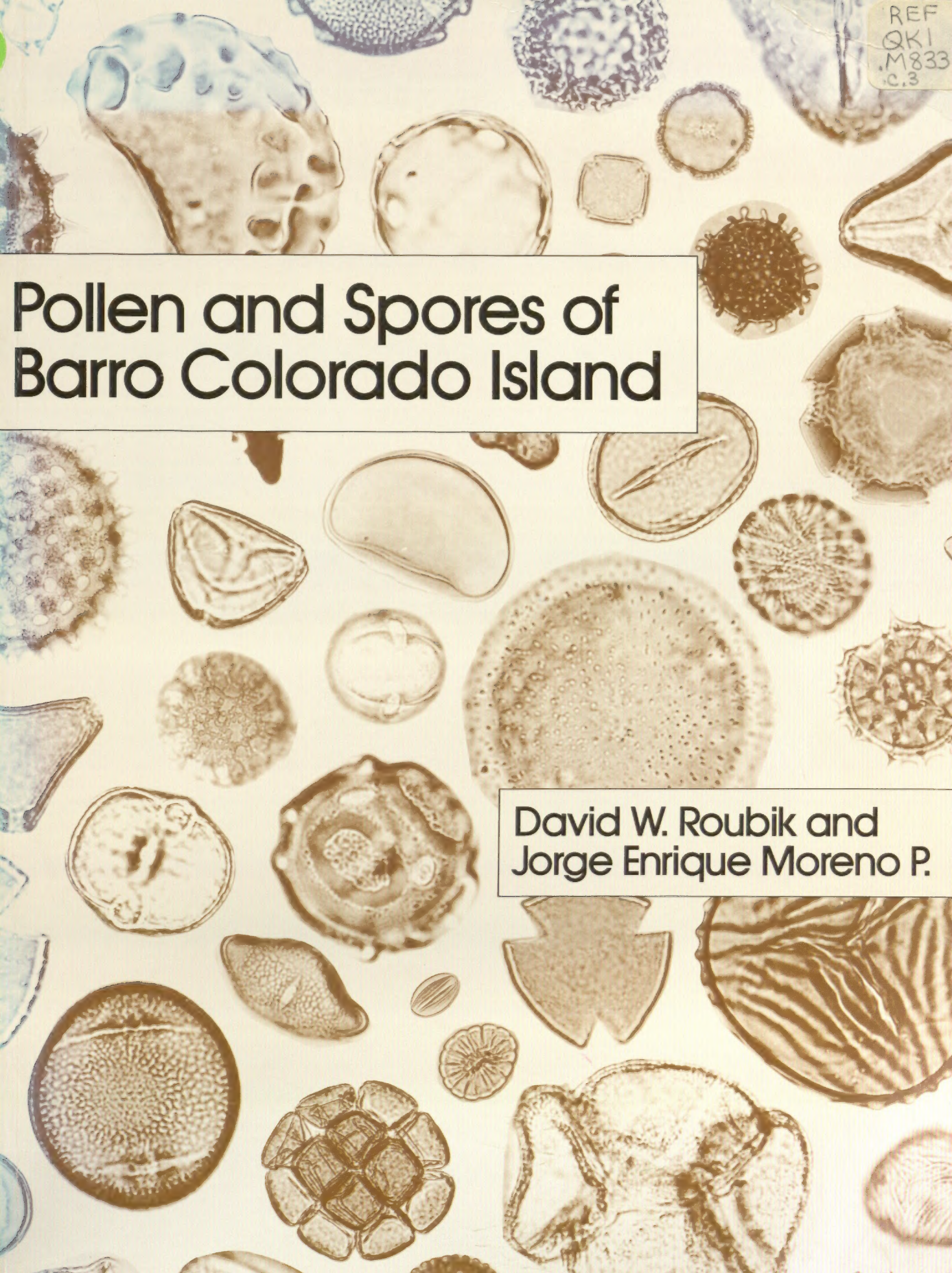

Pollen and Spores of Barro Colorado Island

David W. Roubik and
Jorge Enrique Moreno P.

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The cover illustration is a sample of the pollen and spores of Barro Colorado Island, Panama.

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CONTENTS

Preface

Palynologists can greatly extend our knowledge of tropical communities with microscopic studies of pollen and spores. These nearly indestructable forms, which encapsulate the male gametes of all plants, allow not only characterization of ancient and recent floras but also yield precise information on plant-animal relationships. Although much progress has been made in classification of ancient habitats through fossil pollen and spores—often based upon identification of a few key species, genera, or tribes—modern floras are much less well known. The research value of spores and pollen grains is compromised by our ignorance of how readily the plants in a given tropical plant assemblage can be identified. We usually do not know whether individual species or even genera are distinguishable, and this is due to the lack of basic descriptive knowledge on the total flora of any given tropical forest.

This work began in 1979, a year after the appearance of a book that provided the basis for undertaking the project—*The Flora of Barro Colorado Island* by Thomas Croat. Utilizing this comprehensive treatment as a guide and checklist, we set about collecting, describing, and photographing the pollen and spores listed by Croat, and then constructed the taxonomic keys. Our own research on plant and insect ecology, emphasizing pollination biology and the impact of the Africanized honey bee on the biota of tropical America, could not have been completed without this effort. Development of a reference collection to the pollen and spores of this well-known tropical flora in central Panama required the assistance of many collaborators. With their help, fresh samples were taken in the field, but nevertheless, some of the pollen or spores of BCI remain unknown to us. Where material was not available, we made an effort to substitute other taxa of the same genus, usually from central Panama. In addition, the dozens of nomenclatural changes that have arisen since publication of Croat's flora have been included in order to facilitate accurate biogeographic and comparative work.

The book is intended for use as a botanical reference and primarily an identification manual for the pollen and spores of BCI. We hope that it will stimulate similar studies in other tropical areas and facilitate the interpretation of such diverse areas as vegetational history, plant systematics, and tropical ecology.

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INTRODUCTION

Palynology is a well-established field whose potential is still underutilized. Our goal during the past 10 years was to provide the first comprehensive treatment and guide to the pollen and spores of a lowland tropical forest. In many ways, the flora of Barro Colorado Island (BCI) is among the best studied in the world. Its complement of plant taxa staggers the imagination—over 130 families and 1,400 species. An appreciation of the habitat and flora is essential to any palynological survey, and this need is answered in detail by Croat (1978) and the many additional books and scientific papers dedicated to life on this tropical island. Though we will dwell primarily on the subject of our study rather than upon the island's history and ecology, those who may not have access to a set of references on BCI are provided here with a brief sketch of the forest environment.

Barro Colorado Island is a 15.6 km^2 nature reserve established in 1923, nine years after the formation of Gatun Lake as a reservoir for the operation of the Panama Canal (Fig. 1). Botanical information for this island is the most complete of any tropical forest and several floras have been prepared; those of Standley (1933) and Croat (1978) are the most complete. Croat's treatment provided a convenient basis for compiling information on the pollen and spores. The location of BCI makes it ideal for taking on a project of this magnitude, for the vegetation of central Panama has very broad affinities with that of other areas. The plants of BCI consist of representatives from the lowland flora of Mexico, Central America, and South America, as well as endemic Panamanian species. The floristic elements are both Gondwanan and Laurasian; and they are characteristic of sedimentary or basaltic substrates (Foster & Brokaw, 1982; Foster & Hubbell, 1990; summary in D'Arcy & Correa, 1985). As the name "Barro Colorado" implies, the soil is deep-red clay having little organic matter. The highest point on BCI is 165 m above sea level, and there are some deep ravines and also a large plateau. Apart from the artificial lake surrounding the island, there are a few small streams that are dry during at least part of the dry season, which normally lasts from January through April. Annual rainfall is 261 cm (Windsor 1990).

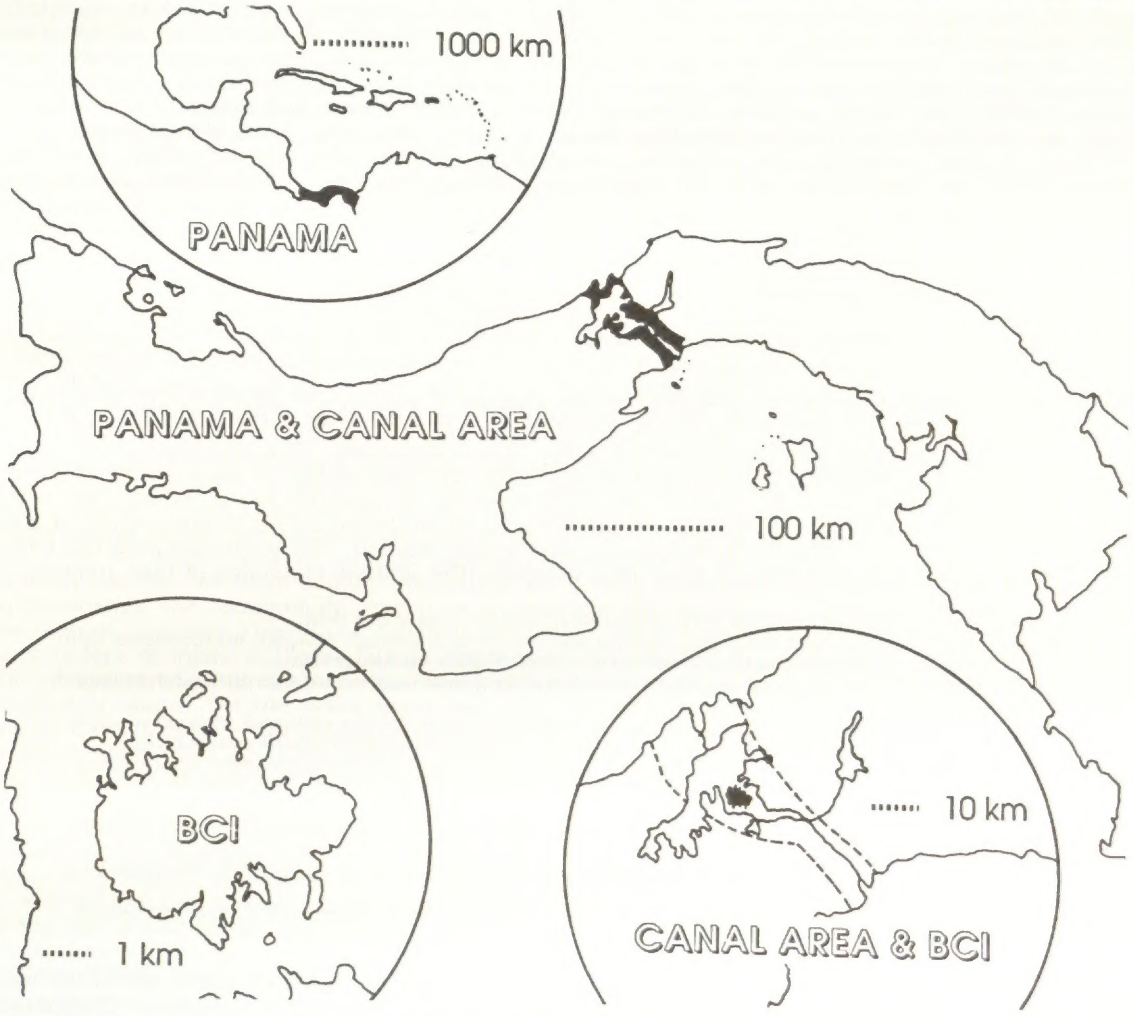

Figure 1. The island of Barro Colorado, within the Panama Canal area, Panama (below left), shown in relation to the isthmus of Panama (below right) and Panama, between South and Central America. (Provided courtesy of R. B. Foster & S. P. Hubbell.)

Due to its position in roughly the middle of the isthmus of Panama, BCI has plants that include species of wet Atlantic forests (3,000 - 5,000 mm rain annually), the drier Pacific forests, and some of intermediate nature (Foster & Brokaw, 1982). The forest contains a small portion of deciduous trees and is secondary forest with some patches of very old primary forest. The latter has existed over 500 years with no human disturbance (Piperno, 1990). Plant growth forms and their habitat classes on BCI were given by Croat (1978): species numbering 1,369 vascular plants were recorded, 104 of them vascular cryptogams, many of which are epiphytic, and 481 arborescent species, 265 scandents, and 466 herbaceous species. Most of the herbs are weedy, introduced, or cultivated, and they are largely confined to clearings near the margins of the lake. The naturalized weedy species and native species, of the forest proper, comprise some 633 genera and 1,207 species (Foster & Hubbell, 1990). The subset of plants in relatively undisturbed forest of closed canopy consists of approximately 966 species and 500 genera (Foster & Hubbell, 1990). These authors emphasize the appropriateness of using this group of plants for comparison with other natural flora in the lowland tropics. To cite one example, some 82% of woody plant genera and 21% of species are shared between BCI and lowland eastern Peruvian forest, the Manu Biosphere Reserve, which lies 2,500 km south of BCI in the Amazon basin. The three dominant taxa on BCI, in terms of species, are the ferns, aroids, and the orchids. The most species-rich tree families are Leguminosae and Moraceae, while the most common shrubs are of the Rubiaceae and Melastomataceae. Most liana species are Bignoniaceae, Sapindaceae, Leguminosae, and Malpighiaceae (Foster & Hubbell, 1990).

Of great significance to palynological work is the basic floristic treatment and the continuing botanical research on BCI. Not only does this provide a useful list for building a reference collection, and thus the possibility of identifying virtually random samples from the flora, but it also gives background information for many other types of research. Descriptions of pollen and spores, in their turn, provide a research tool for general ecology, paleoclimates, soils, geology, plant systematics, archaeology, pollination biology, study of airborne allergens, and the reproductive ecology of an exceedingly diverse group of phytophagous animals—those that feed upon pollen and spores. A significant challenge to palynologists is that of finding a way to progress from a working knowledge of family-level fossil pollen and spores, or those trapped in various acidic sediments free of the microbes that cause pollen decomposition, to a full knowledge of modern taxa. The correspondence between 'microfossils' and modern taxa is often ignored and frequently unknown (Bartlett & Barghoorn, 1973; Palacios-Chávez, 1967, 1985; Graham, 1987a, b; Traverse, 1988). Pollen and spores of BCI will at least become less enigmatic for those undertaking future studies. Recently, a worldwide study made by Thanikaimoni (1981) revealed that one-third of all plant *genera* lacked basic pollen descriptions. Included herein are descriptions of 1,269 species from 683 genera and 133 families. But the pollen and spores are much more than an integral part of the raw material used for plant systematics and classification. These agents of plant reproduction comprise a crucial element of total primary production—in much the same way as seeds and fruit—that play many roles within the tropical forest.

METHODS

While some drawbacks exist in light-microscope studies of pollen and spores—fine structures are not so evident as those revealed by scanning electron microscopy (SEM)— the majority of pollen and spores of BCI are distinguishable to species with the light microscope. This technique, above all else, has the advantages of relative simplicity and accessibility. The processing of material by acetolysis is the single most important step that allows identification of modern taxa. Acetolyzed material constitutes a practical reference base that may, of course, be prepared for SEM work when necessary. Acetolysis procedures were those now well-known and widely applied. The technique was the same for most dried herbarium material and for fresh field samples. The process consisted of nine phases:

1) Material placed in 5 ml concentrated (99%) glacial acetic acid for at least one hour.
2) Sample lightly macerated with blunt glass stirring rod, then poured through 40-mesh brass strainer cloth (C. O. Jelliff Corp., Southport, Connecticut 06490) into 15 ml Nalgene centrifuge tube.
3) Sample tube filled to ca. 10 ml and centrifuged for 10 min, then supernatant discarded after careful removal using glass Pasteur pipette.
4) 10 ml of a 9:1 mixture of 99% anhydrous acetic acid and 99% sulfuric acid (the acetolysis mixture) added to sample tube, then placed in boiling water for 15 to 30 min. or until the sample darkens considerably.
5) Sample centrifuged and supernatant removed with glass pipette; 15 ml distilled water added several times to halt acetolysis, stirring slightly with glass rod.
6) Sample centrifuged and supernatant removed.
7) Sample and remaining liquid removed with glass pipette and carefully 'spotted' onto a paper towel, which absorbs most liquid.
8) Glycerine jelly with phenol used for mounting medium, a small mass on a dissecting needle used to pick up sample from paper towel.
9) Glass slide with small sample heated on hot plate, coverslip placed over sample, paraffin shavings placed around edges of coverslip, cooled to make permanent slide.

Fresh material was obtained whenever possible to ensure that adequate quantities of undamaged grains were examined. Families most susceptible to damage were the Lauraceae, Zingiberaceae, Musaceae, Marantaceae, Annonaceae, some Rubiaceae, the Polypodiaceae (perine damage was common) and polyads such as those of the mimosoid legumes. Preparatory techniques such as light maceration with glass stirring rods were avoided for these samples. The pollen or spores were instead mounted in glycerine jelly after dissection from rehydrated herbarium material, or from fresh collections.

Pollinaria of orchids were prepared by R. L. Dressler and M. Chase from freshly collected material glued to a triangular paper point, mounted on an insect pin. Chase carried out all photomicrophotography with a Wild binocular dissecting microscope equipped with a fiberoptics light source.

The photomicrographs of reference slide material were taken within a month of preparing slides and utilized an Olympus BH stereomicroscope equipped with an Olympus 35AD camera and an AD system exposure control unit. All photographs were taken using automatic exposure settings, and through polarizing and blue light filters placed between the light source and condenser. Black and white Kodak Panatomic ASA 32 film was utilized. A magnification factor of 6.7 diameters of the photograph tube lens was combined with nosepiece planar oculars of 20 diameters, 40 diameters, or immersion 100 diameters for all photographic work. The maximum effective magnification was therefore 670 diameters. Photographic prints were made using four different enlargements, which varied slightly due to changes in the kinds of enlargement apparatus. While we lament any erroneous impressions of relative size that might be conveyed during a quick scan of the photographic plates, general diversity in size is still evident (the reader is urged to consult formal descriptions for accurate size information). Plate photos are usually presented at 8 mm = 10 μ. Exceptionally large grains are shown at 1/2 this scale (8 mm = 20 μ), and two greater enlargements for tiny grains were used, as follows: 8 mm = 200 μ and 8 mm = 400 μ.

For the reference collection, all plants collected on BCI were taken in preference to other localities in Panama, which were preferable to those of Costa Rica or Colombia, and so forth. In preparing descriptions of individual species we occasionally used separate collections for photography and description. Such cases are indicated by a (d) for material used in description or a (p) for material used in photography, in the Descriptions Section. Additionally, when duplicates of our material have been deposited with the major collection of Central American and Panamanian pollen and spore types, maintained by A. Graham at Kent State University, the voucher collection numbers, denoted KE, are included with the species descriptions and collection data.

Herbaria in which voucher specimens are deposited are abbreviated in the Descriptions, as follows: BCI (herbarium of Barro Colorado Island, Republic of Panama); PMA (University of Panama herbarium, Panama City); MO (Missouri Botanical Garden, St. Louis, Missouri and Summit Herbarium, Smithsonian Tropical Research Institute, Balboa, Republic of Panama); CR (Herbario Nacional de Costa Rica, San José, Costa Rica); NY (herbarium of the New York Botanical Garden, Bronx, New York); US (herbarium of the National Museum of Natural History, Smithsonian Institution, Washington, DC); COL (National Herbaria of Colombia, Bogotá); HIFP (herbarium of the French Institute, Pondicherry, India).

Collection localities are are abbreviated as the following: BCI: Barro Colorado Island; BEL: Belize; BRZ: Brazil; COL: Colombia; CR: Costa Rica; ECU: Ecuador; GUA: Guatemala; GUI: French Guiana; HON: Honduras; IN: India; JAM: Jamaica; MEX: Mexico; NIC: Nicaragua; PMA: Panama; SAL: El Salvador; SUR: Suriname; VEN: Venezuela.

The descriptions are given in an inverted pyramid format. That is, we proceed from the large groups, the 35 major pollen and spore types for BCI given in the Table and the general key, then provide a key to plant families. The section for each family gives the species descriptions after family keys. If the reader perceives that pertinent information is omitted in the species description, this is likely because the characteristic applies to all of the species of that family which were examined by us. Such descriptive information is given only once, at the beginning of the section covering the family, to avoid repetition. This section is also meant to provide a general overview of the range of pollen or spore types found in the individual plant families. Often, however, the descriptors may not exist for certain subtle but evident characters, and there is no other recourse but to examine and compare photographs. Naturally there are many cases in which the best diagnostic material would be the actual slides and their comparison under the microscope. While we suspect there is no substitution for this critical research tool, we have tried to include as many photographs as possible to aid the comparative identification process. We were acutely aware that the quality of photographs was very important to the present treatment. The terminology used here is generally that of Faegri and Iverson (1975 and earlier editions) and of Erdtman (1966), as clarified by Kremp (1968, and see References) and incorporates little terminology of other authors. Rather limited use was made of the PA index or of other indices, with the exception of general size ratios along polar and equatorial axes used to denote the general grain form and shape. On the other hand, we often found it useful to record the metric information included in the PA index— the distance measured directly between the ends of colpi or furrows, seen from a polar view. This apparently new "quick and dirty" measurement is dubbed the polar area distance, or PAD. A glossary with brief definitions of palynological terms is included at the end of the book.

More introductory material follows Methods and also has been incorporated in the Index. Family-level characteristics in major pollen and spore types among the flora we have surveyed are given in the Table (pp. 5-7). Faegri & Iverson (1975) should also be consulted for a comprehensive family-level survey, which they call a master key of pollen classes. Either can be used in conjunction with the general key (pp. 8-21). In the Index and keys to families we have indicated with an asterisk taxonomic changes and synonyms for the flora of BCI. These were reported since Croat (1978) and most came from D'Arcy (1987). Plate legends give correct names in brackets, as do the species descriptions, following synonyms listed in Croat's book. In the keys, the latter are followed by an asterisk. Also in the keys, a double asterisk is included when the species was not included in Croat. The Appendix provides the names of 117 taxa originally given in Croat that are not included in the present treatment. In some cases this was because the species are cultivated or exotic plants, which we did not wish to include among the natural flora, and in others because no adequate material was located. Also marked in the

Index, using the symbol § are 30 plants included in the book, that were not in the original list of Croat. In some instances we have substituted these species for congeners of the BCI flora, which are not represented in our slide material, while at other times this was done because the plants are found in central Panama near BCI, or seemed desirable for comparative purposes. Another 58 taxa that we describe were not included among the photographic plates, either because there were too few grains to obtain full views needed for the photographs, or because the taxa varied very slightly from related species that were photographed.

Nearly one-fourth of the taxa we examined from BCI had tricolporate grains, and a final note concerns a potential problem group consisting of the reticulate grains. This becomes abundantly clear as samples of unknown origin, taken through the general key, lead to as many as a dozen possible families. Because many of these are legumes, it is worth mentioning the advice of legume specialists (B. Ludlow-Wiechers, for one) that the characteristics of the pore are particularly useful in narrowing down the range of possible identities. Until the requisite SEM studies are undertaken, we encourage further study of the existing literature. The sources used in preparing this monograph are listed in References. Many are general references that discuss plant families for which we do not include specific references in the family keys. When identifying samples, maximum use should be made of reliably identified local voucher specimens and slide material, in addition to palynological literature.

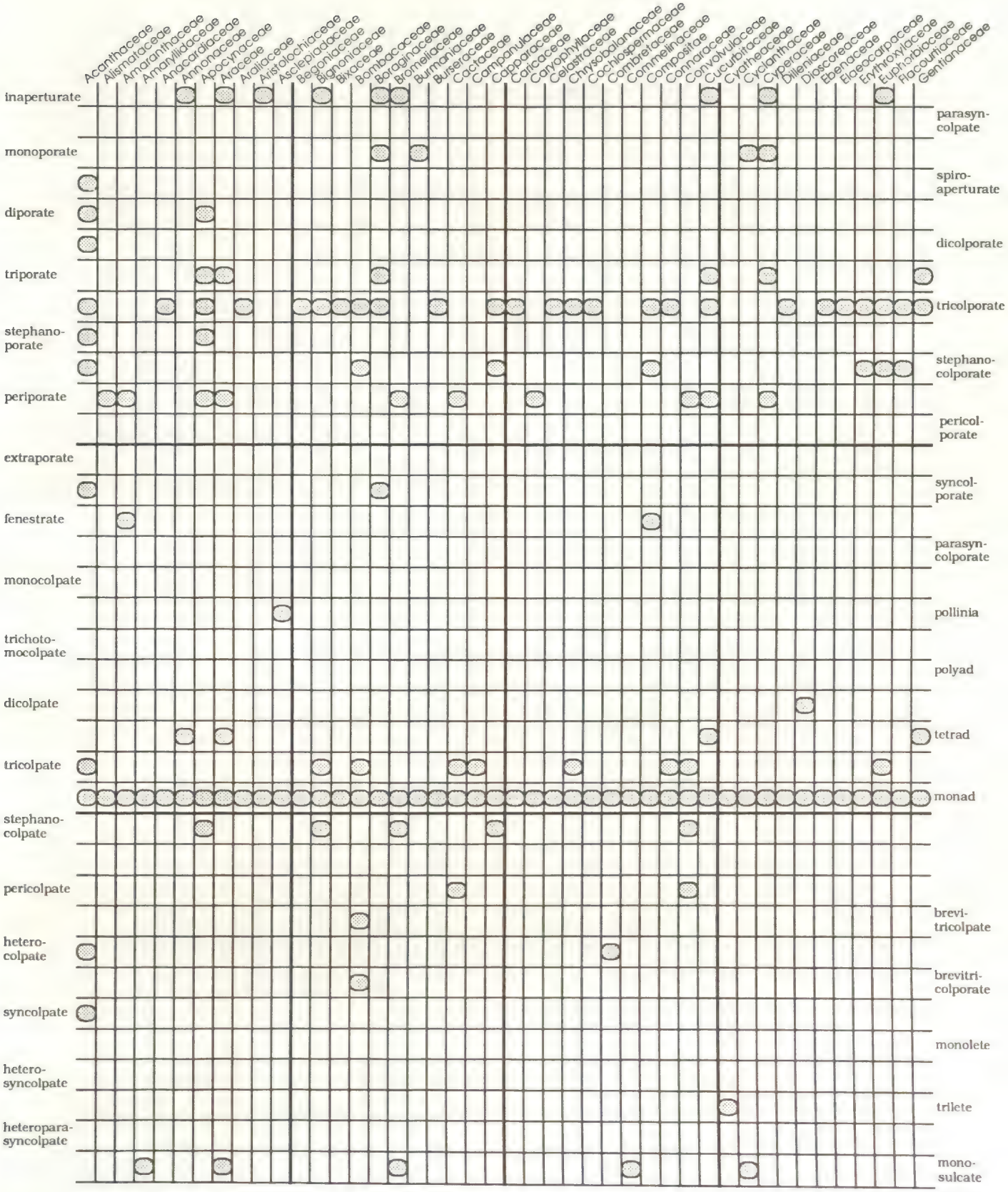

Table. Major family-level characteristics of the pollen and spores of Barro Colorado Island.

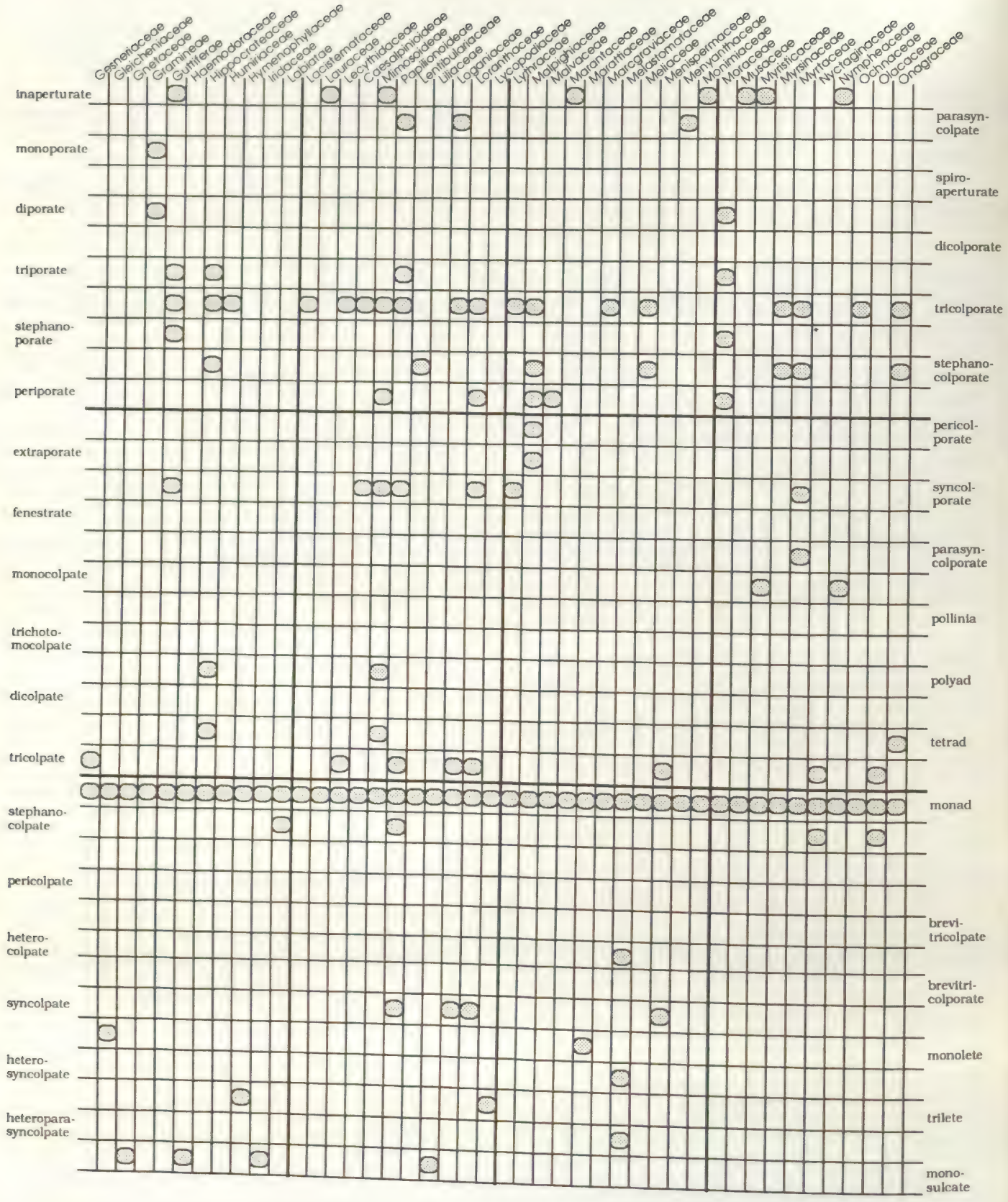

Table. Major family-level characteristics of the pollen and spores of Barro Colorado Island (continued).

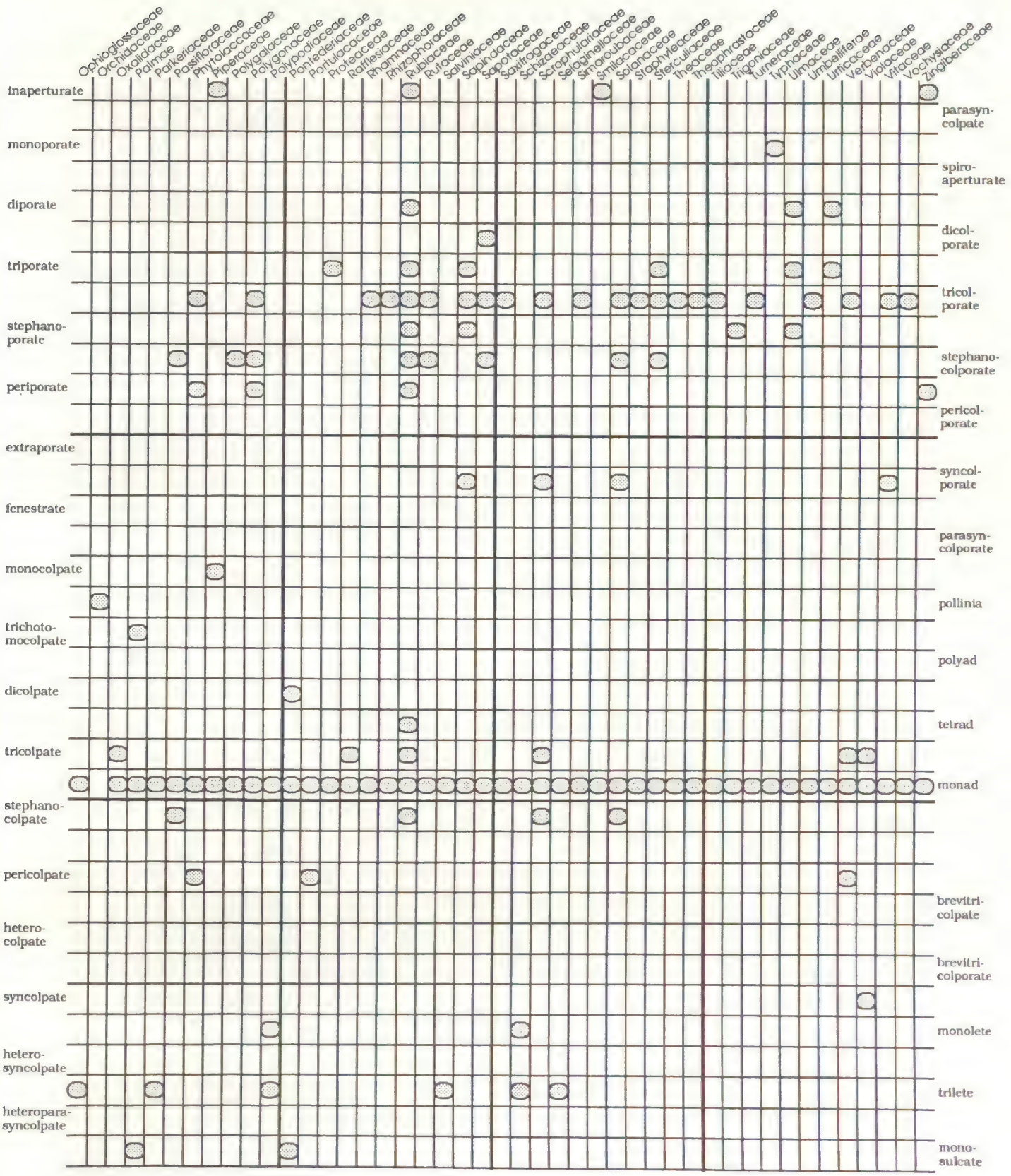

Table. Major family-level characteristics of the pollen and spores of Barro Colorado Island (continued).

KEY TO MAJOR POLLEN AND SPORE TYPES

1a. Grains arranged in groups
- 2a. Groups free, usually showing symmetrical arrangement
  - 3a. 4 grains per group ..... ***TETRAD***
  - 3b. > 8 grains per group ..... ***POLYAD***
- 2b. Grains agglutinated, forming a sac, showing asymmetrical arrangement ..... ***POLLINIA***

1b. Grains isolated (monads)
- 4a. Apertures or scars absent, or if present inconspicuous ..... ***INAPERTURATE***
- 4b. Apertures or scars present, conspicuous
  - 5a. Apertures occurring singly
    - 6a. Pore type, annulus present or absent ..... ***MONOPORATE***
    - 6b. Furrow (sulcus) type
      - 7a. Scars tri-radial
        - 8a. Margo conspicuous; exine with indistinct stratification ..... ***TRILETE***
        - 8b. Margo absent; exine stratified ..... ***TRICHOTOMOSULCATE***
      - 7b. Apertures linear, single
        - 9a. Apertures circling grains, appearing as a spiral ..... ***SPIRAPERTURATE***
        - 9b. Apertures not a spiral
          - 10a. Aperture on distal face (polar view); exine stratified ..... ***MONOSULCATE***
          - 10b. Aperture on proximal face; exine stratification indistinct ..... ***MONOLETE***
  - 5b. Apertures multiple
    - 11a. Exclusively pores
      - 12a. Pores 2 ..... ***DIPORATE***
      - 12b. Pores 3 ..... ***TRIPORATE***
      - 12c. Pores > 3
        - 13a. Arranged equatorially ..... ***STEPHANOPORATE***
        - 13b. Scattered arrangement
          - 14a. Pores solitary, lacking symmetrical arrangement ..... ***PERIPORATE***
          - 14b. Pores in multiples of 4, symmetrical, forming lacunae ..... ***FENESTRATE***
    - 11b. Exclusively colpi
      - 15a. Colpi 2, opposite ..... ***DICOLPATE***
      - 15b. Colpi 3
        - 16a. Colpi free.
          - 17a. Apertures on angular areas; longer than wide ..... ***TRICOLPATE***
          - 17b. Apertures on interangular areas, short ..... ***BREVITRICOLPATE***
        - 16b. Colpi united
          - 18a. Joined at center of polar area ..... ***SYNCOLPATE***
          - 18b. Joined at center of polar area, forming small triangle ..... ***PARASYNCOLPATE***
      - 15c. Colpi > 3
        - 19a. Arranged equatorially ..... ***STEPHANOCOLPATE***
        - 19b. Scattered arrangement ..... ***PERICOLPATE***
    - 11c. Both pores and colpi present
      - 20a. Colpi (or pseudocolpi) and pores independent, or some colpi lacking pores
        - 21a. Pseudocolpi alternating with colpori, arranged equatorially
          - 22a. Apertures free ..... ***HETEROCOLPATE***
          - 22b. Apertures united at apices
            - 23a. Joined at center of polar area at single point ..... ***HETEROSYNCOLPATE***
            - 23b. Joined at center of polar area, forming small triangle ..... ***HETEROPARASYNCOLPATE***
        - 21b. Colpi and pores free, scattered ..... ***EXTRAPORATE***
      - 24b. Colpi always having pores (colporate type)
        - 25a. Colpi 2, opposite ..... ***DICOLPORATE***
        - 25b. Colpi 3
          - 26a. Colpi free
            - 27a. Apertures on angular areas, longer than wide ..... ***TRICOLPORATE***
            - 27b. Apertures on interangular areas, short ..... ***BREVITRICOLPORATE***
          - 26b. Colpi united
            - 28a. Joined at center of polar area ..... ***SYNCOLPORATE***
            - 28b. Joined at polar area, forming small triangle ..... ***PARASYNCOLPORATE***
        - 25c. Colpi > 3
          - 29a. Arranged equatorially ..... ***STEPHANOCOLPORATE***
          - 29b. Scattered ..... ***PERICOLPORATE***

KEYS TO FAMILIES BY MAJOR POLLEN AND SPORE TYPES

TETRAD

1a. Tetrads < 45 µ
- 2a. 9 - 32 x 11 - 25, individual grains inaperturate ..... LEG. Mimosoideae
- 2b. 27 - 30 µ, individual grains tricolporate ..... HIPPOCRATEACEAE (*Hylenaea praecelsa*)

1b. Tetrads > 45 µ
- 2a. Viscin threads attached to grains; individual grains verrucate-rugulate ..... ONAGRACEAE (*Ludwigia*)
- 2b. Tetrads not as above
  - 3a. Tetrads 48 - 86 µ
    - 4a. Individual grains aperturate (triporate or tricolporate)
      - 5a. Sexine psilate ..... RUBIACEAE (*Randia armata*)
      - 5b. Sexine reticulate, verrucate or baculate ..... GENTIANCEAE
    - 4b. Individual grains inaperturate
      - 6a. Tetrads 48 - 250 µ, individual grains scabrate, reticulate, baculate ..... ANNONACEAE
      - 6b. Tetrads 55 - 86 µ, individual grains psilate ..... ARACEAE (*Xanthosoma*)
  - 3b. Tetrads 90 - 250 µ
    - 7a. Individual grains always inaperturate ..... ANNONACEAE
    - 7b. Individual grains inaperturate or periporate ..... CUCURBITACEAE

POLYAD

1a. Grains 16, arranged symmetrically in 4 groups of tetrads, always united; polyads 43 - 50 µ, individual grains triporate-reticulate ..... HIPPOCRATEACEAE (*Hippocratea volubilis*)

1b. Grains > 16, always multiples of 4; 16 - 44 grains per polyad, symmetrically arranged, strongly united, each appearing elliptical; polyads 30 - 225 µ, individual grains inaperturate, tricolporate and 4-8 porate; psilate, verrucate, rugulate, baculate ..... LEG. Mimosoideae

POLLINIA

1a. Two similar pollinia per pollinarium; pollinia 612 - 1070 µ long x 270 - 728 wide; grains always single ..... ASCLEPIADACEAE

1b. Two, four, six or eight pollinia per pollinarium; pollinia > 2000 µ long; grains present as tetrads (less frequently monads) ..... ORCHIDACEAE

INAPERTURATE

1a. Grains > 130 µ
- 2a. Grains ornamented or sculptured
  - 3a. Clavate (*Croton* pattern); grains 290 - 325 µ ..... EUPHORBIACEAE (*Manihot esculenta*)
  - 3b. Echinate (echinulate); grains 130 - 170 µ ..... MUSACEAE
- 2b. Grains psilate, 130 - 300 µ ..... MARANTACEAE

1b. Grains < 130 µ
- 4a. Sexine psilate
  - 5a. Exine 2.5 - 3.0 µ thick
    - 6a. Grains 35 - 64 µ ..... ANNONACEAE
    - 6b. Grains 80 - 130 µ ..... ZINGIBERACEAE (*Renealmia*)
  - 5b. Exine < 1.0 - 2.4 µ thick
    - 7a. Amb circular ..... ANNONACEAE, ARACEAE
    - 7b. Amb elliptical to irregular ..... NYMPHAEACEAE (*Nymphaea*)
- 4b. Sexine scabrate to granulate
  - 8a. Grains > 50 µ
    - 9a. Exine < 0.5 µ thick; intectate ..... BROMELIACEAE (*Aechmea magdalenae*)
    - 9b. Exine 2 - 3 µ thick; tectate ..... BIGNONIACEAE
  - 8b. Grains < 50 µ
    - 10a. Grains > 30 µ; exine < 1 µ thick
      - 11a. Grains 35 - 45 µ ..... CYPERACEAE (*Fimbristylis dichotoma*)
      - 11b. Grains 45 - 48 µ ..... ANNONACEAE (*Crematosperma*)
    - 10b. Grains < 30 µ; exine 1.0 - 1.5 µ thick ..... MONIMIACEAE (*Siparuna*)
- 4c. Sexine echinate or echinulate
  - 12a. Grains 15 - 60 µ; exine < 1 µ thick ..... ARACEAE, LAURACEAE
  - 12b. Grains 60 - 130 µ; exine 2 - 5 µ thick ..... MUSACEAE
- 4d. Sexine verrucate

13a. Grains > 30 µ; exine 1.5 - 3.0 µ thick ..... ARISTOLOCHIACEAE (*Aristolochia*)
13b. Grains < 30 µ; exine 1.0 - 1.5 µ thick
14a. Grains 7 - 16 µ ..... PIPERACEAE (*Peperomia*)
14b. Grains 16 - 26 µ ..... SMILACACEAE (*Smilax*)
4e. Sexine gemmate
15a. Grains > 55 µ
16a. Exine 6 µ thick; grains 57 - 64 µ ..... EUPHORBIACEAE (*Jatropha curcas*)
16b. Exine 2 µ thick; grains 72 - 91 µ ..... EUPHORBIACEAE (*Garcia nutans*)
15b. Grains < 40 µ
17a. Exine 3 - 4 µ thick; grains 24 - 40 µ ..... BORAGINACEAE (*Tournefortia*)
17b. Exine 1 µ thick; grains 16 - 18 µ ..... ARACEAE (*Anthurium flexile*)
4f. Sexine baculate
18a. Exine 1 - 5 µ thick
19a. Grains 24 - 30 µ; exine 1.5 - 5.0 µ thick ..... RUBIACEAE
ANNONACEAE
19b. Grains 48 - 52 µ; exine 1.0 - 1.5 µ thick ..... CYPERACEAE (*Eleocharis caribaea*)*
18b. Exine 8 - 10 µ thick ..... BIGNONIACEAE (*Adenocalymma arthropetiolatum*)
4g. Sexine clavate
20a. Grains 36 - 81 µ; exine 3 µ thick ..... EUPHORBIACEAE (*Croton*)
20b. Grains 53 - 60 µ; exine 1.5 µ thick ..... EUPHORBIACEAE (*Codiaeum variegatum*)
4h. Sexine rugulate ..... RUBIACEAE (*Cephaelis tomentosa*)
4i. Sexine foveolate ..... GUTTIFERAE (*Mammea americana*)
4j. Sexine reticulate
21a. Exine > 6 µ thick ..... BIGNONIACEAE
21b. Exine < 5 µ thick
22a. Grains > 58 µ ..... BIGNONIACEAE
BROMELIACEAE (*Vriesia*)
22b. Grains < 58 µ ..... ARACEAE
BIGNONIACEAE
BORAGINACEAE (*Cordia spinescens*)
RUBIACEAE

