Bromel. 64. 1889.
Bromelia longifolia Rich. Schomburgk, Reise 3:903. 1848. Nomen, not Rudge.
Bromelia fernandae E. Morr. Ill. Hortic. 18:114, *pl. 65.* 1871.
Aechmea schomburgkii Baker, Handb. Bromel. 66. 1889.
PARÁ: Cultivated from material sent by Wallis, *Hort. Liége* (LG).
ALSO: BRITISH GUIANA.

82. ***Aechmea rubiginosa*** Mez in DC. Monogr. Phan. 9:285. 1896.
Aechmea fernandae Baker, Handb. Bromel. 64. 1889. In part, not as to type.
AMAZONAS: (Boca Esperança), *J. G. Kuhlmann* 697 (RB). São Pedro, Rio Padauiri, basin of Rio Negro, *Fróes* 22674 (IAN).
PARÁ: Repartição Cuminá, tributary of Rio Trombetas, *J. G. Kuhlmann* 1706 (RB, US).
ALSO: VENEZUELA.

83. ***Aechmea multiflora*** L. B. Smith, Contr. Gray Herb. 117:4, *pl. 1, figs. 1–3.* 1937. FIGURE 109.
BAÍA: Feira de Santana, *Foster* 2478 (US). Rio Grungogi, *Curran* 297 (US, type). Milagres to Maracás, *Foster* 2451 (US).
ESPÍRITO SANTO: Collatina, *Foster* 224 (GH, R). Itapemirim, *Foster* 153 (GH).

84. ***Aechmea depressa*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1:54, *pl. 66.* 1941.
BAÍA: Agua Preta, *Foster* 71 (GH, type (US neg. 3939, 3949), R).

85. ***Aechmea saxicola*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 2:118, *pl. 48.* 1950.
ESPÍRITO SANTO: Cachoeiro de Itapemirim, *Foster* 164 (US, type; GH, R). Vitória, *Foster* 188 (GH).

86. ***Aechmea conifera*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1:53, *pl. 65.* 1941.
BAÍA: Agua Preta, *Foster* 76 (GH, type (US neg. 3940, 3948), R).

87. ***Aechmea perforata*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1:55, *pl. 70.* 1941.
ESPÍRITO SANTO: Santa Teresa, *Foster* 314 (GH, type (US neg. 3957), R).

88. ***Aechmea sphaerocephala*** (Gaud.) Baker, Journ. Bot. 17:162. 1879.
Chevalieria sphaerocephala Gaud. Atl. Voy. Bonite *pl. 61.* 1843.
Chevaliera gigantea Maury, Bull. Assoc. Franc. (Congr. Toulouse) 556, *pl. 17.* 1888.
Aechmea gigantea Baker, Handb. Bromel. 65. 1889. Not Baker, op. cit. 45.

Espírito Santo: Itapemirim, *Foster* 152 (GH, R, US).
Distrito Federal: Copacabana, *Glaziou* 5466 (P, US). Rio de Janeiro, *Foster* 1139 (GH); *Gaudichaud* 369 in part (P, type, GH neg. 2974).

89. ***Aechmea leucolepis*** L. B. Smith, p. 14, fig. 110.
Baía: Milagres to Maracás, *Foster* 2452 (US, type).

90. ***Aechmea stephanophora*** E. Morr. ex Baker, Handb. Bromel. 67. 1889.
Chevalieria stephanophora Mez in DC. Monogr. Phan. 9: 154. 1896.

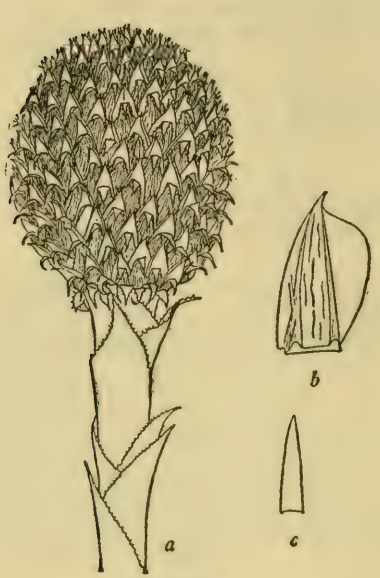

Fig. 109.

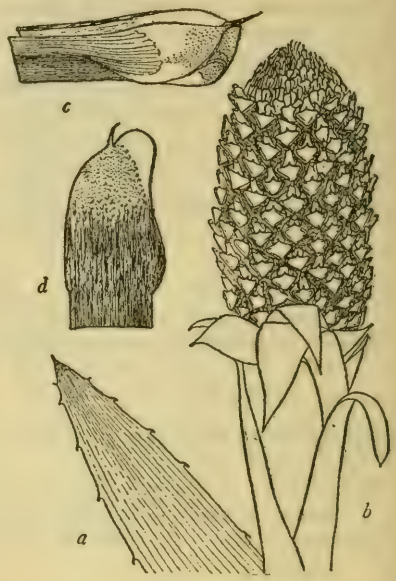

Fig. 110.

Fig. 109.—*Aechmea multiflora: a,* Scape and inflorescence, × ¼; *b,* sepal, × 1; *c,* petal, × 1.
Fig. 110.—*Aechmea leucolepis: a,* Apex of leaf, × ¼; *b,* inflorescence, × ¼; *c,* floral bract, × 1; *d,* sepal, × 1.

Brazil: Cultivated, *E. Morren* icon. (K, type).
Pernambuco: Iguaraçú, *Ridley & Ramage* (BM, US neg. 4024, 4025). Recife, *Foster* 2429 (R, US). South of Recife, Afogados to Boa Viagem, *Baker & Collins* (GH, SP, US).

91. ***Aechmea cariocae*** L. B. Smith, p. 13.
Chevalieria comata Mez in DC. Monogr. Phan. 9: 153. 1896. In part, not as to basonym.
Rio de Janeiro: Vila Nova, *Glaziou* 15485 (K, US neg. 4193).
Distrito Federal: Andarahí Grande, *Glaziou* 9327-b (C (F neg. 22327), P); 14337 (P). Corcovado, *L. B. Smith* 1230 (GH, S).

92. ***Aechmea castanea*** L. B. Smith, p. 13, fig. 111.
Espírito Santo: Santa Teresa, *Foster* 831 (GH, type; US).

30. *Quesnelia* Gaud.

Quesnelia Gaud. Atl. Voy. Bonite *pl. 54.* 1842.

Endemic to Brazil. Records from other countries disproved or highly dubious.

1. Floral bracts subligulate, broadly acute to truncate; inflorescence strobilate, ellipsoid or cylindric; ovary slightly if at all costate; sepals 8–10 mm. long.
   2. Scape-bracts bladeless, entire or nearly so.
      3. Upper part of the floral bract uniform and flat; flowers in about 12 ranks. (Fig. 112.) ..... 1. **Q. arvensis**
      3. Upper part of the floral bract with broad white lepidote strongly crisped margins that contrast sharply with the roseate subglabrous flat center; flowers in 6–10 ranks..... 2. **Q. quesneliana**
   2. Scape-bracts with subfoliaceous serrulate blades..... 3. **Q. testudo**
1. Floral bracts ovate or lanceolate, acute or acuminate; inflorescence dense or lax.
   4. The floral bracts entire, without distinction between base and blade.
      5. Floral bracts dimorphic, the lower large, elliptic, about equaling the flowers, the upper narrowly triangular, surpassed by the sepals; sepals 20 mm. long; inflorescence dense or subdense.
         6. Scape-bracts large, densely imbricate; inflorescence elongate. 4. **Q. imbricata**
         6. Scape-bracts small, barely if at all imbricate; inflorescence subcorymbiform..... 5. **Q. humilis**
      5. Floral bracts uniform or the inflorescence lax.
         7. Inflorescence dense; sepals obtuse, 10–16 mm. long.
            8. Leaves subdensely serrate with spines 4 mm. long; inflorescence cylindric, 15 cm. long; floral bracts cucullate, subcoriaceous. (Fig. 113.) ..... 6. **Q. edmundoi**
            8. Leaves laxly serrulate; inflorescence fusiform, 6–8 cm. long; floral bracts straight, membranaceous.
               9. Floral bracts in 3–4 ranks, the lowest only equaling the sepals; scape-bracts more than half as long as the internodes; leaves rounded and apiculate at least when young..... 7. **Q. lateralis**
               9. Floral bracts in 5–6 ranks, the lowest equaling the petals; scape-bracts remote; leaves acuminate..... 8. **Q. blanda**
         7. Inflorescence lax.
            10. Sepals acute, to 23 mm. long; petals wholly dark blue. (Fig. 114.) 9. **Q. liboniana**
            10. Sepals obtuse, to 17 mm. long; petals green with only the apex blue. 10. **Q. morreniana**
   4. The floral bracts serrate, divided into a reniform base and a distinct narrowly triangular blade.
      11. Inflorescence short, dense; sepals to 19 mm. long..... 11. **Q. indecora**
      11. Inflorescence elongate, lax; sepals 22–27 mm. long. 12. **Q. augusto-coburgii**

1. ***Quesnelia arvensis*** (Vell.) Mez in Mart. Fl. Bras. 3, pt. 3: 381. 1892. FIGURE 112.

Bromelia arvensis Vell. Fl. Fluminensis 130. 1825; Icon. 3: *pl. 114.* 1835.

Quesnelia rufa var. *sororocabae* Lindm. Svensk. Akad. Handl. 24: no. 8: 23, *pl. 3, fig. 1–8.* 1891.

Quesnelia arvensis var. *sororocabae* Mez, Engl. Pflanzenreich IV. 32: 172. 1935.

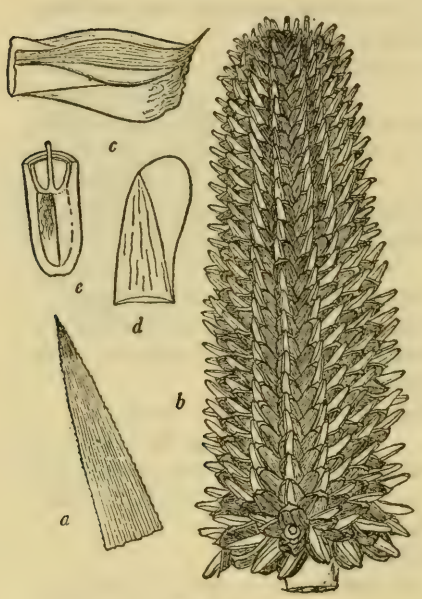

FIG. 111.

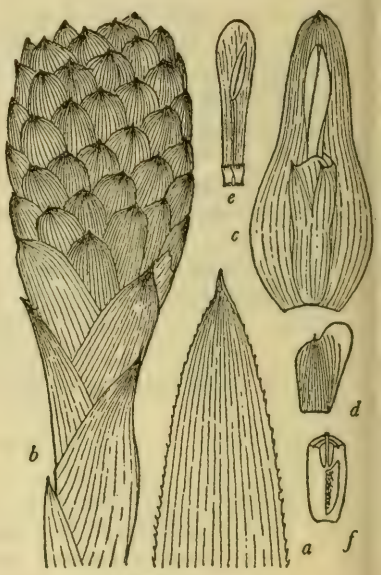

FIG. 112.

FIG. 111.—*Aechmea castanea: a,* Apex of leaf, × ¼; *b,* inflorescence, × ¼; *c,* floral bract, × 1; *d,* sepal, × 1; *e,* longitudinal section of ovary, × 1.

FIG. 112.—*Quesnelia arvensis: a,* Apex of leaf, × ½; *b,* inflorescence, × ½; *c,* floral bract and flower, × 1; *d,* sepal, × 1; *e,* petal and stamen, × 1; *f,* longitudinal section of ovary, × 1.

SÃO PAULO: Caraguatatuba, *Hoehne & Gehrt* (GH, SP). Iguapé, *Hoehne* (SP). Itanhaém, *L. B. Smith* 2060 (GH, S). Piaçaguera, *Hoehne* (SP). Praia Grande, *W. Hoehne* (SP). Suarão, Praia Grande, *Gehrt* (GH, SP). Santos, *Hombron* (P). Guarujá, Santos, *Dusén* 14260 (S). Ramal Mairink to Santos, *Lamber* (GH, SP). Sorocaba, Santos, *Mosén* 3708 (R, S, type of *Quesnelia rufa* var. *sororocabae* Lindm.). São Vicente to Itaipu, *L. B. Smith* 2012 (GH).

2. ***Quesnelia quesneliana*** (Brongn.) L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 2: 196. 1952.

Billbergia quesneliana Brongn. Ann. Sci. Nat. II. 15: 371. 1841.

Quesnelia rufa Gaud. Atl. Voy. Bonite *pl. 54.* 1842.

Quesnelia cayennensis Baker, Handb. Bromel. 85. 1889.

Quesnelia skinneri E. Morr. ex Harms, Engl. & Prantl, Pflanzenfam. ed. 2. 15a: 152. 1930.

Brazil: *Widgren* 1251 (S). Cultivated, *Hemings* (B, F neg. 11330); *Hort. Paris* (P, type, GH neg. 2961); *Reitz* 4794 (HBR).

Espírito Santo: Santa Teresa, *Foster* 312 (GH, R). Vitória, *Foster* 182 (GH, R); 796 (GH).

Rio de Janeiro: Coast, *Foster* 1152 (GH, US). Magé, *Pereira* 607 (RB). Mauá, *Ule* 4044 (R). Mandioca, Serra da Estrella, *Glaziou* 15480 (P, US). Suruí to Petrópolis, *Foster* 330 (GH, R).

Distrito Federal: Gavea, *Frazão* (RB). Laranjeiras, *Glaziou* 18568 (F, P, US). Restinga de Leblon, *Hoehne* 125 (R). Recreio dos Bandeirantes, *Lutz* 945 (R). Rio de Janeiro, *Gaudichaud* 370 (P, type of *Quesnelia rufa* Gaud.; GH neg. 2960); *Reitz* 4186 (HBR).

3. ***Quesnelia testudo*** Lindm. Svensk. Akad. Handl. 24: no. 8: 24, *pl. 3, figs. 9–19.* 1891.

Quesnelia roseo-marginata sensu E. Morr. Belg. Hortic. 31: 82, *pl. 4.* 1881.

Brazil: Cultivated, *Hort. Liége* (LG).

São Paulo: Alto da Serra, *Foster* 376 (GH); *Hoehne* (GH, SP); *L. B. Smith* 1840 (B, GH); 1873 (F, GH). Sorocaba, Santos, *Mosén* 2976 (S, type). Mun. São Paulo: Serra da Cantareira, *Loefgren* (GH, SP).

Santa Catarina: Cultivated in Hort. Museu Nacional, Rio de Janeiro, *Hans* (R).

4. ***Quesnelia imbricata*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 2: 195, *pl. 63.* 1952.

Paraná: Ponta Grossa, *Foster* 2527 (US). Mun. Campo Largo: Campo Largo, *Foster* 405 (GH, type (US neg. 4211), R, US). Serra São Luiz de Purunã, *Hatschbach* 1538 (US); 2301 (US); *M. Kuhlmann* (SP). Mun. Piraquara: Morro Albino Souza, *Hatschbach* 1016 (US).

5. ***Quesnelia humilis*** Mez in Mart. Fl. Bras. 3, pt. 3: 386. 1892.

Quesnelia hoehnei L. B. Smith, Contr. Gray Herb. 95: 43, *pl. 10, figs. 3–5.* 1931.

Brazil: *Glaziou* 16434 (B, type, F neg. 11346).

São Paulo: Cultivated, *M. Kuhlmann* (SP); *T. Rojas* 8839 (US). Alto da Serra, *Foster* 350 (GH); 379 (GH, R); *Gehrt* (GH, SP); *Hoehne & Gehrt* (GH, SP, US); *J. G. Kuhlmann* (RB); *L. B. Smith* 1887 (GH); 1968 (GH, type of *Quesnelia hoehnei* L. B. Smith). Boracéa, Salesópolis, *M. Kuhlmann & Kühn* 1762 (SP). Capivari, *Edwall* (SP). Cubatão, *Gonçalves* (SP). Ribeirão Pires, *Edwall* (SP).

6. ***Quesnelia edmundoi*** L. B. Smith, p. 34, fig. 113.

Rio de Janeiro: Barreiras, Baixada Fluminensis, at the base of the Serra de Teresópolis, *Pereira & Duarte* 1522 (US, type; RB).

7. ***Quesnelia lateralis*** Wawra, Oesterr. Bot. Zeitschr. 30: 149. 1880.

Quesnelia centralis Wawra, Oesterr. Bot. Zeitschr. 30: 150. 1880.

Billbergia enderi Regel, Gartenflora 35: 97, *pl. 1217.* 1886.

Quesnelia enderi Gravis & Wittm. Gartenflora 37: 195, *figs. 41–43.* 1888.

Rio de Janeiro: Serra dos Orgãos, *Brade* 16695 (RB, US); *Gardner* 694 (BM, K (GH neg. 2714)); *Glaziou* 2838 (P); *Ule* 4138 (R); *Wawra* II-315 (W, type); II-376 (W, type of *Quesnelia centralis* Wawra). Petrópolis, *Glaziou*

16439 (P); 16440 (P). Morro da Bandeira, near Petrópolis, *Glaziou* 14336 (P). Teresópolis, *Foster* 992 (GH, US). Sete Quedas, Teresópolis, *Brade* 9303 (R).

8. ***Quesnelia blanda*** (Schott ex Beer) Mez in Mart. Fl. Bras. 3, pt. 3: 383. 1892.

Bromelia blanda Schott ex Beer, Bromel. 43. 1857.

Quesnelia strobilispica Wawra, Oesterr. Bot. Zeitschr. 30: 149. 1880.

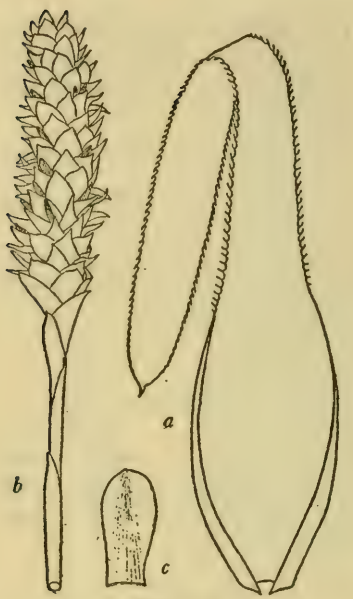

FIG. 113.

FIG. 114.

FIG. 113.—*Quesnelia edmundoi: a,* Leaf, × ¼; *b,* scape and inflorescence, × ¼; *c,* sepal, × 1.

FIG. 114.—*Quesnelia liboniana: a,* Habit (after Botanical Magazine) × ¼; *b,* sepal, × 1; *c,* petal and stamen, × 1; *d,* longitudinal section of ovary, × 1.

ESPÍRITO SANTO: Santa Teresa, *Foster* 272 (GH, R, US); 872 (GH). Mun. Castelo. Braço do Sul, *Brade* 19157 (RB, US).

MINAS GERAIS: Serra do Cipó, *Foster* 617 (GH).

RIO DE JANEIRO: Cantagallo, *Glaziou* 15483 (B, F neg. 11333); *Wawra* II-273 (W, type of *Quesnelia strobilispica* Wawra). Rio Paraíba, *Glaziou* 17820 (P).

DISTRITO FEDERAL: Cultivated (?), Quinta, *Glaziou* 16451 (P).

9. ***Quesnelia liboniana*** (De Jonghe) Mez, Bot. Archiv. 1: 66. 1922. FIGURE 114.

Billbergia liboniana De Jonghe, Journ. Hort. Prat. Belg. 9: 1, *pl. 1.* 1851.

BRAZIL: *Saint-Hilaire* (P). Morro Huniango, *Glaziou* 17284 (F). Cultivated, *Barry* 15 (BH); *Foster* 103 (GH); *Hennings* (US); *E. Morren* (GH); *Hort. Regimont.* (GH); *Reitz* 5653 (HBR).

Baía: *Wetherell* (! Mez).

Rio de Janeiro: Friburgo, *J. G. Kuhlmann* (RB). Restinga de Mauá, *Glaziou* 8015 (P). Meio da Serra, *Smith & Brade* 2294 (GH). Petrópolis to Raiz da Serra, *L. B. Smith* 1325 (B, GH, S). Correas, Petrópolis, *Goés & Constantino* 611 (RB, US). Serra dos Orgãos, *Ule* (R). Castelo de Agua, Serra dos Orgãos, *Pereira* 210 (RB). Teresópolis, *Sampaio* 2039 (R); 2308 (R).

Distrito Federal: Serra da Carioca, *Duarte* 150 (RB); *L. B. Smith* 2151 (GH). Corcovado, *Dusén* 15403 (S); *Glaziou* 9325 (P). Paineiras, Corcovado, *Glaziou* 9324 (P). Realengo, *Viana Freire* 399 (R). Rio de Janeiro, *Reitz* 5674 (HBR); *Schwacke* 23 (R). São Cristovão, *Lindman* A-1 (S). Tijuca, *Brade* 10412 (R); 22128 (R); *Foster* 23-A (GH, R, US); *Hoehne* (SP, GH neg. 7146); *Lutz* 1451 (R); *L. B. Smith* 2127 (GH); *Ule* 4045 (R); *Weddell* 704 (P).

10. ***Quesnelia morreniana*** (Baker) Mez, Engl. Pflanzenreich IV. 32: 176. 1935.

Billbergia morreniana Baker, Handb. Bromel. 74. 1889.

Brazil: Described from living material at Kew. An unpublished plate by E. Morren at Kew is the only representation of the species now known.

11. ***Quesnelia indecora*** Mez in Mart. Fl. Bras. 3, pt. 3: 384, *pl. 74.* 1892.

Brazil: *Saint-Hilaire* B-60 (P, GH neg. 2962); *Schott* 5506 (W, type); 5512 (! Mez). Cultivated, *Reitz* 4795 (HBR).

Minas Gerais: Serra do Caparao, *Brade* 17125 (RB); *Campos Porto* 1168 (RB). Ouro Preto, *Schwacke* 10488 (P). (Teixeira Soares), *Sampaio* 813 (R, US). Mun. Santa Barbara: Caraça, *Foster* 682 (GH, US).

12. ***Quesnelia augusto-coburgii*** Wawra, Oesterr. Bot. Zeitschr. 30: 150. 1880.

Brazil: *Saint-Hilaire* (P).

Minas Gerais: Juiz de Fora, *Wawra* II-185 (W, type); II-196 (! Mez).

Rio de Janeiro: Itatiaia, *Brade* 10079 (R); *Foster* 120 (GH, R, US). Serra de José Vaz, near Rezende, *Glaziou* 7500 (P, GH neg. 2963).

31. *Billbergia* Thunb.

Billbergia Thunb. Decad. Pl. Brasil. 3: 30. 1821.

Southern Mexico to Bolivia and northern Argentina.

It seems probable that in *Billbergia,* simple inflorescences have evolved from compound ones by reduction, and that the spirally recurved petals of subgenus *Helicodea* are an advanced character. The following species are arranged accordingly. Mez's subgenus *Jonghea* is merged with subgenus *Billbergia* since its characters are no better than specific.

1. Petals zygomorphic by position at anthesis and afterward erect and contorted; inflorescence either compound or simple..... Subgenus **Billbergia**
2. Inflorescence compound with obvious branches, at least at its base.
3. The inflorescence lepidote at least on the bracts or sepals.
4. Ovaries not more than twice as long as the upper floral bracts.

5. Floral axes glabrous; inflorescence compound nearly to its apex. 1. **B. sanderiana**
5. Floral axes minutely lepidote; inflorescence compound only near its base.
6. Upper scape-bracts imbricate; sepals narrowly elliptic; petals yellow-green except for the blue apex..... 2. **B. elegans**
6. Upper and lower scape-bracts shorter than the internodes; sepals broadly elliptic; petals wholly blue..... 3. **B. bradeana**

4. Ovaries several times as long as the upper floral bracts.
7. Inflorescence subcorymbose with the lower branches elongate; scape-bracts large, densely imbricate..... 4. **B. tweedieana**
7. Inflorescence longer than broad or the scape-bracts short and lax.
8. Ovaries, axes and sepals densely lepidote.
9. Sepals oblong, four times as long as wide..... 5. **B. pohliana**
9. Sepals elliptic, twice as long as wide..... 6. **B. laxiflora**
8. Ovaries and axes sparsely lepidote, sepals soon glabrous.
10. Scape-bracts remote; branches of the inflorescence elongate; petal-blades dark blue..... 7. **B. reichardtii**
10. Scape-bracts imbricate; branches of the inflorescence short; petals wholly green..... 8. **B. chlorantha**

3. Inflorescence completely glabrous.
11. Sepals with a soft setiform apex, oblong, 20–24 mm. long; petal-blades dark violet; flowers spreading; axes pale when dry; inflorescence usually pendulous. (Fig. 115.)..... 9. **B. vittata**
11. Sepals acute to emarginate or obtuse and apiculate but not setiform at the apex, narrowly elliptic, 20–30 mm. long; petal-blades dark blue or green or the two combined; flowers merely divergent; axes dark when dry; inflorescence erect.
12. Petal-blades blue at the apex only or wholly green. (Fig. 116.) 10. **B. amoena**
12. Petal-blades wholly blue..... 11. **B. buchholtzii**

2. Inflorescence simple or pseudosimple with very short one-flowered branches (distinguished by the apical floral bract).
13. The inflorescence completely glabrous.
14. Flowers sessile or on very short pedicels or branches.
15. Scape erect or ascending; inflorescence truly simple with sessile flowers.
16. Sepals 20–30 mm. long; inflorescence lax with divergent flowers in few rows.
17. Petal-blades blue at the apex only or wholly green. 10. **B. amoena**
17. Petal-blades wholly blue..... 11. **B. buchholtzii**
16. Sepals 13–15 mm. long; inflorescence dense with subspreading flowers in many rows..... 12. **B. horrida**
15. Scape decurved; inflorescence often pseudosimple with short one-flowered branches.
18. Floral bracts all large, acuminate. (Fig. 117.) 13. **B. iridifolia**
18. Floral bracts much reduced toward the apex of the inflorescence.
19. Petals blue at the apex or completely green; leaf-blades to 50 mm. wide. (Fig. 118.)..... 14. **B. distachia**

19. Petals blue on the margins; leaf-blades 6–17 mm. wide. (Fig. 119.) ..... 15. **B. nutans**

14. Flowers on long slender pedicels.

20. Petals blue on the margins; upper floral bracts minute; leaf-blades 6–17 mm. wide. (Fig. 119.) ..... 15. **B. nutans**

20. Petals blue at the apex only.

21. Upper floral bracts minute. (Fig. 120.) ..... 16. **B. minarum**

21. Upper floral bracts large, acuminate.

22. Sepals acute; leaves concolorous ..... 17. **B. lietzei**

22. Sepals broadly rounded and minutely apiculate; leaves marked with pale spots ..... 18. **B. leptopoda**

13. Inflorescence densely lepidote except for the petals.

23. Flowers sessile on the axis or at the ends of very short branches; sepals 10–18 mm. long.

24. Sepals 10 mm. long; inflorescence 20 cm. or longer, pendent, dense. 19. **B. brasiliensis**

24. Sepals 12–18 mm. long.

25. Inflorescence erect or suberect, truly simple with sessile suberect flowers, dense; petals mostly or wholly red. (Fig. 121.) 20. **B. pyramidalis**

25. Inflorescence pendent, generally pseudosimple at the base with flowers at the ends of very short branches; petals pale green below the apex.

26. Lower floral bracts bright red, large, ample, concealing most of the dense inflorescence; leaves concolorous. 21. **B. morelii**

26. Lower floral bracts roseate or more often almost white, small, narrow; leaves banded or spotted. ..... 22. **B. euphemiae**

23. Flowers on long slender pedicels; sepals 20–35 mm. long.

27. Leaves concolorous; axis of the erect inflorescence stout; sepals 24–35 mm. long ..... 23. **B. macrocalyx**

27. Leaves spotted or banded; axis of the inflorescence slender; sepals 20 mm. long.

28. Inflorescence erect; leaves transversely banded. (Fig. 122.) 24. **B. fosteriana**

28. Inflorescence pendent; leaves spotted ..... 25. **B. saundersii**

1. Petals spirally recurved at anthesis; inflorescence almost always simple; flowers sessile. (Fig. 123.) ..... Subgenus **Helicodea**

29. Sepals narrow, triangular or lance-triangular, more or less acuminate, 11–20 mm. long.

30. Floral bracts all exceeding the ovary, the lowest exceeding the sepals, ample; sepals 15–20 mm. long ..... 26. **B. meyeri**

30. Floral bracts shorter than the ovary or the lowest slightly exceeding it; sepals 11–14 mm. long.

31. Epigynous tube 3–4 times shorter than the ovary; sepals nearly or quite equal.

32. Inflorescence 3–4 dm. long, lax except near the apex; lower floral bracts equaling the ovary ..... 27. **B. rupestris**

32. Inflorescence not over 15 cm. long including the petals, subdense; floral bracts all minute ..... 28. **B. brachysiphon**

31. Epigynous tube as long as the ovary; sepals subequal.
29. **B. oxysepala**

29. Sepals broad, oblong, ovate or elliptic, broadly acute to truncate or retuse, sometimes apiculate, 5–13 mm. long.
33. The sepals deeply retuse and apiculate, essentially tridentate, 11 mm. long; floral bracts minute; petals green; inflorescence elongate, lax.
30. **B. alfonsi-joannis**

33. The sepals truncate to acute.
34. Ovary slightly or not at all sulcate, wholly white-farinose.
35. Petal-blades green, strongly spiralled; species of the Amazon Basin.
31. **B. decora**

35. Petal-blades dark blue, only slightly spiralled, then contorted; species of eastern Brazil..... (19. **B. brasiliensis**)

34. Ovary sulcate with the ridges glabrous and dark.
36. The ovary broadly turbinate with large protuberances at the apex, much broader than the epigynous tube at anthesis. (Fig. 123.)
32. **B. zebrina**

36. The ovary ellipsoid or subcylindric, lacking protuberances, slightly if at all wider than the epigynous tube at anthesis.
37. Floral bracts well developed, the lowest resembling the scape-bracts in size and shape..... 33. **B. magnifica**

37. Floral bracts all much reduced or even lacking.
38. Axis of the inflorescence farinose or flocculose at anthesis; sepals 5–10 mm. long.
39. Petals wholly green; scape and floral axis slender.
34. **B. porteana**

39. Petals violet or blue, at least apically.
40. Sepals broadly rounded and apiculate; floral axis stout.
35. **B. cylindrostachya**

40. Sepals acute; floral axis slender..... 36. **B. kuhlmannii**

38. Axis of the inflorescence glabrous at anthesis; sepals 8–13 mm. long; petals green with blue apices..... 37. **B. rubicunda**

Subgenus *Billbergia*

1. ***Billbergia sanderiana*** E. Morr. Belg. Hortic. 34: 17, *pls. 1, 2.* 1884.
Billbergia amoena sensu L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: *pl. 102.* 1943.

Brazil: Cultivated, *Glaziou* 15477 (P); *Hort. Liége* (GH); *Sander* 1 (LG, type).

Espírito Santo: Santa Teresa, *Foster* 305 (GH, US).

Minas Gerais: *Handro* (SP, US); *Hoehne* (SP). Serra de Rola Moça, near Belo Horizonte, *Foster* 526 (GH).

Rio de Janeiro: Serra de Nova Friburgo, *Glaziou* 2731 (P). Teresópolis, *Bessa & Sampaio* 2696 (R).

Distrito Federal: Cultivated (?), São Cristovão, *Glaziou* 16430 (K, GH neg. 2720).

2. ***Billbergia elegans*** Mart. ex Schult. in R. & S. Syst. 7, pt. 2: 1265. 1830.

Minas Gerais: Itabira, *Weddell* (P). Serra de Caraça, *Saint-Hilaire* (P). Pico de Itacolomi, near Vila Rica, *Martius* (M, type); *Sellow* 79 (P); 1099 (B, F neg. 11338). Ouro Preto, *Glaziou* 12229 (P). Mun. Nova Lima: Serra da Mutuca, *Williams* 5615 (GH); 5622 (GH).

3. ***Billbergia bradeana*** L. B. Smith, Arquiv. Jard. Bot. Rio de Janeiro 10: 143, *fig. 3.* 1950.

Espírito Santo: Mun. Castelo: Forno Grande, *Brade* 19720 (US, type (US neg. 3518, 3519), RB).

4. ***Billbergia tweedieana*** Baker, Handb. Bromel. 73. 1889.

1. Sepals broadly rounded or subtruncate.
   2. Sepals 16–20 mm. long, three times as long as wide; plant to 2 m. high. Var. a. **tweedieana**
   2. Sepals not over 13 mm. long, about twice as long as wide. Var. b. **latisepala**
1. Sepals acute, 24 mm. long; plant small..... Var. c. **minor**

4a. ***Billbergia tweedieana*** var. ***tweedieana***

Brazil: Cultivated, *Ule* (R).

Espírito Santo: Vitória, *Foster* 183 (GH); 868 (GH, US).

Distrito Federal: Rio de Janeiro, *Tweedie* 1313 (K, type, GH neg. 2719).

4b. ***Billbergia tweedieana*** var. ***latisepala*** L. B. Smith, p. 22.

Rio de Janeiro: Cantagallo, *Glaziou* 15476 (GH, type (US neg. 4215), P).

4c. ***Billbergia tweedieana*** var. ***minor*** L. B. Smith, p. 22.

Espírito Santo: Santa Teresa, *Foster* 277 (GH, type (US neg. 4216), R).

5. ***Billbergia pohliana*** Mez in Mart. Fl. Bras. 3, pt. 3: 403, *pl. 78.* 1892.

Brazil: *Pohl* 5508 (W, type).

Minas Gerais: Coronel Pacheco, *Heringer* (SP, US neg. 4253).

6. ***Billbergia laxiflora*** L. B. Smith, Arquiv. Jard. Bot. Rio de Janeiro 10: 145, *fig. 5.* 1950.

Espírito Santo: Mun. Castelo: Braço do Sul, *Brade* 19174 (RB, type, US neg. 3258).

7. ***Billbergia reichardtii*** Wawra, Oesterr. Bot. Zeitschr. 30: 115. 1880.

Espírito Santo: Guiomar, *Foster* 941 (GH).

Minas Gerais: Juiz de Fora, *Wawra* II-197 (W, type). Juiz de Fora to Serra de Mantiqueira, *Warming* 2172 (C, F neg. 22320).

8. ***Billbergia chlorantha*** L. B. Smith, Contr. Gray Herb. 154: 32, *pl. 3, figs. 3–6.* 1945.

Espírito Santo: Santa Teresa, *Foster* 287 (GH, type, US neg. 4059).

9. ***Billbergia vittata*** Brongn. ex Morel, Portef. Hort. 2: 353, *pl.* 1848. Figure 115.

Billbergia zonata Hort. Makoy Catal. 1850.

Brazil: Cultivated, *Morel* (P, type, GH neg. 2940); *Regel* (GH).

Espírito Santo: Santa Teresa, *Foster* 249 (GH).

Minas Gerais: Belo Horizonte, *Foster* 1217 (GH, US). Serra do Cipó, near Belo Horizonte, *Foster* 643 (GH); 1218 (GH). Santa Luzia, Serra do Cipó, *Sampaio* 6905 (R). Mun. Caete: Serra de Piedade, *Foster* 574 (GH). Mun. Conceição: Serra do Cipó, *Foster* 644 (GH, US). Mun. Jaboticatubas: Palacio, Serra do Cipó, *Smith & Mus. R* 6753 (US); 6754 (US). Mun. Nova Lima: Lagoa Grande, Serra de Mutuca, *Williams & Assis* 5786 (GH).

Rio de Janeiro: Itatiaia, *Foster* 125 (GH).

DISTRITO FEDERAL: Cultivated (?), Quinta, *Glaziou* 16424 (P). Rio de Janeiro, *Glaziou* 14339 (K, GH neg. 2718).

10. ***Billbergia amoena*** (Lodd.) Lindl. Bot. Reg. 13: sub *pl. 1068.* 1827.

1. Sepals green except for the dark blue apex.
   2. Petals dark blue at apex, elsewhere green..... Var. a. **amoena**
   2. Petals wholly green..... Var. b. **viridis**
1. Sepals red toward apex..... Var. c. **minor**

10a. ***Billbergia amoena*** var. ***amoena.*** FIGURE 116.

Tillandsia amoena Lodd. Bot. Cab. 1: *pl. 76.* Oct. 1818.

Bromelia pallida Ker, Bot. Reg. 4: *pl. 344.* Dec. 1818.

Tillandsia variegata Vell. Fl. Fluminensis 134. 1825; Icon. 3: *pl. 132.* 1835.

Billbergia pallida Beer, Bromel. 121. 1857.

Billbergia pallescens C. Koch & Bouché, Ind. Sem. Hort. Berol. for 1856, App.: 5. 1857.

Billbergia speciosa sensu Baker, Handb. Bromel. 73. 1889. Not Thunb. 1821.

Billbergia wiotiana De Jonghe ex Mez, Repert. Sp. Nov. 14: 241. 1916.

Billbergia wacketii Mez, Repert. Sp. Nov. 16: 7. 1919.

BRAZIL: *Saint-Hilaire* 149 (P); *Sellow bromel.* 34 (P). Praia de Fora, *Glaziou* 13254 (P). Cultivated, *Hort. Liége* (LG); *Lindley* (CGE); *Lindman* A-5 (S); *Platzmann* (B, *Billbergia wiotiana* De Jonghe, F neg. 11345); *Hort. Regimont.* (GH, isotype of *Billbergia wacketii* Mez); *Ule* (R).

BAÍA: Iturassu to Jequié, *Foster* 2447 in part (US).

ESPÍRITO SANTO: Santa Teresa, *Foster* 1219 (GH); 1220 (GH). Vitória, *Foster* 189 (GH, US); 190 (R); 199 (GH, R); 876 (GH). Mun. Cachoeiro de Itapemirim: Vargem Alta, Morro do Sal, *Brade* 19321 (RB, US).

MINAS GERAIS: Catas Altas, *Saint-Hilaire* C-270 (P). Serra do Cipó, *Foster* 606 (GH). Km. 148, Serra do Cipó, *Melo Barreto* 8324 (R). Serra de Ouro Preto, *Ule* (R). Mun. Santa Barbara: Caraça, *Foster* 683 (GH).

GOIÁS: Serra Geral, eastern Goiás, *Luetzelburg* (! Mez).

RIO DE JANEIRO: Ariró, *Glaziou* 2733 (P). Barra de São José to Campos Novos, *Pereira & Araujo* 508 (RB). Cantagallo, *Glaziou* 15478 (P); 16435 (P). Itatiaia, *Luetzelburg* (! Mez). Niteroi, *Smith & Brade* 2349 (B, F, GH, S). Serra dos Orgãos, *Luetzelburg* (! Mez). Petrópolis, *Foster* 332 (GH, US). Teresópolis, *Foster* 975 (GH, US). Guarani, Teresópolis, *Brade* 9581 (R). Mun. Cabo Frio: Praia do Pontal, *Smith & Mus. R* 6596 (US).

DISTRITO FEDERAL: Campo Grande, *Lutz* (R). Quinta da Boa Vista, *Glaziou* 14335 (P, US). Recreio dos Bandeirantes, *Emygdio* 496 (R); *Lutz* 617 (GH, US); 902 in part (R). Rio de Janeiro, *Gaudichaud* 364[3] (P); 364[4] (P); *Reitz* 4027 in part (HBR). São Cristovão, *Glaziou* 16433 (P). Tijuca, *Ule* 4177 (R). Praia de Sernambetiba, L. B. *Smith & Mus. R* 6822 (US).

SÃO PAULO: Alto da Serra, *Foster* 361 (GH); *Gehrt* (SP, GH neg. 7150); *Hoehne* (SP). Bertioga, Santos, *Hoehne & Gehrt* (GH, SP). Boracéa, *Blanco* (GH, IAC). Jaraguá, *Gehrt* (SP). Patrimonio, *Kuhlmann & Kühn* (SP). Pindamonhangaba, *Aragão in Reitz* 4045 (HBR). Santos,

Everett (GH). Iguapé, Santos, *Hoehne* (SP, GH neg 7147). Rio Tijuco, *Foster* 463 (GH, US). Tremembé, *Doering* (SP). Una, *Foster* 386 (GH, R).

PARANÁ: Caiobá, *Foster* 442 (GH, R). Morro Taguá, Caiobá, *Stellfeld & Freitas* 539 (Paran.). Desvio Ipiranga, Serra do Mar, *Dusén* 8224 (S, US). Paranaguá, *M. Kuhlmann* (SP). Serra da Prata, *Dusén* 15305 (GH, S); 17053 (S).

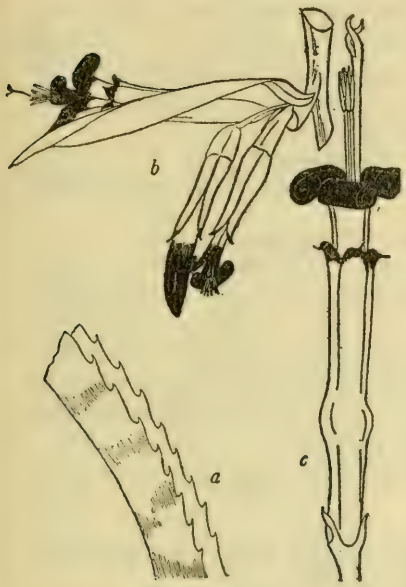

FIG. 115.

FIG. 116.

FIG. 115.—*Billbergia vittata: a,* Section of leaf, × ½; *b,* branch of inflorescence, × ½; *c,* flower, × 1. (All after Belgique Horticole.)

FIG. 116.—*Billbergia amoena* var. *amoena: a,* Upper habit (after Botanical Cabinet) × ½; *b,* sepal, × 1; *c,* base of petal, × 2.

SANTA CATARINA: Blumenau, *Reitz* 4064 (HBR); *Schwacke* 56 (R). Mun. Brusque: Azambuja, *Reitz* 1803 (HBR, US). Brusque, *Reitz* 4022 (HBR); 4032 (HBR). Ribeirão do Ouro, *Reitz* 3558 (HBR); 4033 (HBR). Mun. Jaraguá do Sul: Corupá, *Reitz* 4036 (HBR). Mun. São Francisco do Sul: São João, *Hatschbach* 2771 (US).

10b. ***Billbergia amoena*** var. ***viridis*** L. B. Smith, p. 20.

ESPÍRITO SANTO: Santa Teresa, *Foster* 246 (GH, type; US).

10c. ***Billbergia amoena*** var. ***minor*** (Antoine & Beer ex Beer) L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 104. 1943.

Billbergia speciosa Thunb. Dec. Pl. Brasil. 3: 30, *pl.* 1821.

Billbergia pyramidalis var. *minor* Antoine & Beer ex Beer, Bromel. 108. 1857.

Billbergia variegata sensu E. Morr. Belg. Hortic. 31:73. 1881. Not Schult. 1830.

Billbergia thunbergiana Hort. ex Baker, Handb. Bromel. 73. 1889.

Billbergia binotii Gerard, Journ. Soc. Hort. Rhône for 1896:1. 1896.

BRAZIL: Cultivated, *Foster* (US).

MINAS GERAIS: Pico da Piedade near Belo Horizonte, *Foster* 575 (GH, US neg. 4058).

11. ***Billbergia buchholtzii*** Mez, Repert. Sp. Nov. Fedde 16:7. 1919.

BRAZIL: Cultivated, *Atkinson* 44 (US); *Missouri Bot. Gard.* (GH); *New York Bot. Gard.* (US); *Strauss* (B, type; F neg. 11335).

12. ***Billbergia horrida*** Regel, Ind. Sem. Hort. Petrop. for 1856:17. 1857.

Billbergia horrida var. *tigrina* Hort. ex Baker, Handb. Bromel. 73. 1889.

BRAZIL: Cultivated, *New York Bot. Gard.* (US).

ESPÍRITO SANTO: Santa Teresa, *Foster* 253 (GH); 286 (GH).

MINAS GERAIS: Dist. Ilheu, *Mexia* 4967 (GH, US). Juiz de Fora, *Hoehne* 26 (SP).

RIO DE JANEIRO: Serra de Estrella, *Brade & Kuhlmann* 13106 (RB).

DISTRITO FEDERAL: Corcovado, *Glaziou* 12224 (P). Furnas, *Brade & Duarte* 18587 (RB). Cultivated (?), Quinta, *Glaziou* 16425 (P). Cultivated (?), São Cristovão, *Glaziou* 15479 (F).

13. ***Billbergia iridifolia*** (Nees & Mart.) Lindl. Bot. Reg. 13: *pl. 1068.* 1827.

1. Petals blue at apex, elsewhere pale yellow..... Var. a. **iridifolia**
1. Petals wholly pale yellow..... Var. b. **concolor**

13a. ***Billbergia iridifolia*** var. ***iridifolia.*** FIGURE 117.

Bromelia iridifolia Nees & Mart. Nova Acta Acad. Leop. Carol. 11:16. 1823.

BRAZIL: *Freyreis* (S).

BAÍA: Conquista, southwestern Baía, *Torrend* (FF Bahia). Felisberto, near Ilheus, *Wied-Neuwied* (BR, type, GH neg. 2797).

ESPÍRITO SANTO: Serra da Caparao, *Mexia* 4046 (GH, UC). Linhares, *Foster* 776 (GH). Reeve, *Vidal* 3 (R). Mun. Collatina: Monte Claro, *Foster* 215 (GH, US).

MINAS GERAIS: Fazenda da Tabunha, Dist. Ilheu, *Mexia* 4975-a (UC); 4978-a (GH); 4998-a (GH). Mun. Guanhaes: Jacu, *Melo Barreto* 2105 (R).

RIO DE JANEIRO: Cabo Frio, *Brade* 12765 (GH, RB). Campos, *Sampaio* 8359 (R). Cantagallo, *Glaziou* 15475 (US). Serra da Estrella, *Glaziou* 16432 (F). Imbui, Niteroi, *Brade* 11057 (GH, R).

DISTRITO FEDERAL: Serra da Carioca, *Pereira* 14 (RB). Gavea, *Wittig in Glaziou* 12228 (P, US). São Cristovão, *Glaziou* 16431 (P).

13b. ***Billbergia iridifolia*** var. ***concolor*** L. B. Smith, p. 21.

ESPÍRITO SANTO: Itapemirim, *Foster* 160 (GH, type, US neg. 4275). Vitória, *Foster* 873 (GH, US).

14. ***Billbergia distachia*** (Vell.) Mez in Mart. Fl. Bras. 3, pt. 3:417. 1892. As "distacaia."

1. Leaves concolorous.
   2. Sepals blue at the apex.
      3. Petals blue at the apex..... Var. a. **distachia**
      3. Petals wholly green..... Var. b. **straussiana**

2. Sepals and petals wholly green..... Var. c. **concolor**
1. Leaves flavous-spotted..... Var. d. **maculata**

14a. ***Billbergia distachia*** var. ***distachia***. FIGURE 118.
Tillandsia distachia Vell. Fl. Fluminensis 136. 1825.
Tillandsia distaceia Vell. Fl. Fluminensis Icon. 3: *pl. 141.* 1835.
Billbergia ensifolia Baker, Handb. Bromel. 74. 1889.
Billbergia burchellii Baker, Handb. Bromel. 76. 1889.

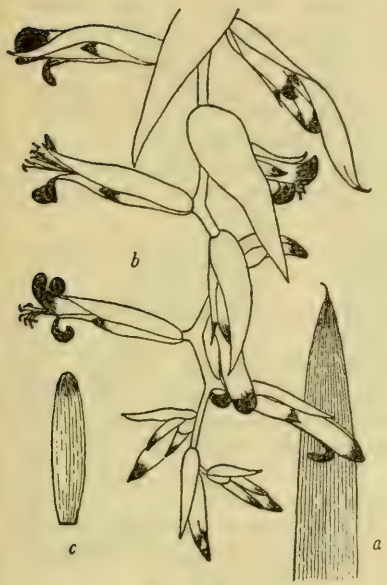

FIG. 117.

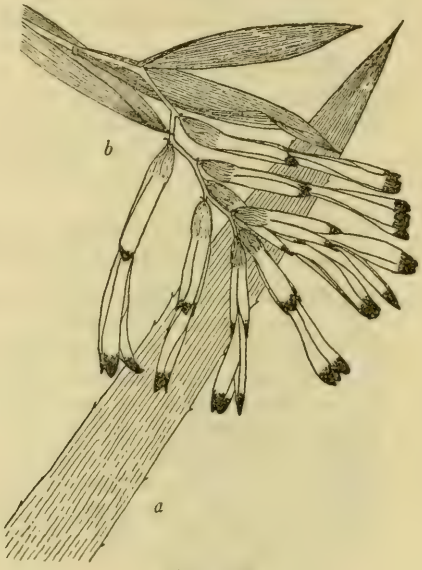

FIG. 118.

FIG. 117.—*Billbergia iridifolia* var. *iridifolia: a,* Apex of leaf, × ½; *b,* inflorescence (after Sertum Botanicum), × ½; *c,* sepal, × 1.
FIG. 118.—*Billbergia distachia* var. *distachia: a,* Apex of leaf, × ½; *b,* inflorescence, × ½.

Billbergia bakeri sensu Lindm. Svensk. Akad. Handl. 24: no. 8: 34, *pl. 8, figs. 47–50.* 1891.
Billbergia caespitosa Lindm. Svensk. Akad. Handl. 24: no. 8: 35, *pl. 8, figs. 41–46.* 1891.
? *Billbergia regeliana* Mez, Repert. Sp. Nov. Fedde 14: 243. 1916.

BRAZIL: *Sellow* bromel. 4 (US); 78 (P); 81 (P); *Widgren* (S). Rio de Janeiro or Minas Gerais, *Glaziou* 16437 (B, isotype of *Billbergia ensifolia* Baker, F neg. 11337). Ruiz Jordão near Rio Gelado, *Glaziou* 13255 (P). Cultivated, *Hort. Regimont* (GH); *Strauss* (B, F neg. 11342); *Ule* 546 (R).