MONOPORATE

1a. Annulate ..... GRAMINEAE
1b. Annulus absent
2a. Sexine psilate ..... BURMANNIACEAE (*Thismia panamensis*)
2b. Sexine not psilate
3a. Ornamented
4a. Gemmate or verrucate; pores circular, 2.5 - 5.0 µ diameter; grains spheroidal, 25 - 40 µ ..... BORAGINACEAE (*Tournefortia*)
4b. Scabrate (resembling fossulate type); pores irregular, slightly lolongate, 1 - 13 µ long; grains oblate 30 - 61 x 23 - 52 µ (distal face) ..... CYPERACEAE
3b. Unornamented, sexine reticulate
5a. Pores 6 - 8 µ diameter; exine 1.5 - 2.0 µ thick ..... CYCLANTHACEAE (*Carludovica*)
5b. Pores inconspicous ca. 1 µ diameter; exine 1.0 - 1.5 µ thick ..... TYPHACEAE (*Typha dominguensis*)

TRILETE

1a. Spores > 100 µ equatorial dimension; sclerine striate ..... PARKERIACEAE (*Ceratopteris*)
1b. Spores < 100 µ; sclerine not striate, ornamentation variable
2a. Sclerine psilate
3a. Perine absent
4a. Spores 23 - 31 µ equatorial dimension ..... SALVINIACEAE (*Salvinia radula*)
4b. Spores 32 - 75 µ equatorial dimension ..... POLYPODIACEAE
3b. Perine present
5a. Laesura half length of spore ..... OPHIOGLOSSACEAE (*Ophioglossum reticulatum*)
5b. Laesura three-fourths length of radius or reaching center of spore ..... HYMENOPHYLLACEAE , POLYPODIACEAE
2b. Sclerine ornamented
6a. Echinate or baculate ..... SELAGINELLACEAE (*Selaginella*)
6b. Fossulate
7a. Sclerine variable ..... LYCOPODIACEAE (*Lycopodium*)
7b. Sclerine homogeneous ..... CYATHEACEAE (*Trichopteris trichiata*)
6c. Scabrate to granulate
8a. Perine absent ..... CYATHEACEAE
POLYPODIACEAE

8b. Perine present ..... HYMENOPHYLLACEAE (*Trichomanes*)
CYATHEACEAE
POLYPODIACEAE
(*Adiantum lunulatum*)

6d. Foveolate ..... HYMENOPHYLLACEAE
(*Trichomanes diversifrons*)

6e. Verrucate
9a. Perine absent ..... HYMENOPHYLLACEAE
(*Trichomanes polypodioides*)

9b. Perine present ..... HYMENOPHYLLACEAE
POLYPODIACEAE
(*Achrostichum aureum*)

TRICHOTOMOSULCATE

Three-slit opening on distal face; radii extending to equator; sexine psilate, scabrate, reticulate or baculate; amb subangular (aperturate face); grains suboblate, 32 - 95 µ..... PALMAE

SPIRAPERTURATE

Continuous and narrow colpus forming spiral between poles; sexine verrucate; amb circular; grains spheroidal 58 - 63 µ..... ACANTHACEAE (*Thunbergia erecta*)

MONOSULCATE

1a. Grains < 20 µ (equatorial dimension)
2a. Sexine psilate to scabrate ..... PIPERACEAE
2b. Sexine slightly baculate ..... GNETACEAE (*Gnetum leyboldii*)

1b. Grains > 20 µ (equatorial dimension)
3a. Sexine echinate
4a. Grains > 50 µ
5a. 68 µ; exine 2.5 - 4.0 µ thick ..... COMMELINACEAE (*Commelina erecta*)
5b. 82 - 93 µ; exine 2 µ thick ..... AMARYLLIDACEAE (*Crinum erubescens*)
4b. Grains < 50 µ
6a. 32 - 35 µ; exine 2 µ thick ..... PALMAE (*Socratea durissima*°)
6b. 42 - 45 µ; exine 1 µ thick ..... IRIDACEAE (*Neomarica gracilis*)
3b. Sexine psilate
7a. Grains > 60 µ; exine > 3 µ thick ..... PALMAE
7b. Grains < 60 µ; exine 1.5 - 2.0 µ thick
8a. Grains spheroidal to prolate-spheroidal; colpi short ..... ARACEAE
8b. Grains subprolate; colpi as long as grain ..... NYMPHAEACEAE (*Nymphaea*)
3c. Sexine baculate
9a. Colpi as long as grain, depressed at polar area; subprolate ..... LILIACEAE (*Cordyline fruticosa*)
9b. Colpi three-fourths length of grain; prolate ..... HAEMODORACEAE
(*Xyphidium caeruleum*)
3d. Sexine reticulate
10a. Grains > 40 µ
11a. 150 - 160 µ; exine 6 µ thick ..... AMARYLLIDACEAE
(*Hymenocallis pedalis*)
11b. 42 - 90 µ; exine 1 - 3 µ thick ..... BROMELIACEAE
10b. Grains < 40 µ
12a. Exine 2.0 - 2.5 µ thick ..... MYRISTICACEAE (*Virola*)
12b. Exine 1.0 - 1.5 µ thick
13a. Grains 29 - 32 µ ..... CYCLANTHACEAE (*Asplundia alata*)
PALMAE (*Cryosophila warscewiczii*)
13b. Grains 33 - 35 µ ..... COMMELINACEAE
(*Tripogandra serrulata*)
3e. Sexine clavate ..... AMARYLLIDACEAE
(*Amaryllis belladonna*)
3f. Sexine verrucate
14a. Grains 100 - 110 µ ..... PALMAE (*Scheelea zonensis*)
14b. Grains 55 - 65 µ ..... BROMELIACEAE (*Billbergia porteana*)
2g. Sexine scabrate
15a. Exine <1 - 1 µ thick; grains < 25 µ ..... COMMELINACEAE
15b. Exine 1.5 - 2.5 µ thick; grains > 25 µ ..... BROMELIACEAE, CYCLANTHACEAE
PALMAE

MONOLETE

1a. Sclerine psilate (unornamented)
- 2a. Perine absent ..... GLEICHENIACEAE, POLYPODIACEAE
- 2b. Perine present ..... POLYPODIACEAE

1b. Sclerine ornamented
- 3a. Echinulate
  - 4a. Spores < 50 µ
    - 5a. Perine absent ..... MARATTIACEAE (*Danaea nodosa*)
    - 5b. Perine present ..... POLYPODIACEAE
  - 4b. Spores > 50 µ
- 3b. Verrucate
  - 6a. Perine absent ..... POLYPODIACEAE
    SCHIZAEACEAE (*Schizaea elegans*)
  - 6b. Perine present ..... POLYPODIACEAE (*Thelypteris serrata*)

DIPORATE

1a. Pores irregularly distributed
- 2a. United on one face of grain, slightly lalongate, 7 x 10 µ; sexine verrucate; exine 8 µ thick; grains 63 - 127 µ ..... ACANTHACEAE (*Trichanthera gigantea*)
- 2b. Circular, 3 - 5 µ diameter; sexine scabrate, granulate, baculate, occasionally verrucate; exine 1.0 - 2.5 µ thick; grains 28 - 66 µ ..... GRAMINEAE

1b. Pores opposite
- 3a. Annulate
  - 4a. Pores ca. 7 µ diameter ..... RUBIACEAE (*Coussarea curvigemmia*)
  - 4b. Pores ca. 2.5 - 6.0 µ diameter ..... APOCYNACEAE
- 3b. Annulus absent; pores < 1 - 3 µ diameter
  - 5a. Sexine psilate, scabrate or granulate
    - 6a. Exine > 2 µ thick ..... ULMACEAE (*Trema micrantha*)
      URTICACEAE (*Urera eggersii*)
    - 6b. Exine < 2 µ thick ..... MORACEAE
  - 5b. Sexine echinate or verrucate ..... URTICACEAE

TRIPORATE

1a. Pores annulate
- 2a. Sexine psilate; pores lalongate; suboblate; exine 1.0 - 1.5 µ thick; grains 23 - 89 x 27 - 91 µ ..... APOCYNACEAE
- 2b. Sexine reticulate
  - 3a. Homobrochate
    - 4a. Grains spheroidal 16 - 21 µ
      - 5a. Pores vestibulate ..... STERCULIACEAE (*Byttneria aculeata*)
      - 5b. Pores common type ..... ARACEAE (*Anthurium*)
    - 4b. Grains suboblate 19 - 26 x 25 - 30 µ ..... PROTEACEAE (*Roupala montana*)
  - 3b. Heterobrochate
    - 6a. Pores > 8 µ diameter; grains > 30 µ ..... LEG. Papilionoideae
    - 6b. Pores < 8 µ diameter; grains < 30 µ
      - 7a. Grains spheroidal 18 - 23 µ ..... STERCULIACEAE (*Theobroma cacao*)
      - 7b. Grains suboblate 13 - 27 x 16 - 33 µ ..... RUBIACEAE

1b. Annulus absent
- 8a. Apertures seen as furrows on one face, irregular; form usually trapezoidal ..... CYPERACEAE
- 8b. Apertures common type, evenly separated; circular to lolongate, usually circular
  - 9a. Sexine psilate or granulate
    - 10a. Amb circular ..... URTICACEAE
    - 10b. Amb elliptical to semiangular
      - 11a. Pores 1.0 - 1.5 µ diameter ..... GENTIANACEAE (*Voyria*)
      - 11b. Pores > 2 µ diameter ..... MORACEAE
  - 9b. Sexine scabrate
    - 12a. Amb angular; pores > 3 µ diameter ..... SAPINDACEAE (*Paullinia*)
    - 12b. Amb elliptical to circular; pores 2.0 - 2.5 µ diameter ..... ULMACEAE (*Celtis*)
  - 9c. Sexine echinate
    - 13a. Grains 118 - 201 µ; pores 20 - 30 µ diameter ..... CUCURBITACEAE (*Cayaponia glandulosa*)
    - 13b. Grains 18 - 22 µ; pores ca. 1 µ diameter ..... GUTTIFERAE (*Tovomitopsis nicaraguensis*)
  - 9d. Sexine gemmate or verrucate
    - 14a. Pores lolongate; gemmae conspicuous; grains spheroidal 24 - 40 µ ..... BORAGINACEAE (*Tournefortia*)
    - 14b. Pores circular; verrucae slightly visible; grains prolate-spheroidal to subprolate 13 - 19 x 11 - 16 µ ..... URTICACEAE (*Boehmeria cylindrica*)
  - 9e. Sexine reticulate or foveolate
    - 15a. Exine 4 - 5 µ thick; grains > 40 µ ..... BORAGINACEAE (*Cordia spinescens*)
    - 15b. Exine 1 - 3 µ thick; grains < 40 µ ..... SAPINDACEAE

STEPHANOPORATE (4-5 PORATE)

1a. Annulate
- 2a. Pores 3 µ diameter; sexine reticulate; grains 15 - 27 x 16 - 33 µ..... RUBIACEAE
- 2b. Pores 8 - 14 µ diameter; sexine scabrate to verrucate; grains 30 - 38 x 41 - 51 µ..... TRIGONIACEAE (*Trigonia floribunda*)

1b. Annulus absent
- 3a. Sexine scabrate or granulate; exine 1.5 - 2.0 µ thick
  - 4a. Grains 10 - 11 x 13 - 15 µ..... MORACEAE (*Maquira costaricana*)
  - 4b. Grains 15 - 22 x 20 - 25 µ..... ULMACEAE (*Celtis*)
- 3b. Sexine reticulate or foveolate; exine 2.0 - 2.5 µ thick
  - 5a. Pores 3 µ diameter..... ACANTHACEAE (*Nelsonia brunelloides*)
  - 5b. Pores 2 - 8 µ diameter..... SAPINDACEAE

PERIPORATE

1a. > 20 pores per grain
- 2a. 32 - 150 pores
  - 3a. Sexine echinate
    - 4a. Echinate-verrucate; echini bottle-shaped; pores 80 - 150; exine 15 - 30 µ thick; grains 100 - 200 µ..... CONVOLVULACEAE (*Ipomoea*)
    - 4b. Echinate-baculate; echini conical; pores 30 - 80; exine 2 - 14 µ thick including echini; grains 70 - 266 µ..... MALVACEAE
  - 3b. Sexine granulate (pores 38 - 40 per grain, 2.5 µ diameter; grains 23 - 35 µ)..... PHYTOLACCACEAE (*Microtea debilis*)
- 2b. 20 - 32 pores
  - 5a. Sexine baculate; pores 20 - 32, 1.5 - 3.0 µ diameter, annulate; grains 15 - 28 µ... AMARANTHACEAE
  - 5b. Sexine granulate; pores 20, on aspis (shield-shaped); grains ca. 19 µ..... MORACEAE (*Dorstenia contrajerva*)
  - 5c. Sexine reticulate, heterobrochate; pores 20, 3 - 4 µdiameter; annuli absent; grains 44 - 60 µ..... POLYGONACEAE (*Polygonum*)

1b. < 20 pores per grain
- 6a. Pores appearing as furrows, irregular, on one face of grain, usually at longest extreme..... CYPERACEAE
- 6b. Pores common type, usually circular
  - 7a. Pores annulate
    - 8a. Pores protuberant
      - 9a. Pores having operculum; pores 5 - 7; grains slightly perforate, 38 - 50 µ. RUBIACEAE
      - 9b. Operculum absent; pores 4 - 6; grains always psilate, ca. 9 x 110 µ..... CACTACEAE (*Rhipsalis cassytha*)
    - 8b. Pores not as above
      - 10a. Sexine psilate; pores 4 - 8; grains 23 - 100 x 27 - 150 µ..... APOCYNACEAE
      - 10b. Sexine verrucate; pores 6; grains 44 - 55 µ..... MALPIGHIACEAE
  - 7b. Annulus absent
    - 11a. Pores 8 - 30 µ diameter
      - 12a. Sexine psilate; pores 8 - 16, 15 - 30 µ diameter; grains 89 - 150 µ..... ZINGIBERACEAE
      - 12b. Sexine scabrate; pores 5 - 6, ca. 9 µ diameter; grains 52 - 60 µ..... BROMELIACEAE (*Aechmea pubescens*)
      - 12c. Sexine echinate-microbaculate; pores 5 - 10, 14 - 20 µ diameter; grains 96 - 150 µ..... CUCURBITACEAE (*Cayaponia*)
    - 11b. Pores < 8 µ diameter
      - 13a. 8 -14 pores
        - 14a. Sexine granulate; pores 8 - 10; grains oblate, 16 x 27 - 32 µ..... LORANTHACEAE (*Phthirusa pyrifolia*)
        - 14b. Sexine baculate; pores 14; grains spheroidal, 25 - 28 µ..... CARYOPHYLLACEAE (*Drymaria cordata*)
      - 13b. < 8 pores
        - 15a. Sexine psilate
          - 16a. 6 - 7 pores; grains spheroidal, 23 - 50 µ..... MALPIGHIACEAE
          - 16b. 4 - 8 pores; grains oblate 20 - 38 µ, slightly verrucate..... LEG. Mimosoideae
        - 15b. Sexine echinulate; pores 5; grains 24 - 27 µ..... ALISMATACEAE(*Sagittaria lancifolia*)
        - 15c. Sexine reticulate; pores 4 - 6; grains 17 - 29 µ..... ARACEAE (*Anthurium*)

FENESTRATE

1a. Sexine granulate to baculate; grains 16 - 24 µ; 12 - 14 lacunae per grain; amb circular... AMARANTHACEAE

1b. Sexine echinate to echinulate; grains 26 - 46 µ; usually 16 - 28 lacunae per grain; amb hexagonal to polygonal..... COMPOSITAE

DICOLPATE

1a. Grains 23 - 26 x 12 - 23; apertures inconspicuous, free; exine 0.5 - 1.5 µ thick..... DIOSCOREACEAE (*Dioscorea*)

1b. Grains 36 - 56 x 20 - 31; apertures conspicuous, apparently united at apices, resembling a continuous meridional aperture; exine 2 - 3 µ thick..... PONTEDERIACEAE

TRICOLPATE

1a. Sexine psilate
- 2a. Amb angular to semi-angular
  - 3a. Polar view showing tri-annulate configuration ..... LORANTHACEAE (*Oryctanthus*)
  - 3a. Polar view not as above ..... VERBENACEAE (*Petrea aspera*)
- 2b. Amb circular
  - 4a. Colpi displaying equatorial constriction ..... CAMPANULACEAE (*Centropogon cornutus*)
  - 4b. Colpi common type
    - 5a. Grains > 45 µ ..... BIGNONIACEAE; LOGANIACEAE (*Spigelia*)
    - 5b. Grains < 45 µ
      - 6a. Grains < 20 µ
        - 7a. Exine 1 µ thick ..... SCROPHULARIACEAE
        - 7b. Exine 1.5 µ thick ..... OLACACEAE (*Heisteria concinna*)
      - 6b. Grains > 20 µ ..... GESNERIACEAE; LOGANIACEAE (*Strychnos*); VIOLACEAE

1b. Sexine scabrate to granulate
- 8a. Grains suboblate
  - 9a. Polar axis > 20 µ ..... LEG. Papilionoideae (*Dioclea reflexa*); RUBIACEAE (*Hamelia patens*)
  - 9b. Polar axis < 20 µ ..... VITACEAE (*Rhoorea squamata*)
- 8b. Grains spheroidal to perprolate
  - 10a. Grains perprolate ..... ACANTHACEAE
  - 10b. Grains spheroidal to prolate
    - 11a. Grains < 30 µ ..... EUPHORBIACEAE (*Omphalea diandra*); RUBIACEAE (*Diodia denudata*)
    - 11b. Grains > 30 µ
      - 12a. Grains 31 - 55 µ ..... BIGNONIACEAE (*Arrabidaea*); GESNERIACEAE; LOGANIACEAE (*Strychnos darienensis*)
      - 12b. Grains 56 - 93 µ ..... BIGNONIACEAE

1c. Sexine baculate
- 13a. Grains > 75 µ; exine 3 - 8 thick ..... CONVOLVULACEAE; LEG. Papilionoideae (*Dioclea wilsonii*)
- 13b. Grains < 25 µ; exine 1.0 - 2.5 µ thick
  - 14a. Grains prolate-spheroidal to spheroidal ..... MENISPERMACEAE (*Cissampelos*)
  - 14b. Grains subprolate ..... OXALIDACEAE (*Averrhoa carambola*)

1d. Sexine gemmate ..... OLACACEAE (*Heisteria longipes*)

1e. Sexine verrucate
- 15a. Grains suboblate to oblate-spheroidal
  - 16a. Grains 160 - 200 µ; exine 7 µ thick ..... VERBENACEAE (*Stachytarpheta jamaicensis*)
  - 16b. Grains 19 - 50 µ; exine 1.5 - 3.0 µ thick
    - 17a. Grains 19 - 21 µ ..... OLACACEAE (*Heisteria costaricensis*)
    - 17b. Grains 37 - 50 µ ..... LEG. Papilionoideae (*Dioclea guianensis*)
- 15b. Grains subprolate to prolate
  - 18a. Grains 40 - 63 µ ..... LEG. Papilionoideae(*Dioclea*)
  - 18b. Grains 19 - 32 µ
    - 19a. Exine < 1 µ thick ..... RAFFLESIACEAE (*Apodanthes caseariae*)
    - 19b. Exine 2 µ thick ..... CHRYSOBALANACEAE (*Licania platypus*)

1f. Sexine echinate
- 20a. Grains > 75 µ ..... CACTACEAE (*Epiphyllum phyllanthus*)
- 20b. Grains < 75 µ
  - 21a. Grains oblate-spheroidal, > 40 µ ..... VERBENACEAE; NYCTAGINACEAE; RUBIACEAE (*Coutarea hexandra*)
  - 21b. Grains spheroidal to subprolate, < 30 µ

1g. Sexine reticulate
- 22a. Sexine homobrochate
  - 23a. Amb angular ..... BOMBACACEAE (*Pseudobombax septenatum*)*
  - 23b. Amb circular
    - 24a. Grains > 50 µ
      - 25a. Colpi covered by fine ectexinic membrane, sometimes with margo ..... BIGNONIACEAE
      - 25b. Colpi common type ..... RUBIACEAE (*Psychotria chagrensis*)
    - 24b. Grains < 50 µ
      - 26a. Suboblate
        - 27a. Grains 29 - 35 µ ..... NYCTAGINACEAE (*Neea amplifolia*)
        - 27b. Grains 17 - 28 µ ..... VERBENACEAE (*Vitex cooperi*)
      - 26b. Spheroidal to subprolate

28a. Grains 35 - 50 µ ..... BIGNONIACEAE
28b. Grains 13 - 26 µ
29a. Colpi displaying equatorial constriction ..... LECYTHIDACEAE (*Gustavia fosteri*)
29b. Colpi common type
30a. Grains < 20 µ ..... MENISPERMACEAE
30b. Grains > 20 µ ..... CONNARACEAE
22b. Sexine heterobrochate
31a. Amb angular ..... BOMBACACEAE (*Bombacopsis*)
31b. Amb circular
33a. Grains > 50 µ ..... BIGNONIACEAE
33b. Grains < 50 µ
34a. Exine 1 µ thick; grains 13 - 15 µ ..... MENISPERMACEAE (*Odontocarya tamnoides*)
34b. Exine > 2 µ thick; grains 25 - 49 µ ..... GESNERIACEAE
RUBIACEAE (*Psychotria*)
SCROPHULARIACEAE
(*Lindernia crustacea*)

BREVITRICOLPATE

Colpi very short, almost as wide as long, 7 - 12 x 3 - 6 µ, always on interangular areas of grains; sexine reticulate; grains oblate, 25 - 35 x 44 - 65 µ ..... BOMBACACEAE

SYNCOLPATE

1a. Colpi having margo
2a. Grains psilate
3a. Oblate, 15 - 20 x 24 - 27 µ; amb lobate ..... LORANTHACEAE (*Struthanthus orbicularis*)
3b. Prolate, 40 - 42 x 25 - 28 µ; amb circular ..... VIOLACEAE (*Hybanthus prunifolius*)
2b. Grains baculate, oblate 65 - 68 x 68 - 73 µ ..... LEG. Papilionoideae (*Canavalia dictyota*)
1b. Margo absent
4a. Grains psilate to scabrate, prolate 30 - 45 x 20 - 50 µ ..... LOGANIACEAE (*Strychnos*)
4b. Grains baculate, spheroidal 18 - 19 µ ..... MENISPERMACEAE (*Cissampelos pareira*)

PARASYNCOLPATE (3-COLPATE)

1a. Sexine verrucate to granulate; exine 3 - 4 µ thick
2a. Grains 40 - 45 µ x 50 - 52 µ ..... MENYANTHACEAE (*Nymphoides indica*)
2b. Grains 49 x 51 - 63 µ ..... LEG. Papilionoideae (*Cymbosema roseum*)
1b. Sexine reticulate; exine 1.0 - 1.5 µ thick ..... LEG. Papilionoideae (*Crotalaria cajanifolia*)

STEPHANOCOLPATE

1a. Colpi having margo; 4 - 5 aperatures
2a. Grains prolate-spheroidal 22 - 24 µ; sexine echinate; exine 2 µ thick ..... CAPPARACEAE (*Capparis frondosa*)
2b. Grains oblate 115 - 160 µ; sexine psilate; exine 3 µ thick ..... APOCYNACEAE (*Thevetia ahouai*)
1b. Margo absent; 4 - 12 aperatures
3a. Sexine psilate or scabrate
4a. 4 - 6 colpi; grains oblate, 49 - 53 µ ..... LEG. Papilionoideae (*Clitoria*)
4b. 20 - 24 colpoid grooves, almost reaching poles; subprolate, 19 - 25 x 17 - 18 µ ..... ARACEAE (*Spathiphyllum*)
3b. Sexine baculate
5a. Grains oblate-spheroidal, 83 - 89 x 76 - 109 µ; exine 7 - 8 µ thick; always 6 colpi ..... CONVOLVULACEAE (*Merremia umbellata*)
5b. Grains spheroidal to subprolate
6a. Colpi 4 - 5
7a. Grains spheroidal, 53 - 58 µ ..... RUBIACEAE (*Cephaelis ipecacuanha*)
7b. Grains subprolate, 39 - 42 x 30 - 40 µ ..... NYCTAGINACEAE (*Guapira standleyana*)
6b. Colpi 6 - 10 ..... RUBIACEAE
3c. Sexine rugulate; colpi 5 - 6; grains spheroidal 44 - 52 µ ..... SOLANACEAE (*Browallia americana*)
3d. Sexine echinate; colpi 4 - 6; grains spheroidal 48 - 52 µ ..... BIGNONIACEAE (*Cydista heterophylla*)
3e. Sexine reticulate

7a. Lophoreticulate; colpi 6 - 12 having large opercula..... PASSIFLORACEAE (*Passiflora*)
7b. Reticulum common type; colpi 4 - 8, opercula absent
8a. Grains > 60 µ..... BIGNONIACEAE
8b. Grains < 60 µ
9a. Colpi 4 - 5..... RUBIACEAE (*Psychotria emetica*)
9b. Colpi 6..... LABIATAE

PERICOLPATE

1a. < 10 colpi per grain
2a. 5 - 6 colpi; grains 93 - 178 µ, echinate or baculate, bacula < 1 µ..... CACTACEAE (*Epiphyllum*)
2b. 5 - 8 colpi; grains 55 - 65 µ, densely baculate, bacula 15 x 1 µ..... CONVOLVULACEAE (*Maripa panamensis*)
1b. > 10 colpi per grain
3a. Grains 78 - 105 µ
4a. 12 colpi; sexine psilate or baculate..... PHYTOLACCACEAE
4b. 15 - 18 colpi; sexine echinate-baculate..... PORTULACACEAE (*Portulaca oleracea*)
3b. Grains 23 - 33 µ; 15 - 20 colpi..... CONVOLVULACEAE (*Aniseia martinicensis*)

HETEROCOLPATE

1a. 20 - 21 pseudocolpi, alternating with 3 - 4 colpori..... ACANTHACEAE (*Hygrophila guianensis*)
1b. 3 pseudocolpi, alternating with 3 colpori
2a. Grains oblate-spheroidal to subprolate; pores circular to lolongate, conspicuous; grains appearing strongly hexalobulate, 17 - 41 µ..... COMBRETACEAE
2b. Grains prolate-spheroidal to subprolate; pores frequently inconspicuous due to presence of persistent equatorial constriction, generally lalongate; grains normally circular to semiangular ,10 - 34 µ..... MELASTOMATACEAE

HETEROSYNCOLPATE

3 colpori, alternating with 3 pseudocolpi, colpori usually united at apices; grains 12 - 25 x 13 - 20 µ, psilate or verrucate..... MELASTOMATACEAE

HETEROPARASYNCOLPATE

3 colpori, alternating with 3 pseudocolpi, colpori usually united at apices, forming small triangular area, grains 19 - 21 x 13 - 14 µ..... MELASTOMATACEAE (*Miconia hondurensis*)

EXTRAPORATE

Pores free and appearing as colpi, forming rows; sexine verrucate..... MALPIGHIACEAE (*Tetrapteris macrocarpa*)

DICOLPORATE

1a. Exine 7 µ thick, reticulate and verrucate; prolate to perprolate, 62 - 93 x 38 - 68 µ..... ACANTHACEAE (*Justicia gracilflora*)
1b. Exine 1.0 - 1.5 µ at poles to 2.0 - 2.5 µ thick at equator; psilate; oblate, 19 - 23x 15 - 18 µ..... SAPOTACEAE (*Pouteria stipitata*)

TRICOLPORATE

1a. Sexine psilate
2a. Amb angular, triangular or lobate
3a. Exine < 1 µ thick..... BEGONIACEAE (*Begonia*)
3b. Exine 1 - 3 µ thick
4a. Pores circular..... MELIACEAE (*Guarea grandifolia*)
4b. Pores lalongate to lolongate
5a. Pores uniting at apices, forming continuous ring (zonorate)..... SAPOTACEAE
5b. Pores not as above
6a. Grains > 25 µ..... APOCYNACEAE
6b. Grains < 25 µ LOGANIACEAE (*Strychnos brachistantha*)

7a. Oblate to oblate-spheroidal
8a. Colpi long, margines present ..... RHAMNACEAE
8b. Colpi short, margines absent ..... HIPPOCRATEACEAE
7b. Spheroidal to prolate-spheroidal ..... OCHNACEAE

2b. Amb circular
9a. Exine < 1 μ thick
10a. Pores lalongate ..... BEGONIACEAE (*Begonia*)
10b. Pores circular ..... COCHLOSPERMACEAE (*Cochlospermum vitifolium*)

9b. Exine 1 - 6 μ thick
11a. Grains < 25 μ
12a. Pores lolongate ..... LEG. Papilionoideae
PHYTOLACCACEAE (*Phytolacca rivinoides*)

12b. Pores lalongate
13a. Pores displaying "H" form ..... ELAEOCARPACEAE (*Sloanea*)
13b. Pores not as above
14a. Pores forming continuous ring (zonorate)
15a. Colpi displaying exitus digitus, equatorial constriction ..... SOLANACEAE
15b. Colpi not as above ..... RUBIACEAE (*Cosmibuena skinneri*)
14b. Pores not as above
16a. Colpi displaying equatorial constriction ..... MYRSINACEAE (*Ardisia pellucida*)
16b. Colpi normal type ..... EUPHORBIACEAE (*Acalypha*)
SCROPHULARIACEAE (*Scoparia dulcis*)

11b. Grains > 25 μ
17a. Pores circular
18a. Grains oblate-suboblate ..... MELIACEAE (*Guarea grandifolia*)
18b. Grains spheroidal-subprolate ..... LEG. Caesalpinioideae
LEG. Papilionoideae
FLACOURTIACEAE (*Casearia*)

17b. Pores lalongate or lolongate
19a. Lolongate ..... APOCYNACEAE
LEG. Caesalpinioideae
LEG. Papilionoideae

19b. Lalongate
20a. Pores forming continuous ring (zonorate) ..... SOLANACEAE
20b. Pores not as above
21a. Colpi displaying equatorial constriction ..... MARCGRAVIACEAE (*Souroubea sympetala*)

21b. Colpi common type
22a. Polar axis > 42 μ ..... APOYNACEAE
EBENACEAE (*Diospyros artanthifolia*)
UMBELLIFERAE(*Spananthe paniculata*)

22b. Polar axis < 42 μ ..... APOCYNACEAE, BURSERACEAE
FLACOURTIACEAE (*Casearia*)
GUTTIFERAE (*Rheedia edulis*)
SAPINDACEAE

1b. Sexine scabrate
23a. Exine > 2.5 μ thick ..... EUPHORBIACEAE
23b. Exine < 2.5 μ thick
24a. Pores circular
25a. Colpi displaying equatorial constriction ..... LECYTHIDACEAE
25b. Colpi normal type
26a. Pores annulate ..... LEG. Mimosoideae (*Entada monostachya*)

26b. Annulus absent
27a. Grains peroblate-suboblate ..... MYRTACEAE
27b. Grains prolate-subprolate ..... LYTHRACEAE
VITACEAE (*Vitis tilifolia*)

24b. Pores lalongate ..... BORAGINACEAE
24c. Pores not as above
28a. Colpi displaying equatorial constriction ..... LECYTHIDACEAE
BIXACEAE (*Bixa orellana*)

29b. Colpi not as above
30a. Exine 1.0 - 1.5 μ thick ..... GUTTIFERAE, LYTHRACEAE
30b. Exine 2 μ thick ..... CAPPARACEAE (*Capparis frondosa*)
CHRYSOBALANACEAE (*Hirtella*)
LEG. Papilionoideae

1c. Sexine granulate
31a. Grains subprolate-prolate
32a. Grains > 30 μ ..... BURSERACEAE, UMBELLIFERAE
32b. Grains < 30 μ
33a. Pores lalongate
34a. Opercula present ..... THEOPHRASTACEAE (*Jacquinia macrocarpa*)

34b. Opercula absent ..... MELIACEAE (*Trichilia pleeana*)
33b. Pores lolongate or circular ..... LEG. Caesalpinioideae

31b. Grains oblate-spheroidal to spheroidal
35a. Pores lolongate ..... LEG. Caesalpinioideae
35b. Pores lalongate or circular ..... ACANTHACEAE , RUBIACEAE
VERBENACEAE (*Lantana camara*)

1d. Sexine baculate
36a. Exine > 2.5 µ thick
37a. Amb angular ..... TILIACEAE
37b. Amb circular
38a. Colpi displaying equatorial constriction ..... POLYGONACEAE
38b. Colpi normal type ..... EUPHORBIACEAE
LEG. Caesalpinioideae

36b. Exine < 2.5 µ thick
39a. Amb angular ..... FLACOURTIACEAE
(*Casearia commersoniana*)

39b. Amb circular
40a. Pores circular
41a. Grains < 20 µ ..... RUBIACEAE (*Uncaria tomentosa*)
41b. Grains 20 - 45 µ
42a. Colpi displaying equatorial constriction ..... LEG. Papilionoideae
42b. Colpi normal type ..... LEG. Mimosoideae (*Adenopodia polystachya*)

40b. Pores lalongate
43a. Exine 1.5 - 2.0 µ thick; colpi having margo; grains 37 - 43 µ ..... STERCULIACEAE (*Melochia lupulina*)
43b. Exine 2.0 - 2.5 µ thick; colpi with equatorial constriction; grains 20 - 37 µ LEG. Papilionoideae

1e. Sexine verrucate
44a. Grains < 20 µ ..... SIMAROUBACEAE (*Simarouba amara*)
44b. Grains 23 - 70 µ
45a. Amb angular; viscin threads present ..... ONAGRACEAE (*Ludwigia*)
45b. Amb circular; viscin threads absent
46a. Grains suboblate ..... CHRYSOBALANACEAE
(*Hirtella triandra*)

46b. Grains spheroidal to prolate
47a. Colpi displaying equatorial constriction ..... LEG. Caesalpinioideae
(*Prioria copaifera*)
47b. Colpi normal type ..... GUTTIFERAE (*Marila laxiflora*)
LEG. Papilionoideae (*Desmodium*)

1f. Sexine echinate
48a. Echini < 1 µ long; colpi having margo ..... BORAGINACEAE (*Cordia*)
48b. Echini 1 - 7 µ long; margo absent ..... COMPOSITAE

1g. Sexine rugulate
49a. Exine 3 - 6 µ thick; pores forming continuous ring (zonorate) ..... SOLANACEAE (*Cestrum nocturnum*)
49b. Exine < 2.5 µ thick; pores not as above
50a. Amb angular ..... CHRYSOBALANACEAE
(*Licania hypoleuca*)

50b. Amb circular
51a. Grains prolate-spheroidal ..... LEG.Caesalpinioideae (*Cassia obtusifolia*)*

51b. Grains oblate-spheroidal
52a. Exine 1.0 - 1.5 µ thick; colpi displaying equatorial constriction ..... DILLENIACEAE
52b. Exine 2 µ thick; colpi normal type ..... RUBIACEAE (*Hoffmannia woodsonii*)

1h. Sexine striate
53a. Pores lalongate; grains > 40 µ ..... ANACARDIACEAE (*Spondias*)
53b. Pores circular; grains < 35 µ
54a. Exine 1 µ thick; grains 14 - 18 µ ..... SIMAROUBACEAE (*Picramnia latifolia*)
54b. Exine 1.5 - 2.0 µ thick; grains 23 - 25 µ ..... CUCURBITACEAE

1i. Sexine foveolate
55a. Grains spheroidal; colpi having margo ..... VOCHYSIACEAE (*Vochysia ferruginea*)
55b. Grains subprolate; margo absent ..... GUTTIFERAE (*Tovomita stylosa*)

1j. Sexine reticulate
56a. Homobrochate
57a. Pores lolongate
58a. Exine > 3 µ thick
59a. Oblate; pores annulate; colpi having margo; grains > 55 µ ..... BOMBACACEAE
59b. Subprolate; annuli absent; colpi with 3 projections; grains < 55 µ ..... ACANTHACEAE (*Justicia pectoralis*)
58b. Exine 2 µ thick
60a. Grains > 30 µ; colpi displaying equatorial constriction ..... SCROPHULARIACEAE
(*Bacopa salzmannii*)
60b. Grains 20 - 28 µ; colpi not as above ..... CONNARACEAE
(*Connarus turczaninowii*)

57b. Pores lalongate, circular or rectangular
61a. Brochi resembling perforate type; pores rectangular ..... APOCYNACEAE
(*Catharanthus roseus*)

61b. Brochi having well-defined lumina; pores lalongate or circular
62a. Pores circular
63a. Grains > 50 µ
64a. Colpi > 15 µ wide ..... BIGNONIACEAE
(*Xylophragma seemannianum*)

64b. Colpi narrow

65a. Margo present..... LEG. Caesalpinioideae
65b. Margo absent..... LEG. Papilionoideae
CUCURBITACEAE

63b. Grains < 50 µ
66a. Colpi displaying equatorial constriction..... ELAEOCARPACEAE
(*Muntingia calabura*)
DILLENIACEAE

66b. Colpi normal type
67a. Grains oblate to oblate-spheroidal..... CUCURBITACEAE
EUPHORBIACEAE
LEG. Caesalpinioideae
LEG. Papilionoideae
MALPIGHIACEAE
RUBIACEAE, STERCULIACEAE

67b. Grains spheroidal to prolate
68a. Amb angular..... STAPHYLEACEAE (*Turpinia occidentalis*)

68b. Amb circular
69a. Grains 30 - 50 µ..... CUCURBITACEAE
EUPHORBIACEAE
LEG. Papilionoideae
RUBIACEAE
SIMAROUBACEAE (*Quassia amara*)
TILIACEAE

69b. Grains < 30 µ..... CONNARACEAE
EUPHORBIACEAE
LEG. Papilionoideae
RUBIACEAE

62b. Pores lalongate
70a. Amb angular..... MELIACEAE (*Trichilia tuberculata*)
70b. Amb circular
71a. Exine > 3 µ thick
72a. Colpi displaying equatorial constriction, often with margo. DILLENIACEAE
EUPHORBIACEAE
FLACOURTIACEAE
HUMIRIACEAE (*Vantanea occidentalis*)
LEG. Papilionoideae
RUBIACEAE

72b. Colpi not as above
73a. Grains > 35 µ..... ANACARDIACEAE
ERYTHROXYLACEAE (*Erythroxylum*)
EUPHORBIACEAE
FLACOURTIACEAE
LEG. Papilionoideae
RUBIACEAE

73b. Grains < 35 µ..... ANACARDIACEAE, ARALIACEAE
BURSERACEAE (*Protium tenuifolium*)
SOLANACEAE (*Capsicum annuum*)

71b. Exine < 3 µ thick
74a. Grains > 30 µ..... ANACARDIACEAE
ARALIACEAE, CARICACEAE
DILLENIACEAE, EUPHORBIACEAE
FLACOURTIACEAE, GUTTIFERAE
LEG. Papilionoideae
POLYGONACEAE, RUBIACEAE
STERCULIACEAE, VITACEAE

74b. Grains < 30 µ..... ARALIACEAE, ANACARDIACEAE
CELASTRACEAE, DILLENIACEAE
EUPHORBIACEAE, LACISTEMATACEAE
LEG. Papilionoideae, MALPIGHIACEAE
MARCGRAVIACEAE, MYRSINACEAE
RHIZOPHORACEAE
RUBIACEAE , RUTACEAE
STERCULIACEAE, THEACEAE

56b. Heterobrochate
75a. Amb angular..... BOMBACACEAE
75b. Amb circular
76a. Pores circular
77a. Exine 3 - 5 µ thick
78a. Colpi long; grains oblate-spheroidal < 40 µ; brochi per-reticulate. RUBIACEAE
78b. Colpi short; grains spheroidal > 40 µ; brochi scrobiculate..... BOMBACACEAE (*Quararibea*)
77b. Exine 1.5 - 2.5 µ thick
79a. Grains > 45 µ..... LEG. Papilionoideae
79b. Grains < 45 µ
80a. Exine 1.5 µ thick..... GUTTIFERAE (*Vismia baccifera*)
80b. Exine 2.0 - 2.5 µ thick..... HIPPOCRATEACEAE (*Prionostemma aspera*)
LEG. Caesalpinioideae

76b. Pores lalongate or lolongate
81a. Exine > 4 µ thick ..... TURNERACEAE (*Turnera panamensis*)
81b. Exine 1 - 3 µ thick
82a. Grains < 20 µ ..... SAXIFRAGACEAE (*Hydrangea peruviana*)
82b. Grains > 20 µ
83a. Brochi appearing striate in form ..... BURSERACEAE (*Bursera simaruba*)
83b. Brochi not as above
84a. Grains spheroidal ..... DILLENIACEAE (*Doliocarpus dentatus*)
EUPHORBIACEAE
LEG. Caesalpinioideae
84b. Grains subprolate to prolate ..... ACANTHACEAE (*Teliostachya alopecuroidea*)
ANACARDIACEAE (*Astronium graveolens*)
EUPHORBIACEAE
RUTACEAE, TILIACEAE

BREVITRICOLPORATE

Colpi short, almost as wide as long, 15 - 22 x 6 - 14 µ, always on interangular areas of grains; pores almost 2/3 length of colpi, circular, conspicuous; grains oblate to spheroidal, 35 - 76 x 48 - 88 µ ..... BOMBACACEAE

SYNCOLPORATE

1a. Pores united, forming a continuous equatorial ring (zonorate) ..... SOLANACEAE
1b. Pores not as above
2a Grains < 20 µ ..... MYRTACEAE
2b Grains > 20 µ
3a. Sexine echinate (echinulate); grains suboblate, 36 x 43 - 46 µ ..... BORAGINACEAE (*Cordia bicolor*)
3b. Sexine psilate
4a. Exine displaying continuous projections, appearing as striae ..... LYTHRACEAE (*Cuphea carthagenensis*)
4b. Exine not as above
5a. Pores lalongate; grains 30 - 39 x 22 - 23 µ ..... GUTTIFERAE (*Rheedia*)
5b. Pores circular; grains 47 - 60 x 40 - 45 µ ..... LEG. Caesalpinioideae (*Bauhinia reflexa*)
SAPINDACEAE
3c. Sexine scabrate
6a. Pores lolongate ..... LEG. Mimosoideae (*Entada monostachya*)
6b. Pores circular
7a. Grains prolate-spheroidal ,25 x 21 µ ..... LORANTHACEAE (*Phoradendron quadrangulare*)
7b. Grains oblate to suboblate, 12 - 43 x 23 - 66 µ ..... SAPINDACEAE (*Cupania*)
3d. Sexine granulate
8a. Oblate-spheroidal; margo absent ..... ACANTHACEAE
8b. Subprolate; colpi having margo ..... LEG. Caesalpinioideae (*Swartzia simplex grandiflora*)
3e. Sexine baculate ..... LEG. Caesalpinioideae
3f. Sexine reticulate or foveolate
9a. Pores circular ..... SAPINDACEAE (*Serjania*)
9b. Pores lalongate or lolongate ..... ACANTHACEAE
LEG. Caesalpinioideae(*Caesalpinia pulcherrima*)
LEG. Papilionoideae (*Aeschynomene*)

PARASYNCOLPORATE (3-COLPORATE)

3 apertures; sexine scabrate to granulate; exine 1.0 - 1.5 µ thick; small triangle formed by union of colpi at apices; grains oblate-suboblate, 12 - 17 x 18 - 31 µ ..... MYRTACEAE

STEPHANOCOLPORATE

1a. Grains 4 - 6 colporate
2a. Sexine psilate
3a. 4-colporate
4a. Pores circular
5a. Annulus present; grains subprolate ..... FLACOURTIACEAE
5b. Annulus absent; grains oblate to prolate-spheroidal ..... MELIACEAE
4b.Pores lalongate
6a. Pores protruding; grains > 30 µ ..... SAPOTACEAE (*Pouteria*)

6b. Pores not as above; grains < 30 µ
7a. Amb circular; pores forming continuous ring; grains spheroidal..... SOLANACEAE (*Physalis angulata*)

7b. Amb angular; pores and grains not as above..... HIPPOCRATEACEAE (*Anthodon panamense*)

3b. 5 - 6 colporate..... MELIACEAE (*Cedrela odorata*)

2b. Sexine scabrate
8a. Pores lolongate; grains > 50 µ; exine > 3 µ thick..... ACANTHACEAE (*Mendoncia gracilis*)
8b. Pores lalongate; grains < 30 µ; exine < 2 µ thick
9a. Amb circular..... EUPHORBIACEAE (*Acalypha*)
RUBIACEAE (*Borreria*)

9b. Amb not as above
10a. Grains suboblate..... MYRTACEAE
10b. Grains prolate-spheroidal..... CAPPARACEAE (*Capparis frondosa*)

2c. Sexine verrucate; grains suboblate 50 - 90 µ; pores circular..... ONAGRACEAE (*Ludwigia*)

2d. Sexine echinate; grains spheroidal to oblate-spheroidal, 15 - 40 µ; pores lalongate..... COMPOSITAE

2e. Sexine reticulate
11a. Heterobrochate; grains 6-colporate; pores operculate..... PASSIFLORACEAE (*Passiflora auriculata*)

11b. Homobrochate; grains 4-5 colporate; pores not as above
12a. Pores annulate; grains oblate-spheroidal..... BOMBACACEAE (*Ochroma pyramidale*)

12b. Pores not as above; grains spheroidal to prolate
13a. Pores circular..... MALPIGHIACEAE (*Spachea membranacea*)
RUBIACEAE (*Bertiera guianensis*)

13b. Pores lalongate
14a. Grains > 30 µ..... RUTACEAE (*Citrus*)
STERCULIACEAE (*Waltheria glomerata*)

14b. Grains < 30 µ..... FLACOURTIACEAE (*Laetia procera*)
MYRSINACEAE (*Ardisia fendleri*)
POLYGONACEAE (*Coccoloba acuminata*)
RUBIACEAE

1b. Grains 8 - 17 colporate
15a. Sexine psilate
16a. 8, 14-colporate; pores forming continuous ring (zonorate)..... POLYGALACEAE
16b. 14, 17-colporate; pores not as above..... LENTIBULARIACEAE (*Utricularia*)
15b. Sexine granulate..... RUBIACEAE (*Borreria*)

PERICOLPORATE

6 - 8 aperturate; grains psilate, scabrate, foveolate or verrucate; pores 6 - 10 µ diameter; exine 2 - 5 µ thick; grains 26 - 81 µ..... MALPIGHIACEAE

CRYPTOGAMAE—LYCOPODOPHYTA

LYCOPODIACEAE

Spores trilete; heteropolar-radially symmetric; sclerine fossulate; laesura 2/3 length of the radius or extending almost to equator; sclerine 1.5 µ thick at radial areas, and 3.5 µ thick at inter-radial areas; amb subangular-convex; spores 28 - 35 µ (equatorial dimension); perine absent. *(1 genus, 2 species; additional reference: 106).*

Key to genera and species:

1a. Spores 28 - 29 µ (equatorial dimension) ; laesura 2/3 length of the radius ..... *Lycopodium cernuum*
1b. Spores 31 - 35 µ ; laesura extending almost to equator..... *Lycopodium dichotomum*

Lycopodium cernuum L.
Sclerine 1.5 µ thick at radial areas to 3.5 µ thick at inter-radial areas; fossulae small and irregularly distributed; laesura 2/3 of the radius, ca. 12 x 1 µ ; margo 3 - 4 µ wide; spores 28 - 29 µ (equatorial dimension).
BCI, Schmalzel 67, MO; plate 1:1.