MINAS GERAIS: Caldas, *Lindberg in Regnell* 564 (S); *Mosén* 757 (S); *Regnell* I-438 1/2 (S, US). Palmira, *Brade* 15920 (RB).

RIO DE JANEIRO: Itatiaia, *Brade* 10078 (R); *Dusén* 721 (R); 724 (R); *Foster* 136 (GH, R); *Rose & Russell* 20587 (US); *L. B. Smith* 1628 (GH).

DISTRITO FEDERAL: Barra da Tijuca, *Reitz* 4755 (! Reitz). São Cristovão, *Glaziou* 12227 (P).

SÃO PAULO: Serra da Bocaina, *Duarte & Brade* 21196 (RB). Campinas, *Mosén* 3930 (S); *Novaes* 1207 (US); *Viegas* (SP); *Zagatto* (IAC). Campos do Jordão, *Campos Porto* 3362 (RB); *Eugenio* 3506 (GH); *Hoehne* (SP). Serra da Caracol, *Mosén* 1728 (S). Cotia to Una, *M. Kuhlmann* (GH, SP). Fonte Sanatoria, *Foster* 389 (GH). Itapira, *Hoehne* (GH, SP). Limeira, *Santos Pires* (SP). Monte Alegre do Sul, *Kuhlmann & Kühn* 1813 (SP). Taubaté, *Loefgren & Edwall* (GH, SP). Una, *Foster* 388 (GH). Mun. Amparo: Monte Alegre, *M. Kuhlmann* 512 (SP). Mun. Oleo: *Edwall* (SP). Mun. São Paulo: Butantã, *Hoehne* (GH, SP). Observatorio, *Foster* 351 (GH, R). Orchidario, *Foster* 341 (R). Santo Amaro, *Krieger* 180 (SP). São Paulo, *Edwall* (SP); *Foster* 1130 (GH).

PARANÁ: Carvalho, *Dusén* 12188 (S). Curitiba, *Foster* 458 (GH, R); 460 (GH); *M. Kuhlmann* (SP, US). Jaguariaíva, *Dusén* (S); 10056 (S, US). Pinhaes, *Dusén* (S, US). Mun. Piraquara: Pinhal, *Hatschbach* 1443 (US).

SANTA CATARINA: Ribeirão Grande, Taió, *Reitz* 4034 (HBR); 4060 (HBR). Mun. Biguaçú: Fachinal, *Reitz* 4096 (HBR).

14b. ***Billbergia distachia*** var. ***straussiana*** (Wittm.) L. B. Smith, Anais Bot. Herb. Barbosa Rodrigues 2: 13. 1950.

Billbergia pallescens sensu Baker, Bot. Mag. 104: *pl. 6342.* 1878.

Billbergia bakeri E. Morr. Belg. Hortic. 30: 166, *pl. 8.* 1880.

Billbergia bakeri var. *straussiana* Wittm. Gartenzeit. 4: 487. 1885.

BRAZIL: Cultivated, *E. Morren* (LG); *Hort. Regimont.* (GH).

SÃO PAULO: Bragança, *Duarte* (SP).

PARANÁ: Guaratuba, *Inst. Malariologia in Reitz* 3594 (HBR).

SANTA CATARINA: Mun. Araquari: Barra do Sul, *Reitz & Klein* 780 (HBR, US). Inferninhos, *Reitz* 4035 (HBR). Mun. Pôrto Belo: Canto Grande, *Reitz* 3626 in part (HBR); 3705-a (HBR); 4039 (HBR).

14c. ***Billbergia distachia*** var. ***concolor*** Reitz, Anais Bot. Herb. Barbosa Rodrigues 4: 33. 1952.

SANTA CATARINA: Mun. Biguaçú: Fachinal, *Reitz* 4152 (HBR, type). Mun. Palhoça: Anitápolis, *Reitz* 4535 (HBR).

14d. ***Billbergia distachia*** var. ***maculata*** Reitz, Anais Bot. Herb. Barbosa Rodrigues 4: 33. 1952.

SANTA CATARINA: Mun. Pôrto Belo: Canto Grande, *Reitz* 4763 (HBR, type).

15. ***Billbergia nutans*** H. Wendland ex Regel, Gartenflora 18: 162, *pl. 617.* 1869.

1. Leaves serrulate; petals green at extreme apex..... Var. a. **nutans**
1. Leaves entire; petals blue at apex as well as margins. Var. b. **schimperiana**

15a. ***Billbergia nutans*** var. ***nutans.*** FIGURE 119.

Billbergia linearifolia Baker, Handb. Bromel. 72. 1889.

Billbergia bonplandiana Gaud. ex Mez in Mart. Fl. Bras. 3, pt. 3: 421, *pl. 76.* 1892.

? *Billbergia minuta* Mez, Repert. Sp. Nov. 14: 244. 1916.

BRAZIL: *Sellow* bromel. 60 (P); bromel. 77 (P); 4001 (B, F neg. 11334). Cultivated, *Regimont.* (GH); *Vratislaw* (GH).

DISTRITO FEDERAL: Cultivated (?), Quinta, *Glaziou* 16436 (P). Cultivated (?), São Cristovão, *Glaziou* 11678 (P).

PARANÁ: *Tessmann* (US). Alto da Serra, *Foster* 408 (GH). Castro, Socavão, *Stellfeld* (Paran). Curitiba, *Foster* 461 (GH, R). Iguaçu, *J. G. Kuhlmann* (RB). Jaguariaíva, *Dusén* 15196 (GH, S); 16733 (S). Pato Branco, *Reitz* 4694 (! Reitz). Pinhaes, *Dusén* 17695 (GH, S). Rio Negro, *Dusén* 6968 (S); *Hoehne* (SP). Tibagi, *Reiss* 58 (GH, US). Vila Velha, *Foster* 423 (GH).

FIG. 119.

FIG. 120.

FIG. 119.—*Billbergia nutans* var. *nutans:* *a,* Scape and inflorescence, × ½; *b,* sepal, × 1; *c,* petal and stamen, × 1.

FIG. 120.—*Billbergia minarum:* *a,* Leaf-blade, × ½; *b,* inflorescence (after M. B. Foster) × ½; *c,* sepal, × 1; *d,* petal and stamen, × 1; *e,* longitudinal section of ovary, × 1.

SANTA CATARINA: Mun. Chapecó: Itapiranga, *Reitz* 4156 (HBR).

RIO GRANDE DO SUL: Kapesberg, near Montenegro, *Rambo* (LIL, US). Nova Wurtemburg, *Bornmueller* 564 (GH). Pareci Novo, *Sehnem* 1548 (LIL). Reutersberg, Dois Irmãos, *Rambo* (IAN). Santo Angelo, *Lindman* A-1087 (S). São Salvador, *Eugenio* (GH); *Sehnem* 2068 (LIL). Silveira Martins, *Lindman* A-1381 (S); A-1393 (S).

ALSO: URUGUAY, PARAGUAY, ARGENTINA.

15b. ***Billbergia nutans*** var. ***schimperiana*** (Wittm. ex Baker) Mez in DC. Monogr. Phan. 9: 328. 1896.

Billbergia schimperiana Wittm. ex Baker, Handb. Bromel. 79. 1889.

Billbergia nutans var. *schimperiana* forma *rupestris* Hassler, Ann. Conserv. & Jard. Bot. Genève 20: 297. 1919.

SANTA CATARINA: Corupá, *Reitz* 4756 (! Reitz); *Reitz & Klein* 800 (HBR, US); *Seidel* 4042 (HBR).
ALSO: PARAGUAY.

16. ***Billbergia minarum*** L. B. Smith, p. 22, fig. 120.
MINAS GERAIS: Gobernador Valadores, Figueiro, Rio Doce, *Foster* 766 (GH, type, US neg. 4056).

17. ***Billbergia lietzei*** E. Morr. Belg. Hortic. 31: 97, *pls. 5–7.* 1881.
BRAZIL: Cultivated, *Lietze* 6 (LG, type).

18. ***Billbergia leptopoda*** L. B. Smith, Contr. Gray Herb. 154: 33, *pl. 3, figs. 7, 8.* 1945.
BRAZIL: Cultivated, *Foster* (US).
ESPÍRITO SANTO: Santa Teresa, *Foster* 304 (GH).
MINAS GERAIS: Gobernador Valadores, Figueira, Rio Doce, *Foster* 765 (GH, type, US neg. 4060).

19. ***Billbergia brasiliensis*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 105. 1943.
Billbergia leopoldii Linden ex Houllet, Rev. Hortic. 41: 87, *fig. 21.* 1869. Not C. Koch. 1857.
DISTRITO FEDERAL: Tijuca, *Glaziou* 16421 (K, GH neg. 2717).

20. ***Billbergia pyramidalis*** (Sims) Lindl. Bot. Reg. 13: sub *pl. 1068.* 1827.
1. Petals blue toward apex, red elsewhere..... Var. a. **pyramidalis**
1. Petals red throughout..... Var. b. **concolor**

20a. ***Billbergia pyramidalis*** var. ***pyramidalis.*** FIGURE 121.
Bromelia pyramidalis Sims, Bot. Mag. 42: *pl. 1732.* 1815.
Billbergia pyramidalis var. *bicolor* Lindl. Bot. Reg. 14: *pl. 1181.* 1828.
Billbergia thyrsoidea Mart. ex Schult. in R. & S. Syst. 7, pt. 2: 1260. 1830.
Billbergia longifolia C. Koch & Bouché, Ind. Sem. Hort. Berol. for **1856**, App.: 5. 1857.
Billbergia thyrsoidea var. *"B." longifolia* Baker, Handb. Bromel. 71. 1889.
BRAZIL: *Blanchet* (G); *Widgren* 1015 (S). Cultivated, *Lindman* A-25 (S); *Rosa* (R).
BAÍA: Serra das Almas, central Baía, *Luetzelburg* (! Mez). Santa Amaro, eastern Baía, *Luetzelburg* (! Mez).
RIO DE JANEIRO: Frade de Macaé, *Brade* 15836 (RB). Itatiaia, *Luetzelburg* (! Mez). Niteroi, *Foster* 1034 (GH). Serra dos Orgãos, *Brade* 12083 (GH, R); *Luetzelburg* (! Mez); *Ule* (R). Pico Magestoso, Serra dos Orgãos, *Pereira* 255 (RB). Petrópolis, *Diogo* 431 (R); *Sampaio* 7792 (R). Serra da Estrela, Petrópolis, *Diogo* 498 (R). Old road below Petrópolis, *Smith & Mus. R* 6495 (US). (Represa São Pedro), *Brade* 10825 (R). Suruí, *Foster* 20-A (GH, R). Teresópolis, *Brade* 9681 (R); *Sampaio* 1710 (R); 2094 (R). Ubá, *Saint-Hilaire* A^2-546 (P).
DISTRITO FEDERAL: Corcovado, *Apparicio & Rizzini* 3 (RB); *Glaziou* 2729 (P). Pedra Dois Irmãos, *L. B. Smith* 2146 (B, BA, BM, F, GH, K, P, S, US). Engenho Novo, *Glaziou* 11690 (F). Realengo, *Freire* 402 (R); 403 (R). Rio de Janeiro, *Gaudichaud* (P); *Glaziou* 12226 (P); *Regnell* 211-a (S); 211-b (S); *Reitz* 4026 (HBR); 4475 (HBR); *Wilkes Expedition* (GH). Tijuca, *Glaziou* 3128 (P); *Hoehne* 175 (GH, SP). Barra da Tijuca, *Brade* 15483 (RB).

20b. ***Billbergia pyramidalis*** var. ***concolor*** L. B. Smith, Bromel. Soc. Bull. 4:6. 1954.

Billbergia thyrsoidea sensu Lindl. Paxton Fl. Gard. 3: *pl. 74.* 1852–53. Not Mart. 1830.

Billbergia paxtonii Beer, Bromel. 113. 1857.

BRAZIL: Cultivated, *Barry* (GH, type, US neg. 4062).

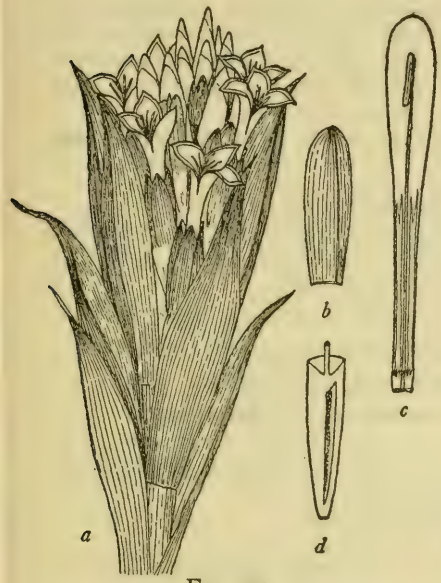

FIG. 121.

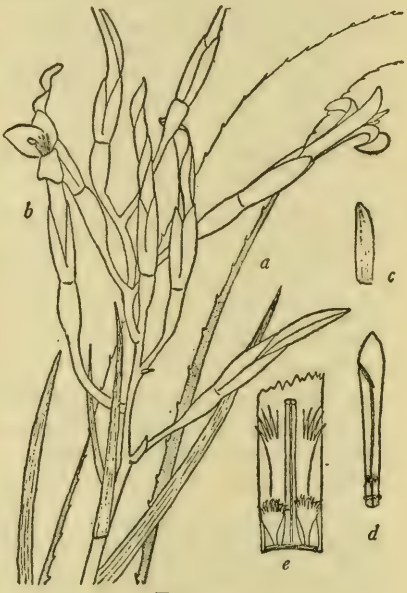

FIG. 122.

FIG. 121.—*Billbergia pyramidalis* var. *pyramidalis: a,* Inflorescence (After Botanical Magazine), ×½; *b,* sepal, ×1; *c,* petal and stamen, ×1; *d,* longitudinal section of ovary, ×1.

FIG. 122.—*Billbergia fosteriana: a,* Leaf-blade, ×½; *b,* inflorescence, ×½; *c,* sepal, ×½; *d,* petal and stamen, ×½; *e,* base of petal, ×2. (All after M. B. Foster.)

21. ***Billbergia morelii*** Brongn. Portef. Hort. 2:97, *pl.* 1848.

PERNAMBUCO: Tapera, *Pickel* 931 (IPA).

BAÍA: *Foster* 2448 (US). Cultivated, *Porte* (P, type, GH neg. 2941). Rio Grungogi, *Curran* 127 (US).

ESPÍRITO SANTO: Mun. Cachoeiro de Itapemirim: Vargem Alta, *Brade* 19964 (RB, US). Mun. Castelo: Braço do Sul, *Brade* 19202 (RB).

RIO DE JANEIRO: Cantagallo, *Peckolt* (BR, GH neg. 2796).

DISTRITO FEDERAL: Cultivated, Quinta da Boa Vista, *Glaziou* 16438 (P).

SÃO PAULO: Alto da Serra, *Handro* (SP, GH neg. 3374).

22. ***Billbergia euphemiae*** E. Morr. Belg. Hortic. 22:11, *pls. 1, 2.* 1872.

1. Leaves with pale cross-bands or nearly concolorous.
   2. Inflorescence lax or sublax; axis geniculate; lower floral bracts like the scape-bracts..... Var. a. **euphemiae**

2. Inflorescence subdense; axis nearly straight; floral bracts all minute or only the lowest large..... Var. b. **nudiflora**

1. Leaves pale-spotted but not banded..... Var. c. **saundersioides**

22a. ***Billbergia euphemiae*** var. ***euphemiae***

Brazil: Cultivated, *Atkinson* 22 (BH); *Barry* (GH); *Hort. Liége* (LG, ? type); *Ule* (R).

Espírito Santo: Cobiça, *Foster* 895 (GH). Collatina, Monte Claro, *Foster* 231 (GH). Estrada da Colonia, 61 km. from Collatina, *J. G. Kuhlmann* 311 (RB). Domingos Martins, *Foster* 238 (GH). Santa Teresa, *Foster* 250 (GH). Vitória, *Foster* 184 (GH, R, US). Mun. Cachoeiro de Itapemirim: Pedra Branca, *Brade* 19381 (RB). Vargem Alta, Corrego d'Ouro, *Brade* 19409 (RB). Mun. Castelo: Forno Grande, *Brade* 19232 (RB, US).

Rio de Janeiro: Campos, *Sampaio* 8561 (R). Sertão de Cacimbas, right bank of Rio Ita, *Sampaio* 1004 (R).

22b. ***Billbergia euphemiae*** var. ***nudiflora*** L. B. Smith, p. 20.

Espírito Santo: Cachoeiro de Itapemirim, *Foster* 969 (GH, US). Itapemirim, *Foster* 159 (GH, type; R). Monte Claro, Collatina, *Foster* 217 (GH, US).

Minas Gerais: Coronel Pacheco, *Heringer* 1159 (SP).

22c. ***Billbergia euphemiae*** var. ***saundersioides*** L. B. Smith, p. 21.

Baía: Jequié, *Foster* 2458 (US). Maracás, *Foster* 2470 (US, type).

23. ***Billbergia macrocalyx*** Hook. Bot. Mag. 85: *pl. 5114.* 1859.

Billbergia quintusiana Wittm. Gartenflora 39: 202, *fig. 49.* 1890.

Brazil: Cultivated, *Cutak* (GH).

Minas Gerais: Belo Horizonte, *Foster* 542 (GH, (US neg. 4057), US).

24. ***Billbergia fosteriana*** L. B. Smith, p. 21, fig. 122.

Baía: Maracás, *Foster* 2447 in part (US, type).

25. ***Billbergia saundersii*** Hort. Bull. ex Dombrain, Floral Mag. new ser. *pl. 106.* 1874.

Billbergia saundersii Hort. Bull. ex C. Koch, Wochenschr. 12: 116. 1869, nomen.

Brazil: Cultivated, *Atkinson* (GH); *Cutak* (US).

Baía: Agua Preta, *Foster* 48 (GH (US neg. 4061), R).

Subgenus *Helicodea* (Lem.) Baker

26. ***Billbergia meyeri*** Mez, Bot. Jahrb. 30: 148. 1902.

Billbergia leucantha Hoehne in Comm. Linh. Telegr. Estrat. Matto-Grosso [Publ. 47], Annexo 5, Bot. pt. 9: 8, *pl. 160.* 1919.

Minas Gerais: Mun. Ituiutaba: Cachoeira Dourada, *Macedo* 3223 (US).

Mato Grosso: Buritizinho, near Serra Itapirapuã, *Lindman* A-2919 (S). Rio Coxim, *Hoehne in Rondon* 3554 (R, type of *Billbergia leucantha* Hoehne); 3555 (R). Mato do Curupira, *Lindman* A-3043 1/2 (S). Upper Rio Kuliseu, *Pilger* 705 (B, type, F neg. 11340). Palmeiras, *Lindman* A-2593 (S).

São Paulo: Itapura, Rio Tietê, *Foster* 1102 (GH, US).

27. ***Billbergia rupestris*** L. B. Smith, Caldasia [1], No. 5: 6, *fig. 1.* 1942.

Acre: Rio Macauã on the Rio Iaco, basin of the Rio Purus, *Krukoff* 5647 (GH, NY).

Also: Colombia.

28. ***Billbergia brachysiphon*** L. B. Smith, Arquiv. Jard. Bot. Rio de Janeiro 10: 142, *fig. 2.* 1950.

MATO GROSSO: Papagaios, Upper Rio Jamari, *J. G. Kuhlmann* (US, type (US neg. 3513), R, RB).

29. ***Billbergia oxysepala*** Mez, Bull. Herb. Boiss. II. 4: 621. 1904.
Billbergia oxypetala Ule, Verh. Bot. Ver. Brand. 48: 137. 1907.

ACRE: Rio Tejo on upper Rio Juruá, *Ule* 40-b (B, type, F neg. 11341).

30. ***Billbergia alfonsi-joannis*** Reitz, Anais Bot. Herb. Barbosa Rodrigues 4: 31, *pl. 9.* 1952.

SANTA CATARINA: Serra do Mirador, Ribeirão Grande, Taió, *Reitz* 4674 (HBR, type).

31. ***Billbergia decora*** Poepp. & Endl. Nov. Gen. & Sp. 2: 42, *pl. 157.* 1838.
Billbergia baraquiniana Lem. Ill. Hortic. 11: *pl. 421.* 1864.
Billbergia boliviensis Baker, Handb. Bromel. 81. 1889.

PARÁ: Cultivated material described as *Billbergia baraquiniana* Lem. No herbarium material from Brazil known.

ALSO: PERÚ, BOLIVIA.

32. ***Billbergia zebrina*** (Herb.) Lindl. Bot. Reg. 13: sub *pl. 1068.* 1827. FIGURE 123.
Bromelia zebrina Herb. Bot. Mag. 53: *pl. 2686.* 1826.
Billbergia canterae André, Rev. Hortic. 69: 60, *pl.* 1897.

BRAZIL: *Freyreis* (S); *Saint-Hilaire* A^1-143 in part (P); C^2-60 (P). Cultivated, *Bretton* (K, GH neg. 2716); *Lindman* A-3 (S).

MINAS GERAIS: Contendas, *Saint-Hilaire* (P).

RIO DE JANEIRO: Niteroi, *Foster* 104 (GH).

DISTRITO FEDERAL: Corcovado, *Dusén* 17059 (SP). Gavea, *Freire & Vidal* (R). Quinta, *Glaziou* 16428 (P). Rio de Janeiro, *Gaudichaud* 363 (P); *Glaziou* 8020 (P); *Regnell* 210 (S). Tijuca, *Foster* 323 (GH); *Lutz* 1446 (R); *Mosén* 4663 (S); *Smith & Brade* 2240 (GH).

SÃO PAULO: Apiai, Rio Tijuco, *M. Kuhlmann* (SP). Canna Verde to Retiro de Lagem, *Regnell* III-1256 (S). Lorena, *Delfarge* (RB). Mogi-Mirim, *Mosén* 1730 (S). Monte Japui, São Vicente, *L. B. Smith* 2101 (GH). São João de Boa Vista, *Mosén* 4430 (S). Mun. Amparo: Monte Alegre, *Kuhlmann & Kühn* 408 (SP).

PARANÁ: Mun. Curitiba: Rio Tijuca, *Foster* 401 (GH).

SANTA CATARINA: Mun. Araranguá: Jundiá, *Reitz* C-437 (GH, HBR). Mun. Chapecó: Itapiranga, *Reitz* 3824 (HBR). Mun. Jaraguá do Sul: Corupá, *Reitz* 5708 (! Reitz). Mun. Palhoça: Campo do Massiambú, *Reitz* 5663 (! Reitz).

RIO GRANDE DO SUL: Hamburger Berg, *Lindman* A-663 (S). São Leopoldo, *Eugenio* 313 (SP); 2046 (GH).

33. ***Billbergia magnifica*** Mez, Bull. Herb. Boiss. II. 3: 133. 1903.

ESPÍRITO SANTO: Santa Teresa, *Foster* 834 (US).

PARANÁ: Bocaiuva do Sul, *Hatschbach* 1610 (US). Jaguariaíva, *Dusén* 10780 (GH, S, US); 11591 (GH, S); 15612 (GH, S, US).

ALSO: PARAGUAY.

34. ***Billbergia porteana*** Brongn. ex Beer, Bromel. 115. 1857.

BRAZIL: *Saint-Hilaire* B^1-939 (P); *Sellow* bromel. 39 (P). Central Brazil, *Weddell* 2518 (P). Rio or São Paulo, *Weir* (K, GH neg. 2715).

PIAUÍ: Upper Rio Gurgueia, southern Piauí, *Luetzelburg* (! Mez).
CEARÁ: Serra do Araripe, southern Ceará, *Luetzelburg* (! Mez).
BAÍA: Jocobina, *Foster* 85 (GH, R). Jequié, *Zehntner* 638 (RB). Santo Amaro, eastern Baía, *Luetzelburg* (! Mez).
ESPÍRITO SANTO: Santa Teresa, *Foster* 285 (GH).
MINAS GERAIS: *Claussen* 150 (P). Belo Horizonte, *Gehrt* (SP); *Melo Barreto* 4126 (R); *Sampaio* 7245 (R). Serra da Rola Moça, Belo Horizonte, *Foster* 550 (GH). Km. 110 from Belo Horizonte, Lagoa Santa to Serra do Cipó, *Chase* 9101 1/2 (US). Caxambú, *Sampaio* 6042 (R). Contendas, *Saint-Hilaire* A^1-143 in part (P). Fazenda do Diamante, Correo Manuel Agustin, *Mexia* 5563 (GH, US). Ouro Preto, *Glaziou* 16426 (P). Papagaios to Pompéo, *Williams & Coadman* 8103 (GH).

35. ***Billbergia cylindrostachya*** Mez in Mart. Fl. Bras. 3, pt. 3: 395. 1892.
? *Billbergia maxima* Ch. Chevalier, Bull. Soc. Nat. d'Hort. France V. 4: 209. 1931.
DISTRITO FEDERAL: Cultivated (?), São Cristovão, *Glaziou* 16427 (B, type, F neg. 11336).

36. ***Billbergia kuhlmannii*** L. B. Smith, Arquiv. Jard. Bot. Rio de Janeiro 10: 144, *fig. 4.* 1950.
MATO GROSSO: *Foster* 1091 (GH); *J. G. Kuhlmann* (RB, type, US neg. 3265).

37. ***Billbergia rubicunda*** Mez, Repert. Sp. Nov. Fedde 14: 244. 1916.
BRAZIL: Cultivated in Vienna, *Schoenbrunn Bot. Gard.* (GH, US neg. 4063).

32. *Neoglaziovia* Mez

Neoglaziovia Mez in Mart. Fl. Bras. 3, pt. 3: 426. 1894.

Endemic to northeastern Brazil.

1. Leaf-blades glabrous above, marked with broad white cross-bands beneath. 1. **N. variegata**
1. Leaf-blades densely white-lepidote on both sides, not banded. 2. **N. concolor**

1. ***Neoglaziovia variegata*** (Arr. Cam.) Mez in Mart. Fl. Bras. 3, pt. 3: 427, *pl. 80, fig. 1.* 1894. FIGURE 124.
Bromelia variegata Arr. Cam. Diss. Pl. Brasil. 7. 1810.
Dyckia glaziovii Baker, Handb. Bromel. 133. 1889.
BRAZIL: *Glaziou* 15671 (K, type of *Dyckia glaziovii* Baker, GH neg. 2722).
PIAUÍ: Southern part of state, *Luetzelburg* (! Mez).
CEARÁ: Aurora, *Loefgren* (R).
RIO GRANDE DO NORTE: *Luetzelburg* (! Mez).
PARAÍBA: Campina Grande to Pernambuco, *Foster* 2417 (US).
ALAGOAS: *Luetzelburg* (! Mez).
SERGIPE: *Luetzelburg* (! Mez).
BAÍA: Iracema, by Rio Paraguassú, *Fróes* 20222 (IAN, NY, US). Jacobina, *Foster* 87 (GH). Itumirim to Joazeiro, *Campos Porto* (RB). Joazeiro, *Rose & Russell* 19733 (US); *Zehntner* 728 (R). Morro da Lapa, *Zehntner* 570 (R).
MINAS GERAIS: São Miguel, *Pohl* 3657 in part (BR, GH neg. 2794).

2. ***Neoglaziovia concolor*** C. H. Wright, Bot. Mag. 136: *pl. 8348.* 1910.
Baía: Cultivated, *Kew* (K, type, GH neg. *2721*). Mun. Gloria: *Schery* 528 (GH).

33. *Portea* C. Koch

Portea C. Koch, Ind. Sem. Hort. Berol. for 1856, App.: 7. 1857.

Endemic to Brazil.

1. Inflorescence dense; primary bracts large, erect, nearly concealing the branches; floral bracts ample, equaling the sepals..... 1. **P. kermesina**

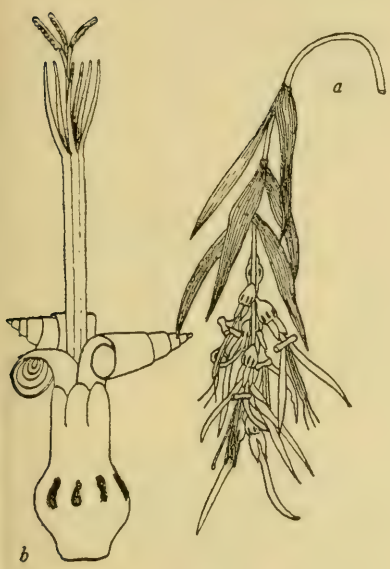

Fig. 123.

Fig. 124.

Fig. 123.—*Billbergia zebrina: a,* Inflorescence, × ¼; *b,* flower, × 1. (Both after Belgique Horticole.)

Fig. 124.—*Neoglaziovia variegata: a,* Habit (after M. B. Foster), × 1/10; *b,* floral bract and flower, × 1; *c,* longitudinal section of ovary, × 5. (*b* and *c* after Flora Brasiliensis.)

1. Inflorescence lax; primary bracts not concealing the branches; floral bracts very narrow, surpassed by the sepals.
   2. The inflorescence corymbose, as broad as long; sepals short-connate. (Fig. 125.)..... 2. **P. leptantha**
2. The inflorescence much longer than broad; sepals connate for about half their length.
   3. Floral bracts high-connate with the pedicels and exceeding them. 3. **P. filifera**
   3. Floral bracts slightly if at all connate with the pedicels and much shorter than they.

4. Inflorescence soon glabrous; pedicels 10–40 mm. long.
4. **P. petropolitana**
4. Inflorescence white-furfuraceous; pedicels 6–10, rarely to 15 mm. long.
5. **P. silveirae**

1. ***Portea kermesina*** C. Koch, Ind. Sem. Hort. Berol. for 1856, App.: 7. 1857.
BRAZIL: Cultivated, *Paris* (P).
BAÍA: *Blanchet* 2997 (BM, US neg. 4012); *Lesson* (P).

2. ***Portea leptantha*** Harms, Notizblatt 10: 786. 1929. FIGURE 125.
PARAÍBA: Areia, *Vasconcellos* 207 (RB, US). Campina Grande, *Loefgren* 797 (R).
PERNAMBUCO: Russinha, *Pickel* 3536 (GH). Tapera, *Pickel* 1919 (B, F neg. 11285).

3. ***Portea filifera*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 58, *pl. 75.* 1941.
BAÍA: Agua Preta, *Foster* 62 (GH, type; R); 63 (GH).

4. ***Portea petropolitana*** (Wawra) Mez in Mart. Fl. Bras. 3, pt. 3: 296, *pl. 64.* 1892.
1. Branches of the inflorescence elongate.
2. Pedicels 10–15 mm. long..... Var. a. **petropolitana**
2. Pedicels 35–40 mm. long..... Var. b. **extensa**
1. Branches of the inflorescence short; pedicels 20–40 mm. long.
Var. c. **noettigii**

4a. ***Portea petropolitana*** var. ***petropolitana***
Acchmea petropolitana Wawra, Oesterr. Bot. Zeitschr. 30: 116. 1880.
Portea gardneri Baker, Handb. Bromel. 21. 1889.
Streptocalyx podantha Baker, Handb. Bromel. 32. 1889.
ESPÍRITO SANTO: Vitória, *Foster* 194 (GH).
RIO DE JANEIRO: Petrópolis, *Glaziou* 12230 (K, type of *Portea glaziovii* Baker (GH neg. 2690), US); 16417 (GH, P); *Wawra* II-63 (W, type).
DISTRITO FEDERAL: Morro Queimado, *Brade* 11271 (R); 18787 (RB, US).

4b. ***Portea petropolitana*** var. ***extensa*** L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 113, *pl. 116.* 1943.
ESPÍRITO SANTO: Vitória, *Foster* 196 (GH, type; R).
RIO DE JANEIRO: Petrópolis, *Foster* 498 (GH).

4c. ***Portea petropolitana*** var. ***noettigii*** (Wawra) L. B. Smith, Arquiv. Bot. Estado São Paulo nov. ser. 1: 113. 1943.
Aechmea noettigii Wawra, Oesterr. Bot. Zeitschr. 30: 117. 1880.
Portea gardneri Baker, Handb. Bromel. 21, 1889.
Aechmea microthyrsa Baker, Kew Bull. 198. 1892.
Streptocalyx orthopoda Baker, Kew Bull. 198. 1892.
Portea noettigii Mez in Mart. Fl. Bras. 3, pt. 3: 296. 1892.
BRAZIL: *Reitz* 4202 (HBR).
MINAS GERAIS: Juiz de Fora, *Hoehne* (SP). São Caetano, *Gardner* 5234 (BM, type of *Portea gardneri* Baker, US neg. 4013).
RIO DE JANEIRO: Entre Rios, *Wawra* II-108 (W, type). Mauá, *Glaziou* 18565 (P, US, isotypes of *Streptocalyx orthopoda* Baker); *Ule* 4042 (R, US).
DISTRITO FEDERAL: Recreio dos Bandeirantes, *Lutz* (GH, R, US); 827 (R). Restinga da Tijuca, *Glaziou* 6454 (P).

5. ***Portea silveirae*** Mez, Bot. Jahrb. 30, Beibl. 67: 4. 1901.
Espírito Santo: Santa Teresa, *Foster* 194-A (GH, R, US); 313 (GH).
Minas Gerais: Coronel Pacheco, *Heringer* 1301 (SP); 1744 (SP). Ipatinga, *Foster* 729 (GH). Juiz le Fora, *Brade* 14103 (RB, US neg. 4201). Serra de Mantiqueira, *Silveira* 8 (B, type, F neg. 11286).

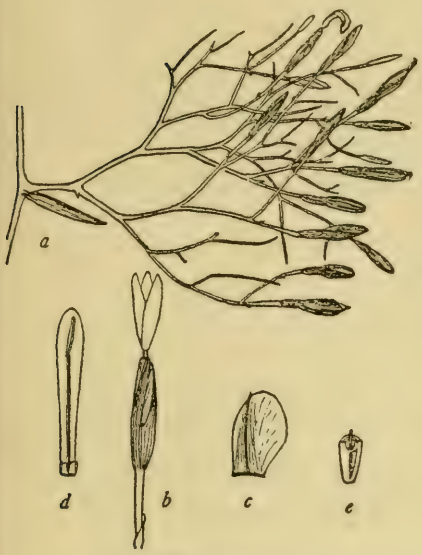

Fig. 125.

Fig. 126.

Fig. 125.—*Portea leptantha: a,* Branch of inflorescence, × ½; *b,* floral bract and flower, × 1; *c,* sepal, × 1; *d,* petal and stamen, × 1; *e,* longitudinal section of ovary, × 1.

Fig. 126.—*Pseudananas sagenarius: a,* Inflorescence, × ½; *b,* petal and stamens, × 1. (Both after Belgique Horticole.)

34. *Pseudananas* Hassler ex Harms

Pseudananas Hassler ex Harms, Engl. & Prantl, Pflanzenfam. ed. 2. 15a: 153. 1930.
Ananas section *Pseudananas* Hassler, Ann. Conserv. & Jard. Bot. Genève 20: 280. 1919.

Monotypic. Brazil, Paraguay.

1. ***Pseudananas sagenarius*** (Arr. Cam.) Camargo, Rev. Agric. Piracicaba 14: nos. 7, 8: reprint page 4. 1939. Figure 126.
Bromelia sagenaria Arr. Cam. Diss. Pl. Brasil. 13. 1810.
Bromelia sylvestris Vell. Fl. Fluminensis 129. 1825; Icon. *pl. 113.* 1835.
Ananas macrodontes E. Morr. Belg. Hortic. 28: 140, *pls. 4, 5.* 1878.
Ananas sylvestris Fritz Mueller, Bericht Deutsch Bot. Gesellsch. 14: 4. 1896. In part, as to basonym.

Pseudananas macrodontes Harms, Engl. & Prantl. Pflanzenfam. ed. 2. 15a: 153. 1930.

Pseudananas sagenarius var. *macrodontes* Camargo, Bol. Técn. Inst. Agron. Norte, Pará no. 1:21, *fig. 4.* 1943.

It has not been possible to find on what basis Camargo subdivides this species.

BAÍA: Maracás, *Foster* 2467 (US).

ESPÍRITO SANTO: Vitória, *Foster* 178 (GH, R).

MINAS GERAIS: Santa Rosa to Alfenes, *Regnell* III-1262 (S). Mun. Santa Barbara: Caraça, *Foster* 677 (GH, US).

MATO GROSSO: East of Bella Vista 73 km., *Baker & Collins* (GH). Bodoquena, *Santos* (R). South of Colonia Miranda 34 km., *Baker & Collins* (GH). Lagoa Sêca, Corumbá, *Baker & Collins* (GH). São Domingos, Corumbá, *Baker & Collins* (GH). Urucum, Corumbá, *Baker & Collins* (GH). Pôrto Felicidade, *Baker & Collins* (GH).

DISTRITO FEDERAL: Jacarepaguá, *J. G. Kuhlmann* 6145 (RB, US).

SÃO PAULO: Capão Redondo, *Gehrt* (SP).

SANTA CATARINA: Mun. Araranguá: Sombrio, *Reitz* (! Reitz). Mun. Itajaí: Praia Braba, *Reitz* 2289 (HBR, US).

35. *Ananas* Mill.

Ananas Mill. Gard. Dict. Abr. ed. 4. 1754.

Brazil, Guiana, Paraguay. Widely distributed by cultivation throughout the tropics.

No attempt is made here to cover the numerous cultivated varieties and forms of pineapple, since others working with living material are much better qualified to do so.

1. Syncarp over 15 cm. long at maturity, succulent; scape stout, usually short.
   2. Floral bracts conspicuous, imbricate and covering the ovaries, coarsely serrate.
      3. Leaf-spines all ascending; floral bracts colored at maturity; petals bearing scales..... 1. **A. bracteatus**
      3. Leaf-spines toward the base recurved; floral bracts pale green at maturity; petals bearing vertical folds. (Fig. 127.) 2. **A. fritzmuelleri**
   2. Floral bracts inconspicuous, not imbricate nor covering the ovaries at maturity, serrulate..... 3. **A. comosus**
1. Syncarp less than 15 cm. long at maturity, dry or nearly so; scape elongate, slender.
   4. Leaves straight, erect, unarmed except for the large terminal spine, 35 mm. wide..... 4. **A. erectifolius**
   4. Leaves recurved, serrate, not more than 25 mm. wide. (Fig. 128.) 5. **A. ananassoides**

1. ***Ananas bracteatus*** (Lindl.) Schult. in R. & S. Syst. 7, pt. 2: 1286. 1830.

Ananassa bracteata Lindl. Bot. Reg. 13: *pl. 1081.* 1827.

Ananas sagenaria sensu Mez, Engl. Pflanzenreich IV. 32: 104. 1934. Not Schult. 1830.

BRAZIL: Cultivated, *W. Hochne* (SP); *M. Kuhlmann* (GH, SP); *Reitz* 2293 (HBR, US); 3685 (HBR); 4010 (HBR).

ESPÍRITO SANTO: Santa Teresa, *Foster* 291 (GH, R).
DISTRITO FEDERAL: Ipanema, *J. G. Kuhlmann* (RB).
SÃO PAULO: Caraguatatuba, *Hoehne & Gehrt* (GH (US neg. 3955, 3956), SP). Ipiranga, *Luederwaldt* (SP). São Sebastião, *Camargo* (IAN). Tatuí to Sorocaba, *Baker & Collins* (GH).
PARANÁ: Morrêtes, *M. Kuhlmann* (GH, SP). 41 km. from Paranaguá, *Foster* 453 (GH, R). Serra da Prata, 25 km. south of Paranaguá, *Tessmann* (US).
SANTA CATARINA: São Francisco do Sul, *Reitz* 3875 (HBR). Araranguá: Meleiro, *Reitz* C-35 (GH, HBR).
RIO GRANDE DO SUL: São Leopoldo, *Eugenio* 446 (NY); 1897 (GH).

2. ***Ananas fritzmuelleri*** Camargo, Bol. Técn. Inst. Agron. Norte, Pará No. 1: 16, *figs. 2, 3.* 1943. FIGURE 127.
Ananas sylvestris Fritz Mueller, Bericht. Deutsch. Bot. Gesellsch. 14: 4. 1896. In part, not as to *Bromelia sylvestris* Vell. 1825.
Ananas bracteatus var. *albus* L. B. Smith, Bot. Mus. Leafl. Harvard 7: 76. 1939.
BRAZIL: *Telles* (GH, SP).
SÃO PAULO: Itapecerica, *Camargo* (GH); *Hoehne & Gehrt* (GH, type of *Ananas bracteatus* var. *albus* L. B. Smith; SP).
PARANÁ: *Dusén* 15469 (S).
SANTA CATARINA: Brusque, *Reitz* 3957 (HBR, US); 4011 (HBR). Itajaí, *Reitz* 4157 (HBR). Mun. Araranguá: Sombrio, *Reitz* C-1344 (HBR).

3. ***Ananas comosus*** (L.) Merrill, Interpr. Rumph. Amb. 133. 1917.
Bromelia ananas L. Sp. Pl. 285. 1753.
Bromelia comosa L. Herb. Amboin. 21. 1754; Amoen. Acad. 4: 130. 1759.
Ananas sativus Schult. in R. & S. Syst. 7, pt. 2: 1283. 1830.
Ananassa sativa Lindl. ex Spach, Hist. Vég. 12: 400. 1846.
Ananas ananas Voss, Vilm. Blumeng. ed. 3. 1: 964. 1895.
BRAZIL: Cultivated, *Baker & Collins* (GH); *Reitz* 3654-b (HBR).
BAÍA: Machado Portella, eastern Baía, *Luetzelburg* (! Mez). Serra de São José, *Luetzelburg* (! Mez).
MATO GROSSO: Cuiabá, *Lindman* A-2351 (S).

4. ***Ananas erectifolius*** L. B. Smith, Bot. Mus. Leafl. Harvard 7: 78, *pl. 1.* 1939.
Ananas sp. Ducke, Arch. Jard. Bot. Rio de Janeiro 5: 81. 1930.
BRAZIL: Cultivated, *Baker & Collins* 9 (GH); *Foster* 1114 (GH).
AMAZONAS or PARÁ: Amazon Basin, *Ducke* (GH, type, US neg. 3953).
PARÁ: Belterra, *Pires* 4072 (IAN, US). Santarém, *Carr* (F); *Ginzberger & Zerny* 393 (F).

5. ***Ananas ananassoides*** (Baker) L. B. Smith, Bot. Mus. Leafl. Harvard 7: 79, *pl. 2.* 1939.
1. Apex of the scape weak and easily broken; syncarp many-flowered, up to 15 cm. long..... Var. a. **ananassoides**
1. Apex of the scape tough; syncarp few-flowered, only about 4 cm. long. Var. b. **nanus**

5a. ***Ananas ananassoides*** var. ***ananassoides.*** FIGURE 128.
Acanthostachys ananassoides Baker, Handb. Bromel. 25. 1889.
Ananas microstachys Lindm. Svensk. Akad. Handl. 24: no. 8: 39, *pl. 7, figs. 20–23.* 1891.

Ananas sativus var. *microstachys* Mez in Mart. Fl. Bras. 3, pt. 3: 294. 1892.
Ananas guaraniticus Bertoni, Monogr. Gen. Ananas in An. Cient. Parag. II. No. 4: 274. 1919.
Ananas comosus var. *microstachys* L. B. Smith, Contr. Gray Herb. 104: 72. 1934.

Pará: Santarem, *Archer* 8328 (IAN, US). Vigia, *Black* 50–8832 (IAN). Campina do Palha, Vigia, *Black* 48–3266 (IAN).

Fig. 127.

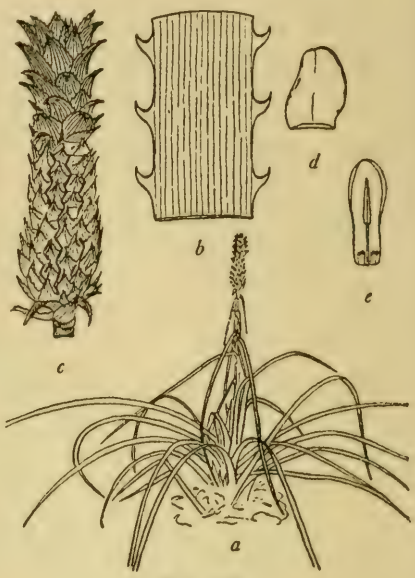

Fig. 128.

Fig. 127.—*Ananas fritz-muelleri: a*, Inflorescence, × 1/10; *b*, petal and stamen, × 1. (Both after Camargo.)

Fig. 128.—*Ananas ananassoides* var. *ananassoides: a*, Habit, × 1/40; *b*, section of leaf, × 1; *c*, inflorescence, × ⅙; *d*, sepal, × 1; *e*, petal and stamen, × 1. (All after Botanical Museum Leaflets, Harvard.)

Minas Gerais: *Pires & Black* 2941 (IAN). Lapinha, Lagoa Santa, *Palacios* 3392 (LIL). La Rosa to Alfenes, *Regnell* III-1261 (S). Mun. Conceição: Serra do Cipó, *Foster* 639 (GH, US).

Mato Grosso: Braco, Rio Arinos, *Baldwin* 3086 (US). Camizão, *Foster* 1089 in part (GH, US). Livramento, southwest of Cuiabá, *Baker & Collins* (GH). Guia, *Baker & Collins* (GH). Nioac to Rio Formiga, *Baker & Collins* (GH). East of Pôrto Felicidade 3 km., *Baker & Collins* (GH). Rosario Oueste, *Baker & Collins* (GH).

São Paulo: Itapura, *Camargo* (GH). Mogi-Mirim, *Gehrt* (GH, SP). Sorocaba to Itapetininga, *Baker & Collins* (GH). Tatuí to Sorocaba, *Baker & Collins* (GH). Mun. Santa Izabel: Igaratá, *M. Kuhlmann* 1956 (SP); 2551 (SP).

5b. ***Ananas ananassoides*** var. ***nanus*** L. B. Smith, Bot. Mus. Leafl. Harvard 7:79, *pl. 3.* 1939.
BRAZIL: Cultivated, *Baker & Collins* (GH); *Camargo* (IAN).
AMAZONAS: São Gabriel, Rio Negro, *Baldwin* 3468-a (US).
PARÁ: Tapari, Rio Tapajoz, *Dahlgren & Sella* 28 (F).
BAÍA: *Foster* 43 (GH).
MATO GROSSO: Camizão, *Foster* 1089 in part (GH, US).

EXCLUDED AND DOUBTFUL TAXA

The majority of the following cases in need of clarification come from the Flora Brasiliensis. It should be noted that this work includes a number of Bromeliaceae not attributed to Brazil and it does not seem necessary to exclude these when they were never claimed.

Aechmea regularis Baker, Journ. Bot. 17:229. 1879; Mart. Fl. Bras. 3, pt. 3:324. 1892.

This is a synonym of *Aechmea bracteata* (Sw.) Griseb., a species ranging from Mexico to Colombia. There is no authentic record of its occurrence in or near Brazil.

Billbergia viridiflora H. Wendl. Allg. Gartenz. 22:154. 1854; Mart. Fl. Bras. 3, pt. 3:424. 1892.

This was described from cultivated material of unknown origin and doubtless ascribed to Brazil because the center of the genus is there. However, the species is now known to be native to southern Mexico, British Honduras, and Guatemala.

Bromelia fastuosa Lindl. Coll. Fasc. 1: *pl. 1.* 1821; Mart. Fl. Bras. 3, pt. 3: 193. 1891.

This name applies to either *B. pinguin* or *B. sylvestris* because of its narrowly triangular sepals and is Mexican, not Brazilian. See under *B. antiacantha* Bertol.

Catopsis nutans (Sw.) Griseb. Fl. Brit. West Ind. 599. 1864; Mart. Fl. Bras. 3, pt. 3:576. 1894.
Tillandsia nutans Sw. Prodr. 56. 1788.

In Flora Brasiliensis this species was confused with *C. sessiliflora* (R. & P.) Mez. Actually it ranges from Mexico and the West Indies to Venezuela and Ecuador.

Deuterocohnia longipetala (Baker) Mez in Mart. Fl. Bras. 3, pt. 3:506. 1894.
Dyckia longipetala Baker, Handb. Bromel. 135. 1889.

The supposed record for this species in Brazil is a Humboldt and Bonpland collection from the Rio Marañon. However, a study of

their route discloses the collection was made in Peru more than a thousand kilometers from where the river enters Brazil.

Dyckia altissima Lindl. Bot. Reg. 27: 84. 1841; Mart. Fl. Bras. 3, pt. 3: 473. 1894.

This species was described from Argentina and then extended to Brazil by the erroneous inclusion of *D. princeps* Lem. and other distinct species.

Hohenbergia gnetacea Mez in Mart. Fl. Bras. 3, pt. 3: *272*. 1891.

The species is native to Jamaica, not to Brazil as originally stated.

Hohenbergia pycnantha (Baker) Mez in Mart. Fl. Bras. 3, pt. 3: 273. 1891.
Aechmea pycnantha Baker, Handb. Bromel. 41. 1889.

This is a synonym of *Hohenbergia polycephala* (Baker) Mez, an endemic species of Jamaica.

Pitcairnia inermis (Meyer) Meyer ex Schult. f. in R. & S. Syst. 7: 1238. 1830; Mart. Fl. Bras. 3, pt. 3: 440. 1894.
Pourretia inermis Meyer in Presl, Rel. Haenk. 1: 123. 1827.

In Flora Brasiliensis Mez states categorically that this species is in Brazil ("In fines Brasiliae septentrionalis descendit"), yet gives no citation to corroborate. In the Pflanzenreich he drops the claim completely and none of the collections are near enough to make it seem probable.

Pitcairnia nigra (Carr.) André, Rev. Hortic. 60: 365. 1888; Mart. Fl. Bras. 3, pt. 3: 461. 1894.
Neumannia nigra Carr. Rev. Hortic. 53: 390. 1881.

This species was described from cultivation and its origin surmised as Brazil. Subsequently it has been collected in Colombia and Ecuador far from the Brazilian boundary and at altiudes that make its occurrence in the Amazon Basin appear most unlikely.