Lycopodium dichotomum Jacq.
Sclerine 1 µ thick at radial areas to 2 µ thick at inter-radial areas; fossulae conspicuous 2 - 2.5 µ wide; laesura extending almost to equator, irregular, very narrow; margo, if present, inconspicuous; spores 31 - 35 µ (equatorial dimension).
BCI, Croat 12408, MO; plate 1:2.

SELAGINELLACEAE

Spores trilete; heteropolar-radially symmetric; sclerine echinulate, baculate; < 1 to 2 µ thick; regularly thickened; sexine elements conspicuous; laesura appearing narrow 2/3 length of the radius, always showing distinct "Y" split marks at their ends; amb subangular-convex to almost circular; spores 30 - 42 µ including ornamentation (equatorial dimension); perine absent. *(1 genus, 5 species; additional reference: 106).*

Key to genera and species:

1a. Sclerine echinulate
  2a. Densely echinulate; spores > 35 µ (including ornamentation)
    3a. 35 - 38 µ; sclerine 1.5 - 2 µ thick; spinulae 5 - 6 µ high x 2 - 3 µ wide..... *Selaginella horizontalis*
    3b. 38 - 42 µ; sclerine 1 µ thick; spinulae 1.5 - 5 µ high x 1 - 3 µ wide..... *Selaginella flagellata*
  2b. Slightly echinulate; spores < 35 µ..... *Selaginella arthritica*
1b. Sclerine baculate
  4a. Sclerine < 1 µ thick (without ornamentation); spores 37 - 40 µ (including ornamentation); margo absent, or if present inconspicuous..... *Selaginella exaltata*
  4b. Sclerine 2 µ thick (without ornamentation); spores 30 µ (including ornamentation); margo present, conspicuous..... *Selaginella haematodes*

Selaginella arthritica Alston
Sclerine echinulate; 1.0 - 1.5 µ thick (without ornamentation); spinulae 3 - 4 µ high x 1 µ wide, rounded at apex; irregularly spaced; laesura narrow, 2/3 of the radius; amb subangular-convex to circular; spores 32 - 34 µ (equatorial dimension).
BCI, Schmalzel 92, MO; plate 1:3.

Selaginella exaltata (Kunze) Spring
Sclerine baculate; < 1 µ thick (without ornamentation); baculum irregular, resembling clavate type; amb circular; spores 37 - 40 µ (equatorial dimension).
PAN, Correa 254, MO; plate 1:4.

Selaginella flagellata Spring.
Sclerine echinulate; 1 µ thick (without ornamentation); spinulae 1.5 - 5 µ high x 1 - 3 wide, rounded at apex; densely aggregated; laesura narrow, 2/3 of the radius; amb subangular-convex; spores 38 - 42 µ (equatorial dimension).
BCI, Croat 9539, MO; plate 1:5.

Selaginella haematodes (Kunze) Spring, in Mart.
Sclerine baculate; 2 µ thick (without ornamentation); bacula short, wide, 2 - 2.5 µ high x 2 µ wide; densely aggregated; at inter-radial areas; laesura narrow, extending to equator; margo present; amb subangular-convex; spores 30 µ (equatorial dimension) x 21 µ (polar dimension).
BCI, Schmalzel 91, MO; plate 1:6.

Selginella horizontalis (Presl.) Spring.
Sclerine echinulate, 1.5 - 2.0 µ thick (without ornamentation); spinulae sharp, 5 - 6 µ high x 2 - 3 µ wide; densely aggregated ; laesura 1 µ wide, extending to equator; margo present 1.5 µ wide; amb subangular-convex to circular; spores 35 - 38 µ (equatorial dimension) x 25 µ (polar dimension).
BCI, Schmalzel 13, MO; plate 1:7.

CRYPTOGAMAE—PTEROPHYTA[1]

CYATHEACEAE

Spores trilete; heteropolar-radially symmetric; sclerine scabrate, granulate, fossulate, perforate; sclerine 1 - 5 µ thick regularly thickened; laesura narrow, reaching equator or extending 2/3 of the radius; commisure bordered by broad margo, 2 - 4 µ wide; amb subangular-convex to subangular-concave; spores 32 - 60 µ (equatorial dimension) x 28 - 36 µ (polar dimension); perine sometimes present, often susceptible to damage by acetolysis. (*4 genera, 5 species*).

Key to genera and species:

1a. Sclerine 3 - 5 µ thick; perine present
  2a. 58 - 60 x 35 µ polar dimension, perine scabrate; laesura extending to equator..... *Nephelea cuspidata* *
  2b. 38 - 44 x 36 µ polar dimension , perine echinulate; laesura 2/3 length of the radius. *Trichopteris microdonta**
1b. Sclerine 1 - 2 µ thick; perine absent
  3a. < 35 µ equatorial dimension..... *Trichopteris trichiata**
  3b. > 35 µ equatorial dimension
    4a. Laesura narrow, 2/3 length of the radius; amb subangular-concave..... *Cnemidaria petiolata**
    4b. Laesura 2 - 3 µ wide, reaching equator; amb subangular-convex..... *Metaxya rostrata*

Cnemidaria petiolata (Hook.) Copie. (*Cyathea petiolata* R. Tryon)
Sclerine 1.5 - 2.0 µ thick; scabrate to perforate; scabrae < 0.5 µ high; laesura 2/3 length of radius x 1 µ wide, sinuous; margo 3 µ wide; densely scabrate; amb subangular; spores 38 - 44 µ (equatorial dimension) x 33 µ (polar dimension); perine absent.
BCI, Schmalzel 15, MO; plate 1:8.

Metaxya rostrata (H. & B. ex. Willd.) Presl.
Sclerine 1 µ thick; scabrate to perforate; scabrae very short; laesura reaching equator 2 - 3 µ wide, irregular; margo 3 - 4 µ wide, slightly scabrate; amb subangular-convex; spores 39 µ (equatorial dimension) x 28 µ (polar dimension); perine absent.
BCI, Schmalzel 801, MO; plate 1:9.

Nephelea cuspidata (Kunze) R. Tryon (*Alsophila cuspidata* (Kunze) Conant)
Sclerine 4 - 5 µ thick; psilate to scabrate; laesura reaching equator; narrow; margo 3 µ wide; amb subangular-concave; spores 58 - 60 µ (equatorial dimension) x 35 µ (polar dimension); perine conspicuous, scabrate to rugulate; 7 µ wide.
BCI, Croat 6529, MO; plate 2:10.

Trichopteris microdonta (Desv.) R. Tryon (*Cyathea microdonta* (Desv.)Domin)
Sclerine 3 µ thick; densely granulate; laesura 2/3 of radius, narrow; margo 2 µ wide; densely granulate; amb subangular-concave; spores 38 - 44 µ (equatorial dimension) x 36 µ (polar dimension); perine echinulate, thick.
BCI, Schmalzel 1175, MO; plate 2:11.

Trichopteris trichiata (Max.) R. Tryon (*Cyathea trichiata* (Max)Domin)
Sclerine; 2 µ thick; fossulate; laesura reaching equator, narrow; margo granulate; amb subangular-convex; spores 32 µ (equatorial dimension); perine absent.
BCI, Croat 9524, MO; plate 2:12.

GLEICHENIACEAE

Spores monolete; heteropolar-bilateral; sclerine psilate; laesura curved, 2/3 length of spore; narrow; acute apex; commisure bordered by broad margo, 2 - 3 µ thick; amb elliptical (polar face) concave-convex (equatorial face); spores 45 - 50 µ (equatorial dimension) x 20 - 27 µ (polar dimension); perine absent (*2 genera, 2 species; additional reference: 107*).

Key to genera and species:

1a. 48 µ (equatorial dimension) x 20 µ (polar dimension); laesura 22 - 24 µ long..... *Dicranopteris flexuosa*
1b. 48 µ (equatorial dimension) x 27 µ (polar dimension); laesura 28 µ long..... *Gleichenia bifida* *

Dicranopteris flexuosa (Schrad.) Und.
Sclerine 1.5 - 2.0 µ thick; laesura 22 - 24 µ long x 1 µ wide; margo 20 µ wide; acute on apex; spores 45 (equatorial long dimension) x 23 (equatorial short dimension) x 20 µ (polar dimension).
PAN, Schmalzel 1018, MO; plate 2:13.

Gleichenia bifida (Willd.) Spreng. (*Stichenus bifidus* (Willd.)Ching)
Sclerine 2 µ thick; laesura 28 µ long x 2 - 3 µ wide; margo 2.5 - 3.0 µ wide; spores 50 µ (equatorial) x 27 µ (polar).
PAN, Tyson et al. 2406, MO; plate 2:14.

HYMENOPHYLLACEAE

Spores trilete; heteropolar radially-symmetric; sclerine psilate, granulate, verrucate, foveolate, 1.0 - 1.5 µ thick; laesura reaching equator, narrow, irregular; commisure often bordered by margo; amb subangular-biconvex to circular; spores 22 - 75 µ; perine thick, occasionally absent (susceptible to damage by acetolysis). Species not readily distinguishable. (*2 genera, 9 species*).

[1]asterisk denotes synonym given in Croat (1978), bracketed name denotes senior synonym

Key to genera and species:

1a. > 40 µ (equatorial dimension)
  2a. 42 - 48 µ
    3a. Psilate..... *Trichomanes punctatum*
    3b. Verrucate
      4a. Sclerine 1 µ thick; amb circular..... *Trichomanes krausii*
      4b. Sclerine 1.0 - 1.5 µ thick; amb subangular biconvex..... *Trichomanes polypodioides*
  2b. 75 µ..... *Hymenophyllum brevifrons*
1b. < 40 µ (equatorial dimension)
  5a. Psilate..... *Trichomanes ekmanii*
  5b. Foveolate..... *Trichomanes diversifrons*
  5c. Verrucate
    6a. 22 µ; sclerine 1 µ thick..... *Trichomanes godmanii*
    6b. 25 - 26 µ; sclerine <1 µ..... *Trichomanes kapplerianum*
  5d. Granulate..... *Trichomanes pinnatum*

Hymenophyllum brevifrons Kunze
Sclerine psilate, 1 µ thick; laesura extending to equator x < 1 µ wide sinuous; amb subangular, convex; spores 75 µ (equatorial dimension); perine undulating, narrow, slightly scabrate.
PAN, Correa & Dressler 183, MO; plate 2:15.

Trichomanes diversifrons (Bory) Mett.
Sclerine foveolate, slightly perforate, 1 µ thick; laesura 3/4 length of radius; margo 2 µ wide; amb subangular biconvex to circular; spores 38 µ (equatorial dimension); perine narrow, granulate to baculate.
BCI, Croat 8577, MO; no plate.

Trichomanes ekmanii Wessels-Boer
Sclerine psilate, 1 µ thick; laesura extending to equator, narrow, irregular; commisure bordered by densely granules; amb subangular biconvex to circular; spores 29 µ (equatorial dimension) x 24 µ (polar dimension); perine scabrate to granulate, undulating, thick.
BCI, Croat 16510A, MO; plate 2:16.

Trichomanes godmanii Hook. in Baker
Sclerine verrucate, 1 µ thick; laesura extending to equator; narrow; margo apparently 1 µ wide; amb circular; spores 22 µ (equatorial dimension) ; perine thick, baculate.
MEX, Mickel 5848, NY; plate 2:17.

Trichomanes kapplerianum Sturm in Mart.
Sclerine verrucate; < 1 µ thick; laesura extending to equator, narrow; margo inconspicuous; amb circular; spores 25 - 26 µ (equatorial dimension); perine, if present, inconspicuous.
CR, Mickel 3642, NY; no plate.

Trichomanes krausii Hook. & Grev.
Sclerine granulate, < 1 µ thick; laesura inconspicuous, apparently extending to equator; amb circular irregular; spores 48 - 52 µ (equatorial dimension) ; perine absent.
PAN, Correa & Dressler 631, MO; no plate.

Trichomanes pinnatum Hedw.
Sclerine granulate, <1 µ thick; laesura extending to equator; narrow; sometimes showing complete "Y" split mark; amb circular; Spores 31 - 32 µ (equatorial dimension); perine absent.
BCI, Croat 8767, MO; plate 2:18.

Trichomanes polypodioides L.
Sclerine slightly verrucate, 1.0 - 1.5 µ thick; laesura extending to equator; amb subangular-convex; spores 42 - 44 µ (equatorial dimension); perine absent.
PAN, Dressler 3251, MO; plate 2:19.

Trichomanes punctatum Poir. subsp. ***sphenoides*** (Kunze) Wessels-Boer
Sclerine psilate, 1 µ thick; laesura extending to equator; narrow; spores irregular; margo absent; amb irregular, tending to be circular; spores 43 - 46 µ (equatorial dimension).
BCI, Croat 7808, MO; plate 2:20.

MARATTIACEAE

Spores monolete; heteropolar-bilateral; sclerine echinulate; laesura 2/3 length of spore, elliptical-acute; commisure bordered by thin margo; spinulae conspicuous; amb circular to elliptical (proximal face) to convex-planar (polar face); spores 38 (equatorial dimension) x 33 - 34 µ (polar dimension); perine absent. (*1 genus, 1 species*).

Danaea nodosa (L.) J. Sm.
Sclerine 2 µ thick (without echinulate ornamentation); laesura 2.5 µ wide, apex acute; margo 1 µ thick; spinulae 2.0 - 2.5 µ high x 1.5 - 2 µ wide; spores 38 µ (equatorial dimension)x 33 - 34 µ (polar dimension).
BCI, Croat 932, MO; plate 2:21.

OPHIOGLOSSACEAE

Spores trilete; heteropolar-radially symmetric; sclerine psilate; laesura 1/2 of the radius, showing complete "Y" split mark; commisure bordered by conspicuous margo; amb circular; spores 53 - 57 µ (equatorial dimension); perine present; irregular, short, baculate-perforate. (*1 genus, 1 species; additional reference: 106).*

Ophioglossum reticulatum L.
Sclerine 1 µ thick; laesura conspicuous, short, 15 µ long x 1.0 - 1.5 µ wide, acute at apex; margo 2.0 - 2.5 µ thick; perine irregular, 1.5 - 2 wide, spores 53 - 57 µ (equatorial dimension).
BCI, Dressler 2874, MO; plate 2:22.

PARKERIACEAE

Spores trilete; heteropolar-radially symmetric; sclerine striate-verrucate, striate-scabrate; 2 - 5 µ thick; undulating; laesura extending almost to equator; striate 2.0 - 3.5 µ wide, without particular orientation; densely verrucate; verrucae irregular; amb subangular-biconvex to slightly circular, spores 110 - 135 µ (equatorial dimension); perine absent. (*1 genus, 2 species*).

Key to genera and species:

1a. 110 - 112 µ (equatorial dimension); sclerine 2 - 3 µ thick, striate-verrucate..... ***Ceratopteris pteridoides***
1b. 120 - 135 µ; sclerine 5 µ thick, striate-scabrate..... ***Ceratopteris deltoidea***

Ceratopteris deltoidea Benedict
Sclerine 5 µ thick, striate-scabrate, undulating; scabrae < 1 µ; striae 3 - 3.5 µ wide; inter-striae area 5 µ wide; laesura extending to equator, narrow; amb subangular convex; spores 120 - 135 µ (equatorial dimension).
PAN, Tyson et al. 4602, MO; plate 3:23.

Ceratopteris pteridoides (Hook.) Hieron.
Sclerine 2 - 3 µ thick, striate-verrucate, undulating; verrucae irregular; striae 2 - 3 µ wide; inter-striae areas 8 - 10 µ wide; laesura 35 µ x 2 - 3 µ wide; amb subangular convex, tending to be circular; spores 110 - 112 µ (equatorial dimension) x 100 µ (polar dimension).
VEN, Davidse et al. 3933, MO; plate 3:24.

POLYPODIACEAE

Spores monolete, heteropolar-bilateral and trilete, heteropolar-radially symmetric; sclerine psilate, scabrate, granulate, verrucate, fossulate, < 1 µ - 10 µ thick; laesura always narrow (trilete type) and elliptical-acute (monolete type), 2/3 length of radius; margo wide, conspicuous; amb subangular-convex (proximal face) and convex-planar to biconvex (equatorial face) in trilete spores and elliptical-biconvex (polar face), convex-planar and concave-convex (equatorial face) in monolete spores; spores 32 - 75 µ (equatorial, trilete) and 24 - 80 x 20 - 58 x 18 - 46 µ (monolete); perine present, conspicuous in ca. 50% of species; psilate, scabrate, reticulate, granulate, echinulate, baculate; frequently displaying irregular projections; undulating in most species, occasionally susceptible to damage by acetolysis. (*26 genera, 65 species; additional references: 106, 107).*

Key to genera and species:

1a. Monolete
  2a. ≥ 50 µ (equatorial dimension)
    3a. Psilate to scabrate
      4a. Perine present
        5a. Perine psilate to scabrate
          6a. Perine 8 - 18µ wide; amb convex-planar (equatorial face)
            7a. Sclerine 1 µ thick..... ***Elaphoglossum sporadolepis***
            7b. Sclerine 1.5 - 2.0 µ thick
              8a. Polar dimension > 35 µ ..... ***Thelypteris spp.***
              8b. Polar dimension < 35 µ..... ***Diplazium grandifolium***
          6b. Perine 2 - 8 µ wide; amb concave-convex (equatorial face)..... ***Asplenium serratum***
        5b. Perine echinulate
          9a. Sclerine 2 µ thick..... ***Asplenium falcinellum****
          9b. Sclerine 1.5 µ thick..... ***Tectaria incisa***
        5c. Perine granulate
          10a. > 55 µ (equatorial dimension)..... ***Dictyoxiphium panamense***
          10b. < 55 µ
            11a. Polar dimension 30 - 34 µ..... ***Thelypteris torresiana***
            11b. Polar dimension 24 µ..... ***Thelypteris totta***
      4b. Perine absent
        12a. Sclerine 1.5 µ thick..... ***Polypodium occultum****
        12b. Sclerine 2 µ thick..... ***Vittaria lineata***
    3b. Verrucate
      13a. Perine present..... ***Thelypteris serrata***
      13b. Perine absent
        14a. > 55 µ (equatorial dimension)
          15a. Laesura 34 x 1 µ..... ***Lomariopsis vestita****
          15b. Laesura 50 x 7 µ..... ***Ananthacorus angustifolius***
        14b. < 55 µ..... ***Maxonia apiifolia,***
Polypodium crassifolium*
***Polypodium* spp.**

2b. < 50 µ (equatorial dimension)
16a. Psilate
17a. 41 - 49 µ (equatorial dimension)
18a. Polar dimension < 33 µ
19a. Scabrate ... *Asplenium auritum*
19b. Reticulate ... *Asplenium laetum*
19c. Echinulate ... *Tectaria euryloba*
19d. Baculate ... *Thelypteris balbisii*
18b. Polar dimension > 33 µ
20a. Psilate
21a. Sclerine 1 µ thick ... *Bolbitis cladorrhizans**
21b. Sclerine 2 µ thick ... *Elaphoglossum hayesii*
20b. Granulate ... *Cyclopeltis semicordata*
17b. < 40 µ (equatorial dimension)
22a. Perine absent ... *Ctenitis protensa*
22b. Perine present
23a. Psilate ... *Hemidictyum marginatum*
23b. Scabrate
24a. Sclerine 1.0 - 1.5 µ thick
25a. Margo 1 µ wide ... *Bolbitis nicotianifolia*
25b. Margo 3 µ wide ... *Asplenium auritum*
24b. Sclerine 2 µ thick ... *Blechnum occidentale*
23c. Perine gemmate ... *Blechnum serrulatum*
23d. Perine reticulate
26a. Amb convex planar (equatorial face); spores > 35 µ (equatorial dimension) ... *Asplenium delitescens*
26b. Amb concave-convex (equatorial face); spores < 35 µ (equatorial dimension) ... *Asplenium pteropus*
23e. Perine echinulate
27a. Sclerine 1 µ thick; spinulae 3 µ high ... *Thelypteris dentata*
27b. Sclerine 1.5 µ thick; spinulae 4 - 7 µ high, irregular ... *Thelypteris extensa*
16b. Echinulate ... *Ctenitis sloanei*
16c. Verrucate
28a. Sclerine 1 - 2 µ thick
29a. 45 - 47 µ (equatorial dimension) ... *Dicranoglossum panamense*
29b. 41 µ ... *Nephrolepis pendula*
28b. Sclerine 4 - 5 µ thick
30a. Amb convex-planar (equatorial face) ... *Nephrolepis biserrata*
30b. Amb concave-convex (equatorial face) ... *Polypodium ciliatum**

1b. Trilete
31a. > 55 µ (equatorial dimension)
32a. Psilate to granulate
33a. Sclerine 2 µ thick; perine scabrate ... *Acrostichum danaifolium*
33b. Sclerine 4 µ thick; perine psilate ... *Adiantum lunulatum*
32b. Verrucate ... *Acrostichum aureum*
32c. Fossulate
34a. Amb subangular (proximal face); sclerine homogeneous 3 µ thick ... *Pityrogramma calomelanos*
34b. Amb subangular-convex; sclerine variable 2 - 10 µ thick ... *Pteris grandifolia*
31b. < 55 µ (equatorial dimension)
35a. Psilate
36a. Perine absent
37a. Laesura thick, resembling large 'costa' ... *Vittaria graminifolia*
37b. Laesura less thick
38a. Laesura extending to equator ... *Adiantum obliquum*
38b. Laesura 2/3 length of radius ... *Anetium citrifolium*
36b. Perine present
39a. Psilate ... *Adiantum pulverulentum*
39b. Scabrate-granulate
40a. 40 µ (equatorial dimension) ... *Adiantum decoratum*
40b. 42 - 50 µ ... *Adiantum humile*
39c. Verrucate ... *Dennstaedtia cicutaria*
39d. Perine striate ... *Saccoloma elegans*
35b. Scabrate to granulate
41a. Polar axis < 30 µ
42a. Sclerine 1.5 - 2 µ thick ... *Adiantum lucidum*
42b. Sclerine 3 µ thick ... *Adiantum fructuosum*
41b. Polar axis > 30 µ ... *Adiantum petiolatum*
35c. Fossulate
43a. 52 µ (equatorial dimension); sclerine 2 µ thick at inter-radial area ... *Pteris altissima*
43b. 40 µ; sclerine 2 - 3 µ thick (radial area) 4 - 5 µ thick (inter-radial) ... *Pteris propinqua*

Acrostichum aureum L.
Spores trilete; sclerine verrucate, 3 µ thick; laesura 22 - 25 µ x 1 µ; commisure bordered by thin margo, ca. 1 µ wide; amb subangular biconvex (proximal face) to convex-planar (equatorial face); spores 58 (equatorial dimension) x 46 µ; perine granulate
BCI, Schmalzel 114, MO; plate 3:25

Acrostichum danaifolium Langsd. & Fischer
Spores trilete; sclerine psilate, 2 µ thick; laesura 20 x 1 - 4 µ; margo inconspicuous; amb circular; (proximal face) spores irregular, 64 - 79 µ; perine scabrate, thick.
BCI, Croat 5559, MO; plate 4:26.

Adiantum decoratum Max. & Weath.
Spores trilete; sclerine scabrate, 1.5 - 2.0 µ thick; laesura 18 - 20 x 1 µ; margo wide at center, narrow at apex 1 - 7 µ; amb subangular (proximal face); spores 40 µ (equatorial dimension); perine thick, scabrate.
PAN, Tyson et al. 4850, MO; plate 4:27.

Adiantum fructuosum Spreng.
Spores trilete; sclerine granulate, 3 µ thick; laesura reaching equator x 1 - 2 µ wide; commisure bordered by conspicuous margo; margo densely granulate; amb subangular (proximal face); spores 40 µ (equatorial dimension); perine absent.
PAN, Croat 10965, MO; plate 4:28.

Adiantum humile Kunze
Spores trilete; sclerine psilate; 2 µ thick; laesura 17 µ x < 1 µ; commisure bordered by broad margo, 3 - 4 µ wide; amb subangular (proximal face); spores 42 - 50 µ (equatorial dimension); perine apparently granulate, thick.
BCI, Croat 11613, MO; plate 4:29.

Adiantum lucidum (Cav.) Sw.
Spores trilete; sclerine granulate, 1.5 - 2.0 µ thick; laesura 12 - 14 x 1 µ commisure bordered by thick margo, 1.5 µ wide; amb subangular-concave, (proximal face) and concave-convex (equatorial face), depressed at center; spores 38 µ (equatorial dimension); perine absent.
BCI, Schmalzel 681, MO; plate 4:30.

Adiantum lunulatum Burm.
Spores trilete; sclerine granulate, sometimes displaying small verrucae; 4 µ thick; laesura 22 x 1 - 2 µ; commisure bordered by thick margo, 1 - 2 µ wide; amb subangular convex (proximal face) spores 55 µ (equatorial dimension); perine thick, psilate.
PAN, Tyson & Loftin 6296, MO; plate 4:31.

Adiantum obliquum Willd.
Spores trilete; sclerine psilate, 1 µ thick; laesura extending to equator, narrow; commisure bordered by broad margo, 2 - 3 µ wide; amb subangular-concave (proximal face); spores 43 µ (equatorial dimension); perine absent.
PAN, Croat 11117, MO; plate 4:32.

Adiantum petiolatum Desv.
Spores trilete; sclerine scabrate; 2.5 - 3 µ thick; laesura 15 x 1 µ; commisure bordered by oblong margo, 1 - 4 µ wide; amb subangular, slightly convex (proximal face) and convex-planar (equatorial face); spores 40 - 46 µ (equatorial dimension) x 35 µ (polar dimension); perine absent.
PAN, Schmalzel 1245, MO; plate 4:34.

Adiantum pulverulentum L.
Spores trilete; sclerine psilate, slightly scabrate, 2 µ thick; laesura extending to equator, narrow; amb subangular concave to convex (proximal face); spores 32 µ (equatorial dimension) perine very thick, psilate.
BCI, Croat 4340, MO; plate 4:33.

Ananthacorus angustifolius (Sw.) Und. & Max. (*Vittaria costata* Kze.)
Spores monolete; sclerine verrucate, 1.5 - 2.0 µ thick; laesura 50 x 7 µ, acute; commisure bordered by thick margo, 1. 5 - 2 µ wide; verrucae < 1 µ high; amb elliptical biconvex (proximal face); spores 70 (equatorial dimension) x 40 (polar dimension) x 33 µ (lateral dimension); perine absent.
BCI, Croat 6944, MO; plate 5:35.

Anetium citrifolium (L.) Splitg.
Spores trilete; sclerine psilate, ca. 0.5 µ thick; laesura 15 x 1 µ wide; commisure bordered by gross margo, 4 - 5 µ wide; amb subangular (proximal face); spores 40 - 42 µ (equatorial dimension); perine absent.
PAN, Nee & Wambrudt 10344, MO; plate 5:36.

Asplenium auritum Sw.
Spores monolete; sclerine psilate, 1. 5 - 2.0 µ thick; laesura 21 - 22 x 1 - 2 µ wide; commisure bordered by margo, 3 µ wide, amb elliptical-biconvex (proximal face) to convex-planar (equatorial face); spores 35 - 45 (equatorial dimension) x 20 - 24 µ (polar dimension); perine scabrate, irregular, undulating.
IN, Manickman 1246, HIFP; no plate.

Asplenium delitescens (Max.) A. R. Smith
Spores monolete; sclerine psilate, 1 µ thick; laesura inconspicuous, covered by perine; amb elliptical-biconvex (proximal view) to convex-planar (equatorial face); spores 36 - 39 (equatorial dimension) x 28 µ (lateral dimension); perine reticulate, 5 µ wide, undulating.
BCI, Croat 8643, MO; plate 5:37.

Asplenium falcinellum Max. (*Asplenium juglandifolium* Lam.)
Spores monolete; sclerine psilate, 2 µ thick; laesura 32 - 38 x 1 - 3 µ wide; commisure bordered by conspicuous margo 1 - 4 µ wide; amb elliptical-biconvex (proximal face) to concave-convex (equatorial face); spores 50 - 57 (equatorial dimension) x 33 - 39 µ (lateral dimension); perine irregular, echinulate to verrucate, 6 - 8 µ wide, undulating.
PAN, Correa & Dressler 753, MO; plate 5:38.

Asplenium laetum Sw.
Spores monolete; sclerine psilate, 1 µ thick; laesura inconspicuous covered by dense perine; amb elliptical biconvex (proximal face) to concave-convex (equatorial face); spores 43 - 45 (equatorial dimension) x 27 - 31 µ (polar dimension); perine densely reticulate, 8 - 12 µ wide, irregular, undulating.
BCI, Croat 8475, MO; plate 5:39.

Asplenium pteropus Kaulf.
Spores monolete; sclerine psilate, 1 µ thick; laesura 2/3 length of radius; margo apparently absent; amb elliptical biconvex (proximal face) to concave-convex (equatorial face); spores 32 (equatorial dimension) x 22 µ (lateral dimension); perine reticulate, 1 - 2 µ wide, slightly undulating.
PAN, Leisner, no voucher, MO; no plate.

Asplenium serratum L.
Spores monolete; sclerine psilate, 1.5 - 2.0 µ thick; laesura 23 x 1 µ; acute at apex; commisure bordered by thin margo, < 1 µ; amb elliptical-biconvex (proximal face) to concave-convex (equatorial face); spores 56 (equatorial dimension) x 32 µ (lateral dimension), perine scabrate, undulating, 2 - 8 µ wide.
BCI, Croat 9443, MO; plate 5:40.

Blechnum occidentale L.
Spores monolete; sclerine psilate, 2 µ thick; laesura 16 x 1 µ, oblongate-acute; commisure bordered by thick margo, 4 µ wide; amb elliptical to circular (proximal face) to convex-planar (equatorial face); spores 34 - 35 (equatorial dimension) x 30 (polar dimension) x 24 µ; (lateral dimension); perine strongly undulating; scabrate, 5 - 6 µ wide, irregular.
BCI, Schmalzel 712, MO; plate 5:41.

Blechnum serrulatum L. C. Rich.
Spores monolete; sclerine psilate, 1 µ thick; laesura 15 x < 1 µ; amb elliptical biconvex (proximal face) to concave-convex (equatorial face); spores 30 - 34 (equatorial dimension) x 22 (polar dimension) x 18 µ (lateral dimension); perine gemmate, irregular; gemmae 1 µ high, slightly separated.
PAN, Nee 6687, MO; plate 5:42.

Bolbitis cladorrhizans (Spreng.) Ching in Christensen (*B. portoricensis* (Spreng.) Hennipm..
Spores monolete, sclerine psilate, 1 µ thick; laesura inconspicuous, apparently 3/4 of the radius, narrow; amb elliptical biconvex (proximal face) to convex-planar (equatorial face); spores 46 (equatorial dimension) x 38 µ (lateral dimension); perine irregular, undulating, psilate, 8 - 10 µ wide.
BCI, Croat 11894, MO; plate 6:43.

Bolbitis nicotianifolia (Sw.) Ching in Christensen
Spores monolete; sclerine psilate, 1.5 µ thick; laesura 2/3 of the radius, narrow; commisure bordered by inconspicuous margo, ca. 1 µ thick; amb elliptical biconvex (proximal face) to convex-planar (equatorial face); spores 32 (equatorial dimension) x 22 µ (lateral dimension); perine irregular, undulating, scabrate, 10 - 18 µ wide.
PAN, Folson 3565, MO; plate 6:44.

Ctenitis protensa (Afz.) Copel.
Spores monolete; sclerine psilate, < 1 µ; laesura 18 x 1 µ; commisure bordered by thin margo, 1 µ wide; amb elliptical (proximal face) to convex-planar (equatorial face); spores 33 (equatorial dimension) x 26 µ (lateral dimension); perine absent.
PAN, Mori & Kallunki 2190, MO; no plate.

Ctenitis sloanei (Poepp.) Mort.
Spores monolete; sclerine echinulate, 6 µ thick (including ornamentation); laesura inconspicuous, covered by thin perine; amb elliptical biconvex to circular (proximal face); spores 43 (equatorial dimension) x 33 µ (lateral dimension); perine sessile, echinulate; spinulae conical, large, 6 x 6 µ.
PAN, Bartlett & Lasser 16610, MO; plate 6:45.

Cyclopeltis semicordata (Sw.) J. Sm.
Spores monolete; sclerine psilate; covered by gross perine; laesura inconspicuous; amb elliptical (equatorial face); spores 43 (equatorial dimension) x 34 µ (lateral dimension); perine folded, echinulate, spinulae sharp, narrow, 1 µ high, densely aggregated; perine 12 - 15 µ wide, irregular, undulating.
BCI, Schmalzel 808, MO; plate 6:46.

Dennstaedtia cicutaria (Sw.) Moore
Spores trilete; sclerine psilate, 1. 5 µ thick; laesura short, well defined 9 x 1 µ; commisure bordered by margo 1 - 3 µ wide; amb subangular-convex (proximal face); spores 24 - 25 (equatorial dimension) x 18 µ (lateral dimension); perine verrucate, densely aggregated, irregular, 3 - 6 µ wide.
BCI, Croat 6406, MO; plate 6:47.

Dicranoglossum panamense (Christensen) Gómez
Spores monolete; sclerine verrucate, 2 - 2.5 µ thick; laesura 22 x 1 µ commisure bordered by margo 1 - 1.5 µ wide; verrucae, short, 2 µ wide, densely aggregated; irregular; amb elliptical biconvex (proximal face) to convex-planar (equatorial face); spores 45 - 47 (equatorial dimension) x 27 - 33 µ (lateral dimension); perine absent.
BCI, Schmalzel 772, MO; plate 6:48.

Dictyoxiphium panamense Hook.
Spores monolete; sclerine psilate, 2 µ thick; laesura 26 x 1 µ; commisure bordered by margo 2 µ wide; amb elliptical-biconvex (proximal face) to convex-planar (equatorial face); spores 57 (equatorial dimension) x 39 µ (lateral dimension); perine irregular, folded, granulate, 2 - 12 µ wide.
BCI, Schmalzel 807, MO; plate 6:49.

Diplazium grandifolium Sw.
Spores monolete, sclerine psilate, 1.0 - 1.5 µ thick; laesura inconspicuous; amb elliptical (proximal face) to concave-convex (equatorial face); spores 53 (equatorial dimension) x 32 µ (lateral dimension); perine psilate, irregular, undulating, 8 - 18 µ wide, displaying conspicuous projections.
BCI, Schmalzel 810, MO; plate 6:50.

Elaphoglossum hayesii (Mett.) Max.
Spores monolete; sclerine psilate, 2 µ thick; laesura 35 µ long, narrow; commisure bordered by thin margo, 1 µ wide; amb elliptical biconvex (proximal face) to convex-planar (equatorial face); spores 45 - 48 (equatorial dimension) x 38 - 40 (polar dimension) x 35 µ (lateral dimension); perine undulating, 10 - 12 µ wide, translucid; psilate; irregular.
BCI, Schmalzel 1276, MO; plate 7:51.

Elaphoglossum sporadolepis (Kunze) Moore
Spores monolete; sclerine psilate, 1 µ thick; laesura 28 x 3 µ acute; commisure bordered by margo 1.5 - 2.0 µ wide; amb elliptical biconvex (proximal face) to convex-planar (equatorial face); spores 55 (equatorial dimension) x 43 - 47 (polar dimension) x 35 µ (lateral dimension); perine psilate, strongly folded, irregular, undulating, 8 - 10 µ wide.
BCI, Croat 10941, MO; plate 7:52.

Hemidictyum marginatum (L.) Presl
Spores monolete; sclerine psilate, 2 µ thick; laesura 25 x 1.5 - 2.0 µ; commisure bordered by thin margo 1 - 1.5 µ wide; amb elliptical (proximal face) to concave-convex (equatorial face); spores 38 - 40 (equatorial dimension) x 31 (polar dimension) x 19 µ (lateral dimension); perine thick, psilate, 6 - 8 µ wide.
PAN, Kirkbridge & Vristan 1404, MO; plate 7:53.

Lomariopsis vestita Fourn. (*L. fendleri* D. Eaton)
Spores monolete; sclerine verrucate; 1 µ thick; laesura 34 x 1 - 2 µ; commisure bordered by margo 34 x 1 - 2 µ; amb elliptical-(proximal face) to slightly convex-planar (equatorial face); spores 56 - 66 (equatorial dimension) x 50 (polar dimension) x 44 µ (lateral dimension); perine absent.
BCI, Croat 9438, MO; plate 7:54.

Maxonia apiifolia (Sw.) Christensen var. *dualis* (J. D. Smith) Christensen
Spores monolete; sclerine verrucate, 2 µ thick; laesura 2/3 length of radius; margo apparently present; amb elliptical biconvex (proximal face) to concave-convex (equatorial face); spores occassionally trilete; spores ca. 54 (equatorial dimension) x 40 µ (lateral dimension); perine absent.
PAN, Nee 7659, MO; plate 7:55.

Nephrolepis biserrata (Sw.) Schott
Spores monolete; sclerine verrucate to rugulate, 5 µ thick; laesura 20 µ long, narrow, margo inconspicuous, bordered by dense verrucae; amb elliptical (proximal face) to slightly convex-planar (equatorial face); spores 44 - 45 (equatorial dimension) x 32 µ (lateral dimension); perine absent.
BCI, Schmalzel 929, MO; plate 7:56.

Nephrolepis pendula (Raddi) J. Sm.
Spores monolete; sclerine psilate, 2 µ thick; laesura as long as spores, approaching 2/3 length of spore; narrow; commisure bordered by margo, 2 µ wide; amb elliptical-biconvex (proximal face) to convex-planar (equatorial face); spores 41 (equatorial dimension) x 28 µ (lateral dimension); perine sessile, verrucate, verrucae irregular, 2 - 6 µ wide.
BCI, Croat 5045, MO; plate 8:60.

Pityrogramma calomelanos (L.) Link
Spores trilete; sclerine fossulate, 3 µ thick; laesura as long as spores, narrow; amb subangular to circular (proximal face); fossulae 1 µ wide, irregular, spores 60 - 75 (equatorial dimension) x 50 - 60 µ (lateral dimension); type of ornamentation variable, concentrated at center of spores; perine absent.
BCI, Schmalzel 915, MO; plate 8:57.

Polypodium ciliatum Willd. (*Microgramma reptans* (Cav.) A. R. Smith)
Spores monolete; sclerine 4 µ thick; laesura 3/4 length of spore; verrucae 3 - 5 µ wide, irregular ; amb concave-convex (equatorial face); spores 44 (equatorial dimension) x 27 µ (lateral dimension).
CR, MNCR 79338, CR; plate 8:61.

Polypodium costaricense H. Christ
Spores monolete; sclerine verrucate, 1 µ thick; laesura 3/4 length of spore; verrucae 1.0 - 1.5 µ wide; amb convex-planar (equatorial face); spores 50 (equatorial dimension) x 43 µ (lateral dimension).
PAN, Croat 16582, MO; plate 8:58.

Polypodium crassifolium L. (*Niphidium crassifolium* (L.) Lellinger)
Spores monolete; sclerine 1.5 - 4.0 µ thick; laesura as long as spore, narrow; verrucae sunken, recessed, scarcely protruding, barely projecting 0.5 µ; amb elliptical-biconvex (proximal face) and convex-planar (equatorial face); spores 55 - 64 (equatorial dimension) x 37 - 48 µ (lateral dimension).
BCI, Schmalzel 214, MO; plate 8:59.

Polypodium hygrometricum Splitg.
Spores monolete; sclerine 3 µ thick; laesura 3/4 of spore; verrucae 4 - 5 µ wide, densely aggregated, irregular; margo 44 x 5 µ wide, acute; amb convex-planar (equatorial face); spores 50 (equatorial dimension) x 63 (polar dimension) x 47 µ (lateral dimension).
BCI, Schmalzel 813, MO; plate 8:62.

Polypodium lycopodioides L.
Spores monolete; sclerine 2 µ thick; laesura 1/2 length of spore, ca. 28 x 1 - 1.5 µ; margo 2 µ wide, acute; verrucae 1 - 1.5 µ wide, homogeneous; amb biconvex (equatorial face); spores variable in size, 55 (proximal dimension) x 42 µ (lateral dimension).
BCI, Croat 10160, MO; plate 8:63.

Polypodium maritimum Hieron.
Spores monolete; sclerine 4 - 6 µ thick; laesura 3/4 length of spore; margo 4 - 5 µ wide; amb concave-convex (equatorial face); spores 70 - 80 (equatorial dimension) x 40 - 58 µ (lateral dimension)..
PAN, Tyson 5335, MO; plate 8:64

Polypodium occultum H. Christ. (*Campyloneurum occultum* (H. Crist.) Gómez)
Spores monolete; sclerine psilate, sometimes verrucate, 1.5 - 2.0 µ thick; laesura 35 x 1.0 - 1.5 µ; margo thin 1.5 µ wide; amb convex-planar (equatorial face); spores 59 - 63 (equatorial dimension) x 37 - 42 (polar dimension) x 30 - 35 µ (lateral dimension).
BCI, Croat 6281, MO; plate 8:65.

Polypodium pectinatum L.
Spores monolete; sclerine verrucate, 1.0 - 1.5 µ thick; laesura 3/4 length of spore; margo 3 µ wide; amb slightly concave-convex (equatorial face); verrucae variable, decreasing toward aperture, ca. 4 µ diameter; spores 52 (equatorial dimension) x 36 µ (lateral dimension).
BCI, Croat 5351, MO; plate 8:66.

Polypodium percussum Cav. (*Microgramma percussa* (Cav.) Sota)
Spores monolete; sclerine verrucate, 5 - 6 µ thick; laesura 1/2 length of spore; narrow; margo 5 µ wide; verrucae small, 4 µ wide; amb concave-convex (equatorial face); spores 71 - 80 (equatorial dimension) x 52 - 53 (polar dimension) x 38 µ (lateral dimension).
BCI, Schmalzel 795, MO; plate 9:67.

Polypodium phyllitidis L. (*Campyloneurum phyllitidis* (L.) Presl)
Spores monolete; sclerine verrucate, 2 - 2.5 µ thick; laesura 3/4 length of spore to as long as spore, narrow; margo 3 µ wide, irregular, bordered by dense verrucae; amb elliptical-biconvex ·proximal face) and convex-planar (equatorial face); spores 75 (equatorial dimension) x 55 µ (lateral dimension).
BCI, Schmalzel 713, MO; plate 9:68.

Polypodium polypodioides (L.) Watt.
Spores monolete; sclerine verrucate, 2.5 - 3 µ thick; laesura 40 x 2 µ; margo 2 µ wide; verrucae sessile, variable, 1 - 3 µ wide; amb elliptical biconvex (proximal face); spores 59 - 64 (equatorial dimension) x 50 (polar dimension) x 43 µ (lateral dimension).
PAN, Tyson 5774, MO; plate 9:69.

Polypodium triseriale Sw.
Spores monolete; sclerine verrucate, 3 µ thick; laesura 40 x 3 µ; margo 4 µ wide; amb elliptical-biconvex (proximal face) and concave-convex (equatorial face); verrucae 6 - 10 µ wide; spores 68 (equatorial dimension) x 52 µ (lateral dimension).
PAN, Dwyer, no voucher, MO; plate 9:70.

Pteris altissima Poir. in Lam.
Spores trilete; sclerine psilate to fossulate; 2 µ thick at radial area, 6 µ thick at inter-radial area; laesura extending 2/3 to equator; margo conspicuous; amb subangular (proximal face); spores 52 (equatorial dimension) x 35 µ (lateral dimension); perine psilate, inconspicuous.
PAN, Croat 11509, MO; plate 9:71.

Pteris grandifolia L.
Spores trilete; sclerine fossulate; 2 µ thick at radial area, 10 µ thick at inter-radial area; laesura narrow, extending to equator; commisure bordered by thick margo 17 µ wide; amb subangular to circular (proximal face); spores 70 µ (equatorial dimension); perine present, psilate, showing slightly baculate-verrucate undulating projections.
PAN, Schmalzel 781, MO; plate 9:72.

Pteris propinqua J. Agardh
Spores trilete; sclerine fossulate, 4 - 5 µ thick; laesura baculate on proximal face; commisure bordered by thin margo, 1.0 - 1.5 µ wide; amb subangular (proximal face); spores 40 µ (equatorial dimension); perine apparently absent.
BCI, Croat 8480, MO; plate 9:73.

Saccoloma elegans Kaulf.
Spores trilete; sclerine psilate, < 1 µ thick; laesura linear, reaching equator, narrow; commisure bordered by thin margo; amb subangular (proximal face); spores 30 µ (equatorial dimension); perine strongly striate; striae narrow, without special orientation
BCI, Schmalzel 802, MO; plate 10:74.

Tectaria euryloba (H. Christ) Max. (*Tectaria nicotianifolia* (Baker) Christensen)
Spores monolete; sclerine psilate, 1 µ thick; laesura near 1/2 length of spores, 24 x 1 µ; commisure bordered by thin margo, 1 µ wide; amb elliptical-biconvex (proximal face) and slightly convex-planar (equatorial face); spores 43 (equatorial dimension) x 30 µ (lateral dimension); perine echinulate, spinulae sharp, 5 - 7 µ long, densely aggregated.
BCI, Croat 511, MO; plate 10:75.

Tectaria incisa Cav.
Spores monolete; sclerine psilate, 1.5 µ thick; laesura as long as spore, narrow; commisure bordered by conspicuous margo, 2 µ wide; amb irregularly elliptical (proximal face); spores 50 (equatorial dimension) x 40 (polar dimension) x 30 µ (lateral dimension); perine echinulate, spinulae < 1 µ high; undulating, densely aggregated; perine 6 - 10 µ wide.
BCI, Schmalzel 809, MO; plate 10:76.

Thelypteris balbisii (Spreng.) Ching
Spores monolete; sclerine psilate, 2 µ thick; laesura 1/2 length of spore, narrow; amb elliptical-biconvex (proximal face) and convex-planar (equatorial face); spores 45 (equatorial dimension) x 33 µ (polar dimension); perine baculate, 7 µ high, undulating.
BCI, Schmalzel 710, MO; plate 10:77.

Thelypteris dentata (Forssk.) E. St. John
Spores monolete; sclerine psilate, 1 µ thick; laesura 2/3 length of spore, ca. 20 x 1 µ; amb elliptical-biconvex (proximal face) and convex-planar (equatorial face); spores 32 (equatorial dimension) x 22 µ; perine echinulate, spinulae conical 3 µ high x 2 - 2.5 µ wide, sharp; perine displaying long projections.
BCI, Croat 8669, MO; plate 10:78.

Thelypteris extensa (Blume) Mort.
Spores monolete; sclerine psilate, 1.5 µ thick; laesura ca. 3/4 length of spore, sinuous, poorly defined; amb elliptical biconvex (proximal face) to convex-planar (equatorial face); spores 32 (equatorial dimension) x 25 µ (lateral dimension); perine absent.
BCI, Croat 6517, MO; plate 10:79.

Thelypteris nicaraguensis (Fourn.) Mort.
Spores monolete; sclerine psilate, 2 µ thick; laesura as long as spore; commisure bordered by thick margo, 4 µ wide; amb elliptical-biconvex (proximal face) and slightly convex-planar (equatorial face); spores 53 (equatorial dimension) x 40 - 42 µ (lateral dimension); perine psilate, fragile, irregular, undulating.
BCI, Croat 4251, MO; plate 10:80.

Thelypteris polleana (Bory) Proct.
Spores monolete; sclerine psilate, 1.0 - 1.5 µ thick; laesura 3/4 length of spore; commisure, bordered by margo 2 µ wide, acute; amb elliptical-biconvex (proximal face) and concave-convex (equatorial face); spores 50 (equatorial dimension) x 38 µ (lateral dimension); perine strongly undulating, displaying large projections, irregular.
BCI, Croat 6988, MO; plate 11:81.

Thelypteris serrata (Cav.) Alston
Spores monolete; sclerine verrucate; 1.0 - 1.5 µ thick; laesura 3/4 length of spore; verrucae sessile, aggregated; 1 µ wide; amb elliptical-biconvex (proximal face) and convex-planar (equatorial face); spores 60 (equatorial dimension) x 40 µ (lateral dimension); perine microspinulose, irregular, undulating.
PAN, Tyson et al. 4601, MO; plate 11:82.

Thelypteris torresiana (Gaud.) Alston
Spores monolete; sclerine scabrate, 2 µ thick; laesura 3/4 length of spore; narrow; amb elliptical-biconvex (proximal face) and plano-convex (equatorial face); spores 48 - 53 (equatorial dimension) x 30 - 34 µ (lateral dimension); perine irregular, folded, 3 - 4 µ wide, psilate.
BCI, Croat 7715, MO; plate 11:83.

Thelypteris totta (Thunb.) Schelpe
Spores monolete; sclerine psilate, 2 µ thick; laesura as long as spore, narrow; margo poorly defined; amb elliptical-biconvex (proximal face) and convex-planar (equatorial face); spores 53 (equatorial dimension) x 24 µ (lateral dimension); perine perforate, undulating, irregular.
BCI, Schmalzel 814, MO; plate 11:84.

Vittaria graminifolia Kaulf.
Spores trilete; sclerine psilate, 1.5 µ thick; laesura extending to equator, thick, resembling large "costa"; amb subangular (proximal face); spores 45 µ (equatorial dimension); perine absent.
PAN, Croat & Porter 16104, MO; plate 11:85.

Vittaria lineata (L.) J. Sm.
Spores monolete; sclerine psilate, 2 µ thick; laesura as long as spore x 3 - 4 µ wide; commisure bordered by thin margo; amb elliptical-biconvex (proximal face) and convex-planar and concave-convex (equatorial face); spores 60 - 65 (equatorial dimension) x 33 - 40 µ (lateral dimension); perine absent.
BCI, Croat 4011A, MO; plate 11:86.

SALVINIACEAE

Spores trilete; heteropolar, radially symmetric; sclerine psilate; laesura well-defined, reaching equator, very narrow; amb circula (proximal face); spores 23 - 31 µ (equatorial dimension); perine absent. *(1 genus, 1 species).*

Salvinia radula Baker
Sclerine 1.0 - 1.5 µ thick; laesura < 1 µ wide, margo apparently absent; spores 23 - 31 µ (equatorial dimension).
BCI, Schmalzel 1186, MO; plate 12:87.

SCHIZAEACEAE

Spores monolete, heteropolar-bilateral and spores trilete, heteropolar-radially symmetric; sclerine psilate-verrucate to gemmate, 1 - 10 µ thick; laesura narrow, 3/4 length of radius or reaching equator; margo conspicuous in trilete type, 2 - 6 µ wide; amb elliptical (proximal face) concave-convex (equatorial view) when monolete and subangular convex (proximal face) when trilete; spores 39 - 110 µ (equatorial dimension); perine present in trilete forms. *(2 genera, 3 species).*

Key to genera and species:

1a. Monolete; psilate-verrucate; sclerine 1 μ thick; spores 39 μ (equatorial dimension)..... *Schizaea elegans*
1b. Trilete; gemmate; sclerine 3 - 10 μ thick; spores 75 - 110 μ
  2a 75 - 80 μ; sclerine 3 - 4 μ thick; gemmae irregular..... *Lygodium venustum*
  2b. 100 - 110 μ; sclerine 8 - 10 μ thick; gemmae isodiametric..... *Lygodium radiatum*

Lygodium radiatum Prantl.
Spores trilete; sclerine 8 - 10 μ thick, gemmate; gemmae isodiametric 5 μ high; laesura extending to equator; narrow; commisures bordered by broad margo, ca. 2 - 6 μ wide; margo densely gemmate; spores 100 - 110 (equatorial dimension) x 98 μ (polar dimension); perine present, thick, appearing rugulate, undulating slightly.
BCI, Schmalzel 241, MO; plate 12:89.

Lygodium venustum Sw.
Spores trilete; sclerine 3 - 4 μ thick, gemmate; gemmae irregularly aggregated; 1 - 4 μ at distal area to 10 μ at radial area; laesura extending to equator; narrow; commisure bordered by conspicuous margo, ca. 6 μ wide; spores 75 - 80 μ (equatorial dimension); perine present, irregular, rugulate.
BCI, Schmalzel 777, MO; plate 12:88.

Schizaea elegans (Vahl.) Sw.
Spores monolete; sclerine psilate-verrucate; 1 μ thick; laesura curved, inconspicuous, appearing as long as 3/4 length of spore; margo absent or if present inconspicuous; spores 39 (equatorial dimension) x 26 μ (polar dimension); perine absent.
BCI, Foster 2795, MO; no plate.

GYMNOSPERMAE—GNETOPHYTA

GNETACEAE

Monad, heteropolar-bilateral, monosulcate; exine tectate; sexine baculate, appearing as granulate type; sulcus inconspicuous, as long as grain; baculum inconspicuous, short; grain form circular-irregular (proximal face); grains 13 - 14 μ (equatorial axis). (*1 genus, 1 species*).

Gnetum leyboldii Tul. var. ***woodsonianum*** Markg.
Exine < 1 μ thick; sulcus narrow, ca. 1 μ wide; inconspicuous; baculum < 0.5 μ high, isodiametric; grains small.
BCI, Schmalzel 398, MO; plate 12:90.

ANGIOSPERMAE—MONOCOTYLEDONEAE[1]

ALISMATACEAE

Monad; apolar-asymmetric; periporate; exine tectate; sexine echinate, densely columellate; grains spheroidal, 24 - 27 μ. *(1 genus, 1 species).*

Sagittaria lancifolia L.
Exine 1.0 - 1.5 μ thick; nexine easily distinguishable from sexine; echinate, echini narrow and sharp, < 1 μ high; grains appearing 5-porate; pores inconspicuous, resembling small punctures covered by fine membrane; grains 24 - 27 μ.
BCI, Schmalzel 315, MO; plate 12:91.

AMARYLLIDACEAE

Monad; heteropolar-bilateral; monosulcate; exine tectate to intectate; sexine clavate, echinate and reticulate, exine 1 - 6 μ thick; sulcus as long as grain displaying irregular margins; apertures always on distal face; amb elliptical, grains suboblate to oblate, 75 - 165 μ x 35 - 135 μ (equatorial dimension) x 30 - 90 μ (polar dimension). *(3 genera, 3 species).*

Key to genera and species:

1a. Exine tectate or semitectate
  2a. Echinate; grains < 100 μ (equatorial dimension)..... *Crinum erubescens*
  2b. Reticulate; grains > 150 μ ..... *Hymenocallis pedalis*
1b. Exine intectate; sexine clavate; grains 75 - 120 μ..... *Amaryllis belladonna*

Amaryllis belladonna L.
Exine intectate, 1.0 - 1.5 μ thick; sexine clavate, clavate homogeneous 1 μ high x 1.5 μ wide, grain appearing reticulate; clavae forming groups of 14 clavae 5 μ in diameter; sulcus as long as grain, narrow, with irregular margin, form elliptical, grains suboblate 75 - 120 μ x 31 - 62 μ (equatorial dimension) x 30 - 58 μ (polar dimension).
BCI, Schmalzel 523, MO; plate 12:92.

Crinum erubescens Ait.
Exine tectate, 2 μ thick; sexine echinulate; echini conical 2 - 2.5 μ x 1.5 - 2.0 μ; aggregated on grain surface; sexine easily distinguishable from nexine; sulci 70 x 8 μ, irregular; form elliptical; grains suboblate, 82 - 93 x 60 - 65 μ (equatorial dimension) x 38 - 50 μ (polar dimension).
BCI , Schmalzel 217, MO; plate 12:93.

Hymenocallis pedalis Herb.
Exine semitectate, 6 μ thick; sexine lopho-reticulate; brochi wide 16 x 10 μ decreasing toward apices, forming small free bacula 7 μ high x 4 μ wide; muri 4 - 5 μ wide simplibaculate; form angular to elliptical; grains oblate 150 - 165 x 97 - 135 μ (equatorial dimension).
BCI, Schmalzel 1026, MO; plate 12:94.

ARACEAE

Monad and tetrad (*Xanthosoma* spp.); apolar-asymmetric, isopolar radiosymmetric and heteropolar-bilateral; monosulcate, polyplicate, triporate, periporate (4 - 6 porate) and inaperturate; exine tectate to intectate, frequently displaying indistinct stratification; sexine psilate, scabrate, foveolate, reticulate, verrucate, and echinate; exine < 0.5 - 3.0 μ thick; sulcus poorly differentiated frequently as long as grain; pores inconspicuous, resembling a small broken area; amb irregular to circular, grains peroblate to spheroidal, 10 - 125 μ. *(13 genera, 43 species).*

Key to genera and species:

1a. Grains arranged in tetrads
  2a. Square tetrads < 70 μ
    3a. Grains 35 μ; sexine granulate..... *Xanthosoma helleborifolium*
    3b. 36 - 50 μ; sexine psilate..... *Xanthosoma nigrum*
  2b. Square tetrads 71 - 86 μ; grains 50 - 60 μ..... *Xanthosoma pilosum*
1b. Grains occurring as monads
  4a. Stephanocolpate (polyplicate)
    5a. Grains 17 - 21 μ; ca. 24 colpoid grooves; exine < 1.5 μ thick..... *Spathiphyllum friedrichsthalii*
    5b. 14 - 18 x 23 - 25 μ; < 24 colpoid grooves; exine > 1.5 μ thick..... *Spathiphyllum phryniifolium*
  4b. Monosulcate
    6a. Spheroidal
      7a. > 40 μ (equatorial dimension)
        8a. Exine 2.5 μ thick; grains > 50 μ..... *Caladium bicolor*
        8b. Exine 1.0 μ thick; grains < 50 μ..... *Philodendron hederaceum*
      7b. < 40 μ..... *Homalomena wendlandii*
    6b. Peroblate to suboblate
      9a. Oblate to peroblate

[1]asterisk denotes synonym given in Croat (1978), bracketed name denotes senior synonym

10a. Exine ≤ 2 μ thick
11a. Sulcus 45 x 5 μ ..... *Philodendron grandipes*
11b. Sulcus as long as grain x 2 μ wide ..... *Philodendron tripartitum*
10b. Exine > 2 μ thick; sulcus 3/4 length of grain, narrow ..... *Philodendron panamense*
9b. Oblate to suboblate
12a. < 35 μ (equatorial dimension)
13a. Exine 1.0 - 1.5 μ thick
14a. Sulcus 2/3 length of grain ..... *Philodendron inaequilaterum*
14b. Sulcus as long as grain ..... *Philodendron nervosum**
13b. Exine 2. 5 - 3.0 μ thick ..... *Philodendron pterotum*
12b. > 35 μ (equatorial dimension)
15a. 40 - 50 μ
16a. Exine 1 μ thick ..... *Philodendron scandens*
16b. Exine 1.5 - 2.0 μ thick
17a. Sulcus as long as grain
18a. Sulcus 1.5 μ wide ..... *Philodendron guttiferum**
18b. Sulcus 5 μ wide ..... *Philodendron radiatum*
17b. Sulcus 2/3 length of grain ..... *Philodendron fragrantissimum**
15b. 35 - 40 μ
19a. Sulcus 2 - 3 μ wide ..... *Rhodospatha moritziana*
19b. Sulcus < 1 μ wide ..... *Rhodospatha wendlandii*
4c. Periporate (3 - 6 pores)
20a. Scabrate ..... *Anthurium ochranthum*
20b. Reticulate
21a. Exine ≤ 1 μ thick
22a. < 20 μ ..... *Anthurium tetragonum**
22b. > 20 μ ..... *Anthurium bombacifolium**
21b. Exine 1 - 2.5 μ thick
23a. 25 - 30 μ ..... *Anthurium scandens*
23b. 17 - 23 μ
24a. Exine 2.0 - 2.5 μ thick ..... *Anthurium clavigerum*
24b. Exine 1.0 - 1.5 μ thick
25a. Homobrochate ..... *Anthurium brownii*
25b. Heterobrochate ..... *Anthurium gracile*
4d. Inaperturate
26a. Psilate
27a. < 60 μ
28a. Exine < 1 μ thick ..... *Pistia stratiotes*
28b. Exine > 1.5 thick
29a. 44 - 50 μ ..... *Syngonium erythrophyllum*
29b. 50 - 52 μ ..... *Monstera dubia*
27b. > 60 μ
30a. 60 - 90 μ ..... *Dieffenbachia oerstedii, D. pittieri*
Montrichardia arborescens
30b. 105 - 125 μ ..... *Dieffenbachia longispatha*
26b. Foveolate ..... *Monstera dilacerata*
26c. Scabrate
31a. 10 - 13 μ ..... *Stenospermation angustifolium*
31b. 16 - 18 μ ..... *Anthurium flexile*
26d. Echinate
32a. 38 - 60 μ; echini conical, 5 x 2 μ, exine 7 - 8 μ thick ..... *Syngonium podophyllum*
32b.14 - 19 μ; echinulate, exine 0.5 μ thick ..... *Anthurium dugandii,*
A. friedrichsthalii, A. littorale
26e. Reticulate
33a. Exine < 1 μ; grains 45 - 50 μ ..... *Monstera adansonii* var. *laniata*
33b. Exine 2.0 - 2.5 μ; grains 15 - 25 μ
34a. Exine 2 μ thick; brochi 1 μ; wide grains 15 - 18 μ ..... *Anthurium acutangulum*
34b. Exine 2.5 μ thick; brochi 2 μ; wide grains 23 - 24 μ ..... *Anthurium bakeri*

Anthurium acutangulum Engler
Monad; apolar-asymmetric; exine 2 μ thick, semitectate; inaperturate; sexine reticulate, homobrochate, brochi 1 μ wide; muri < 0.5 μ thick; grains spheroidal, 15 - 18 μ.
PAN, Croat 12858, MO; plate 13:95.

Anthurium bakeri Hook
Monad; apolar-asymmetric; inaperturate; exine semitectate, 2.5 μ thick; sexine reticulate, homobrochate; brochi 2 μ wide; muri < 1 μ; simplibaculate; bacula 1.5 μ high; lumina displaying ectecxinic processes; grains spheroidal, 23 - 24 μ.

Anthurium bombacifolium Schott (*A. pentaphyllum* (Aubl.) G. Don. var. *bombacifolium* (Schott) M. Madison)
Monad; apolar-asymmetric; 3 - 5 porate; exine tectate, 1 μ thick; sexine reticulate, homobrochate; brochi < 1 μ wide; muri simplibaculate; pores inconspicuous; grains spheroidal, 21 - 28 μ.
BCI, Schmalzel 1311, MO; plate 13:97.

Anthurium brownii Mast.
Monad; apolar-asymmetric; 3 - 4 porate; exine semitectate, 1.0 - 1.5 μ thick; sexine reticulate, homobrochate; brochi < 1 μ wide; muri simplibaculate; pores circular 1. 5 μ diameter, inconspicuous; grains frequently spheroidal, 17 - 19 μ.
BCI, Schmalzel 800, MO; plate 13:98.

Anthurium clavigerum Poepp. & Endl.
Monad; apolar-asymmetric; 3 - 5 porate; exine tectate, 2.0 - 2.5 μ thick; sexine reticulate, homobrochate, brochi < 1 μ wide; muri simplibaculate; pores inconspicuous, circular, covered by fine membrane; grains spheroidal, 18 - 22 μ.
BCI, Schmalzel 225, MO; plate 13:99.

Anthurium flexile Schott
Monad; apolar-asymmetric; inaperturate; exine intectate, 1 μ thick; sexine scabrate, scabrae < 1μ high, isodiametric; amb circular; grains spheroidal, 16 - 18 μ.
PAN, Ducke 5016, MO; plate 13:100.

Anthurium friedrichsthalii Schott
Monad; apolar-asymmetric, inaperturate; exine tectate, 0.5 μ thick; sexine echinulate; echini < 0.5 μ high, narrow, sharp; grains displaying inconspicuous rudimentary aperture (sulcus?); grains frequently spheroidal, 16 - 19 μ.
BCI, Croat 8080, MO; plate 13:102.

Anthurium gracile (Rudge) Lindl.
Monad; apolar-asymmetric; 3 - 6 porate; exine tectate, 1.0 - 1.5 μ thick; sexine reticulate, heterobrochate; brochi 1 - 2 μ wide, muri 0.5 μ wide, simplibaculate; pores 1.5 - 2.0 μ diameter; grains spheroidal, 19 - 23 μ.
BCI, Croat 7957, MO; plate 13:103.

Anthurium littorale Engler (*A. durandii* Engl.)
Monad; apolar-asymmetric; inaperturate; exine tectate, 1 μ thick; sexine echinulate; echini < 0.5 μ high, narrow, sharp; grains spheroidal, 14.0 - 17.5 μ.
BCI, Croat 13989, MO; plate 13:101.

Anthurium ochranthum K. Koch
Monad; isopolar-radiosymmetric; triporate; exine semitectate; 1.5 μ thick, tectum perforate; sexine scabrate, asymmetric, ca. 1 μ high; arrangement resembling fovea with ectexinic element; pores endexinic, 2 μ diameter; amb circular-irregular; grains oblate-spheroidal, 18 x 23 μ.
BCI, Schmalzel 1405, MO; plate 13:104.

Anthurium scandens (Aubl.) Engler in Mart.
Monad; isopolar-radiosymmetric; triporate; exine tectate, 2 μ thick; sexine reticulate, heterobrochate; brochi 0.5 - 1.0 μ wide; muri simplibaculate; pores inconspicuous, ca. 2 μ diameter, resembling small punctures (pseudopori?); amb circular; grains spheroidal, 25 - 29 μ.
BCI, Croat 12346, MO; plate 13:105.

Anthurium tetragonum Hook. ex Schott (*A. salviniae* Hemsl.)
Monad; isopolar-radiosymmetric; triporate; exine semitectate, 0.5 μ thick; sexine reticulate; brochi 1 μ wide; muri < 0.5 μ wide; simplibaculate; pores 2 μ diameter, poorly defined (pseudopori ?); amb circular; grains spheroidal, 16 - 18 μ.
BCI, Schmalzel 1294, MO; plate 13:106.

Caladium bicolor (Ait.) Vent.
Monad; heteropolar-bilateral; monosulcate; exine tectate, 2.5 μ thick; sexine psilate; sulcus long; irregular, poorly defined; resembling an inaperturate grain; grains spheroidal, 46 - 61 μ.
BCI, Croat 10184, MO; plate 13:107.

Dieffenbachia longispatha Engler & Krause
Monad; apolar-asymmetric; inaperturate; exine tectate, < 0.5 μ thick; sexine psilate; grains fragile, susceptible to damage by acetolysis, spheroidal, 105 - 125 μ.
BCI, Stimson 5277, MO; plate 13:108.

Dieffenbachia oerstedii Schott
Monad; apolar-asymmetric; inaperturate; exine tectate, < 0.5 μ thick; sexine psilate; grains fragile, susceptible to damage by acetolysis, frequently spheroidal, 72 - 78μ.
PAN, Tyson et al. 4834, MO; plate 13:109.

Dieffenbachia pittieri Engler & Krause
Monad; apolar-asymmetric; inaperturate, exine tectate, < 0.5 μ thick; sexine psilate; grains susceptible to damage by acetolysis, spheroidal, 60 - 70 μ.
BCI, Croat 12660, MO; plate 13:110.

Homalomena wendlandii Schott
Monad; heteropolar-bilateral;monosulcate; exine tectate, 1.5 - 2.0 μ thick; sexine psilate; sulcus as wide as distal face of grain; margins irregular; grains oblate-spheroidal, 30 - 38 μ.
BCI, Croat 14078, MO; plate 13:111.

Monstera adansonii Schott var. *laniata* (Schott) Madison
Monad; apolar-asymmetric; inaperturate; exine tectate, < 0.5 μ thick; sexine reticulate; homobrochate; brochi ca. 1 μ wide; muri simplicolumellate, grains susceptible to damage by acetolysis, spheroidal, 44 - 55 μ (description based on fresh material).
PAN, Leisner 4840, MO; plate 13:112.

Monstera dilacerata (K. Koch & Sello)
Monad; apolar-asymmetric; inaperturate; exine semitectate, 1.5 - 2.0 μ thick, punctitegillate; sexine foveolate; foveolae 1.0 - 1.5 μ diameter; irregular; grains 41 - 47 x 38 - 47 μ.
BCI, Croat 7251, MO; plate 13:114.

Monstera dubia (H.B.K.) Engler & Krause
Monad; apolar-asymmetric; inaperturate; exine tectate, 1.5 μ thick; sexine psilate; grains displaying incomplete distal face (sulcus?); appearing rectangular-biconvex; grains 50 - 52 x 34 - 35 μ.
BCI, Croat 5476, MO; plate 13:113.

Montrichardia arborescens (L.) Schott
Monad; apolar-asymmetric; inaperturate; exine tectate; < 0.5 μ thick; sexine psilate; grains susceptible to damage by acetolysis; grains spheroidal, 60 - 87 μ.
BCI, Schmalzel 128, MO; plate 14:115.

Philodendron fragrantissimum (Hook.) Kunth (*P. schottianum* Wendl. ex. Schott)
Monad; heteropolar-bilateral; monosulcate; exine tectate; sexine psilate; exine 1.5 - 2.0 μ thick; sulcus as long as 2/3 length of grain, elliptical; grains oblate, 20 - 24 x 40 - 42 μ (equatorial dimension).
PAN, Blum 1273, HFSU; plate 14:116.

Philodendron grandipes Krause
Monad; heteropolar-bilateral; monosulcate; exine tectate; sexine psilate; exine 1.5 - 2.0 μ thick; sulcus 45 μ long x 5 μ wide; rounded at apices; elliptical ; grains oblate to peroblate, 17 - 18 x 45 - 46 μ (equatorial dimension).
BCI, Schmalzel 849, MO; plate 14:117.

Philodendron guttiferum Kunth (*P. auranttifolium* Schott)
Monad; heteropolar-bilateral; monosulcate; exine tectate; sexine psilate; exine 1.5 μ thick; sulcus as long as grain, narrow, with irregular margins; elliptical; grains oblate to peroblate, 11 - 23 x 40 - 47 μ (equatorial dimension).
BCI, Croat 11776, MO; plate 14:118.

Philodendron hederaceum (Jacq.) Schott
Monad; heteropolar-bilateral; monosulcate; exine tectate; sexine psilate; exine 1 μ thick; sulcus inconspicuous, appearing as wide as distal face of grain; grains spheroidal, 50 μ, susceptible to damage by acetolysis.
COL, Dugand & Jaramillo 3296, COL 14414; plate 14:120.

Philodendron inaequilaterum Liebm.
Monad; heteropolar-bilateral; monosulcate; exine tectate; sexine psilate; exine < 1 μ thick; sulcus 2/3 length of grain, inconspicuous; amb elliptical-irregular; grains oblate, 18 - 19 x 25 - 35 μ (equatorial dimension).
BCI, Croat 5831, MO; plate 14:119.

Philodendron nervosum (Schult. & Schult.) Kunth (*P. lewisii* Croat & Grayum)
Monad; heteropolar-bilateral; monosulcate; exine tectate; sexine psilate; exine 1.5 μ thick; sulcus inconspicuous; appearing as wide as distal face; sexine appearing rugulate; grains oblate, 30 - 32 x 18 - 20 μ (equatorial dimension).
CR, KE 17442, MO; plate 14:121.

Philodendron panamense Krause
Monad; heteropolar-bilateral; monosulcate; exine tectate; sexine psilate; exine 2.0 - 2.5 μ thick; sulcus as long as 3/4 length of grain x 1.0 - 1.5 μ wide; grains oblate to peroblate, 48 - 54 x 14 - 15 μ (equatorial dimension).
BEL, Gentry 8033, MO; plate 14:122.

Philodendron pterotum C. Koch & Aug.
Monad; heteropolar-bilateral; monosulcate; exine tectate; sexine psilate; exine 2.5 - 3.0 μ thick; sulcus as long as 2/3 length of grain x 1.0 - 1.5 μ wide; elliptical in polar view; grains oblate, 33 - 35 x 25 - 27 μ (equatorial dimension).
PAN, Croat 10792, MO; plate 14:123.

Philodendron radiatum Schott
Monad; heteropolar-bilateral; monosulcate; exine tectate; sexine psilate; exine 1.5 - 2.0 μ; sulcus as long as grain x 5 μ wide; sulcus having margo ca. 1 μ wide; sexine appearing rugulate; elliptical in polar view; grains suboblate, 42 - 47 x 24 - 25 μ (equatorial dimension).
BCI, Schmalzel 104, MO; plate 14:124.

Philodendron scandens K. Koch & Sell.
Monad; heteropolar-bilateral; monosulcate; exine tectate; sexine psilate; exine 1 μ thick; sulcus as long as grain x 2 μ wide; irregular; irregularly elliptical in polar view; grains suboblate, 46 - 50 x 34 - 36 μ (equatorial dimension).
BCI, Schmalzel 1283, MO; plate 14:125.

Philodendron tripartitum (Jacq.) Schott
Monad; heteropolar-bilateral; monosulcate; exine tectate; sexine psilate; exine 2 μ thick; sulcus as long as grain x 2 μ wide; occasional presence of irregular small scabrae; elliptical in polar view; grains oblate to suboblate, 45 - 46 x 16 - 30 μ (equatorial dimension).
PAN, Correa & Dressler 592, MO; plate 14:126.

Pistia stratiotes L.
Monad; apolar-asymmetric; inaperturate; exine tectate, < 1 μ thick; sexine psilate; monosulcate; grains 17 - 28 x 34 - 37 μ.
BCI, Schmalzel 111, MO; plate 14:127.

Rhodospatha moritziana (Schott) Croat
Monad; heteropolar-bilateral; monosulcate; exine tectate, 1.5 μ thick; sexine psilate, sometimes resembling a rugulate type; sulcus as long as grain x 2 - 3 μ wide; amb elliptical in equatorial view; grains suboblate, 35 - 37 x 23 - 27 μ (equatorial dimension).
PAN, Folson 5910, MO; plate 14:128.

Rhodospatha wendlandii Schott
Monad; heteropolar-bilateral; monosulcate; exine tectate, 1.5 µ thick; sexine psilate; sulcus inconspicuous, as long as grain, narrow; irregularly elliptical; grains suboblate, 37 - 38 x 22 - 24 µ.
PAN, Croat 22931, MO; no plate.

Spathiphyllum friedrichsthalii Schott
Monad; isopolar-radiosymmetric; stephanocolpate; exine semitectate, 1.0 - 1.5 µ thick; sexine psilate; colpoid grooves long and narrow, running lengthwise almost to poles, separating ca. 24 ridges, each 1 µ wide; amb circular; grains subprolate (?), 19 - 21 x 17 - 18 µ, susceptible to damage by acetolysis.
BCI, Schmalzel 103, MO; plate 14:129.

Spathiphyllum phryniifolium Schott
Monad; isopolar-radiosymmetric; stephanocolpate; exine semitectate, 1.5 µ thick; sexine psilate; colpoid grooves long and narrow, separating ca. 20 ridges, each 1 µ wide; amb circular; grains prolate to subprolate (?), 23 - 25 x 14 - 18 µ.
BCI, Croat 17050, NY; plate 14:130.

Stenospermation angustifolium Hemsl.
Monad; apolar-asymmetric; inaperturate; exine intectate, ≤ 0.5 µ thick; sexine scabrate; scabrae < 0.5 µ high; grains spheroidal, 10 - 13 µ.
PAN, Gentry et al. 16903, COL; plate 15:131.

Syngonium erythrophyllum Birds. ex Bunt.
Monad; apolar-asymmetric; inaperturate; exine tectate 2.5 µ thick; sexine psilate, appearing monosulcate due to optical artifact; grains spheroidal, 44 - 52 µ.
PAN, Folson 2558, MO; plate 15:132.

Syngonium podophyllum Schott
Monad; apolar-asymmetric; inaperturate; exine tectate, 7 - 8 µ thick; sexine echinate; echini 5 µ high x 2 µ wide; sharp; conical; grains spheroidal; variable in size, 38 - 42 µ and 50 - 60 µ.
PAN, Tyson & Blum 4003, MO; plate 15:13.

Xanthosoma helleborifolium (Jacq.) Schott
Square tetrad; tetragonal and cross; 55 - 70 µ; isolated grains apolar-asymmetric; inaperturate; exine tectate, 2 µ thick; sexine psilate; grains spheroidal, 30 - 55 µ.
BCI, Schmalzel 670, MO; plate 15:134.

Xanthosoma nigrum (Vell.) Stellf.
Square tetrad; tetrahedral, 65 - 70 µ; isolated grains apolar-asymmetric; inaperturate; exine tectate, 2.5 µ thick; sexine psilate, slightly granulate; grains spheroidal 33 - 36 µ.
PAN, Croat 11423, MO; no plate.

Xanthosoma pilosum K. Koch & Aug.
Square tetrad; tetrahedral and cross; 72 - 86 µ; isolated grains apolar-asymmetric, inaperturate; exine tectate, 2.5 - 3.0 µ thick; sexine psilate; grains spheroidal, 50 - 60 µ.
PAN, Blum & Tyson 596, HFSU; plate 15:135.

BROMELIACEAE

Monad; apolar-asymmetric and heteropolar-bilateral; inaperturate, periporate, monosulcate; exine tectate, semitectate and intectate; sexine scabrate, baculate, verrucate, reticulate, foveolate; exine < 0.5 - 3.0 µ thick; apertures generally irregular; amb poorly defined, irregular to elliptical; grains spheroidal to suboblate, 29 - 60 x 25 - 80 µ, susceptible to damage by acetolysis.
(8 genera, 15 species; additional reference: 33).

Key to genera and species:

1a. Inaperturate
  2a. Scabrate; exine < 0.5 µ thick ..... *Aechmea magdalenae*
  2b. Reticulate; exine 1 - 2.5 µ thick
    3a. < 65 µ ..... *Vriesia sanguinolenta*
    3b. 70 - 80 µ
      4a. Per-reticulate ..... *Vriesia gladioliflora*
      4b. Reticulum homogeneous ..... *Vriesia heliconioides*
1b. Monosulcate
  5a. Scabrate
    6a. Exine < 0.5 µ thick; grains oblate-spheroidal to spheroidal < 30 µ ..... *Guzmania monostachia*
    6b. Exine 1.5 µ thick; grains suboblate > 30 µ (equatorial dimension) ..... *Guzmania lingulata*
  5b. Baculate; exine 3 µ thick; grains 60 - 77 µ (equatorial dimension) ..... *Billbergia porteana**
  5c. Verrucate; exine 2 µ thick; grains 55 - 65 µ ..... *Billbergia macrolepis*
  5d. Foveolate; exine < 0.5 µ thick; grains 46 - 50 µ ..... *Ananas comosus*
  5e. Reticulate
    7a. Exine > 2 µ thick; grains > 50 µ (equatorial dimension)
      8a. Homobrochate; grains 58 - 65 µ ..... *Catopsis sessiliflora*
      8b. Heterobrochate; grains 67 - 90 µ
        9a. Exine 3 µ thick; grains 67 - 74 µ ..... *Aechmea setigera*
        9b. Exine 2 µ thick; grains 76 - 90 µ ..... *Tillandsia bulbosa*

7b. Exine ≤ 1 μ thick; grains < 50 μ
10a. Homobrochate..... *Tillandsia anceps*
10b. Heterobrochate..... *Pitcairnia heterophylla*
1c. Periporate (5 - 6 porate); sexine scabrate; 52 - 60 μ..... *Aechmea pubescens*

Aechmea magdalenae (Andre) Andre ex Baker
Apolar-asymmetric; inaperturate; exine intectate, < 0.5 μ thick; sexine scabrate, scabrae < 0.5 μ high; grains usually spheroidal, 52 - 60 x 38 - 50 μ, susceptible to damage by acetolysis.
BCI, Schmalzel 863, MO, plate 15:136.

Aechmea pubescens Baker
Apolar-asymmetric; stephanoporate (5 - 6 porate); exine semitectate, 1.5 - 2.0 μ thick; tectum perforate; sexine scabrate; pores inconspicuous, 8 - 10 μ diameter, with irregular margins, formed by aggregated small bacula; grains usually spheroidal, 65 - 80 μ.
PAN, Croat 8972, MO; plate 15:137.

Aechmea setigera Mart. ex Schult. in R. & S.
Heteropolar-bilateral; monosulcate; exine semitectate, 3 μ thick; sexine reticulate, heterobrochate; brochi 1 - 3 μ wide; muri simplibaculate, 1 μ wide; bacula conspicuous, 2 μ high; sulcus as long as grain x 2 - 3 μ wide; amb elliptical in polar view; grains suboblate, 49 - 60 x 67 - 74 μ.
BCI, Croat 8595, MO; plate 15:138.

Ananas comosus (L.) Merr.)
Heteropolar-bilateral; monosulcate; exine intectate, < 0.5 μ thick; sexine foveolate; foveolae irregular, 1 - 2 μ wide, free ectexinic elements projecting into lumina; sulcus poorly defined, as long as grain x 8 μ wide; amb irregular to circular; grains suboblate, 32 - 38 x 46 - 50 μ.
BCI, Schmalzel 187, MO; plate 16:139.

Billbergia macrolepis L. B. Smith
Heteropolar-bilateral; monosulcate; exine semitectate, 2.5 μ thick; tectum perforate; sexine verrucate, verrucae 1.5 - 2.0 μ high x 2 μ wide; sulcus as long as grain, wide; amb irregular to elliptical; grains suboblate, 33 - 38 x 55 - 65 μ.
COL, Foster & Foster 1792, COL 40975; no plate.

Billbergia porteana (Brongniart ex Beer)
Heteropolar-bilateral; monosulcate; exine intectate, 3 μ thick; sexine baculate, bacula isodiametric, dense, 2 μ high x 1 μ wide; sulcus inconspicuous, as long as grain, narrow; edges formed by free small bacula; amb usually circular; grains oblate-spheroidal to suboblate, 60 - 70 x 68 - 77 μ.
BRZ, Irwin et al. 32575, MO; plate 16:140.

Catopsis sessiliflora (R. & P.) Mez. in DC
Heteropolar-bilateral; monosulcate; exine semitecate, 2 μ thick; sexine reticulate, homobrochate, brochi 1.0 - 1.5 μ wide; muri < 1 μ wide; simplibaculate, bacula conspicuous, dense, 1.5 μ high x 1 μ wide; sulcus 2/3 length of grain x 2 - 3 μ wide; amb elliptical in polar view; grains suboblate, 37 - 40 x 58 μ.
PAN, Foster & Hammell 2906, MO; plate 16:141.

Guzmania lingulata (L.) Mez. var. ***minor*** (Mez.) L. B. Smith & Pittend.
Heteropolar-bilateral; monosulcate; exine tectate, 1.5 μ thick, densely columellate; sexine scabrate; sulcus inconspicuous, as long as grain, narrow; amb irregular to circular, slightly elliptical in polar view; grains suboblate, 30 - 34 x 43 - 46 μ.
PAN, Gentry & Clary 6948, MO; no plate.

Guzmania monostachia (L.) Rusby ex Mez. in DC.
Heteropolar-bilateral; monosulcate; exine intectate, < 0.5 μ thick; sexine scabrate; scabrae dense < 0.5 μ, usually circular; grains spheroidal to oblate-spheroidal, 26 - 29 x 29 - 32 μ.
BCI, Schmalzel 693, MO; plate 16:142.

Pitcairnia heterophylla (Lindl.) Beer.
Heteropolar-bilateral; monosulcate; exine semitectate, 1 μ thick; sexine reticulate, heterobrochate; brochi diminishing toward apex, 2 - 0.5 μ wide; muri narrow < 0.5 μ wide, simmplibaculate; bacula < 1 μ high, conspicuous; sulcus as long as grain x 3 - 4 μ wide; grains irregular, suboblate, 27 - 28 x 42 - 45 μ.
PAN, Hunter & Allen 364, MO; no plate.

Tillandsia anceps Lodd.
Heteropolar-bilateral; monosulcate; exine semitectate, 0.5 μ thick; sexine reticulate, homobrochate; brochi and muri < 0.5 μ wide; simplibaculate; amb irregular; grains suboblate, 25 - 27 x 44 - 47 μ.
NIC, Molina 15036, NY; no plate.

Tillandsia bulbosa Hook.
Heteropolar-bilateral; monosulcate; exine semitectate, 2 μ thick; sexine reticulate, heterobrochate; brochi 1 - 3 μ wide, muri simplibaculate, narrow; bacula 2.0 x 0.5 μ; sulcus inconspicuous as long as grain; grains suboblate, 58 - 69 x 76 - 90 μ.
BCI, Schmalzel 1008, MO; plate 16:143.

Vriesia gladioliflora (Wendl.) Ant.
Apolar-asymmetric; inaperturate; exine semitectate, 1 - 2 μ thick; sexine reticulate; grains per-reticulate, heterobrochate; brochi 3 - 4 μ wide to 0.5 μ on apex; muri narrow, simplibaculate; bacula 1 - 2 μ high; sulcus apparently absent; grains 70 - 83 x 65 - 71 μ.
PAN, Schmalzel 1070, MO; plate 16:144.

Vriesia heliconioides (H.B.K.) Hook. ex Walp.
Apolar-asymmetric; inaperturate; exine semitectate, 1.5 - 2.5 μ thick; sexine reticulate, heterobrochate; brochi 5 - 0.5 μ wide; muri simplibaculate, narrow; grains 74 - 80 x 49 - 55 μ.
PAN, Tyson & Dwyer 4470, MO; plate 16:145.

Vriesia sanguinolenta Cogn. & Marchal
Apolar-asymmetric; inaperturate; exine semitectate, 1.0 - 1.5 µ thick; sexine reticulate, heterobrochate; brochi ca. 4 - 10 µ wide, muri simplibaculate, narrow; grains 58 - 61 x 37 - 38 µ; (description based on fresh material).
CR, Foster 2693, MO; no plate.

BURMANNIACEAE

Monad; heteropolar-radiosymmetric; monoporate; exine tectate; sexine psilate; pores common type; grains usually spheroidal , 29 - 47 µ. (*1 genus, 1 species*).

Thismia panamensis (Standl.) Jonk.
Exine 1 µ thick; pores 3 µ diameter, circular; grains frequently elliptical to spheroidal, 41 - 47 x 29 - 30 µ.
BCI, Schmalzel 979, MO; plate 16:146.

COMMELINACEAE

Monad; heteropolar-bilateral; monosulcate; exine tectate to intectate, < 1 - 4 µ thick; sexine scabrate, echinate, rugulate-verrucate, reticulate; aperture irregular, inconspicuous, generally as long as grain; amb elliptical-biconvex in polar view, grains suboblate to oblate-spheroidal, 12 - 41 x 19 - 68 µ. (*6 genera, 6 species; additional reference: 147).*

Key to genera and species:

1a. Scabrate
  2a. Exine 1 µ thick; grains < 40 µ (equatorial dimension)
    3a. Suboblate; 19 - 21 x 12 - 15 µ..... *Callisia ciliata*
    3b. Oblate-spheroidal; 25 - 26 x 19 - 20 µ..... *Gibasis geniculata*
  2b. Exine > 1.5 µ thick; grains 40 - 48 µ..... *Dichorisandra hexandra*
1b. Echinate (exine 3.5 - 4 µ thick; grains 67 - 68µ)..... *Commelina erecta*
1c. Rugulate-verrucate (exine 2.0 µ thick; grains 38 - 47 µ)..... *Campelia zanonia*
1d. Reticulate (exine < 0.5 µ thick; grains 33 - 35 µ)..... *Tripogandra serrulata*

Callisia ciliata HBK
Exine tectate, 1 µ thick; sexine scabrate, densely columellate; sulcus long, somewhat irregular with thicker columellae on sulcus edge; amb elliptical-biconvex in polar view; grains suboblate, 12 - 15 x 19 - 21 µ.
BCI, Schmalzel 250, MO; plate 16:149.

Campelia zanonia (L.) HBK
Exine intectate, 2 µ thick; sexine rugulate-verrucate; rugulae variable forming small, free bacula, 2 µ high; verrucae inconspicuous, sulcus having irregular margin, as long as grain, narrow; amb elliptical in polar view; biconvex; grains suboblate, 25 - 28 x 38 - 47 µ.
BCI, Schmalzel 873, MO; plate 16:147.

Commelina erecta L.
Exine intectate, 3.5 - 4.0 µ thick; nexine 1 µ thick; sexine echinate; echini short, rounded, 2.0 - 2.5 µ high x 1.5 - 2.0 µ wide; sulcus 2/3 as long as grain x 1 - 2 µ wide; amb elliptical-biconcave in polar view; grains suboblate 67 - 68 x 38 - 41 µ.
PAN, Schmalzel, no voucher, MO; plate 16:148.