Pitcairnia poeppigiana Mez in Mart. Fl. Bras. 3, pt. 3: 461. 1894.

The only collection of this species is from Peru. Mez's suggestion that the species may also occur in Brazil is not too improbable although the type locality is about three hundred kilometers distant.

Pitcairnia recurvata (Scheidw.) K. Koch, Ind. Sem. Hort. Berol. for **1857**: App. 4. 1858; Mart. Fl. Bras. 3, pt. 3: 460. 1894.
Puya recurvata Scheidw. Allg. Gartenz. 10: 275. 1842.

This species was described from cultivation with Brazil as its supposed origin. Subsequent collections from the wild have been limited to southern Mexico, British Honduras, and Guatemala.

Pitcairnia xanthocalyx Mart. Hort. Monac. Sem. for **1848**: 4. 1848; Mart. Fl. Bras. 3, pt. 3: 438. 1894.

The species is native of Mexico. Here again Brazil seemed the probable origin for an ornamental cultivated species.

Quesnelia chacoensis Rojas, Bull. Geogr. Bot. 26: 159. 1918; Pflanzenreich IV. 32: 176. 1935.

Only written evidence is available on this species but the description indicates the genus *Dyckia,* not *Quesnelia,* and "Chaco" would indicate Paraguay, Argentina, or Bolivia, not Brazil.

Quesnelia lamarckii Baker, Handb. Bromel. 85. 1889.

This is a synonym of *Musa coccinea* Andr. Being from Guiana it would not require noting here except that *Quesnelia* has been indicated as endemic to Brazil in the systematic treatment above.

Quesnelia tillandsioides (Baker) Mez in Mart. Fl. Bras. 3, pt. 3: 386, *pl. 75.* 1892.
Billbergia tillandsioides Baker, Handb. Bromel. 84. 1889.

This supposed species consists of a rosette of a *Vriesia* (probably *V. corcovadensis* (Britten) Mez) and the scape and inflorescence of *Quesnelia liboniana* (De Jonghe) Mez in close juxtaposition. Whether it is an error of attempted reconstruction in preparing the specimen or a deliberate hoax as some would claim, it has been the source of no small confusion and embarrassment.

Tillandsia bandensis Baker, Journ. Bot. 25: 235. 1887; DC. Monogr. Phan. 9: 858. 1896.

This species has been cited from Brazil on the basis of the type, which actually came from Uruguay.

Tillandsia bracteata Vell. Fl. Fluminensis 132. 1825; Icon 3: *pl. 125.* 1835.

It has not been possible to link this name with any known species. From the illustration it appears to be an *Aechmea* like *Ae. fasciata* (Lindl.) Baker but with sepals too large and pointed for that species.

Tillandsia brasiliensis Larrañaga, Escritos D. A. Larrañaga 1: 396. 1922.

The description given the above is so vague and general that it is impossible to identify it. No material is known to exist.

Tillandsia comata Vell. Fl. Fluminensis 136. 1825; Icon. 3: *pl. 140.* 1835.

The illustration indicates an *Aechmea* with the habit of *Ae. cariocae* L. B. Smith, but the floral bracts are much too long for that species.

Tillandsia imbricata Vell. Fl. Fluminensis 133. 1825; Icon 3: *pl. 131.* 1835.

This must be a *Vriesia* but its combination of lax simple inflorescence and long straight acute bracts are not duplicated in any known species.

Tillandsia saxatilis Vell. Fl. Fluminensis 136. 1825; Icon. 3: *pl. 139.* 1835.

There must be an error in this illustration as everything indicates *Aechmea nudicalis* (L.) Griseb. or a close relative, but the ovary is shown as superior.

Tillandsia tetrasticha Vell. Fl. Fluminensis 135. 1825; Icon. 3: *pl. 137.* 1835.

As suggested by Mez this may be an aberrant form of an *Aechmea* with a dense many-flowered simple inflorescence. However, those it most nearly resembles have ranges too far south for the area covered by Vellozo.

Tillandsia vernicosa Baker, Journ. Bot. 25: 241. 1887.

The type of this species is a cultivated plant labeled "Christie. Paraná," but no trace has been found of this collector and no subsequent collection has been made in or near Brazil.

Vriesia albescens Alv. Silveira, Fl. Montium 2: *pl. 131, fig. 2.* 1931. Nomen.

This appears to be an error for his *V. glauca.*

Vriesia atro-purpurea Alv. Silveira, Fl. Montium 2: Add. 3, *pl. 131, fig. 1.* 1931.

It has not been possible to examine material of any of Silveira's species and the description and illustration of the above are inadequate for classification.

Vriesia decipiens F. Mueller, Gartenflora 42: 737. 1893. (See under *V. erythrodactylon.*)

Vriesia glauca Alv. Silveira, Fl. Montium 2: Add. 3. 1931.

It has not been possible to classify this species.

Vriesia macropoda (Baker) Mez in Mart. Fl. Bras. 3, pt. 3: 554. 1894.
Tillandsia macropoda Baker, Handb. Bromel. 218. 1889.

Mez identifies this with *V. inflata* Wawra, a species with sepals completely covered by the floral bracts, while Baker describes the sepals as much exceeding the floral bracts. It has not been possible to explain the contradiction as yet.

LOCALITIES CITED

The following localities are defined because of their absence from the "Index to Map of Hispanic America 1: 1,000,000" published by

the American Geographical Society. In a few cases names found there are included here because of ambiguity as in the use of the same name for two or more localities in the same state.

Bearings are mostly given in the same style as in the Index. That is, the nearest full degree of latitude is given, then a dash and the nearest full degree of longitude, followed by the letter a, b, c, or d. The quadrant lying northwest of the intersection of the degree lines is a; northeast, b; southwest, c; and southeast, d. A capital "N" or "S" indicates the latitude.

Usually localities in the Distrito Federal are not defined further since their position is already sufficiently definite for plotting range maps.

Agua, Ilha de. Distrito Federal. Baía da Guanabara.

Albino Souza, Morro. Paraná. Mun. Piraquara.

Alcatrazes, Ilha das. São Paulo. Near Santos, 24–46d. S.

Alexio. Amazonas. Mun. Manaus.

Alfenes. Minas Gerais. Near Santa Rosa.

Almada. Baía. Near Ilheus.

Almas, Serra das. Baía. The range at 14–42b. S.

Alto da Serra. Paraná. The crest of the Serra do Mar, east of Curitiba on the road to Paranaguá.

Alto dos Marins. São Paulo. Between Piquete and the boundary with Minas Gerais. ! Hoehne.

Andaraí Grande. Distrito Federal. ! Brade.

Angelim, Cascata do. Mato Grosso. Near Buritizinho.

Anhangava, Morro. Paraná. Mun. Piraquara.

Araguai (Araguaya of Index). Espírito Santo. Near Vitória.

Araquari. Santa Catarina. Município immediately south of Joinvile and São Francisco do Sul, formerly Paraty.

Arará. Ceará. North of Araripe.

Aratuba. Ceará. Formerly Coite, 4–39b. S.

Archer, Morro de. Distrito Federal.

Aricá. Mato Grosso. Near Cuiabá.

Ariro, Serra de. Rio de Janeiro or São Paulo, 23–44a. S.

Armação de Piedade. Santa Catarina. The same as Armação do Sul, Ilha de Santa Catarina.

Arpoador, Praia do. Distrito Federal. Between Copacabana and Pedra Dois Irmãos.

Atafona. Rio de Janeiro. East of São João de Barra on the south side of the Rio Paraiba do Sul.

Aurá. Pará. The name of a farm in Belém.

Azambuja. Santa Catarina. Not the one listed in the Index. Part of Brusque.

Babilônia, Morro da. Distrito Federal.

Baependy. Minas Gerais. Município, now Baipendi.

Baixada Fluminense. Distrito Federal, Rio de Janeiro. The lowland about Rio.

Bananal. São Paulo. The locality at 23–44a. S. ! Brade.

Bandeira, Morro da. Rio de Janeiro. Serra dos Orgãos, west side of the Parque Nacional. ! Brade.

Banhado. Paraná. Mun. Morrêtes, on the Serra do Mar.

Barra de São José. Rio de Janeiro. Somewhat north of Cabo Frio, 22° 45′ S. ! Brade.

Barração. Paraná. Southwest corner of the state. ! Reitz.

Barreira. Rio de Janeiro. At the foot of the Serra dos Orgãos in the Parque Nacional. ! Brade.

Barro, Espigão de. Santa Catarina. Near Araranguá.

Bateia, Morro da. Santa Catarina. Near Brusque.

Berberibe. Pernambuco. The same as Beberibe, just north of Recife.

Betim. Minas Gerais. Município, including the former município of Contagem, 20–44a. S. ! L. O. Williams.

Bica, Serra da. Distrito Federal.

Bico Alto. Ceará. In the Serra de Baturité.

Biribiri. Minas Gerais. The same as Beribéri of the Index, 18–44d. S.

Blei (Bley). Paraná. Mun. Lapa.

Boa Vista. Rio de Janeiro. The locality at 22–42b. S., collection by Glaziou on the Rio Paraíba do Sul.

Boa Vista, Alto da. Distrito Federal.

Bôca da Mata. Minas Gerais. Mun. Serro.

Bôca do Rio. Baía. Just south of Salvador, 13–38b. S.

Bocaiú. Minas Gerais. Near Pomba, 21–43c. S. ! Hoehne.

Bom Gosto. Baía. Near Olivença, 15–39a. S.

Bom Jardim. Santa Catarina. Near Biguaçú.

Bom Jesus. Rio Grande do Sul. Northeastern highlands, about 28° 30′ S., 50° W., alt. 1000 m. ! Rambo.

Bom Jesus da Lapa. The same as Lapa.

Bom Retiro. Santa Catarina. The locality at 28–50b. S., Município.

Bom Socorro, Morro do. Santa Catarina. Near Nova Trento.

Boracéa. São Paulo. Near Salesópolis.

Borda do Campo. Paraná. Mun. Piraquara, 25–49c. S.

Bosque da Saude. São Paulo. Mun. São Paulo. ! Brade.

Botafogo. Distrito Federal.

Braco. Mato Grosso. A mining camp on the Rio Arinos, about 12° south. ! Baldwin.

Braco do Sul. Espírito Santo. Mun. Castelo, 20° 40′ S. ! Brade.

Bragança. São Paulo. Now Bragança Paulista, 23–47b. S.

Brajatúba, Morro de. Paraná. Mun. Guaratuba, 2 km. southeast of Guaratuba. ! Stellfeld.

Brejo. Serra do. Piauí. 7–42 to 43. S.

Bussuquara. Pará. In Belém on the grounds of the water reserve. ! Black.

Butantan (Now Butantã). São Paulo. Mun. São Paulo. ! Hoehne.

Buturoca, Rio. São Paulo. Near Santos.

Caapoeira. Not a locality but a habitat indicating secondary woods. ! Hoehne.

Caaró. Rio Grande do Sul. Near São Luiz, northwestern highlands, about 28° S., 55° W., alt. 300 m., campo, wood islets. ! Rambo.

Cabeça de Boi. Mato Grosso. Near Cuiabá.

Cabritos, Morro dos. Distrito Federal. Between Jardim Botânico and the ocean. ! Brade.

Cabritos, Serra dos. Minas Gerais. Near Capivari.

Caceres. The same as São Luiz de Caceres.

Cachoeira do Rancho Frio. Rio de Janeiro. Serra dos Orgãos, on the Rio Paquequer in the Parque Nacional, alt. 1400 m. ! Brade.

Cachoeira Dourada. Minas Gerais. Mun. Ituiutaba, 60 km from Ituiutaba on the boundary with Goiás.

Cacupé. Santa Catarina. On the Ilha de Santa Catarina, 28–49b. S.

Caeté. Minas Gerais. The locality at 20–44b. S., collection by Martius.

Caiobá. Paraná. Mun. Paranaguá, 35 km south of Paranaguá on the coast.

Cajazeiras. Paraíba. The locality at 7–38a. S.

Cajurú. São Paulo. The locality at 21–47c. S., collection by Regnell.

Caldeirão. Amazonas. Less than 30 km west of Manaus but on the Amazon. Collection by Martius.

Camizão. Mato Grosso. Near Aquiduana.

Campina do Palha. Pará. Near Vigia.

Campininha. Paraná. Mun. Piraquara, 8 km from Quatro Barras toward the sea, 25–49c. S. ! Hatschbach.

Campo Bonito. Rio Grande do Sul. Near Tôrres.

Campo dos Padres. Santa Catarina. Near Bom Retiro.

Campo Grande. Mato Grosso. The locality at 20–55d. S., collection by Foster.

Campo Largo. Paraná. Município, the locality at 25–50d. S., collection by Hatschbach.

Canna Verde. São Paulo. Near Cajurú, collection by Regnell.

Canoas. Rio Grande do Sul. 15 km northeast of Pôrto Alegre, near Esteio. ! Rambo.

Cantareira, (Serra da). São Paulo. Mun. São Paulo, Horto Florestal. ! Hoehne.

Canto Grande. Santa Catarina. Near Pôrto Belo.

Capão Redondo. São Paulo. Near Sorocaba. ! Hoehne.

Capela, Estação. Rio Grande do Sul. Now Estação Azevedo, 50 km northeast of Pôrto Alegre, near Montenegro, campo, arenitic hills, wood islets, alt. 50 m. ! Rambo.

Carioba. São Paulo. On the Rio Piracicaba between Campinas and Limeira, 22° 41′ S. and 47° 19′ W. ! M. Kuhlmann.

Carioca, Serra da. Distrito Federal.

Cariri. Ceará. Near Imbuzeiro. Collection by Loefgren.

Carmo. Minas Gerais. Mun. Ituiutaba, 5 km south of Ituiutaba, 19–49a. S. ! Macedo.

Carmo. Rio de Janeiro. The locality on the Rio Paquequer near Teresópolis.

Caruá-açu. Rio Branco. Evidently a peak in the Serra da Lua, 2–60a. N.

Caruarú. Pernambuco. Near the Paraíba boundary. ! D. A. Lima. About 50 miles west of Campo Grande, Paraíba. ! Foster.

Carvalho. Paraná. Near Ipiranga. ! Asplund.

Cascadura. Distrito Federal. City of Rio de Janeiro. ! Brade.

Cascata. Rio Grande do Sul. Apparently the same as Cascata da Hermenegilda. ! Rambo.

Casino Aú. Paraná. In Curitiba. ! Stellfeld.

Castanho, Rio. Amazonas. Upper Rio Negro basin, about 1° 22′ N., 64° 38′ W.

Castelo, Mun. Espírito Santo. 20° 40′ S., 41° W. ! Brade.

Castelo de Agua. Rio de Janeiro. Serra dos Orgãos, in the Parque Nacional. ! Brade.

Catuni. Baía. Not listed in the Index but shown on the Map. 10–40 c. S.

Caumba Nova. Ceará. Error for Cacimba Nova, 5–40c. S.

Caxias. Rio de Janeiro. Just north of the Distrito Federal on the Baía da Guanabara.

Chapeu de Sol. Minas Gerais. Mun. Jaboticatubas, 19° 40′ S., 43° 57′ W. ! Segadas-Vianna.

Chuquê, Serra de. Baía. Apparently the same as Serra do Jacú, 10–38a. S.

Cidade Jardim. São Paulo. Mun. São Paulo.

Cipó, Serra do. In the Index as Sipó, northeast of Belo Horizonte.

Cochrane, Monte do. Distrito Federal.

Cocui. Amazonas. A large mountain on the point of the Rio Negro where Brazil, Colombia, and Venezuela meet. Most collections are from the Brazilian army post of

the same name a few miles below the mountain. ! Schultes.

Cocuruto (not Cocuruté). Rio Grande do Sul. Near Pelotas. ! Rambo.

Coite. Ceará. Now Aratuba.

Collatina, Mun. Espírito Santo. 20–41b. S.

Colonia. Piauí. The same as Floriano, 7–43a. S.

Colonia São Pedro. Rio Grande do Sul. Mun. São Pedro, 20 km north of Tôrres. ! Schultz.

Conceição. Goiás. The locality at 12–47c. S., collection by Burchell.

Conceição de Itanhaen. São Paulo. Now simply Itanhaém.

Conchas. São Paulo. The locality at 23–48d S., on the Sorocabana railroad line between Laranjal and Botucatú, near Tietê. ! Hoehne.

Conselheiro Matta-Rodeador. Minas Gerais. Now Conselheiro Mata.

Contas, Rio das. Santa Catarina. Near São Joaquim.

Copacabana. Distrito Federal.

Corcovado. Distrito Federal.

Coronel Pacheco. Minas Gerais. Experiment Station, now Agua Limpa, 22–43a. S. ! Hoehne.

Correas. Rio de Janeiro. North of Petrópolis between Cascatinha and Nogueira, 23–43a. S.

Corrego Alegre, (Fazenda). Minas Gerais. Mun. Delfim Moreira, 22° 32′ S., 45° 13′ W. ! M. Kuhlmann.

Corupá. Santa Catarina. Near Jaraguá.

Cosme Velho. Distrito Federal.

Cotia. São Paulo. Now Ibiuna, near Una, 23° 38′ S., 47° 05′ W. ! M. Kuhlmann.

Cresciuma. Santa Catarina. Now Criciúma, 29–49a. S.

Cristais, Serra dos. Minas Gerais. Near Diamantina. ! Brade.

Cruzeiro, Morro do. Minas Gerais. Mun. Ouro Preto, 1 km south of Ouro Preto. ! Macedo.

Cuibiça. Espírito Santo. The same as Cobiça, south of Vitória. ! Foster.

Cume do Bico. Ceará. In the Serra de Baturité.

Cunha, Serra da. São Paulo. Near the Serra Geral in Cunha, 23° 06′ S., 44° 56′ W. ! M. Kuhlmann.

Curral, Serra do. Minas Gerais. About 25 km southwest of Belo Horizonte. ! Foster.

Curralinhos. Santa Catarina. 29–50d. S.

Curupira, Mato do. Mato Grosso. Near Cuiabá.

Curupira, Morro do. São Paulo. Near Santos, collection by Mosén.

Delfim Moreira, Mun. Minas Gerais. Region of the Serra da Mantiqueira near the São Paulo boundary, 22° 35′ S., 45° 24′ W. ! M. Kuhlmann.

Demora, Rio. Paraná. Near Antonina.

Desengano. Rio de Janeiro. Mun. Santa Maria Madalena, 22° S., 2° east of Rio de Janeiro. ! Brade.

Desterro. Santa Catarina. Now Florianópolis.

Desvio Ypiranga. Paraná. Apparently the same as Ipiranga.

Deuses, Terra dos. Minas Gerais. In Lavras. ! Black.

Diamente, Fazenda do. Minas Gerais. Near Corinto. ! Bracelin.

Dimití, Serra. Amazonas. Near Rio Dimití, 1–67d. N.

Dionisio Cerqueira. Santa Catarina. Extreme northeast corner of the state.

Dois Irmãos. Rio Grande do Sul. Southern slope of the highlands, about 50 km northeast of Pôrto Alegre, alt. 100 m., rain forest belt. ! Rambo.

Dois Irmãos, Pedra. Distrito Federal.

Dona Castorina, Estrada. Distrito Federal.

Dona Francisca, Estrada. Santa Catarina. In Joinvile.

Dourada, Serra. Goiás. The locality at 16–50c. S., collections by Schott and Ule.

Douro, Mision. Goiás. The same as São José do Duro, 11–46c. S., collection by Gardner.

Ega. Amazonas. Now Tefé.

Engenho Novo. Distrito Federal. In Rio de Janeiro. ! Brade.

Escola. Pernambuco. São Bento, near Tapera. ! D. A. Lima.

Esperança. Amazonas. Near Peruvian border, across from Leticia, 4–70d. S. ! Black.

Esperança. Paraná. About 10 km northwest of Prudentópolis, 25–51c. S. ! Stellfeld.

Espigão do Curupira. São Paulo. Near Santos, collection by Mosén.

Esteio. Rio Grande do Sul. 20 km northeast of Pôrto Alegre, lowlands with campos, swamps, and wood islets, alt. 20 m. ! Rambo.

Estreito do Uruguai. Santa Catarina. Near Concordia.

Excelsior. Distrito Federal. Probably part of Pico da Tijuca.

Fabriciano, Coronel. Minas Gerais. Mun. Antônio Dias. ! Foster.

Fachinal. Santa Catarina. Near Biguaçú.

Feira. Baía. The same as Feira de Santana, 12–39c. S.

Felisberto. Baía. Near Ilheus.

Figueiredo. Santa Catarina. Near Bom Retiro.

Flamengo, Morro. Distrito Federal.

Flores, Ilha das. Rio de Janeiro. Just off the northern end of Niteroi.

Flores, Pedra das. Rio de Janeiro. Mun. Santa Maria Madalena, 22° S., 1° 10′ east of Rio de Janeiro. ! Brade.

Florestal. Paraná. Mun. Piraquara, 29 km east of Curitiba. ! Hatschbach.

Florestal, Estação. São Paulo, on the grounds of the Instituto de Botânica. ! Foster.

Fonseca, Chacara de. Distrito Federal. ! Brade.

Fonte Sanatoria. São Paulo. About 150 km from São Paulo on the road to Curitiba. ! Foster.

Formiga, Rio. Mato Grosso. The one at 21–56d. S.

Forno Grande. Espírito Santo. Mun. Castelo, 20° 40′ S., 2° east of Rio de Janeiro. ! Brade.

Furquilha, Serra da. Rio de Janeiro. Mun. Santa Maria Madalena, 22° S., 1° 10′ east of Rio de Janeiro. ! Brade.

Garrafão, Morro do. Santa Catarina. Near Jaraguá.

Gavea, Pedra da. Distrito Federal.

Geral, Serra. Goiás. Luetzelburg collections near São José do Duro.

Gloria, Mun. Baía. 9–39d. S. ! Schery.

Governador Valadares, Mun. Minas Gerais. 19–42b. S.

Governo, Mato do. São Paulo. Mun. São Paulo, former name of the Parque do Estado including the Instituto de Botânica and its Jardim Botânico. ! Hoehne.

Grongogy, Rio. Baía. The same as Rio Grungogi.

Guaíba, Rio. Rio Grande do Sul. The mouth of the Rio Jacui. 30–51c. S. ! O'Donell.

Guapi (Guapi Mirim). Rio de Janeiro. Due south of Teresópolis on the railroad.

Guaribas. Piauí. Between São João do Piauí and Raimundo Nonato.

Guiomar. Espírito Santo. Southwest of Vitória. ! Foster.

Gurupi, Rio. Pará-Maranhão. 1–46c. S.

Heitor Legrú. São Paulo. Interior of São Paulo. ! Hoehne.

Hermenegilda, Cascata. Rio Grande do Sul. Near Pelotas, about 32° S., 52° W. ! Rambo.

Herval. Santa Catarina (not Paraná). 27–51c. S., collections of Dusén, March 7–9, 1911. ! Asplund.

Humaïta. Amazonas. 8-63a. S.

Humaïta. Ceará. Now Senador Pompeu, 6–39a. S. ! Ducke.

Humaïta. Mato Grosso. Near Rio dos Bugres, collection of Lindman.

Igarapé. See second capitalized word of title.

Ilha. See also the second capitalized word of title.

Ilha Comprida. São Paulo. Includes Iguapé, 48–25b. S.

Ilheu, Dist. Minas Gerais. Includes Viçosa in drainage basin of Rio Doce. ! Bracelin.

Imbé, Santo Antonio de. Rio de Janeiro. Evidently the same as Imbé, 22–42b. S.

Imbetiba. Rio de Janeiro. A small harbor (enseada) south of Macaé, 22–42d. S.

Imbuzeiro, (? Riacho). Ceará. 5–41b. S., collection by Loefgren.

Indaial. Santa Catarina. Near Encano.

Inferninhos. Santa Catarina. Near Itajuba.

Ipanargna. Paraíba. 10 or 15 miles north of Campina Grande. ! Foster.

Ipanema. Distrito Federal.

Ipero. São Paulo. Near Sorocaba. ! Hoehne.

Ipiranga. Paraná. Just below the crest of the Serra do Mar on the eastern slope east of Curitiba, on the railroad. Collections by Dusén.

Iracema. Baía. On the road to Serra de Sincorá, 13–41d. S. ! Fróes.

Irá Igarapé. Amazonas. Affluent of the Rio Tiquié, which is the first large affluent of Vaupés in Brazil below the boundary Rio Papuri. ! Schultes.

Isana, Rio. Amazonas. The same as Içana.

Itabapoana. Espírito Santo. About 21° S., 41° W.

Itabapoana, Ponte de. The same as Itabapoana, separated merely by the river dividing Rio de Janeiro and Espírito Santo. ! Hoehne.

Itacorubí. Santa Catarina. 28–48a. S.

Itamarati. Rio de Janeiro. Near Petrópolis. ! Brade.

Itambé. Minas Gerais. The locality at 19–43c. S., collection by Saint-Hilaire.

Itapeba, Restinga de. Distrito Federal. Near Recreio dos Bandeirantes.

Itapemirim. See Cachoeiro de Itapemirim.

Itapiranga. Santa Catarina. Mun. Chapecó, 27–54d. S.

Itapirapuã (Itapirapuan), Mount. Mato Grosso. Near Buritizinho and Diamantino. Collection by Lindman.

Itapoan. Rio Grande do Sul. 50 km south of Pôrto Alegre at the northern end of the Lagoa dos Patos, granitic hills, campos, woods, swamps, alt. 30 m. ! Rambo.

Itararé. Paraná. Across the river from Itararé in São Paulo, 24–49c. S. ! Asplund.

Itatinga. Baía. 15° 05′ S., 39° W. ! Fróes.

Itubira, Serra de. Baía. Near Serra das Almas, 14–42b. S.

Itumirim. Baía. The locality at 10–40c. S. ! Campos Porto.

Iturassu. Baía. About 40 miles southeast of Maracás, midway between Maracás and Jequié. ! Foster.

Izidoro, Mato do. Minas Gerais. Possibly a limestone sinkhole near Diamantina. ! L. O. Williams.

Jabaquara. São Paulo. Mun. São Paulo, near the Jardim Botânico and the Instituto de Botânica. ! Hoehne.

Jacareí (Jacarehy). Paraná. Near Ipiranga. ! Asplund. Collections

of Dusén. The citation of "restinga" as a habitat on some labels indicates a coastal locality.

Jacarepaguá, Restinga de. Distrito Federal.

Japui, Monte. São Paulo. In São Vicente.

Japuiba (Japuhyba). Rio de Janeiro. A few kilometers northeast of Angra dos Reis on the railroad. ! Hoehne.

Jaraguá, Morro da. São Paulo. Some 25 km northwest of the city of São Paulo. ! Brade.

Jarau. Rio Grande do Sul. 25 km west of Quarai, southwestern Rio Grande do Sul on the Uruguayan frontier, about 30° 30′ S., 56° W., arenitic ranges, campos, woods, alt. 200 m. ! Rambo.

Jeremoabo. Baía. The same as Geremoabo.

João Coelho. Pará. The same as Santa Isabel.

João Pessoa. Paraíba. Formerly Paraíba.

José Vaz, Serra de. Rio de Janeiro. Near Campo Belo, Itatiaia. ! Brade.

Jucú, Rio. Espírito Santo. About 30 miles southwest of Vitória. ! Foster.

Juruema, Riosinho. Amazonas. Right bank of the Rio Jutai, 6° S., 69° W. ! Fróes.

Juruena, Rio. Mato Grosso. Not listed in the Index but shown as 13–59b. S.

Kappesberg. Rio Grande do Sul. 100 km northeast of Pôrto Alegre, southern rim of the highlands, rain forest, alt. 600 m., about 29° S., 51° W. Now Estação São Salvador. ! Rambo.

Km 279 (toward Curitiba). São Paulo. Nearest Apiai, collection of Foster.

Lagem (Lagen or Layen), Retiro de. São Paulo. Region of Cajurú, collection of Regnell.

Lago, Igarapé do. Amapá. Mun. Macapá, 1° N., 52° W. ! Fróes.

Lagoa de Piri. Santa Catarina. Evidently the same as Lagoa, Ilha de Santa Catarina.

Lagoa Grande. Minas Gerais. Mun. Nova Lima, in Serra de Mutuca, 6–7 km south of Belo Horizonte. ! L. O. Williams.

Lagoa, Ribeirão da. São Paulo. May be an affluent of the Rio Feio, interior of São Paulo. ! Hoehne. Collection of Edwall.

Lapa (Bom Jesus de Lapa). Baía. 13–43c. S. ! Campos Porto.

Lapinha. Minas Gerais. 10–15 km south of Lagoa Santa. ! O'Donell.

Laranjeiras. Distrito Federal.

Layen. Error for Lagem, see above. ! Asplund.

Leblon, Praia do. Distrito Federal.

Leopoldina. Espírito Santo. The same as Cachoeira de Santa Leopoldina, 20–40c. S. Collection of Luetzelburg.

Luiz de Melo, Mata. Paraíba. Northeast of Campina Grande. ! Foster.

Macieiras. Rio de Janeiro. On Itatiaia.

Mãe Catira, Rio. Paraná. Mun. Morrêtes, by the Estrada da Graciosa, near São João. ! Hatschbach.

Mairori, Serra de. Rio Branco. Near Rio Surumú, 4–60a. N.

Majestoso, Pico. Rio de Janeiro. Serra dos Orgãos, in the Parque Nacional. ! Brade.

Mandioca. Rio de Janeiro. Below Petrópolis, collection by Glaziou. ! Brade.

Manga. Piauí. Near Floriano. 7–43a. S.

Mantiqueira, Serra da. Minas Gerais. The boundary between Minas Gerais and Rio de Janeiro, collection by Magelhães.

Manuel Agustin, Corrego. Minas Gerais. Near Corinto. ! Bracelin.

Mar, Serra do. São Paulo, Paraná. The main north-south range and drainage divide in both states.

Maracajá. Santa Catarina. 29–49a. S.

Maracanã. Santa Catarina. Evidently the same as Maracajá.

Maracassumé, Rio. Maranhão. 2° S., 47° W. ! Fróes.

Maracujá, Rio. Santa Catarina. Near Anitápolis.

Marambaia, Ilha de. Rio de Janeiro. West of the Distrito Federal, 23–44d. S.

Marapendi, Lagoa. Distrito Federal.

Marari. Amazonas. On the Rio Juruá, 6–68b. S.

Marco da Legua. Pará. Near Belém. ! Black.

Maromba, Ponte. Rio de Janeiro. On Itatiaia.

Massiambú. Santa Catarina. Mun. Palhoça, 27° 49′ S., 48° 40′ W.

Mata Luiz de Melo. Paraíba. Northeast of Campina Grande. ! Foster.

Matinhos. Paraná. Between Paranaguá and Guaratuba, near Caiobá, 25° 51′ S., 48° 32′ W. ! M. Kuhlmann.

Mato Dentro, Mun. Minas Gerais. Between Belo Horizonte and the Serra do Cipó, about 50 km from Conceição de Mato Dentro. ! Macedo.

Mauá. Rio de Janeiro. The locality at 23–43a. S.

Meio da Serra. Rio de Janeiro. Halfway up the serra to Petrópolis.

Meio, Rio do. Paraná. Mun. Antonina, 25–49d. S.

Miguel Burnier. Minas Gerais. The same as the railroad station, Burnier. ! Hoehne.

Milho Verde. Minas Gerais. The locality at 18–43c. S., collection by Saint-Hilaire.

Mirador, Rio. Santa Catarina. Near Orleães.

Moinho Velho. São Paulo. Between São Paulo and Osasco, near Butantã.

Monte Claro. Espírito Santo. Northwest of Collatina 35 miles. ! Foster.

Montenegro. Rio Grande do Sul. 60 km northeast of Pôrto Alegre, foothills of the Serra Geral (southern slope of the highlands), campo, rain forest, 30 m. alt. ! Rambo.

Monte Serrat. Rio de Janeiro. On Itatiaia.

Mooça. São Paulo. Mun. São Paulo. ! Brade.

Morin. Rio de Janeiro. Near Petrópolis. ! Brade.

Morro. See also second capitalized word of title.

Morro Grande. Paraná. Coastal. ! M. Kuhlmann.

Morro Velho. Minas Gerais. Now Vila Nova Lima, an English gold mine near Sabará and Belo Horizonte. ! Hoehne.

Morungava (Morungaba). Paraná. A district including Itararé, 24–49c. S.

Muguentaua. Amazonas. Right bank of the Rio Tefé, 3–65d. S. ! Fróes.

Mutuca, Serra da. Minas Gerais. Mun. Nova Lima, 20° 03′ S., 44° W. ! L. O. Williams.

Nariz do Frade. Rio de Janeiro. Serra dos Orgãos, Parque Nacional, alt. 1800 m. ! Brade.

Nataia, Igarapé. Amapá. Right bank of the Rio Oiapoque, 2° 05′ N. ! Fróes.

Negra, Serra. Pernambuco. Not one of those listed, near the Paraíba line. ! Foster.

Neu Württemberg. Rio Grande do Sul. Now Panambi; northwestern highlands, 28° S., 54° W., alt. 500 m., rain forest, campo. ! Rambo.

Niemeier, Avenida. Distrito Federal.
Nordeste, Escola Agronomica do. Paraíba. At Areia.
Nova Granja. Minas Gerais. Mun. Santa Luzia, near Santa Luzia on the east. ! L. O. Williams.
Nova Wurtemburg. See Neu Württemberg.

Olho d'Agua, Serra d'. Paraíba. Near 7° S., 37° W.
Olimpo, Pico. Paraná. Mun. Morrêtes, the same as Pico do Marumbi, 25–49d. ! Hatschbach.
Osório. Rio Grande do Sul. Município, near Lagoa de Pinguela (30–50a S.). Probably Conceição do Arroio of the Map.

Paduiri, Rio. Amazonas. From the Sierra Parima, 1° 22′ N., 64° 38′ W.
Pae Ricardo, Matas do. Distrito Federal.
Paineiras. Distrito Federal. On the Corcovado.
Palacios. Minas Gerais. Mun. Jaboticatubas, 19° 10′ S., 43° 35′ W., alt. 1200 m. ! Segadas-Vianna.
Palmarco. Pernambuco. Evidently an error for Palmares, 9–35a.
Palmeira. Rio Grande do Sul. Northeastern highlands, about 27° 30′ S., 54° W., alt. 600 m., campo, woods. ! Rambo.
Palmeiras. Mato Grosso. The locality at 16–56b. S., near Cuiabá. Collection by Lindman.
Palmeiras. Paraná. Between Curitiba and Ponta Grossa, 25° 24′ S., 50° W. ! M. Kuhlmann.
Panuré. Amazonas. The same as Ipanuré, Ipanoré, and São Jeronimo; on the Rio Uaupés, 0–68a. N. ! Pires.
Pão d'Assucar. Distrito Federal. Peak at the west side of the entrance to the bay.
Papagaio, Pico do. Distrito Federal.
Papagaio, Rio. Mato Grosso. Near Utiariti.
Paraíba. Paraíba. Now João Pessoa.
Paraíba do Norte. The same as the state of Paraíba.
Paraibana. Minas Gerais. The same as Rio Paraibuna in Juiz de Fora. ! Hoehne.
Paramirim dos Creoulos. Baía. The same as Paramirim at 13–42c. S.
Pardo, Rio. Rio Grande do Sul. The locality at 30–52a. S., collection by Sellow.
Parecí Novo. Rio Grande do Sul. 60 km northeast of Pôrto Alegre, 10 from Montenegro, foothills of the Serra Geral, rain forest region, alt. 50 m. ! Rambo.
Parque do Estado. São Paulo. Mun. São Paulo, surrounds the Instituto de Botânica. ! Hoehne.
Parque Nacional. Minas Gerais. Mun. Antônio Dias, near Ipatinga. ! Foster.
Parque Nacional. Rio de Janeiro. Near Teresópolis.
Patrimonio. São Paulo. Between Piedade and Juquiá, 23° 50′ S., 47° 27′ W. ! M. Kuhlmann.
Pedra Bonita. Distrito Federal.
Pedra Branca. Espírito Santo. Mun. Cachoeiro de Itapemirim, 20° 40′ S., 2° east of Rio de Janeiro. ! Brade.
Pedra Grande. São Paulo. The same as Pedra Grande de Atibaia. ! Hoehne.
Pedra, Serra da. Santa Catarina. Near Araranguá.
Pedras, Morro das. São Paulo. Mun. Iguapé, near the coast about 15 km north of Iguapé. ! Brade.
Pelado, Morro. São Paulo. Near Lindóia, 23–47b. S. ! Hoehne.
Pereque, Rio. Paraná. Mun. Paranaguá, 26–48a. S. ! Hatschbach.
Peroba. Santa Catarina. Near Araranguá.

Pharmacópolis (of Vellozo). Rio de Janeiro. Now Parati, 23–45d. S. ! Brade.

Piaçaguera (Piassaguera). São Paulo. An island in the delta just north of Santos.

Picu, Serra do. Minas Gerais. The Serra lying south of Itatiaia, collections by Glaziou. ! Brade. Near the boundary with São Paulo and with Rio de Janeiro.

Piedade, Pico da. Minas Gerais. Near Caete, 20–44b. S.

Pilão, Serra do. Santa Catarina. Near Araranguá.

Pilões. Santa Catarina. Near Palhoça.

Pinhaes. Paraná. São José dos Pinhaes, collections of Dusén, 26–49a. S.

Pinhal. Rio Grande do Sul. Possibly the railroad station at 30–54b. S., collection of Palacios and Cuezzo.

Pinheiral. Rio de Janeiro. Indicates a spontaneous stand of Araucaria on Itatiaia, alt. 2000–2200 m., between Macieiras and Agulhas Negras. ! Brade.

Pirajussara. São Paulo. Mun. São Paulo, by Butantã. ! Hoehne.

Piraquara, Mun. Paraná. 29 km east of Curitiba.

Piratininga, Restinga da. Rio de Janeiro. South of Niteroi, collection of J. G. Kuhlmann.

Poção. Pernambuco. The locality at 8–37d. S., 28 km north of Pesqueira. ! Pickel.

Pontanarrí, Igarapé. Amapá. About 20 km west of Oiapoque on the Brazilian side. ! Black.

Ponte de Pedra. Mato Grosso. The locality at 14–57a. S., collection by Hoehne.

Portoa. Baía. Across the bay from Ilheus. ! Foster.

Pôrto da Caixa. Rio de Janeiro. Near Niteroi on the Baía da Guanabara. ! Brade.

Pôrto das Canoas. Santa Catarina. Mun. São Francisco do Sul, between Joinvile and the Paraná line.

Pôrto Dom Pedro II. Paraná. On the Baía de Paranaguá. ! Asplund.

Pôrto União. Santa Catarina. On the Map at 26–51c. S., incorrectly indexed.

Pouso Alegre. Minas Gerais. The locality at 22–46d. S. ! Hoehne.

Praia. See also the second capitalized word of the title.

Praia Braba (Brava). Santa Catarina. South of Itajaí.

Praia Grande. São Paulo. The same as the station of Moncaguá or Mongaguá on the Sorocabana railroad line. ! Hoehne.

Prateleiras. Rio de Janeiro. On Itatiaia.

Prazeres, Serra dos. Paraíba. Near Triumfo.

Queimada Grande, Ilha da. São Paulo. South of Itanhaém, 24–47d. S.

Queimado, Morro. Distrito Federal.

Quilombo, Rio. São Paulo. The locality at 24–46a. S., collection by Doering.

Quinta da Boa Vista. Distrito Federal.

Quintas. Goiás. Mun. Goiás, 25 km from Goiás on the slopes of Serra Dourada. ! Macedo.

Rats, Isle aux. Distrito Federal. Baía da Guanabara.

Recreio dos Bandeirantes. Distrito Federal.

Redentor, Estrada do. Distrito Federal.

Republica, Alto da. Rio de Janeiro. Mun. Santa Maria Madalena, 22° S., 1° 10′ east of Rio de Janeiro. ! Brade.

Retiro. Minas Gerais. Probably just a shelter on the Fazenda do Diamante, collection by Mexia. ! Bracelin.

Retiro, Morro do. Rio de Janeiro. Near Petrópolis, collection by Glaziou. ! Brade.

Retiro, Rio. Minas Gerais. In the Serra da Mantiqueira south of Itatiaia. ! Brade.

Retiro da Lagem (Lagen or Layen). See Lagem.

Reutersberg. Rio Grande do Sul. 70 km from Porto Alegre, 10 from Dois Irmãos, alt. 400 m., rain forest. ! Rambo.

Ribeirão do Ouro. Santa Catarina. Near Brusque.

Ribeirão do Tijuco. São Paulo. The same as Rio do Tijuco, Apiai, 24° 33′ S., 48° 55′ W. ! M. Kuhlmann.

Ribeirão Grande. Santa Catarina. Near Taió.

Ribeirão Pires. São Paulo. Mun. Santo Andre, on the Santos to São Paulo railroad. ! Hoehne. Not in the Index but shown on the Map, 24–46a. S. Collection by Edwall.

Ribeirão, Ilha do. Distrito Federal. In the city of Rio de Janeiro. ! Brade.

Ricardo Franco, Pico. Pará. 2° 17′ 59″ N., 55° 56′ 47″ W., collection of Sampaio.

Rio do Restro, Serra do. Santa Catarina. Near Orleães.

Rodrigo de Freitas, Lagoa. Distrito Federal.

Rola Moça, Serra de. Minas Gerais. Boundary between Mun. Betim and Mun. Brumadinho, 20 km from Belo Horizonte. ! Foster.

Salto. Santa Catarina. Near Blumenau. Collection by Reitz.

Salto Alegre. Rio Grande do Sul. Near Neu Württemberg, collection by Bornmueller. ! Rambo.

Salvador. Rio Grande do Sul. The same as Estação São Salvador, formerly Kappesberg. ! Rambo.

Sanga da Anta. Santa Catarina. 29–50d. S.

Sanga do Engenho. Santa Catarina. 29–50b. S.

Sanitaria, (Fonte). São Paulo. About 150 km from São Paulo on the road to Curitiba. ! Foster.

Santa Cruz. Mato Grosso. None of those listed in the Index. On the Rio Paraguai and evidently the same as Barra dos Bugres on the map, 15–57c. S. Collection by Moore.

Santa Felicidade. Paraná. Mun. Curitiba, 25–49c. S. ! Hatschbach.

Santa Isabel. Pará. Now João Coelho on the Belém-Bragança railroad line, 1–48c. S.

Santa Luzia, Morro. Santa Catarina. Near Brusque.

Santa Teresina. Pernambuco. Mun. Palmares, 9–35a. S.

Santa Terezinha. Minas Gerais. Mun. Ituiutaba, north of Ituiutaba on the Rio Paranaíba, 19–50b. S. ! Macedo.

Santo Antonio. Santa Catarina. Evidently the same as Santo Antonio da Ilha and Santo Antonio de Lisboa, 28–49b. S.

Santos Dumont. Ceará. Now Aratuba.

São Bento. Pernambuco. The locality at 8–35b. S., near Tapera.

São Bento (do Sul). Santa Catarina. The locality at 26–49c. S.

São Caetano. Minas Gerais. The locality at 21–44b. S., collection by Gardner.

São Cristovão. Distrito Federal.

São Francisco dos Campos. Minas Gerais. Region of the Serra da Mantiqueira, almost on the São Paulo line, 22° 35′ S., 45° 24′ W. ! M. Kuhlmann.

São Gabriel, Rio. Espírito Santo. Meets the northern Rio Doce at about 19° 30′ S., 41° W. ! Brade.

São Ignacio, Serra do. Baía. Near São Ignacio, 11–43d. S.

São João. Amazonas. 7–72c. S. Collection by Ule.

São João. Paraná. The locality at 25–49d. S., collection by Dusén.

São João do Piauí. Piauí. The locality at 9–43b. S.

São João dos Barreiros. São Paulo. Now simply São João, near São Roque, 24–47ab. S. ! Hoehne.

São João, Pedra. Rio de Janeiro. On the Rio Paquequer in the Parque Nacional, 22–43d. S. ! Brade.

São Joaquim, Mun. Santa Catarina. The same as São Joaquim da Costa da Serra on the Map, 50–28d. S. Collection by Reitz.

São Jose, Serra de. Baía. North of Geremoabo, 10–38a. S.

São José del Rei, Serra. Minas Gerais. Error for São João del Rei, collection by Glaziou.

São Luiz. Paraná. Near Ponta Grossa. ! Foster.

São Luiz de Purunã, Serra. Paraná. Mun. Campo Largo, 49 km from Ponta Grossa, the beginning of the campos of the planalto, 25–50d. S. ! Hatschbach.

São Marcelino. Amazonas. The same as Marcellino, 1–67c. N. On the left bank of the Rio Negro opposite the Rio Xié. ! Schultes.

São Miguel. Minas Gerais. Near Viçosa, collection by Mexia. ! Bracelin.

São Pedro. Amazonas. On the Rio Paduiri, 1° N. ! Fróes.

São Sebastião. São Paulo. The locality at 23–46c. S., near Campinas.

São Vicente, Campos de. Minas Gerais. 8 km south of Ituiutaba. ! Macedo.

Saquarema. Paraná. Between Morrêtes and Alexandra. ! Stellfeld.

Sernambetiba, Restinga de. Distrito Federal.

Serra. São Paulo. The same as Alto da Serra.

Serra. See second capitalized word of title.

Sertão da Lagoa. Santa Catarina. On the Ilha de Santa Catarina and evidently near or the same as Lagoa.

Sete Lagoas. Minas Gerais. 60 km northwest of Belo Horizonte, 19° 30′ S. ! Brade.

Silvestre. Distrito Federal. On the Corcovado.

Sipó. See Cipó.

Sitio. Minas Gerais. On the railroad south of Barbacena. Not indexed but on the Map, 21–44d. S. Collection of Sampaio.

Soberbo. Rio de Janeiro. Just south of Teresópolis and below the divide of the Serra dos Orgãos, 22–43d. S.

Socavão. Paraná. 30 km east of Castro, 25–50b. S. ! Stellfeld.

Spitzkopf. Santa Catarina. Two different peaks, one near Blumenau, a collecting locality of F. Mueller and others, the other near Brusque, a collecting locality of R. Reitz.

Suarão. São Paulo. Coast near Itanhaém, 24–47d. S. ! Hoehne.

Sumare. Distrito Federal.

Tabunha, Fazenda da. Minas Gerais. Viçosa in the drainage basin of the Rio Doce, collection by Mexia. ! Bracelin.

Taguá, Morro. Paraná. About 2 km west of Caiobá, 26–49b. S. ! Stellfeld.

Taimbe. Rio Grande do Sul. More usually Taimbesinho, 190 km northeast of Pôrto Alegre, about 29° 30′ S., 50° W., alt. 930 m., Araucaria woods, campo, cloud forests, peat bogs. ! Rambo.

Taió. Santa Catarina. Evidently the same as the Rio Itayo of the Map, 27–50cd. S.

Taipú, Ponte de. São Paulo. The same as Itaipú and Morro de Taipú, 24–46c. S.

Tambe (Itambe), Taboleiro de. Paraíba-Pernambuco. 7–35c. S.

Tapari. Pará. About 25 miles up the Rio Tapajoz from Santarém, 3–55a. S. ! Dahlgren.

Tapera. Pernambuco. Railroad station, 8–35c. S., collections by Pickel. ! D. A. Lima. Not in Index but on Map.

Taperinha. Pará. Near Santarém, collection by Ginzberger & Zerny, probably a farm where they stayed. ! Rechinger.

Tapes, Serra dos. Rio Grande do Sul. Granitic range, north of Pelotas and south of the Rio Camaquam, about 31° 30′ S., beginning at the Lagoa dos Patos. ! Rambo.

Taquaril, Serra de. Minas Gerais. Mun. Belo Horizonte, collection by Oliveira.

Taraira, Rio. Amazonas. Part of the Brazil-Colombia boundary, flowing south into the Rio Apaporis about 50 km above its mouth, 1–70b. S. ! Schultes.

Taraqua. Amazonas. The locality at 0–68c. S., collection by Pires.

Taruva. Santa Catarina. Near Araranguá.

Tavares, Rio. Santa Catarina. On the Ilha de Santa Catarina south of Lagoa.

Theewald. Rio Grande do Sul. 70 km northeast of Pôrto Alegre, foothills of the Serra Geral, rain forest region, alt. 500 m. ! Rambo.

Tijuca, (Pico da). Distrito Federal.

Tijuca, Barra da. Distrito Federal.

Tijuca, Restinga. Distrito Federal. The coast west of Gavea.

Tijuco, Rio. São Paulo. Near Apiaí, 24° 33′ S., 48° 55′ W. ! M. Kuhlmann.

Timoneira. Paraná. The same as Tamandaré, 25–49c. S.

Tinga, Rio. Pará. On the Rio Cupari about 45 miles from its mouth. ! Black.

Toca do Tigre. Rio Grande do Sul. 5 km from Itapoan. ! Rambo.

Tomé Assú. Pará. Japanese colony on the Rio Acará and its tributary the Tomé Assú, 2–48c. S., collection by Mexia. ! Bracelin.

Trinidade. Santa Catarina. On the Ilha de Santa Catarina, collection by Rohr.

Turma 23. Paraná. Near Ponta Grossa. ! Asplund. Probably a railroad installation.

Uanari. Amazonas. The same as the Serra do Uranari, near São Gabriel, 0–67b. S. ! Pires.

Ubatuba. São Paulo. The locality at 23–45c. S., on the coast north of Caraguatatuba and the Ilha de São Sebastião. ! Hoehne.

Umuarama. São Paulo. On the Planalto da Mantiqueira, 22° 46′ S., 45° 34′ W. ! M. Kuhlmann.

Utinga. Pará. In Belém. ! Black.

Vaccaria. Minas Gerais. 106 km north of Belo Horizonte near Cipó. ! Foster.

Val Veneto. Rio Grande do Sul. Near Santa Maria, about 29° 45′ S., 53° W., southern slope of the highlands, rain forest region. ! Rambo.

Varadouro. Pará. Probably refers to a low habitat with a little water rather than a locality. Collection of Sampaio.

Vargem Alta. Espírito Santo. Mun. Cachoeiro de Itapemirim, 60 km northeast of Cachoeiro do Itapemirim. ! Foster.

Vargem do Cedro. Santa Catarina. The same as Vargem do Cerro on the Map, 28–49d. S.

Vargem Grande. Goiás. On the upper Rio Tocantins, 15–48d. S.

Victoria. Espírito Santo. Now Vitória.

Viera. Rio Grande do Sul. Near Rio Grande, collection by Archer.

Vila Ema. São Paulo. Mun. São Paulo, by Ipiranga. ! Brade.

Vila Friburgo. São Paulo. Mun. São Paulo. ! Hoehne.

Vila Mariana. São Paulo. Mun. São Paulo, collection by Usteri. ! Hoehne.

Vila Nova. Santa Catarina. The locality at 28–49d. S., collection by Reitz.

Vila Velha. Paraná. A castlelike geological formation, not a settlement, southeast of Ponta Grossa.

Vista Chineza. Distrito Federal.

Vitória. Pernambuco. The locality at 8–35c. S. Collection by Pickel.

Viuva, Morro da. Distrito Federal.

Volta Grande. Paraná. km 39 from Curitiba on the road to Paranagua, 25–49d. S. Not indexed but on the Map.

Vossoroca. Paraná. Mun. São José dos Pinhaes, a reserve of the light and power company, 26–49a. S. ! Hatschbach.

Xiborem, Rio. Amazonas. Evidently the same as Xiborena of the Index, collection by Luetzelburg.

Ypiranga. See Ipiranga.

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THE ARCHEOLOGICAL AND PALEONTOLOGICAL SALVAGE PROGRAM IN THE MISSOURI BASIN, 1950–1951

By PAUL L. COOPER

River Basin Surveys, Smithsonian Institution

(With 12 Plates)

INTRODUCTION

The Inter-Agency Salvage Program in the Missouri Basin continued in operation throughout calendar years 1950 and 1951 with a number of institutions carrying on investigations of archeological and paleontological remains to be destroyed by Federal water-control projects. Activities were on a larger scale than previously because of augmented funds available to the Missouri Basin Project and increased participation by State-supported agencies. Through the combined resources of the various institutions, selected sites in 11 reservoir areas were intensively investigated and many other reservoirs were surveyed more or less exhaustively.

The Missouri Basin Project, a unit of the nation-wide River Basin Surveys of the Smithsonian Institution, continued its studies of archeological and paleontological resources to be lost as a result of the present water-development program. Previous summary reports (Wedel, 1947b, 1948, 1953a, and 1953b) have described in detail the history, organization, and general background of the Survey, and repetition here is not necessary. Suffice it to say that, since 1946, in accordance with various interbureau agreements and operating with funds provided by the Department of the Interior through the National Park Service, the project has visited and examined for archeological and paleontological remains many proposed reservoir sites and has submitted to the National Park Service reports on the results together with recommendations for salvage where this was deemed necessary. During part of this period it also has undertaken intensive investigation of significant sites to be lost.

This report is intended only as a brief review of progress made by the Missouri Basin Project during 1950 and 1951, with summary statements relative to the fieldwork of other agencies active in the salvage program. It makes no attempt at reporting and evaluating

total accomplishments during the period, since these will not be known until the completion of studies still under way. I have attempted to keep interpretations at a minimum, partly because they must rest primarily upon preliminary and tentative statements by the research men, who will undoubtedly in some instances revise their opinions at later stages of their studies. Periodic progress reports and more comprehensive summary reports, when available, have been the main sources relied upon, and I hope that little violence has been done to the facts and to the opinions of those who have compiled the reports.

The work of the Missouri Basin Project continued to be facilitated by the freely given assistance of many organizations, agencies, and individuals. Personnel of the Washington and regional offices of the National Park Service, and of the Bureau of Reclamation and Corps of Engineers, were consistently helpful. In the National Park Service, various officials assisted in planning operations and provided consultative services, especially in the field of historic-sites archeology. Officials in the district and various field offices of the Corps of Engineers and in the regional and field offices of the Bureau of Reclamation contributed in many ways to the success of our fieldwork. In addition to making information of all kinds freely available, both agencies also provided various facilities, including space for field headquarters and storage, and the loan of equipment. In the Fort Randall Reservoir area the schedule for acquisition of certain tracts of land was accelerated, and these were withheld from agricultural leases to permit cost-free access for excavation. State agencies throughout the Basin cooperated in every possible way, including the provision of needed information and making their research and other facilities available. The University of Nebraska, through its Laboratory of Anthropology, continued to provide office and laboratory space and to offer the use of its library. Landowners were uniformly indulgent in permitting excavations, often at the cost of personal inconvenience, and they and other local residents were helpful to field personnel in ways too numerous to mention. As in the past, the Committee for the Recovery of Archeological Remains, representing the anthropological profession, gave invaluable aid and support to the salvage program.

In previous years, with a few notable exceptions, funds were provided only for survey and test excavation to determine the extent of the salvage problem. In the meantime, construction on a number of dams was proceeding apace, and the day when large numbers of sites not duplicated elsewhere would disappear beneath the waters of the newly created reservoirs was looming ever closer. Construction on

49°
47°
C

1 Absaroka
2 Alzada
3 Amherst
4 Anchor
5 Angostura
6 Antelope
7 Apex
8 Badwater
9 Baldhill
10 Beacon
11 Bellwood
12 Bernice
13 Bison
14 Bixby
15 Blue Horse
16 Bonny
17 Box Butte
18 Boysen
19 Brenner
20 Brewster
21 Broncho
22 Buffalo Bill
23 Buffalo Creek
24 Bull Creek
25 Cairo
26 Cannonball
27 Canyon Ferry
28 Cedar Bluff
29 Cherry Creek
30 Clark Canyon
31 Colwell
32 Crookston
33 Crosby
34 Cushing
35 Davis Creek
36 Deerfield
37 Des Lacs
38 Devils Lake
39 Dickinson
40 Du Noir
41 Edgemont
42 Eldridge
43 Eli
44 Enders
45 Ericson
46 Fort Randall
47 Garrison
48 Gavins Point
49 Glendo
50 Glen Elder
51 Green Grass
52 Harlan County
53 Heart Butte
54 Hobson
55 Hunter Mountain
56 Jamestown
57 Kanopolis
58 Kasinger Bluff
59 Kelley
60 Keyhole
61 Kilgore
62 Kirwin
63 Kortes
64 Lake Solitude
65 Landon
66 Little Bighorn
67 Long Pine
68 Loretto
69 Lovewell
70 Meadville
71 Medicine Creek
72 Medicine Lake
73 Merritt
74 Middle Fork
75 Moorhead
76 Mullen
77 Narrows
78 Nelson Buck
79 Newlan
80 Nilan
81 Norton
82 Oahe
83 Onion Flat
84 Oregon Basin
85 Pactola
86 Parks
87 Philip
88 Pioneer
89 Plum Creek
90 Pomme de Terre
91 Ponca Creek
92 Raft Lake
93 Red Gulch
94 Red Willow
95 Rockville
96 Rocky Ford
97 Rosedale
98 Ross Fork
99 Shadehill
100 Shell Creek
101 Sherman
102 Sheyenne
103 Smith
104 Snowy
105 Soral Creek
106 South Fork
107 Sparks
108 Stanford
109 Sun Butte
110 Sunlight
111 Sweetgrass
112 Thacher
113 Thief Creek
114 Tiber
115 Trenton
116 Triangle Park
117 Webster
118 Wells
119 Whitetail
120 Willow Park
121 Wilson
122 Wray
123 Yellowtail

Fig. 1.—Map of Missouri River Basin (heavy broken line) showing reservoir projects investigated under the Inter-Agency Salvage Program as of December 31, 1951. Numbers on the map correspond to those opposite the project names in the list at the right. Circles indicate archeological investigation, and squares indicate paleontological investigation. (Certain reservoir names have been changed since the compilation of the map accompanying the summary report for 1948. These are: Absaroka, formerly Mission; Beacon, formerly Bridger; Bernice, formerly Terry; Eldridge, formerly Taylor; Nelson Buck, formerly Beaver City; Parks, formerly Rock Creek; Sun Butte, formerly Wilson; and Trenton, formerly Culbertson.)

the three largest reservoirs in the Basin—Fort Randall, Garrison, and Oahe—was in progress and on the first two had been for several years. It was known that in the Oahe Reservoir alone virtually hundreds of sites, many exceedingly large and showing evidence of long or repeated occupancy, would be flooded. There in late prehistoric and early historic times dwelt a number of semisedentary agricultural groups, the remains of whose earth-lodge villages are among the most impressive sites in the northern United States. Notwithstanding the known presence of the many sites containing irreplaceable data which were certain to be lost in the near future, no excavation other than some small-scale test trenching and the emergency removal of a mound in the Fort Randall spillway area had been possible in previous years in any of the reservoirs on the main stem of the Missouri River. With a substantial increase in funds earmarked for excavation in fiscal year 1950, and presuming that similar funds would be available in subsequent years, the prospect of achieving a significant sampling of the doomed remains seemed much brighter.

The funds were not only greater than in the past, but they became available so late that there was little drain on them for fieldwork in calendar year 1949. Consequently a sizable sum was unexpended at the end of the fiscal year on June 30, 1950. The large carryover permitted the planning and execution of a large-scale program in the summer of 1950, despite the fact that the passage of the appropriation bill for fiscal year 1951 was delayed until late fall. A similar state of affairs existed on June 30, 1951. Such a situation is advantageous for a program of summer fieldwork which of necessity utilizes student labor, ordinarily available only if firm commitments for a full season's employment can be made. It is difficult if not impossible to program effectively for the final quarter of one fiscal year and the first quarter of the next without knowledge of what funds will be available, and when.

In 1950, the Missouri Basin Project had six archeological parties and one paleontological unit in the field. Of the former, one was a reconnaissance team and five were engaged primarily in excavation. An additional excavation unit, to investigate Indian sites in the Fort Randall Reservoir, was planned but could not be activated because of inability to obtain supervision for it. Accordingly, the only unit functioning in that reservoir was one which was committed to excavation mainly in sites of White origin. Again in 1951, there were a single archeological reconnaissance party and one paleontological

party, but seven excavation units were in the field. Of the latter, two were at sites of White origin and five at aboriginal sites.

For the first time, in 1950 and 1951, Federal funds were available for allocation to State-supported agencies, a number of which had assisted in the salvage task in earlier years entirely with their own resources. Under agreements with the National Park Service, agencies in Montana, North Dakota, South Dakota, Nebraska, Kansas, and Wyoming undertook investigations in threatened areas during both years. The Missouri Basin Project participated in this program by recommending sites for excavation, by providing the agencies with previously developed records relating to the sites, and by consultation in the field.

For the Missouri Basin Project, the expansion of the program in 1950 and 1951 meant an increase in staff as well as in transportation and other equipment and necessitated the acquisition of additional working and storage space. Additions to the archeological staff were made under both temporary indefinite and 6-month appointments, and the laboratory and clerical staff was also augmented.

PERSONNEL

There were numerous changes in personnel during the years 1950 and 1951, largely because of the increase in funds available and the expansion of River Basin Surveys activities. Of the professional staff, Archeologists Richard P. Wheeler, Robert B. Cumming, Jr., and Paul L. Cooper were on duty throughout this period. Cooper was designated acting field director in January 1950, after Dr. Waldo R. Wedel severed his connection with the Missouri Basin Project, and was appointed field director in October of that year. Cumming was in charge of the laboratory until October 1950, at which time he assumed the duties of a research archeologist. Franklin Fenenga was appointed as an archeologist at that time and supervised the laboratory activities until the beginning of the 1951 field season, when he assumed supervision of a survey party. Several archeologists were appointed on a 6-month basis to lead excavation or survey parties during the field season of 1950. They were G. Ellis Burcaw, Walter D. Enger, Jr., Donald J. Lehmer, and Robert L. Shalkop. All remained through or nearly through the terms of their appointments except Enger, who left the project late in September to return to school. Lehmer's appointment was extended to March 1951, to permit the writing of a report on the site whose excavation he completed in 1950, and he was reappointed in June to complete

the excavation of another site, begun in 1950. In April 1951 Donald D. Hartle was added to the staff as archeologist. Two archeologists were employed during this period to excavate sites of White provenience; Thomas R. Garth served on the staff from July of 1950 to May of 1951, at which time G. Hubert Smith was appointed. During the field season of 1951, Dr. Waldo R. Wedel, curator of archeology, U. S. National Museum, assumed supervision of one of the excavation parties from June to September, having been detailed to the River Basin Surveys for that purpose. Carl F. Miller was transferred from the River Basin Surveys staff in Washington, D. C., to lead a historic-sites party from July to September. The River Basin Surveys paleontologist, Dr. Theodore E. White, was on duty in the Missouri Basin May 15–November 15, 1950, and June 8–November 6, 1951.

The laboratory and office staff was considerably expanded in 1950 and 1951 to handle the processing of specimens and records and to perform other functions relating to the administration and technical activities of the organization. Among the full-time personnel, Dean E. Clark, in charge of specimen processing and protection, and George Metcalf and J. M. Shippee, field and laboratory assistants, were on duty throughout the period. A record clerk, Evelyn Bauman, and an administrative clerk, Lawrence L. Tomsyck, were added to the staff during the spring and summer of 1950. A second clerk-stenographer was also employed; Erma Jean Piest held this position from January to June 1950, when she resigned to leave the city, and was succeeded by Doris Winninger, who was appointed in July 1950. Ina May Reagan, clerk-stenographer (secretary) resigned at the end of March 1950, and was replaced by Clara Rehn. In the photographic department, Alva E. Nixon served throughout 1950 and until March 1951, when he went into the armed service, and it was not until early September that a full-time photographer, Nathaniel L. Dewell, was appointed to succeed him. In June 1951, La Verna Pendleton was transferred to the project from Washington, D. C., and during most of the remainder of that year supervised the routine laboratory activities.

Others employed in the office and laboratory on a temporary or part-time basis were Richard Holmes and Herbert Ball, draftsmen; Rose Lee Cohen, draftsman and illustrator; Halcyon Harris and Alice Rowe Bell, illustrators; and Lee Madison, laboratory helper.

Field personnel consisted largely of students from various parts of the country, although local labor was also utilized where available. In some instances, especially with larger parties, members of the per-

manent staff or others, usually students, with previous field experience were assigned as assistants to the party chiefs. J. M. Shippee assisted Wheeler during both field seasons, except for about two weeks with Fenenga in 1951. George Metcalf assisted Wheeler briefly in 1950 and Burcaw, Smith, and Hartle in 1950 and 1951, when he was not leading a reconnaissance team in the Garrison Reservoir area. Those employed as assistants during the 1950 field season were Donald D. Hartle, with Lehmer's party, and Harold McAllister, assisting Garth. Shalkop was accompanied during much of his reconnaissance by Gordon F. McKenzie. In 1951, Hartle was assisted by Lynd Esch, Smith by Byron Houseknecht, Wedel by William Bullard, Cumming by Harry Meyers, and Lehmer by Thomas Cummings and, briefly, by Raymond Price, who also worked for a short time with Miller. Edward Moorman, transferred from the River Basin Surveys in Texas, also assisted Wedel and led a reconnaissance team in the Oahe Reservoir area. Fenenga was assisted in his reconnaissance at different times by Homer Aschman, Frederick Hadleigh-West, and W. Raymond Wood. The paleontologist was accompanied in 1950 by Prentiss Shepherd and William Harrup and in 1951 by Harrup and William Easton.

The field parties varied in size with the nature of the work and the availability of labor. During the main part of the season, while students were generally available, the average number of workers with the excavation parties was 10 or 11, although there were sometimes as few as 6 or 7, and one party consisted of nearly 20 persons.

LABORATORY ACTIVITIES

As in previous years, the headquarters of the project were in the Laboratory of Anthropology, University of Nebraska, and throughout 1950 and part of 1951 all laboratory activities were carried on and much of the specimen storage was in space provided there. Some specimens and most of the project's equipment were stored in a building at the Lincoln Air Base during this period. Because of the rapidly increasing bulk of collections and equipment, the expansion of the staff, and the certainty that these storage facilities would soon become unavailable through reactivation of the Base, the first floor and basement of a store building a few blocks from the University campus were acquired by lease early in 1951, and equipment other than vehicles was immediately installed there. During the spring the specimens and processing activities were transferred to the new quarters. By the end of the year, the records and photographic departments

were functioning there, although the project office and a considerable part of the research activities continued in the Laboratory of Anthropology on the campus.

The increased intensity of field activities in 1950 and 1951 resulted in a much greater flow of specimens and records into the laboratory than in former years. This fact, together with an attempt to make the basic-site files more nearly complete than had previously been possible with limited personnel, drastically increased the workload. Thus, the number of reflex copies of field records made and incorporated in the files was almost 25,000. Most of these copies went into a control file and a file that is available for use in the field or for loan to qualified persons outside the organization.

During this period 153,600 specimens were cleaned, cataloged, and filed. Many of them required, in addition, such special attention as treatment with preservatives or minor repairs to prevent their deterioration in storage or in handling during analysis. Restoration was on a rather limited scale, partly because restorable pottery vessels or other objects were not often recovered in the excavations and partly because the time of qualified persons could not be spared for such work. A number of partial restorations were made, however, and two small vessels from mounds in the Fort Randall Reservoir and a pot from a site in the Boysen Reservoir were completely restored.

Animal bones recovered by excavation were identified by the paleontologist in the Lincoln laboratory, but bones identified generally as canine, fish, and bird were sent out for more specific identification by specialists, as were molluscan, vegetal, and White trade materials. Additions were made to the comparative collections of identified animal bones and molluscan remains previously begun. It is evident that the large mass of documented animal bone accumulated from various localities throughout the Missouri Basin and from different time periods constitutes a valuable body of data relative to the problem of faunal variations in time and space. This opinion is fortunately shared by the director of the University of Nebraska State Museum, Dr. C. Bertrand Schultz, and an agreement was reached that, when proposed new storage space became available, the Museum would accept those collections for permanent preservation. That the generally unexploited potential of such material for cultural interpretation may be considerable is suggested by a study made by the paleontologist on the staff of the animal bones found in certain sites from the standpoint of the butchering techniques employed by the inhabitants.

The much-expanded excavation program during this period resulted not only in a greatly increased quantity of specimens and

records to be processed for incorporation into the files but also, because of an attendant shift in emphasis to preparation of technical archeological reports, in the need for many photographs, maps, and profiles for illustrative use in the resultant publications. As persons qualified to perform this task were available, drawings of artifacts were made to supplement the photographic presentation. Approximately 1,100 such drawings, mostly of specimens from sites in Medicine Creek, Boysen, Angostura, and Oahe Reservoirs, were completed. Photographs of specimens for use in plates made up a larger proportion than previously of the more than 3,600 negatives processed and the 13,000 contact prints and 500 enlargements made. The approximately 1,000 color transparencies added to the files were, on the other hand, almost exclusively made in the field. In the drafting department, scores of maps, ground plans, profiles, and other drawings were made for inclusion in final reports, in addition to maps for appraisals and the inking and tracing of field drawings for preservation in the permanent record files.

The time of the archeologists in the laboratory was spent on appraisal statements or detailed archeological reports, depending upon the nature of their field activities. Because of the preponderance of excavation in the field program, by far the greater effort was expended on detailed analysis of specimens and writing of technical reports.

A number of mimeographed appraisals, containing recommendations for salvage in reservoir areas investigated, were transmitted to the National Park Service, while others were nearly ready for distribution as the period ended. Preliminary appraisals of Bixby Reservoir, South Dakota; Moorhead Reservoir, Montana and Wyoming; Rockyford Reservoir, South Dakota; and Onion Flat, Raft Lake, and Soral Creek Reservoirs, Wyoming, were distributed in January 1950. They had been completed in December 1949. Similar statements prepared and distributed during the period were on the Sun River Basin, Montana (including Nilan and Wilson Reservoirs); the Jefferson River Basin, Montana (Apex, Brenner, Clark Canyon, Kelley, and Landon Reservoirs); the Niobrara Basin, Nebraska (Colwell, Crookston, Eli, Kilgore, Long Pine, Meadville, Merritt, Ponca Creek, Sparks, and Thacher Reservoirs); Keyhole Reservoir, Wyoming; Lovewell Reservoir, Kansas; and Narrows Reservoir, Colorado. Preliminary appraisals of Alzada Reservoir, Wyoming, and Little Bighorn Reservoir, Montana, were nearly ready for duplication on December 31, 1951. In addition, a supplementary appraisal of the Moorhead Reservoir was written and transmitted.

A few brief articles based on the work of the Missouri Basin Project appeared in print during 1950 and 1951, but comprehensive reports of the results of fieldwork were either in press or still being prepared. During 1950, two papers prepared by former staff members were published. They were: "Birdshead Cave, a Stratified Site in Wind River Basin, Wyoming," by Wesley L. Bliss, in American Antiquity, vol. 15, No. 3, and "An Experiment in Relative Dating of Archeological Remains by Stream Terraces," by Jack T. Hughes, in Texas Archeological and Paleontological Society Bulletin, vol. 21. Also published during 1950 was the "Proceedings of the Sixth Plains Archeological Conference, 1948" (University of Utah Anthropological Papers No. 11), in which appeared a number of brief papers by members of the staff. A paper based on his excavations in the Oahe Dam area by Donald J. Lehmer, "Pottery Types from the Dodd Site, Oahe Reservoir, South Dakota," appeared in the September 1951 issue of the Plains Archeological Conference News Letter.

A few reports intended for publication were completed during the period but had not yet been printed by the end of 1951. They included a report on the Woodruff ossuary, prepared by Marvin F. Kivett (1953) on the basis of his excavation of the site in 1947; a paper synthesizing data from the Oahe Dam area, by Donald J. Lehmer (1952); two papers on paleontological subjects, one on the Boysen Reservoir area, the other on the Canyon Ferry area, by Theodore E. White (1952b, 1954); and a paper by White (1952a) on the butchering techniques of the inhabitants of two sites in the Angostura Reservoir area as reflected by the animal bones recovered.

The status of reports uncompleted at the end of 1951 varied greatly, depending partly on the schedule of excavations. The manuscript of the report on excavations at the Dodd and Philip Ranch sites, in the Oahe Dam vicinity, in 1950 and 1951 was all but complete (Lehmer, 1954), while in other instances, where the first excavation was accomplished during the summer of 1951, analysis had just begun. This was true of the Oldham site in the Fort Randall Reservoir, Fort Stevenson in the Garrison Reservoir, the Cheyenne River site in the Oahe Reservoir, and the various sites in the Keyhole Reservoir. In the case of the Rock Village, in the Garrison Reservoir, where excavation was begun in 1950, additional large-scale excavation was undertaken in 1951 to round out the picture of that extremely important site. Reporting of the work of 1950 in Tiber Reservoir was held in abeyance, since it was felt that additional work should be done in a significant buried site, 24TL26, which had been inadequately explored. Analysis of the results at Angostura Reservoir

in 1950 and previous years and at Boysen Reservoir in 1950 was well along, but it was believed that a more coherent presentation of archeology in the northwestern Plains would result from the incorporation into a single report of the description of these areas and of the Keyhole Reservoir, investigated in 1951. Similarly, although a summary report on the historic sites investigations in the Fort Randall Reservoir was completed and made available to the historians of the National Park Service, the compilation of a report for publication seemed undesirable pending more definitive results from excavation and documentary research.

Assistance was provided in the preparation of the report on the extensive excavations in the Medicine Creek Reservoir in 1948. Primary responsibility for the report on investigations accomplished under his supervision had been assumed by Marvin F. Kivett, who left the employ of the River Basin Surveys in 1949 and has since served as director of the Nebraska State Historical Society Museum. With the assistance of George Metcalf of the project staff, he made material progress on the report, although only a small proportion of his time was available for that activity.

Members of the staff participated in the meetings of the Eighth Plains Conference for Archeology, held in Lincoln in November 1950, and in the sessions of the Nebraska Academy of Sciences in 1950 and 1951. In addition, they made several appearances before interested groups to explain the work of the River Basin Surveys. Also in the field of interpretation of the program, occasional exhibits were developed and installed in the project headquarters or in such places as the observation building at the Oahe Dam. An exposition of the salvage program in the Medicine Creek Reservoir, utilizing an automatic slide projector, was developed jointly by the project and the University of Nebraska State Museum and installed in the latter institution.

The laboratory cooperated throughout 1950 and 1951 with the various State agencies participating in the salvage program by providing maps, photographs, and site records, as needed, as well as by making collections available on a loan basis.

FIELDWORK AND EXPLORATIONS

During each of the years 1950 and 1951, the field activities of the Missouri Basin Project included archeological reconnaissance, intensive excavation of selected sites, and paleontological exploration. The primary emphasis was on excavation, but throughout each sum-

mer a survey team ranged widely over the Missouri Basin inspecting previously unvisited reservoir areas and occasionally returning to selected areas for more intensive investigations. Figure 1 shows the locations of all reservoirs investigated as of December 31, 1951. In 1950, Robert L. Shalkop, accompanied most of the summer by Gordon F. McKenzie and for a brief time by Willy Stahl, was in the field from July 3 to November 22 reconnoitering reservoir sites in the western Plains. He made the initial reconnaissance of Nilan, Wilson, Landon, Apex, Kelley, Clark Canyon, and Brenner Reservoirs in Montana; Narrows Reservoir in Colorado; and Middle Fork and South Fork Reservoirs in Wyoming. Additional reconnaissance was accomplished at Keyhole Reservoir, Wyoming, previously surveyed in 1948; at Yellowtail Reservoir, Montana and Wyoming, where the most accessible areas were spot-checked in 1946; and at Moorhead Reservoir, Montana and Wyoming, inspected in 1949. The reconnaissance party in 1951 was led by Franklin Fenenga, who was assisted at various times by Homer Aschman, Frederick Hadleigh-West, J. M. Shippee, and W. Raymond Wood. This party visited Lovewell Reservoir in Kansas; Alzada, Badwater, Buffalo Bill, Bull Creek, Red Gulch, Smith, Triangle Park, and Willow Park Reservoirs in Montana; and Gavins Point Reservoir in Nebraska and South Dakota. It also extended previous surveys in Yellowtail Reservoir, Montana and Wyoming, and Sheyenne Reservoir, North Dakota. Additional survey was also accomplished each year in the reservoirs in which excavation parties were operating. In the autumn of 1950 Richard P. Wheeler and J. M. Shippee surveyed 10 reservoirs in the Niobrara Basin, Nebraska, and Robert B. Cumming, Jr., and Shippee extended the survey of the Lower Platte Basin, Nebraska.

Excavation units in 1950 were as follows: At Rock Village (32ME15), Garrison Reservoir, under the supervision of G. Ellis Burcaw, assisted by George Metcalf, who also led a survey team during part of the field season; at the Dodd (39ST30) and Philip Ranch (39ST14) sites, Oahe Reservoir, under the supervision of Donald J. Lehmer, assisted by Donald D. Hartle; at various historic sites in the Fort Randall Reservoir area, under the supervision of Thomas R. Garth, assisted by Harold McAllister; at various sites in the Angostura and Boysen Reservoirs, under the supervision of Richard P. Wheeler, assisted by J. M. Shippee and briefly by George Metcalf; and at various sites in the Tiber Reservoir, under the supervision of Walter D. Enger, Jr.

In 1951, excavation units operated as follows: Fort Stevenson (32ML1), Garrison Reservoir, Archeologist G. Hubert Smith, as-

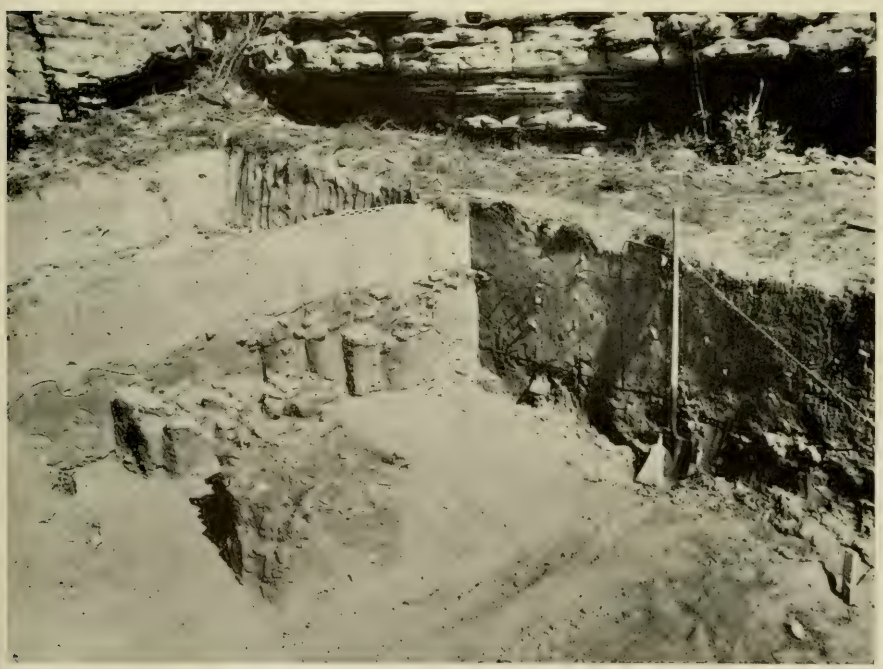
sisted by Byron Houseknecht; Rock Village (32ME15) and Star Village (32ME16), Garrison Reservoir, Archeologist Donald D. Hartle, assisted by Lynd Esch; Philip Ranch site (39ST14), Oahe Reservoir, Archeologist Donald J. Lehmer, assisted by Thomas Cummings; Cheyenne River site (39ST1), Oahe Reservoir, Archeologist Waldo R. Wedel, assisted by William Bullard and Edward Moorman, who led a survey team in the Oahe Reservoir area; Oldham (39CH7) and Hitchell (39CH45) sites, Fort Randall Reservoir, Archeologist Robert B. Cumming, Jr., assisted by Harry Meyers; Fort Lookout (39LM57), Fort Randall Reservoir, Archeologist Carl F. Miller; and various sites in the Keyhole Reservoir, Archeologist Richard P. Wheeler, assisted by J. M. Shippee. During this summer, George Metcalf carried on reconnaissance in the Garrison Reservoir area and also assisted Hartle and Smith on occasion.

In 1950, Paleontologist Theodore E. White, assisted during most of the season by Prentiss Shepherd and William Harrup, investigated the paleontological situation in Bonny Reservoir, Colorado; Angostura, Fort Randall, and Oahe Reservoirs, South Dakota; Garrison Reservoir, North Dakota; Canyon Ferry Reservoir, Montana; and Boysen and Anchor Reservoirs, Wyoming. He also made a trip to Ainsworth, Nebr., to obtain information relative to the paleontological resources of suggested reservoir sites in the Niobrara Basin, Nebraska. In 1951, accompanied by William Harrup and William Easton, he revisited Canyon Ferry, Garrison, Oahe, and Fort Randall Reservoirs, and also spent some time in the Tiber Reservoir, on the Marias River in Montana.

COLORADO

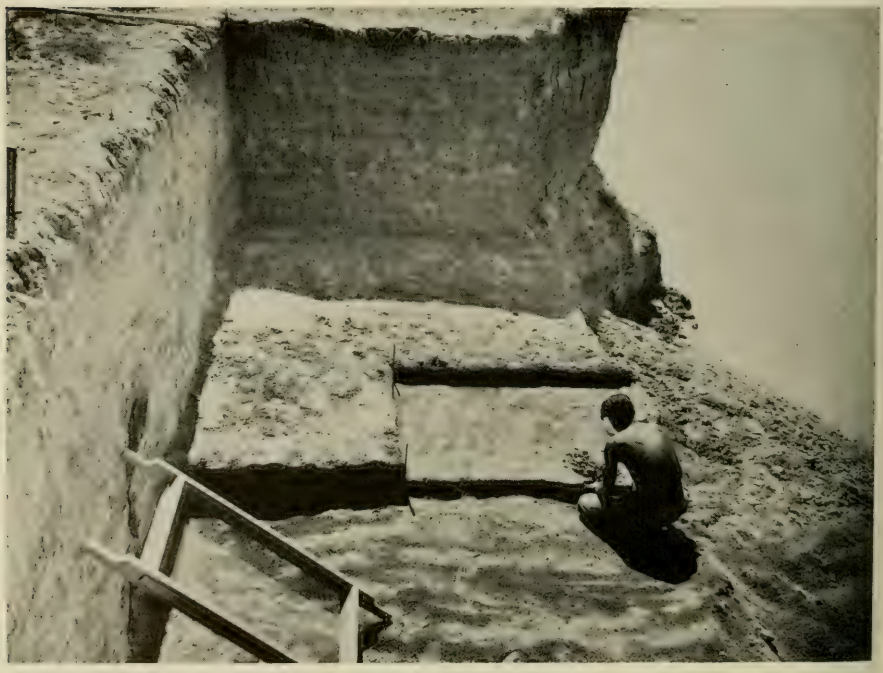
Narrows Reservoir site.—Archeological investigations in Colorado by the River Basin Surveys were restricted to a reconnaissance of about two weeks in November 1950 of the area to be affected by the proposed Narrows Reservoir, in Morgan County. The dam site is on the South Platte River 7 miles west of Fort Morgan, and the reservoir will extend about 12 miles above this point. In this area the river flows in a broad, shallow valley flanked by a gently rolling plain covered by sagebrush and sparse short grasses. Only four sites, three of which are above the maximum pool level, were found in the course of an exhaustive search. Since all of them appear to be represented by superficial, scanty deposits, it appears that the reservoir will have no adverse effect on archeological resources of any consequence.

a, Excavations in a shallow camp site, 48FR23, Boysen Reservoir.



b, View of excavations in stratified site, 48CK204, Keyhole Reservoir, showing numerous stone hearths.

a, View across Marias River toward a buried pottery-bearing site, 24TL26, Tiber Reservoir, Mont. Two excavation units are near center of photograph.



b. Excavation in lower, pottery-bearing occupational level at site 24TL26, Tiber Reservoir, Mont. Marias River at right.

Chipped-stone artifacts from site 24TL26, Tiber Reservoir.

Bone and antler artifacts from site 24TL26, Tiber Reservoir.

KANSAS

Archeological work in Kansas by the River Basin Surveys during this 2-year period was confined to reconnaissance of the site of the proposed Lovewell Reservoir, one of the few proposed or potential water-control projects in that State that had not been previously investigated, at least briefly.

Lovewell Reservoir site.—The Lovewell Reservoir, a Bureau of Reclamation project, will extend approximately 6 miles upstream from an earth-fill dam which will span White Rock Creek some 15 miles above the point at which this intermittent stream enters the Republican River. The valley here is fairly broad and is flanked on the north by gentle slopes to the upland and on the south by an escarpment from which steep slopes descend to the valley floor. Dense stands of deciduous trees line the banks of the creek and its tributaries, and some timber grows on the south slopes.

Two trips were made to the area during the summer of 1951—one of five days in June, the other of four days in September—during which all the terrain to be affected by the reservoir was examined. Seven sites attributable to aboriginal activity were observed within and near the limits of the future pool. Two of these (14JW204 and 207) are mounds; the remainder are occupational sites. With one exception (14JW202), where a few flint objects were found among the debris of a modern homestead and may owe their presence to the activities of a collector, the occupational sites (14JW1, 2, 201, and 205) yielded pottery fragments, seemingly representative of a single complex. In one instance, however, concentration of sherds at one end of the site and of stone artifacts at the other end suggests the possibility that two components are present. Minor excavations were undertaken in one of the sites (14JW1) by the Nebraska State Historical Society in 1937, but the main results of that extremely limited work consist of pointing up the importance of the site rather than of solving the problems to which it is relevant. Wedel has called attention to the fact that the pottery resembles that from sites attributed to the Oneota aspect (Hill and Wedel, 1936, pp. 40, 67; Wedel, 1935, pp. 227, 229; 1940, p. 337), and little can be added to his observation until this or a closely related site has been more intensively investigated. Judging from the relatively small collection from the Lovewell Reservoir area, there are appreciable differences between the ceramics there and those from the Leary site, the geographically closest site attributed to the Oneota aspect which has been described in print (Hill and Wedel, 1936). These include the predominant inclusion of

grit as tempering; the presence of simple stamping on the bodies; and, in the matter of decoration, a greater frequency of impressions on the inner rim surface and a lesser frequency of modification of the lip proper at 14JW1. Despite these differences in detail, however, the general character of the ceramics and the presence of certain other traits in the limited collection from this site seem to support Wedel's suggestion (1940, p. 337) of a fairly close relationship to manifestations elsewhere which are identifiable as Oneota. The clustering of sites apparently referable to this significant but undefined complex presents the opportunity for its comprehensive characterization and the determination of its relationship to identified Oneota sites. The presence near one of the mounds of sherds resembling those found on the occupational sites inspires the hope that the burial complex of this cultural entity may also be ascertained, although these structures may relate to some other manifestation.

MONTANA AND WYOMING

Archeological investigations were carried on by the River Basin Surveys in 23 reservoir areas in Montana and Wyoming during 1950 and 1951. Nine of these reservoirs are in Montana, 12 are in Wyoming, and two straddle the Montana-Wyoming State line. In 1950 one excavation party was in the Tiber Reservoir on the Marias River, Mont., throughout the summer, while another spent the period July 20–September 24 in Boysen Reservoir on the Bighorn River, in Wyoming. A 2-man survey party reconnoitered seven reservoir sites (Apex, Brenner, Clark Canyon, Kelley, Landon, Nilan, and Wilson) in Montana, three reservoir sites (Keyhole, Middle Fork, and South Fork) in Wyoming, and two reservoir sites (Yellowtail and Moorhead) on the line between these two States. In 1951 the only excavation project in this region was at Keyhole Reservoir, on the Belle Fourche River, northeastern Wyoming, where the party devoted the full field season to the investigation of several sites. A 2-man survey party inspected the Little Bighorn Reservoir area in Montana and the Alzada, Badwater, Buffalo Bill, Bull Creek, Red Gulch, Smith, Triangle Park, and Willow Park Reservoirs in Wyoming; this party also completed the reconnaissance, mainly by boat, of the Yellowtail Reservoir on the Montana-Wyoming line.

Alzada Reservoir site.—The site of the proposed Alzada Dam is on the Little Missouri River, in Crook County, Wyo., approximately 6 miles south of the Montana-Wyoming line. The dam, an earth-fill structure, will create a 2-armed reservoir; the valley of the Little

Missouri River proper will have slack water for a distance of 6 miles, while another arm will extend up the North Fork of the Little Missouri to a point about 5 miles above the dam site. Both the Little Missouri River and the North Fork flow here through broad, alluvial valleys, but recent stream cutting is indicated by deeply incised stream beds. The region is relatively dry, and the vegetation on the shale-derived soils is sparse.

The reconnaissance of about 1½ weeks in August 1951 covered the entire reservoir area and resulted in the location of 12 archeological sites, 9 or possibly 10 of which will be destroyed by the reservoir. Most of the sites appear to be relatively unpromising, but three of those which will be flooded yield rather abundant cultural materials in deposits of some depth and warrant more intensive investigation. At two of these sites (48CK229 and 231) numerous hearths were observed, while at the third (48CK227), a deep camp site, materials were found which suggest several occupations over a considerable period of time. Among the artifacts collected from this last site is the base of a point of Angostura type, found elsewhere in contexts known to have an age of several millennia. It was with stemmed and notched points characteristic of much more recent complexes. Another site (48CK221), so situated that it may not be destroyed, yielded sherds of a pottery vessel, simple-stamped and with a thickened rim decorated with diagonal cord impressions, which appears to be related to wares found on the Missouri River to the east.

The results of the survey indicate that three of the sites to be lost in the Alzada Reservoir can be expected to yield significant data for filling in the cultural picture of this little-known area.

Apex Reservoir site.—The proposed dam site is on Birch Creek, a tributary of the Big Hole River, in Beaverhead County, Mont. The 1-day survey in July 1950 revealed no archeological sites in the narrow valley, almost 6,000 feet above sea level, which will be occupied by the small reservoir. The presence of heavy silt deposits on the floor of the valley, reportedly the result primarily of flooding in the last decade of the nineteenth century, suggests the possibility that construction activities will uncover remains of archeological significance.

Badwater Reservoir site.—The Badwater Dam is proposed for construction on Snyder Draw, an intermittent stream in Fremont County, Wyo. The reservoir site lies in an arid badland region with scanty vegetation at the southern edge of the Bighorn Mountains. The immediate area is unknown archeologically, and the survey accomplished little to alleviate this situation, for no concentrations of

cultural material were found that appear to require further attention. The fact that the few scrapers and other stone artifacts found were scattered thinly over the reservoir site suggests that camp sites or other sites of intensive cultural activity are absent. The single report received by the survey party of archeological remains in the vicinity was of an aboriginal steatite quarry in the mountains a few miles north of the reservoir location.

Boysen Reservoir site.—Boysen Dam, one of the earlier projects begun under the Missouri Basin water resources development program, will create a reservoir about 20 miles long in the Shoshone Basin just above the point at which the Bighorn River enters the Wind River Canyon to make its way between the Owl Creek and Bridger Mountains. The dam was closed and water storage began in October 1951. Timber in the area is restricted to the slopes of the mountains and to the banks of the streams. The region supports sagebrush and greasewood rather than grass as its predominant vegetation, in which respect it resembles the Great Basin to the west rather than the Plains to the east. Physiographically it is continuous with the Great Plains and is separated from the Great Basin by an unusually low divide. Sand-dune areas are common in the river valley, and many of the occupational sites are found among these surface features. Brief reconnaissance in 1946 and additional survey of three weeks in 1947 had resulted in the recording of 75 sites in and near the reservoir area. These consist of camp sites, often marked by clusters of fire-blackened stones, "tipi-ring" sites, petroglyphs, burials, and rock shelters. During the latter part of the 1947 season a stratified deposit in a cave, 48FR54 (Birdshead Cave), near the base of the Owl Creek Mountains was excavated. Although the artifact sample recovered is small, cultural materials were found in all levels and seem to reflect changes through time. It was hoped that through additional investigation in the reservoir area the correlation of more prolific single-component sites with individual strata in the cave would become possible, thus establishing a sequence of more or less exhaustively defined complexes for the region.

In 1950 parties from both the Missouri Basin Project and the University of Wyoming investigated numerous sites in the reservoir area, the former during only the later part of the summer. The activities of the River Basin Surveys included search for new sites, surface reexamination of previously recorded sites, small-scale test trenching of some sites and more extensive excavation of a few, and recording of numerous petroglyphs. Eleven camp sites, one rock shelter, one workshop, four petroglyph sites, and a burial, all previ-

ously unrecorded, were found. Test trenches were excavated in four open camps, in a rock shelter, and at the bases of the exposures at three petroglyph sites. At one petroglyph site (48FR12) charcoal, burned areas, and animal bones were found to a depth of 3 feet, but no artifacts were recovered; no indubitable evidence of occupation was found in the tests of the other two petroglyph sites.

A month was devoted to rather extensive excavation of a large, newly discovered camp site, 48FR84, the Wise site. A large stone-paved hearth, 5 feet in diameter, and many small unprepared and stone hearths were exposed in the site, which proved to be a shallow one. The fairly large artifact sample recovered included rather numerous projectile points, predominantly triangular and side-notched with concave or notched bases; miscellaneous chipped-stone artifacts; full-grooved mauls; and pottery sherds, many of which belonged to a single restorable vessel. Manos and metates appear to be largely if not entirely lacking in the site. The sherds are mostly gray and are fairly heavily tempered with angular stone fragments. The restored vessel has a subconoidal base and is constricted only moderately above the rounded shoulder. There is a very slight outward curve just below the rounded lip. Both surfaces are unevenly smoothed and there is no decoration.

At site 48FR23 (pl. 1, *a*), on the right side of Tuff Creek, an eastern tributary of the Bighorn River, artifacts were abundant on the surface and in the trenches excavated by the party. Numerous hearths—areas of burned earth, clusters of fire-cracked rocks, and basins lined and filled with rocks—were uncovered but, as at 48FR84, no evidence of structures was observed. The artifact complex is distinct from that of 48FR84 and suggests a markedly different economy and probably an appreciable difference in time. Perhaps the most obvious difference is the presence in great abundance of manos and metate fragments, which were sometimes found in hearths with other, unworked stones. Among the chipped-stone artifacts projectile points, predominantly corner-notched, are rather numerous, as are scrapers of various kinds except end scrapers, which are rare. Also of rather common occurrence are choppers, averaging about fist size and usually made by minimum percussion flaking of fragments of quartzite cobbles.

The results of the work at 48FR23 and 48FR84, together with materials from other sites in the reservoir area, suggest that at least two complexes, characterized by different economies and probably temporally separated, are represented. Judged from the evidence of Birdshead Cave and other evidence pertaining to the sequence of

artifact types in the western Plains, the complex—or predominant complex if the site has been occupied more than once—at 48FR23 is probably the earlier. The abundance of manos and metates suggests a heavy reliance on gathering, perhaps in contrast to a primarily hunting orientation on the part of the inhabitants of 48FR84. Laboratory analysis of the collections from these two sites and from others in the area may permit the definition of still other complexes and go a long way toward outlining the history of the exploitation of this little-known area over what will undoubtedly prove to be many centuries of occupation.

Brenner Reservoir site.—This reservoir, to be created by an earth-fill dam on Horse Prairie Creek in Beaverhead County, Mont., will flood approximately 750 acres. Five small surface camp sites, yielding scattered flint artifacts, were found in the area during the 2-day reconnaissance in July 1950. The yield of artifacts from all the sites was very scanty, and the evidence indicates that in every case the cultural deposits are thin and do not require further attention.

Buffalo Bill Reservoir site.—This project, on the Shoshone River in Park County, Wyo., consists of an enlargement of an existing reservoir. It was visited by the reconnaissance party during a single day in June 1951. Examination of the terrain that will be flooded by the increased water storage failed to reveal any evidence of aboriginal occupation.

Bull Creek Reservoir site.—The site of the dam that will create this reservoir lies about 5 miles southwest of Buffalo, Wyo., on Bull Creek, an intermittent tributary of Clear Creek in the Powder River drainage. It lies in the eastern foothills of the Bighorn Mountains, and vegetationally it is characterized by sparse short grasses and a lack of trees. Five sites of archeological interest were observed by the reconnaissance party during two inspections of the few-hundred-acre area in June 1951. Two of these consist of numerous stone circles—approximately 25 circles in one site (48JO201), approximately 100 in the other (48JO204)—and yielded chipped-stone artifacts, and another is a series of small stone cairns which may cover burials. The two remaining sites are a single isolated stone circle and a small camp. In view of our lack of knowledge relative to the prehistory of this vicinity and of "tipi-ring" sites in general, some further investigation of at least two of these sites would be desirable.

Clark Canyon Reservoir site.—The dam site is on the Beaverhead River just below the junction of Red Rock and Horse Prairie Creeks, in Beaverhead County, Mont., approximately 18 miles southwest of the town of Dillon. The reservoir will cover an area of approxi-

mately 5,000 acres, much of which is a relatively wide, flat valley bordered by rugged, sagebrush-covered hills. Four camp sites, marked by a thin scattering of stone artifacts and chips on the surface, appear to be the result of brief occupations. None of them is believed to contain deposits of any depth. Several sites, apparently of similar nature, are known to exist along the Beaverhead River below the dam site. Among the artifacts and flakes from these sites, as from some of the sites in the reservoir area, obsidian occurs frequently.

Kelley Reservoir site.—The proposed reservoir will be on Rattlesnake Creek, a tributary of the Beaverhead River, in Beaverhead County, Mont. The flat valley floor is bordered by steep, pine-clad slopes, and locations suitable for occupational sites are few. No locations of archeological interest were found during the 1-day reconnaissance in July 1950, and local residents reported having found no aboriginal materials in the immediate vicinity.

Keyhole Reservoir site.—Keyhole Dam, under construction in 1951, is on the Belle Fourche River, in Crook County, Wyo. The reservoir will occupy the main valley for an airline distance of approximately 11 miles and will drown the lower reaches of six intermittent tributaries. Two markedly different types of terrain are found along this stretch of the river. The upper part of the reservoir is flanked by extensively eroded buttes and hills which support short grasses and sagebrush, while the topography adjoining the river nearer the dam is characterized by rugged hills and ridges covered by pines and junipers.

Twenty-nine sites were recorded during a 5-day examination of the more accessible and promising parts of the area in September 1948. During the period October 7–November 1, 1950, a 2-man reconnaissance party led by Robert L. Shalkop re-examined previously recorded sites and discovered 17 additional ones in the course of a rather comprehensive coverage of the area. A party under the supervision of Richard P. Wheeler was in the Keyhole Reservoir area from June 25 to September 25, 1951, primarily for the purpose of excavating the most significant sites. During this season 13 new sites were found. Most of the 59 recorded sites are open camps, but two stratified rock shelters, three workshops, and a quarry site are among the total. Six sites were more or less extensively excavated by the Wheeler party; these included the two known rock shelters and four open camp sites.

At 48CK47 (Miller Creek site), an extensive camp on a low terrace in the upper part of the reservoir, an unprepared hearth and a stone hearth were uncovered in a shallow occupational deposit. The

artifacts recovered include side-notched and corner-notched points, a milling slab, a perforated silver concha, and a small sample of smooth and simple-stamped sherds. Among the last are rims which resemble some from site 39FA83, in the Angostura Reservoir area, in having a slightly S-shaped profile and bearing horizontal incised lines on their exterior surfaces; these specimens differ, however, in having oblique incised lines on the lip. The presence of corner-notched points, on the one hand, and of side-notched points and simple-stamped pottery, on the other, suggests more than one occupation, each of which was evidently brief.

Site 48CK46, an open camp site on a pine-covered ridge bordering Deer Creek, proved to contain numerous stone hearths, basin- or bowl-shaped, and stone-filled roasting pits sometimes more than 2 feet deep. The artifact collection includes corner-notched projectile points and lacks pottery.