Dichorisandra hexandra (Aubl.) Standl. in Standl. & Cald.
Exine tectate, 1.5 - 2.0 µ thick; sexine scabrate; sulcus irregular, narrow, as long as grain; margins delimited by small scabrae; amb elliptical in polar view; grains suboblate 27 - 28 x 40 - 48 µ.
BCI, Croat 11435, MO; plate 16:150.

Gibasis geniculata (Jacq.) Rohw.
Exine tectate, 1 µ thick; sexine scabrate; scabrae < 0.5 µ high; sulcus wide, 2/3 length of grain, irregular; amb elliptical-biconvex; grains oblate-spheroidal, 25 - 26 x 19 - 20 µ.
MEX, Breedlove 34644, MO; no plate.

Tripogandra serrulata (Vahl) Handl.
Exine tectate, < 1 µ thick; sexine reticulate, homobrochate; brochi < 1 µ wide; muri simplibaculate < 0.5 µ wide; sulcus inconspicuous, sinuous, narrow; amb elliptical in polar view; grains suboblate, 18 - 19 x 33 - 35 µ.
PAN, Sullivan 624, MO; plate 17:151.

CYCLANTHACEAE

Monad; heteropolar-radiosymmetric and heteropolar-bilateral; monoporate, monosulcate; exine tectate to semitectate, 1 - 2 µ thick; sexine scabrate and reticulate (homobrochate); pores circular, conspicuous; sulcus variable narrow to wide, margins irregular; amb elliptical biconvex in polar view; grains suboblate to oblate, 16 - 27 µ. (*4 genera, 5 species*).

Key to genera and species:

1a. Monosulcate
  2a. Reticulate; (exine > 1 µ thick; suboblate; grains < 35 µ; sulcus narrow)..... *Asplundia alata*
  2b. Scabrate

3a. Exine ≤ 1 μ thick; oblate-spheroidal; grains > 35 μ; sulcus wide as grain..... *Cyclanthus bipartitus*
3b. Exine 1.5 μ thick; oblate; grains < 35 μ; sulcus narrow, as long as grain..... *Ludovia integrifolia*
1b. Monoporate
4a. Exine 2 μ thick; pore 6 μ diameter..... *Carludovica drudei*
4b. Exine 1.5 μ thick, pore 8 μ diameter..... *Carludovica palmata*

Asplundia alata Harl.
Heteropolar-bilateral; monosulcate; exine semitectate, 1.0 - 1.5 μ thick; sexine reticulate, homobrochate; brochi < 1 μ wide, muri simplibaculate; sulcus as long as grain, thin, sinuous; amb elliptical, plano-convex (polar view); grains suboblate, 21 - 23 x 29 - 33 μ.
PAN, Croat 10204, MO; plate 17:152.

Carludovica drudei Mast.
Apolar-asymmetric; monoporate; exine semitectate, 2 μ thick; sexine reticulate, homobrochate; brochi 1 μ wide; muri < 0.5 μ wide simplibaculate; baculum conspicuous, 1.5 μ high; pore circular, 6 μ diameter, common type, on apex of grain; grains elliptical, 19 - 20 x 27 - 28 μ.
PAN, Stimson 5268, MO; plate 17:153.

Carludovica palmata R. & P.
Apolar-asymmetric; monoporate; exine semitectate, 1.5 μ thick; sexine reticulate, homobrochate, brochi < 0.5 μ wide; muri narrow; simplibaculate; pore circular, 8 μ diameter; common type on apex of grain; grains oblate, 16 - 17 x 28 - 30 μ.
PAN, Blum & Tyson 2003, MO; plate 17:154.

Cyclanthus bipartitus Poit.
Heteropolar-bilateral; monosulcate; exine tectate, 1 μ thick; sexine scabrate; scabrae < 0.5 μ high; sulcus irregular to well defined, frequently appearing as wide as distal face of grain, less frequently rounded 3/4 length of grain x 9 μ wide; amb elliptical in polar view; grains suboblate, 25 - 27 x 38 - 40 μ.
BCI, Schmalzel 625, MO; plate 17:155.

Ludovia integrifolia (Woods.) Harl.
Heteropolar-bilateral; monosulcate; exine tectate, 1.5 μ thick; sexine scabrate, scabrae < 0.5 μ high; sulcus narrow, as long as grain; amb circular (lateral view), to elliptical (polar view); grains oblate, 14 - 17 x 32 - 36 μ.
COL, Hugh-Jones 288, COL 94186; plate 17:156.

CYPERACEAE

Monad; apolar-asymmetric; inaperturate, monoporate, aberrantly triporate (vestigal fossulae?), periporate (4 - 7 porate); exine tectate to intectate, 0.5 - 2 μ thick; sexine scabrate, baculate, verrucate; pores generally inconspicuous circular to oval, ectexinic, covered by membrane, irregularly arranged on distal face of grain when periporate; sexine densely columellate, columellae conspicuous; grains irregular displaying several types, frequently trapezoidal to elliptical; grains appearing oblate to spheroidal, 17 - 52 x 21 - 61 μ (polar view). *(9 genera, 26 species).*

Key to genera and species:

1a. Inaperturate
2a. Scabrate; exine < 1 μ thick; grains ≤ 45 μ..... *Fimbristylis dichotoma*
2b. Baculate; exine 1.0 - 1.5 μ thick; grains > 45 μ..... *Eleocharis plicarhachis*
1b. Porate
3a. Monoporate
4a. ≤ 40 μ (long axis)
5a. Pore ≤ 5 μ diameter
6a. 36 - 40 μ..... *Fuirena umbellata*
6b. 30 - 35 μ
7a. Exine > 1.0 μ thick..... *Rhynchospora nervosa*
7b. Exine 0.5 μ thick
8a. Pore inconspicuous..... *Eleocharis caribaea**
8b. Pore conspicuous, 5 μ diameter..... *Rhynchospora corymbosa*
5b. Pore 8 - 10 μ diameter..... *Scleria secans*
4b. > 40 μ (long axis)
9a. 55 - 60 μ..... *Cladium jamaicense*
9b. 41 - 50 μ
10a. Exine < 1 μ thick
11a. Amb trapezoidal..... *Scleria pterota**
11b. Amb circular to elliptical..... *Eleocharis elegans*
10b. Exine 1.5 μ thick
12a. 45 - 48 μ; pore 10 μ diameter..... *Scleria macrophylla*
12b. 41 - 44 μ; pore 12 μ diameter..... *Scleria mitis*
3b. Triporate
13a. > 35 μ (long axis)
14a. 55 - 60 μ; exine < 1 μ thick..... *Cladium jamaicense*
14b. 35 - 45 μ; exine 1.5 μ thick..... *Scirpus cubensis**
13b. < 35 μ (long axis)
15a. Exine 2 μ thick..... *Cyperus diffusus*
15b. Exine 1.0 - 1.5 μ thick
16a. 20 - 21 μ
17a. Exine 1 μ thick..... *Calyptrocarya glomerulata*
17b. Exine 1.5 μ thick..... *Cyperus brevifolius*
16b. 28 - 32 μ

18a. Scabrate
19a. Amb trapezoidal ..... *Cyperus simplex*
19b. Amb circular-irregular ..... *Rhynchospora cephalotes*
18b. Baculate ..... *Cyperus luzulae*
2c. Periporate
20a. 4 - 5 porate
21a. Baculate ..... *Cyperus haspan*
21b. Scabrate
22a. > 30 µ (long axis)
23a. Pores ca. 10 µ diameter ..... *Cyperus odoratus*
23b. Pores ca. 12 - 18 µ diameter ..... *Cyperus rotundus**
22b. < 30 µ (long axis)
24a. Exine 1 µ thick
25a. 20 - 21 µ ..... *Cyperus brevifolius**
25b. 28 - 30 µ
26a. Amb trapezoidal ..... *Cyperus simplex*
26b. Amb circular - irregular ..... *Rhynchospora cephalotes*
24b. Exine 1.5 µ thick
27a. Ca. 21 µ ..... *Calyptrocarya glomerulata*
27b. Ca. 25 µ ..... *Cyperus sesquiflorus**
20b. 6 - 7 porate
28a. Baculate ..... *Cyperus densicaespitosus**
28b. Scabrate
29a. 42 - 50 µ ..... *Cyperus tenuis*
29b. 36 - 37 µ ..... *Cyperus giganteus*

Calyptrocarya glomerulata (Brongn.) Urban
Triporate, 4-porate; exine tectate, 1.5µ thick; sexine densely columellate, sexine scabrate; pores inconspicuous, circular, ca. 3 µ diameter on lateral side of grain; amb trapezoidal-irregular; grains appearing oblate, 17 - 18 x 21 µ (polar view).
CR, MNCR 89434; plate 17:157.

Cladium jamaicense Crantz
Monoporate, triporate and 4-porate; exine tectate, < 1 µ thick; sexine scabrate, scabrae < 0.5 µ high; pores circular, 6 µ diameter, inconspicuous; amb trapezoidal-irregular; grains appearing oblate, 41 - 52 x 56 - 61 µ (polar view).
PAN, Lazor et al. 2298, MO; plate 17:158.

Cyperus brevifolius (Rottb.) Endl. ex Hassk. (*Kyllinga brevifolia* Rottb.)
Triporate, 4-porate; exine tectate, 1 µ thick; sexine scabrate; scabrae < 0.5 µ high; pores inconspicuous, irregular, appearing as small rupture of ectexine; amb circular-irregular; grains usually spheroidal, 17 - 21 µ (polar view).
COL, Nee & Mori 3601, COL 134911; no plate.

Cyperus densicaespitosus Mattf. & Kuek. (*Kyllinga pumila* Michx.)
6 - 7 porate; exine tectate, 2 µ thick; densely columellate; sexine baculate; bacula ca. 1 µ high, isodiametric, pores irregular to circular, ca. 5 µ diameter; appearing as rupture of exine; amb circular to elliptical; grains spheroidal to sub-oblate, 28 - 32 x 36 - 38 µ (polar view).
PAN, Croat 11206, MO; plate 17:159.

Cyperus diffusus Vahl
Triporate; exine tectate, 2 µ thick; densely columellate; sexine scabrate to verrucate; verrucae 1 µ high x 1.5 µ wide, irregularly distributed on surface grain; pores inconspicuous, usually circular ca. 6 µ diameter; amb circular-irregular; grains oblate, 22 - 23 x 27 - 28 µ (polar view).
BCI, Croat 5798, MO; plate 17:160

Cyperus giganteus Vahl
6 - 7 porate; exine tectate, 2 µ thick; densely columellate; sexine scabrate; scabrae < 0.5 µ high; pores irregularly arranged, appearing as ruptures of exine, oval, margin poorly defined, ca. 6 - 8 x 3 µ; amb circular to elliptical; grains sub-oblate, 26 - 28 x 36 - 37 µ (polar view).
BCI, Croat 6168, MO; plate 17:161.

Cyperus haspan L.
4 - 5 porate; exine tectate, 1.5 µ thick, densely columellate; sexine baculate; bacula ≤ 1 µ high; pores inconspicuous, appearing as irregular ruptures of exine; amb irregularly angular; grains usually oblate, 20 - 23 x 26 - 29 µ (polar view).
PAN, Lazor & Correa 2831, MO; plate 17:162.

Cyperus luzulae (L.) Retz.
Triporate, 4-porate; exine tectate; 1.0 - 1.5 µ thick; densely columellate; sexine scabrate; scabrae isodiametric < 1µ high; pores inconspicuous, margins irregular, appearing as ruptures of exine; amb elliptical; grains suboblate, 22 - 25 x 30 - 32 µ (polar view).
PAN, Croat 9767, MO; plate 17:163.

Cyperus odoratus L.
5-porate; exine tectate, 1 µ thick; sexine scabrate; scabrae < 1 µ high; pores oval, variable in size, ca. 10 x 3 µ; amb circular-irregular; grains oblate, 37 - 40 µ (polar view).
PAN, Tyson et al. 2498, MO; plate 17:164.

Cyperus rotundus L.
4 - 5 porate; exine tectate, 1 µ thick; sexine scabrate; scabrae < 1 µ high; pores elongate, ca. 12 - 18 x 2 - 3 µ, restricted to one face of grain; amb trapezoidal; grains oblate, 35 x 37 - 42 µ (polar view).
PAN, Lazor et al. 2604, MO; no plate.

Cyperus sesquiflorus (Torr.) Mattf. & Kuek. (*Kyllinga odorata* Vahl)
4 - 5 porate; exine tectate, 1.5 µ thick; densely columellate; sexine scabrate; pores inconspicuous; appearing as rupture of ectexinic membrane; amb circular-irregular; grains spheroidal, 25 µ.
PAN, Tyson 1410, MO; plate 17:165.

Cyperus simplex HBK
Triporate and 4-porate; exine tectate, 1 µ thick; densely columellate; sexine scabrate; scabrae 0.5 µ high; pores inconspicuous, frequently three, elongate, ca. 15 x 3 µ; amb trapezoidal; grains oblate, 25 x 29 - 30 µ (polar view).
PAN, Croat 10341, MO; no plate.

Cyperus tenuis Sw.
5 - 7 porate; exine tectate 2 µ thick; densely columellate; sexine scabrate; scabrae < 0.5 µ high; pores circular, 10 µ diameter, conspicuous; sometimes appearing as elongate furrows ca. 20 x 3 µ; amb trapezoidal; grains oblate, 32 - 35 x 42 - 50 µ (polar view).
BCI, Croat 11710, MO; plate 17:166.

Eleocharis caribaea (Rottb.) S. F. Blake (*E. geniculata* (L.) R. & S.)
Monoporate; exine tectate, 0.5 µ thick; sexine finely scabrate; pore inconspicuous, circular; grains spheroidal, 28 - 35 µ.
BCI, Croat 11302, MO; plate 17:167.

Eleocharis elegans (H.B.K.) R. & S.
Monoporate, exine tectate, 1 µ thick; densely columellate; sexine scabrate; pore inconspicuous; appearing as rupture of exine; grains frequently resemble inaperturate type; grains have a tendency to be spheroidal, 40 - 50 µ.
BCI, Schmalzel 971, MO; no plate.

Eleocharis plicarhachis (Griseb.) Svens.
Inaperturate; exine tectate, 1.0 - 1.5 µ thick sexine baculate; bacula densely aggregated, 1 µ high; apparently inaperturate; amb irregular to circular; grains spheroidal (?), 48 - 52 µ, susceptible to damage by acetolysis.
PAN, Tyson 6054, MO; no plate.

Fimbristylis dichotoma (L.) Vahl
Inaperturate; exine intectate, < 1 µ thick; sexine scabrate; scabrae arranged in small groups resembling clavae; grains spheroidal 35 - 45 µ, susceptible to damage by acetolysis.
PAN, Tyson & Roepke 5065, MO; plate 17:168.

Futrena umbellata Rottb.
Monoporate; exine tectate; 1.0 - 1.5 µ thick; densely columellate; sexine scabrate; pore circular, 4 - 5 µ diameter; grains spheroidal, 36 - 40 µ.
PAN, Blum et al. 2502, MO; plate 17:169.

Rhynchospora cephalotes (L.) Vahl
Triporate and 4-porate; exine tectate, 1 µ thick; densely columellate; sexine scabrate; scabrae < 0.5 µ high; pores inconspicuous appearing as irregular ruptures of exine; amb circular to slightly elliptical; grains oblate, 28 - 30 µ (polar view).
PAN, Porter et al. 4081, MO; plate 17:170.

Rhynchospora corymbosa (L.) Britt.
Monoporate; exine tectate, 0.5 µ thick; sexine scabrate; pore having irregular margin, circular, 5 µ diameter, rarely 3-porate; grains 24 - 25 x 30 - 34 µ (polar view).
PAN, Croat 9805, MO; plate 17:171.

Rhynchospora nervosa (Vahl) Boeck. in Vid.
Monoporate; exine tectate, 1 µ thick; densely columellate; sexine scabrate; pore inconspicuous; appearing as small rupture of ectexinic membrane; apparently 3-aperturate; grains 23 - 26 x 30 - 31 µ (polar view).
PAN, Schmalzel 999, MO; plate 17:172.

Scirpus cubensis Kunth (*Oxycaryum cubense* (Poepp. & Knuth ex Knuth) Lye)
Triporate; exine tectate; 1.5 µ thick; sexine scabrate; pores resembling rudimentary sulcus (furrow), elongate 25 x 4 - 8 µ; amb trapezoidal; grains oblate, 31 - 35 x 32 - 48 µ (polar view).
BCI, Croat 974, MO; plate 18:173.

Scleria macrophylla Presl.
Monoporate; exine tectate, 1.5 µ thick; densely columellate; sexine scabrate; pore circular, 10 µ diameter; appearing as rupture of ectexinic membrane; grains spheroidal, 45 - 48 µ.
BCI, Croat 5021, MO; plate 18:174.

Scleria mitis Berglus
Monoporate; exine tectate, 1.5 µ thick; sexine scabrate; pore circular, 12 µ diameter; covered by fine densely scabrate membrane; very infrequently 3-aperturate; grains 33 x 40 µ (polar view).
PAN, Croat 9825, MO; plate 18:175.

Scleria pterota Presl. (*S. melaleuca* Rehb. ex Schiecht. & Cham.)
Monoporate; exine tectate, < 1 µ thick; sexine scabrate; pore circular, ca. 8 µ diameter; densely scabrate ; grains 45 µ (polar view).
PAN, Tyson 6426, MO; plate 18:176.

Scleria secans (L.) Urban
Monoporate; exine tectate, 1 µ thick; sexine scabrate, pore 8 - 10 µ diameter, circular, ectexinic; amb elliptical; grains resembling oblate form, 40 µ (polar view).
BCI, Croat 4765; MO; no plate.

DIOSCOREACEAE

Monad; isopolar-radiosymmetric; di-sulcate; exine tectate to intectate, < 0.5 - 1.5 µ thick sexine scabrate and striate; sulcus as long as grain, narrow, sinuous, opposite; amb circular in polar view; grains prolate to subprolate (?), 23 - 36 x 12 - 23 µ. *(1 genus, 6 species).*

Key to genera and species:

1a. Striate, exine intectate..... *Dioscorea haenkeana*
1b. Scabrate, exine tectate
  2a. < 30 µ (long axis)..... *Dioscorea alata*
  2b. > 30 µ
    3a. Exine 1.5 µ thick; grains > 35 µ..... *Dioscorea urophylla*
    3b. Exine < 1 µ thick, grains < 35 µ
      4a. 23 - 24 µ..... *Dioscorea sapindoides*
      4b. 30 µ..... *Dioscorea spp., D. macrostachya D. polygonoides*

Dioscorea alata L.
Exine tectate, < 0.5 µ thick; sexine scabrate; sulci inconspicuous, as long as grain; grains irregular to circular, 23 x 12 µ.
CR, Shank & Molina 4441; MO; plate 18:177.

Dioscorea haenkeana Presl
Exine intectate, 1.0 - 1.5 µ thick; sexine striate; striae densely aggregated, < 0.5 µ wide, without particular orientation; sulcus sinuous, inconspicuous, as long as grain; grains 27 - 28 x 19 - 20 µ.
BCI, Croat 11880, MO; plate 18:178.

Dioscorea macrostachya Benth.
Exine tectate, 1 µ thick; sexine scabrate , densely columellate; sulci sinuous, inconspicuous; appearing united at apex, narrow; grains 30 x 18 µ (description based on 1 grain).
PAN, Skog & D'Arcy, MO; no plate.

Dioscorea polygonoides H. & B ex Willd.
Exine tectate, < 1 µ thick; sexine scabrate; di-sulcate, sulci as long as grain, narrow; reaching apex of grain; apex depressed; grains elliptical, 30 x 20 µ.
BCI, Croat 12877, MO; plate 18:179.

Dioscorea sapindoides Presl.
Exine tectate, 1 µ thick; sexine scabrate; sulci inconspicuous, narrow as long as grain, uniting at apex; depressed; circular to grains elliptical, 23 - 24 x 19 - 23 µ.
BCI, Croat 12837, MO; plate 18:180.

Dioscorea urophylla Hemsl.
Exine tectate, 1.5 µ thick; sexine scabrate; scabrae conspicuous < 0.5 µ high; sulci as long as grain x 2 - 3 µ wide; sinuous, rounded at edges; circular; grains elliptical , 35 - 36 x 20 - 23 µ.
PAN, Croat 15095, MO; plate 18:181.

GRAMINEAE (POACEAE)

Monad; heteropolar-radiosymmetric; monoporate, rarely diporate; exine tectate, < 1.0 - 2.5 µ thick; sexine psilate, scabrate, granulate, baculate, verrucate, rugulate; sculptural elements fine, small; pore always annulate; annulus conspicuous, granulate and scabrate; circular; costa pori present; pores common type, occasionally protuberant; grains spheroidal, 16 - 76 µ; species not readily distinguishable. *(38 genera, 64 species; additional references: 19, 23, 73, 85).*

Key to genera and species:

1a. < 30 µ
  2a. Psilate
    3a. Pore (excluding annulus) ≤ 2 µ diameter
      4a. Annulus 1.5 wide
        5a. 16 - 24 µ..... *Lithachne pauciflora*
        5b. 25 - 28 µ..... *Brachiaria mutica*
      4b. Annulus 3 µ wide
        6a. Exine 1 µ thick..... *Paspalum saccharoides*
        6b. Exine 2 µ thick..... *Paspalidium geminatum*
    3b. Pore (excluding annulus) > 2 µ diameter
      7a. Pore 2.5 µ; annulus 1 µ wide..... *Olyra latifolia*
      7b. Pore 3 µ; annulus 2 µ wide..... *Chusquea simpliciflora*
  2b. Scabrate
    8a. 27 - 28 µ
      9a. Costa pori 1.0 - 1.5 µ thick..... *Panicum milleflorum*
      9b. Costa pori 2 µ thick..... *Paspalum decumbens*
    8b. 22 µ..... *Panicum trichoides*
  2c. Baculate (also diporate)..... *Sporobolus indicus*
1b. 31 - 50 µ
  10a. Pore (excluding annulus) > 4 µ diameter
    11a. Annulus > 3 µ wide

12a. Annulus 3 μ wide
13a. Costa pori 3 μ thick ..... *Saccharum spontaneum*
13b. Costa pori 2 μ thick
14a. Exine 2 - 2.5 μ thick ..... *Paspalum plicatulum*
14b. Exine < 1.5 μ thick
15a. > 45 μ ..... *Setaria geniculata*
15b. < 45 μ
16a. Psilate ..... *Rhipidocladum racemiflorum*
16b. Scabrate
17a. 36 - 43 μ ..... *Bothriochloa pertusa*
17b. 44 μ ..... *Digitaria horizontalis*
12b. Annulus 4 - 5 μ wide
18a. Costa pori 2 - 3 μ thick; grains scabrate ..... *Setaria vulpiseta*
18b. Costa pori 4 μ thick; grains rugulate ..... *Streptochaeta sodiroana*
11b. Annulus < 3 μ wide
19a. Exine 2 μ thick ..... *Andropogon glomeratus*
19b. Exine < 1.0 - 1.5 μ thick
20a. Psilate
21a. 34 μ ..... *Leptochloa virgata*
21b. 40 - 50 μ
22a. Costa pori 1.0 - 1.5 μ thick ..... *Panicum pilosum*
22b. Costa pori 2. 5 μ thick ..... *Paspalum notatum*
20b. Sculptured or ornamented
23a. Baculate ..... *Orthoclada laxa*
23b. Scabrate
24a. 39 μ ..... *Oplismenus burmanni*
24b. 47 - 50 μ ..... *Andropogon bicornis*
10b. Pore (excluding annulus) < 4 μ diameter
25a. Psilate
26a. > 40 μ ..... *Ichnanthus pallens*
26b. < 40 μ
27a. Pore > 3 μ diameter ..... *Lasiacis oaxacensis*
27b. Pore < 3 μ diameter
28a. Annulus 2 μ wide
29a. Exine < 1 μ thick ..... *Leersia hexandra*
29b. Exine > 1 μ thick
30a. 33 - 37 μ ..... *Paspalum paniculatum*
30b. 37 - 40 μ ..... *Panicum pulchellum*
28b. Annulus 3 - 3.5 μ wide
31a. Pore protruding ..... *Panicum grande*
31b. Pore common type
32a. Exine densely columellate ..... *Pharus latifolius*
32b. Exine poorly columellate ..... *Panicum mertensii*
25b. Scabrate
33a. Pore 3 μ diameter
34a. Costa pori 1.5 μ thick
35a. 31 - 32 μ ..... *Eleusine indica*
35b. > 40 μ ..... *Hyparrhenia rufa*
Ischaemum indicum
*Panicum fasciculatum**
34b. Costa pori > 2 μ thick
36a. Exine < 1 μ thick ..... *Chloris virgata*
36b. Exine 1.5 - 2.0 μ thick
37a. 36 - 41 μ ..... *Cynodon dactylon*
37b. 47 - 50 μ ..... *Lasiacis procerrima*
33b. Pore 2 μ diameter
38a. Annulus 1.5 μ wide ..... *Gynerium sagittatum*
38b. Annulus 2 - 3 μ wide
39a. Exine 1.5 - 2.0 μ thick
40a. 31 μ ..... *Rottboellia exaltata*
40b. 41 μ ..... *Paspalum virgatum*
39b. Exine 1 μ thick
41a. 35 - 38 μ ..... *Pharus parvifolius*
41b. 45 - 48 μ ..... *Panicum maximum*
25c. Granulate
42a. Pore 3 μ diameter; costa pori 2 μ thick
43a. 33 μ ..... *Chloris radiata*
43b. 41 - 50 μ ..... *Anthephora hermaphrodita*
42b. Pore 2 μ diameter; costa pori 1.5 μ thick
44a. 37 - 40 μ; exine > 1 μ thick ..... *Hymenachne amplexicaulis*
44b. 48 - 50 μ; exine < 1 μ thick ..... *Homolepis aturensis*
25d. Verrucate
45a. 35 - 45 μ; pore 1.0- 1.5 μ diameter, annulus 2 wide ..... *Phragmites australis*
45b. 45 - 50 μ; pore 2.5 - 3.0 μ diameter, annulus 3 - 4 μ wide ..... *Polytrias amaura*
25e. Rugulate ..... *Panicum polygonatum*
1c. > 50 μ
46a. Pore (excluding annulus) 2 - 3 μ diameter
47a. 51 - 56 μ
48a. Psilate; exine 1 μ thick; ..... *Oryza latifolia*

48b. Verrucate; exine 2.0 - 2.5 μ thick; ..... *Saccharum officinarum*
47b. 57 - 66 μ
49a. Scabrate (also diporate) ..... *Paspalum conjugatum*
49b. Baculate (only monoporate) ..... *Setaria pantculifera*
46b. Pore (excluding annulus) 4 - 6 μ diameter
50a. Psilate ..... *Bambusa arundinacea*
50b. Scabrate
51a. Exine 1.0 - 1.5 μ thick
52a. 51 μ
53a. Diporate and monoporate ..... *Digitaria ciliaris*
53b. Monoporate only ..... *Schizachyrium microstachyum*
52b. 56 - 76 μ ..... *Oplismenus hirtellus*
51b. Exine 2.0 - 2.5 μ thick
54a. Pore 6 μ diameter, annulus 4 μ wide ..... *Andropogon virginicus*
54b. Pore 4 μ diameter, annulus 2.5 μ wide ..... *Axonopus compressus*
50c. Baculate
55a. Annulus 2 μ wide ..... *Orthoclada laxa*
55b. Annulus 3 μ wide ..... *Setaria geniculata*
50d. Granulate (also diporate) ..... *Cenchrus brownii*
50e. Verrucate (also diporate) ..... *Ischaemum rugosum*

Andropogon bicornis L.
Exine 1μ thick; sexine scabrate; pore 4 μ diameter; annulus 2.5 wide; costa pori absent; grains 47 - 50 μ.
BCI, Croat 11124, MO; plate 18:182.

Andropogon glomeratus (Walt.) B. S. P.
Exine 2 μ thick; sexine scabrate to granulate; pore 4 μ diameter; annulus 2 μ wide; costa pori 3 μ thick; grains 42 - 49 μ.
PAN, Tyson 5869, MO; plate 18:183.

Andropogon virginicus L.
Exine 2.5 μ thick; densely columellate; sexine scabrate; pore 6 μ diameter; annulus 4 μ wide; costa pori 4 μ thick; grains 53 - 56 μ.
PAN, Tyson 4393, MO; plate 18:184.

Anthephora hermaphrodita (L.) O. Kuntze
Exine < 1 μ thick; sexine granulate; pore 3 μ diameter; annulus 2.5 μ wide, thin; costa pori 2 μ thick; grains 41 - 50 μ.
PAN, Dwyer 2657, MO; plate 18:185.

Axonopus compressus (Sw.) Beauv.
Exine 2 μ thick; densely columellate; sexine scabrate; pore 4 μ diameter; annulus 2.5 wide; costa pori 4 μ thick; grains 51 - 55 μ.
PAN, Blum et al. 1740, MO; plate 18:186.

Bambusa arundinacea Retz.
Exine 1 μ thick; sexine psilate to slightly scabrate; pore 4 μ diameter; annulus 3.5 μ wide; costa pori 2 μ thick; annulus densely granulate; grains 52 - 57 μ.
BCI, Croat 11746, MO; plate 18:187.

Bothriochloa pertusa (L.) A Camus
Exine 1.0 - 1.5 μ thick; sexine scabrate; pore 4 μ diameter; annulus 3 μ wide; costa 2 μ thick; grains 36 - 43 μ
PAN, Dwyer, no voucher, MO; no plate.

Brachiaria mutica (Forssk.) Stapf in Prain
Exine 1 μ thick; densely columellate; sexine psilate; pore 2 μ diameter; annulus 1.5 μ wide; costa pori 2 μ thick; annulus granulate; grains 25 - 28 μ.
BCI, Croat 8679, MO; no plate.

Cenchrus brownii R. & S.
Exine 2.0 - 2.5 μ thick; densely columellate; sexine granulate; pore 5 μ diameter; annulus 3 μ wide; costa pori 2 μ thick; less frequently diporate type; grains 55 μ.
PAN, Stimson 5219, MO; plate 18:188.

Chloris radiata (L.) Sw.
Exine < 1 μ thick; sexine granulate; pore 3 μ diameter; annulus 2 μ wide; densely granulate; costa pori 2 μ thick; grains 33 μ.
SAL, Pohl 13629, MO; plate 18:189.

Chloris virgata Sw.
Exine < 1 μ thick; sexine scabrate; pore 3 μ diameter; annulus 2 μ wide; slightly granulate; costa pori 2 μ thick; grains 31 - 32 μ.
IN, Sastre 9164, HIFP 196421; no plate.

Chusquea simpliciflora Munro
Exine 1 μ thick; sexine psilate; pore 3 μ diameter; annulus 2 μ wide; scabrate; costa pori 1.5 μ thick; grain 25 μ (description based on one grain).
PAN, Stern et al. 341, MO; no plate.

Cynodon dactylon (L.) Pers.
Exine 1 - 2 μ thick; densely columellate; sexine scabrate; pores 3 μ diameter; annulus 2 μ wide; costa pori 2.5 μ thick; grains 36 - 41 μ.
PAN, Stern et al. 69, MO; plate 19:190.

Digitaria ciliaris (Retz.) Koeler
Exine 1 µ thick; sexine scabrate; pore 4 µ diameter; annulus 2.5 µ wide; costa pori 2.5 µ thick; less frequently diporate; grains 51 µ.
IN, Saldanha 12958, HIFP 15430; plate 19:191.

Digitaria horizontalis Willd.
Exine 1 - 2 µ thick; sexine scabrate; pore 4 µ diameter; annulus 3 µ wide; costa pori 2 µ thick; grains 44 µ.
BCI, Croat 11746, MO; no plate.

Eleusine indica (L.) Gaertn.
Exine 1 µ thick; sexine scabrate; pore 3 µ diameter; annulus 2.5 µ wide; costa pori 1.5 µ thick; grains 31 - 32 µ.
BCI, Croat 9241, MO; plate 19:192.

Gynerium sagittatum (Aubl.) Beauv.
Exine 1 µ thick; sexine scabrate; pore 2 µ diameter; annulus 1.5 µ wide; costa pori 1.5 µ thick; grains 33 - 34 µ.
CR, Pohl, CR 126701; no plate.

Homolepis aturensis (H.B.K.) Chase
Exine < 1 µ thick; sexine granulate; pore 2 µ diameter; annulus 1.5 µ wide; costa pori 1.5 µ thick; grains 48 - 50 µ.
BCI, Croat 5624, MO; plate 19:193.

Hymenachne amplexicaulis (Rudge) Nees
Exine 1 µ thick; sexine granulate; pore 2 µ diameter; annulus 2 µ wide; costa pori 1.5 µ thick; grains 37 - 40 µ.
BCI, Croat 7197, MO; plate 19:195.

Hyparrhenia rufa (Nees) Stapf in Prain
Exine 1 µ thick; sexine granulate; pore 3 µ diameter; annulus 2.5 wide; costa pori absent; grains 41 µ.
COL, Denslow 2513, COL 244743; plate 19:194.

Ichnanthus pallens (Sw.) Munro ex Benth.
Exine 1.5 µ thick; sexine psilate, with small perforations (puntitegillate); pore 3 µ diameter; annulus 1.0 - 1.5 µ wide; costa pori 2 µ thick; grains 40 - 50 µ.
BCI, Croat 4228, MO; plate 19:196.

Ischaemum indicum (Houtt.) Merr.
Exine 1 µ thick; sexine scabrate; pore 3 µ diameter; annulus 2 µ wide; costa pori 1.5 µ thick; grains 41 - 47 µ.
PAN, Schmalzel 1269, MO; plate 19:197.

Ischaemum rugosum Salisb.
Exine 2 µ thick; sexine verrucate; verrucae ca. 1 µ high; pore 4 µ diameter; annulus 5 µ wide; costa pori 3 µ thick; less frequently diporate; grains 51 - 55 µ.
BCI, Croat 8275, MO; plate 19:198.

Lasiacis oaxacensis (Steud.) Hitchc.
Exine 1 µ thick; sexine psilate; pore 3 µ diameter; annulus 2.0 - 2.5 µ wide; costa pori 2 µ thick; grains 34 - 38 µ.
PAN, Lewis et al. 2594, COL 117467; plate 19:200.

Lasiacis procerrima (Hack.) Hitchc.
Exine 2 µ thick; sexine clearly differentiated from nexine; densely columellate, scabrate; pore 2.5 µ diameter; annulus 3 µ wide; costa pori 4 µ thick; grains 47 - 50 µ.
PAN, Croat 6108, MO; plate 19:199.

Leersia hexandra Sw.
Exine 1 µ thick; sexine psilate; pore 2.5 µ diameter; protruding; annulus 2.0 µ wide; costa pori 1.0 - 1.5 µ thick; grains 35 - 37 µ.
BCI, Croat 13243, MO; plate 19:202.

Leptochloa virgata (L.) Beauv.
Exine 1 µ thick; sexine psilate; pore 4 µ diameter; annulus 2.5 µ wide; costa pori 1.5 µ thick; grains 34 µ.
PAN, McCorkle 173, MO; plate 19:201.

Lithachne pauciflora (Sw.) Beauv. ex Poir.
Exine < 1 µ thick; columellate; sexine scabrate; pore 1 µ diameter; annulus 1.5 µ wide; costa pori 1.5 µ thick; grains 16 - 24 µ.
CR, Lent 2711, MO; plate 19:203.

Olyra latifolia L.
Exine 1.0 - 1.5 µ thick; sexine psilate; pore 2.5 µ diameter; annulus 1 µ wide; costa pori 1 µ thick; grains 22 - 28 µ.
PAN, Tyson & Blum 1665, MO; plate 19:204.

Oplismenus burmanni (Retz.) Beauv.
Exine 1 µ thick; sexine scabrate; pore 4.5 - 5.0 µ diameter; annulus 2 µ wide; costa pori inconspicuous; grains 39 µ.
PAN, Croat 4257, MO; plate 19:205.

Oplismenus hirtellus (L.) Beauv.
Exine 1.5 µ thick; densely columellate; sexine scabrate; pore 4 - 5 µ diameter; annulus 3 - 4 µ wide; costa pori 2 µ thick; grains dimorphic, 56 - 57 µ and 71 - 76 µ.
BCI, Croat 5777, MO; plate 19:206.

Orthoclada laxa (L.C. Rich.) Beauv.
Exine 1.5 µ thick; sexine baculate; bacula ca. 1 µ high; pore 4 µ diameter annulus 2 µ wide; costa pori 2 µ thick; grains 45 - 55 µ.
PAN, Croat 4431, MO; plate 20:207.

Oryza latifolia Desv.
Exine 1 µ thick; sexine psilate to slightly scabrate; pore 3 - 3.5 µ diameter; annulus 3 µ wide; costa pori 2.5 µ thick; grains 51 - 53 µ.
PAN, Tyson & Clewell 5923, MO; plate 20:208.

Panicum fasciculatum Sw. (*Brachiaria fasciculata* (Sw.) Parodi)
exine 1 µ thick; sexine scabrate; pore 3 µ diameter; annulus 2 µ wide; costa pori 1.5 µ thick; grains 42 - 48 µ.
PAN, Tyson 5440, MO; plate 20:209

Panicum grande Hitchc. & Chase
Exine 1.5 - 2.0 µ thick; sexine psilate; pore 2 µ diameter, tending to protrude slightly, annulus 3.0 - 3.5 µ wide; costa pori 3 µ thick; grains 35 - 38 µ.
PAN, Croat 12700, MO; plate 20:210.

Panicum maximum Jacq.
Exine 1 µ thick; sexine scabrate; pore 2 µ diameter; annulus 3 µ wide, slightly granulate; costa pori 2 µ thick; grains 45 - 48 µ.
PAN, Lewis et al. 5418, MO; plate 20:211.

Panicum mertensii Roth in R. & S.
Exine 1 - 2 µ thick; sexine slightly granulate; pore 2 µ diameter; annulus 3 µ wide; densely granulate; costa pori inconspicuous; grains 36 µ.
SUR, Geysias 112, COL 161195; no plate.

Panicum milleflorum Hitchc. & Chase
Exine 1.5 - 2.0 µ thick; sexine scabrate; pore 1.5 - 2.0 µ diameter; annulus 2 µ wide; costa pori 1.0 - 1.5 µ thick; grain 27 µ (description based on one grain).
BCI, Croat 6408, MO; no plate.

Panicum pilosum Sw.
Exine 1.0 - 1.5 µ thick; sexine psilate; pore 3.5 - 4 µ diameter; annulus 2.0 - 2.5 µ wide; costa pori 1.0 - 1.5 µ thick; grains 40 - 43 µ.
PAN, Croat 11258, MO; plate 20:212.

Panicum polygonatum Schrad. ex. Schult.
Exine 2 µ thick; sexine rugulate; aperture inconspicuous, apparently covered by ectexinic membrane; grains 31 - 35 µ.
PAN, McCorkle 175, MO; plate 20:213.

Panicum pulchellum Raddi.
Exine 1 µ thick; sexine psilate to slightly scabrate; pore 2 µ diameter; annulus 2 µ wide; costa pori 1.5 µ thick; grains 37 - 40 µ.
PAN, Croat 9269, MO; plate 20:214.

Panicum trichoides Sw.
Exine 1.5 - 2.0 µ thick; densely columellate; sexine scabrate; pore < 1 µ diameter; annulus 1 µ wide; costa pori absent; grains 22 µ.
GUA, Harmon & Dwyer 3397, MO; no plate.

Paspalidium geminatum (Forssk.) Stapf in Pain
Exine 2 µ thick; densely columellate; sexine clearly differentiated from nexine, scabrate; pore 2 µ diameter; annulus 3 µ wide; costa pori 3 µ thick; grains 28 - 30 µ.
BCI, Croat 11942, MO; plate 20:215.

Paspalum conjugatum Bergilus
Exine 2 µ thick; sexine scabrate; pore 3 µ diameter; annulus 2.5 µ wide; costa pori 2.5 thick; less frequently diporate; grains 56 - 66 µ.
IN, Saldanha & Ramamoorthy 1157, HIFP 15419; plate 21:221.

Paspalum decumbens Sw.
Exine 2 µ thick; sexine scabrate; densely columellate; pore 2 µ diameter, annulus 1.5 - 2.0 µ wide; costa pori 2 µ thick; grains 28 µ.
PAN, Lewis et al. 3501, COL 188070; plate 20:220.

Paspalum notatum Flugge
Exine 1.5 µ thick; sexine psilate, clearly differentiated from nexine; pore 4 µ diameter; annulus 2 µ wide; costa pori 2.5 µ thick; grains 40 - 50 µ.
BCI, Croat 16565, MO; plate 20:216.

Paspalum paniculatum L.
Exine 1 µ thick; sexine psilate to slightly scabrate; pore 2 - 3 µ diameter; annulus 2 µ wide; costa pori 1.5 µ thick; grains 33 - 38 µ.
BCI, Croat 6936, MO; plate 20:217.

Paspalum plicatulum Michx.
Exine 2 - 2.5 µ thick; sexine psilate; pore 4 µ diameter; annulus 3 µ wide; costa pori 2 µ thick; grains 42 - 45 µ.
PAN, Stimson 5216, MO; plate 20:218.

Paspalum saccharoides Nees in Trin.
Exine 1 µ thick; sexine psilate; pore 2 µ diameter; annulus 3 µ wide; costa pori 2 µ thick; grains 27 µ.
COL, Garcia 13186, COL 35451; no plate.

Paspalum virgatum L.
Exine 1.5 - 2.0 µ thick; densely columellate; sexine scabrate; pore 2.0 - 2.5 µ diameter; annulus 2 µ wide; grains 41 µ.
PAN, Correa et al. 20, PMA; plate 20:219.

Pharus latifolius L.
Exine 1.5 - 2.0 μ thick; sexine psilate; pore 2.0 - 2.5 μ diameter; annulus 3.5 μ wide; grains 36 μ.
PAN, Tyson & Blum, no voucher, MO; plate 21:222.

Pharus parvifolius Nash
Exine 1.0 - 1.5 μ thick; sexine scabrate; pore 2 μ thick; annulus 2.5 μ wide; costa pori 2 μ thick; grains 35 - 38 μ.
BCI, Croat 8335, MO; plate 21:223.

Phragmites australis (Cav.) Trin. in Steud.
Exine 1 μ thick; sexine verrucate, densely columellate; pore 1.0 - 1.5 μ diameter; annulus 2 μ wide; costa pori 1.5 μ thick; grains 35 - 46 μ.
BCI, Croat 12585, MO; plate 21:224.

Polytrias amaura (Buse ex Miq.) O. Kuntze
Exine 1.0 - 1.5 μ thick; densely columellate; sexine verrucate; pore 2.5 - 3.0 μ diameter; protruding; annulus 3.5 - 4 μ wide; costa pori 3 μ thick; grains 44 - 50 μ.
BCI, Croat 12184, MO; Plate 21:225.

Rhipidocladum racemiflorum (Steud.) McClure
Exine 1 μ thick; sexine psilate to slightly scabrate; pore 3.5 - 4.0 μ diameter; annulus 3 μ wide; costa pori 2 μ thick; grains 34 - 40 μ.
PAN, Tyson 2116, MO; plate 21:226.

Rottboellia exaltata (L.) L.f.
Exine 2 μ thick; densely columellate; sexine scabrate; pore 2.0 μ diameter; annulus 2.5 - 3.0 μ wide; costa pori 2 μ thick; grain 31 μ. (description based on one grain).
BCI, Croat 5966, MO; no plate.

Saccharum officinarum L.
Exine 2.0 - 2.5 μ thick; sexine verrucate; pore 3 μ diameter; annulus 3 μ wide; costa pori 4 μ thick; grains 53 - 57 μ.
IN, HFP 643; plate 21:227.

Saccharum spontaneum L.
Exine 2 μ thick; densely columellate; sexine baculate; pore 4 μ diameter; annulus 3 μ wide; costa pori 3 μ thick; grains 37 - 46 μ.
PAN, Tyson et al. 4459, MO; plate 21:228.

Schizachyrium microstachyum (Desv.) Roseng.
Exine 1 μ thick; sexine scabrate; pore 4 μ diameter; annulus 3 μ wide; costa pori 2.5 - 3.0 μ thick; grains 51 μ.
PAN, Mc Corkle 112, MO; plate 21:229.

Setaria geniculata (Lam.) Beauv.
Exine 1.0 - 1.5 μ thick;, densely columellate; sexine baculate; pore 4 μ diameter; annulus 3 μ wide; costa pori 2 μ thick; grains 47 - 58 μ.
BCI, Croat. 6811, MO; plate 21:230.

Setaria paniculifera (Steud.) Fourn.
Exine 1.0 - 1.5 μ thick; densely columellate; sexine baculate; pore 2.0 - 2.5 μ diameter; annulus 2.0 - 2.5 μ wide; costa pori 2 μ thick; grains 57 - 64 μ.
BCI, Croat 6365, MO; plate 21:231.

Setaria vulpiseta (Lam.) R. & S.
Exine 2 μ thick; sexine scabrate; pore 4 - 5 μ diameter; annulus 4 μ wide; costa pori 2 - 3 μ thick; grains 44 - 50 μ.
PAN, Kirkbridge 184, MO; plate 21:232.

Sporobolus indicus (L.) R. Br.
Exine 2 μ thick; densely columellate; sexine baculate; pore 3 μ diameter; annulus 2 μ wide; costa pori 2.0 - 2.5 μ thick; infrequently diporate; grains 28 - 33 μ.
BCI, Croat 5427, MO; plate 21:233.

Streptochaeta sodiroana Hack.
Exine 2.0 - 2.5 μ thick; sexine rugulate; pore 4 μ diameter; annulus 5 μ wide; costa pori 4 μ thick; grains 45 - 50 μ.
PAN, Croat 13226, MO; plate 21:234.

HAEMODORACEAE

Monad; heteropolar-bilateral; monosulcate; exine tectate, 1.5 μ thick; sexine baculate; bacula conspicuous, short; sulcus as long as grain; narrow; amb elliptical in polar view; grains oblate to suboblate, 38 - 40 μ long axis. (*1 genus, 1 species*).

Xiphidium caeruleum Aubl.
Exine columellate; sexine baculate, resembling reticulate condition; margins of sulcus irregular, as long as grain x 1.2 μ wide; grains appearing elliptical-biconvex; usually oblate, 23 - 26 x 38 - 40 μ.
BCI, Schmalzel 847, MO; plate 21:235.

IRIDACEAE

Monad; heteropolar-bilateral; monosulcate; exine intectate; sexine echinate; echini conical, sharp; sulcus irregular; as long as grain; amb circular to elliptical; grains suboblate, 42 - 45 μ long axis, susceptible to damage by acetolysis. (*1 genus, 1 species*)

Neomarica gracilis (Herb.) Sprague
Exine 1 µ thick; echini slightly separated on surface of grain; 4 µ high x 3 - 3.5 µ at base, conical, sharp; sulcus variable, margins, poorly defined, delimited by echini; grains 42 - 45 x 29 - 33 µ.
BCI, Croat 11268, MO; no plate.

LILIACEAE

Monad; heteropolar-bilateral; monosulcate; exine intectate; sexine baculate; sulcus as long as grain, conspicuous, margins well defined; grains elliptical; grains oblate to suboblate, long axis 34 - 41 µ. (*1 genus, 1 species; additional reference: 189*).

Cordyline fruticosa (L.) A. Chev. ex Goepp.
Exine 1.5 - 2 µ thick; sexine baculate, bacula isodiametric, 1 µ high; densely aggregated on surface of grain, resembling reticulate condition; sulcus as long as grain; narrow equatorially, rounded at edges separating grain into two valves; amb elliptical-biconvex in polar view, elliptical-plano convex in equatorial view; grains usually suboblate 20 - 21 (polar dimension) x 34 - 41 x 25 - 26 µ (equatorial dimension).
BCI, Schmalzel 247, MO; plate 21:236.

MARANTACEAE

Monad; apolar-asymmetric; inaperturate; exine displaying indistinct stratification, with two layers in L-O pattern; exine psilate; 4 - 18 µ thick; translucid; amb circular; grains spheroidal, 130 - 300 µ, highly susceptible to damage by acetolysis; descriptions based on fresh material. (*4 genera, 11 species*).

Key to genera and species:

1a. ≥ 200 µ
  2a. Exine 7 - 14 µ thick
    3a. 200 µ; exine wavy ..... *Calathea inocephala*
    3b. 210 µ; exine smooth ..... *Ischnosiphon leucophaeus*
  2b. Exine 20 µ thick (grains 300 µ) ..... *Calathea insignis*
1b. 160 - 198 µ
  4a. Exine ≥ 9 µ thick
    5a. Exine 9 µ ..... *Calathea lutea*
    5b. Exine 14 µ ..... *Ischnosiphon pruinosus**
  4b. Exine 6 - 7 µ thick
    6a. Displaying 3 - 6 irregular ruptures of exine appearing as furrows ..... *Calathea marantifolia*
    6b. Displaying continuous exine ..... *Calathea latifolia*
1c. 130 - 155 µ
  7a. Exine < 10 µ thick
    8a. Exine 4 µ thick ..... *Calathea villosa*
    8b. Exine 8 µ thick ..... *Calathea panamensis*
      Thalia geniculata
  7b. Exine > 10 µ thick ..... *Stromanthe jacquinii*

Calathea inocephala (O. Kuntze) Kenn. & Nic.
Exine surface undulating, 7 - 14 µ thick, displaying two layers, outer layer 3 - 6 µ thick, inner layer 4 -8 µ thick; grains very large, 200 µ.
BCI, Schmalzel 842, MO; no plate.

Calathea insignis O.H. Petersen in Mart.
Exine 20 µ thick displaying two layers, outer layer 8 µ thick, inner layer 12 µ thick; grains gigantic, 300 µ.
PAN, Kirkbridge & Duke 877, MO; plate 22:237.

Calathea latifolia (Willd. ex Link) Klotzsch in R. Schomb.
Exine 7 µ thick, displaying two layers, outer layer 3 µ thick; inner layer 4 µ thick, resembling columellate type; grains very large, 148 - 154 µ.
BCI, Schmalzel 840, MO; plate 22:238.

Calathea lutea (Aubl.) G. Heyer
Exine 9 µ thick, displaying two layers, outer layer 4 µ thick, inner layer 5 µ thick, appearing as columellate type; grains very large, 160 - 165 µ.
BCI, Schmalzel 1287, MO; plate 22:239.

Calathea marantifolia Standl.
Exine 6 µ thick, displaying two layers; outer layer 4 µ thick, inner layer 2 µ thick, grains having 3 - 6 µ irregular ruptures of exine, resembling inconspicuous furrows, very large 198 x 160 µ.
PAN, Kennedy 1534, MO; plate 22:240.

Calathea panamensis Rowl. ex Standl.
Exine 8 µ thick, displaying two layers, outer layer 2 µ thick, inner layer 4 - 6 µ thick; grains very large, 130 - 140 µ.
BCI, Schmalzel 870, MO; no plate.

Calathea villosa (Lodd.) Lindl.
Exine 4 µ thick, displaying two inconspicuous layers, outer layer 1 µ thick; inner layer 3 µ thick; grains very large 141 - 150 µ
BCI, Schmalzel 844, MO; no plate.

Ischnosiphon leucophaeus (Poepp & Endl.) Koern.
Exine 10 µ thick, displaying two layers, outer layer 4 µ thick, inner layer 6 µ thick; grains gigantic, 210 µ.
PAN, Duke 8849, MO; plate 22:241.

Ischnosiphon pruinosus (Req.) O.G. Petersen (*Pleiostachya pruinosa* (Regel) Schum. in Engl.)
Exine 14 µ thick, displaying two layers, outer layer 5 µ thick, inner layer 9 µ thick; grains very large, 160 - 190 µ.
BCI, Schmalzel 831, MO; no plate.

Stromanthe jacquinii (R. & S.) Kenn. & Nic.
Exine 12 µ thick, displaying two layers, outer layer 2.5 - 3.0 µ thick, inner layer 8 - 9 µ thick; grains very large, 138 - 140 µ.
BCI, Schmalzel 875, MO; plate 22:242.

Thalia geniculata L.
Exine 8 µ thick; displaying two layers, outer layer 6 µ thick, inner layer 2 µ thick; grains appearing as densely columellate type, very large, 130 - 140 µ.
BCI, Schmalzel 921, MO; no plate.

MUSACEAE

Monad, apolar-asymmetric; inaperturate; exine displaying indistinct stratification, apparently tectate; 2 - 5 µ thick; sexine psilate to echinulate; grains spheroidal, large to very large 61 - 170 µ, very susceptible to damage by acetolysis; species not readily distinguishable; descriptions based on fresh material (*2 genera, 8 species*).

Key to genera and species:

1a. Psilate
- 2a. <100 µ
  - 3a. 70 - 74 µ; apparently densely columellate..... *Heliconia metallica*
  - 3b. 78 - 82 µ apparently slightly columellate..... *Heliconia vaginalis*
- 2b. > 150 µ (160 - 170 µ)..... *Musa sapientum*

1b. Sexine echinulate
- 4a. < 80 µ
  - 5a. Exine 4 - 5 µ thick..... *Heliconia irrasa, H. mariae, H. pogonantha*
  - 5b. Exine 2.5 µ thick..... *Heliconia latispatha*
- 4b. ≥ 80 µ
  - 6a. Exine 5 µ thick, grains 80 µ..... *Heliconia catheta**
  - 6b. Exine 4 µ thick, grains 88 - 94 µ..... *Heliconia pogonantha*

Heliconia catheta R. R. Smith (*H. platystachys* Baker)
Exine 5 µ thick; echinulate, echini < 0.5 µ high, conical, sharp; grains 80 µ.
BCI, Schmalzel 837, MO; plate 22:244.

Heliconia irrasa Lane ex R. R. Smith
Exine 4 - 5 µ thick; echinulate; echini 1 µ high x 1 µ wide; sharp; conical; grains 76 µ.
BCI, Schmalzel 850, MO; plate 22:243.

Heliconia latispatha Benth.
Exine 2.5 µ thick; echinulate; echini 0.5 µ high; sharp; grains 61 - 62 µ.
BCI, Schmalzel 832, MO; plate 22:245.

Heliconia mariae Hook. f.
Exine 5 µ thick; apparently columellate, echinulate, echini 0.5 - 1.0 µ high x 1.0 - 1.5 µ wide; sharp, conical; grains 75 - 78 µ.
BCI, Schmalzel 834, MO; no plate.

Heliconia metallica Planch. & Lind. ex Hook.
Exine 2 µ thick; apparently densely columellate, psilate; grains 70 - 74 µ.
BCI, Schmalzel 851, MO; no plate.

Heliconia pogonantha Cuf.
Exine 4 µ thick; apparently densely columellate, echinulate; echini poorly represented, rounded, short; grains 88 - 94 µ.
BCI, Schmalzel 835, MO; no plate.

Heliconia vaginalis Benth.
Exine 2 µ thick, appearing slightly columellate; psilate; grains 78 - 82 µ.
BCI, Schmalzel 836, MO; no plate.

Musa sapientum L.
Exine 5 µ thick; psilate; grains 160 - 170 µ.
BCI, Schmalzel 1265, MO; plate 22:246.

ORCHIDACEAE

Pollinia 2,4,8, globose, rounded, ovoid, flattened, superposed, elongate; much shorter than, subequal to, and much longer than stipe; caudicle sometimes present; viscidium sometimes present; total length 0.7 to 12.0 mm, width variable (*37 genera, 52 species; additional references:1, 197*).

Key to genera and species:

1a. Two pollinia per pollinarium
- 2a. Pollinium drop-shaped
  - 3a. Flattened ..... *Oncidium stipitatum*
  - 3c. Rounded
    - 4a. Pollinium shorter than stipe ..... *Trichopilia subulata*
    - 4b. Pollinium subequal to or longer than stipe
      - 5a. Caudicle present; pollinia > 2.5 mm long
        - 6a. Pollinia 2.7 x 1.7 mm ..... *Cattleya skinneri*
        - 6b. Pollinia 2.8 x 1.9 mm ..... *Encyclia cordigera*
      - 5b. Caudicle absent; pollinia < 2.5 mm long ..... *Brassia maculata*
- 2b. Pollinium kidney-shaped
  - 7a. Flattened, subequal to stipe ..... *Encyclia pentotis*
  - 7b. Ovoid, longer than stipe ..... *Masdevallia livingstoneana*
- 2c. Pollinium globose
  - 8a. Shorter than stipe
    - 9a. Pollinium < 0.5 mm
      - 10a. Stipe 1.1 mm long ..... *Ionopsis spp.*
      - 10b. Stipe 1.7 mm long ..... *Notylia barkeri*
    - 9b. Pollinium > 0.5 mm ..... *Loeochilus scriptus*
  - 8b. Subequal to stipe
    - 11a. < 1.7 mm long ..... *Sievekingia suavis*
    - 11b. > 1.7 mm long ..... *Eulophia alta*
- 2d. Pollinium elongate and flattened
  - 12a. Longer than stipe
    - 13a. Pollinia > 5 mm long ..... *Peristeria elata*
    - 13b. Pollinia < 5 mm long
      - 14a. Viscidium present
        - 15a. Viscidium small (< 0.8 mm long)
          - 16a. Pollinia 1.5 x 0.6 mm ..... *Oncidium ampliatum*
          - 16b. Pollinia 3.3 x 1.6 mm ..... *Aspasia epidendroides*
        - 15b. Viscidium larger (> 1.2 mm long) ..... *Trichocentrum capistratum*
      - 14b. Viscidium absent
        - 17a. Pollinia > 3 mm long; stipe > 1 mm long
          - 18a. Pollinium slightly flattened ..... *Spiranthes schappneri*
          - 18b. Pollinium strongly flattened ..... *Gongora spp.*
        - 17b. Pollinia < 1.5 mm long; stipe < 0.5 mm long ..... *Lockhartia oerstedii*
  - 12b. Subequal to stipe
    - 19a. Pollinia > 5 mm long; stipe > 5 mm long; viscidium present ..... *Catasetum bicolor*
    - 19b. Pollinia < 2 mm long; stipe < 2.5 mm long; viscidium absent ..... *Trichopilia maculata*
  - 12c. Shorter than stipe
    - 20a. Pollinium oblong, < 1 mm long; viscidium present
      - 21a. Caudicle conspicuous ..... *Scaphyglottis reedii*
      - 21b. Caudicle absent ..... *Pleurothallis arietina*
    - 20b. Pollinium angular, > 1 mm long; viscidium absent ..... *Habenaria pauciflora**
- 2e. Pollinium irregular
  - 22a. Pollinia > 4 mm long; stipe > 2 mm long
    - 23a. Viscidium present; pollinium angular, 4 mm long ..... *Vanilla pompona*
    - 23b. Viscidium absent; pollinium flattened, 6 mm long ..... *Coryanthes maculata*
  - 22b. Pollinia < 2 mm long; stipe < 1.5 mm long ..... *Mormodes roseum*

1b. Four pollinia per pollinarium
- 24a. Pollinium drop-shaped
  - 25a. Flattened ..... *Polystachya masayensis*
  - 25b. Rounded
    - 26a. Longer than stipe; caudicle present ..... *Epidendrum stangeanum*
    - 26b. Subequal to stipe; caudicle absent ..... *Maxillaria neglecta*
- 24b. Pollinium kidney-shaped
  - 27a. > 1.5 mm ..... *Maxillaria variabilis*
  - 27b. < 1.5 mm long ..... *Epidendrum difforme*
- 24c. Pollinium elongate
  - 28a. Pollinia > 4.5 mm long
    - 29a. Slightly flattened, subequal to or shorter than stipe ..... *Maxilllaria friedrichsthalii*
    - 29b. Strongly flattened, longer than stipe ..... *Maxillaria uncata*
  - 28b. Pollinia < 3.5 mm long
    - 30a. Viscidium present
      - 31a. Pollinia 1.5 to 2.0 mm long, superposed ..... *Teuscheria pickiana*, *Trigonidium egertonianum*, *Xylobium foveatum*
      - 31b. Pollinia 1.0 mm long, not superposed ..... *Palmorchis powellii*
    - 30b. Viscidium absent ..... *Cochleanthes aromatica*

24d Pollinium globose
32a. Pollinia shorter than stipe
33a. Pollinia < 1.5 mm long..... *Ornithocephalus powelli*
33b. Pollinia > 3.0 mm long..... *Dichaea panamensis*
32b. Pollinia longer than stipe..... *Epidendrum nocturnum*
24e. Pollinium irregular and flattened
34a. Pollinia angular, > 2 mm long
35a. Longer than stipe, stipe 2.3 x 0.4 mm; viscidium large..... *Epidendrum coronatum*
35b. Shorter than stipe, stipe 3.5 x 0.4 mm; viscidium absent..... *Lycaste powellii*
34b. Pollinia flattened, < 1.5 mm long
36a. Caudicle present; viscidium absent..... *Epidendrum schlecterianum*
36b. Caudicle absent; viscidium present..... *Palmorchis nitida*
1c. Eight pollinia per pollinarium
37a. Elongate to kidney-shaped, flattened
38a. Pollinia < 1.5 mm long
39a. Viscidium present; pollinia longer than stipe..... *Sobralia suaveolens*
39b. Viscidium absent; pollinia subequal to stipe..... *Sobralia fragans*
38b. Pollinia > 3.0 mm long..... *Sobralia panamensis*
37b. Globose to irregular; pollinia > 2.5 mm long; subequal to stipe..... *Chysis maculata*

Aspasia epidendroides Lindl.
2 pollinia, elongate, flattened 3.3 x 1.6 mm, slightly longer than stipe, 2.8 x 1.2 mm; viscidium small.
no locality, M. Chase; plate 23 :247 (adaxial view).

Brassia maculata (R. Br.)
2 pollinia, drop-shaped, rounded, 2.1 x 1.3 mm, longer than stipe; stipe 1.7 x 0.7 mm; viscidium large, 1.0 x 0.7 mm.
no locality, M. Chase; plate 23:248 (adaxial view).

Catasetum bicolor Klotzch
2 pollinia, elongate, slightly flattened 5.3 x 1.8 mm, subequal to stipe 5.6 x 1.5 mm; viscidium large, 1.1 x 1.9 mm
no locality, M. Chase; plate 23:249 (adaxial view).

Cattleya skinneri Batem (*C. patinii* Cogn.)
2 pollinia, drop-shaped, rounded 2.7 x 1.7 mm, longer than stipe; caudicle present .
PAN, R. Dressler; plate 23:250 (adaxial view).

Chysis maculata Hook. (*C. aurea* var. *maculata* Hook.)
8 pollinia, globose, irregular shape 2.9 x 2.4 mm, subequal to stipe, 3.1 x 1.1 mm.
no locality; M. Chase, plate 23:251 (adaxial view).

Cochleanthes aromatica (Reichb. f.) Schult. & Garay
4 pollinia, elongate, superposed, flattened 3.3 x 2.3 mm; stipe wide, 1.7 x 3.3 mm.
no locality, M. Chase, plate 23:253 (adaxial view).

Coryanthes maculata Hook.
2 pollinia, flattened, irregular 6.0 x 2.5 mm; stipe wide, 2.9 x 2.4 mm.
no locality, M. Chase, plate 23:252 (adaxial view).

Dichaea panamensis Lindl.
4 pollinia, globose, superposed, flattened 3.3 x 2.3 mm; stipe wide, 1.7 x 3.3 mm.
PAN, R. Dressler; plate 23:254 (adaxial view).

Encyclia cordigera (HBK) Dressler
2 pollinia, drop-shaped 2.8 x 1.9 mm; caudicle present.
PAN, R. Dressler; plate 23:255 (adaxial view).

Encyclia pentotis (Reichb. f.) Dressler
2 pollinia, ovoid, kidney-shaped 1.7 x 0.8 mm, flattened, subequal to stipe, 2.0 x 0.7 mm.
no locality, M. Chase; plate 23:256 (adaxial view).

Epidendrum coronatum R. & P
4 pollinia, flattened, angular 2.4 x 1.8 mm, slightly longer than stipe 2.3 x 0.4 mm; viscidium large, 1.1 x 1.3 mm.
PAN, R. Dressler; plate 23:257 (adaxial view).

Epidendrum difforme Jacq.
4 pollinia, ovoid, kidney-shaped 1.3 x 0.7 mm, longer than stipe 0.7 x 0.6 mm; viscidium large, 0.9 x 0.6 mm.
PAN, R. Dressler; plate 23:258 (adaxial view).

Epidendrum nocturnum Jacq.
4 pollinia, globose, 1.1 x 0.7 mm, longer than stipe 0.6 x 0.4 mm.
PAN, M. Chase; plate 23:259 (adaxial view).

Epidendrum schlechterianum Ames
4 pollinia, irregular, slightly flattened, 1.2 x 0.8 mm; caudicle present.
no locality; M. Chase; plate 23:261 (adaxial view).

Epidendrum stangeanum Reichb. f.
4 pollinia, drop-shaped, rounded, 0.8 x 0.5 mm, longer than stipe; caudicle present.
PAN, R. Dressler; plate 23:260 (adaxial view).

Eulophia alta (L.) Fawc. & Rendle
2 pollinia, globose, ovoid, appearing subequal to stipe, 1.9 x 1.9 mm.
PAN, R. Dressler; plate 23:262 (adaxial view).

Gongora quinquenervis R. & P.
2 pollinia, elongate, flattened 3.5 x 1.3 mm, longer than stipe, 1.1 x 0.9 mm.
PAN, M. Chase; plate 24:263 (adaxial view).

Gongora tricolor (Lindl.) Reichb. f. (*G. fulva* Lindl.)
2 pollinia, elongate, flattened, slightly longer than stipe, 3.0 x 0.6 mm.
PAN, R. Dressler; plate 24:264 (adaxial view).

Habenaria pauciflora (Lindl.) Reichb. f. (*H. trifida* HBK)
2 pollinia, elongate, flattened, angular, 1.1 x 2.0 mm, shorter than stipe 2.1 x 1.7 mm.
PAN, R. Dressler; plate 24:265 (adaxial view).

Ionopsis satyrioides (Sw.) Reichb. f.
2 pollinia, globose 0.3 x 0.4 mm, shorter than stipe,1.1 x 0.2 mm.
PAN; R. Dressler, plate 24:266 (adaxial view).

Ionopsis utricularioides (Sw.) Lindl.
2 pollinia, globose, 0.4 x 0.6 mm, shorter than stipe, 1.1 x 0.3 mm.
PAN, R. Dressler; plate 24:267 (adaxial view).

Leochilus scriptus (Scheidw.) Reichb. f.
2 pollinia, globose, drop-shaped, 1.1 x 1.0 mm, shorter than stipe, 1.7 x 0.7 mm.
PAN, R. Dressler; plate 24:268 (adaxial view).

Lockhartia oerstedii Reichb. f.
2 pollinia, elongate, flattened, 1.3 x 0.6 mm, longer than stipe, 0.4 x 0.3 mm.
PAN, R. Dressler; plate 24:269 (adaxial view).

Lycaste powellii Schlechter
4 pollinia, superposed, flattened, angular, 2.1 x 1.7 mm, shorter than stipe, 3.5 x 0.4 mm.
PAN, R. Dressler; plate 24:270 (adaxial view).

Masdevallia livingstoneana Reichb. f.
2 pollinia, flattened, kidney-shaped, 1.6 x 0.4 mm; viscidium present
no locality, M. Chase; plate 24:271 (adaxial view).

Maxillaria friedrichsthalii Reichb. f.
4 pollinia, superposed, elongate, slightly flattened, 4.9 x 1.3 mm, subequal to stipe, 6.0 x 1.7 mm.
PAN, R. Dressler; plate 24:272 (adaxial view).

Maxillaria neglecta L. O. Wms.
4 pollinia, drop-shaped, rounded, 0.5 x 0.5 mm, subequal to stipe, 0.6 x 0.6 mm.
PAN, R. Dressler; plate 24:273 (adaxial view).

Maxillaria uncata Lindl.
4 pollinia, superposed, flattened, elongate, 4.7 x 2.1 mm; viscidium present.
no locality, M. Chase; plate 24:274 (adaxial view).

Maxillaria variabilis Batem. ex Lindl.
4 pollinia, superposed, kidney-shaped, slightly flattened,1.6 x 1.0 mm; viscidium present.
no locality, M. Chase; plate 24:275 (adaxial view).

Mormodes roseum Barb. Rodr.
2 pollinia, ovoid, irregular, 1.8 x 1.3 mm; stipe large, irregular, 1.5 x 0.9 mm; viscidium present.
no locality, M. Chase; plate 24:276 (adaxial view).

Notylia barkeri Lindl.
2 pollinia, globose 0.5 x 0.3 mm, shorter than stipe, 1.7 x 0.5 mm.
PAN, R. Dressler; plate 24:277 (adaxial view).

Oncidium ampliatum Lindl.
2 pollinia, elongate, slightly flattened, 1.5 x 0.6 mm; viscidium 0.7 x 0.4 mm.
PAN, Dressler; plate 24:278 (adaxial view)

Oncidium stipitatum Linsl. in Benth.
2 pollinia, drop-shaped, flattened, 1.5 x 1.0 mm, subequal to stipe 1.7 x 0.9 mm
no locality; M. Chase; plate 25:279 (adaxial view)

Ornithocephalus powellii Schlechter
4 pollinia, globose 1.3 x 1.1 mm, much shorter than stipe, 8.4 x 1.9 mm.
PAN, R. Dressler; plate 25:280 (adaxial view).

Palmorchis nitida Dressler
4 pollinia, slightly flattened, irregular ,1.0 x 0.3 mm; viscidium present.
Pan, R. Dressler; plate 25: 281 (adaxial view).

Palmorchis powellii (Ames) Schweinf. & Corr.
4 pollinia, elongate, slightly flattened, 1.0 x 0.5 mm; viscidium present.
PAN, M. Chase; plate 25:282 (adaxial view).

Peristeria elata Hook.
2 pollinia, elongate, flattened 5.6 x 2.0 mm, slightly longer than stipe, 4.4 x 1.8 mm.
PAN, R. Dressler; plate 25:283 (adaxial view).

Pleurothallis arietina Ames
2 pollinia, elongate, slightly flattened, shorter than stipe, 1.0 x 0.3 mm; viscidium present.
no locality, M. Chase; plate 25:284 (adaxial view).

Polystachya masayensis Reichb. f.
4 pollinia, superposed, drop-shaped, flattened, 0.6 x 0.5 mm; viscidium present.
no locality, M. Chase; plate 25:285 (adaxial view).

Scaphyglottis reedii (Reichb. f.) Ames
2 pollinia, elongate, flattened, oblong, shorter than stipe, 0.7 x 0.7 mm; viscidium present; caudicle present.
no locality, M. Chase; plate 25: 286.

Sievekingia suavis (Reichb. f.)
2 pollinia, ovoid, globose, subequal to stipe, 1.6 x 1.0 mm; stipe 1.7 x 0.9 mm; viscidium present.
PAN, R. Dressler; plate 25:287 (adaxial view).

Sobralia fragans Lindl.
8 pollinia, superposed, flattened, elongate, subequal to stipe, 0.7 x 0.7 mm.
PAN, R. Dressler; plate 25:288 (adaxial view).

Sobralia panamensis Schlechter (*S. fenzliana* Reichb. f.)
8 pollinia, superposed, elongate, kidney-shaped, flattened 3.3 x 1.3 mm.
PAN, M. Chase; plate 25:290 (adaxial view).

Sobralia suaveolens Reichb. f.
8 pollinia, superposed, kidney-shaped, slightly flattened 1.1 x 0.4 mm; stipe 0.9 x 0.3 mm; viscidium present
PAN, R. Dressler; plate 25:289 (adaxial view).

Spiranthes schaffnert Reichb f.
2 pollinia, elongate, slightly flattened, 3.5 x 0.9 mm.
no locality, M. Chase; plate 25:291 (adaxial view).

Teuscheria pickiana (Schlechter) Garay
4 pollinia, superposed, elongate, slightly flattened, 1.5 x 0.8 mm; viscidium present.
PAN, M. Chase; plate 25:292 (adaxial view).

Trichocentrum capistratum Linden & Reichb. f.
2 pollinia, elongate, flattened, 2.7 x 1.0 mm; viscidium 1.3 x 0.9 mm.
PAN, R. Dressler; plate 25: 293 (adaxial view).

Trichopilia maculata Reichb. f.
2 pollinia, elongate, flattened 2.0 x 0.7 mm, subequal to stipe, 2.4 x 0.8 mm.
no locality, M. Chase; plate 25:294 (adaxial view).

Trichopilia subulata (Sw.) Reichb. f.
2 pollinia, drop-shaped 1.5 x 0.7 mm, rounded, shorter than stipe, 2.0 x 0.6 mm.
no locality, R. Dressler; plate 25:295 (adaxial view).

Trigonidium egertonianum Batem. ex Lindl.
4 pollinia, superposed, elongate, slightly flattened ,2.0 x 0.5 mm; viscidium present.
no locality, M. Chase; plate 25:296 (adaxial view).

Vanilla pompona Schiede
2 pollinia, slightly flattened, angular, irregular, 4.0 x 2.3 mm; viscidium present.
PAN, R. Dressler; plate 25:297 (adaxial view).

Xylobium foveatum (Lindl.) Nichols.
4 pollinia, superposed, elongate, slightly flattened, ovoid ,1.8 x 1.0 mm; viscidium present.
PAN, R. Dressler; plate 25:298 (adaxial view).

PALMAE (ARECACEAE)

Monad; heteropolar-bilateral and heteropolar-radiosymmetric; monosulcate and trichotomosulcate; exine tectate, semitectate and intectate, 1 - 6 μ thick; generally densely columellate; sexine psilate, scabrate, baculate, verrucate, echinate, reticulate; amb and shape sub-oblate, angular, when trichotomosulcate, sub-prolate, elliptical when monosulcate; grains 15 - 87 x 24 - 110 μ. *(13 genera, 18 species; additional references: 109, 140, 170).*

Key to genera and species:

1a. Monosulcate
- 2a. Psilate
  - 3a. Exine 1 μ thick
    - 4a. Grains > 35 μ (40 - 42 μ long axis) ..... *Synechanthus warscewiczianus*
    - 4b. < 35 μ (long axis)
      - 5a. Oblate 15 - 18 x 30 - 32 μ ..... *Chamaedorea wendlandiana**
      - 5b. Suboblate 16 - 19 x 25 - 28 μ ..... *Geonoma procumbens*
  - 3b. Exine 3 μ thick
    - 6a. 92 - 97 μ (long axis) ..... *Cocos nucifera*
    - 6b. 50 - 63 μ (long axis) ..... *Elaeis oleifera*
- 2b. Scabrate
  - 7a. > 35 μ; sulcus as wide as distal face of grains ..... *Astrocaryum standleyanum*
  - 7b. < 35 μ sulcus narrow, long
    - 8a. 24 - 27 μ (long axis) ..... *Geonoma cuneata*
    - 8b. 27 - 35 μ (long axis)
      - 9a. Exine 1 μ thick ..... *Geonoma interrupta*
      - 9b. Exine 1.5 - 2.0 μ thick
        - 10a. 27 - 32 μ (long axis) ..... *Desmoncus panamensis*
        - 10b. 33 - 35 μ (long axis) ..... *Oenocarpus panamanus*
- 2c. Reticulate
  - 11a. 60 - 68 μ; homobrochate ..... *Phytelephas microcarpa*
  - 11b. 29 - 32 μ; heterobrochate ..... *Cryosophila warscewiczii*
- 2d. Echinate (grains 43 - 46 μ) ..... *Socratea durissima**
- 2e. Verrucate (grains 100 - 110 μ) ..... *Scheelea zonensis*

1b. Trichotomosulcate
- 12a. > 50 μ
  - 13a. Psilate
    - 14a. 50 - 63 μ (equatorial dimension) ..... *Elaeis oleifera*
    - 14b. 92 - 97 μ ..... *Cocos nucifera*
  - 13b. Reticulate ..... *Phytellephas microcarpa*
- 12b. < 50 μ
  - 15a. Exine 1.0 - 2.5 μ thick
    - 16a. Psilate ..... *Bactris coloniata*
    - 16b. Ornamented
      - 17a. Tectate ..... *Oenocarpus panamanus**
      - 17b. Semitectate, tectum perforate ..... *Bactris major*
  - 15b. Exine > 3 μ thick
    - 18a. 40 -42 μ (equatorial dimension) ..... *Bactris gasipaes*
    - 18b. 34 - 36 μ ..... *Bactris barronis*

Astrocaryum standleyanum L. H. Bailey
Heteropolar-bilateral; monosulcate; exine tectate, 1.5 - 2.0 μ thick; sexine scabrate; sulcus as wide as distal face of grain, margins irregular; usually angular, grains suboblate, 35 x 40 - 42 μ.
BCI, Croat 16626, MO; plate 26:299.

Bactris barronis L. H. Bailey
Heteropolar-radiosymmetric; trichotomosulcate; exine tectate, 3 μ thick; densely columellate; sexine scabrate; three-slit opening on distal face; margins irregular, as wide as grain; grains suboblate, 34 - 36 μ (aperturate face).
PAN, Croat 5867, MO; plate 26:300.

Bactris coloniata L. H. Bailey
Heteropolar-radiosymmetric; trichotomosulcate; exine tectate, 1.5 - 2.0 μ thick; slightly columellate; sexine psilate; three-slit opening as wide as distal face of grain; grains suboblate, 32 - 41 μ (aperturate face).
BCI, Croat 8787, MO; plate 26:301.

Bactris gasipaes HBK
Heteropolar-radiosymmetric; trichotomosulcate; exine tectate, 3 μ thick; densely columellate; sexine scabrate; three-slit opening with irregular margins, as long as distal face; amb angular; grains sub-oblate, 40 - 42 μ (aperturate face).
PAN, Croat 14479, MO; plate 26:302.

Bactris major Jacq.
Heteropolar-radiosymmetric; trichotomosulcate; exine semitectate, 2.0 - 2.5 μ thick; densely columellate; sexine baculate; tectum perforate; three-slit opening with poorly defined margin; grains appearing suboblate, 39 x 49 μ (aperturate face).
BCI, Schmatzel 925, MO; plate 26:303.

Chamaedorea wendlandiana (Oerst.) Hemsl. (*C. tepejilote* Liebm. ex Mart.)
Heteropolar-bilateral; monosulcate; exine tectate, 1 μ thick; sexine psilate; sulcus irregular 24 μ long x 1 - 2 μ wide; amb elliptical-biconvex in polar view and elliptical plano-convex in equatorial view; grains 15 - 18 x 30 - 32 μ.
BCI, Croat 6506, MO; plate 26:304.

Cocos nucifera L.
Dimorphic; heteropolar-bilateral, monosulcate and less frequently apolar-radiosymmetric, trichotomosulcate; exine tectate, 3 μ thick; columellate; sexine psilate; sulcus as long as grain; costa colpi apparently present displaying thin margo; amb elliptical and angular; grains oblate to suboblate, 54 - 55 x 92 - 97 μ when monosulcate, oblate to suboblate, 91 - 95 μ (aperturate face) when trichotomosulcate.
PAN, Schmalzel 909, MO; plate 26:305.

Cryosophila warscewiczii (H. Wendl.) Bartl.
Heteropolar-bilateral; monosulcate; exine semitectate, 1 μ thick; sexine reticulate, heterobrochate; brochi becoming sparser toward aperture, 2 - 0.5 μ wide; muri simplibaculate, < 0.5 μ wide; sulcus as long as grain x 6 μ wide; edges sharp; amb elliptical; grains oblate, 13 (polar dimension) x 29 - 32 x 17 - 18 μ (equatorial dimension).
PAN, Croat 12510, MO; plate 26:306.

Desmoncus panamensis Linden
Heteropolar-bilateral; monosulcate; exine tectate, 1.0 - 1.5 thick; sexine scabrate; sulcus as long as grain, margins irregular, conspicuous; amb elliptical slightly depressed at edges; grains suboblate, 20 - 22 x 27 - 32 μ (equatorial dimension).
PAN, Williams 691, NY; plate 26:307.

Elaeis oleifera (HBK) Cortes
Dimorphic; heteropolar-bilateral, monosulcate and occasionally apolar-radiosymmetric, trichotomosulcate; exine tectate, 3 μ thick; densely columellate; sexine psilate; sulcus well defined, 38 x 9 - 10 μ; amb elliptical-irregular, trapezoidal and sub-angular; grains suboblate 33 - 45 x 50 - 63 μ when monosulcate, suboblate, 52 - 60 μ (aperturate face) when trichotomosulcate.
PAN, Schmalzel 1052, MO; plate 26:308.

Geonoma cuneata H. Wendl. ex Spruce
Heteropolar-bilateral, monosulcate; exine tectate, 1.0 - 1.5 μ thick; densely columellate; sexine scabrate; sulcus as long as grain, rounded at edges x 6 - 7 μ wide; amb elliptical-irregular; grains suboblate, 24 - 27 x 20 μ (equatorial dimension).
BCI, Croat 11237, MO; plate 26:309.

Geonoma interrupta (R. & P.) Mart.
Heteropolar-bilateral; monosulcate; exine tectate, 1 μ thick; sexine scabrate; sulcus the length of grain, irregular, inconspicuous; amb elliptical grains suboblate, 30 - 31 x 17 - 19 μ (equatorial dimension).
PAN, Schmalzel 1168, MO; plate 26:310.

Geonoma procumbens H. Wendl. ex Spruce
Heteropolar-bilateral; monosulcate; exine tectate, 1 μ thick; sexine psilate; sulcus as long as grain x 1 - 2 μ wide; amb elliptical irregular; grains suboblate, 25 - 28 x 16 - 19 μ (equatorial dimension).
BCI, Croat 10222, MO; plate 26:311.

Oenocarpus panamanus Bailey (*O. mapora* Karst)
Dimorphic; heteropolar-bilateral, monosulcate, occasionally apolar-radiosymmetric, trichotomosulcate; exine tectate, 2 μ thick; densely columellate; sexine scabrate; sulcus as long as grain x 2 μ wide; amb elliptical with acute edges, angular semi-lobate; grains suboblate, 33 - 36 x 20 - 23 μ (equatorial dimension) when monosulcate, oblate 32 μ (aperturate face) when trichotomosulcate.
BCI, Schmalzel 1371, MO; plate 27:312.

Phytelephas microcarpa (R. & P.)
Dimorphic; heteropolar-bilateral, monosulcate and rarely apolar-radio-symmetric, trichotomosulcate; exine tectate, 2 μ thick; sexine reticulate, homobrochate; brochi 1 μ wide; muri simplibaculate; sulcus as long as grain, wide; amb elliptical and angular; grains suboblate, 60 - 68 x 42 - 44 μ when monosulcate and suboblate, 37 - 67 μ (equatorial dimension) when trichotomosulcate.
ECU, Bolsier 8262, NY; plate 27:313.

Scheelea zonensis L. H. Bailey
Heteropolar-bilateral; monosulcate; exine tectate; exine 5 - 6 μ thick, densely columellate; tectum psilate; sexine verrucate, verrucae irregular; sulcus conspicuous 90 x 1 - 2 μ; costa present, displaying margo; amb elliptical; grains suboblate, 100 - 110 x 77 - 87 μ (equatorial dimension).
BCI, Schmalzel 904, MO; plate 27:314.

Socratea durissima (Oerst.) H. Wendl. (*S. exorrhiza* (Mart.) Wendl.)
Heteropolar-bilateral; monosulcate; exine intectate, 2 μ thick; sexine echinate; echini conical, sharp, densely aggregated, 1.5 - 2.0 high x 1.5 - 3.0 μ wide; sulcus as long as grains, narrow at equator widening and rounded at edges; amb usually elliptical; grains suboblate, 43 - 46 x 32 - 35 μ (equatorial dimension).
BCI, Croat 8638, MO; plate 27:315.

Synechanthus warscewiczianus H. Wendl.
Heteropolar-bilateral; monosulcate; exine tectate, 1 μ thick; sexine psilate; sulcus 25 - 30 x 1 μ, well defined; amb elliptical grains suboblate, 40 - 42 x 28 - 29 μ (polar view).
BCI, Croat 11953, MO; plate 27:316.

PONTEDERIACEAE

Monad; isopolar-radiosymmetric; monosulcate and di-sulcate; exine tectate, 2 - 3 µ thick; columellate; sexine scabrate; sulcus as long as grain, united at edges, apparently zonorate; amb elliptical biconvex to plano-convex; grains suboblate, 36 - 56 x 20 - 34 µ (*2 genera, 3 species; additional reference: 164*).

Key to genera and species:

1a. > 50 µ; exine densely columellate..... *Pontederia rotundifolia*
1b. < 50 µ; exine slightly columellate
  2a. 36 µ (long axis); exine > 2 - 3 µ thick..... *Eichhornia azurea*
  2b. 43 µ (long axis); exine < 2 µ thick..... *Eichhornia crassipes*

Eichhornia azurea (Sw.) Kunth.
Exine 2 - 3 µ thick, columellate; sulcus with irregular margins; elliptical, plano-convex, grains 36 x 20 - 23 µ (equatorial dimension).
BCI, Schmalzel 154, MO; plate 27:317.

Eichhornia crassipes (Mart.) Solms in DC
Exine 1.5 - 2.0 µ thick, slightly columellate; sulcus well defined, as long as grain x 1 - 2 µ wide; amb elliptical-biconvex; grains 43 x 26 µ.
BCI, Schmalzel 119, MO; plate 27:318.

Pontederia rotundifolia L. f.
Exine 2 µ thick; densely columellate; sulcus as long as grain, united at edges, zonorate; grains resembling two independent valves; amb elliptical, plano-convex; grains 56 x 34 µ (equatorial dimension).
BCI, Schmalzel 304, MO; plate 27:319.

SMILACACEAE

Monad; apolar-asymmetric; inaperturate; exine tectate, 1.0 - 1.5 µ thick; densely columellate; sexine intectate and verrucate; grains spheroidal, 16 - 26 µ; species not readily distinguishable. (*1 genus, 5 species; additional reference: 189*).

Key to genera and species:

1a. 21 - 26 µ..... *Smilax spissa*
1b. < 20 µ
  2a. Displaying small rupture of exine..... *Smilax spinosa*
  2b. Displaying continuous exine
    3a. 16 - 18 µ..... *Smilax lanceolata*
    3b. 19 - 20 µ
      4a. Verrucae conspicuous, densely aggregated..... *Smilax panamensis*
      4b. Verrucae inconspicuous, independent..... *Smilax mollis*

Smilax lanceolata L.
Exine 1 µ thick; verrucae independent, small ca. 1 µ high; grains 16 - 18 µ.
CR, Bunger & Gentry 3369, MNCR 64214; plate 28:320.

Smilax mollis H. & B. ex Willd.
Exine 1 µ thick; verrucae independent, small, inconspicuous; grains 19 - 20 µ.
CR, Leon, no voucher, CR; plate 28:321.

Smilax panamensis Morong
Exine 1 µ thick; verrucae densely aggregated, conspicuous, 1 µ high x 2 µ wide; grains 19 - 20 µ.
PAN, Croat 5449, MO; plate 28:322.

Smilax spinosa P. Mill.
Exine 1.0 - 1.5 µ thick; displaying small rupture areas, resembling vestigial apertures; verrucae short, separated; grains 17 - 19 µ.
PAN, Tyson 3644, MO; plate 28:323.

Smilax spissa Killip & Mort.
Exine 1.0 - 1.5 µ thick; verrucae densely aggregated, irregular, 0.5 - 2.0 µ; grains 21 - 26 µ.
PAN, Croat 8772, MO; plate 28:324.

TYPHACEAE

Monad; heteropolar-radiosymmetric; monoporate; exine tectate; sexine reticulate, homobrochate; pore circular; common type; grains spheroidal, 19 - 27 µ. (*1 genus, 1 species*).

Typha domingensis Pers.
Exine 1.0 - 1.5 µ thick; brochi 0.5 µ wide; muri simplibaculate; baculum conspicuous; pore margins delimited by small baculum; grains 19 - 27 µ.
BCI, Schmalzel 588, MO; plate 28:325.

ZINGIBERACEAE

Monad; apolar-asymmetric; inaperturate and periporate; exine stratification indistinct, apparently tectate, 1 - 3 μ thick; sexine psilate; pores circular, 15 - 30 μ diameter, 8 - 16 per grain; occasionally covered by fine ectexinic membrane; amb circular; grains spheroidal, large to very large 80 - 150 μ, highly susceptible to damage by acetolysis; species not readily distinguishable; description based on fresh material. *(3 genera, 9 species; additional reference: 131).*

Key to genera and species:

1a. Inaperturate
- 2a. 80 - 86 μ ..... *Renealmia alpinia*
- 2b. 87 - 103 μ ..... *Renealmia cernua*

1b. Periporate
- 3a. < 100 μ; 14 - 16 porate ..... *Costus scaber*
- 3b. > 100 μ; 8 - 12 porate
  - 4a. Exine 3 - 4 μ thick; 10 - 12 porate, pores 30 μ diameter ..... *Costus villosissimus*
  - 4b. Exine 1 - 2 μ thick; 8 - 10 porate, pores 15 - 25 μ diameter
    - 5a. 140 - 150 μ; exine undulating ..... *Costus pulverulentus*
    - 5b. 100 - 135 μ; exine regular
      - 6a. Pores 15 - 20 μ diameter
        - 7a. Exine 1 - 15 μ thick; grains 125 μ ..... *Dimerocostus strobilaceus*
        - 7b. Exine 2 μ thick; grains 100 - 120 μ ..... *Costus guanaiensis*
      - 6b. Pores 20 - 25 μ diameter
        - 8a. 130 μ; 8 - 10 porate ..... *Costus laevis*
        - 8b. 135 μ; 8-porate ..... *Costus allenii*

Costus allenii Maas
8-porate; psilate; exine 1.5 - 2 μ thick; pores 25 μ diameter; grains large, 135 μ.
PAN, Blum et al. 2501, MO; 28:326.

Costus guanaiensis Rusby var. ***macrostrobilus*** (K. Schum.) Maas
8 - 10 porate; scabrate; exine 2 μ thick; pores 15 - 20 μ diameter; grains very large, 100 - 120 μ.
BCI, Schmalzel 633, MO; plate 28:327.

Costus laevis R. & P.
8 - 10 porate; psilate; exine 2 μ thick; pores 20 - 25 μ diameter; grains very large, 130 μ.
BCI, Schmalzel 839, MO; plate 28:328.