Site 48CK13 appears on typological grounds to have been occupied two or three times, although no stratigraphic separation was observable. Hearths uncovered include both unprepared and rock-lined, basin-shaped types. The projectile points are of three distinct kinds—lanceolate with basal notches, side-notched and basally notched, and corner-notched. The lanceolate points from the site are like those recovered in the two rock shelters excavated by Wheeler, and discussed below, and by a University of Wyoming party in the lower level of a very productive open camp site, 48CK7, on the right side of the Belle Fourche River below the mouth of Wind Creek. These points have been described as a type under the name "McKean Lanceolate" by Wheeler (Wheeler, 1952).

Rather small-scale excavations were undertaken at site 48FR209, on a high terrace south of the Belle Fourche River and east of Wind Creek. In the vicinity of a single unprepared hearth and a nearby post hole were found several stone artifacts, including corner-notched, concave-based points, large pointed oval blades, and scrapers, and two antler fragments which may have been flakers. A very small camp site seems to be indicated by the evidence.

Perhaps the most significant excavations by the River Basin Surveys party were in two rock shelters, 48CK4 (Belle Rockshelter) and 48CK204 (Mule Creek site), both within about a mile of the dam site. Intensive excavation revealed that points of the McKean type were present in the lower levels of both and that later forms characterized the overlying deposits. In both sites the stratigraphic situation was rather obscure throughout most of the relatively shallow deposits, but in each instance evidence was found to establish the pri-

ority of the McKean point. At 48CK204 (pl. 1, *b*), for example, three of these points and a stemmed and basally notched point were found with a stone hearth just above bedrock, while above an overlying rock fall, upon which lay several later stone hearths, was a side-notched triangular point. At 48CK4, too, triangular points were recovered from the deposits which overlay those containing points of lanceolate form. An additional element was present in the later deposits of 48CK204. A number of cord-marked sherds were recovered. They include a fragment of rim with one of what was probably a series of somewhat vertically elongated punctations creating nodes on the interior of the vessel a short distance below the lip. This pottery is probably assignable to some Woodland variant with relationships primarily to the east. Charcoal was collected from the various levels of these two sites, and samples from hearths in the lower levels of both were submitted for radiocarbon dating. They yielded a date of 2790±350 years ago for the lower level of 48CK204 and an average date of 1646±200 for the corresponding horizon in 48CK4. It would appear that these dates must be regarded with some skepticism. Since the association of the charcoal with an apparently identical complex at the two sites seems certain, the time difference of more than a thousand years is not archeologically acceptable. Furthermore, either figure seems somewhat low in the light of the stratigraphic positions of specimens resembling the McKean point found elsewhere, as at Signal Butte, western Nebraska, and Pictograph Cave, near Billings, Mont.

Landon Reservoir site.—The Landon Dam site is on Blacktail Deer Creek, about 15 miles southeast of Dillon, in Beaverhead County, Mont. The site of the reservoir, which will be approximately 2 miles long, includes an extensive, fairly level terrace which would seem to be well adapted to aboriginal occupation, but only four small, thinly occupied camp sites were discovered. Only one or two artifacts were collected from each of the sites. More numerous and apparently more prolific sites are found along the creek just below the reservoir area, and collections of artifacts from nearby sites are in the possession of local residents.

Little Bighorn Reservoir site.—This reservoir will flood approximately three miles of the Little Bighorn River in Big Horn County, Mont., at a point about 40 miles northwest of Sheridan, Wyo. It will be located in a region of low, rolling hills just below the canyon of the Bighorn Mountains through which the river flows. The hills are scantily covered with short grasses, while the valley floor supports a heavy growth of small trees, and the general area is one which

would be favorable for peoples with a hunting and gathering economy. Bad weather limited the July 1951 reconnaissance to less than two days, and it seems certain that further search of the terrain will reveal additional archeological remains. Of the three sites found during the incomplete survey, two appear to be of exceptional importance; the third is a small, briefly inhabited camp site. Both of the more significant sites are large, contain hearths, and yield cultural materials in quantities which betoken occupation of some intensity and duration. The basal portion of a Plainview point and two end scrapers like some which have been found elsewhere in old contexts were collected from the surface of one (24BH202). The point fragments found at the second site (24BH201) suggest a later complex.

Middle Fork Reservoir site.[1]—The proposed dam, on the Middle Fork of the Powder River approximately 12 miles southwest of Kaycee in Johnson County, Wyo., will form a reservoir about 6 miles long. The valley to be flooded is in general broad and flat-floored and is bordered by sheer sandstone cliffs or steep-sided bluffs. A 9-day reconnaissance in August and September 1950 covered the entire reservoir area, and since the vegetation cover was not heavy it is believed that all exposed sites were found. Sixteen locations of archeological interest were recorded; 11 are camp sites, 1 is a "tipi ring," 2 are groups of petroglyphs, 1 is a rock shelter which contains evidence of occupation, and 1 is a camp site with adjacent petroglyphs. Several of the camp sites yielded rather abundant surface collections of stonework, and some will probably prove to have deposits of some depth. Projectile points are exceedingly rare among the materials recovered by the reconnaissance party, but a local collection, reported to be exclusively from Johnson County, contains large numbers of points of several types characteristic of different complexes and time levels. Among these are specimens which appear to be representative of the Plainview and other early types and, at the other end of the time scale, specimens of iron and copper. Seven sites in this reservoir have been recommended for further investigation. Four (48JO2, 11, 12, and 15) are camp sites, two (48JO4 and 6) are petroglyphs, and one (48JO3) is an occupied rock shelter with petroglyphs.

Moorhead Reservoir site.—The Moorhead Reservoir, to be created by a dam situated near Moorhead, Mont., will flood approximately 32 miles of the Powder River in Powder River County, Mont., and Campbell and Sheridan Counties, Wyo. In 1949, five days were spent

[1] In 1952 the name of this project was changed to Hole-in-the-Wall Reservoir.

in careful examination of the lower end of the reservoir area and in spot checks along the right side of the river (Wedel, 1953b, pp. 84-85). In 1950 the reconnaissance of the area to be inundated was completed during a period of approximately a month which was punctuated by bad weather. In all, 18 locations of archeological significance were recorded within or at the border of the future pool. Three of these are sites composed of from one to three "tipi rings," and the remainder are camp sites varying in size and in the abundance of cultural materials found on the surface. All the sites appear to be nonceramic. Cultural debris was lacking on the surface of the "tipi-ring" sites, while the other sites yielded lithic remains including scrapers, knives, flakes, cores, and—rarely—fragmentary projectile points, mainly stemmed and of medium size. A few fragments of obsidian occur in the collections. Locally owned collections, reputedly from the vicinity of the reservoir area, include projectile points which appear to relate to various time levels, from fairly early to the historic period. Several bison kills are reported from the region and artifacts from some of them are in the local collections. Most of the objects seem to refer to other than very ancient horizons, but collections reportedly made from the surface include occasional specimens which suggest early contexts.

Two of the camp sites in the reservoir, 24PR8 and 48CA6, appear to have deposits of some depth and have been recommended for excavation.

Nilan Reservoir site.—As proposed, this reservoir will be an enlargement of a small existing natural body of water, Beale Lake. It is in a rolling section of the high plains within view of the continental divide, a few miles to the west. Only two locations of archeological interest, a rock cairn and a "tipi ring," were found during the reconnaissance in July 1950, and they were both above the full pool line. No artifacts were recovered from either.

Red Gulch Reservoir site.—The dam, as proposed, will be on Red Gulch, an intermittent tributary of Shell Creek, a stream which enters the Bighorn River just below Greybull, Wyo. The very small lake, less than 450 acres in extent at flood level, will be entirely within a badland area and over a valley floor which now supports exceedingly scanty vegetation. The brief but comprehensive reconnaissance in June 1951 revealed that the surface of the entire reservoir area bears the litter of flint-working activities and possibly of camping. In addition, cultural deposits were observed in cut banks at depths of as much as 3 feet beneath the surface. Few artifacts were found by

the reconnaissance party, but it is presumed that the previous activities of collectors is largely responsible for this fact.

Smith Reservoir site.—An attempt was made in June 1951 to survey the proposed reservoir area, but unfavorable weather prevented extensive examination of the surface. No sites were found and it seems unlikely that this small reservoir, at an elevation of over 8,000 feet above sea level on the North Fork of the Powder River, Wyo., will destroy archeological remains of consequence.

South Fork Reservoir site.—As proposed, the South Fork Dam will form a lake less than 2 miles long on the South Fork of the Tongue River in Sheridan County, Wyo. Situated on a high plateau in the Bighorn Mountains, at an elevation in excess of 7,500 feet, the area to be inundated consists largely of rather steep, densely wooded slopes. No locations of archeological interest were observed, and no information was obtained to suggest that archeological materials had ever been found in the immediate vicinity.

Sun Butte Reservoir site.[2]—The site of the proposed Sun Butte Dam is just above the existing Gibson Reservoir on the North Fork of the North Fork of the Sun River approximately 24 miles northwest of Augusta, Mont. The terrain in which the 5- or 6-mile-long lake will lie consists of pine-clad slopes on the right side of the stream and grassy terraces flanked by forested hills on the left side. Only two sites reflecting aboriginal activity were recorded during the brief but comprehensive reconnaissance in July 1950. Neither of the sites—one a small camp site yielding a small triangular point of obsidian, charcoal, and bones, the other a petroglyph locality—will be flooded.

Tiber Reservoir site.—The Tiber Dam, situated about 45 miles above the mouth of the Marias River, a major tributary of the Missouri in northern Montana, will form a reservoir about 26 miles long. The area in question, although unsuitable for native agriculture, once possessed considerable food resources for the aboriginal population, as shown by Meriwether Lewis's observation of abundant game during his exploration of the Marias River in 1806. The Blackfoot and Gros Ventres hunted the territory in historic times.

The comprehensive reconnaissance of the reservoir area in 1946 and 1947 (Wedel, 1948, pp. 34-36) revealed 53 locations of archeological significance, including sites of "tipi rings" and of hearths, both surface and buried. In 1950 a party under the supervision of Walter D. Enger, Jr., spent the period from June 9 to September 20

[2] Formerly Wilson Reservoir.

in more or less intensive excavation of five sites, all lying in the lower half of the reservoir area and so situated that they will be destroyed soon after the beginning of impoundment. In most instances the yield of artifacts was lamentably scanty, but one site of particular interest, insufficiently investigated late in the field season because of earlier high water in the Marias River, appears to be unusually rich and is worthy of additional excavation.

Site 24LT2 was first observed in 1946, when hearths were found exposed for a distance of about 200 yards along the left bank of the Marias River. In 1950, six trenches, 10 to 40 feet long and of various widths, were excavated at intervals along the cut bank where exposures suggested concentrations of cultural materials. Hearths, usually simple open fireplaces, were found in five of these trenches at depths of approximately 1 to 4 feet in banded alluvial deposits. One stone-lined hearth, partially destroyed by stream cutting, lay at a depth of 1 foot beneath the surface. With one exception, the cultural material was found in a single stratum about 6 inches thick overlain by 6 inches to 1 foot of sterile earth. In one trench, however, a hearth was uncovered at a depth of about 4 feet, and small quantities of bone were found above this feature to a point 1½ feet beneath the surface. Part of a small end scraper with chipping only on the working end comprises the entire artifact yield from the excavations. The balance of the specimens consists of a few flakes of chalcedony and jasper, fragments of water-worn stone, two small fragments of ocher, and bones of bison, cottontail, deer, and sharp-tailed grouse.

Site 24LT3, revealed by the presence of hearths and charcoal layers in the river bank, lies about one-third mile upstream from 24LT2, at the foot of a steep-sided hill. Two trenches, 10 feet and 35 feet long, respectively, were excavated to uncover the exposed cultural strata. The smaller excavation revealed three dark zones of varying thicknesses containing charcoal at approximate depths of 2 feet, 4½ feet, and 7½ feet. Indubitable evidence of human occupation was confined to the lowest level, which contained a stone-lined hearth, small quantities of bison bones and stone, and rare chalcedony flakes. It seems probable that the considerable depth of this deposit is largely the result of slope wash from the contiguous hill, and that the higher charcoal-bearing lenses may be secondary deposits. The significant features in the larger trench consisted of shallow, basin-shaped pits surrounded by relatively thin deposits of burned earth and charcoal of limited extent. These features, lying beneath overburden of 3 or 3½ feet, contained bone and stone refuse, but no artifacts.

A brief period was devoted to the testing of site 24TL3, where

four shallow hearths were uncovered. The excavations yielded only a few chips of chalcedony, chert, and quartzite; a fair quantity of concretions, apparently from the local shales, and of other stones; and a small number of bone fragments, some of which show the effects of fire. None of these materials shows convincing evidence of intentional modification or of use as tools, although a minute smooth-surfaced, grit-tempered sherd, a small side-notched triangular point of jasper, and a fragment of a chert blade were collected from the surface.

At site 24TL6, consisting of "tipi rings" and mounds of stone suspected of covering burials, trenches carried through two of the latter features uncovered a layer of charcoal nearly a foot beneath one of them but no evidence of disturbance beneath the other. The significance of this charcoal lens is in doubt, since no other evidence of human activity was observed. The only artifact from the site is a fragment of a chipped implement, probably a drill, collected from the surface by a reconnaissance party in 1946.

By far the most illuminating site investigated in the Tiber Reservoir was unavailable for excavation until late in the summer because of the earlier high level of the Marias River. Approximately a month, partly with a considerably reduced crew, was spent on this extensive occupational area, site 24TL26 (pl. 2). Exposed for a distance of more than a thousand feet in a terrace just below the point at which the river bends sharply away from the high valley wall, a rich cultural deposit lies beneath alluvial overburden varying from 7 to 12 feet in thickness. The differences in depth appear to be the result of varying distances of the exposures from the bluffs which border the terrace in which the site occurs, since the overburden is greatest adjacent to the uplands and becomes progressively less downstream. Two excavation units were laid out in the shallower part of the site to encompass hearth areas which were visible in the cut bank. Both had an average width of approximately 10 feet and were 25 to 30 feet long, respectively. Excavation was carried to depths of 8 feet in one and 8½ feet in the other. Near the bottom of both excavations there was a continuous stratum half a foot thick containing hearths, both simple and stone-lined; charcoal; ashes; bones; and pottery and other artifacts. Above this stratum, especially at depths of approximately 4 to 6 feet, were discontinuous lenses containing evidences of human occupation. These lenses in most instances apparently represented hearth areas and there was one group of six holes, perhaps post molds, in a roughly circular arrangement around an area with diameters of approximately 12 to 14 feet. Cultural materials were

scanty in the upper levels. They consisted of fragments of bone, mostly of bison but occasionally of deer; obsidian and chalcedony chips and other stone fragments; and an exceedingly small number of artifacts. Much of the bone was in small fragments and some of it was scorched. Stone artifacts in the upper levels include the basal fragment of a small side-notched triangular point of chalcedony with concave base. The width at the base is 14 mm. and the length of the complete point was probably about 27 mm. Another fragment, of chert, is presumably from a fairly small, straight-based point, but the dimensions and form are not further determinable. The only other stone object showing indubitable evidence of human workmanship is a small chalcedony flake with fine retouching on one edge. Other objects which have been modified further than simply by breaking are a fragment of scapula with two straight parallel lines lightly incised on one surface and an antler tine 180 mm. long with a battered and somewhat polished tip suggesting use in chipping (pl. 4, *14*). A series of transverse cuts encircling the latter specimen at 58 to 77 mm. from the base suggests that a beginning was made toward shortening the implement. A minor amount of abrasion on the tip of another, short, antler fragment may be the result of use.

The lower cultural deposit appears to represent an occupation of considerable intensity, judging by the results of the limited excavation and by its uninterrupted exposure for hundreds of feet along the terrace edge. Averaging approximately a half foot in thickness, it contains quantities of unworked stone, much of it fractured probably by heat, and bone; flint chips; relatively abundant artifacts of stone and bone; and pottery sherds. The bone is predominantly bison, but dog remains are fairly numerous and one to three bones each of deer, elk, antelope, and jack rabbit were found in the excavations. Hearths, only one of which was lined with stones, were uncovered in both trenches.

Fourteen pottery sherds, some of which have been combined to make a final total of eight fragments, were recovered in the lower cultural zone. In every instance the paste is rather compact and is dark gray to black, but the exterior surfaces of five fragments are light gray or tan. Tempering material, which is only moderately abundant, appears to be preponderantly crushed granite, though an occasional grain of sand is visible on the broken edges. Deposits of carbonized material are present on both exterior and interior surfaces, but more commonly on the latter. The deposit on the inside of one vessel is 4 mm. thick. Surface hardness is between 3.5 and 4 (i.e., surfaces can be scratched by the mineral fluorite but not by

the mineral celestite). The sherds range in thickness from 3.5 to 11 mm., with the mode at about 6 mm. Interior surfaces are rather smooth to the touch, but are frequently uneven, as though the fingers or small objects of some sort had been used to support the vessel walls on the inside during the manufacture.

Three fragments, one a rim sherd, have smooth exterior surfaces. The body sherds are too small to yield information as to vessel shape, but the rim is apparently from a heavy-walled, open bowl (pl. 5, *a, 1*), the rim of which is thickened both inwardly and outwardly to give the perfectly flat lip a width of 15 mm. in contrast to the 10-mm. thickness of the vessel body. This specimen is very similar to a rim sherd in our collections from a late level in Birdshead Cave, in the Owl Creek Mountains of western Wyoming (Bliss, 1950, p. 193), except that the surfaces of the latter have a gritty feel lacking in the present collection. The exterior surfaces of the remainder of the sherds were impressed with fibrous material of some sort, apparently never twisted (pl. 5, *a, 2-5*). The impressions are invariably shallow and in three instances they are relatively fine and lie parallel as though the individual elements of the impressing object were wrapped about a paddle. On another specimen, parallel grooves about 2.5 mm. wide and spaced about 1 mm. apart lie across, and perpendicular to, shallow elongated depressions, about 75 mm. wide, which alternate with low ridges (pl. 5, *a, 3*); a similar effect was created in the laboratory by impressing modeling clay with coiled basketry. Still another sherd (pl. 5, *a, 4*) may have been treated in the same fashion, but the evidence is less clear. All but one of the sherds with roughened surfaces bear traces of decoration, which in every instance appears to consist of a shallow, crudely trailed line following a zigzag path about the vessel (pl. 5, *a, 2-5*). The one specimen in which the lip is present is a rim which appears to slope somewhat inwardly (pl. 5, *a, 2*). The flat lip bears a series of slightly elliptical impressions, the creation of which, perhaps with the fingers, has thickened this feature toward both surfaces of the vessel. The upper points of the trailed zigzag line reach nearly to the lip. Another specimen consists of what appears to be a segment of an angularly S-shaped rim and of the constricted neck of a jar (pl. 5, *a, 5*). A series of nearly circular impressions, probably made with the finger tips, encircles the rim at its maximum circumference and the trailed decoration is on the shoulder area. One other sherd, probably from a different pot, also indicates the presence of a constricted neck (pl. 5, *a, 4*). Except for the features noted above, the sherds in the small collection yield no information relative to the shape of the complete

vessels, but both open bowls and pots with constricted necks are suggested.

The relationships of this pottery are not readily apparent. Except for the rim sherd from Birdshead Cave, mentioned above, I have not seen sherds or descriptions of sherds which resemble it closely. Collections described by Wedel (1951) from sites geographically close to the Tiber Reservoir area, notably a site near Ethridge in Toole County, Mont., seem to differ significantly in surface treatment and decorative technique. One similarity, for whatever it may be worth, is the presence of a series of notches on a carinate portion of the vessel. In the case of the Ethridge specimens, however, this feature apparently is found on the body of the pot, whereas I am of the opinion the Tiber specimen in question is a rim (pl. 5, *a, 5*). Furthermore, the technique of producing the notches appears to be different in the two instances. Rims of somewhat reminiscent form and decorative treatment occur rarely in the collections from the Oldham site, and from other sites on the Missouri River in South Dakota, but otherwise, except for general resemblances in paste and tempering, these sherds do not seem to correspond closely with known ceramics from the central and northern Plains.

Other artifacts from this occupational zone include objects of stone and bone. Chipped artifacts, which are of limited variety, and chipping debris consist of jasper, chalcedony, chert, flint, quartzite, and obsidian. Of the 20 projectile points (pl. 3, *1-12, 14*) and fragments identifiable as parts of points, 8 are of chert, 6 of obsidian, 2 of flint, 2 of jasper, and 2 of chalcedony. End scrapers, on the other hand, are predominantly of jasper. Of the implements of this class or fragments believed to be parts of them, 14 are made of that material, while 3 are of chert, 2 are of flint, 1 is of chalcedony, and 1 is of fine-grained quartzite. Points are both side-notched and plain. Of the complete specimens or fragments on which this feature can be determined, 10 are notched and 8 are plain. In general, the former have straight or very slightly concave bases and straight or slightly convex sides. The unnotched points have straight, concave, or convex bases and convex sides. Most of the points are rather skillfully chipped over all, but a few, notably those of obsidian (pl. 3, *7, 8, 14*), are exceedingly crude and most often chipped only at the edges. One of the obsidian points appears to have been reworked (pl. 3, *8*). Complete points range in length from 12 to 36 mm. and in width from 9 to 18 mm. There are no fragments that indicate points appreciably larger than the largest of these.

Most of the complete or nearly complete end scrapers are triangu-

loid in outline and planoconvex in cross section (pl. 3, *15-23*). The ventral surface invariably consists of the unmodified flake surface, while the dorsal surface is ordinarily chipped to the extent necessary to achieve the desired triangular shape. The steep, carefully chipped working edge is always convex. The specimens vary in length from 18 to 30 mm. and in width from 19 to 26 mm. A planoconvex object perhaps related to these implements is an oval with the two opposite edges chipped to resemble the working edge of an end scraper (pl. 3, *24*).

Other chipped objects in addition to retouched flakes are an asymmetrical, unifacially worked point of flint (pl. 3, *13*), a small bifacially worked blade of quartzite (pl. 3, *26*), and a flake with two notches chipped into two of its three edges (pl. 3, *25*).

Awls are the most numerous of the bone artifacts. Of the complete specimens, three are made from the split proximal ends of deer or antelope metapodials (pl. 4, *9, 10, 13*), one is from part of the axillary border and adjacent portion of a scapula, possibly of deer (pl. 4, *8*), and one is from a rough fragment of the lateral surface of a bison rib with the cancellous bone unmodified (pl. 4, *4*). All but the last of these have sharp, slender points. Of the two fragmentary specimens, one is a segment, squarish in cross section, of a long bone (pl. 4, *11*), and the other is from a split rib with the cancellous bone partially removed (pl. 4, *7*). Three blunt-pointed objects are splinters of long bones which have been worked only at and near the tips (pl. 4, *1, 3, 12*). The single shaft straightener in the collection is a section of rib bearing a complete perforation and the remains of another at each of the broken ends (pl. 4, *2*). Each edge of the rib bears two groups of 5 to 7 narrow, shallow, transverse notches. Two incomplete specimens made from split ribs have rounded ends and smoothed edges (pl. 4, *5, 6*). In both instances, the cancellous bone has been partially removed. On two fragments of rib, probably of bison, the mesial surface was broken away near one end and the remaining lateral surface was worked to a blunt point (pl. 4, *15, 16*). The remaining artifact of this material is a small, highly polished tubular bead of bird bone.

Of exotic material, there is a single specimen from the lower level of this site, a shell, *Olivella* (*Callianax*) *biplicata* Sowerby, with provenience on the Pacific coast, which has been altered by a large break through the wall away from the natural opening. The borders of the break are well polished, as is the exterior surface of the shell in general, and so there is no question that the specimen was used subsequent to the breakage (pl. 5, *a, 7*).

On typological grounds, the lower occupation of 24TL26 appears to be relatively late and thus attests to the recency of the considerable deposits above it. A study of the site by a geologist would be desirable.

Triangle Park Reservoir site.—This will be a very small reservoir on the South Fork of Rock Creek, high in the Bighorn Mountains in Johnson County, Wyo. No archeological sites were found during the reconnaissance, in June 1951, of this area, which lies at an altitude of approximately 8,800 feet above sea level.

Willow Park Reservoir site.—Within a few miles of the Triangle Park Reservoir area is the site of the proposed Willow Park Reservoir, on the South Fork of Piney Creek, in Johnson County, Wyo., in the Bighorn Mountains. It is more than 8,500 feet above sea level. The reconnaissance, accomplished in June 1951, revealed no evidence of aboriginal occupation.

Yellowtail Reservoir site.—The site of the Yellowtail Dam is on the Bighorn River in Big Horn County, Mont., approximately 40 miles southeast of Billings. The water to be impounded by the 500-foot-high concrete structure will flood the full length of the spectacular Bighorn Canyon and will back up to a point some miles above Kane, Wyo. The river here is flanked by the Bighorn Mountains on the east and the Pryor Mountains on the west. These ranges are forested, in contrast to the sparsely sagebrush-covered lower surfaces bordering the river valley. In the upper end of the reservoir area the valley is broad and shallow, with cottonwoods and smaller growth on the flood plain and sagebrush on the terraces. About 8 miles below the mouth of the Shoshone River, the only major tributary in the reservoir area, the Bighorn River enters the Bighorn Canyon, through which it flows to a point below the dam site. In its course through the predominantly narrow, sheer-walled canyon, the river is frequently characterized by impressive rapids.

The reservoir area has been the object of attention by archeologists of the Missouri Basin Project at three different times, in 1946, 1950, and 1951. A 4-day reconnaissance in 1946 amounted to little more than a spot check of the most accessible places, but during a 3-week period in 1950 the entire area outside the canyon was examined. Finally, in July 1951, an 11-day boat trip through the canyon was accomplished with the aid of local guides and boatmen, and all terrain suitable for aboriginal occupation within the canyon was inspected. Forty-nine sites of various kinds have been recorded, but only about half of them are likely to be destroyed. "Tipi-ring" sites and other open camp sites account for more than two-thirds of the locations of archeological interest, which include also rock shelters, petroglyphs,

bison kills, a group of rock cairns, a workshop area, an Indian trail, and a recent Indian hunting lodge. Several of the camp sites are of considerable size, and some appear to have deposits of appreciable depth. Cultural materials, although absent or scanty on the surfaces of some sites, are rather abundant on others. One interesting site, 48BH7 (pl. 5, *b*), consisting of 23 stone circles, yielded numerous sherds of pottery characterized by coarse, abundant grit tempering; surfaces which probably were treated with a grooved or thong-wrapped paddle; and, at least sometimes, a constricted neck and a flat lip thickened to the interior. In addition, a number of artifacts of stone were collected from the surface.

Despite the relative inaccessibility of the canyon, much of the favorable terrain within its confines was found to bear evidence of aboriginal occupation, usually camp sites with or without "tipi rings." Aside from the circles of stones, the occupational evidence observable on the surface consisted primarily of hearths, stone artifacts, and chipping debris.

The evidence accumulated by the surveys in the Yellowtail area demonstrates that the banks of the Bighorn River, lying within the historic habitat of the Crow Indians, have been inhabited during a relatively long period of time, most of which undoubtedly antedates the arrival of that group in the area.

NEBRASKA

Field work in Nebraska by the River Basin Surveys was restricted during this period to the Niobrara River Basin, where 10 potential reservoir sites were reconnoitered by Richard P. Wheeler and J. M. Shippee in October, 1950, and to the Lower Platte River Basin, where Robert B. Cumming, Jr., and Shippee carried out limited investigations in November of the same year.

Lower Platte River Basin

A number of potential reservoirs in the Lower Platte Basin had been previously surveyed by the River Basin Surveys and by a party from the Laboratory of Anthropology of the University of Nebraska. A brief reconnaissance was undertaken in November 1950 by Robert B. Cumming, Jr., and J. M. Shippee to supplement the earlier surveys and to investigate burials reported by the Bureau of Reclamation to have been encountered by its survey crews. Both reported burials were excavated and the sites of several possible water-development structures were examined. One of the burials, 25HW201, was near the Cushing Dam site, in Howard County. Although badly disturbed

before excavation by the survey party, the evidence indicates it consisted of two adults, at least one of which was tightly flexed. Only a few fragments of the other remained. A grit-tempered, cord-marked pottery sherd was found in the earth which had been recently disturbed. The other burial, 25NC201, was on a ridge bordering the valley of Cedar River, in Nance County. The incomplete remains of four individuals, representing secondary burials, were found generally scattered in an oval pit covered with stones. Among the bones present was one small fragment, probably from a tibia, which had been artificially perforated. In the pit fill were a number of grit-tempered, cord-marked sherds which appear to be attributable to one of the early Woodland variants in the area. Long bones with perforations similar to the one mentioned here were found in secondary burials in a submound pit in a site, 39CH4, excavated in 1947 by the River Basin Surveys in the Fort Randall Reservoir, South Dakota (Cooper, 1949, p. 309).

The area that would be occupied by the Sherman Reservoir and the routes to be followed by the Sherman Feeder Canal and the Sargent and Woods Park Canals, if these various features are constructed, were surveyed. Only one site pertaining to archeology was found, and that was a small area yielding a sherd, two scrapers, and a little White material, which does not warrant further investigation. This site and a site where fossil bones of elephant and possibly bison were found weathering out of a loess deposit are near the course of the potential Sherman Feeder Canal. The paleontological site probably deserves investigation.

Niobrara River Basin

The survey of the Niobrara River Basin, together with the more intensive investigations that should follow it, exemplifies in miniature one of the notable ways in which the salvage program is contributing to our knowledge of the prehistory of the Missouri Basin, namely by the sampling of archeological manifestations over extensive areas of locally diverse environments. The Niobrara River, heading in eastern Wyoming, flows east across northern Nebraska through parts of the Nebraska-Wyoming Upland, the Nebraska Sand Hills, and the Loess Plains, all subdivisions of the High Plains, and through the southern part of the Missouri Plateau to its confluence with the Missouri River (Fenneman, 1931, pp. 17-22, 61-72). In its upper reaches, it has a narrow, sparsely tree-fringed channel meandering in a valley bordered by high, slightly undulating plains covered with short grass, but to the east, augmented by a number of spring-fed tributaries, it

becomes a sizable stream with a relatively uniform flow in a valley which supports rather heavy stands of timber. There is a corresponding variation in the climate of the basin. For example, average annual precipitation ranges from less than 15 inches near the headwaters to about 23 inches in the lower part of the valley. The Niobrara drainage basin comprises a narrow strip of land, never in excess of approximately 60 miles in width, across the northern edge of Nebraska with extensions west into Wyoming and north into South Dakota. It may be anticipated that cultural remains will reflect the climatic and ecological variations along the east-west profile provided by this basin.

The 10 reservoir sites reconnoitered, in most instances incompletely, in 1950 are all in Nebraska. They are Colwell, in Sheridan and Dawes Counties about 70 miles east of the Wyoming line; Crookston, Eli, Kilgore, Long Pine, Meadville, Merritt, Sparks, and Thacher in the central section of the basin; and Ponca Creek on the stream of the same name, actually outside the Niobrara drainage but immediately adjacent to its lower reaches.

Other projects in the basin are the existing Box Butte Reservoir, briefly visited by a River Basin Surveys party in 1946, and two potential reservoirs—Keya Paha and Verdel—not investigated in 1950 because their locations were not known at that time.

Colwell Reservoir site.—The Colwell Dam, if constructed, will create a reservoir approximately 4½ miles long in the Niobrara River Valley proper and extending some distance up Sand Canyon and Pepper Creek, northern tributaries of the river. The river here is a small stream in a valley of low, flat terraces cut into high rolling plains covered with short grass. Other vegetation consists of scanty trees and brush along the water courses. Part of the reservoir area was examined during a 2-day visit, during which three camp sites and a workshop were found. In each instance, materials were relatively scanty on the surface but this is, at least in some cases, undoubtedly owing to the existence of sterile overburden. The collections made from the sites are preponderantly stone objects, but a sherd or two were found on two of the sites. These pottery fragments are small and nondiagnostic, although one appears to be simple-stamped and accordingly suggests a relatively late date. The three sites which will be destroyed by the reservoir (25SH201, 203, and 204) are believed to warrant test-trenching, and additional survey will be required to complete coverage of the area to be flooded.

Crookston Reservoir site.—The potential Crookston Reservoir will be a lake approximately 12½ miles long if current plans for a dam on the Niobrara River about 10 miles southwest of Valentine are carried

through. The lower end of the Snake River will also be flooded. Both the Niobrara and Snake Rivers flow here in narrow valleys bordered by high wooded bluffs, and the region would seem to be suitable for aboriginal occupation, but during the reconnaissance of approximately two days no archeological sites were discovered.

Eli Reservoir site.—According to present plans, the Niobrara will be dammed at a point about 17 miles southwest of Cody to create a reservoir approximately 12½ miles long. The valley to be flooded varies from deep and narrow to flat and wide and its bottom supports cottonwood groves. Other deciduous species and juniper grow sparsely on the slopes. A partial reconnaissance during two days revealed two archeological sites, one producing pottery and the other only lithic materials. It is reasonable to suppose that complete reconnaissance would produce a number of additional sites. The ceramic site appears to have been occupied two or more times, since heavy sherds of Woodland type and other cord-marked and plain sherds similar to pottery from Upper Republican or Nebraska aspect sites were collected. The lithic site apparently is the remains of a workshop.

Kilgore Reservoir site.—Current plans are for the construction of a dam on the Niobrara River 10 miles south of the town of Kilgore to impound a pool approximately 12½ miles long. The valley here is narrow and wooded both on the bottomland and the slopes. The partial reconnaissance of less than two days resulted in the discovery of three sites which yielded pottery, though in small quantities probably because of the heavy vegetation cover. The sherds collected from one of the sites are plain and those from another are simple-stamped, while the surface treatment of those from the third is indeterminable. Two of the sites (25CE214 and 215) are considered worthy of some excavation and those portions of the reservoir area not visited should be examined for additional sites.

Long Pine Reservoir site.—The site of the potential Long Pine Dam is on Long Pine Creek, about half a mile above its confluence with the Niobrara River. The reservoir would directly affect about 10 miles of the valley of Long Pine Creek and the lower 2 or 3 miles of two tributaries, Short Pine and Bone Creeks. All these streams are contained in narrow wooded valleys bordered by loess-mantled bluffs. During a brief inspection of part of the reservoir area, the reconnaissance party recorded seven occupational sites, all of which yielded pottery. Three of the sites had been discovered by previous parties, one by personnel of the Nebraska State Historical Society, and two by a group representing the University of Nebraska Laboratory of

Anthropology. The latter party also recorded two sites in the reservoir area which were not observed in 1950. The reconnaissance produced no evidence of structures in any of the sites, some of which are extensive while others appear to be the locations of small camps. The collections, although in no case large and often rather scanty, suggest that, except for a suspected lithic component at one site, all the occupations represented are referable to a single complex or to rather closely related ones. The pottery in the larger collections has simple-stamped surfaces; trailed or incised and punctated shoulders; rims which are undecorated or have incised decorations, usually a series of horizontal lines, on the exterior surface; and lips which usually bear incised or impressed lines. Most of the sherds from the smaller collections have characteristics which are compatible with the ceramic complex represented by the larger collections. The pottery is like that reported from northeastern Wyoming by Wedel (1947a) and closely resembles ceramics found in excavations at the Minaric sites near the mouth of Ponca Creek by the University of Nebraska Laboratory of Anthropology. Similar pottery has been collected from numerous sites in northern Nebraska and on the Missouri River as far north as the North Dakota-South Dakota line. It has been suggested, on the basis of the presumably relatively late date of the complex and its presence in an area dominated by the Ponca tribe when first recorded by Europeans, that this ethnic group was responsible for the culture revealed, but not yet reported, by the excavations in northeastern Nebraska.

Meadville Reservoir site.—The Meadville project, if carried through, would include a reservoir approximately 21 miles long in the valley of the Niobrara River, with an arm extending about 8 miles up the valley of Plum Creek. Both of these streams flow perennially in valleys with wooded bottom lands and slopes. Less than half the reservoir area was covered by the reconnaissance in October 1950, but six sites of aboriginal occupation were found. Few artifacts were recovered, and they were generally not diagnostic. Three of the sites (25BW202, 203, and 204), all apparently nonceramic, may be of some age and are considered worthy of further investigation. Additional survey will probably produce further evidence of Indian activity.

Merritt Reservoir site.—Current plans call for a dam on the Snake River, in Cherry County, about 3 miles below the mouth of Boardmans Creek and a similar distance above the Snake River Falls. The impounded water will extend about 12 miles up the Snake River and about 4 miles up Boardmans Creek, the principal tributary in the reservoir area. The vegetation in this sandhill region is limited to

grasses on the uplands away from the streams, clumps of cottonwoods along the channels, and sporadic junipers on the valley slopes. A minor proportion of the area to be affected by the reservoir was examined during the brief 1950 reconnaissance, but three archeological sites were recorded. The only one of these which produced pottery (25CE210) is apparently the site visited by Wedel in 1931 and reported in a paper (1947a) devoted primarily to a description of sherds from northeastern Wyoming. Wedel's impression, based on his memory of the materials observed in 1931, was that they closely resembled the Wyoming specimens. The present collection is too small to permit any appreciable contribution in this regard; the few small body sherds recorded are either plain or are decorated with narrow incised lines and seem to be compatible with Wedel's description of the Wyoming pottery. The other two sites, apparently the locations of camps, produced small numbers of stone objects.

Ponca Creek Reservoir site.—Potential Ponca Creek Reservoir, although for administrative reasons included by the Bureau of Reclamation in the Niobrara River Basin, is on a stream which lies outside the drainage of this river. Ponca Creek rises in Tripp County, S. Dak., and enters the Missouri River only a few miles above the mouth of the Niobrara. The reservoir is planned for a location near Butte, in Boyd County, Nebr., where it will flood approximately 9 miles of a valley which is bordered by high, loess-mantled terraces. Deciduous trees line the banks of the streams, and there is some timber on the slopes to the uplands. The reconnaissance of 1950, which constituted merely a spot check of part of the area, resulted in the recording of seven archeological sites, all occupational areas. Two of these (25BD201 and 25BD207) are extensive villages, in one of which evidences of three house structures were observed in the edge of an abandoned gravel pit, which had destroyed part of the site. The collections of pottery from these two villages appear to belong to closely related, though perhaps not identical, complexes. Both collections contain pottery with smooth or cord-marked surfaces, rims which are usually flaring and predominantly undecorated except for impressions or incisions on the lip panel or border, and punctated and incised or trailed shoulders. Collared rims are rare, as are rims whose exterior surfaces have been decorated by incising or trailing. The exterior surface of this part of the vessel is frequently cord-marked. There are differences in the samples from the two sites which may or may not accurately reflect differences in the total pottery complexes. These include the presence of handles and a greater frequency of shoulder decoration in the materials from 25BD201 and, on the other hand,

a number of simple-stamped body sherds and a fabric-marked sherd in the 25BD207 collection. On the basis of the relatively scanty evidence available, it appears that these two sites are closely related to the Lynch site (25BD1), partially excavated in 1936 by the University of Nebraska Laboratory of Anthropology but not yet comprehensively reported in print. Of the remaining sites, all of which yielded few specimens, two, and perhaps three, are probably related to sites 25BD201 and 25BD207. Another has pottery which resembles at least in a general way certain of the ceramics from the Loseke Creek sites, in Platte County, Nebr., excavated by the Nebraska State Historical Society (Kivett, 1952, pp. 52-55); from the Eagle Creek site, in Holt County, Nebr., excavated by the University of Nebraska (Hill and Kivett, 1940, p. 240); and from the Scalp Creek site in Gregory County, S. Dak. (Hurt, 1952, pp. 25-27, and Appendix VIII). The pottery in question has rims that are decorated on their outer surfaces with series of horizontal lines either incised or impressed with a single cord. The sherds are too few and too small to permit assigning them to a pottery complex with any confidence. Only stone specimens were found on the remaining site and these were few and nondiagnostic of specific cultural entities.

Sparks Reservoir site.—The potential Sparks Reservoir site is on the Niobrara River near the eastern boundary of Cherry County. It is in an area characterized by fairly heavy tree growth on the bottom lands and more scattered timber on the slopes. Only the most accessible parts of the reservoir area were covered by the reconnaissance, which resulted in the recording of seven archeological locations, all probably camp sites. A few minute sherds, simple-stamped and incised and apparently related to the pottery from a site in the Merritt Reservoir area, discussed above, were found on one of the sites; the collections of artifacts from the other sites suggest lithic complexes. Most of the 12-mile stretch of the valley to be affected by the reservoir remains to be examined.

Thacher Reservoir site.—The potential Thacher Reservoir, near Valentine, Nebr., will flood approximately 11 miles of the Niobrara River valley and the lower 4 miles of Minnechaduza Creek. Both the valley floor and the slopes in this area support stands of timber. Two sites were recorded during the brief and incomplete reconnaissance. Both are lithic camp sites but one includes, in addition, evidence of an early White settlement. The specimens recovered from these sites are too few and nondescript to permit any suggestion as to their cultural affinities.

NORTH DAKOTA

Field work in North Dakota included excavation in three sites, two of Indian and one of White provenience, and additional reconnaissance in the Garrison Reservoir and in the Sheyenne Reservoir area, briefly visited by the Surveys in 1946. The Jamestown Reservoir was also on the reconnaissance schedule, but protracted bad weather prevented examination of any appreciable part of the area; no sites were found, but this may be largely owing to the unsatisfactory conditions for survey, since significant sites were recorded during the earlier investigation.

Garrison Rerservoir site.—Archeological excavation by the River Basin Surveys in North Dakota was confined in both 1950 and 1951 to the Garrison Reservoir, one of the largest water-control projects in the Missouri Basin. The lake to be created by the huge earthen dam, under construction since 1946 and now closed, will occupy the immediate valley of the Missouri River and the lower reaches of its tributaries from the dam in McLean and Mercer Counties to a point above Williston, a distance of almost 200 miles. Previous investigations by this organization had consisted of inspection of the dam site in 1946 and a reconnaissance of parts of the reservoir area during a period of approximately two months in 1947. Despite the shortage of time available for the achievement of an adequate sampling of this little-known area, limited resources and imminent destruction dates elsewhere in the Missouri Basin prevented further work in 1948 and 1949. While the reservoir lies outside the region intensively occupied by the Mandan, Hidatsa, and Arikara before the beginning of the breakdown of their aboriginal cultures, it contains the remains of the latest earth-lodge villages of those three tribes and thus a large part of the archeological record of the impact of industrial culture on the village tribes of the northern Plains. Such village remains range from a few in which the objects of material culture are predominantly of native manufacture, but include moderate quantities of White trade materials, to others in which the artifacts are almost exclusively of White origin. Earlier sites in the area appear to represent less intensive occupation. Some of them are apparently temporary camps of the Mandan or Hidatsa during the time their main villages were situated farther downstream, or of closely related groups, while others represent quite distinct cultural traditions. Among the latter are a number that yield heavy, cord-marked pottery of Woodland affiliations. Pottery of this sort occasionally is found stratigraphically beneath materials attributable to groups of the Mandan-Hidatsa tradition. Still other sites yield only nonceramic artifacts, usually in

relatively small numbers. Some of them may be of fair age, but none has yielded convincing evidence of any considerable antiquity. Many of these sites are moderately deeply buried beneath sterile deposits.

Despite its evident importance, this area had seen no excavation prior to 1950, when the River Basin Surveys and the State Historical Society of North Dakota initiated programs of intensive investigation in significant sites to be destroyed by the reservoir. What previous excavations had been accomplished on the Missouri River in North Dakota were in earlier and more spectacular sites downstream, well outside the Garrison Reservoir (e.g., the Burgois, or Double Ditch, site on the east side above Bismarck, and the Slant, or Fort Abraham Lincoln, village on the west side below Mandan).

During both years under consideration, small survey teams were detached from the excavation parties in the Garrison area to extend the previous reconnaissance and to re-examine sites recorded in 1947. This work was in every instance headed by George Metcalf, who was assisted at various times by one or two other men. In 1950, a 2-man party spent a period of approximately two months primarily in an examination of the area comprised in the Fort Berthold Reservation, which had been untouched in 1947. During rather brief and intermittent surveys in 1951, the emphasis was again on the land within the confines of the reservation but, as in the previous year, some attention was given to other parts of the area to be flooded which had received at least partial coverage in 1947. The list of 70 sites recorded in 1947 has now been expanded to include approximately 130 Indian sites, plus about 15 additional sites of trading posts, Indian agencies, abandoned nineteenth-century towns, historic trails, and other features more or less intimately related to the White occupation of the region. Two of the latter are of especial significance as far as the Indian history of the region is concerned. They are site 32MN1, believed to be the remains of Kipp's trading post built about 1825, and the site of two trading posts, Fort Berthold and Fort Atkinson, at Like-a-Fishhook Village, the last home of the Mandan, Hidatsa, and Arikara before they scattered to individual allotments on the reservation (the village and associated posts are included in the project's records under a single number, 32ML2).

Sites relating to the Indian occupancy of the area now on record include winter villages on the river bottoms, earth-lodge villages on terraces or butte tops, small camp sites with and without pottery, stone circles, depressions which are probably the remains of eagle traps, rock cairns, burial mounds, other burial sites, and such recent phenomena as the ruin of a late hunting lodge and the remains of the last

Arikara earth lodge, which was used as a community and ceremonial center from 1907 to 1918. Especially deserving of salvage are two mound sites, which lie outside the pool but may be jeopardized by road relocations, and a number of earth-lodge sites, some late but others relating to a time when the culture was still basically aboriginal, Site 32ME57 is a single mound approximately 60 feet in diameter and 6 feet high, from which a local resident has obtained many human bones by minor pitting, while site 32ME63 is a group of seven mounds which range in size from 25 feet in diameter and 2 feet in height to almost 70 feet in diameter and 6 feet in height. Mounds along this segment of the Missouri River appear to be exceedingly rare, so that the relationships of the sites in question will have to be sought at considerable distances. Apparently the nearest reported occurrences of mounds are to the east on the Sheyenne and James Rivers, where the cultural affiliations are as yet undefined, and to the north in southwestern Manitoba, where the manifestations have been ascribed to the Headwaters Lakes aspect and an Assiniboin authorship has been suggested (Vickers, 1949, p. 33).

Among the earth-lodge sites which seem on present evidence to be especially noteworthy are the Rock Village (32ME15), a fortified site yielding primarily materials of native manufacture; Like-a-Fishhook (32ML2), the last earth-lodge village of the Three Affiliated Tribes; two butte-top earth-lodge villages (32ML39 and 32DU18); a large fortified late Arikara site, the Star Village (32ME16); a well-preserved late winter village (32ML38); and an earth-lodge site (32ME59) associated by tradition with one of the Mandan-Hidatsa supernaturals and known as Grandmother's Lodge.

The intensive excavation program in Garrison Reservoir was carried out by a single party in 1950 and by two parties in 1951. During these two summers, excavations were undertaken in two earth-lodge villages, the Rock Village (32ME15) and the Star Village (32ME16), and in a frontier military post, Fort Stevenson (32ML1). The field season of 1950 was spent entirely in the Rock Village, where a party under the supervision of G. Ellis Burcaw excavated from mid-June until the end of October. In 1951 a party headed by Donald D. Hartle continued the investigation of this site from early June until late August, after which the party, considerably reduced in numbers, worked in the Star Village for the remainder of the season, which terminated there about November 1.

Rock Village, so named because of its proximity to a conspicuous expanse of sandstone which outcrops along the bank of the Missouri River, is situated on a level uncultivated terrace approximately 15

feet above the river (pl. 6, *b*). A narrow strip of timbered bottom land intervenes between the stream and the present edge of the site, which has been scarped by erosion. An indeterminate portion of the site has disappeared, for lodges and other features are now partially destroyed at the terrace border. Shallow depressions and other surface irregularities suggest the presence of 35 to 40 closely spaced earth lodges within the confines of the occupied area, which is bounded by the steep bank along the edge of the terrace and by the remains of an artificial ditch. Expansion of the village is attested by evidence that the course of the ditch had been altered during the occupation to enclose probably 10 lodges in addition to those within the original fortified area. Although little cultural material is visible on the sodded surface, examination of the cut bank and test pits dug by the survey party in 1947 had revealed the presence of abundant refuse within the village level. The work in 1950 and 1951 resulted in the excavation of 13 earth lodges and 60 cache pits, as well as a number of such features as borrow pits, sweat lodges, and structures of uncertain function, and included numerous test trenches in additional lodges, across the defensive works, and in the general village area. Among the test trenches was one, 282 feet long by 5 feet wide, extending entirely across the site; in addition, the face of the eroded terrace was trimmed and examined. The tests revealed that, except where the occupants had altered the surface by excavation, refuse attributable to the village was confined to a zone just beneath the surface to a depth of approximately a foot. At a depth of about 5 feet, however, evidences of an earlier, much less intensive occupation were consistently found in the deepest trenches. No extensive excavation of this deeper horizon was undertaken after its detection in 1951, but the limited evidence indicated a nonceramic occupation.

The houses, apparently always constructed on the surface, were circular and averaged slightly more than 40 feet in diameter (pl. 6, *b*). All had 4 center posts and 9 to 16 outer support posts, and frequently there was evidence of leaner posts at the peripheries of the structures. The central fireplaces were always basin-shaped depressions in the lodge floors, but in six instances sandstone slabs were associated with them. Four of the pits had either the sides alone or the sides and bottom lined with slabs (pl. 7, *a*), while in two cases slabs were laid upon the lodge floor surrounding the hearth. The entrances, which lacked any consistent orientation, were characterized by walls consisting of puncheons set in trenches (pl. 6, *b*), a feature described by Wilson (1934, p. 369) for Hidatsa earth lodges. Features found within the houses included sweat lodges, fire-screen trenches, and

cache pits, as well as numerous posts which probably were associated with beds and other miscellaneous minor structures. There was abundant evidence that several of the lodges had burned, but in many instances unburned post remnants testified to destruction by less sudden means. Cache pits were found both inside and outside of the lodges, the locations of the outside ones frequently being marked by depressions on the surface. There was a marked absence of stylization as far as size and shape are concerned. A considerable number were cylindrical, while the walls of others expanded to varying extents. The large, deep, cistern-shaped pits so characteristic of the later villages of the central Plains were lacking or exceedingly rare in Rock Village.

As indicated previously, there was evidence for expansion of the village at some time during its occupation. A segment of the original ditch was abandoned and a new segment was excavated to enclose a larger area. The sequential relationship of the two segments is established by the fact that the inner one is overlain by one or more lodges and by the refuse with which it is filled. Perhaps at a still later time the ditch was extended to enclose a single house at the northeast end of the site. Test trenches across the ditches revealed considerable variation in width and depth but they were nowhere very wide or deep; widths of $2\frac{1}{2}$ to $4\frac{1}{2}$ feet and depths of 2 to $2\frac{1}{2}$ feet seem indicated. Post molds in alignment outside the abandoned portion of the ditch suggest a palisade, and there was clear evidence of such a feature situated at distances of 2 to 3 feet outside the outer, and later, segment. The latter consisted of posts set close together in a trench approximately half a foot wide and a foot deep.

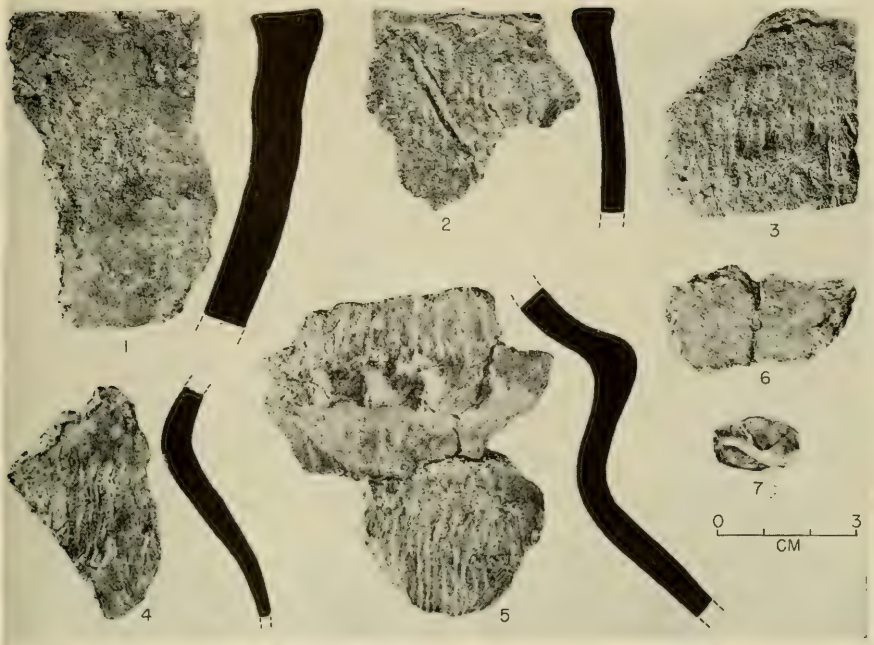
Refuse was relatively abundant in cache pits, borrow pits, the abandoned ditch, and on the village surface. While materials of White provenience occurred in considerable quantities, the main reliance of the inhabitants was still on artifacts of native manufacture. Few of the metal objects were tools, although there is evidence of the use of heavy metal implements, probably axes, for shaping many of the bone artifacts and for cutting timbers. No metal axes or hoes were found, but there are a few knives or knife parts in the collection. Most of the metal objects were projectile points, tinklers, and scraps of brass and iron, objects which are of little aid in the problem of dating. Other materials of White origin include rather numerous glass beads and some clay pipes of European manufacture. On the basis of an examination of all the trade materials, Glenn Black has "guess-dated" the site as 1800 to 1850 plus. This statement and the presence of two percussion caps of a type which Carlyle S. Smith, of the University

of Kansas, informs us was invented in England in 1819 are consistent with Hartle's opinion, based on the archeology and on statements obtained by Libby (1908, p. 465; 1920, pp. 200-201; and notes in files of State Historical Society of North Dakota) from Hidatsa informants early in the twentieth century, that the Rock Village was occupied during part of the 1830's and perhaps as early as the mid-1820's.

Artifacts of Indian manufacture from local materials were numerous; over 4,500 pottery sherds were collected, for example. The pottery appears to be very similar to the River Basin Survey's collections from the Hidatsa sites at the mouth of the Knife River, although it is perhaps somewhat less homogeneous and carefully made. It certainly resembles this material more closely than it does the ceramics described and illustrated from the earlier, presumably Mandan, Double Ditch and Slant village sites near Bismarck. So-called Knife River flint, a chalcedony available in abundance in quarries not more than 35 miles distant, was overwhelmingly favored for chipped-stone implements. Other materials, mainly schist and quartzite, were utilized primarily for large choppers. Among ground-stone objects are grooved mauls, abrading stones, shaft smoothers, pipes of catlinite and other stones, a small vessel and a number of sherds of steatite, and small double-pointed sandstone hammers perforated for hafting. Bone artifacts include hoes and knives of scapula, toothed metapodial fleshers, shaft wrenches, paint applicators, hide-tanning tools, knife handles, whistles, bone tubes and awls. Antler was used for scraper and knife handles and other items including what are apparently saddle bows. Artifacts of shell and wood were recovered in small numbers. Notable among the latter is an object apparently intended as a small-scale replica of a boat with pointed bow and square stern.

Animal and vegetal remains indicate that agriculture, hunting, and gathering all contributed to the solution of the subsistence problem. There is a wide range of mammalian forms, but bison bones predominate. Horse bones are surprisingly rare, but dogs, some very large, are rather well represented. Other animal forms are several species of birds, two species of fish, and a number of molluscan species. Cultivated plants indicated by the specimens recovered are corn (related to the flint corns of northeastern United States, according to a letter of October 29, 1952, from Norton H. Nickerson), squash, beans, melons, and gourds, while edible wild plants include plums, chokecherries, grapes, wild black cherry, and blueberry or whortleberry.

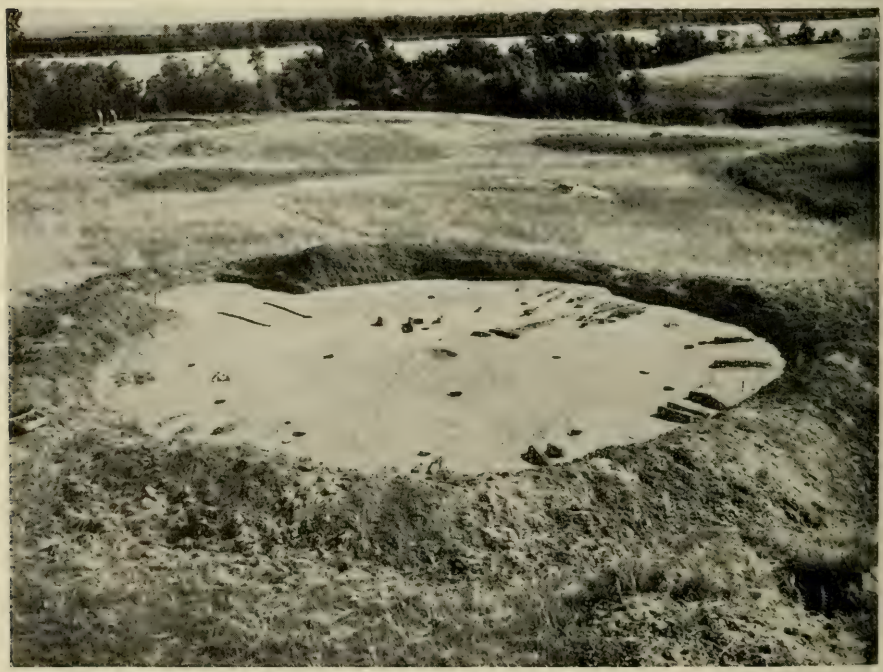
Evidence suggesting trade with tribes to the west consists in the presence in the site of a shell of a Pacific coast olivella and of a quan-



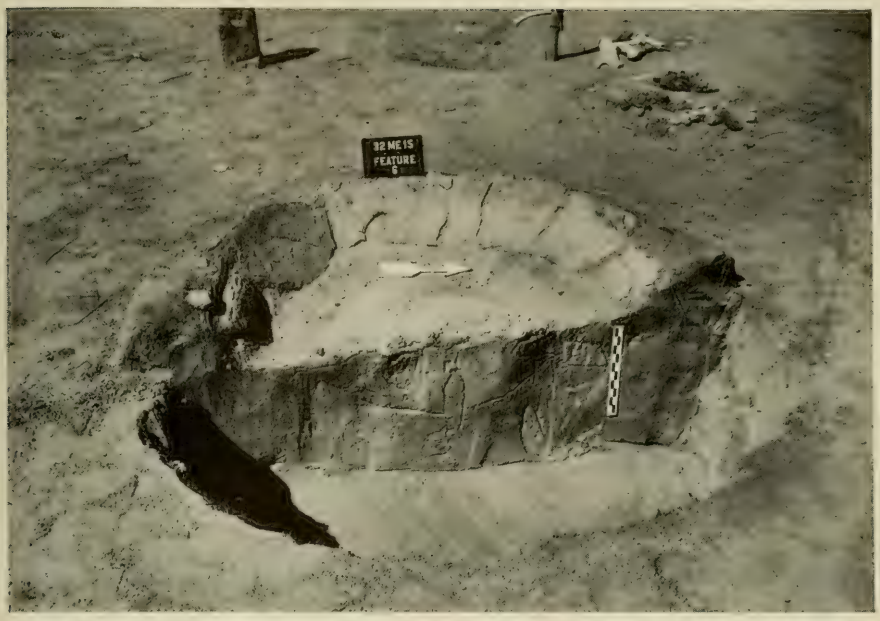
a, Pottery sherds and shell bead from site 24TL26, Tiber Reservoir.

b, Part of site 48BH7, group of 23 tipi rings, Yellowtail Reservoir. Pottery was collected from the surface of this site.

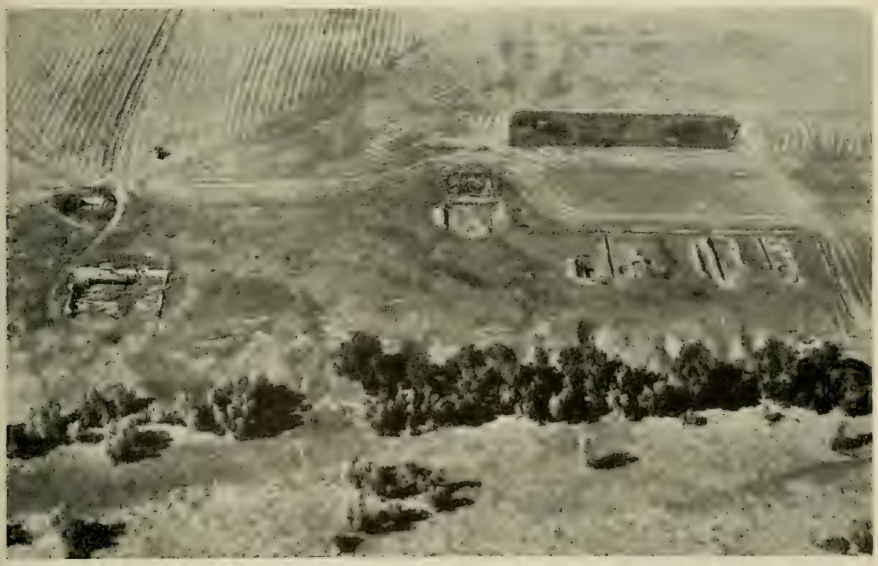
a, River Basin Surveys camp at Rock Village, 32ME15, Garrison Reservoir, in October 1950. Missouri River in background.



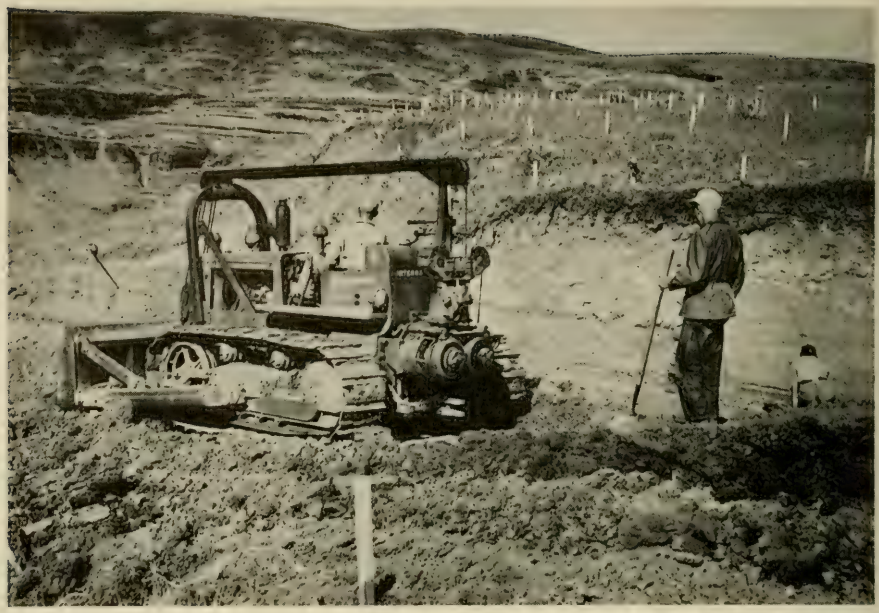
b, Excavated floor of circular house in Rock Village, 32ME15, Garrison Reservoir. Structure has central fireplace, 4 center posts, and trenches at sides of entrance passage. Note timber fragments on floor.



a, Cross-section view of slab-lined central fireplace in house, Rock Village, 32ME15, Garrison Reservoir. Line drawn on vertical face marks base of burned earth.



b, Aerial view of site 32ML1, Fort Stevenson, Garrison Reservoir, a year after excavation by River Basin Surveys. Excavations, all in right half of photograph, are, left to right, in officers' quarters, commissary warehouse, south barracks, and hospital. Photograph is looking north.



a, Bulldozer removing overburden in Trench 1 of Area B, Long site, 39FA65, Angostura Reservoir.

b, Excavation in Area A, Long site, 39FA65, Angostura Reservoir, after removal of overburden with bulldozer.

tity of steatite specimens. A steatite vessel in the collections of the River Basin Surveys somewhat resembling in form and technique of manufacture the vessel from Rock Village came from the vicinity of of the Wind River, western Wyoming, according to the donor.

After the termination of work at Rock Village, the party headed by Hartle undertook excavations in the Star Village (32ME16), identified as the last home of the Arikara before they moved across the river to join the Mandan and Hidatsa at Like-a-Fishhook Village. The village was briefly described and its abandonment mentioned in a report of 1862 from the Agent for the Upper Missouri (Commissioner of Indian Affairs, 1863, p. 194) and was referred to by several of Libby's Arikara informants (Libby, 1920, pp. 187, 195, 204). It is a large site of approximately 90 conspicuous house rings enclosed within a well-defined ditch. The excavations uncovered five earth-lodge floors, three other post-mold patterns, a gateway through the ditch, and sections of the ditch itself. One of the lodges, all of which were circular, was of particular interest. Situated in the center of the village and of unusual size, it was presumably a ceremonial structure. Averaging approximately 70 feet in diameter, it was supported by 4 center posts and 20 outer posts the molds of which had average diameters and depths of nearly 1½ feet. As in the case of the houses at Rock Village, the walls of the entrance of this structure rose from narrow trenches and, in addition, the butts of the leaners stood in a rather irregular trench which ran continuously around the house except where it was interrupted by the entryway. At least in the places where it was trenched, the defensive ditch was a rather unimpressive structure. Its depth beneath the general surface was 2 feet and less and the walls in general were rather gently sloping; its effectiveness as a protective feature was enhanced, however, by piling the excavated dirt along the outside of the trench. As at Rock Village, evidence of such specialized features as bastions was lacking.

As was to be expected in view of the late date (1862) and the brief occupancy (about 3 months) of the village, artifacts were not abundant in the excavations and objects of native manufacture were especially scanty. There were a few stone artifacts, including a well-chipped triangular point with straight base and a pair of side notches, an ovate scraper, retouched flakes, and a whetstone. Most of the chipped objects are of "Knife River flint," and the whetstone is of fine-grained sandstone. Two or three bone fragments were modified in a minor fashion, but there are no indubitable implements of that material. Also, about the same number of shell fragments bear evidence of cutting or perforating. Approximately 300 pottery sherds,

most of them small, were recovered. While the number and size are so small that virtually nothing can be said about them in reference to form, decorative treatment, etc. (except that they have simple-stamped bodies), the ware represented is of surprisingly good quality, suggesting a much earlier date than that of the village for its fabrication.

Objects of White origin, recovered in rather small quantities, include glass beads; nails, files, and knives of iron; tinklers; tin cans and cups; sheet iron; and fragments of glass, mostly from bottles.

During the period June to October 1951, a party under the supervision of G. Hubert Smith accomplished the first excavation of a site of White provenience in the Garrison Reservoir area. The site was that of Fort Stevenson, a frontier military post from June 1867 until August 1883 and thereafter utilized as an Indian school until 1894. The post was established primarily for the protection of the Three Affiliated Tribes, who were living at Like-a-Fishhook Village a few miles above on the same side of the Missouri River, and of emigrants from the east en route to the gold mines of Montana. The availability of detailed official records of the post in the National Archives (utilized in a comprehensive historical account by Mattison, 1951) and of a contemporary account of life there by the commanding officer during part of its existence (de Trobriand, 1951) provides an opportunity for correlating archeological and historical data. It was of course impossible to uncover the entire post area, or even the major part of it. But during the time available sufficient excavation was accomplished to check on the accuracy of contemporary records, to supplement them in matters of architecture, for example, and to recover a large collection of artifacts of the period during which the site was occupied. In general, the archeological results confirmed the contemporary records, although certain discrepancies, notably in the relative positions of certain structures, were revealed. Excavation was concentrated on features to the south and southwest of the parade ground, near the edge of the terrace on which the post was located and in an area that has been less affected by cultivation than have other parts of the site (pl. 7, *b*).

A plan of the post made in 1879 was available during the investigations and was very useful in the laying out of excavation units and in the study of the site generally. Examination of the plan and of the existing surface permitted the selection of areas for excavation which promised to yield the most information for the effort expended. On the basis of these two sources of information, the hospital, the west half of the south barracks, the south officers' quarters, the com-

missary storehouse, and the commanding officer's quarters were selected for more or less complete stripping. In addition, two latrines, one of the military period and one of the Indian school period, were excavated.

Excavation revealed that the walls of all the buildings had been erected upon footings of masonry composed of field stone, either unaltered or very roughly dressed, laid in rather shallow trenches. Often, owing to subsequent activities—intentional leveling or the removal of stones for other purposes—these footings did not extend to their full original height. The walls of the larger buildings were constructed mainly of adobe bricks made from local materials, with some timber framework, while the officers' quarters apparently were primarily of timber, with adobe-brick packing. Chimneys were made of fired brick, probably all shipped in from St. Louis, if we may judge by their similarity to specimens that bear inscriptions of the maker. Occasionally, the remnants of sills were found lying upon the footings, and additional wooden elements were found in the area of the commanding officers' quarters, but details of the timber construction of the buildings were usually absent. A few cellars were found. Usually they were simple excavations, but that in the commissary storehouse was walled and floored with fired brick. The two latrine sites differed. One was marked by a simple pit, while the other was characterized by a pit that had been shored with planks set on end. The contents indicated that the former was in use primarily, or exclusively, during the time the site was used as a school, the other during the military period and apparently for the most part by personnel and patients in the hospital.

The objects recovered in the excavations are of great variety and represent most of the activities that took place on the site, even the recent agricultural activity. While many of the objects—e.g., military buttons and parts of school desks—can be attributed rather surely to the period of the post or to that of the Indian school, many others, such as tablewares of various kinds, may derive from any phase of the occupation of the site. This is true especially because of the fact that a number of the buildings were utilized during both periods and the commanding officer's house, furthermore, was used still later as a farmhouse. Since little new was added to our knowledge of the site from the architectural point of view, the major contribution of the archeological investigation here is the light it casts on the everyday activities at the fort, revealed by the objects recovered. This information supplements the formal history of the establishment recorded in the official archives.

Smith's party completed its work of the 1951 season by making small-scale test excavations in a site believed to be that of Kipp's fur trading post (32MN1), near the mouth of White Earth River. Traces of a stockade were uncovered, as well as evidence that the post had been burned. The few specimens recovered are consistent with the fairly early date, about 1825, of that establishment. This would appear to be one of the most important sites of the fur-trade period in the Garrison Reservoir, and it should be adequately investigated before its destruction.

Sheyenne Reservoir site.—The Sheyenne River, in the area of the proposed reservoir, flows in a narrow, rather steep-sided valley. Previous reconnaissance, in 1946, had revealed the presence of small camp sites on the valley floor and of village and mound sites on the bordering uplands. The reconnaissance of six days in 1951 added three sites—two camp sites and a mound—to the list of those known. It appears that the sites actually below the pool level are not of great importance and that significant archeological resources will be affected adversely only by construction activities or other developments outside the reservoir proper.

SOUTH DAKOTA

Most of the field work in South Dakota during this period consisted of an intensive program of investigation of selected sites. Excavations were continued in the Angostura Reservoir during the first half of the 1950 season, and excavation parties were in the Fort Randall and Oahe Reservoirs both years. Additional reconnaissance was accomplished in both these latter areas, and the Gavins Point Reservoir, scheduled for early activation, was surveyed.

Angostura Reservoir site.—The Angostura Reservoir is a lake approximately 10 miles long on the Cheyenne River where this stream skirts the southern edge of the Black Hills. Rather extensive investigations, involving numerous sites, had been accomplished during the summers of 1948 and 1949, but some additional work was deemed urgently needed before complete filling of the reservoir, which had already begun by the spring of 1950. By April 20 of that year a number of sites just above the dam, including one, 39FA68, which had been strongly recommended for further excavation, were covered by water. Of especial urgency was more intensive examination of site 39FA65 (the Ray Long site) on Horsehead Creek. There deeply buried evidences of occupation had been exposed only at limited points, owing to the thickness and toughness of the overburden, in the side of a ravine. Previous excavations had revealed

the presence of small fireplaces which had not been dug beneath the living surface and were unaccompanied by stones. The predominant projectile point recovered there is lanceolate with sides contracting to a straight or slightly concave base and exhibiting exceedingly fine oblique ribbon flaking; the basal edges have been ground. Many of these points are made of a fine-grained quartzite, available in quarries within a few miles of the site. This point, originally referred to as the "Long point," from the name of the owner of the land on which site 39FA65 was located (Hughes, 1949, p. 270), is now commonly known as the "Angostura point" (Wheeler, 1954). Other artifacts recovered include small end scrapers, knives of plate chalcedony, percussion-flaked blades, drills, side scrapers, flake scrapers, and manos but, unfortunately, many of these specimens were collected from the ravine slopes. It seems reasonable to suppose that most if not all of them have been derived, through erosion, from occupational deposits equivalent to those uncovered by excavation, but unhappily the association is not certain.

In the early summer of 1950, during a period of $5\frac{1}{2}$ weeks, more extensive areas of the Long site were uncovered by the combined use of machinery and hand labor. A bulldozer was used to remove the overburden at two fairly widely separated locations (Areas A and B) in the site (pl. 8, *a*). Two large trenches (50 by 40 feet and 70 by 40 feet) in Area B were excavated by this means to maximum depths of 7 feet and 10 feet respectively, leaving $\frac{1}{2}$ to over 4 feet of earth above the occupational zone. At Area A, where most of the previously excavated artifacts had been recovered, a space 85 feet long and 50 feet wide was stripped to an average depth of approximately $3\frac{1}{2}$ feet. Excavations were then carried out by hand below the floors of the bulldozer trenches (pl. 8, *b*). Two smaller exploratory trenches, one west of Area A and the other east of Area B, were also dug with the bulldozer.

In Area B evidences of two occupations, represented by small, simple hearths, were found. There were only a few flakes in the lower level, but the upper level produced fragments of rough lanceolate blades, a metate, a mano fragment, and many flakes of quartzite and chalcedony. In Area A four fragments of Angostura points and numerous chalcedony and quartzite flakes were found with four hearths representing a single occupation. Charcoal was collected from both areas. Two samples, one collected in 1949, the other in 1950, have been tested by the radiocarbon method and have been assigned ages of 7073 ± 300 and 7715 ± 740 years. Unfortunately, both samples were from Area B, where diagnostic points have not been

found in place; it is probable, however, that adequate samples for testing from Area A are on hand. There seems to be little reason to doubt that the occupations at Areas A and B are substantially contemporaneous. Fragments of Angostura points have been found on the surface of the eroded edge of Area B, and the deposits in both areas have yielded an abundance of very thin flakes of fine-grained quartzite which are apparently the byproducts of the manufacture of these points.

During a period of approximately three weeks, tests made previously in two pottery sites in the reservoir were extended. Several days were spent at 39FA23, rather extensively trenched in 1948 and 1949. This site, situated on Horsehead Creek, not far from 39FA65, had produced evidence of a series of brief, intermittent occupations, possibly by hunting parties of agricultural people from settled communities to the east or south. No evidences of structures had been found, but there were numerous unprepared hearths scattered through the area of occupation. The investigations in 1950 uncovered seven new hearths and added materially to the artifact collection. The site has yielded pottery in relatively abundant quantities. Vessels appear to be globular with rounded shoulders and have simple flaring rims, which are undecorated or are decorated only on the lip or at the lip–outer rim juncture. Lip decorations are incised; in the few instances where the rim has been modified adjacent to the lip that was done by impressing. Body sherds are plain or, more often, stamped with a paddle wrapped with a fibrous material which sometimes, but probably not invariably, was loosely twisted. Frequently the stamping extends to the full height of the rim. There are perhaps a few simple-stamped sherds in the collection. Other artifacts include stemmed and triangular points, the latter both side-notched and plain; plano-convex end scrapers; drills; large blades; and rare bone artifacts. Materials utilized for the chipped-stone objects include chalcedony, chert, jasper, and fine-grained quartzite. There is a suggestion, in pottery and point differences at least, that more than one cultural entity was involved in the repeated occupations of this site. The predominant pottery does not appear to be identical to that of any complex defined to date, but its general character is certainly not incongruous with an assignment to the middle ceramic horizon of the Plains and, more specifically, is suggestive of certain of the pottery associated with the Upper Republican complex to the south.

Site 39FA83 is a camp site on a low terrace on the left side of Horsehead Creek, where some trenching had been done in 1949. During two weeks in the spring of 1950 the earlier excavations were con-

siderably expanded to uncover 27 unprepared hearths and an area about 7 feet in diameter paved with fragmented concretions which may be the floor of a sweat lodge. The evidence suggests a seasonal hunting camp occupied by one or more groups of agricultural people whose main settlements were outside the immediate area. The pottery, of which there is only a fair sample, is a rather heterogeneous lot as to paste, tempering, and surface finish. Both coarse, heavily grit-tempered, and compact, sparsely tempered pastes are represented. Surfaces are cord-marked or smooth, and two smooth sherds, containing as tempering material thin plates of what appears to be shell, have polished outer surfaces. One of these bears the remnant of a rather elaborate incised design. The few rims are simple flaring or recurve slightly toward the mouth to create a slightly S-shaped profile. They may be undecorated or the space between the lip and neck may be filled with a series of rather crudely incised horizontal lines; incising of the lip is rare. Other artifacts include small triangular side-notched and plain points of chert, chalcedony, jasper, quartzite, and obsidian; drills; and a number of fairly large blades, some stemmed, most often made of quartzite. Diagnostic bone artifacts are rare.

The 1950 work at Angostura, terminated July 18 when the Wheeler party moved to Boysen Reservoir for the remainder of the season, did not materially change the general cultural picture as it was delineated by the two earlier seasons' work and was described by Wedel (1953b, pp. 74-80). It did, however, considerably expand our knowledge of three sites, one occupied by an early hunting and gathering people, the others by late prehistoric groups whose main settlements were probably elsewhere, and did nothing to invalidate the characterization of the region as one which had been occupied on a temporary basis by people of various cultures for many millennia. The evidence points, not to intensive and prolonged occupation, but to brief, and probably seasonal, incursions from various directions—probably from considerable distances—by small groups attracted by the varied resources available here. As Wedel has pointed out, this situation presents an unusual potentiality for determining temporal and cultural sequences involving groups ordinarily so separated spatially as to make correlation difficult or impossible.

Fort Randall Reservoir site.—Reconnaissance in 1947, together with information from South Dakota institutions and the documentary research of National Park historians, had revealed that sites of Indian and frontier White provenience were numerous in this reservoir, but, except for some test-trenching in 1947 and a salvage excavation in the area of the spillway at the dam site in 1949, no excavation was

possible until 1950. This was despite the steady progress on construction of the dam since 1946 and the rapidly diminishing time available for the salvage of history and prehistory along a segment of the Missouri River completely lacking in published archeological excavations. In 1950 a single party, headed by Thomas R. Garth, searched selected portions of the reservoir for previously unlocated sites, especially those of White origin, reinvestigated a number of previously recorded locations, and carried out a program of excavation primarily in historic sites but incidentally also in one prehistoric Indian village. This party was in operation from July 17 to November 4. In 1951, a small party under the supervision of Carl F. Miller spent a rather brief period continuing the excavation of a post of the fur-trade period which had been only briefly tested the previous summer. Miller left Lincoln for the field July 24 and returned September 18. Also during this summer a start was made on a program of intensive excavations in aboriginal sites by a unit led by Robert B. Cumming, Jr. This unit was in the field from June 5 to November 6.

The main purpose of the Garth and Miller parties was the investigation of sites related to the White history of the region whose existence and significance had been established or suggested by the research activities of historians of the National Park Service. That agency has assumed the responsibility for outlining the broad program of historic-sites archeology and for the selection of specific sites to be investigated. The archeology, both in the field and in the laboratory, is done by the Smithsonian River Basin Surveys, and the archeologists charged with these duties maintain close liaison with the Park Service historians in the Omaha regional office.

The Garth party began the 1950 season with an intensive search of an area in which construction for the dam was imminent and where it was suspected, on the basis of certain historical records, the original Fort Randall had stood. This important military establishment was founded in 1856 and originally consisted largely of crude log buildings. During the period 1870-1872 a new post was built after the earlier buildings were for the most part torn down, and was occupied until 1892. The ruins of the permanent post, lying downstream from the dam, are still clearly visible. The examination of the area some hundreds of yards above these surface remains, where it was believed the earlier quadrangle might have been situated, produced no affirmative evidence and it appears probable that the new construction was on the site of the earlier unit. This site, including the picturesque ruins of the Fort Randall church, will not be adversely affected by the dam, but a limited area containing brick and other

debris, apparently associated with the military post, found on a lower terrace to the southeast will probably be covered by a proposed chalk blanket.

Other sites which were revisited and in which minor test pits were dug include Whetstone Agency, established in 1868 for Brule and Ogallala Sioux and occupied until 1872; the Lower Brule Agency at the mouth of American Crow Creek, which was in existence from 1868 to 1892, at which time the Agency was moved to its present location near the Big Bend of the Missouri River; and Fort Hale, the military post attached to the Lower Brule Agency, but located several miles above it. At each of these sites there was abundant evidence, in the form of surface irregularities and debris, of the former existence of the establishments in question, although most of Fort Hale had been destroyed by a shift in the course of the Missouri River. A search was made for the site of the Brule Agency, a very temporary predecessor of Whetstone Agency presumably situated just below the mouth of the White River. No evidence of the site was observed, perhaps because there was little construction during its brief existence in 1867.

Owing to its importance in the history of White penetration of the region, notably its connection with the Leavenworth expedition of 1823 to chastise the Arikara, the site of Fort Recovery, possibly identifiable with the Cedar Fort referred to in earlier sources as in the same vicinity, was made the object of a protracted and intensive search, but without success. Mattes (1949, pp. 522-528) has made a convincing case for its location within a rather restricted area on the right side of the Missouri near Oacoma, but repeated examinations of the present surface and numerous test pits failed to produce indications of its presence. It may be that the post was on a lower terrace and has been covered by flood deposits, since there is reason to believe it was occupied long enough to have left ample traces of its existence.

The most intensive excavations of the 1950 season in the Fort Randall Reservoir were at a site (39LM53) superficially marked by low mounds and depressions and by fragments of burned earth. The site lies along the border of a flat, uncultivated terrace immediately adjacent to the timbered bottoms on the west side of the Missouri River about 3 miles above Chamberlain. Horizontal stripping of two of the mounds uncovered two structural units, each consisting of two rooms separated by a roofed space. Fortunately the structures were burned so that there were observable certain details of construction which are usually obscure in the sites of destroyed wooden buildings. Thus it seems certain that only the northern room of the more southerly unit had

been floored with wood. The other rooms and the "breezeways" simply had earth floors. Concentrations of burned chinking in general revealed the positions of the walls, and impressions in this material indicated that these walls were composed of logs of eastern red cedar and probably cottonwood.

The floored room of the southern unit contained a fireplace built of chalkstone, between which and the wall behind it was a clay filling presumably installed to safeguard the wall from fire. Separated from this room by a space 7 feet wide was another room of approximately the same size which, judging from its furnishings and other contents, was a blacksmith shop. Near the north wall was a chalkstone platform about 4 by 5 feet in horizontal dimensions and 8 inches high which it is suspected served as the base of a forge. Three feet south of this stood a 9-inch oak post which may have supported an anvil, and on the floor perhaps 4½ feet still farther south were the remains (2 iron hoops and a small amount of charred wood) of a large barrel, perhaps to contain water. In addition, the room contained a large quantity of iron stock and a number of fragments of tools and other iron objects. The space between the two rooms was not only roofed but it was also enclosed at the ends by vertical planks whose lower ends were set about 2 inches into narrow trenches. A break in the east wall was probably a doorway. The other double unit was rather less well defined, but it too consisted of two rooms, one of which contained a fireplace, separated by a space which had probably been roofed. Here, however, the rooms were separated by approximately 19 feet.

Near this latter structure were the remains of a well marked by a surface depression approximately 10 feet across and 2½ feet deep. It may originally have been somewhat deeper than the 18 feet at which the Garth party was forced to terminate its excavation because of the movement of sand and water into the hole. Below a point 12 feet from the surface, the well was cribbed with split oak logs, notched at the ends. It was from here that many of the better-preserved artifacts were recovered. These included 58 ice gliders and a number of shoes. The one other feature excavated in the site was a cellar, the architectural details of which were rather obscure and from which few artifacts were recovered.

The site yielded artifacts only in moderate quantities. Items that appear to be specifically of military origin are a few .50-.70 caliber, center-fire cartridges of the type used by the United States Army in the 1860's and 1870's and a fragment of a hat insigne of brass. Other objects of White manufacture include sections of an octagonal rifle

barrel, a toothed flesher of iron similar in design to the fleshers made from bison or elk metapodials which occur commonly in relatively late Plains Indian sites, a stoneware crock marked "Dakota City, N.T." probably made by the Dakota City Pottery (in operation as early as 1859), a number of metal wagon parts, and miscellaneous items such as chain links, buttons, etc. The ice gliders, made from the ribs of large mammals, are undoubtedly of Indian manufacture. The complete specimens are pointed at one end, while the square bases are hollowed to receive the feathered sticks which were originally part of these objects. Thirteen of the specimens are decorated with incised designs of various kinds which include series of diamonds, series of triangles, dots forming a triangle, and straight lines. Among the few realistic representations are one of a bird and one of an actual ice glider, complete with feathers. Their presence in the well suggests that it may have served as a target in the game with which these objects were associated.

There is apparently no historical record which will permit the identification of this site on the basis of its location alone. The presence of military items, the dates indicated by some of the specimens, and the location of the site within a few miles of the Lower Brule Agency at the mouth of American Crow Creek strongly suggest, however, that it is the site of the original Fort Lower Brule, the military post established for the protection of the Agency in 1870, but moved to Fort Hale in the same year. Both the earthenware crock, which cannot be earlier than 1859, and the cartridges in use during the 1860's and 1870's are consistent with this identification.

During the excavations at site 39LM53, tests made in a depression a few hundred feet distant and on a higher terrace revealed the presence of a prehistoric occupation. Extensions of the test trenches uncovered a rectangular house and yielded a moderate quantity of pottery and other artifactual materials, which appear to be similar to materials from the Thomas Riggs site (Meleen, 1949). Further excavations should be undertaken at that site, 39LM55, to permit a more comprehensive definition of the complex represented.

Late in the season the party accomplished small-scale testing in two sites on the west side of the river near the southern boundary of the Lower Brule Indian Reservation. At one of them, the site of a military post, Fort Lookout (39LM63), occupied for only a year in 1856 and 1857, evidence was found of the former presence of structures. About 300 yards to the southeast stripping also uncovered evidences of occupation. Limitations of time and personnel prevented more

than the briefest examination of this site (39LM57), and intensive investigation was postponed until the field season of 1951.

Primarily during the late weeks of the season, after the party had been drastically reduced by the return of personnel to school, additional reconnaissance of parts of the reservoir area, mostly on the west side of the river, was accomplished. A number of previously recorded sites were reexamined and 30 new sites were found, bringing the total number of known archeological locations in the Fort Randall Reservoir to 123.

The Miller party devoted its entire time in 1951 to further investigation of site 39LM57, found and briefly tested by Garth the previous year. Four levels of occupation were reported, the upper two referable to establishments of White construction, the lower two of prehistoric age. The upper level yielded briquettes, ashes, and burned timbers outlining an area, presumably the site of a building, 70 feet long and 20 feet wide. Except for what appeared to be a fireplace footing of chalkstone, details of construction were virtually lacking. It was not possible, for example, to find evidence relative to the partitioning of the structure into rooms. It is believed, however, that the floor was of earth. At a depth of about 0.2 foot beneath this level were indications of another structure. Here again structural details were absent except that short sections of horizontal molds indicated a log building.

The somewhat scanty materials recovered from the historic levels included china and crockery fragments, glass beads, fragments of trade pipes and bottles, buttons, cartridges cases, and miscellaneous hardware. Much of this material is of little diagnostic value as far as age and source are concerned—or insufficient studies have been made to demonstrate such value—but a few items provide some light on the time factor. Thus, percussion caps recovered are stated to be of a type used possibly during the period 1822-1850 and some beads are of a variety with a terminal date of 1825 at other sites. Both hand-made and machine-cut nails, the latter dating from not earlier than the late 1830's, are in the collection.

On the basis of documentary materials it has been suggested by Merrill Mattes, National Park Service Regional Historian, that 39LM57 may well be the site of a "French" Fur Company trading post, called Fort Lookout, which was in existence in 1833. This site appears to have been abandoned at some unknown date after 1833, and then to have been reoccupied in 1840 by an independent trader named La Barge and finally abandoned in 1851. The available archeological evidence seems consistent with this identification, especially if recon-

struction was necessary at the time of reoccupation. Such reconstruction would account for the presence of the superimposed structures and of machine-cut nails. There appears to be nothing among the artifact materials which would be incompatible with this hypothesis. Unfortunately, neither the contemporary accounts of Fort Lookout trading post nor the archeological remains materially illuminate the problem from the architectural point of view.

The associations of the remains of a well-defined structure (pl. 9, *a*) are uncertain. Vertical posts, set close together in a trench on two sides and one end and more widely spaced in individual holes on the other end, enclosed a rectangular area 35 feet long and 27 feet wide. Three interior post molds suggest roof supports. There was no well-defined fireplace, but there was a fairly large, circular burned area near the center of the enclosure. A gap near a corner on one long side may represent an entrance. Many butts of posts, mostly cottonwood, remained in place and all had flat bases as though they had been sawed. It is reported to have underlain the other historic features, and it was partially superimposed upon a circle of post molds associated with a deeper cultural deposit.

Separated by 6 inches of sterile earth from the base of the deposit attributed to the trading post was evidence of a prehistoric Indian occupation with which were associated irregular shallow pits and numerous post holes. In two instances post holes were arranged in such fashion as to suggest the former presence of small circular structures, 18 feet and 19 feet in diameter, respectively. A fireplace was found near the center of one of the circles and there were traces of burned earth in the central portion of the other. In neither case was there evidence for interior support posts. Other post molds on the same level possibly show the location of racks to hold supplies or for drying hides. Beneath this horizon and separated from it by a sterile deposit 4 inches thick, were traces of an earlier occupation consisting of a compacted surface suggesting a house floor, a number of pits, and a quantity of refuse material.

Since the artifacts and illustrations of them are not available, the brief discussion here of the materials recovered from the two prehistoric horizons is based entirely on the descriptions in a manuscript on site 39LM57 prepared by Miller. Both occupations are attributed to a single cultural complex, which Miller believes is closely related to the Upper Republican aspect of the central Plains. Stone artifacts include notched and unnotched triangular points, end scrapers, miscellaneous knives and scrapers, gravers, and drills of quartzite, chalcedony, jasper, chert, and flint, as well as a number of ground-stone

forms. The latter include grooved mauls, sandstone shaft smoothers, pumice rubbing and sharpening stones, hammerstones, and pipes and miscellaneous objects of catlinite. Among the bone artifacts are awls, spatulate objects, scrapers or knives of scapula fragments, bird-bone tubes, and flakers. Two fragments of antler are rather elaborately decorated. The pottery is described as representing predominantly globular vessels with either plain or cord-marked surfaces. Handles are apparently rare. Decoration is confined to the rim, which may be simple or collared and is predominantly incised, although there is some pinching of the outer lip margin. Incised designs, found only on the rim exterior, include series of horizontal, vertical, or diagonal lines, pendant triangles, hachures, and combinations of these. One distinctive decorative treatment consists of a series of horizontal lines across which a single line meanders angularly around the rim. Also found were a few plain sherds of conoidal vessels, from the lowest levels of the site, and thick, heavily tempered sherds with exterior nodes.

The second field unit in the Fort Randall Reservoir area in 1951 spent the five-month season in the investigation of aboriginal sites near the mouth of Platte Creek, some 30 miles by river above the dam. Most of the work consisted of excavation in the stratified Oldham site (39CH7), which lies on a rather extensive terrace bordering what is now a narrow river bottom. Since the site has been under cultivation for many years, surface features are lacking except for the portions of a defensive ditch which lie along the edge of the terrace and the bank of a ravine which bounds the site on the northwest. Test excavations there in the fall of 1947 had produced evidence of two occupations separated by a sterile silty deposit. The upper zone, which had been substantially destroyed by the plow except for features (such as houses and cache pits) excavated beneath the general village surface, produced, among other rather abundant remains, simple-stamped pottery, while the lower yielded a very small quantity of cord-marked pottery sherds and other debris. Two circular earth lodges attributable to the later occupation were uncovered at that time.

The excavations in 1951 produced information primarily relating to the later of the two previously observed occupations. Test trenches across the ditch, both in places where it was still visible on the surface and where it had been filled by cultivation, showed it to be 3 to 4 feet deep and about 5 feet wide, with sloping sides. An additional element in the fortification complex was a stockade of vertical posts, spaced an average of 1 to 2 feet apart, a few feet inside the ditch. Two bastions were found in the 450 feet of stockade uncovered.

Seven earth lodges resembling more or less closely the two previously investigated and another, deviant, structure were excavated in the area enclosed within the ditch (Area A). The lodges (pl. 9, *b*), circular in ground plan, were outlined with posts and, with one exception, had four inner roof support posts. The exception, an unusually large house, boasted six center posts. Other invariable features were basin-like central fireplaces and vestibule entrances. The atypical structure had a central fireplace and four center posts in a compacted floor area, but there was no outer row of posts nor was there evidence to indicate the nature of the entrance. Cache pits within the houses were rare, and the few that did occur were ordinarily small, but the numerous test trenches excavated throughout Area A uncovered a number of large cache pits, as well as some 20 other refuse-filled pits, probably originally borrow pits.

The excavations in Area A failed to uncover any considerable concentrations of material in the lower occupational level, but tests made late in the season to the southeast and outside the ditch-enclosed village demonstrated that the terrace had been rather intensively occupied during the earlier period. In this location (designated Area B), a buried zone apparently corresponding to the lower level in Area A was found to contain cultural debris, including cord-marked pottery, in quantity. Above this zone, the soil that had been disturbed by cultivation contained material like that in the late occupation of the fortified part of the site. One earth lodge, falling within the range of those lying inside the ditch, was excavated, as were several pits, some assignable to the upper level and others to the lower one.

Pending laboratory analysis, it is not possible to say much about the artifact complexes of the two occupations. As previously indicated, the earlier pottery is characterized by predominantly cord-marked bodies, the later by simple-stamped bodies. The pottery of the later component appears to resemble rather closely that of the Oacoma sites (39LM26 and 39LM27), excavated by the Nebraska State Historical Society, and of the Fort Thompson focus component at the Talking Crow site, investigated by the University of Kansas. The ceramics from these sites, and probably the remainder of the artifact complex as well, seem related, not at all remotely, to the Lower Loup sites in Nebraska. Roughly equivalent dates for the various sites are suggested by the presence of relatively minor amounts of White trade materials, although there are undoubtedly some time differences. The late component of the Oldham site, for example, is probably somewhat earlier than the Oacoma sites, judged by the relative quantities of trade goods.

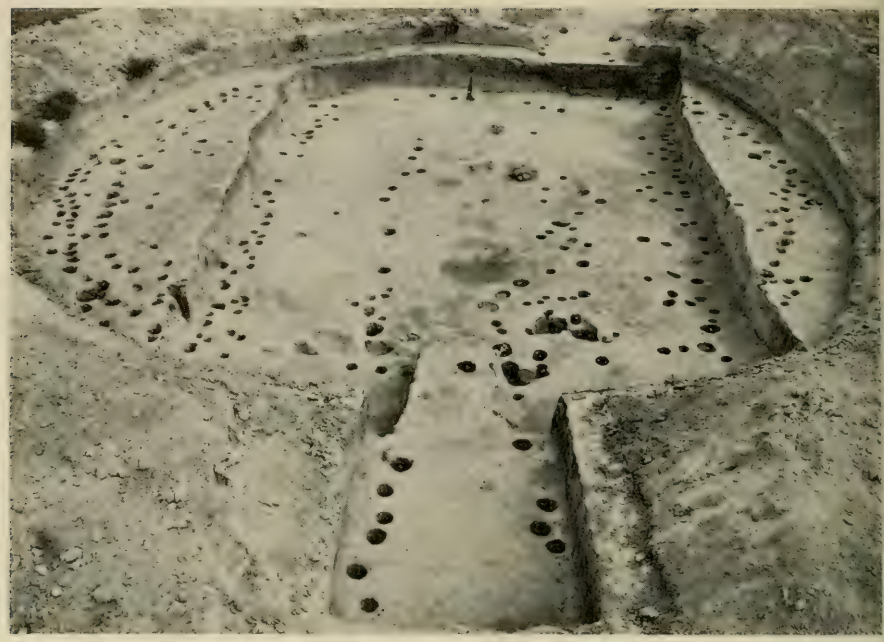
The pottery of the earlier component appears to comprise a new complex at least for the immediate vicinity of the Missouri River. Much of it is characterized by straight, outsloping rims which often meet the body of the vessel at a sharp angle. The juncture of rim and body on the interior is often an especially abrupt angle. Handles appear to be absent. Some of the vessels represented by sherds of this sort are undecorated or, in a few instances, have short incised or impressed lines at the outer edge of the lip, but an apparently large proportion bear incised decorations on the exterior of the rim. On most if not all of these decorated vessels there is a series of short diagonal or vertical lines incised or impressed on the rim immediately adjacent to the lip. The rim beneath the narrow band formed by these lines is characteristically filled simply by a series of horizontal lines extending continuously around the vessel or by a similar series crossed by single or paired diagonal lines which are either continuous rectilinear meanders or are separated by varying distances where they approach the lip and neck. Variations include the omission of the horizontal lines beneath the diagonals and the occasional filling of the upper triangles with oblique lines. Where the space below the diagonals is left plain, the meander extends only part of the way up the rim and is topped by a series of continuous horizontal lines. At least many of these sherds appear to be indistinguishable from Great Oasis ceramics as described by Wilford (1945).

Also found in Area B was a fair quantity of pottery at least some of which closely resembles in form and design that just described except that the decoration is applied by impressing with single cords rather than by incising. It is as yet uncertain whether a time difference within the site suggested by the superposition of certain features can be correlated with these pottery differences. Also of interest in this connection is the presence of a minor quantity of cord-marked pottery with collared, incised rims.

The Hitchell site (39CH45), also near the mouth of Platte Creek, was briefly investigated during the latter part of the 1951 season. Depressions were visible in that part of the site still in native grass, and occupational debris was present on the surface of the cultivated portion. Excavation was carried out in three of the depressions and three trenches were dug in the cultivated area. Fireplaces and post molds were found beneath the depressions, but a well-defined patterning of posts was not apparent. The posts appeared to be unusually small, and no evidence of the conventional earth-lodge entrance was found. Some sort of a light structure without an earth covering seems indicated. Artifacts associated with these structures suggest a

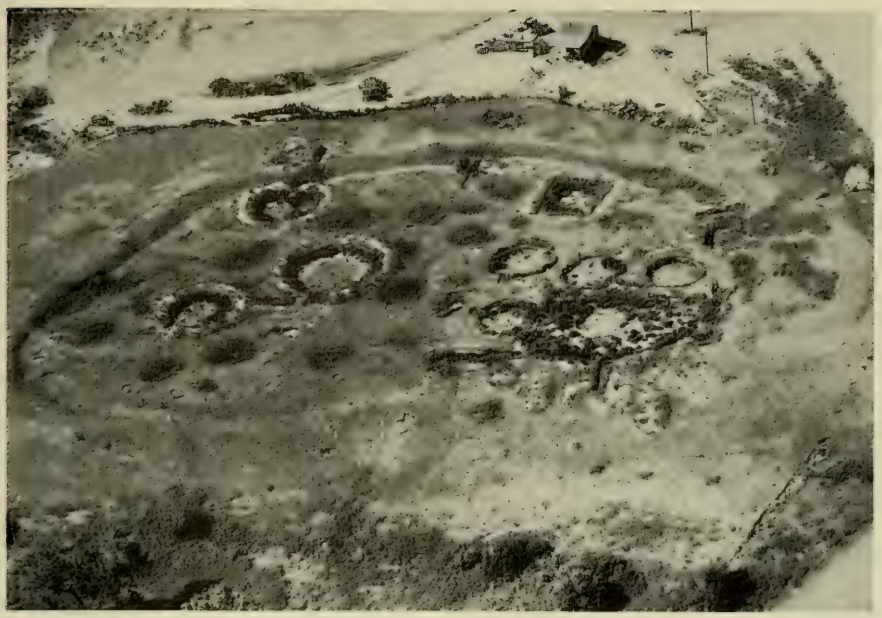
a, Workers clearing site of rectangular structure in 39LM57, site of Fort Lookout trading post and prehistoric Indian village, Fort Randall Reservoir, S. Dak. Lines of holes mark locations of vertical posts.

b, View of circular house, after excavation, and general site surface in Area A of the Oldham site, 39CH7, Fort Randall Reservoir. Missouri River in background.