Costus pulverulentus Presl
8 -10 porate; psilate; exine 2 μ thick; pores 20 μ diameter; grains very large, 140 - 150 μ.
BCI, Schmalzel 816, MO; plate 28:329.

Costus scaber R. & P.
14 -16 porate; psilate; exine 2 μ thick; pores 15 μ diameter; grains large, 89 - 98 μ.
BCI, Croat 14868, MO; plate 28:330.

Costus villosissimus Jacq.
10 -12 porate; psilate; exine 3 - 4 μ thick; pores 30 μ diameter; grains very large, 140 μ.
BCI, Schmalzel 853, MO; plate 28:331.

Dimerocostus strobilaceus O. Kuntze subsp. ***strobilaceus***
8-porate; psilate; exine 1.0 - 1.5 μ thick; pores 18 μ diameter; grains very large, 125 μ.
BCI, Schmalzel 930, MO; no plate.

Renealmia alpinia (Rottb.) Maas.
Inaperturate; exine 3 μ thick; grains large, 80 - 87 μ.
BCI, Schmalzel 871, MO; no plate.

Renealmia cernua (Sw.) Macbr.
Inaperturate; exine 2.5 - 3.0 μ thick; grains large, 87 - 103 μ.
BCI, Schmalzel 630, MO; no plate.

ANGIOSPERMAE-DICOTYLEDONEAE[1]

ACANTHACEAE

Monad; isopolar-radiosymmetric (except *Thunbergia*:, asymmetric); tricolpate, heterocolpate, syncolpate, (spiraperturate); diporate, stephanoporate, dicolporate, tricolporate, syncolporate syncolpate, stephanocolporate; exine semitectate and tectate 1.5 - 8.0 µ thick (nexine 1 - 2 µ), sexine granulate, verrucate, scabrate, reticulate, punctitegillate; amb circular to angular; grains oblate spheroidal to perprolate 17 - 127 x 22 - 127 µ. (*12 genera, 14 species; additional references: 69, 142*).

Key to genera and species:

1a. Tricolpate
- 2a. Grains 48 - 63 µ, sexine granulate..... *Aphelandra sinclairiana*
- 2b. Grains 66 - 78 µ, sexine scabrate..... *Ruellia metallica*

1b. Heterocolpate
- 3a. Apertures ≤ 12..... *Herpetacanthus panamensis*
- 3b. Apertures > 20..... *Hygrophila guianensis**

1c. Syncolpate (spiraperturate)..... *Thunbergia erecta*
1d. Diporate..... *Trichanthera gigantea*
1e. Stephanoporate..... *Nelsonia brunelloides*
1f. Dicolporate..... *Justicia graciliflora*
1g. Tricolporate or syncolporate
- 4a. Reticulate or granulate
  - 5a. Prolate, pores circular, exine 2.5 µ thick..... *Teliostachya alopecuroidea*
  - 5b. Subprolate, pores lalongate, exine 3.5 µ thick..... *Justicia pectoralis*
- 4b. Granulate
  - 6a. ≤ 25 µ, exine < 2 µ thick..... *Elytraria imbricata*
  - 6b. > 25 µ
    - 7a. Pores 10 µ diameter..... *Blechum brownei*
    - 7b. Pores 6 µ diameter..... *Blechum costaricense*

1h. Stephanocolporate..... *Mendoncia gracilis*

Aphelandra sinclairiana Nees in Benth.
Tricolpate; exine tectate, 1.5 µ thick, sexine granulate; colpi narrow, 60 x 3 µ, displaying granular membrane, extending to poles; amb circular; grains perprolate, 48 - 63 x 22 - 25 µ.
BCI, Croat 7279, MO; plate 28:332.

Blechum brownei Ant. Juss.
Tricolporate to syncolporate; exine semitectate, 2 µ thick, sexine granulate, appearing verrucate, 1 µ thick; pores prominent, circular, 10 µ diameter; amb semiangular to circular; grains oblate-spheroidal, 29 - 40 x 33 - 40 µ.
PAN, Correa 780, KE 18079, MO; no plate.

Blechum costaricense Oerst.
Tricolporate to syncolporate; exine semitectate, 2.5 - 3.0 µ thick, sexine granulate, appearing verrucate; pores circular 6 µ diameter; amb circular; grains oblate-spheroidal, 32 - 40 x 33 - 43 µ.
BCI, Croat 4355, KE 18080, MO; plate 28:333.

Elytraria imbricata (Vahl) Pers.
Tricolporate to syncolporate; exine tectate, 1.5 µ thick, sexine granulate; colpi moderately long, narrow; pores lalongate 2 x 5 µ; amb circular, poles strongly depressed; grains oblate-spheroidal, 17 - 19 x 19 - 23 µ.
PAN, Stern et al. 1905, KE 18082, MO; plate 28:334.

Herpetacanthus panamensis Leonard
Heterocolpate (9 pseudocolpi, 3 colpori) moderately long and narrow; exine semitectate, 2.5 µ thick, sexine reticulate, homobrochate, brochi < 1 µ wide; pores circular, 7 - 8 µ diameter; amb circular; grains oblate-spheroidal 33 - 40 x 38 - 44 µ.
PAN, Dressler & Lewis 3704, KE 18083, MO; plate 29:335.

Hygrophila guianensis Nees (***Hygrophila costata*** Nees)
Heterocolpate; 20 - 21 colpi, 3 - 4 colpori, long, extending to poles; exine tectate, 1 µ thick, sexine psilate, granulate at poles; pores circular 5 µ diameter; amb circular; grains oblate-spheroidal, 28-40 x 30-43 µ.
PAN, Fairchild 2105, KE 18084, MO; plate 29:336.

Justicia graciliflora (Standl.) D. Gibson
Dicolporate; exine semitectate, 7 µ thick (nexine 2 µ thick, sexine 4 - 5 µ thick), reticulate to verrucate, heterobrochate, lumina 1 - 2 µ wide; colpi 8 µ wide, reaching poles, pores appearing annulate 3 - 4 µ diameter; amb circular; grains laterally compressed, prolate to perprolate, 62 - 93 x 38 - 68 µ.
BCI, Schmalzel 78, MO; plate 29:337.

Justicia pectoralis Jacq.
Tricolporate to syncolporate; exine 3. 5 µ thick to 2.0 µ at poles, sexine reticulate, homobrochate, lumina 1 µ wide; colpi wide, moderately long, displaying 3 lateral projections 6 - 8 µ; pores lolongate 6 x 4 µ; amb circular; grains subprolate, 38 - 51 x 23 - 28 µ.
PAN, Croat 34405, KE 18091, MO; plate 29:338.

[1]asterisk denotes synonym given in Croat (1978), bracketed name denotes senior synonym

Mendoncia gracilis Turrill
Stephanocolporate (5-colporate); exine semitectate, 4 µ thick at poles, 3 µ at intercolpium, sexine scabrate to punctitegillate; colpi short, narrow, brevissimicolpate; pores circular, protuberant to lolongate, 11 x 7 µ; amb angular, pentagonal; grains subprolate to prolate-spheroidal, 57 - 60 x 50 - 54 µ.
BCI, Croat 16519, MO; plate 29:339.

Nelsonia brunelloides (Lam.) O. Kuntze
Stephanoporate (4-porate) or triporate; exine semitectate, 2 µ thick, sexine reticulate (lophoreticulate), homobrochate, lumina < 1 µ wide; pores circular 3 µ diameter; amb circular; grains subprolate to spheroidal, 25 - 28 x 25 - 27 µ.
PAN, Dwyer et al. 5100, KE 18097, MO; plate 29:340.

Ruellia metallica Leonard
Tricolpate; exine semitectate, 2 µ thick, sexine scabrate at poles, rugulate at equator, rugulae1 µ wide x 3 µ high; colpi wide 2.5 µ long, displaying granular membrane; amb circular; grains perprolate, 66 - 78 x 25 - 30 µ.
PAN, Dressler 4239, KE 18098, MO; plate 29:341.

Teliostachya alopecuroidea (Vahl) Nees
Tricolporate to syncolporate; exine semitectate, 2.5 µ thick, sexine reticulate-heterobrochate, brochi 3 - 5 µ wide, displaying 2 to 5 large lumina, muri simplicolumellate; colpi wide, moderately long; pores lalongate 3.5 long x 4.5 µ wide; amb circular; grains prolate to subprolate, 38 - 40 x 28 - 30 µ.
PAN, Lewis et al. 5486, KE 18199, MO; plate 29:342.

Thunbergia erecta (Benth.) T. Anderson
Apolar, asymmetric, syncolpate (spiraperturate), exine intectate, 3 µ thick, sexine verrucate; continuous colpi narrow, forming spiral between poles; grains spheroidal, 59 - 63 x 58 - 63 µ.
ECU, Dodson 11108, MO; plate 30:343.

Trichanthera gigantea (H. & B.) Nees
Isopolar, bilateral, diporate, structure complex, 24-pseudocolpi (bands in opposite hemispheres), perpendicular; exine semitectate, 8 µ thick, sexine reticulate, columellae bordering pores; pores lalongate, 7 x 10 µ, annulate; amb circular; grains spheroidal, 63 - 127 µ.
PAN, Tyson et al. 3118, KE 18100, MO; plate 30:344.

AMARANTHACEAE

Monad; apolar-asymmetric; fenestrate, periporate; exine tectate 1.5 - 2.5 µ thick, sexine baculate, granulate, tectum psilate; 12 - 18 fenestrae; fenestrae 5 - 8 µ diameter; 20 - 32 pores, 3 µ diameter, annulate; amb circular to hexagonal; grains spheroidal, 16 - 25 µ. *(6 genera, 8 species; additional references: 65, 79, 172, 205).*

Key to genera and species:

1a. Fenestrate
  2a. 14 to 18 lacunae, grains > 20 µ, amb circular..... *Gomphrena decumbens**
  2b. 12 lacunae, grains ≤ 20 µ, amb hexagonal
    3a. Exine ≤ 2 µ thick
      4a. Exine 1.5 µ thick, lacunae 6.5 µ wide..... *Alternanthera ficoidea**
      4b. Exine 2 µ thick, lacunae 6 µ wide..... *Alternanthera sessilis*
    3b. Exine > 2 µ thick..... *Iresine angustifolia*
1b. Periporate
  5a. Psilate, > 30 pores..... *Cyathula prostrata*
  5b. Baculate, ≤ 30 pores
    6a. Pores ≤ 20, grains > 20 µ, exine 2.5 µ thick..... *Chamissoa altissima*
    6b. Pores ≥ 22, grains ≤ 20 µ, exine < 2.0 µ thick
      7a. Pores 3.0 µ diameter..... *Iresine celosia**
      7b. Pores 1.5 µ diameter..... *Amaranthus viridis*

Alternanthera ficoidea (L.) R. Br. (***Alternanthera paronychioides*** St. Hil)
Fenestrate; exine 1.5 µ thick, sexine granulate to baculate, 8 bacula on each fenestral wall, lacunae 12, 6.5 µ wide, annulate, fenestral wall 1.5 - 2.0 µ thick; amb hexagonal; grains spheroidal, 17 - 19 µ.
BCI, Croat 12201, MO; plate 30:345.

Alternanthera sessilis (L.) R. Br.
Fenestrate; exine 2 µ thick, sexine granulate to baculate, bacula conspicuous, lacunae 12, 6.5 µ wide, annulate, fenestral wall 2 µ thick; amb hexagonal; grains spheroidal,16 - 19 µ.
PAN, Correa et al. 3214, MO; plate 30:346.

Amaranthus viridis L.
Periporate (32-porate); exine 1.5 µ thick, sexine slightly baculate; pores circular, 1.5 µ diameter, slightly annulate; amb circular; grains spheroidal, 15 - 19 µ.
PAN, D'Arcy 11161, MO; no plate.

Chamissoa altissima (Jacq.) HBK
Periporate (20-porate); exine 2.5 µ thick, sexine baculate, bacula < 1 µ; pores circular, 3 µ diameter, annulus 0.5 µ thick, interporium 5 µ; amb circular; grains spheroidal, dimorphic, 25 - 28 µ and 19 - 23 µ.
BCI, Croat 4681, MO; plate 30:347.

Cyathula prostrata (L.) Blume
Periporate (32-porate); exine 1.5 µ thick, sexine psilate to baculate; pores circular, 3 µ diameter, appearing annulate, interporium 3 µ; amb circular; grains spheroidal, 16 - 19 µ.
BCI, Croat 6674, MO; plate 30:348.

Gomphrena decumbens Jacq. (*Gomphrena serrata* L.)
Fenestrate; exine 1.5 µ thick, sexine baculate simplicolumellate, ca. 50 bacula surrounding each lacuna, lacunae 14 - 18, 8 x 8 µ, annulus narrow, fenestral wall 2 µ; amb circular-irregular; grains subspheroidal, 21 - 24 µ.
PAN, Lombardo 60, PAN; plate 30:349.

Iresine angustifolia Euphr.
Fenestrate; exine 2.5 µ thick, sexine baculate, lacunae 12, 5.5 - 6.0 µ diameter, annulus 0.5 µ diameter, interfenestral wall 2.5 µ thick; amb hexagonal; grains spheroidal, 16 - 19 µ.
BCI, Croat 8710, MO; plate 30:350.

Iresine celosia L. (*Iresine diffusa* H & B in Willd.)
Periporate (22-porate); exine 1.5 - 2.0 µ thick, sexine baculate, bacula conspicuous, 1.5 µ high; pores circular, 3 µ diameter, interporium 2 µ; amb circular; grains spheroidal, 16 - 18 µ.
PAN, Troetsch 51, PMA; plate 30:351.

ANACARDIACEAE

Monad; isopolar-radiosymmetric; tricolporate; exine semitectate 2 - 4 µ thick, sexine reticulate, striate, striate-reticulate, homo- and heterobrochate; pores lalongate; striae always longitudinal; amb circular; grains oblate-spheroidal to prolate, 25 - 56 x 20 - 49 µ. (*5 genera, 7 species*).

Key to genera and species:

1a. Striate
  2a. Prolate, pores 15 µ diameter, grains > 45 µ (long axis)..... *Spondias mombin*
  2b. Subprolate, pores 6 µ diameter, grains < 45 µ
    3a. 41 - 44 µ..... *Spondias radlkofert*
    3b. 25 - 26 µ..... *Mangifera indica*
1b. Reticulate
  4a. Exine ≥ 3 µ thick
    5a. Oblate-spheroidal to prolate-spheroidal..... *Anacardium excelsum*
    5b. Prolate-spheroidal to subprolate..... *Anacardium occidentale*
  4b. Exine ≤ 3 µ thick
    6a. ≤ 35 µ (long axis)..... *Astronium graveolens*
    6b. > 35 µ (long axis)..... *Mosquitoxylum jamaicense*

Anacardium excelsum (Bert. & Balbir.) Skeels
Reticulate, homobrochate, brochi < 1 µ wide; exine 3.5 µ thick, sexine simplicolumellate, colpi as long as grains; pores lalongate 12 x 14 µ; amb circular; grains oblate-spheroidal to prolate spheroidal, 30 - 49 x 37 - 49 µ.
PAN, Kennedy 2254, KE 18343, MO; plate 30:352.

Anacardium occidentale L.
Reticulate, homobrachate, brochi indistinct, occasionally resembling striae; exine 4 µ thick, sexine simplicolumellate, colpi sharp, as long as grains; pores lalongate 4 x 10 µ; amb circular; grains prolate spheroidal to subprolate, 46 - 49 x 42 - 45 µ.
PAN, Blum & Tyson 1964, KE 18351, MO; plate 30:353.

Astronium graveolens Jacq.
Striate-reticulate, heterobrochate, brochi diminishing toward apertures, resembling striae, muri < 1 µ wide formed by dense bacula; exine 2 µ thick, sexine policolumellate; colpi 28 x 3 µ, costa colpi 3 µ; pores transversely parallel, 2 x 8 µ wide; amb circular; grains subprolate, 27 - 32 x 22 - 26 µ.
CR, PAO 1630; plate 31:354.

Mangifera indica L.
Striate-reticulate, homobrochate, brochi < 1 µ wide, exine 2 µ thick, sexine simplibaculate, separated from nexine at pores; colpi long, wide, displaying slight equatorial constriction; pores lalongate 6 µ wide; amb circular; grain subprolate to prolate, 25 - 26 x 20.5 - 22.0 µ.
PAN, Schmalzel 685, MO; plate 31:355.

Mosquitoxylum jamaicense Krug & Urban
Reticulate, homobrochate, brochi < 1 µ wide; exine 2.5 µ thick, sexine indistinct; colpi as long as grain, apices rounded, ca. 3 µ wide, gradually expanded toward equator; pores transversely parallel, 1.0 x 16.5 µ, edges curving; amb circular; grains subprolate 44 - 48 x 36.5 - 43.0 µ.
CR, Holdridge 6343, KE 17584, MO; plate 31:356.

Spondias mombin L.
Striate, striae < 1 µ, longitudinally oriented; exine 2.5 µ thick; colpi as long as grain, narrow, < 1 µ wide; pores lalongate, 10 x 15 µ, edges curving; amb circular; grains prolate, variable in size, 46 - 56 x 33 - 44 µ.
PAN, Dwyer et al. 4688, KE 18352, MO; plate 31:357.

Spondias radlkoferi J. D. Sm.
Striate, striae < 1 µ, longitudinally oriented; exine 2.5 µ thick; colpi as long as grain, narrow; pores lalongate to transversely parallel, 1 x 6 µ; amb circular, grains subprolate, 41 - 45 x 22 - 33 µ.
BCI, Croat 10082, KE 18387, MO; plate 31:358.

ANNONACEAE

Tetrad, tetragonal and square, 48 - 250 µ; grains (monads) apolar, asymmetric, inaperturate; exine tectate, 1 - 8 µ thick, semitectate and intectate; sexine psilate, reticulate, baculate or scabrate; grains spheroidal to oblate, 35 - 130 x 20 - 81 µ.
(7 genera, 11 species; additional references: 196, 201, 202).

Key to genera and species:

1a. Grains arranged in tetrads
  2a. Tetrads ≥ 150µ
    3a. Tetrads 230 - 250 µ, sexine reticulate ..... *Annona muricata*
    3b. Tetrads 150 - 170 µ, sexine baculate
      4a. Square tetrad, exine 3 µ thick ..... *Annona glabra*
      4b. Tetragonal tetrad, exine variable < 3 µ thick ..... *Annona spraguei*
  2b. Tetrads < 150 µ
    5a. Tetrads approximately 130 µ ..... *Annona acuminata*
    5b. Tetrads 48 - 82 µ
      6a. Psilate, exine > 2µ thick, grains < 40µ ..... *Xylopia frutescens*
      6b. Scabrate or baculate, exine < 1.5 µ thick
        7a. Bacula conspicuous ..... *Crematosperma* sp.
        7b. Scabrae small, resembling granulae
          8a. Tetrads 77 - 82 µ ..... *Annona hayesii*
          8b. Tetrads 48 - 64 µ ..... *Guatteria dumetorum*
1b. Grains appearing as monads (isolated from original tetrad)
  9a. Sexine psilate
    10a. Exine < 1 µ thick, grains 48 - 64 µ (long axis) ..... *Guatteria dumetorum*
    10b. Exine 2 -3 µ thick, grains 42 - 53 µ
      11a. < 40 µ ..... *Xylopia frutescens*
      11b. 42 - 53 µ
        12a. Exine 2 µ thick ..... *Anaxagorea panamensis*
        12b. Exine 3 µ thick ..... *Desmopsis panamensis*
  9b. Reticulate ..... *Annona muricata*
  9c. Scabrate ..... *Crematosperma* sp.
  9d. Baculate
    13a. < 60 µ (long axis)
      14a. < 50 µ ..... *Annona hayesii*
      14b. 50 - 60 µ ..... *Unonopsis pittieri*
    13b. > 100 µ (long axis)
      15a. Exine ca. 3 µ thick ..... *Annona glabra*
      15b. Exine 1.5 - 2.5 µ thick
        16a. 92 - 104 µ ..... *Annona acuminata*
        16b. 110 - 130 µ ..... *Annona hayesii*

Anaxagorea panamensis Standl.
Tetrads, susceptible to breakage, description based upon isolated grains; monads apolar, asymmetric, inaperturate; exine tectate, 2 µ thick, at distal area reduced to < 0.5 µ, intectate at proximal area, sexine scabrate, columellate; grains spheroidal, 47 - 53 µ.
BCI, Schmalzel 1130, MO; plate 31:359.

Annona acuminata Saff.
Tetragonal tetrads ca. 130 µ, susceptible to breakage; monads apolar, asymmetric, inaperturate; exine tectate, 1.5 - 2.0 µ thick, sexine densely baculate, bacula similar in form and size, < 1 µ high; LO patterns show reticulate sexine; isolated grains oblate, 66 - 81 x 92 - 104 µ.
BCI, Croat 11757, MO; plate 31:360.

Annona glabra L.
Square tetrads, occasionally cross tetrads 150 - 170 µ; monad apolar, asymmetric, inaperturate, semitectate; exine 3 µ thick, sexine strongly baculate, bacula 1.0 - 2.5 µ wide, increasing at distal area; grains oblate, 60 - 80 x 100 - 130 µ.
BCI, Schmalzel 297, MO; plate 31:361.

Annona hayesii Saff.
Square tetrads 77 - 82 µ, cross tetrads 66 - 70 µ; monads apolar, asymmetric, inaperturate; exine tectate, 1.5 µ thick, sexine baculate, bacula < 1 µ wide; grains oblate to suboblate, 37 - 41 x 46 - 51 µ.
BCI, Foster 2284, MO; plate 31:362.

Annona muricata L.
Tetragonal and cross tetrads 230 - 250 µ; monads apolar, asymmetric, inaperturate, tectate; exine 8 µ thick, sexine reticulate, heterobrochate, brochi circular, muri ca. 2 µ wide; simplicolumellate; lumina 2 - 4 µ wide; grains oblate, 60 - 70 µ.
HON, Clewell & Cruz 4128, MO; plate 32:363.

Annona spraguei Saff.
Tetragonal tetrads, susceptible to breakage 160 - 170 μ; monads apolar, asymmetric, inaperturate, tectate; exine 3 μ thick at distal area to < 1 μ thick at proximal area, sexine baculate; grains oblate, 68 - 85 x 110 - 130 μ.
BCI, Croat 10144, MO; plate 32:364.

Crematosperma sp. R. E. Fries
Tetragonal tetrads, susceptible to breakage 50 - 74 μ; monads apolar, asymmetric, inaperturate, tectate; exine < 1 μ thick; sexine scabrate; grains irregular, 30 - 48 x 39 - 45 μ.
PAN, Duke 3627, MO; plate 32:365.

Desmopsis panamensis (Rob.) Saff.
Tetrads, susceptible to breakage, description based upon isolated grains; monads apolar, asymmetric, inaperturate, tectate; exine 3 μ thick, sexine scabrate; grains appearing spheroidal, 42 - 48 μ.
BCI, Schmalzel, no voucher, BCI; plate 32:366.

Guatteria dumetorum R. E. Fries
Tetragonal tetrads, appearing circular, 48 - 64 μ; monads apolar, asymmetric, inaperturate, exine intectate < 1 μ thick, sexine baculate, bacula < 1 μ wide; grains suboblate, 40 x 52 μ.
BCI, Croat 7738, MO; plate 32:367.

Unonopsis pittieri Saff.
Tetrads, susceptible to breakage, descriptions based upon isolated grains; monads apolar, asymmetric, inaperturate, intectate; exine 1.0 - 1.5 μ thick, sexine punctitegillate, appearing microbaculate; grains oblate, 38 - 40 x 52 - 60 μ.
PAN, Duke 9358, MO; plate 32:368.

Xylopia frutescens Aubl.
Tetragonal tetrads 48 - 54 μ; monads apolar, asymmetric, inaperturate, tectate; exine 2.0 - 2.5 μ thick, sexine psilate; grains suboblate to spheroidal, 30 - 35 μ.
BCI, Foster 805, PMA; plate 32:369.

APOCYNACEAE

Monad; isopolar-radiosymmetric and apolar-asymmetric; stephanocolpate, diporate, triporate, periporate, stephanoporate, tricolporate; exine tectate, < 1 - 7 μ thick; sexine psilate, granulate, punctitegillate; colpi short; pores always annulate; amb circular to angular; grains oblate to subprolate, 26 - 124 x 27 - 160 μ. *(14 genera, 21 species; additional reference: 193).*

Key to genera and species:

1a. Stephanocolpate (4 -5 colpi, psilate, grains > 115 μ)..... *Thevetia ahouai*
1b. Diporate
  2a. ≥ 40 μ..... *Odontadenia macrantha*
  2b. < 40 μ
    3a. Pores 2.5 - 3.5 μ diameter, crassimarginate..... *Forsteronia myrtantha*
    3b. Pores 5 - 6 μ diameter, common type..... *Malouetia guatemalensis*
1c. Triporate
  4a. Pores ovoid 8 x 5 μ..... *Lacmellea panamensis*
  4b. Pores circular 2.5 - 12.0 μ
    5a. Oblate-spheroidal to spheroidal
      6a. 60 - 90 μ, pores 7-12 μ diameter
        7a. Exine ≤ 1 μ thick..... *Rhabdadenia biflora*
        7b. Exine > 1 μ thick..... *Prestonia obovata*
      6b. 35 - 60 μ, pores 3 - 6 μ diameter
        8a. Pores crassimarginate..... *Forsteronia peninsularis*
        8b. Pores normal type..... *Prestonia ipomaeifolia*
    5b. Suboblate
      9a. < 40 μ
        10a. Pores 2.5 - 3.5 μ diameter, crassimarginate..... *Forsteronia myrtantha*
        10b. Pores 5 - 6 μ diameter, common type..... *Malouetia guatemalensis*
      9b. ≥ 40 μ
        11a. 40 - 70 μ
          12a. Pores 4 - 6 μ, crassimarginate..... *Odontadenia macrantha*
          12b. Pores 5 - 12 μ, common type..... *Prestonia acutifolia*
        11b. 70 - 90 μ..... *Prestonia portobellensis*
1d. Periporate or stephanoporate (4 - 8 porate)
  13a. ≤ 60 μ
    14a. < 30 μ..... *Forsteronia myrtantha*
    14b. 30 - 60 μ
      15a. Pores 3 - 6 μ diameter
        16a. Pores scattered..... *Prestonia ipomaeifolia*
        16b. Pores equatorial
          17a. Interporium 12 μ..... *Forsteronia peninsularis*
          17b. Interporium 24 μ..... *Malouetia guatemalensis*
      15b. Pores 6 - 12 μ diameter
        18a. Annulus 3 μ..... *Prestonia acutifolia*
        18b. Annulus 1 μ
          19a. Granulate..... *Odontadenia punticulosa*

19b. Psilate ..... *Mesechites trifida*
13b. ≥ 60 µ
20a. 60 - 90 µ
21a. Suboblate ..... *Prestonia portobellensis*
21b. Spheroidal
22a. Annulus 2 µ, exine 1 µ thick ..... *Prestonia obovata*
22b. Annulus 1 µ, exine < 1 µ thick ..... *Rhabdadenia biflora*
20b. > 90 µ
23a. Interporium 60 µ ..... *Mandevilla subsagittata*
23b. Interporium 45 µ ..... *Mandevilla villosa*
1e. Tricolporate
24a. ≥ 80 µ
25a. Oblate-spheroidal, sexine psilate ..... *Allamanda cathartica*
25b. Subprolate, sexine reticulate ..... *Catharanthus roseus*
24b. < 80 µ
26a. 40 - 75 µ
27a. Subprolate, costa pori present ..... *Stemmadenia grandiflora*
27b. Suboblate, costa pori absent ..... *Aspidosperma cruenta*
26b. 30 - 40 µ
28a. Suboblate PAD 3 - 6 µ ..... *Aspidosperma megalocarpon*
28b. Subprolate, PAD 20 µ ..... *Tabernaemontana arborea*

Allamanda cathartica L.
Isopolar-radiosymmetric, tricolporate; exine 1.0 - 2.5 µ thick, sexine psilate to granulate; colpi 6 x 2.5 µ, margines granular, 6 - 7 µ wide, PAD 56 µ; pores lolongate, 20 x 10 µ; amb semiangular; grains oblate-spheroidal, 95 - 124 x 90 - 130 µ.
BCI, Croat 6573, KE 18190, MO; plate 33:370.

Aspidosperma cruenta Woods.
Isopolar-radiosymmetric, tricolporate; exine 2 µ thick, sexine psilate to finely granulate; colpi moderately long, wide, PAD 6 µ, margines 5 x 3 µ, wide and thick; colpi displaying equatorial constriction; pores lalongate, 12 x 20 µ; amb angular; grains suboblate, 41 - 48 x 43 - 48 µ.
GUI, Fanshawe F1226, KE 18191, MO; plate 33:371.

Aspidosperma megalocarpon Müell Arg.
Isopolar-radiosymmetric, tricolporate; exine 1 - 3 µ thick, sexine granulate to psilate; colpi 16 x 4 µ, margo protuberant 3 - 5 µ wide, PAD 3 - 6 µ; pores lolongate 6 x 3 µ; amb circular-angular; grains suboblate, 29 - 34 x 35 - 39 µ.
GUA, Gentry 8352, PMA; plate 33:372.

Catharanthus roseus (L.) G. Don.
Isopolar-radiosymmetric, tricolporate; exine 3 µ thick, sexine reticulate, homobrochate; colpi long 84 - 95 x 3 µ, PAD 15 - 25 µ, margo wide 4 - 8 µ; pores rectangular, 8 - 11 x 12 - 20 µ; amb angular; grains subprolate, 90 - 100 x 87 - 93 µ.
PAN, Warner 210, KE 18192, MO; plate 33:373.

Forsteronia myrtantha J.D. Sm.
Apolar, asymmetric and isopolar-radiosymmetric, diporate, triporate and stephanoporate (4 - 5 porate), usually triporate; exine 1µ thick, sexine psilate; pores crassimarginate, circular, 2.5 - 3.5 µ diameter, annulus 2 µ thick, granulate; amb circular-irregular; grains usually suboblate, 23 - 24 x 27 - 30 µ.
BCI, Foster 4107, MO; plate 33:374.

Forsteronia peninsularis Woods.
Apolar-asymmetric and isopolar-radiosymmetric, triporate and stephanoporate (4 - 5 porate); exine 1 µ thick, sexine scabrate; pores crassimarginate, circular, 5 µ diameter amb circular (when triporate); annulus 2 µ thick, interporium 12 µ; grains oblate-spheroidal, 43 - 44 x 44 - 51 µ.
BCI, Croat 14000, MO; plate 33:375.

Lacmellea panamensis (Woods.) Markg.
Isopolar-radiosymmetric, triporate; exine 1.0 - 1.5 µ thick, sexine psilate-scabrate; pores lolongate 8 x 5 µ, annulus 2 µ thick; amb circular; grains suboblate, 26 - 27 x 29 - 33 µ.
BCI, Schmalzel 392, MO; plate 33:376.

Malouetia guatemalensis (Müell. Arg.) Standl.
Apolar, asymmetric to isopolar-radiosymmetric, diporate, triporate and 4-porate; exine 1.0 - 2.0 µ thick, sexine psilate to scabrate; pores circular, 5 - 6 µ diameter, annulus 1 - 2 µ thick, irregular; interporium 24 µ; amb semi-angular; grains suboblate, 31 - 34 x 33 - 38 µ.
BCI, Croat 13486, KE 18193, MO; plate 33:377.

Mandevilla subsagittata (R. & P.) Woods.
Apolar-asymmetric, periporate (4 - 5 porate); exine 1.0 - 1.5 µ thick, sexine scabrate; pores circular, 17 - 20 µ diameter, usually arranged at equator, annulus 0.5 µ thick, interporium 60 µ; grains appearing oblate-spheroidal, 100 x 116 - 150 µ.
PAN, Dwyer 2340, KE 18194, MO; plate 34:378.

Mandevilla villosa (Miers.) Woods.
Apolar-asymmetric, periporate (4 - 5 porate); exine 1 µ thick, sexine psilate, irregularly scabrate near pores; pores circular to slightly elliptical, 15 - 23 µ diameter, annulus 2 µ thick, interporium 45 µ; grains appearing suboblate, 100 x 104 - 150 µ.
PAN, Nee & Mori 3659, KE 18195, MO; plate 34:379.

Mesechites trifida (Jacq.) Müell. Arg.
Apolar-asymmetric, periporate (4 - 6 porate); exine 1.0 µ thick, sexine psilate; pores circular 6 - 8 µ diameter; annulus 1 µ thick, slightly granulate; interporium 28 µ; amb circular; grains suboblate, 43 - 49 x 50 - 58 µ.
BCI, Croat 12951, KE 18196, MO; plate 34:380.

Odontadenia macrantha (R. & S.) Markg.
Apolar-asymmetric, diporate and triporate; exine 1.0 - 1.5 µ thick, sexine psilate to granulate; pores circular, crassimarginate, 4 - 6 µ diameter, scattered; annulus 2 - 3 µ thick; amb circular-irregular; grains suboblate, 39 - 47 x 55 - 61 µ.
BCI, Putz 821, MO; plate 34:381.

Odontadenia punticulosa (L. C. Rich.) Pulle
Apolar-asymmetric, periporate (4 - 5 porate); exine 0.3 - 1.0 µ thick, sexine psilate; pores circular, 6 - 9 µ diameter; annulus incomplete ca. 1 µ thick, consisting of dense granular area; grains 53 - 66 µ.
BCI, Croat 8633 (p), Dressler 4312 (d), KE 18198 (d), MO; plate 34:382.

Prestonia acutifolia (Benth.) K. Schum.
Apolar-asymmetric, triporate and 4-5 porate; exine 1.0 - 1.5 µ thick, sexine psilate; pores circular, 5 - 12 µ diameter, scattered, annulus 3 µ wide; grains perprolate, 37 - 75 µ wide.
BCI, Croat 4401, KE 18199, MO; plate 34:383.

Prestonia ipomaefolia (A. DC.) Standl.
Apolar-asymmetric, triporate and periporate (4 - 8 porate); exine 1 µ thick, sexine psilate; pores circular, 3 - 6 µ diameter, scattered, annulus 2 - 3 µ thick, thicker in smaller grains; grains irregular, appearing circular, 33 - 55 x 35 - 60 µ.
PAN, Gentry 5727, KE 18201, MO; plate 35:384.

Prestonia obovata Standl.
Apolar-asymmetric, triporate and periporate (4 - 5 porate); exine 1 µ thick, sexine psilate; pores circular, 7 - 12 µ diameter, scattered, annulus 2 µ thick; grains irregular, 61 - 86 x 69 - 91 µ.
PAN, Kennedy & Dressler 2941, KE 18085, MO; plate 35:385.

Prestonia portobellensis (Beurl.) Woods.
Apolar-asymmetric, triporate and 4-porate; exine < 1µ thick, sexine psilate; pores circular, 7 - 12 µ diameter, annulus inconspicuous; grains irregular, 74 - 81 x 81 - 92 µ.
PAN, Nee 10706, KE 18086, MO; plate 35:386.

Rhabdadenia biflora (Jacq.) Müell. Arg. in Mart.
Apolar-asymmetric, triporate and periporate (4-porate); exine < 1 µ thick, sexine psilate; pores circular, 10 - 12 µ diameter, scattered, annulus 1 µ thick, granulate; grains irregular, 66 - 89 µ.
BCI, Croat 8296, KE 18087, MO; plate 35:387.

Stemmadenia grandiflora (Jacq.) Miers.
Isopolar-radiosymmetric, tricolporate; exine 2 µ thick, thickening at poles, sexine punctitegillate; colpi 25 - 33 µ long, aperture club type; pores slightly protuberant, lalongate, interconnected at equator (colpus transversalis) 10 µ wide; amb circular; grains subprolate, 58 - 75 x 43 - 54 µ.
PAN, Duke 15477, KE 18088, MO; plate 35:388.

Tabernaemontana arborea Rose
Isopolar-radiosymmetric, tricolporate; exine 3 µ thick, sexine slightly scabrate; colpi 18 x 4 µ, PAD 20 µ; pores lalongate, 3 x 10 µ, costa pori 4 µ; amb circular; grains subprolate, 37 - 38 x 31 - 33 µ.
BCI, Croat 5243 (p), Schmalzel 414 (d), MO; plate 36:390.

Thevetia ahouai (L.) A. DC.
Isopolar-radiosymmetric, 4-5 colpate; exine 3 µ thick at intercolpium, 7 µ thick near colpi, sexine punctitegillate; colpi 33 x 10 µ, PAD 46 - 54 µ, margo 3 µ wide; amb circular semi-angular; grains oblate-spheroidal, 115 x 160 µ.
PAN, Nee 7648, KE 18089, MO; plate 36:389.

ARALIACEAE

Monad; isopolar-radiosymmetric; tricolporate; exine semitectate, 1.5 - 4.0 µ thick; sexine reticulate, homobrachate, brochi < 1 µ wide, muri simplibaculate; colpi long, sharp, narrow, pores always lalongate, usually transversely parallel; amb circular, semi-angular; grains oblate-spheroidal to subprolate, 21 - 38 x 18.5 - 32.0 µ. *(4 genera, 5 species).*

Key to genera and species:

1a. Pores 3 - 5 x 8 µ, lalongate
  2a. Suboblate to oblate-spheroidal ..... *Polyscias gutlfoylei*
  2b. Oblate spheroidal to spheroidal ..... *Oreopanax capitatus*
1b. Pores < 3 µ x > 10 µ, transversely parallel
  3a. Oblate-spheroidal to spheroidal. ..... *Didymopanax morototoni**
  3b. Spheroidal to subprolate
    4a. Exine ≤ 2 µ thick, PAD 8 µ, grains ca. 26 x 25 µ ..... *Dendropanax stenodontus*
    4b. Exine > 2 µ thick, PAD 12 µ, grains ca. 30 x 32 µ ..... *Dendropanax arboreus*

Dendropanax arboreus (L.) Dec. & Planch.
Exine 2 - 4 μ thick, sexine reticulate, homobrochate, brochi < 1 μ wide, muri simplibaculate; colpi narrow, long, sharp, 24 x 1 μ, margo 2 μ wide, PAD 12 μ; pores transversely parallel, 2.0 - 2.5 x 16 μ; amb semi-angular; grains subprolate to prolate-spheroidal, 28 - 32 x 26 - 36 μ.
BCI, Knight, KE 18210, MO; plate 36:391.

Dendropanax stenodontus (Standl.) A. C. Smith
Exine 1.5 - 2.0 μ thick, sexine microreticulate, homobrochate; muri simplibaculate; colpi long, narrow, sharp, PAD 8 μ, costa colpi 2 μ thick; pores transversely parallel, 2.5 - 3.0 x 12 - 14 μ; amb hexagonal; grains spheroidal to prolate-spheroidal, 25 - 27 x 23 - 26 μ.
PAN, Dwyer & Duke 7905, KE 18211, MO; plate 36:392.

Didymopanax morototoni (Aubl.) Dec. & Planch. (***Schefflera morototoni*** (Aublet) Maguire, Steyerm. & Frodin)
Exine 2.5 - 3.0 μ thick, sexine reticulate, homobrochate; muri simplibaculate, brochi 1 μ wide; colpi long, sharp, PAD 9 μ; pores transversely parallel, 2 x 12 μ thick; amb hexagonal; grains oblate-spheroidal to spheroidal, 24 - 30 x 27 - 30 μ.
PAN, Correa & Dressler 429, KE 18212, MO; plate 36:393.

Oreopanax capitatus (Jacq.) Dec. & Planch.
Exine 1.5 - 3.0 μ thick, sexine reticulate, homobrochate, brochi < 1 μ wide; colpi long, 1 - 2 μ wide, PAD 8 μ; pores slightly protuberant, lalongate, 3 - 5 x 8 μ; amb hexagonal to subangular; grains oblate-spheroidal to spheroidal, 28 - 38 x 23 - 32 μ.
CR, Frankie 199a, KE 18213, MO; plate 36:394.

Polyscias guilfoylei (Bull.) Bailey
Exine 2 μ thick, sexine reticulate, homobrochate, simplicolumellate; colpi long, narrow, PAD 7 μ; pores inconspicuous, appearing lalongate, 4 x 8 μ; colpi having equatorial constriction, costa colpi 2 μ; amb circular; grains suboblate to oblate-spheroidal, variable in size, 21 - 34 x 24 - 39 μ.
Caroline Islands, Fosberg 31945, NY; plate 36:395.

ARISTOLOCHIACEAE

Monad, apolar-asymmetric, inaperturate, intectate; exine 1.5 - 3.0 μ thick; sexine verrucate, verrucae < 1 μ x 1.5 - 3.0 μ wide; grains appearing circular, 33 - 48 μ, susceptible to damage by acetolysis. (*1 genus, 3 species*).

Key to genera and species:

1a. ≤ 40 μ ..... *Aristolochia chapmaniana**
1b. > 40 μ
  2a. 40 - 50 μ, verrucae variable ..... *Aristolochia gigantea**
  2b. 45 - >60 μ, verrucae uniform ..... *Aristolochia pilosa*

Aristolochia chapmaniana Standl. (*Aristolochia tonduzii* Schmidt)
Exine 2.0 - 2.5 μ thick, sexine verrucate, verrucae uniform, 2 μ wide x 1 μ; grains circular, 33 - 37 μ.
BCI, Croat 6733, MO; plate 36:396.

Aristolochia gigantea Mart. & Zucc. (*Aristolochia cordiflora* Mutis)
Exine 2.5 μ thick, sexine verrucate, verrucae variable, 1.5 - 3.0 μ wide x < 1 μ high; grains circular, 44 - 57 μ.
BCI, Schmalzel 1241, MO; plate 36:397.

Aristolochia pilosa HBK
Exine 2.5 - 3.0 μ thick, sexine verrucate, slightly perforate, verrucae uniform, 3 μ wide x < 1 μ high; grains circular, size variable, 45 - >60 μ.
BCI, Schmalzel 324, MO; plate 36:398.

ASCLEPIADACEAE

Pollinia, two similar pollinia per pollinarium; pollinia large, globular, oblong, triangular, kidney-shaped and lanceolate, 612 - 1070 μ long x 270 - 728 μ wide, grains per pollinium; > 120, pollinia united by two caudicles to a central corpusculum; caudicle triangular, filiform and club-shaped 150 - 944 μ; corpusculum variable in form, usually rectangular, 180 - 586 μ long x 110 - 388 μ wide; monads apolar, asymmetric, inaperturate, tectate; exine 1.5 - 12.0 μ thick; sexine psilate; amb irregular-geometric; grains 25 - 85 μ. (*8 genera, 11 species; additional references: 34, 35*).

Key to genera and species:

1a. Pollinia > 700 μ long
  2a. 700 - 850 μ long
    3a. Globular > 500 μ wide, grains < 50 μ ..... *Gonolobus allenii*
    3b. Lanceolate < 300 μ wide, grains > 50 μ ..... *Marsdenia crassipes*
  2b. 850 - 1100 μ long
    4a. Globular > 700 μ wide
      5a. Kidney-shaped, corpusculum < 400 μ long, exine 4 μ thick ..... *Fischeria funebris**
      5b. Oblong, corpusculum > 400 μ, exine 2.0 - 2.5 μ thick ..... *Matelea trianae*
    4b. Lanceolate < 400 μ
      6a. Caudicle triangular, exine > 10 μ thick ..... *Asclepias curassavica*
      6b. Caudicle club-shaped, exine < 6 μ thick ..... *Sarcostemma clausum*
1b. Pollinia < 700 μ long
  7a. > 400 μ wide ..... *Matelea viridiflora**

7b. < 400 µ wide
8a. Grains < 40 µ
9a. Caudicle filiform..... *Cynanchum cubense*
9b. Caudicle triangular..... *Cynanchum recurvum**
8b. Grains 40 - 70 µ
10a. Caudicle < 200 µ long, club-shaped, exine > 4 µ thick..... *Blepharodon mucronatum*
10b. Caudicle > 200 µ long, triangular, exine < 4 µ thick..... *Matelea pinquifolia*

Asclepias curassavica L.
Pollinia lanceolate (oblong-fusiform), 950 - 972 µ long x 342 - 357 µ wide; caudicle club-shaped, 510 µ long; corpusculum rectangular, 418 µ long x 311 µ wide; grains > 200 per pollinium, apolar, asymmetric, inaperturate, tectate; exine 12 µ thick, sexine psilate; grains irregular to polyhedral, 60-70 µ.
PAN, Tyson & Smith 4135, MO; plate 37:399.

Blepharodon mucronatum (Schlecht.) Decne in DC.
Pollinia globular, 684 µ long x 332 µ wide; caudicle club-shaped 168 µ long; corpusculum rounded, 357 µ long x 200 µ wide; grains > 200 per pollinium, apolar, asymmetric, inaperturate, tectate; exine 4 µ thick, sexine psilate; grains 65 µ long.
PAN, Gentry 1898, MO; plate 37:400.

Cynanchum cubense (A. Rich.) Woods
Pollinia globular, 673 µ long x 321 µ wide; caudicle filiform, 944 µ long; corpusculum heart-shaped, 306 µ long x 189 µ wide; grains > 200 per pollinium, apolar, asymmetric, inaperturate, tectate; exine 3 µ thick, sexine psilate; grains irregular, 25 - 35 µ.
BCI, Croat 11175, MO; plate 37:401.