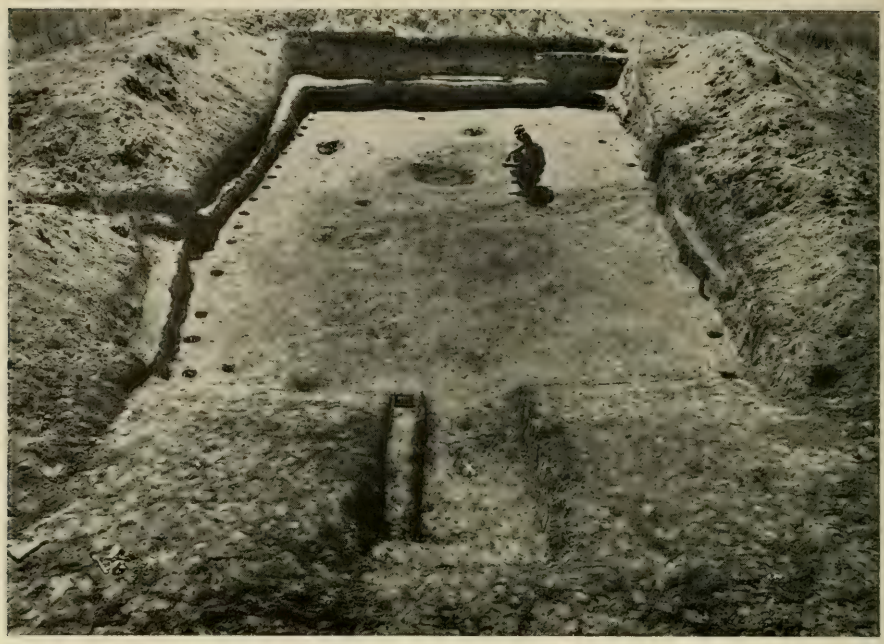
a, House floors at the Dodd site, 39ST30, Oahe Reservoir, after excavation of the earlier, rectangular house had removed part of the later, circular house. Note double row of inner roof supports and ramp into house from vestibule entrance.

b, Rectangular house underlying later, circular house at Dodd site, 39ST30, Oahe Reservoir.

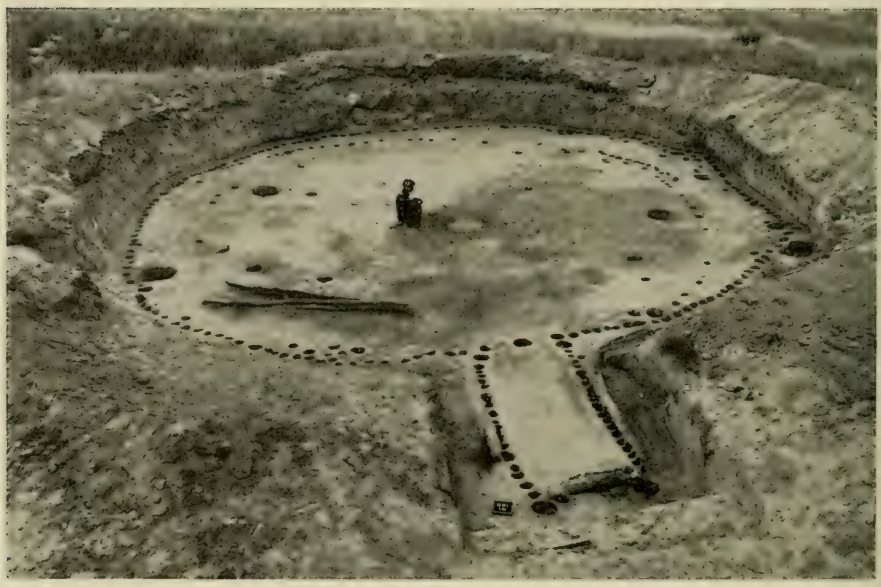


a, Aerial view of Philip Ranch site, 39ST14, Oahe Reservoir, a year after final excavation by River Basin Surveys in 1951.

b, Excavation of house floor in Philip Ranch site, 39ST14, Oahe Reservoir. The size of the house, its central location in the village, and the presence of the earthen platform opposite the entrance suggest it was probably a ceremonial lodge.



a, Rectangular house in early component of Cheyenne River site, 39ST1, Oahe Reservoir.



b, Circular house in historic component of Cheyenne River site, 39ST1, Oahe Reservoir. Unburned cedar timbers on house floor at left of vestibule entrance.

rather close relationship to the later component at the Oldham site, previously discussed. Evidence was also found of an earlier occupation which appears to be similar to that of the earlier Oldham component. This evidence was mainly from a number of pits. It is evident that additional investigation of this site, as well as of the area of the concentrated earlier occupation at Oldham, is urgently needed.

In addition to the excavations accomplished, the Fort Randall Indian sites party undertook some additional reconnaissance. A number of sites, mostly within a few miles of Platte Creek, were reexamined and two new sites were found. Test trenches were excavated in a number of the sites in order to determine whether intensive excavation is needed.

Gavins Point Reservoir site.—The Gavins Point Reservoir, to be created by a dam across the Missouri River approximately 3 miles above Yankton, S. Dak., will be confined to the channel and flood plain of the river and will accordingly not destroy archeological resources unless construction activities affect sites on higher terrain. Three sites previously known and of considerable archeological importance lie on the uplands bordering the reservoir, while the two sites discovered during a 4-day reconnaissance in September 1951 will not be flooded and are, furthermore, apparently of minor importance.

Oahe Reservoir site.—The Oahe Dam, the largest structure in the Missouri Basin water-development program, will create a reservoir more than 260 miles long. Water will be backed up by the dam near Pierre, S. Dak., to a point near Bismarck, N. Dak. The nature of the reservoir area and the salvage problem posed by the proposed inundation of this archeologically rich segment of the Missouri River Valley have been fully described by Wedel (1953a) and need not be detailed again here. Suffice it to say that our various sources of information—our own surveys, the reports of other scientific institutions and of interested individuals, and such records as systematic aerial photographic surveys—make it clear that literally hundreds of sites, many of them exceedingly large and impressive, will be destroyed when the waters rise behind the Oahe Dam. Some of these sites are apparently attributable to the Arikara, Mandan, and Cheyenne, all known or believed to have been residents in the area for varying lengths of time, but many others were undoubtedly occupied by various unidentified groups. Collections of artifacts resulting from the limited excavations to date and from surface surveys suggest that several traditions are represented in the area.

Although a number of institutions have given the area to be affected

by the Oahe Dam some attention, the amount of work accomplished to date is only a microscopic proportion of the investigation that is essential for even a bare sampling of the most important sites. Excavations prior to 1950 of which there are published accounts have been accomplished by the Bureau of American Ethnology in burials in the Mobridge, S. Dak., vicinity in 1923 and in village sites in the same vicinity in 1932 (Stirling, 1924; Strong, 1940); by Columbia University and the State Historical Society of North Dakota at Slant Village near Mandan, N. Dak., in 1938 (Strong, 1940; Will and Hecker, 1944); by Columbia University at the Buffalo Pasture site near Pierre, S. Dak., in 1939 (Strong, 1940); by the University of South Dakota at the Thomas Riggs site, also near Pierre, in 1940 and by the South Dakota Archaeological Commission at the same site in 1947 (Meleen, 1949); by the University of North Dakota and the State Historical Society of North Dakota near Fort Yates, N. Dak., in 1947 (Hewes, 1949a, b); and by the South Dakota Archaeological Commission at the Robinson and Myers sites, in the lower part of the reservoir area, in 1948 and 1949 (George, 1949; Hoard, 1949). Much of this work was on a small scale and in some instances constituted little more than testing.

Except for very minor test trenching in two or three sites in 1948, the year 1950 saw the first excavation by the River Basin Surveys in the Oahe Reservoir area. The reconnaissance of 1948 had indicated that at least three sites would be in jeopardy immediately upon or soon after the initiation of construction on the dam. One of these, the Dodd site (39ST30), lay on the course of the approach channel, scheduled for early excavation. The others are the Philip Ranch site (39ST14) in the work area just below the dam on the same (right) bank of the river, and site 39HU22, which will be covered by the dam on the left bank. These three sites were accordingly scheduled for investigation in 1950 by a party supervised by Donald J. Lehmer. Original plans were for relatively small-scale excavations in the Dodd site, the first on the schedule because of the imminence of its destruction. Early in the investigation, however, it became apparent that this site was so complex and of such significance that nearly all the resources of a comparatively large unit (13 to 19 workers) were devoted to it until late October, when work was begun on the Philip Ranch site. This unit remained in the field until the end of November. During the summer, minor excavations were undertaken in nearby sites, and a 2-man team spent some time in reconnaissance of the east side of the river between the dam site and the mouth of the Cheyenne River.

In 1951 two excavation units were in operation in the Oahe Reservoir area. A party composed mainly of local workers, under Lehmer's supervision, returned to the Philip Ranch site, while another party, led by Waldo R. Wedel and composed of student workers, established camp at the mouth of the Cheyenne River to undertake the investigation of the Cheyenne River site (39ST1). Previous reconnaissance and minor testing had indicated that the latter had been occupied more than once and it was thought excavation would cast additional light on the tradition represented by the later components of the sites under investigation in the Oahe Dam area and demonstrate its temporal relation to a new, as yet undefined complex. A survey team detached from this unit reconnoitered parts of the Missouri River banks, mainly on the east side, above the Cheyenne River.

The Dodd site was situated on the right bank of the Missouri River on two sides of a ravine the bottom of which has been severely gullied in relatively recent times. Both parts of the site were in sod and had apparently never been cultivated. Depressions of varying size and prominence characterized the surface and marked the locations of some of the original houses and cache pits, but excavations revealed that there were many such features for which there was no surface evidence. In the time which was available before the contractor moved his machinery onto the site to begin excavation for the approach channel, 21 houses were completely uncovered, and numerous features outside the houses were excavated in test trenches. An additional eight houses were test-trenched. Houses of three different kinds were found, in several instances in definite stratigraphic relationship (pl. 10, *a, b*). Thus it is clear that nine circular houses and one octagonal structure (containing an altar and presumably having a ceremonial function) belong to the latest occupation of the site, while two earlier components are both characterized by rectangular houses, which exhibit some differences. The rather shallow circular houses had a central fireplace, a square central roof-support complex with single or multiple posts at the corners, upright posts around the edge of the pit, and a covered entrance passage. The entrances were oriented generally toward the river. The rectangular structures were alike in being oblong, having the fireplace situated between the center and the entrance, having a step within the house at the doorway, and in having the floor deeper than those of the round houses. An antechamber was at least often a part of the entrance complex. In each instance, the doorway was to the southwest, away from the river. The earlier structures of this type, however, differed in that post holes were distributed more or less evenly along all walls of the pit in con-

trast to the situation in the later houses, where the posts were concentrated along the two long sides. A roof construction differing from that of the circular houses is suggested by the fact that single or double rows of posts commonly lay on or parallel to the long axis of the structure.

Cache pits were not abundant within the houses, and those which were found there were usually relatively small. Outside cache pits were usually larger and were ordinarily bell-shaped.

Differences in artifacts inventories were associated with the different classes of houses. The pottery has been described by Lehmer (1951). With the latest houses, those of circular form, was associated simple-stamped pottery with rounded shoulders and rather high, slightly curved rims which were usually thickened by the application of a fillet on the portion adjoining the lip. The area above the rim-body juncture was commonly brushed, and decoration is usually confined to the fillet, where it consists either of cord impressions or of incisions or impressions made with tools of various kinds. One common rim treatment is a pinching which has produced a sinuous appearance when the vessel is viewed from above. Lehmer has distinguished four types in this late-component pottery, all of which he has assigned to a larger group which he has named Stanley ware. This pottery resembles closely that which is found in numerous sites scattered along the Missouri River from the vicinity of Pierre at least as far upstream as the vicinity of Mobridge. Some of these sites have been more or less surely identified with the Arikara of the late eighteenth and early nineteenth centuries. Thus, the Leavenworth site (39CO9), a few miles above the Grand River, is without doubt the double Arikara village visited by Lewis and Clark and other travelers in the first quarter of the nineteenth century, while it seems probable the Tolton site (39ST25), approximately three miles below the mouth of the Cheyenne River, is one of the Arikara villages visited by Truteau in 1795.

The earlier pottery of the Dodd site is plain or cord-marked and characterized by simple, collared, or S-shaped rims. To a large extent, the types defined by Lehmer occur in both of the earlier components but there are changes in popularity and in the later Anderson focus component cord-impressed decoration largely replaces the incised decoration of the earlier Monroe focus component.

There are differences in the inventories of other artifacts which correlate with the differences in architecture and pottery. These cannot be detailed here, but examples are the presence only in the late Stanley focus component of toothed metapodial fleshers, elk-antler

scraper handles, and objects of metal. Scapula hoes, present in all components, are characterized in the Stanley component by the removal of the glenoid portion of the bone, whereas there is no such alteration in the case of the earlier specimens.

All evidence indicated that the site was fortified only during the second occupation. A ditch, 3.5 to 4 feet deep and about 3 feet wide, extended across the ridge on which lay the northwestern part of the site, to which the two earlier occupations were confined. This, together with the two shallow ravines that it connected, and the terrace slope, apparently constituted the sole defensive feature, for no evidence of a palisade was found in the test trenches.

Despite the extensive excavations within the occupational area and rather intensive search, by test trenching, of the ridge behind the northwestern part of the site and a prominent hill adjoining the southeastern occupational area, no burials were found except for a single hematite-stained cranium in the fill of one of the rectangular houses.

During the excavation of the Dodd site, three other sites were briefly investigated. One of these, site 39ST53, was a burial on the edge of the uplands in the dam area. Excavation revealed that a boulder cairn, visible on the surface, covered two burials, the lower one of which consisted of an articulated skeleton, complete only from the pelvis up. This burial was accompanied by three strands of shell disk beads, which lay on and near the skull. The upper grave, which intruded into the lower one, contained only a number of disarticulated bones, some of which had been burned, of at least two individuals. Another site (39ST33) was near the city of Fort Pierre in an area which had been utilized as a borrow pit during the relocation of U. S. Highway 14 and was scheduled to be again so used for the access railroad to the dam. Test trenches indicated that the site was almost if not completely destroyed by the earlier activity. Tests at 39HU22, which will lie beneath the dam on the east side of the river, indicated that the nature of the soil was such that extensive excavation would not be feasible. The collection from this site suggests a relationship to the late occupation at the Dodd site, but there are significant differences, at least in the pottery.

Also, during several weeks in August and September, a small reconnaissance team worked on the left bank of the Missouri from the dam site to the Little Bend, opposite the mouth of the Cheyenne River. Many previously recorded sites were reexamined and 27 new sites were found. Most of these are earth-lodge settlements, but a few are mounds or cairns which probably mark the locations of burials. The Little Bend proved to be especially prolific in sites. Almost every

habitable surface there shows evidence of occupation in the form of depressions numbering from two or three to several dozen. A considerable time range for the occupations is suggested by the collections recovered.

During the latter part of October and through the month of November 1950, and again in the summer of 1951, Lehmer excavated a portion of the Philip Ranch site (39ST14) in the work area below the dam and about a mile downstream from the Dodd site. This is a very well-preserved village with a ditch entirely enclosing an oval area approximately 400 feet long and 250 feet wide situated at the edge of the first terrace above the river bottom (pl. 11 *a*). Well-defined depressions indicated the presence of 23 lodge sites and a few smaller depressions probably mark the locations of cache pits. Oddly enough, in view of its conspicuous character and accessibility, the site appeared to have suffered from none of the haphazard but often extensive pitting which has been the fate of so many in the area. This is probably explainable in terms of the tight sod cover which has prevented the outcropping of cultural debris. Several examinations of the surface prior to 1950 had resulted in the collection of less than 50 sherds, generally small and unimpressive.

Fairly extensive excavations in the area of the ditch revealed that the bottom of this feature was about 6 feet beneath the present surface and was U-shaped. Evidence was uncovered of an uncompleted stockade on the village side of the ditch. Ten houses, 107 cache pits, and 8 borrow pits, in addition to a number of such features as hearths, were excavated. All evidence indicates that a single occupation is represented here. The houses, none of which were superimposed, were circular and generally similar to those of the late component at the Dodd site, although there were some differences in details. Cache pits beneath the floors of the houses were numerous and were often large. One unusually large house, with a double row of outer posts, had an earthen platform against the wall opposite the entrance, presumably indicating a specialized function for the lodge (pl. 11, *b*). Many of the outside cache pits and borrow pits were found in an area of the site of about 175 square yards which was completely stripped to reveal the relationships of features outside the houses.

No burials were found within the village or in test trenches excavated in the vicinity, but occasional scattered human bones were found within the occupational deposits.

The material culture manifested at the Philip Ranch site is closely related to that of the latest occupation of the Dodd site. There are some differences, however, in pottery and other traits (e.g., fortifica-

tion structures and greater quantities of trade materials) which have led Lehmer to suggest that it should be considered a component of a different focus (Snake Butte focus). A somewhat later date for this site seems to be indicated.

During the 1951 season, burials were exposed at the Indian Creek site (39ST15) by machinery involved in construction of the access railway. Lehmer's party was able to remove two of these. The burials were encountered some distance west of the occupational area, which may represent more than one component. In both instances the interments were in pits and the skeletons were articulated except that there was evidence the legs may have been detached from the body before burial. A small vessel of Stanley ware accompanied one of the individuals, while the other grave contained sherds of simple-stamped pottery and two tubular beads of sheet copper.

Site 39ST1 (Cheyenne River site) is situated on a point between two ravines, and partially subdivided by a very short third ravine, just below the mouth of the Cheyenne River. It has been occupied more than once. On the upstream side of the short ravine is a small area, partially enclosed by a well-defined ditch, within which are several circular depressions. This area has been and is still subjected to conditions—presumably saturation of the underlying Pierre shale—which bring about severe slumping. The presence of abundant cultural objects in the slumped materials far from the edge of the intact surface testifies to an extensive occupied area prior to the drastic alteration of the terrain. There is evidence that this alteration, at least insofar as it has affected the archeological site, is of fairly recent origin. At the beginning of the twentieth century the ditch entirely enclosed an oval area, according to a contemporary observer. Outside this fortification ditch are a considerable number of depressions, at least some of which are markedly oblong. The presence of another ditch is suggested by a linear depression across the point on which the entire site lies where this point narrows because of the headward convergence of the two ravines which bound it. Collections previously made from the surface and in minor test trenches had suggested that the area within the ditch at the terrace edge represented at least predominantly an occupation in the Arikara tradition and that the area to the southeast had been occupied by people with a culture related to that of the Myers site (39ST10), a nearby earth-lodge village which had been partially excavated and reported by the South Dakota Archaeological Commission (Hoard, 1949).

The Missouri Basin Project was able to assign a party to this site for a relatively brief period (late June to early September) in 1951,

when Waldo R. Wedel became available to undertake the investigations. The time spent on the excavations was inadequate for more than a beginning on this large and complex site and it seems essential that extensive additional work be accomplished to establish the relationships of the many and varied features. In the limited time in 1951, however, numerous test trenches were excavated to cross-section the ditch associated with the late component and to determine the stratigraphic situation. Also, a number of exterior cache pits were dug, and five houses were completely or partially uncovered. Two circular houses within the small fortified area were completely excavated (pl. 12, *b*). Each had a central fireplace, four center posts, and closely spaced posts about the periphery of the pit which had been excavated below the surface. The entrance passages of both extended toward the river, in a northerly direction. Neither had been burned, and fragments of unburned timbers were found in the fill of both. Some instances of superposition were found in this area, but these do not necessarily indicate considerable time differences since metal was found in some of the underlying features as well as in the upper ones. It appears, however, that at least one earlier occupation lies beneath the level associated with the circular houses.

In the southeastern part of the site, excavations were in three cache pits and in three large depressions. All the latter marked the locations of oblong rectanglar structures. One, 45 feet long by 34 feet wide, had wall posts more widely spaced than in the round houses and had a large, partially stone-lined fireplace on the long axis offset toward the south wall (pl. 12, *a*). The position of the entrance is uncertain. In the second house, 47 feet long by 30 feet wide, the floor was difficult to define and no fireplace or entrance was found. The excavation of the remaining house was not completed but presumably will be when it is possible to return to the site. Overlying this structure was a rich midden deposit containing pottery of the kind characteristic of the Myers site, in which the only house excavated was circular. The presence of material of this sort overlying rectangular houses seems to indicate that 39ST1 is a 3-component site and suggests that round houses may be present as the dwellings associated with the second component.

No extensive burial areas were found, although some search was made for them.

Since the artifacts from the site are not available for examination, no detailed or even general statement can be made relative to them, except that the late component, a compact fortified village yielding a moderate quantity of trade goods, appears to be in the Arikara tra-

dition and that a component with pottery like that of the Myers site (vessels with predominantly simple flaring rims and incised decoration on both body and rim; rim decoration most often a series of horizontal lines) is present.

A 2-man survey team detached from this unit spent several days in examination primarily of the east bank of the Missouri River between the Little Bend and Cheyenne Agency. Some sites were revisited and four new archeological locations were recorded in this area, which seems to have a considerably smaller number of sites than most comparable stretches of the river in the Oahe Reservoir area. During one day, two sites in Armstrong County, on the west side of the river, were visited for the first time.

FIELDWORK IN PALEONTOLOGY

After an interruption of a year, in 1949, paleontological field investigations were resumed in 1950 and continued in 1951, under the supervision of Dr. Theodore E. White. With two assistants in 1950 and one in 1951, White revisited six reservoir areas that had previously been examined more or less intensively, initiated work in the three large reservoirs under construction on the Missouri River in the Dakotas, and collected information, through consultation with other paleontologists, relative to the situation in a number of potential reservoirs in the Niobrara Basin of northern Nebraska. The 1950 schedule included visits to Angostura, Boysen, Anchor, Canyon Ferry, Garrison, Oahe, Fort Randall, and Bonny Reservoirs, in addition to a conference relative to the Niobrara Basin. In 1951, the party returned to the Canyon Ferry, Garrison, Oahe, and Fort Randall Reservoirs and added Tiber Reservoir to its itinerary.

Two days were spent in the Angostura Reservoir area, during which time a deposit of bones of Pleistocene age reported by the archeologists was examined. No evidence of cultural association was observed and the deposit did not appear to be very productive. At Boysen Reservoir, where in 1948 important collections had been made from the Lower Eocene formations, survey of approximately a week revealed that insufficient weathering had taken place to expose additional materials of significance. It was possible, however, to photograph the major structural features of the area. Results were almost wholly negative at Anchor Reservoir, where no vertebrate fossils were found in the exposures of the Permian Embar and the Triassic Dinwoody and Chugwater formations inspected during a stay of four days. A single fragment of sandstone bearing impressions of fish scales found in the bed of an arroyo was the sole specimen observed.

These three reservoirs will require no further investigation, either because of immiment flooding or lack of productive exposures, unless construction activities or other unusual circumstances unexpectedly uncover significant remains.

Several weeks were spent in both 1950 and 1951 in the Canyon Ferry area, which had been found to be unusually productive of small mammals of Oligocene and Miocene ages. The investigations were highly successful in that numerous individuals of forms only scantily represented heretofore and a number of forms previously unknown for the area were collected. During both years previously known localities provided additional collections and in 1950 two new Miocene fossil localities were discovered. A large number of jaws of a small rodent of the genus *Eumys* were recovered. New or very rare forms, for the area, include *Peratherium,* an opossumlike marsupial of Oligocene age; *Cylindrodon,* from the Lower Oligocene; and a shrewlike insectivore of the Middle Oligocene. The excellent results obtained at Canyon Ferry—in the expansion of the faunal assemblage of the Oligocene and Miocene deposits and in the collection of large samples of small mammals which will permit comparisons, from the standpoint of environmental adaptation, with equivalent forms of the same age in the Big Badlands of South Dakota—indicate the desirability of exploiting this productive area as long as it is available.

During approximately six weeks in 1950 and 1951, exposures of the Paleocene Fort Union formation were explored in the Garrison Reservoir area. In the lower part of the reservoir the remains of vertebrates were found to be extremely rare, but it was possible to make a number of collections of invertebrate forms. Farther upstream, vertebrates were more plentiful and the collections included mammals, turtles, alligators, and fish. Several stratigraphic sections were made and sediment samples for micropaleontological studies were taken from various parts of the reservoir area.

Only a rapid reconnaissance in the Oahe Reservoir area was made in 1950, but during the next summer the Mobridge, S. Dak., vicinity was inspected for four days and the lower end of the reservoir received somewhat more protracted study. Satisfactory exposures were not found near Mobridge, but in the Pierre area a nearly complete skeleton of a pygmy mosasaur (*Clidates pumulis*) and a number of shark teeth were obtained from the Upper Cretaceous Pierre formation. Several weeks of work in 1950 and 1951 in the Upper Cretaceous Pierre sediments in the Fort Randall Reservoir area yielded the skull of a large plesiosaur, a marine turtle, and a fish, all from the Oacoma Clay member of the formation.

Both the littoral and marine phases of the Upper Cretaceous Colorado group in the Tiber Reservoir were explored during a period of approximately two weeks, but only materials too fragmentary to be of paleontological value were observed. This fact, and certain characteristics of the sediments which would make recovery of suitable materials difficult or impossible, led the paleontologist to recommend that no further effort be expended there. A survey of a few days in the Bonny Reservoir likewise yielded nothing but fragmentary material from the exposures of the Middle Pliocene Yuma formation, but periodic inspection of the shore line of the new lake to recover fossils that might be exposed by wave action was recommended.

Information relative to the paleontological potentialities of ten sites suggested for possible reservoir construction in the Niobrara Basin was secured by White from Morris F. Skinner of the Frick Laboratory, American Museum of Natural History, who has carried on paleontological research in that area for many years. Two of the reservoirs—Thacher and Crookston—will, if constructed, inundate three productive Pliocene localities, and it is believed, on the basis of the nature of the formations and the recovery in the past of isolated specimens, that construction activities and/or wave action are likely to reveal significant fossils in the other reservoirs (namely, Colwell, Eli, Kilgore, Long Pine, Meadville, Merritt, Ponca Creek, and Sparks).

FIELDWORK BY OTHER AGENCIES

As in previous years, a significant part of the salvage task was assumed by State-supported agencies in the Missouri Basin. This was especially fortunate because of the imminent flooding dates for a number of reservoirs. Participation by these agencies was facilitated and rendered more effective by the implementing of a new policy, that of establishing a Federal-State partnership through allocation of Federal funds by the National Park Service to defray a portion of the cost of excavating sites threatened by Federal water-control projects. Under memoranda of agreement, the State agencies undertook to investigate specified sites and to provide periodic progress reports and final technical reports of their investigations, in consideration of which funds were made available by the National Park Service for labor and other costs. One of the most satisfying results of this policy was the willingness of archeologists to postpone work on their major research interests in their own States to assist in more urgent salvage operations in other areas. During both 1950 and 1951, Montana State University, the University of Wyoming, the State His-

torical Society of North Dakota, the University of South Dakota and the South Dakota Archaeological Commission, the University of Kansas, and three Nebraska agencies—the Nebraska State Historical Society, the University of Nebraska State Museum, and the Laboratory of Anthropology of the University of Nebraska—all participated in the salvage program under memoranda of agreement. The University of Kansas in 1950 and 1951 and the Nebraska State Historical Society in 1951 undertook the salvage of sites in the Fort Randall Reservoir, South Dakota, and Montana State University agreed to excavate sites in the Garrison Reservoir, North Dakota, in 1951. In addition, the University of Denver investigated a site in the Bonny Reservoir area, Colorado, in 1950, with its own resources.

For the summaries that follow I have utilized periodic progress reports and more detailed reports, published or unpublished, when available. It should be pointed out that many of these reports are not the final statements of the archeologists and that undoubtedly in some instances their interpretations will be altered before their final published reports appear.

COLORADO

During a brief survey of the Bonny Reservoir area, Yuma County, in the spring of 1947, a River Basin Surveys party recorded a site from which points variously described as reminiscent of Plainview or of Yuma forms had reportedly been recovered. The site, 5YM7, consists of a "mound" on the side of a small northern tributary of the South Fork Republican River. Only a few flakes and quantities of bison bone, some burned, were observed by the survey party at the site, but points reported to have been found there by a resident of Burlington, Colo., were examined. The site had been called to the attention of Arnold M. Withers, Department of Anthropology, University of Denver, and in May 1951, assisted, among others, by Herbert Dick and Robert Lister of the University of Colorado, he devoted a weekend to trenching it. The "mound" (which was a natural feature) proved to have been largely destroyed by previous digging, but portions of the thin occupational deposit which were apparently undisturbed were still available for examination. The only inclusions found were innumerable bones and fragments of bone, burned and unburned, some of which occurred in the top few inches of the underlying basal remnant of an old soil. The bones, some of which are mineralized, are probably of bison. Not even a stone chip was found, and it appears that the limited artifact content of the site had been previously removed.

MISSOURI

As in previous years, salvage work in Missouri Basin reservoirs within this State was not undertaken by the River Basin Surveys, but the University of Missouri carried out reconnaissance and testing in reservoirs both within and outside the basin. During 1950, the University's Summer Field Session in Archaeology spent approximately two weeks in the Pomme de Terre Reservoir and some time in the Kasinger Bluff Reservoir. At the former, situated on the Pomme de Terre River, a tributary of the Osage River, approximately 50 new sites were found, and test trenches were excavated in two sites. Approximately 25 sites were recorded in the Kasinger Bluff Reservoir, on the Osage River, and two of these were tested. These activities were in addition to investigation in the Bull Shoals Reservoir, on the White River, outside the Missouri Basin.

MONTANA

In Montana, the Canyon Ferry Reservoir area, previously surveyed briefly by small parties from the River Basin Surveys in 1946 and 1947 and from Montana State University in 1949, was again in 1950 the scene of archeological investigations, this time by a minimum party of five from the latter institution. The work, supervised by Carling Malouf, was done under a memorandum of agreement with the National Park Service. At the end of this summer a total of 84 sites had been recorded in the district including the reservoir; 59 of these would be flooded upon impoundment of water behind the completed dam. The 1950 operations consisted of search for new sites, intensive examination of those newly discovered and previously recorded, the excavation of test trenches in more promising locations, and an extensive mapping program. The resulting picture does not differ materially from that revealed by previous less intensive investigations and described by Wedel in the 1947 and 1949 summary reports (Wedel, 1948; 1953b). Most of the sites are marked by the presence of stone hearths, boulder circles, chipping debris, or combinations of these features. Diagnostic artifacts were scanty both on the surface and in the excavations, and even such undistinctive objects as modified flakes appear not to have been abundant. As in previous years, no pottery was observed anywhere in the area. Both stemmed and side-notched projectile points are reported, but these apparently were found in such small numbers and so rarely in significant contexts that little light was shed on the problems of their associations with other cultural items or their temporal relationships. Artifacts

were rarely encountered in association with those hearths and stone circles that were excavated. Stone hearths excavated were either simply clusters of stones on the former habitational surface or rock-filled, bowl-shaped pits. The excavations in stone circles, most of which occurred in groups on higher terrain, revealed no hearths or post holes.

The final investigations in Canyon Ferry Reservoir seem to confirm unequivocally Wedel's earlier observation that only sporadic and brief occupations by small groups engaged in hunting and gathering activities are represented here. It would appear that most of the sites investigated might be accounted for by an occupation of not more than a few days by a few individuals. Despite the extremely limited character of the conclusions that can now be drawn from the data collected, the investigations have been worthwhile in that they reveal the nature of aboriginal exploitation of a small area with a particular ecological setting. The significance of this contribution to knowledge will increase, too, as it becomes possible at some future time, through the construction of a cultural and temporal framework from investigations in more intensively occupied surrounding areas, to assign the products of human activity here to their respective places in the overall historical picture of the larger region.

NEBRASKA

As in previous years, three Nebraska organizations—the Nebraska State Historical Society, the University of Nebraska State Museum, and the Laboratory of Anthropology, University of Nebraska—applied a major part of their resources available for archeological research to the study of areas that had become critical as a result of the Federal water-development program. In 1951 the Historical Society accepted the responsibility for the investigation of certain sites in the Fort Randall Reservoir, in South Dakota, but otherwise the studies were in threatened areas in Nebraska. During both years, the Laboratory of Anthropology continued its investigations in the Harlan County Reservoir, and the State Museum carried on researches previously begun in the Medicine Creek Reservoir. In 1950 the Historical Society surveyed and carried out salvage excavations in the Trenton Reservoir.

Harlan County Reservoir site.—In the Harlan County Reservoir area, where previous work had revealed the existence of remains attributable to four periods, investigations were continued on an extensive basis by the Laboratory of Anthropology party. During the two field seasons excavations were in seven sites, among which were

representatives of all the known complexes. Some of the sites were investigated in only one of the years, but four received some attention each summer. Work continued at site 25HN37, the White Cat Village, in 1950 and 1951 to expand the information obtained by the excavations of 1948 and 1949. At this Dismal River village, for which a dendrochronological date of 1723 has been given, the main excavations in 1951 were confined to a productive midden deposit lying along Prairie Dog Creek below the occupied terrace. In 1950, however, a 300-foot trench was carried across the eastern end of the village proper to determine its lateral extent, and two houses intersected by this trench were excavated. This brings the number of dwelling structures uncovered in the site to eight. As previously described (Champe, 1949), these structures are characterized by a central fireplace, around which is a series of five or six posts presumably serving as central roof supports. Other evidences of posts are lacking except that there is sometimes a pair of smaller molds outside the ring which may be associated with an entrance. Thus the work at White Cat Village during the two years in question had resulted mainly in confirming the results of past study and in expanding the artifact collection.

Several sites attributable to the Upper Republican aspect were investigated on a more or less intensive scale. At 25HN11, partially excavated in 1949, two earth lodges, one overlapping the other, were opened. A few other earth lodges are probably present in this small site, which lies on the first terrace on the left side of Prairie Dog Creek. An excellent collection of artifacts includes abundant pottery which is reported to resemble closely that described from Lost Creek by Strong (1935, pp. 82-85). Approximately 30 test pits were dug in 1950 at site 25HN34, where a collection of artifacts was recovered but no evidences of structures were observed. The site was reexamined briefly in 1951. A road crew, borrowing earth for repair work, was found in 1950 to be destroying site 25HN36 and an emergency investigation was initiated there. The profile in the road cut was exposed and photographed and minor testing was accomplished at once, and in 1951 a new profile was cut. The site was threatened both by construction work and by the activities of individuals attracted by the unusually accessible and rather abundant artifacts. At 25HN44, on the first terrace north of the Republican River, 70 test pits in 1950 revealed a buried occupational horizon containing cultural detritus and two lodge floors, one of which was partially exposed. In 1952 both of these structures were completely uncovered. One of them was unusual in being oblong—the length was 10 feet greater than the

width—and in having six rather than four center posts. The various Upper Republican sites investigated here, in addition to their cultural similarities, have a common characteristic of more than passing interest. This is an overlying deposit of a foot or more of sterile material which appears to be of aeolian origin and indicative of a period of unusual dryness, probably of some duration. The potential significance of this phenomenon for climatic studies and for correlating cultural history with climatic episodes has been pointed out repeatedly, especially by Wedel.

An early ceramic horizon is apparently represented at 25HN9, a site which has been drastically affected by road and other construction and where a series of small test pits and a trench 10 feet wide and 190 feet long were excavated in 1950. A fairly sizable sample of artifacts, including cord-marked, calcite-tempered sherds identifiable as Harlan Cord Roughened, and predominantly stemmed points, was recovered. Concentrations of ashes may have been fireplaces, but no evidences of structures were observed. The site is apparently referable to the Keith focus, as defined by Kivett (1953, pp. 135, 136).

The remaining site, 25HN39, belongs to a fourth complex, probably falling in time between the Upper Republican and Dismal River occupations of the area. Here in 1950 extensive test trenching between the corn rows yielded moderate quantities of specimens which lay immediately beneath the plow line, usually in large, shallow, refuse-filled pits. The form and decorative treatment of the pottery vessels represented by the sherds recovered is strongly suggestive of Oneota ceramics, but the paste is apparently always grit-tempered and cord markings are at least sometimes present on the surfaces. The manifestation at this site apparently is rather closely related to the complex represented at the Glen Elder and White Rock sites in Kansas, which have been only briefly investigated. That complex, as has been pointed out (Hill and Wedel, 1936, pp. 40, 67), in turn bears resemblances to that of the Oneota Leary site in southeastern Nebraska. It is to be hoped that within the near future a sufficient inventory from similar sites in this region can be developed to permit a determination of their relationships to each other, to the Oneota aspect, and to other complexes.

Medicine Creek Reservoir site.—As in several previous years, the University of Nebraska State Museum concentrated most of its archeological efforts on early preceramic sites to be affected by the Medicine Creek Reservoir. In 1950 and 1951 the archeological investigations were directed by E. Mott Davis, who continued excavations initiated earlier in sites 25FT41 and 25FT42, both on the left side

of Lime Creek some miles above its confluence with Medicine Creek. A maximum party of eight spent approximately six weeks in the excavation of the two sites in 1950, and in 1951 ten weeks were devoted primarily to 25FT42, most of the time with 12 workers.

In the spring of 1950 it was apparent that 25FT41, the Lime Creek site, would be inundated by the rising waters of the reservoir before autumn, so an effort was made to recover all possible further information as quickly as possible. The fill, near the base of which the occupational deposits occur, has been correlated by the paleontologists concerned with the studies here with Republican River Terrace 2, which they believe to be referable to the Mankato stage of the Wisconsin glaciation. Previous archeological work had demonstrated the existence of three cultural zones—C (the lowest), K, and R (the highest)—and each of these was further investigated in 1950. Work in Zone C, which lay upon the surface of a compact blue clay deposit, in 1947 yielded points not unlike the Scottsbluff type, as well as other artifacts. Unfortunately, except for one specimen, the points were not *in situ*. The additional work in 1949 and 1950 did not produce points nor did it materially expand the inventory otherwise. Zone K, about 3 feet higher, has produced only two artifacts, both during the limited digging of 1950. Neither of these is a point. Finally, the excavations of 1950 produced no identifiable artifacts in Zone R, where two Plainview points were found in 1949. This horizon lies approximately 8 feet above Zone C. Charcoal suitable for radiocarbon dating was not recovered from any of the occupational zones, but a series of logs collected in 1949 from the blue clay lying beneath the lowest zone has yielded a date of 9524 ± 450 years.

Early in the summer of 1950, tests in a buried site, 25FT101, which had been observed in a cliff on Medicine Creek about 6 miles above the dam, produced flakes and bone, some burned, and evidence that a more concentrated deposit might lie nearby. The site was revisited in September to explore the possibility of further excavation, but by that time the reservoir was almost full and wave action had destroyed the area that it was believed might repay investigation.

The remainder of the field season of 1950 and most of the season of 1951 were devoted to 25FT42, the Red Smoke site, about half a mile up Lime Creek from 25FT41. Since the discovery of the site in 1947, limited investigations had revealed the existence of two cultural horizons in a geological situation like that of site 25FT41, i.e., in fill attributed to Terrace 2, and thus to the Mankato. Level 88 (occupational layers are designated at this site by numbers which represent the elevation above the site datum) had proven to be an intensively

occupied zone containing almost continuous concentrations of flint and numerous bones, mostly of bison; a few stone artifacts, not including points, also had been found. Very scanty material had been uncovered in level 83. In 1950, two higher occupational zones, at 91 and 92 feet, and a suggestion of a zone just below 83, were uncovered. Artifacts were rare or absent from those parts of all levels excavated except 88, which yielded four points and point fragments and a number of other artifacts. In 1951, an area of 925 square feet was excavated to augment the information on the previously known cultural levels and to expand the total number of known levels to seven. By the end of this field season, the western and southern limits of the site had been determined, but to the north and east the cultural deposits extend beyond the boundaries of the investigated areas. Again all levels except 88 yielded disappointingly scanty cultural information. Level 88, the major occupational horizon at the site, produced a considerable number of artifacts, including sufficient points and fragments to bring the total found in this level to 27. With few exceptions, these points correspond to the description of the Plainview type. They are predominantly parallel-sided, concave-based, skillfully chipped, and exhibit basal grinding. Most of the exceptions are Meserve points, as named by Davis, with sides constricted sharply toward the tip and a blade which has a pronounced right-hand bevel. Two points of this type have been reported from the vicinity of Grand Island, Nebr., in association with *Bison occidentalis*. Among the other artifacts from the level are a few thin, well-made blades with straight bases which seem to constitute a type.

Among the major accomplishments at this site during the two seasons are the recovery in geological context of numerous Plainview points, the definition of at least a limited accompanying stone artifact inventory, and the establishment of the Plainview-Meserve association. Archeologically, Level 88 at 25FT42 appears to correlate with Zone R at site 25FT41, where Plainview points were found in a deposit approximately 8 feet above Zone C, the occupants of which made points of Scottsbluff type.

Other activities of the Museum party in 1951 included the testing, with largely negative results, of site 25FT51 in the spillway area at the dam and the topographic mapping of the lower part of Lime Creek valley and the adjacent section of Medicine Creek. Paleontological and geological studies of the area were also continued, partly for the purpose of illuminating the problems of dating the early sites discussed above. On the basis of these studies, the loess above Level 92 at 25FT42 "seems to have been deposited near the climax of and dur-

ing the early retreat of the Mankato" (C. Bertrand Schultz, in 1951 field report by E. Mott Davis, in files of River Basin Surveys, p. 38).

Trenton Reservoir site.[3]—This reservoir site, on the Republican River behind a dam situated about 2 miles west of Trenton, in Hitchcock County, had not been surveyed prior to 1950. In 1947, a survey team from the River Basin Surveys briefly reconnoitered part of the lower reaches of the proposed Culbertson Reservoir, the dam for which was planned for a point 2 miles from the town of Culbertson. Subsequently the Bureau of Reclamation altered its plans for development in this vicinity and selected a site several miles upstream for the dam, which was renamed for the adjacent town of Trenton. The new site was not touched by the earlier reconnaissance. Because construction had begun and the reservoir is in an area that might reasonably be expected to contain significant archeological remains, the Nebraska State Historical Society, entirely with its own resources, surveyed the terrain to be affected in the spring of 1950. When it developed that sites warranting salvage did indeed exist, the Society entered into an agreement with the National Park Service to undertake the necessary investigations. Two sites were rather extensively excavated and another was briefly tested by a party of six or seven during a period of approximately two months.

The activities of the party were concentrated at 25HK7, in the dam work area, and at 25HK13, below the dam but destined for destruction by railway relocation necessitated by creation of the reservoir. When the party reached the field, considerable damage had already been done to 25HK7 (the Carmody site) by construction activities. Much of an upper deposit yielding pottery suggesting occupation by a group of Pawnee or culturally related people had been removed by earth-moving machinery. Evidence indicated the occupation was by a small group and probably for a relatively brief period, although six basin-shaped hearths exhibited sufficiently intensive burning to indicate much more than overnight camping. Separated from the above by a sterile loess zone was a dark layer containing charcoal, burnt earth, broken stones, bones, mussel shell fragments, and limited quantities of pottery and chipped stone. Two relatively shallow trash-filled pits, several unprepared hearths, a rectangular basin outlined by small sandstone slabs set on end and containing evidence of fire, and a cluster of stones that had been intensively fired were also in this level, although the last feature, which was probably at the base of a pit, may have been associated with the upper

[3] Formerly Culbertson Reservoir.

level, previously destroyed at this point by construction. It is probable that several burials had been destroyed by the contractor's machinery, and the remnants of a single bundle burial were found in place. Associated grave goods were absent. The few sherds from this level appear to be assignable to the Harlan Cord Roughened type, the dominant pottery of the Keith focus, previously defined by Kivett. A few sherds found on the disturbed surface are not at present assignable to a complex, but have attributes found in pottery of Woodland sites and others suggestive of Upper Republican wares.

At 25HK13 (Massacre Canyon site) rather extensive excavations revealed a zone of very black soil underlying a sterile loesslike deposit as much as 1½ feet thick. Only four hearths, all simple fireplaces on the original living surface and all suggesting rather brief use, were uncovered. Pits were also limited in number. Kivett has suggested that the larger of two oval basins, 8.5 feet long and 7 feet wide, may represent the remains of a light, temporary structure and that the other, smaller one may be a central excavation in such a feature. His suggestion is based on their similarity to basins, usually larger, found in Woodland sites in Frontier and Valley Counties. These latter features have central fireplaces, however, and may indicate seasonal differences. Six burials, in circular or oval pits, usually the latter, were uncovered, in addition to a few scattered fragmentary bones of a young child. Five of these were single flexed skeletons, while the sixth represented a more complex interment. In the case of this latter, the bones of an individual, mainly scattered but some in articulation, lay on and near the floor of the pit. Over these bones was a yellow clay layer upon which was a burned zone containing charred bones. Grave accompaniments were in the main confined to the two undisturbed child burials. They consisted mostly of disk beads of shell and tubular beads of bone.

Despite the general impression of an intensive occupation of the site, artifacts, including pottery, were not abundant. The some 85 sherds appear to represent not more than seven or eight vessels. All except a group apparently from a single pot have many of the attributes of Harlan Cord Roughened pottery but are sufficiently different to suggest they represent a distinct, as yet undefined type. The vessel of which the remaining sherds were a part had been smoothed after cord marking and the interior surface was apparently fabric-impressed. The rim, which flares from a slightly constricted neck, bears a series of oblique oval impressions immediately below the lip. Kivett has suggested it resembles pottery found thus far in minor amounts in southeastern Nebraska. Among the other artifacts recov-

ered are stemmed projectile points, one of obsidian, and a shaft wrench made from a deer metapodial decorated with incised lines. A specimen somewhat similar to the latter was recovered in 1946 from the Woodruff ossuary, a Kieth focus burial, in the Harlan County Reservoir area (Kivett, 1953, pl. 22, *a*, *2*).

It appears that the work of the Historical Society at the Trenton Reservoir has extended the range of the Keith focus to the west and has indicated the existence, although it does not permit the comprehensive definition of, two or three new Woodland variants. One of the more conspicuous results of expanded research in the central Plains during recent years has been the steadily expanding list of variants assignable to the Woodland pattern, a list which, it seems, cannot yet be considered exhaustive.

The results of the 1950 investigations at the various Woodland sites in the Trenton Reservoir area have been reported in a publication of the Historical Society (Kivett, 1952).

NORTH DAKOTA

Responsibility for the archeological investigation of certain sites in the Garrison Reservoir was assumed under memoranda of agreement with the National Park Service by the North Dakota Historical Society in both 1950 and 1951 and by Montana State University in 1951.

One of the sites that will be lost with the filling of the Garrison Reservoir is Like-a-Fishhook (32ML2), the last village occupied by the Three Affiliated Tribes—the Mandan, Hidatsa, and Arikara. Founded in 1845 by the Hidatsa and some Mandan, it was augmented about 1862 by the arrival of the Arikara and the remainder of the Mandan and was occupied by these three groups until about 1890, when the inhabitants moved to individual allotments distributed throughout the Fort Berthold Reservation. There are numerous contemporary records, as well as a considerable body of ethnographic information collected during and after the occupation of the site, relative to the character of the village and of the life within it. Originally consisting entirely of earth lodges and still predominantly composed of such structures in 1865, by 1872 it contained a preponderance of rectangular, windowless log cabins. The Mandan and Hidatsa occupied the section of the site near the river bank and the Arikara quarter was immediately adjacent, to the north. A trading post, Fort Berthold, was established at the village in 1845 and a second, competing post was built in 1858. Originally known as Fort Atkinson, the

latter was taken over by the earlier establishment in 1862 and was thenceforth called Fort Berthold. At the present time the site is an impressive one. Occupying an area of approximately three-quarters of a square mile adjoining the margin of the first terrace above the Missouri River bottom, it contains numerous conspicuous large depressions and rings marking the locations of lodges and deep smaller depressions which are partly filled cache pits.

For various reasons, including the potentialities for coordinating archeological and ethnographic data and for illuminating the acculturation process, the excavation of this site was deemed vital and the project was undertaken by the State Historical Society of North Dakota. In 1950, a group of 8 men worked in the site from June 13 to August 4, until the last week under the supervision of Glenn Kleinsasser. When Mr. Kleinsasser was incapacitated by a serious accident, Allen C. Croft assumed supervision for the remainder of the time in the field. A larger crew, consisting of a maximum of 18 workers under the supervision of James H. Howard, returned to Like-a-Fishhook for two months in 1951, and further investigation was planned for 1952. During the two seasons the sites of 12 earth lodges and 2 log cabins were uncovered and a number of cache pits were excavated in both the Arikara and Mandan-Hidatsa quarters of the village. The lodges were all circular, with 4 center posts, 12 to 15 outer support posts, and a row of small leaners, but those in the Arikara quarter differed somewhat from the others in being considerably shallower and having the center posts situated closer to the outer supports. Entrances could not always be found, but those that were defined consisted of conventional covered passages. Cache pits were usually large and cistern-shaped.

Artifacts of White manufacture were recovered in enormous quantities and in great variety, while, as might be expected, objects of native manufacture and of native materials were exceedingly scarce. A few sherds and artifacts of stone and bone were found, but usually in such small quantities that accidental inclusion in the deposits from other sources cannot be ruled out. Even objects of White origin modified by the inhabitants of the village were recovered in very small numbers. Oddly enough, only two metal projectile points were found. While firearms undoubtedly replaced the bow and arrow to a large extent fairly early in the history of the village, it seems likely that the older weapons would have been fairly numerous during the first few years of occupation. It is possible that future investigations will reveal more of the earlier deposits and expand the inventory of native products.

Inasmuch as in 1951 no dams were under construction in Montana that were then believed to constitute a serious archeological salvage problem, Montana State University agreed to put a party into the Garrison Reservoir, where the time when many sites would be lost through inundation was drawing inexorably nearer. Garrison was selected from among the high-priority reservoirs because of the probability that, in view of its location, it would yield materials relating to Montana archeological problems, properly the first concern of the Montana institution. Carling Malouf, with 10 student helpers, excavated in 3 small camp sites on the right side of the Missouri River in Mercer County during the period June 12 to August 1. The three sites (32ME43, 32ME54, and 32ME55), although differing widely in productiveness, were similar in their topographic situations, lack of evidence for dwellings or other structures, and the general nature of the occupations represented. All were found along the edges of low terraces bordering the river bottoms and in at least two there was evidence, in the presence of sterile lenses separating occupational deposits, that the use of the location was intermittent. The artifact complexes appear to have been similar at the three sites and in their various levels, except that White trade materials were confined to the higher deposits and at one site (32ME43) pottery was absent in the lower ones. This last situation may, however, be explainable in terms of the very small quantity of cultural materials of any kind recovered.

Fire hearths were found to characterize all the sites and were especially numerous in 32ME43. They were of three kinds; unprepared surface fireplaces, basins averaging about 25 inches in diameter and 7 inches in depth, and relatively deep pits with fairly straight walls containing fire-cracked stones. Clusters of stones and concentrated areas of fragmented bones were distributed through the deposits, and it was near these and the hearths that most of the pottery was found. Chipped-stone artifacts, predominantly of "Knife River flint," included side-notched and, rarely, corner-notched points, knives, and scrapers. The pottery is reported by Malouf to be of the "Mandan-Hidatsa-Arikara tradition."

The evidence reported from these three sites suggests that they are all locations that were occupied briefly and intermittently by small parties, probably from larger, relatively settled communities in the region, engaged in hunting or gathering activities.

SOUTH DAKOTA

Owing to the magnitude of the salvage task in the Fort Randall Reservoir and the rapidly dwindling time remaining to accomplish it,

various Missouri Basin institutions engaged in archeological research were requested by the National Park Service to lend assistance. The State of South Dakota, through the W. H. Over Museum and the South Dakota Archaeological Commission, put field parties into this area in both 1950 and 1951, and the University of Kansas and the Nebraska State Historical Society agreed to interrupt pursuit of their research interests in their own States to contribute to the effort. The Nebraska institution, having undertaken the salvaging of sites in the critical Trenton Reservoir area in that State in 1950, was unable to begin work in Fort Randall until 1951, but the University of Kansas sent excavation parties into the area both years.

The operations of the South Dakota Archaeological Commission–W. H. Over Museum project during both seasons were under the supervision of Wesley R. Hurt, Jr., who has published reports covering the complete investigations (Hurt, 1951, 1952). In 1950, a group of a maximum of 16 workers excavated in the Swanson site (39BR16), a compact village on a low terrace bordering the Missouri River bottoms approximately 6 miles above Chamberlain. When discovered, the site was apparent on the surface as a number of large, conspicuous, more or less circular depressions on a small point which was isolated from the body of the terrace by a shallow linear depression. Excavation revealed that a ditch approximately 3 feet deep lay beneath the latter feature and that the other depressions were underlain by deep house floors. No evidence that a stockade was part of the defensive system was found in the intensive tests. Four houses were completely uncovered and six miscellaneous trenches were excavated. The latter revealed that there were in the site an unknown number of houses whose locations were not evident on the surface. Although there was evidence, in the intrusion of houses into cache pits and vice versa, that the village had existed for some time, the relative homogeneity of the cultural materials and the lack of evidence of superposition of dwelling structures suggests that the length of occupation was not of great magnitude.

The typical house was an oblong rectangular structure, 4 to 5 feet deep, with posts rather closely spaced along the side walls and rarely along the ends. A single row of large posts on the long axis or a double row straddling the midline constituted the other vertical members of the superstructure. The entrance was characterized by a vestibule and a ramp leading from it into the interior of the house. With one exception, where there was a single central fireplace, there were two hearths, both on the midline but situated between the center and the end walls. All in all, the structures here resemble rather

closely those of the second component at the Dodd site, near Pierre.

Specimens found in relative abundance in the fill of houses, in the cache pits, and on the general village level indicate heavy reliance for subsistence on agriculture and hunting and rather little emphasis on fishing or the collection of shellfish. The artifact inventory, notably the pottery, together with the architecture, suggests a close relationship to villages on the James and Big Sioux Rivers to the east—among them the Mitchell and Brandon sites, previously excavated and reported by the W. H. Over Museum—and Hurt has assigned the Swanson site, together with these others, to the Over focus.

In 1951, with a maximum party of 13 individuals, Hurt reinvestigated two sites, 39GR1 (Scalp Creek site) and 39GR2 (Ellis Creek site), which had been partially investigated in 1941 by the W. H. Over Museum, with WPA assistance, but which required additional field study to make laboratory analysis and reporting possible. The Scalp Creek site appeared superficially to be simply a small fortified earth-lodge village, with perhaps 15 houses, on the point of a terrace cut off by the remains of a ditch, but previous excavation had revealed that materials relating to at least two cultural complexes were present. The work during the two seasons, including the complete uncovering of nine earth lodges and the excavation of a number of trenches, demonstrated that a village of earth lodges is underlain by materials of Woodland affiliations. The upper village, surrounded by a stockade of posts spaced 1 to 3 feet apart and defended with a ditch 3 feet deep on the side not protected by a slope, contains circular houses with central fire basin, four center posts, varying numbers of outer roof supports, a row of leaners, and a covered entrance passage. Unlike the situation in many earth-lodge villages of the region, cache pits were rather scarce and were usually small. A subsistence pattern based on agriculture and hunting, especially of bison, is indicated by the specimens recovered. The pottery is simple-stamped and decorated primarily by incising, both on the rim and body, and appears to resemble that previously recovered and reported from the La Roche site, some distance up the Missouri River (Meleen, 1948). Although there seem to be some differences, at least in proportions of various pottery types and perhaps in architectural and other traits, Hurt has assigned the upper (Wheeler) component of the Scalp Creek site to the La Roche focus.

In the lowest cultural deposits at the Scalp Creek site and at the Ellis Creek site, situated on a terrace some 2 miles downriver, artifacts were recovered which included pottery very similar to the ceramics at sites on Loseke Creek and Eagle Creek in Nebraska, the

former of which have been described by Kivett (1952). This pottery is characterized by decoration of the rim area, predominantly with single-cord-impressed lines or nodes. Hurt has also distinguished another component in the upper part of the Woodland deposits at the Scalp Creek site in which there are cord-marked vessels with flaring, undecorated rims (or with only the lip decorated) and vessels whose outer rims are decorated with horizontal incised or trailed lines, usually below a band of short impressed lines. Shallow fireplaces occurred throughout the Woodland level, but evidences of structures were absent except for two patternless clusters of small post molds and areas which suggested floors. Rather small shallow pits were numerous, and large bell-shaped cache pits were entirely absent. No evidence of corn or other cultivated plants was found, although a few scapula hoes were present. The suspicion that corn cultivation was practiced seems warranted, in view of the probable relative recency of the complex and, especially, in view of Kivett's report of corn in one of the related Loseke Creek sites (Kivett, 1952, p. 57).

Site 39BF3 (the Talking Crow site), an earth-lodge village on a low terrace in the upper part of the Fort Randall Reservoir area, has intrigued archeologists for some time, primarily because of the variety of the ceramic remains collected from its surface. The University of Kansas, through Carlyle S. Smith, assumed the responsibility for the intensive investigation of this site, which proved upon excavation to be as complex as was suspected. A party of a dozen to 15 workers spent approximately two months each of the years 1950 and 1951 in the Talking Crow site and an additional season's work was planned for 1952. By the end of the 1951 field season, seven houses, not all of which were marked by surface depressions; a refuse mound; and many cache pits and other features had been excavated and test trenching had uncovered parts of such defensive features as the bastioned ditch, stockade, and a mound that may have served in place of the stockade at the eastern edge of the site. A few burials had been encountered in various parts of the village. Houses were basically circular, with central fireplace, four center posts, outer posts generally closely spaced around the perimeter, and vestibule entrance. A number of features were found in stratigraphic relationship, and the contents of the refuse mound, excavated in 6-inch levels, appeared to show ceramic changes from bottom to top.

Two pottery wares, not previously isolated, have been described and named by Smith. They are the Talking Crow and Campbell Creek wares. The former is characterized by simple-stamped globular bodies, frequently somewhat flattened shoulders, and straight high

rims on which the lips are often decorated by impressing or notching. Shoulders are frequently incised. Campbell Creek ware embraces globular vessels with rounded shoulders and simple flaring or collared rims. Surfaces are predominantly cord-marked and decoration, confined mainly to the rim, consists of notching or pinching of the lip on flaring rims and incising on collared rims. Talking Crow ware resembles in many respects the ceramics of the Lower Loup complex in Nebraska, while the Campbell Creek pottery suggests rather close affinities to that of the Nebraska and Upper Republican aspects. These two categories include the bulk of the pottery found in the site, but other kinds occur in smaller numbers. These include a few sherds of Stanley ware, predominant in sites farther up the river, and somewhat more abundant fragments of vessels with horizontally incised rims and shoulders which are usually decorated by incising and punctating.

At the end of the 1951 work Smith felt that, in addition to a late nineteenth-century Dakota occupation, three periods—defined by pottery, since other artifacts seemed to be much the same throughout the occupation—could be distinguished in a cultural continuum. Campbell Creek ware predominated in the earliest period, Talking Crow ware in the latest, with pottery of the two represented in approximately equal proportions in the middle period. Small quantities of White trade materials were present in proveniences attributable to all periods. If further excavation and final analysis sustain Smith's impression, based on incomplete results, of continuity rather than a series of discrete occupations of the site it will be of considerable interest, since continuous occupation would seem to imply an unexpected compression of the history of the ceramic types present. Among other things, pottery apparently closely related to the Campbell Creek types, and perhaps even assignable to them, occurs in other contexts without evidence of White contact and even the later pottery with horizontally incised rims seems elsewhere to be prehistoric.

Evidences of intensive aboriginal occupation on a level terrace adjacent to the town of Oacoma, across the Missouri from Chamberlain, were assigned the numbers 39LM26 and 39LM27 by the River Basin Surveys in 1947 and, more recently, the names Sharpe site and Donahue site by Marvin F. Kivett, who began their excavation for the Nebraska State Historical Society in 1951, under an agreement with the National Park Service. The sites, if not actually parts of a single village, appear at least to represent a single cultural complex. A party of five worked there for approximately two months that year. Two houses (one in each of the sites) and a part of a third, a refuse

mound, a segment of a ditch and stockade at 39LM26, and a number of storage pits were excavated. Additional investigation was planned for 1952. The house remains that were completely uncovered were circular, with central fireplace, square central roof support arrangement, closely spaced outer posts, and an intermediate set of posts that did not conform to a well-defined pattern. The vestibule entrances faced to the south and southeast. The house in 39LM26 appeared to have been extensively remodeled, as indicated by the presence of two fireplaces, one intruding into the other, and by evidence of abandonment and filling of old post holes and the setting of new posts. There was evidence, too, of an attempt to seal off old refuse deposits by blanketing them with clay at points where the house walls were expanded. Storage pits were of two kinds, bell-shaped and cylindrical. The walls of the former were often plastered with red clay, but the cylindrical pits lacked such treatment. The nature of the artifact inventory is consistent with an early contact date for the sites and this is borne out by the consistent presence of limited amounts of materials derived from White culture in the various features. A large proportion of the pottery is of the Talking Crow Straight Rim type defined by Smith, but other Talking Crow types are present also, as are cloistered rims like those from Nebraska Lower Loup sites. The sites appear to be rather closely related to the late period at Talking Crow and probably to the late component of the Oldham site as well. Kivett has tentatively suggested a date of not later than 1750 and perhaps as early as the last half of the seventeenth century for the major occupation of the Oacoma sites. His reasons for this estimate seem valid and it will be surprising if further evidence does not support his suggestion.

WYOMING

In view of the large numbers of sites in the two Wyoming reservoirs—Boysen and Keyhole—in which the River Basin Surveys carried on intensive investigations in 1950 and 1951, respectively, and of the significance of many of them as revealed by earlier surveys, it was fortunate indeed that the University of Wyoming was able to assist in the task of salvage. Under memoranda of agreement with the National Park Service, parties from the University, under the supervision of William Mulloy, investigated several sites in the Boysen Reservoir in 1950 and excavated in one site in the Keyhole Reservoir in 1951. While each of the two organizations carried on an independent program in different sites, consultation during the field

season and other mutual assistance materially expedited the work of the Surveys and, it is hoped, were of aid to the University as well.

Boysen Reservoir site.—In 1950 the Wyoming party operated in the Boysen Reservoir from June 20 to August 15, during which time excavations of varying magnitude were accomplished in nine sites and a number of petroglyph sites were studied. Two of the sites consisted of groups of stone circles, while the remainder were camps containing hearths. At 48FR16, where dozens of stone circles lie on terraces on the east side of the Bighorn River, the entire site was mapped, as were individual circles, and the circles were examined in detail both by minute inspection of the surface and by excavation. Although there were central clusters of stones within some of the rings, none appeared to have been subjected to intense heat; in fact, no evidence of fire was found anywhere within the site. Nor were any indications of floors observable. Artifacts were found in exceedingly small numbers. Flakes and percussion-flaked quartzite cores were most common and there were only occasional blades and projectile points.

Site 48FR25, on the north side of Poison Creek, was the other group of stone circles investigated. The circles were mapped and a surface collection was made. Near this site, but on the opposite bank of Poison Creek in an area sheltered by considerable sand dunes, were stone hearths, often containing mano and metate fragments. Both surface and basin-shaped hearths were included. This site, 48FR25, yielded artifacts, including corner-notched projectile points, in rather small quantities. Because of their proximity and a similarity in the artifact assemblages from these two sites, Mulloy has suggested the possibility that they are related and that the stone circles served some special function for the inhabitants of the camp site.

Other camp sites in which excavation was done include 48FR33, 48FR55, and 48FR59, all of which contained hearths and yielded artifact collections apparently rather similar to that from 48FR5. Sites 48FR8, in the sand dunes along the north bank of Muddy Creek, and 48FR34, at the base of a sandstone outcropping on which there are numerous petroglyphs, appear to be continuous, but the latter consists of two occupational levels separated by a sterile sand layer. Both levels produced corner-notched points which exhibit some differences.

Keyhole Reservoir site.—During a month in June and July, 1951, Mulloy, with a force of 6 workers, partially dug site 48CK7 (McKean site) on the Belle Fourche River in the Keyhole Reservoir area. This site, unimpressive as far as surface evidence is concerned, proved

upon excavation to be unusually extensive and productive. In the limited time available, five trenches 75 feet long were dug at intervals of 200 feet perpendicular to the border of the terrace upon which the site is situated and, in addition, the earth from 145 5-foot squares was removed and screened. Cultural material was found to a depth of as much as 4 feet in two well-defined occupational levels separated by a sterile zone. The upper cultural deposit, like the lower one, is covered by sterile earth, a fact which explains the unpromising surface appearance of the site. The lack of any cultural material in the upper deposits of an abandoned meander adjacent to the terrace edge suggests that this feature postdates even the later occupation.

The upper cultural horizon contained large rock-filled hearths, while the hearths in the lower level were smaller and only part of them were stone-lined. The relatively considerable cultural inventories of the two horizons differ in several respects, among which the projectile point differences are prominent. The earlier points are either of the McKean type defined by Wheeler or are similarly basally notched but have proximally constricted edges to create shoulders and a stem. There is no grinding on any of the specimens. The points in the upper level, by contrast, are predominantly corner-notched and convex-sided or triangular and unnotched. Certain other differences in the two levels suggest distinct economic orientations. The later deposits contained mano and metate fragments, numerous mussel shells, and very few bones, while the earlier ones lacked grinding stones and mussels and produced greater quantities of bone, especially of larger forms.

Productive as the 1951 excavations were, the evidence is that the parts of the site in which occur the heaviest concentrations of cultural material remain unexcavated. Accordingly, it was decided that additional excavation in the site should be undertaken in 1952.

CONCLUSION

Some measure of the emphasis on and accomplishment of actual salvage operations during 1950 and 1951 is provided by the statistics relating to the basin-wide archeological program. These show that the combined efforts of the River Basin Surveys and other participating agencies resulted in the excavation of 66 sites in 11 reservoirs rather widely distributed in the Missouri Basin. This is in addition to some minor testing in a few other sites which cannot be tabulated because the pertinent figures are not given in certain of the reports on file with the Project. The magnitude of operations varied widely, depending primarily upon the characteristics of the sites in question. Thus,

at Boysen Reservoir, only a few days to a month were spent by the Project party at each of the shallow and/or small sites investigated. On the other hand, nearly two full seasons were devoted to Rock Village and the Oldham site, large important earth-lodge villages on the Missouri River in the Garrison and Fort Randall Reservoirs, respectively. The fact that reconnaissance was the sole responsibility of but a single small party each year also reflects the changing emphasis from extensive search to discover what remains are threatened to intensive study of the important sites which will be submerged. Despite the seemingly considerable accomplishment in the way of excavation suggested by the figures cited above, in actuality work will have to proceed in the future on an appreciably larger scale, at least in some areas, if the minimum essential sample of the archeological data is to be obtained. Only three of the hundreds of earth-lodge villages to be lost in the Oahe Reservoir had been at all extensively excavated by the end of 1951, and additional work in one of these is necessary.

The reconnaissance of a large number of reservoirs, most of them in the more westerly portions of the Basin, gratifyingly revealed that a number of the smaller projects will result in no serious archeological loss and will require no further attention, although others will call for additional examination if construction is initiated.

Although the full significance of the intensive research by the various agencies in Montana, Wyoming, Nebraska, and the Dakotas will not be known until the laboratory studies have been completed and the results made available, it is evident that a considerable advance in our knowledge of aboriginal culture history over a wide spatial and temporal range can be anticipated. In the western part of the area, the recent work in the Angostura, Boysen, Canyon Ferry, Keyhole, and Tiber Reservoirs has produced information that is rather uneven as far as quantity and potentiality for reconstructing history are concerned. Sites within the confines of the Canyon Ferry Reservoir appear to have been occupied so briefly and are so unproductive that any interpretation must be largely of a negative nature. Elsewhere, on the other hand, new information was acquired which should materially aid in closing some of the temporal and spatial gaps in the current picture of prehistoric occupancy of the western Plains. As far as the apparently earliest occupations that have been studied are concerned, the work of the two years under review consisted mainly of supplementation of previous investigations. At the Ray Long site in the Angostura Reservoir area, the exposing of a rather extensive area yielded a few additional specimens of the characteristic Angos-

tura point but added little to the cultural inventory otherwise. The radiocarbon dates of 7073 ± 300 and 7715 ± 740 are, unfortunately, from an area of the site that has yielded no diagnostic points *in situ,* but there is good reason to believe the dates are applicable to these distinctive artifacts. Nearly 300 miles to the southeast, in the Medicine Creek Reservoir, the continued excavations in buried sites on Lime Creek, most especially in the Red Smoke site, added considerably to the previously rather scanty collection of Plainview points, established the association of the Plainview and the somewhat similar Meserve point, and expanded the inventory of other artifacts in the complex. Although the geological associations of the Angostura and Medicine Creek deposits are not such as to permit comparison between the two and radiocarbon dates have not yet been obtained for the latter, the Plainview occupation at Lime Creek is presumably the earlier. Plainview and Meserve points have been found elsewhere associated with extinct bison, while at the Agate Basin site, which produced points rather closely resembling Angostura points, only modern bison are reported.

Evidence newly acquired promises to fill in many details regarding the succession of cultures during the several millennia succeeding the earliest occupations in the more westerly parts of the Plains. Indications that eventually a number of horizons can be defined for this area are beginning to emerge from the relatively scanty data now on hand, and recent investigations under the salvage program will undoubtedly sharpen the definitions. The prospects seem bright that, as instances of stratification multiply, as the artifact assemblages for different complexes are expanded, and as radiocarbon dates are determined, a relatively complete history of the region can be developed. At the present time, a general succession of projectile-point forms seems to be definable, but undoubtedly as additional research results in the determination of more or less complete complexes and of finer typological distinctions, a much more refined temporal and cultural breakdown will be achieved. Pending additional excavation, or at least the analysis of the data now in the laboratories, about all that can be said at present is that small notched and unnotched triangular points were preceded by corner-notched points, which were in turn preceded by lanceolate and other points that seem to occur in relatively early contexts in the region and elsewhere.

Apparently later in time than the complex represented at the Ray Long site is a culture newly defined, mainly on the basis of work in the Keyhole Reservoir. Both here and in the Angostura Reservoir, its most distinctive artifact, the McKean point, has been found strati-

graphically beneath other cultural deposits, and in one stratified site, 48CK7, the prospect is for the recovery of a rather exhaustive artifact assemblage associated with the points. At a number of sites in the various reservoirs the predominant point is either corner-notched or side-notched, and where stratigraphic evidence exists, the latter seems to characterize the latest occupations. For the later part of the time span of aboriginal occupation of this region, the presence or absence of pottery seems to depend at least partly on factors other than temporal ones. It is probable, for example, that potteryless sites with a predominance of side-notched triangular points are generally later in time than sites yielding heavy, cord-marked pottery and corner-notched points. Later nonceramic sites may, of course, represent occupations either by groups using no pottery or by small hunting parties of pottery-making peoples. In the Boysen area, the occurrence of large numbers of metates and manos in sites producing corner-notched points suggests a considerable emphasis on gathering, which may represent an orientation different from that of other complexes in the area.

As yet it is difficult to fit the relatively few occurrences of pottery in the western Plains into the cultural picture of the Plains as a whole, since the small collections generally cannot be surely identified with known complexes. The sherds from the upper levels of site 48CK204 in the Keyhole Reservoir are apparently referable to a Woodland variant, and some sherds from 39FA23 and 39FA83, in the Angostura Reservoir, for example, could be lost in the collections from Upper Republican sites in southern Nebraska, but much of the pottery, notably that from the Boysen and Tiber Reservoirs, does not appear to be closely related to any well-defined ceramic complexes. Present evidence indicates that pottery-bearing sites are widely distributed, although apparently in small numbers, throughout the western Plains, but their significance in the late prehistory of the region will be known only when more knowledge of their distribution and variations is at hand. What little is known of the associations and stratigraphic position of pottery in the part of the region west of the Black Hills suggests that it does not occur here earlier than fairly late prehistoric times. The presence of pottery beneath 8 feet and more of overburden at site 24TL26 in the Tiber Reservoir is apparently evidence for depositional recency rather than for ceramic antiquity.

In the Harlan County Reservoir, the investigations of the University of Nebraska, when reported, will expand our knowledge of a number of cultural entities of the ceramic period in the central Plains.

Together with the results of the intensive work of the River Basin Surveys in the Medicine Creek Reservoir, new information on Upper Republican and Woodland manifestations should provide, in the case of the former, a comprehensive cultural picture unprecedented in the Plains and, in the case of the latter, illumination of the variations present in the region. Continuing excavations at White Cat Village constitute an unusually thorough study of a single Dismal River community and should reveal much in regard to the community plan and the everyday life of the inhabitants. Finally, it is to be hoped that work in sites of a fourth manifestation will permit an adequate definition of a complex about which tantalizingly little is known from sites at Glen Elder, Kansas, and on White Rock Creek, in the Lovewell Reservoir area.

Perhaps the outstanding contribution of the work of the Nebraska State Historical Society in the Trenton Reservoir consists in the additional information it produced on the range and character of the Woodland variant known as the Keith focus, although the presence of two or three new, as yet undefinable, Woodland variants was also demonstrated.

By far the largest part of the resources of the agencies engaged in the salvage program was expended on the Missouri River in the Dakotas, where hundreds of village sites will be flooded when three large dams now under construction are completed. In the Garrison Reservoir, North Dakota, the River Basin Surveys excavated in two earth-lodge village sites, 32ME15 and 32ME16, and in a frontier military post, Fort Stevenson (32ML1). The extensive excavations in the Rock Village (32ME15), probably occupied by a predominantly Hidatsa group, are the first of any magnitude accomplished in a site attributable to this tribe, and reveal Hidatsa culture before any appreciable replacement by objects of industrial society origin had taken place. The Star Village (32ME16), on the other hand, represents a village of the Arikara, a group with a material culture fundamentally similar to that of the Hidatsa, at a time when the earth lodge was still built but artifacts of White origin had largely replaced native products. In part still later in time is the Like-a-Fishhook site, composed of earth lodges and cabins, occupied by the three village tribes—the Mandan, Hidatsa, and Arikara—mainly in the latter half of the nineteenth century. Small camp sites investigated by the University of Montana in the same vicinity probably represents occupations by small hunting and gathering parties from the larger earth-lodge villages in the region.

Recent excavations by the River Basin Surveys and other institu-

tions in the lower part of the Oahe Reservoir and in the Fort Randall Reservoir have revealed cultural remains that apparently will be assignable to something more than 10 foci. Although there seems no doubt that some of these complexes represent different stages of development in single cultural traditions, additional research will be necessary before it is possible to state in each instance what differences are of primarily temporal significance. One thing, however, seems clear; the region is characterized, not by the development through time of a single cultural tradition, but by several traditions present during various segments of the total cultural time span and participating in the characteristics of the horizons into which that time span can undoubtedly be subdivided. Relationships to cultural manifestations both to the east and the south are apparent in the materials recovered to date, and analysis now in progress will undoubtedly clarify these relationships. External evidences of the relative temporal positions of various complexes have already made possible the construction of a partial sequence. Cultural deposits have been found in clear stratigraphic relationship at the Scalp Creek, Dodd, Talking Crow, Cheyenne River, and Oldham sites. At the Scalp Creek site, a Woodland component assignable to the Loseke Creek focus defined in Nebraska underlay a component related to the La Roche site. At the Oldham site, an occupation with Great Oasis pottery is earlier than one related to the Oacoma sites and the latest occupation at the Talking Crow site, where the earliest occupation, assigned to the Campbell Creek focus, bears some relationship to the Nebraska and Upper Republican manifestations. At the Dodd site, two components characterized by long rectangular houses and cord-marked pottery lay beneath a horizon containing circular houses, simple-stamped pottery, and White trade goods. Finally, at the Cheyenne River site, a historic occupation in the Arikara tradition is later than a component with predominantly incised pottery, which in turn overlies rectangular structures. Other evidences for placement of sites in time consists, of course, in the presence or absence of metal and, as a partial framework based on external evidence is constructed, the internal evidence of typology is becoming more significant as a means of completing the sequence.

It should be apparent that when present studies have been reported a good beginning will have been made toward filling the gap in our knowledge of cultural history in the area where the largest reservoirs in the water-development program will eliminate a large proportion of the archeological data, the Missouri River in the Dakotas. It will be only a beginning, however; perhaps the most impressive accom-

plishment of the investigations to date has been the revelation of the complexity of the region's archeology. Unless a great deal of additional investigation is accomplished before the dams, especially the Oahe Dam, are completed, we shall have not a great deal more than the scant consolation of knowing that prehistory along the Missouri River was far more complex than was suspected before the salvage program began.

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A REVISION OF SOME GLANDULINE NODOSARIIDAE (FORAMINIFERA)

(With One Plate)

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In 1839 d'Orbigny described *Glandulina* as a subgenus of *Nodosaria* (type species *Nodosaria* (*Glanduline*) *laevigata* d'Orbigny, 1826). This type species has a biserial early chamber arrangement and, as was shown much later, also an internal tube connecting with the radial aperture.

For many years all uniserial forms with strongly overlapping chambers were placed in this genus. In 1929 Cushman proposed a new generic name, *Pseudoglandulina,* for the completely uniserial forms, leaving in *Glandulina* those species which, like the type species, have an early biserial chamber arrangement. Perhaps because the early stages are not always clearly visible, in recent years the generic names *Glandulina* and *Pseudoglandulina* have both been rather loosely applied, many completely uniserial forms being left in *Glandulina* and some with a biserial stage and internal tube were placed in *Pseudoglandulina.* Some authors even placed the species *laevigata,* the type of *Glandulina,* in *Pseudoglandulina,* although d'Orbigny's name had nearly a century's priority.

The type designated by Cushman for the genus *Pseudoglandulina* was *Nautilus comatus* Batsch, but as will be shown in the generic discussion that follows, this form is actually a *Nodosaria;* hence the name is a junior synonym. As a new name is therefore needed for the uniserial, rectilinear *Glandulina*-like species, one is here proposed.

Recently, Boomgaart (1949) proposed the name *Pseudonodosaria* for the rectilinear *Glandulina*-like species which show a tendency to become like *Nodosaria* in the adult, with inflated, less-embracing

chambers and constricted sutures. A description is here given of an American species we consider to belong to this genus.

During the course of these investigations we found specimens of a *Glandulina*-like form that differed from those mentioned above in having a uniserial chamber arrangement, but with a curved axis, somewhat as in *Marginulina* and with strongly embracing chambers. A new name has been here proposed to include this new species and some earlier described species formerly referred to *Glandulina.*

The three genera here considered should be classed with the Nodosariidae, as they have a hyaline calcareous wall and radial aperture and show neither a biserial early stage nor an internal siphon.

Unfortunately, it is impossible to determine from the literature to which of these genera each described species should be referred, as many writers have ignored the early portions of their species in both figures and descriptions and few have shown the internal characters. Many of the species must be critically re-examined to determine whether they should be placed in *Glandulina, Pseudonodosaria,* or in one of the two genera here named, *Rectoglandulina* or *Pandaglandulina.*

Family NODOSARIIDAE Schultze, 1854

Genus PSEUDOGLANDULINA Cushman, 1929, suppressed

Pseudoglandulina CUSHMAN, Contr. Cushman Lab. Foram. Res., vol. 5, p. 87, 1929.

Type species.—*Nautilus comatus* Batsch, 1791. Original designation.

Discussion.—Cushman (1929, p. 87) defined *Pseudoglandulina* as similar to *Nodosaria* but with embracing chambers, and as differing from *Glandulina* in lacking the early biserial "pyruline" stage. Cushman designated *Nautilus comatus* Batsch, 1791, as type species of *Pseudoglandulina.*

Batsch (1791, pl. 1, fig. 2a-d) originally figured two completely different types as *Nautilus comatus.* One of these was a typical *Nodosaria* (fig. 2a, b) and the other a *Glandulina* (fig. 2c, d). Apparently it was the latter form to which Cushman referred. However, Parker, Jones, and Brady (1865, p. 226) had earlier recognized these distinct differences in Batsch's figures, and they had already designated Batsch's fig. 2a, b, as *Nodosaria comata* (Batsch) (although stating that this was a "smallish specimen of *Nodosaria raphanus*"), and they referred Batsch's fig. 2c, d, to *Glandulina glans* d'Orbigny. Thus when Cushman designated *Nautilus comatus* Batsch

as type species of *Pseudoglandulina* he immediately, although unknowingly, created only a junior synonym of *Nodosaria,* for Parker, Jones, and Brady had selected the nodosarian form as the type of *comatus*. Even if the genus were based on the other form of Batsch (the one later referred to *Glandulina glans* d'Orbigny by Parker, Jones, and Brady), *Pseudoglandulina* would have no standing for it would then be a synonym of *Glandulina* as was shown by Selli (1947, p. 5, pl. 3, figs. 1-6). He showed *Glandulina glans* d'Orbigny to be a true *Glandulina* with internal tube and biserial early stage. Selli considered *G. glans* to be the type of *Pseudoglandulina* and therefore considered the latter to be a synonym of *Glandulina.* However, Parker, Jones, and Brady's assignation of the name *comatus* to the nodosarian form of Batsch precludes this later fixation by Selli.

Nevertheless, *Pseudoglandulina* has been recognized by many foraminiferal workers, although there has been much confusion between this genus and *Glandulina* d'Orbigny, 1826 (type species *G. laevigata* d'Orbigny). This confusion culminated in the referring of some specimens by Renz (1948, p. 154), and by Cushman and McCulloch, as late as 1950 (p. 325) to the combination *"Pseudoglandulina laevigata* (d'Orbigny)." The specimens of Cushman and McCulloch were typical *Glandulina* however, and they clearly showed the internal tube in their figures. Nevertheless, these authors had placed the type species of *Glandulina* (*laevigata*) in another genus (*Pseudoglandulina*), which is antedated by nearly a century. The type species of a genus could not in any legal way be placed in a later-named genus.

This unfortunate type citation places the genus *Pseudoglandulina* within the synonymy of *Nodosaria* and the name must therefore be suppressed. Furthermore, many specimens referred in the literature to *Pseudoglandulina* are obviously true *Glandulina* showing either a biserial base or internal tube or both, and many other references would seem to be better placed in *Nodosaria* or in *Pseudonodosaria* Boomgaart, 1949. Nevertheless, some species remain for which a name must be proposed, as they can not be placed in *Nodosaria,* or in *Glandulina* or *Pseudonodosaria.*

Genus RECTOGLANDULINA Loeblich and Tappan, new genus

Pseudoglandulina (part) CUSHMAN, 1929, and later authors.
Glandulina (part) of authors, not d'Orbigny, 1826.
Nodosaria (part) of authors, not Lamarck, 1812.

Type species.—Rectoglandulina appressa Loeblich and Tappan, new species.

Derivation.—*rectus* L. straight, upright+*glandula* L. dim. acorn (shaped). Gender feminine.

Diagnosis.—Test free, uniserial, with chambers increasing rapidly in diameter and strongly overlapping, sutures horizontal and parallel, never strongly depressed; wall calcareous; aperture terminal, radiate.

Remarks.—This genus differs from *Glandulina* d'Orbigny in lacking an early biserial stage, and from *Pseudonodosaria* Boomgaart in having all chambers closely appressed and with the later chambers unseparated by constricted sutures as are found in *Pseudonodosaria.* It includes many of the species previously placed in *Pseudoglandulina* Cushman, 1929, but does not include the type species of *Pseudoglandulina, Nautilus comatus* Batsch, which has been shown to belong to the genus *Nodosaria* Lamarck, 1812.

RECTOGLANDULINA APPRESSA Loeblich and Tappan, new species

Plate 1, figures 1-4

Pseudoglandulina lagenoides (Olszewski) CUSHMAN and DEADERICK (not *Glandulina lagenoides* Olszewski, 1875), Journ. Pal., vol. 18, p. 334, pl. 51, figs. 14, 15, 1944.

Pseudoglandulina sp. PLUMMER, Univ. Texas Bull. 3101, p. 158, pl. 10, figs. 16, 17, 1931.

not *Pseudoglandulina lagenoides* (Olszewski) CUSHMAN and HEDBERG, Contr. Cushman Lab. Foram. Res., vol. 17, p. 89, pl. 21, fig. 34, 1941.—CUSHMAN and TODD, ibid., vol. 19, p. 58, pl. 10, fig. 14, 1943.—CUSHMAN, ibid., vol. 20, p. 8, pl. 2, fig. 4, 1944.—CUSHMAN, U. S. Geol. Surv. Prof. Paper 206, p. 76, pl. 27, fig. 29, 1946.

Test free, subfusiform, widest centrally, chambers uniserial, closely appressed, increasing rapidly in diameter from the pointed base, last chamber occupying one-half to three-fifths the length of the test, elongate turbinate in form; sutures distinct, horizontal, flush with the surface; wall calcareous, surface smooth; aperture terminal, radiate.

Length of holotype 0.44 mm., greatest breadth 0.23 mm. Other specimens range from 0.26 to 0.57 mm. in length.

Types and occurrence.—Holotype (U.S.N.M. P2010), figured paratypes (U.S.N.M. P2011a-c), and unfigured paratypes (U.S.N.M. P2012) all from the Ozan sand, 7.8 miles south of Nashville on State Highway 4, Hempstead County, Ark., Deaderick Collection. Unfigured paratypes (U.S.N.M. P2013) from the Annona chalk, 8.3 miles south of Mineral Springs on the road to Saratoga, 0.4 mile north of junction with Okay road, Howard County, Ark., Deaderick Collection. Unfigured paratypes (Cushman Coll. 41957 and 41958) from

north side of road, 2 miles east of Saratoga on road to Columbus, Ark., Deaderick Collection. Unfigured paratype (U.S.N.M. P2014) from the Corsicana marl, 2 miles south of Manda, Travis County, Tex. Unfigured paratype (U.S.N.M. P2015) from the Corsicana marl, on Mexia highway at forks of Wortham road, 2.8 miles ESE of Cooledge, Limestone County, Tex. Unfigured paratypes (U.S.N.M. P2016) from the Taylor marl, Colorado River, 1 mile NNE of Delvalle, Travis County, Tex.

Remarks.—Cushman and others had referred this species to *Pseudoglandulina lagenoides* (Olszewski) but had also included with it many varying forms, some fusiform, others subcylindrical, some with bluntly rounded base, others with pointed and even apiculate base. The present species differs from *Glandulina lagenoides* Olszewski in having much lower chambers and in the shape of the test. *G. lagenoides* has a strongly fusiform test in contrast to the subfusiform outline of *Rectoglandulina appressa.*

RECTOGLANDULINA OBESA Loeblich and Tappan, new species

Plate 1, figures 5a-6

Test free, robust, ovate in outline, widest slightly above the midline, base pointed, apertural end broadly rounded, chambers rectilinear, very strongly overlapping, final chamber occupying three-fifths the length of the test; sutures distinct, horizontal, flush, not constricted; wall calcareous, hyaline, surface smooth; aperture terminal, radiate.

Length of holotype 0.47 mm., greatest breadth 0.34 mm. Paratypes range from 0.36 to 0.68 mm. in length and from 0.21 to 0.36 mm. in breadth.

Types and occurrence.—Holotype (U.S.N.M. P2017), figured paratype (U.S.N.M. P2018), and unfigured paratypes (U.S.N.M. P2019) all from the Ozan sand, Murfreesboro road, 0.9 mile west of Wright's Store at junction of Okolona and Murfreesboro roads, Clark County, Ark., Deaderick Collection. Unfigured paratypes (U.S.N.M. P2020) from the Annona chalk in a natural erosion about one-half mile north of White Cliffs Post Office, Ark., Deaderick Collection.

Remarks.—This species somewhat resembles *Glandulina inflata* Bornemann from the Oligocene of Germany but differs in being smaller, in having a more broadly rounded upper surface, rather than a produced aperture, and a more rounded final chamber.

Genus PSEUDONODOSARIA Boomgaart, 1949

Pseudonodosaria Boomgaart, Smaller Foraminifera from Bodjonegoro (Java), Thesis Univ. Utrecht, p. 81, 1949.

Type species.—*Glandulina discreta* Reuss, 1850. Original designation.

Test free, uniserial and rectilinear throughout, chambers embracing strongly in the early portion, later chambers inflated, less embracing and separated by constricted sutures; sutures horizontal; aperture terminal, radiate.

PSEUDONODOSARIA LARVA (Carsey)

Plate 1, figures 7-11

Nodosaria larva Carsey, Univ. Texas Bull. 2612, p. 31, pl. 2, fig. 2, 1926.
Nodosaria radicula (Linné) Plummer (not *Nautilus radicula* Linné, 1758), Univ. Texas Bull. 3101, p. 155, pl. 11, fig. 2 (? fig. 1), 1931.
Pseudoglandulina manifesta (Reuss) Cushman (not *Glandulina manifesta* Reuss, 1851), U. S. Geol. Survey Prof. Paper 206, p. 76, pl. 27, figs. 21-26 (not fig. 20), 1946.

Test free, elongate, base smooth and rounded, consisting of a rectilinear series of chambers, early ones closely appressed, strongly overlapping and subcylindrical, later chambers slightly inflated with a lesser amount of overlap and separated by slight constrictions, final chamber turbinate in form, somewhat produced to the aperture; sutures distinct, straight, horizontal, flush with the surface in the early portion, slightly constricted in the later portion where the chambers are more inflated; wall calcareous, hyaline, surface smooth; aperture terminal, radiate. Specimens range from 0.39 to 0.88 mm. in length and 0.18 to 0.26 mm. in width.

Types and occurrence.—Figured topotypes (U.S.N.M. P2021a-e) and unfigured topotypes (U.S.N.M. P2022) from basal Navarro strata exposed in a steep 80-foot exposure on the right bank of Onion Creek just east of the bridge on the Austin-Bastrop Highway, Travis County, Tex. Collected by A. R. Loeblich, Jr.

Remarks.—Plummer placed Carsey's species under the synonymy of *Nodosaria radicula* (Linné); Cushman considered it equivalent to *Pseudoglandulina manifesta* (Reuss). It differs from the former species in having a rounded, rather than an apiculate base, and in having closely appressed early chambers. It is also much smaller than the Recent species. It differs from Reuss's species in having a more rounded base and a much less flaring test and in the later chambers being more separated and sutures more constricted.

Genus PANDAGLANDULINA Loeblich and Tappan, new genus

Type species.—*Pandaglandulina dinapolii* Loeblich and Tappan, new species.

Derivation.—*pandus* L. bent, curved+*glandula* L. dim. acorn (shaped). Gender feminine.

Diagnosis.—Test free, like *Rectoglandulina* with chambers much overlapping, and all chambers uniserially arranged, but with a slightly arcuate axis, sutures very slightly radiate in the early portion, later ones horizontal, and may be very slightly depressed; wall calcareous, hyaline; aperture terminal, radiate.

Remarks.—This genus differs from *Rectoglandulina* Loeblich and Tappan, n. gen., in having a curved axis in the early portion, with the sutures somewhat radial, rather than horizontal and parallel. It differs from *Glandulina* d'Orbigny in being uniserial throughout, rather than biserial in the early portion, and in lacking an internal tube. It differs from *Pseudonodosaria* Boomgaart in having a curved axis and in having closely appressed chambers throughout, and in lacking the constricted sutures of the later stage of *Pseudonodosaria.*

Glandulina laevigata var. *dentalinoides* Silvestri belongs to this genus and very probably also *Glandulina aduncа* Costa and *Glandulina laevigata* var. *marginulinoides* Fornasini. In the latter two species nothing is known of their interior structures.

PANDAGLANDULINA DINAPOLII Loeblich and Tappan, new species

Plate 1, figures 12-16

Test free, fusiform to elongate; chambers much embracing, uniserial but with a slightly curved axis; sutures straight, very slightly radial in the early portion, later nearly horizontal, flush with the surface or very slightly depressed in the later portion of the longer individuals; wall calcareous, hyaline, surface smooth; aperture terminal, radiate, slightly produced.

Length of holotype 0.83 mm., greatest breadth 0.39 mm. Other specimens range from 0.68 to 1.17 mm. in length.

Types and occurrence.—Holotype (U.S.N.M. P2023) and figured paratypes (U.S.N.M. P2024a-d) and unfigured paratypes (U.S.N.M. P2025) all from the Lower Pliocene blue clays, Ponticello di Savena, on right bank of the stream below the bridge near San Ruffillo, Province of Bologna, Italy. Collected by H. T. and A. R. Loeblich, Jr., 1954.

Remarks.—This species somewhat resembles the figures of *Glandulina laevigata* d'Orbigny var. *dentalinoides* Silvestri, 1903, from the

Miocene (Helvetian). Silvestri gave no magnification and no measurements of his figures and the comparative size of the two forms is not known. However, the present species has a more produced aperture. *Glandulina laevigata* d'Orbigny var. *marginulinoides* Fornasini, 1901, from the Pliocene of Siena is also similar, but has constricted sutures in the later portion, somewhat as in *Pseudonodosaria*. Whether this is a diagnostic character or merely represents an aberrant specimen is not known, but apparently only one specimen was found, which would suggest the latter possibility. *Glandulina adunca* Costa differs in being more slender with the early sutures nearly equidistant, and final chamber higher and more tapering.

This species is named in honor of Dr. Enrico di Napoli Alliata, of Rome, Italy, in recognition of his outstanding work on the Foraminifera of Italy.

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EXPLANATION OF PLATE 1

Rectoglandulina, Pseudonodosaria, Pandaglandulina

Page

FIGS. 1-4. *Rectoglandulina appressa* Loeblich and Tappan, new genus, new species 4

1, 2, 4, Side views of paratypes (U.S.N.M. P2011a-c), showing variations in form and outline, with subfusiform shape and large final chamber. 3a, Side view of holotype (U.S.N.M. P2010). 3b, Top view, showing radiate aperture. All from Ozan sand of Arkansas, × 107.

FIGS. 5a-6. *Rectoglandulina obesa* Loeblich and Tappan, new species..... 5

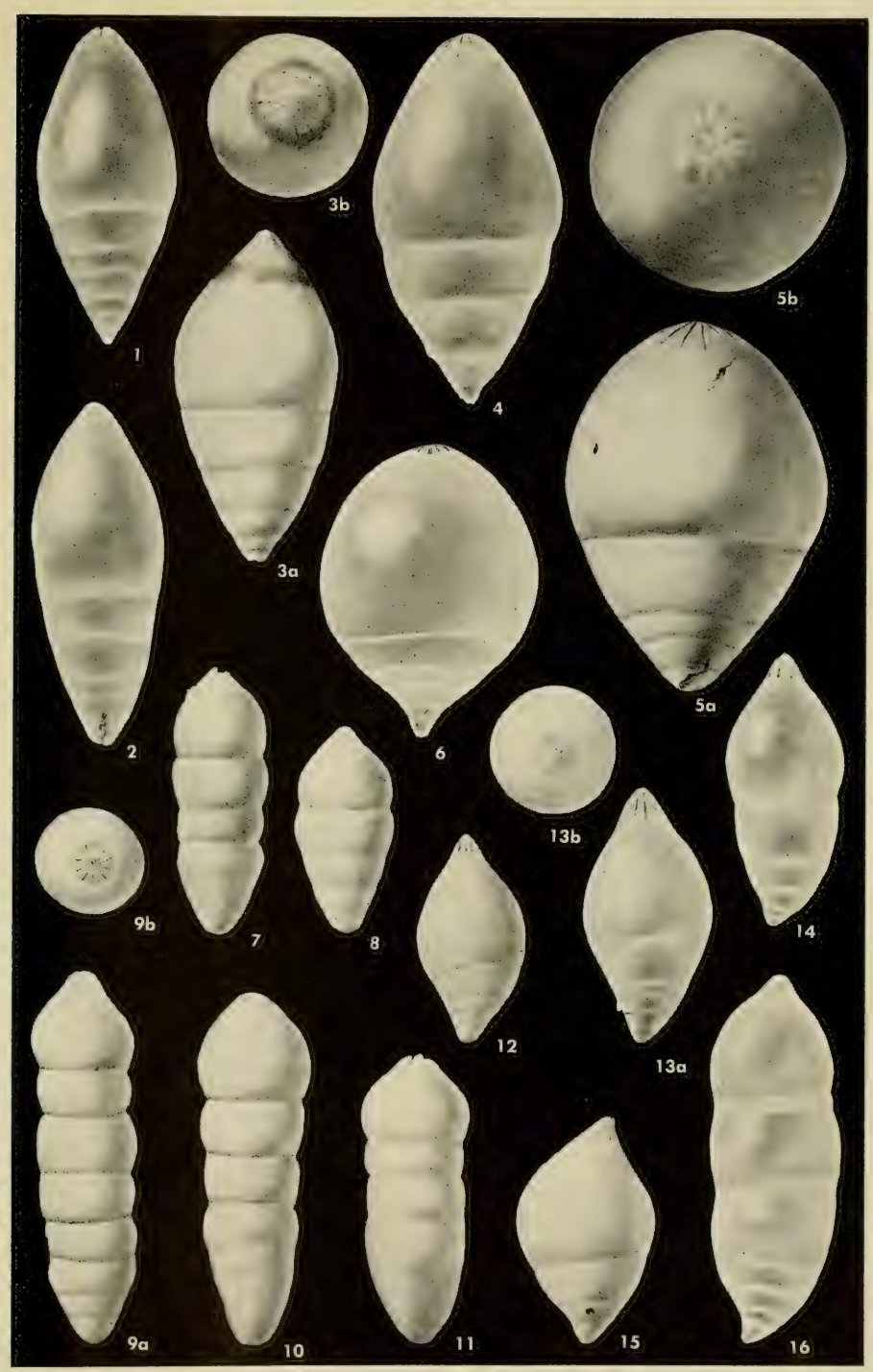
5a, Side view of holotype (U.S.N.M. P2017), showing very inflated character of this species. 5b, Top view, showing radiate aperture. 6, Side view of paratype (U.S.N.M. P2018), showing a more pointed base. Both from the Ozan sand of Arkansas, × 115.

FIGS. 7-11. *Pseudonodosaria larva* (Carsey)..... 6

7-9a, 10, 11, Side views of topotypes (U.S.N.M. P2021a-e), showing closely appressed early chambers, followed by more discrete, nodosarian later chambers, and the turbinate form of the final chamber. 9b, Top view, showing radiate aperture. From basal Navarro strata of Texas, × 59.

FIGS. 12-16. *Pandaglandulina dinapolii* Loeblich and Tappan, new genus, new species 7

12, 14-16, Side views of paratypes (U.S.N.M. P2024a-d), showing marginuline-like early portion, with slightly radial sutures and curved axis, followed by more rectilinear later chambers, with typical strong chamber overlap, proportionately large final chamber and slightly produced apertural end. 13a, Side view of holotype (U.S.N.M. P2023). 13b, Top view showing radiate aperture. From the Pliocene of Italy, × 45.



Rectoglandulina, Pseudonodosaria, Pandaglandulina

(For explanation see page 9.)