Cynanchum recurvum (Rusby) Spellm. (*Tassadia obovata* Dec.)
Pollinia lanceolate, 525 µ long x 225 µ wide; caudicle short, sessile, triangular; corpusculum semi-triangular, 150 µ long x 100 µ wide; grains > 200 per pollinium, apolar, asymmetric, inaperturate, tectate; exine 4 - 6 µ thick, sexine psilate; grains irregular to geometric, 35 - 40 µ.
BCI, Croat 15000, MO; plate 37:402.

Fischeria funebris (J. D. Sm.) S. F. Blake (*Fischeria blepharopetala* Blake)
Pollinia globular, kidney-shaped, 1070 µ long x 728 µ wide; caudicle club-shaped, 500 µ long; corpusculum, 346 µ long x 280 µ wide; grain > 200 per pollinium, apolar, asymmetric, inaperturate, tectate; exine 4 µ thick, sexine psilate; grains irregular to geometric, 25 µ long.
PAN, Gentry 4863, MO; plate 37:403.

Gonolobus allenii Woods
Pollinia globular, 750 µ long x 540 µ wide, description based upon a single pollinium; grains > 200 per pollinium, apolar, asymmetric, inaperturate, tectate; exine 2.5 µ thick, sexine psilate; grains irregular to geometric, 36 µ long.
BCI, Croat 6102, MO; plate 37:404.

Marsdenia crassipes Hemsl.
Pollinia lanceolate, 863 µ long x 270 µ wide; caudicle triangular, < 150 µ wide; corpusculum concave-rectangular, 586 µ long x 342 µ wide; grain > 200 per pollinium, apolar, asymmetric, inaperturate, tectate; exine 3 µ thick, sexine psilate; grains irregular, oblate 50 - 65 µ long.
BCI, Garwood 103, MO; plate 38:406.

Matelea pinquifolia (Standl.) Woods.
Pollinia globular, 612 µ long x 347 µ wide; caudicle triangular, ca. 200 µ long; corpusculum semi-triangular, 229 µ long x 110 µ wide; grains 120 - 150 per pollinium, apolar, asymmetric, inaperturate, tectate; exine 2.5 - 3.0 µ thick, sexine psilate; grains irregular to geometric, 50 x 78 µ.
PAN, Witherspoon 8814, MO; plate 37:405.

Matelea trianae (Trin.) Spellm.
Pollinia globular, 1020 µ long x 707 µ wide; caudicle triangular, 350 µ long; corpusculum semi-triangular, 444 µ long x 245 µ wide; grains > 200 per pollinium, apolar, asymmetric, inaperturate, tectate; exine 2.5 µ thick, sexine psilate; grains irregular to geometric, 40 x 80 µ.
BCI, Schmalzel 673, MO; plate 38:407.

Matelea viridiflora (G. Meyer) Woods (*Matelea denticulata* (Vahl.) Fontella & Schwarz)
Pollinia globular, 697 µ long x 468 µ wide; caudicle triangular, 203 µ long; corpusculum semi-triangular, 180 µ long x 125 µ wide; grains > 200 per pollinium, apolar, asymmetric, inaperturate, tectate; exine 1.5 - 2.0 µ thick, sexine psilate; grains irregular, 50 - 55 µ.
BCI, Schmalzel 829, MO; plate 38:408.

Sarcostemma clausum (Jacq.) R. & S.
Pollinia lanceolate, 936 µ long x 325 µ wide; caudicle triangular, 400 µ long; corpusculum triangular, 393 µ long x 388 µ wide; grains > 200 per pollinium, apolar, asymmetric, inaperturate, tectate; exine 5 µ thick, sexine psilate; amb geometric; grains oblate 45 x 60 µ.
BCI, Schmalzel 499, MO; plate 38:409.

BEGONIACEAE

Monad, isopolar-radiosymmetric, tricolporate; exine < 1 µ thick, tectate, sexine psilate; colpi long, narrow, inconspicuous; pores lalongate 1.0 x 1.5 - 4.0 µ; costa colpi present; amb circular-trilobate; grains prolate, 14 - 19 x 7 - 10 µ. (*1 genus, 3 species*).

Key to genera and species:

1a. ≥ 17 µ (long axis)..... *Begonia guaduensis*
1b. < 17 µ (long axis)
2a. 14.0 - 17.5 x 7.0 - 9.5 µ, pores 1.0 x 1.5 µ..... *Begonia filipes**
2b. 13 - 14 x 8.5 - 10.0 µ, pores 1 x 4 µ..... *Begonia patula**

Begonia filipes Benth. (*Begonia hirsuta* Aubl.)
Colpi 16 µ long; pores lalongate 1.0 x 1.5 µ wide ; grains prolate, 14.0 - 17.5 x 7.0 - 9.5 µ.
PAN, Tyson et al. 2920, KE 18271, MO; plate 38:410.

Begonia guaduensis HBK
Colpi 18 µ long; pores lalongate 1 x 2 µ wide; grains prolate, 17 - 19 x 9.5 - 10.0 µ.
PAN, Nee 7773, KE 18272, MO; plate 38:411.

Begonia patula Haw (*Begonia fischeri* Schrank)
Colpi narrow, as long as grain; pores lalongate 1 x 4 µ wide; grains prolate, 13 - 14 x 8.5 - 10.0 µ.
JAM, Proctor 33671, NY; plate 38:412.

BIGNONIACEAE

Monad, isopolar-radiosymmetric and apolar-asymmetric; inaperturate, tricolpate, stephanocolpate, tricolporate; exine 1.5 - 10.0 µ thick, tectate to semitectate; sexine psilate, scabrate, reticulate to baculate and verrucate; grains reticulate, frequently heterobrochate, per-reticulate; colpi deep, wide, occasionally syncolpate configuration; amb circular to trilobate; grains suboblate to prolate, 30 - 108 x 22 - 108 µ. *(21 genera, 31 species; additional reference: 17).*

Key to genera and species:

1a. Inaperturate
2a. > 85 µ
3a. Exine ≥ 5 µ thick
4a. Brochi wide, ca. 25 µ..... *Pithecoctenium crucigerum*
4b. Brochi displaying lumina ca. 12 µ..... *Anemopaegma chrysoleucum*
3b. Exine < 5 µ thick..... *Amphilophium paniculatum*
2b. < 85 µ
5a. Reticulate, homobrochate..... *Phryganocydia corymbosa*
5b. Reticulate, heterobrochate
6a. 63 - 68 µ..... *Cydista aequinoctialis*
6b. 43 - 58 µ
7a. Exine ≤ 4 µ thick
8a. Lumina 2 - 3 µ wide..... *Clytostoma binatum*
8b. Lumina 12 - 15 µ wide..... *Adenocalymma arthropetiolatum*
7b. Exine > 4 µ thick..... *Adenocalymma apurense*
1b. Tricolpate
9a. Psilate
10a. > 55 µ
11a. Spheroidal..... *Arrabidaea verrucosa*
11b. Prolate to suboblate..... *Ceratophytum tetragonolobum*
10b. < 55 µ
12a. Exine ≥ 2 µ thick..... *Stizophyllum riparium*
12b. Exine < 2 µ thick
13a. Colpi ≥ 8 µ thick
14a. Prolate to subprolate, PAD 6 µ..... *Arrabidaea florida*
14b. Subprolate to oblate spheroidal, PAD 5 µ..... *Arrabidaea patellifera*
13b. Colpi < 8 µ thick
15a. Colpi 5 µ wide..... *Jacaranda copaia spectabilis*
15b. Colpi 8 µ wide..... *Macfadyena unguis-cati*
9b. Scabrate
16a. 30 - 40 µ (polar axis)
17a. Colpi 6 µ wide..... *Arrabidaea candicans*
17b. Colpi 8 µ wide..... *Arrabidaea chica*
16b. > 40 µ
18a. > 75 µ..... *Paragonia pyramidata*
18b. 50 - 75 µ
19a. Colpi ≤ 10 µ wide..... *Arrabidaea corallina*
19b. Colpi > 10 µ wide..... *Callichlamys latifolia*
9c. Reticulate
20a. ≥ 90 µ (polar axis)..... *Martinella obovata*
20b. < 90 µ
21a. 30 - 50 µ
22a. Oblate..... *Tynnanthus croatianus*
22b. Prolate to subprolate
23a. Brochi ≥ 2 µ wide, colpi 8 µ wide..... *Tabebuia guayacan*
23b. Brochi < 2 µ wide, colpi ≤ 6 µ wide
24a. Colpi having equatorial membrane, brochi 1.0 - 1.5 µ wide, colpi 2 µ wide..... *Tabebuia chrysantha **

24b. Colpi free, brochi < 1 µ wide, colpi 6 µ wide ..... *Tabebuia ochracea neochrysantha*
21b. 51 - 70 µ
25a. Homobrochate
26a. 50 - 60 µ ..... *Pachyptera kerere**
26b. 61 - 70 µ ..... *Tabebuia rosea*
25b. Heterobrochate
27a. 50 - 60 µ ..... *Pleonotoma variabilis*
27b. 60 - 70 µ ..... *Spathodea campanulata*
1c. Stephanocolpate
28a. ≤ 60 µ, sexine clavate ..... *Cydista heterophylla*
28b. > 60 µ, sexine psilate
29a. 85 - 100 µ ..... *Anemopaegma chrysoleucum*
29b. 60 - 70 µ ..... *Cydista aequinoctialis*
1d. Tricolporate ..... *Xylophragma seemannianum*

Adenocalymma apurense (HBK) Sandw.
Apolar-asymmetric, inaperturate; exine semitectate, 2.5 µ thick, sexine reticulate, per-reticulate, heterobrochate, muri simplibaculate, bacula 3 µ high, lumina irregular, 12 - 15 µ wide; grains spheroidal, 34 - 39 µ.
CR, CR 64569, CR; plate 39:413.

Adenocalymma arthropetiolatum A. Gentry
Apolar-asymmetric, inaperturate; exine semitectate, 8 - 10 µ thick, sexine reticulate, heterobrochate, muri simplibaculate, bacula 2.0 µ wide x 4.5 µ, lumina irregular, 10 - 15 µ wide, containing endexinic elements; grains spheroidal, 54 - 58 µ.
PAN, Duke 5828, MO; plate 39:414.

Amphilophium paniculatum (L.). HBK
Apolar-asymmetric, inaperturate; exine semitectate, 5 µ thick, sexine reticulate, per-reticulate, heterobrochate, muri 2 - 5 µ wide, simplibaculate, bacula 5 µ high, lumina irregular, 15 µ wide; grains spheroidal, 93 - 106 µ.
PAN, Blum 1258, KE 18112, MO; plate 39:415.

Anemopaegma chrysoleucum (Kunth) Sandw.
Isopolar-radiosymmetric when stephanocolpate (6-7 colpate), apolar-asymmetric when inaperturate, dimorphic; exine semitectate, 7 - 8 µ thick, sexine reticulate, per-reticulate, heterobrochate, muri 2.5 - 3.5 µ wide, simplibaculate, lumina irregular 5 - 13 µ wide; colpi short, 7 µ wide, PAD 30 µ; amb circular to ellipsoidal; grains spheroidal, 86 - 108 µ.
PAN, Gentry 6481, KE 18113, MO; plate 39:416.

Arrabidaea candicans (L. C. Rich) DC.
Isopolar-radiosymmetric, tricolpate; exine tectate, 2 µ thick, sexine scabrate; colpi large, deep 6 µ wide; PAD 2 - 3 µ, margo 1 µ wide; amb circular; grains subprolate to prolate-spheroidal, 32 - 43 x 33 - 41 µ.
BCI, Croat 6201, MO; plate 39:417.

Arrabidaea chica (H. & B.) Verlot
Isopolar-radiosymmetric, tricolpate; exine tectate, 2 µ thick, sexine scabrate; colpi large, deep, sharp 8 µ wide; PAD 3 µ, margo < 1 µ wide; amb circular; grains subprolate to prolate-spheroidal, 34 - 37 x 28 - 29 µ.
PAN, Harlow 28, KE 18115 (p), BCI, Schmalzel 959 (d), MO; plate 39:418.

Arrabidaea corallina (Jacq.). Sandw.
Isopolar-radiosymmetric, tricolpate; exine tectate, 3 µ thick, sexine scabrate; colpi irregular, large, 9 µ wide, occasionally uniting at poles, PAD 5 µ; amb circular; grains subprolate to prolate-spheroidal, 57 - 63 x 38 - 48 µ.
PAN, Croat 14258, KE 18116, MO; plate 39:419.

Arrabidaea florida DC.
Isopolar-radiosymmetric, tricolpate; exine 1.5 - 2.0 µ thick, sexine psilate, reticulate; colpi large, deep, occasionally syncolpate, margo 1.5 µ thick; amb circular; grains subprolate to prolate spheroidal, 53 - 56 x 36 - 48 µ.
PAN, Aviley, KE 18117, MO; plate 40:420.

Arrabidaea patellifera (Schlecht.) Sandw.
Isopolar-radiosymmetric, tricolpate; exine tectate, 2 µ thick, sexine psilate, colpi large, deep, 10 µ wide; PAD 6 µ, margo < 1 µ thick; amb circular; grains subprolate to prolate-spheroidal, 42 - 55 x 40 - 53 µ.
PAN, Bartlett & Lasser 16595, KE 18118, MO; plate 40:421.

Arrabidaea verrucosa (Standl.) A. Gentry
Isopolar-radiosymmetric, tricolpate; exine tectate, 3 µ thick, sexine psilate; colpi large, deep, 12 µ wide; PAD 5 µ, margo < 1 µ thick; amb circular; grains prolate-spheroidal to spheroidal, 60 - 65 µ.
BCI, Foster 1071 (p), PAN, Dwyer 2236 (d), KE 18119, MO; plate 40:422.

Callichlamys latifolia (L. C. Rich) K. Schum in Engler & Prantl.
Isopolar-radiosymmetric, tricolpate; exine tectate, 2 µ thick, sexine scabrate; colpi large, deep, edges irregular, margo 3 µ thick; amb circular; grains prolate, 61 - 63 x 43 - 48 µ.
BCI, Schmalzel 1033 (p), BCI, Croat 7819 (d), KE 18120, MO; plate 40:423.

Ceratophytum tetragonolobum (Jacq.) Sprague & Sandw.
Isopolar-radiosymmetric, tricolpate; exine tectate, 3 µ thick, sexine psilate; colpi large, 15 µ wide; PAD 5 µ, margo lacking; amb circular; grains prolate to oblate-spheroidal, 50 x 53 - 76 µ.
GUA, Lundell 15945, KE 18121, MO; plate 40:424.

Clytostoma binatum (Thunb.) Sandw.
Apolar-asymmetric, inaperturate; exine tectate, 3 µ thick, sexine reticulate, heterobrochate; muri < 1 µ wide, simplibaculate, lumina 2 - 3 µ wide; grains spheroidal, 43 - 57 µ.
CR, Opler 739, KE 18122, MO; plate 40:425.

Cydista aequinoctialis (L.) Miers.
Isopolar-radiosymmetric when stephanocolpate (4-6 colpate), apolar-asymmetric when inaperturate; colpi inconspicuous; exine semitectate, 4 - 5 µ thick, sexine per-reticulate, heterobrochate; muri 1 µ wide, lumina 1 - 4 µ wide; amb circular; grains spheroidal, 62 - 68 µ.
PAN, Stuam et al. 882, KE 18123, MO; plate 40:426.

Cydista heterophylla Seib.
Isopolar-radiosymmetric, stephanocolpate (4-6 colpate); exine intectate, 5 µ thick, sexine echinate, bacula and echini resembling verrucae; sculpturing irregular in form and size; colpi inconspicuous; amb circular; grains subspheroidal, 48 - 52 µ.
PAN, Croat 14482, KE 18124, MO; plate 40:427.

Jacaranda copaia (Aubl.) D. Don. subsp. *spectabilis* (DC.) A. Gentry
Isopolar-radiosymmetric, tricolpate; exine tectate, 2 µ thick, sexine psilate, resembling scabrate type; colpi 5 µ wide, reaching poles, displaying irregular edge and forming triangle resembling para-syncolpate configuration; amb circular; grains prolate to prolate-spheroidal, 43 - 58 x 30 - 38 µ.
PAN, Dressler 3608, KE 18125, MO; plate 41:428.

Macfadyena unguis-cati (L.) A. Gentry
Isopolar-radiosymmetric, tricolpate; exine tectate, 1.5 - 2.0 µ thick, sexine psilate; colpi large, long 8 µ wide, occasionally uniting at poles; amb circular; grains subprolate to prolate- spheroidal, 43 - 53 x 30 - 48 µ.
BCI, Croat 14081, KE 18126, MO; plate 41:429.

Martinella obovata (HBK) Bur. & K. Schum.
Isopolar-radiosymmetric, tricolpate; exine semitectate, 2 - 3 µ thick, sexine reticulate, heterobrochate, simplicolumellate to multicolumellate, muri 2 µ wide x 7 -8 µ, brochi < 1 µ wide; colpi long, covered by thin ectexinic membrane; amb circular; grains prolate-spheroidal, 51 - 60 x 49 - 53 µ.
PAN, Lewis & Dressler 7566, KE 18127, MO; plate 41:430.

Pachyptera kerere (Aubl). Sandw. (*Mansoa kerere* Aubl. A. Gentry)
Isopolar-radiosymmetric, tricolpate; exine tectate, 2.5 µ thick, sexine reticulate, homobrochate, muri simplicolumellate, brochi < 1 µ wide; colpi long, covered by thin ectexinic membrane; amb circular; grains prolate-spheroidal 51 - 60 x 49 - 53 µ.
BCI, Schmalzel 60, MO; no plate.

Paragonia pyramidata (L. C. Rich) Bur.
Isopolar-radiosymmetric, tricolpate; exine tectate, 3 µ thick, sexine scabrate; colpi large, long, PAD 5 - 9 µ; amb circular; grains subprolate, 78 - 93 x 58 - 91 µ.
BCI, Croat 6895, KE 18128, MO; plate 41:431.

Phryganocydia corymbosa K. Schum.
Apolar-asymmetric, inaperturate; exine tectate, 2 - 3 µ thick, sexine microreticulate, homobrochate; sexine irregular; grains spheroidal, 50 - 56 µ.
PAN, Gentry 6081, KE 18129, MO; plate 41:432.

Pithecoctenium crucigerum (L.) A. Gentry
Apolar-asymmetric, inaperturate; exine semitectate, 6 - 9 µ thick, sexine reticulate, heterobrochate; muri 2 - 5 µ wide x 9 µ high, simplibaculate; lumina large, irregular, ≤ 25 µ wide; grains spheroidal, 100 µ.
BCI, Croat 5804, KE 18133, MO; plate 41:433.

Pleonotoma variabilis (Jacq.) Miers.
Isopolar-radiosymmetric, tricolpate; exine tectate, 3 µ thick, sexine reticulate, homobrochate, brochi < 1 µ wide; colpi frequently displaying ectexinic membrane, constricted at equator, margo 1 µ thick; amb circular; grains subprolate, 50 - 56 x 48 - 53 µ.
BCI, Croat 5607, KE 18132, MO; plate 42:435.

Spathodea campanulata Beauvois
Isopolar-radiosymmetric, tricolpate; exine tectate, 3 µ thick, sexine reticulate, homobrochate, brochi < 1 µ wide; colpi deep, displaying slight bridge at equator, resembling protuberant pores, PAD 7 µ; amb circular; grains subprolate, 60 - 65 x 45 - 58 µ.
PAN, Tyson 2042, KE 18131, MO; plate 42:434.

Stizophyllum riparium (HBK) Sandw.
Isopolar-radiosymmetric, tricolpate; exine tectate, 2.5 - 3.0 µ thick, sexine psilate, micro-scabrate; colpi large 5 µ wide, margo 1.5 µ thick; amb circular; grains prolate to subprolate, 45 - 53 x 33 - 38 µ.
PAN, Blum et al. 2505, KE 18130, MO; plate 42:436.

Tabebuia chrysantha (Jacq.) Nichols. (*T. ochracea* (Cham.) Standl. var *neocrysantha* (A. Gentry) A. Gentry)
Isopolar-radiosymmetric, tricolpate; exine tectate, 2 µ thick, sexine reticulate, homobrochate, brochi 1.0 - 1.5 µ wide; muri simplicolumellate, irregular; colpi long 2 µ wide, displaying equatorial membrane resembling lalongate pores 2 x 9 µ; amb circular; grains prolate to subprolate, 35 - 40 x 30 - 37 µ.
PAN, Smith 1972, KE 18137, MO; plate 42:438.

Tabebuia guayacan (Seem.) Hemsl.
Isopolar-radiosymmetric, tricolpate; exine tectate, 2.0 - 2.5 μ thick, sexine reticulate, homobrochate, brochi 2.0 - 2.5 μ wide, diminishing slightly toward poles, muri simplibaculate, bacula < 1 μ; colpi large, deep 8 μ wide, margo 1 μ thick, PAD 2 μ; amb circular; grains prolate to spheroidal, 30 - 40 x 22 - 30 μ.
PAN, Nee 10447, KE 18136, MO; plate 42:437.

Tabebuia ochracea (Cham.) Standl. var. *neochrysantha* (A. Gentry) A. Gentry
Isopolar-radiosymmetric, tricolpate; exine semitectate, reticulate, homobrochate, ca. 1.5 μ thick, sexine densely baculate, bacula 1 μ high, occasionally seen as free, complete bacula where tectum broken, brochi 1 μ wide, muri < 0.5 μ wide, simplibaculate; colpi as long as grains, large, deep 6 μ wide becoming syncolpate, edge irregular; amb circular; grains subprolate, 37 - 40 x 27 - 31 μ.
PAN, Gentry 4786, MO; plate 42:439.

Tabebuia rosea (Bertol.) DC.
Isopolar-radiosymmetric, tricolpate; exine tectate, 2 - 3 μ thick, sexine reticulate, homobrochate, muri simplibaculate, bacula 1.0 - 1.5 μ high, diminishing slightly at poles; colpi 15 μ wide, margo 2 μ thick, PAD 2 - 5 μ; amb circular; grains subprolate to spheroidal, 60 - 71 x 50 - 66 μ.
BCI, Croat 7771, KE 18135, MO; plate 42:440.

Tynnanthus croatianus A. Gentry
Isopolar-radiosymmetric, tricolpate; exine tectate, 1.5 - 2.0 μ thick, sexine reticulate, homobrochate, brochi < 1 μ wide; colpi large, deep 10 μ wide, margo 1.5 μ thick, PAD 4 μ; amb circular; grains subprolate to prolate-spheroidal, 45 - 46 x 43 - 50 μ.
BCI, Croat 11927, KE 18134, MO; plate 43:441.

Xylophragma seemannianum (O. Kuntze) Sandw.
Isopolar-radiosymmetric, tricolporate; exine tectate, 3 μ thick, sexine reticulate, homobrochate, brochi < 1 μ wide; colpi 15 μ wide, PAD 7 μ; pores endexinic, circular 13 μ diameter; amb circular; grains subprolate to spheroidal, 56 - 66 x 53 - 59 μ..
PAN, Gentry 4903, KE 18141, MO; plate 43:442.

BIXACEAE

Monad; isopolar-radiosymmetric; tricolporate; exine tectate 2 μ thick, sexine punctitegillate; pores lalongate; colpi displaying equatorial constriction with echinulate membrane; amb circular; grains subprolate, 58 - 62 x 41 - 54 μ. (*1 genus, 1 species*).

Bixa orellana L.
Colpi 50 μ long x 2 μ wide, apices rounded, costa colpi 9 μ wide; pores slightly lalongate, 4 x 6 μ, displaying ectexinic elements; colpi displaying equatorial constriction; amb circular to trilobate; grains subprolate, 58 - 62 x 41 - 54 μ.
PAN, Tyson et al. 3109, KE 18249, MO; plate 43:443.

BOMBACACEAE

Monad; isopolar-radiosymmetric; brevitricolpate, brevitricolporate, stephanocolporate; exine semitectate 1.5 - 5.0 μ thick; sexine reticulate-scrobiculate, homobrochate and heterobrochate; apertures always displaying costa; amb circular to intersubangular; grains oblate to spheroidal, 25 - 80 x 44 - 80 μ. (*7 genera, 9 species; additional references*: 56, 115, 146, 187)

Key to genera and species:

1a. Tricolpate (brevitricolpate)
  2a. Reticulate-homobrochate ..... *Pseudobombax septenatum*
  2b. Reticulate-heterobrochate
    3a. Colpi 10 μ long, grains > 50 μ ..... *Bombacopsis quinata**
    3b. Colpi 7 μ long, grains < 50 μ ..... *Bombacopsis sessilis**
1b. Tricolporate (brevitricolporate)
  4a. Amb circular, spheroidal, scrobiculate
    5a. ≥ 70 μ, exine 5 μ thick, 80 lumina ..... *Quararibea pterocalyx*
    5b. < 70 μ, exine 3 μ thick, 30 lumina ..... *Quararibea asterolepis*
  4b. Amb inter-subangular, oblate, reticulate
    6a. Homobrochate
      7a. Annulate, prominent, muri simplibaculate ..... *Ochroma pyramidale*
      7b. Pores lacking annulus, hidden, muri duplibaculate ..... *Ceiba pentandra*
    6b. Heterobrochate
      8a. Muri pilate, lumina large, muri thick ..... *Pachira aquatica*
      8b. Muri baculate, lumina small, muri thin ..... *Cavanillesia platanifolia*
1c. Stephanocolporate (4 - 5 colporate) ..... *Ochroma pyramidale*

Bombacopsis quinata (Jacq.) Dugand (*Pochota quinata* (Jacq.) W. D. Stevens)
Brevitricolpate; exine 2 μ thick, sexine reticulate, heterobrochate, brochi 1 - 2 μ wide, diminishing toward poles, gradually forming continuous bacula to 7 - 9 μ from apices, muri simplibaculate, colpi short, 10 x 2 μ, margo present; pores inconspicuous, lalongate; amb inter-subtriangular; grains oblate, 25 - 30 x 45 - 53 μ.
PAN, Allen 872, KE 18291, MO; plate 43:444.

Bombacopsis sessilis (Benth.) Pitt. (***Pochota sessilis*** (Benth.) W. D. Stevens)
Brevitricolpate; exine 2 μ thick, sexine reticulate, heterobrochate, brochi 1 - 2 μ wide, diminishing toward poles, forming continuous bacula 6 - 7 μ high at apices; muri simplibaculate to duplibaculate; colpi short, 7 x 2 μ, margo present, moderately protuberant; amb inter-subtriangular; grains oblate, 30 x 50 - 65 μ.
BCI, Schmalzel 306, MO; plate 43:445.

Cavanillesia platanifolia (H. & B.) HBK
Brevitricolporate; exine 3 μ thick, sexine reticulate, heterobrochate, brochi 1 μ wide, reticulum suprarugulate 2.5 μ high at polar areas; colpi 7 μ wide, ectexinic membrane ornamented and persistent, margo protuberant, 3 - 4 μ wide; pores lolongate, length subequal to colpi; amb inter-subtriangular; grains suboblate, 50 x 69 - 81 μ.
BCI, Croat 8421, KE 18293, MO; plate 43:446.

Ceiba pentandra (L.) Gaertn.
Brevitricolporate; exine 3 - 4 μ thick, sexine reticulate, homobrochate, brochi 5 - 10 μ wide, muri simplibaculate, 2 μ wide, duplibaculate; colpi short 20 x 6 - 7 μ, margo not protuberant, 3 μ thick; pores obscure, lolongate, 10 μ long; amb inter-subtriangular; grains oblate, 54 - 60 x 70 - 80 μ.
MEX, Breedlove & Thorne 30388, KE 18294, MO; plate 44:447.

Ochroma pyramidale (Cav. ex Lam.) Urban
Brevitricolporate; occasionally stephanocolporate (4 - 5-colporate); exine 3 μ thick, sexine reticulate, homobrochate, brochi 3 - 9 μ wide, muri simplibaculate, bacula irregular, muri 1.0 - 2.5 μ wide; colpi short, 18 x 6 μ; pores lolongate, 15 x 7 - 8 μ, annulus 4 - 5 μ thick; amb usually circular, occasionally inter-subangular; grains oblate-spheroidal, 69 x 73 - 75 μ.
BCI, Schmalzel 24, MO; plate 44:448.

Pachira aquatica Aubl.
Brevitricolporate; exine 3.5 - 4.0 μ thick, sexine reticulate, heterobrochate, echinate near colpi, brochi narrow at poles 12 - 15 μ from apex, forming continuous arrangement of conspicuous pila 5 μ high; colpi short, 16 x 4 μ, margo 2.5 μ thick; pores indistinct, extending laterally with colpi margin; amb inter-subtriangular; grains oblate, 45 x 71 - 88 μ.
PAN, Croat 278, KE 18296, MO; plate 44:449.

Pseudobombax septenatum (Jacq.) Dugand
Brevitricolpate; exine 1.5 μ thick, sexine reticulate, homobrochate; colpi 12 x 4 μ, margo 2 μ thick; amb inter-subtriangular; grains oblate, 35 x 44 - 58 μ.
BCI, Schmalzel 260, MO; plate 44:450.

Quararibea asterolepis Pitt.
Tricolporate; exine 3 μ thick, sexine reticulate-scrobiculate; lumina 30, 1 - 10 μ wide, muri multibaculate; colpi short, 15 x 14 μ; pores circular 3 - 4 μ diameter, annulus 5 μ wide; amb circular; grains spheroidal, 48 - 50 μ.
BCI, Foster 1044, PAN; plate 44:451.

Quararibea pterocalyx Hemsl.
Brevitricolporate; exine 5 μ thick, sexine reticulate-scrobiculate, lumina 80 per grain, 1 - 6 μ wide, muri multibaculate, 2 - 6 μ wide; colpi short 22 x 14 μ; pores circular, 7 - 9 μ diameter, annulus 5 μ wide; amb circular; grains spheroidal, 75 - 78 μ.
BCI, Schmalzel 686, MO; plate 45:452.

BORAGINACEAE

Monad; isopolar-radiosymmetric to apolar-asymmetric; tricolporate, triporate, frequently appearing inaperturate or monoporate; exine tectate, 1 - 5 μ thick, sexine echinate, scabrate, gemmate, reticulate, psilate; amb circular; grains oblate to prolate 20 - 50 μ. *(3 genera, 11 species; additional references: 24, 118, 119, 125, 141).*

Key to genera and species:

1a. Triporate or appearing, inaperturate or monoporate
  2a. Reticulate, exine ≥ 4 μ thick..... *Cordia spinescens*
  2b. Gemmate-verrucate, exine < 4 μ thick
    3a. Exine 2 μ thick..... *Tournefortia cuspidata*
    3b. Exine 1.0 - 1.5 μ thick
      4a. 24 - 28 μ, pores 2.5 μ diameter..... *Tournefortia bicolor*
      4b. 28 - 40 μ, pores 3 - 5 μ diameter..... *Tournefortia hirsutissima*
1b. Tricolporate
  5a. Echinate
    6a. Exine ≥ 3 μ thick..... *Cordia alliodora*
    6b. Exine < 3 μ thick
      7a. Exine 1.5 - 2.0 μ thick, costa colpi 4 - 5 μ thick..... *Cordia panamensis*
      7b. Exine 2 - 3 μ thick, costa colpi < 4 μ thick
        8a. Echini ≤ 1 μ high..... *Cordia bicolor*
        8b. Echini > 1μ high..... *Cordia lasiocalyx*
  5b. Scabrate to psilate
    9a. Amb semi-angular, grains prolate to subprolate
      10a. > 40 μ (long axis)..... *Heliotropium indicum*
      10b. < 40 μ (long axis)..... *Tournefortia angustiflora*
    9b. Amb circular, grains subprolate to spheroidal..... *Tournefortia maculata*

Cordia alliodora (R. & P.) Cham. Oken
Isopolar-radiosymmetric, tricolporate; exine 3.5 - 5.5 µ thick, sexine echinulate; colpi 13 x 1 µ, margo 4 µ thick, PAD 14 µ; pores lalongate, 3 - 4 x 10 -12 µ; amb circular, grains usually oblate-spheroidal, less frequently prolate-spheroidal, 27 - 35 x 25 - 42 µ.
PAN, Stern et al. 1721, KE 18163 (p), BCI, Schmalzel 397 (d), MO; plate 45:453.

Cordia bicolor A. DC.
Isopolar-radiosymmetric, tricolporate, occasionally syncolporate; exine 2.0 - 2.5 µ thick, sexine echinulate, echini < 0.5 µ high; colpi moderately long, narrow, PAD variable; pores lalongate, inconspicuous; amb circular; grains oblate-spheroidal to prolate-spheroidal, 36 x 43 - 46 µ.
BCI, Croat 8809, KE 18164, MO; plate 45:454.

Cordia lasiocalyx Pitt.
Isopolar-radiosymmetric, tricolporate; exine 2 - 3 µ thick, sexine echinate, echini 1 µ high; colpi moderately long, narrow, PAD 12 µ, costa colpi 3 µ wide; amb circular; grains oblate-spheroidal, 42 - 48 x 47 - 53 µ.
BCI, Croat 8568, KE 18165, MO; plate 45:456.

Cordia panamensis Riley
Isopolar-radiosymmetric, tricolporate; exine 1.5 - 2.0 µ thick, sexine echinate, echini 1 µ high; colpi displaying persistent verrucate membrane; costa colpi 4.5 µ wide; pores lalongate, margo irregular; amb circular; grains oblate-spheroidal, 41 - 45 x 43 - 52 µ.
PAN, Webster 16768, KE 18166, MO; plate 45:455.

Cordia spinescens Riley L.
Apolar-asymmetric, triporate; exine 4 - 5 µ thick, sexine reticulate, homobrochate, muri simplibaculate, bacula < 1.5 µ high, lumina < 4 µ wide; pores lalongate, 6 - 8 x 3.5 - 5.0 µ; amb circular; grains spheroidal, 39 - 52 µ.
PAN, Wedel 2839, KE 18168, MO; plate 45:457.

Heliotropium indicum L.
Isopolar-radiosymmetric, tricolporate; exine 1.5 - 2.0 µ thick, sexine scabrate, scabrae irregularly distributed; colpi long, narrow 12 - 15 µ; pores lalongate, slightly constricted near colpi, 5 x 12 µ, margo 5 µ thick; amb semi-angular, sides convex; grains prolate, 41 - 52 x 30 - 36 µ.
PAN, KE 18169, MO; plate 46:458.

Tournefortia angustiflora R. & P.
Isopolar-radiosymmetric, tricolporate; exine 1 µ thick, sexine scabrate; colpi short 18 µ, pores lalongate, constricted near colpi 5 x 7.5 µ, margin 2.0 - 2.5 µ thick; amb semiangular; grains prolate-spheroidal, 38 - 41 x 25 - 33 µ.
PAN, Lewis et al. 876, KE 18170, MO; plate 46:459.

Tournefortia bicolor Sw.
Apolar-asymmetric, triporate, apparently inaperturate or monoporate, apertures obscured by sculpturing; exine variable ca. 1 µ thick, sexine densely gemmate-verrucate, gemmae 2.5 - 3.0 µ diameter; pores circular, 2.5 µ diameter; grains spheroidal, 25 - 29 µ.
PAN, Stern et al. 1898, KE 18171, MO; plate 46:460.

Tournefortia cuspidata HBK
Apolar-asymmetric, triporate, apparently inaperturate or monoporate, apertures obscured by sculpturing; exine 2 µ thick, sexine densely gemmate-verrucate, gemmae 2 - 7 µ diameter; pores inconspicuous; grains spheroidal, 26 - 35 µ.
PAN, McDaniel 5138, KE 18172, MO; plate 46:461.

Tournefortia hirsutissima L.
Apolar-asymmetric, triporate, appearing inaperturate or monoporate, apertures obscured by sculpturing; exine 1.0 - 1.5 µ thick, sexine densely gemmate-verrucate, gemmae 2 - 7 µ diameter; pores circular, 3 - 5 µ diameter; grains spheroidal 28 - 40 µ.
PAN, Croat & Porter 15380, KE 18173, MO; plate 46:462.

Tournefortia maculata Jacq.
Isopolar-radiosymmetric, tricolporate; exine 1.0 - 1.5 µ thick, sexine psilate to scabrate; colpi 5 - 10 µ long, narrow; pores lalongate, appearing to form equatorial ring (costa transversalis) 3 - 5 µ wide; amb circular; grains subprolate to spheroidal, 33 - 38 x 25 - 36 µ.
PAN, Lewis et al. 5587, MO; plate 46:463.

BURSERACEAE

Monad; isopolar-radiosymmetric; tricolporate; exine tectate 1 - 4 µ thick; sexine psilate, granulate, striate-reticulate; pores always lalongate forming equatorial ring (costa transversalis), uniting slightly at extremes; amb circular to lobate; grains prolate to subprolate, 25 - 46 x 21 x 42 µ. (*4 genera, 6 species; additional references: 102, 123*).

Key to genera and species:

1a. Striate-reticulate
- 2a. < 30 µ, pores ≤ 7 µ wide; costa pori 2 µ ..... *Protium tenuifolium*
- 2b. > 30 µ, pores 7 - 10 µ, costa pori 5 µ ..... *Bursera simaruba*

1b. Granulate
- 3a. < 40 µ, exine < 1 µ thick, pores ≤ 9 µ wide ..... *Protium panamense*
- 3b. > 40 µ, exine 2 µ thick, pores 12 µ wide ..... *Tratlinnickia aspera*

1c. Psilate
- 4a. Amb semi-lobate, pores 14.5 x 3.5 µ ..... *Tetragastris panamensis*
- 4b. Amb circular, pores 12 x 3 µ ..... *Protium costaricense*

Bursera simaruba (L.) Sarg.
Exine 2.5 µ thick, sexine striate-reticulate, heterobrochate, muri < 0.5 µ wide, simplibaculate, lumina 1 µ diameter, brochi arranged in striae; colpi 16 x 10 µ, edges sharp; pores transversely parallel, 5 x 10 µ, costa colpi 5 µ thick; amb circular, aspidate; grains prolate-spheroidal, 33 - 38 µ x 28 - 37 µ.
PAN, Dwyer et al. 5114, KE 18427, MO; plate 46:464.

Protium costaricense (Rose) Engler
Exine 1 µ thick, sexine psilate; colpi long, sharp, very narrow 20 - 30 µ x < 1 µ; pores transversely parallel, 3 x 12 µ, costa pori 5 µ thick, occasionally zonorate, forming costa aequatorialis; amb circular; grains prolate, 36.5 - 38.0 x 23 - 27 µ.
PAN, Mori & Kallunki 2284, KE 18428, MO; plate 46:465.

Protium panamense (Rose) I. M. Johnston
Exine 1 µ thick, sexine granulate; colpi 22 x 10 µ, edges curving; pores transversely ovoid, 4 x 9 µ; costa pori 5 µ thick, interporium 11 µ; amb circular; grains prolate, 35 - 39 x 26.5 - 30.0 µ.
BCI, Woodworth & Vestal 559, KE 18429, MO; plate 46:469.

Protium tenuifolium Engler subsp. ***sessiliflorum*** (Rose) Standl.D. M. Porter
Exine 2.5 - 4.0 µ thick, increasing at equator, sexine striate-reticulate, homobrochate, brochi arranged in striae; colpi long, narrow 22 x 1 µ; pores transversely ovoid 3 x 7 µ; costa pori 2 µ thick; PAD 7 µ; amb circular; grains subprolate to prolate-spheroidal, 25 - 29 x 21 - 25 µ.
PAN, Tyson & Lazor 6279, PMA; plate 46:466.

Tetragastris panamensis (Engler) O. Kuntze
Exine 1 µ thick, sexine psilate to slightly striate; colpi long, narrow, 25 x 1 µ; pores transversely ovoid, normally widened at extremes 3.5 x 14.5 µ; interporium 5 µ; costa pori 5 µ thick; amb semilobate to circular; grains prolate, 39 - 41 x 25.5 - 29.5 µ.
PAN, Tyson et al. 4727, KE 18430, MO; plate 46:467.

Trattinnickia aspera (Standl.) Swart.
Exine 2 µ thick, semitectate, displaying slightly conspicuous fosulate processes, sexine granulate; colpi sharp, narrow, moderately long, 28.0 x 1.5 µ, costa colpi 5 µ thick; pores transversely elliptical, 5 x 12 µ; interporium 15 µ; amb circular; grains subprolate, 44 - 46 x 36.5 - 42.5 µ.
BCI, Croat 11667, KE 18431, MO; plate 46:468.

CACTACEAE

Monad; isopolar-radiosymmetric to apolar-asymmetric; tricolpate, pericolpate; periporate; exine tectate to intectate; sexine echinate, psilate; amb circular to irregular; grains spheroidal 85 - 178 µ. *(2 genera, 3 species; additional reference: 75).*

Key to genera and species:

1a. Colpate (3 to many colpi); grains ≥ 100 µ; sexine echinate, exine 6 µ thick..... ***Epiphyllum phyllanthus***
1b. 4 - 6 porate; grains < 100 µ, sexine psilate, exine < 1 µ thick..... ***Rhipsalis cassytha****

Epiphyllum phyllanthus (L.) Haw.
Isopolar-radiosymmetric when tricolpate, apolar-asymmetric when pericolpate; exine 3 - 6 µ thick, sexine echinate, echini 3 µ high, short bacula present; colpi varying with aperture number, when tricolpate, 56 x 12 - 16 µ, when pericolpate, 19 - 38 x 2.5 µ, 6 - 8 colpi in pericolpate form; amb circular; grains spheroidal, 111 - 178 µ.
BCI, Croat 14059, KE 18273, MO; plate 46:470.

Epiphyllum phyllanthus (L.) var. ***rubrocoronatum*** Kimn.
Isopolar-radiosymmetric, tricolpate, occasionally 5 - 6 colpate, appearing pericolpate; intectate, exine 2 - 3 µ thick; sexine baculate, resembling echini; colpi long and narrow, inconspicuous; amb circular; grains spheroidal, 93 - 136 µ .
BCI, Croat 12000, MO; plate 47:471.

Rhipsalis cassytha Gaertn. (***Rhipsalis baccifera*** (J. Miller) Stern)
Apolar-asymmetric, periporate, 4 - 6 pores , exine very thin, tectate < 1 µ thick, echinulate; pores protuberant, circular to slightly ovoid 12 - 15 x 10 µ diameter, annulus conspicuous 5 - 8 µ wide; amb subcircular; grains suboblate, 85 - 95 x 104 - 115 µ. Grains fragile following acetolysis.
BCI, Busey 312, PMA; plate 47:472.

CAMPANULACEAE

Monad; isopolar-radiosymmetric; tricolpate; exine tectate; sexine psilate; colpi large, long, displaying equatorial constriction; amb circular; grains prolate to subprolate, 48 - 58 x 32 - 41 µ. *(1 genus, 1 species).*

Centropogon cornutus (L.). Druce
Sexine strongly columellate, columellae 1.5 µ high; colpi 10 µ wide, usually constricted equatorially, displaying persistent verrucate membrane, PAD 5 µ.
PERU, Kayap 1444, KE 17764, MO; plate 47:473.

CAPPARACEAE

Monad; isopolar-radiosymmetric; 4-colpate; tricolporate, 4-colporate; exine tectate; sexine scabrate to microechinate; colpi short; pores inconspicuous; grains usually displaying 4 apertures; amb semi-angular; grains prolate-spheroidal, 22 - 26 x 20 - 25 µ. *(2 genera, 2 species).*

Key to genera and species:

1a. Colpate, sexine microechinate, margo present..... *Cleome parviflora*
1b. Colporate, sexine scabrate, margo lacking, pores annulate..... *Capparis frondosa*

Capparis frondosa Jacq.
Exine 2 µ thick, sexine scabrate; colpi displaying irregular orientation, appearing to unite (syncolporate) 3 µ wide, costa colpi 2 µ; pores slightly ovoid 3 x 4 µ; amb circular when tricolporate, angular when stephanocolporate; grains prolate-spheroidal, variable in size, 3-aperturate: 22 - 23 x 19 - 22 µ, 4-aperturate: 23 - 26 x 22 - 25 µ.
BCI, Schmalzel 373, MO; plate 47:474.

Cleome parviflora HBK
Exine 2 µ thick, sexine echinate, echini < 1µ high, always displaying 4 apertures; colpi sharp, short , 9 x 2 µ, margo 1.5 µ wide, PAD 15 µ; amb usually angular (tetrangular); grains prolate-spheroidal, 22 - 24 x 20 - 23 µ.
MEX, Hamen & McNee 7620, MO; plate 47:475.

CARICACEAE

Monad; isopolar-radiosymmetric; tricolporate; exine tectate; sexine reticulate, homobrochate, brochi < 1µ wide; muri columellate, columellae conspicuous; colpi, when short, always having margo; pores lalongate; amb circular; grains subprolate to spheroidal, 27 - 48 x 26 - 40 µ. *(2 genera, 3 species; additional reference: 83).*

Key to genera and species:

1a. ≥ 40 µ, colpi short, pores inconspicuous..... *Carica cauliflora*
1b. < 40 µ, colpi long, pores evident
  2a. Colpi having margo, pores ≥ 10 µ wide..... *Carica papaya*
  2b. Colpi lacking margo, pores < 10 µ..... *Jacaratia spinosa*

Carica cauliflora Jacq.
Exine 1 µ thick; margo 1.5 µ wide, colpi relatively short 13 x 2 µ; pores lalongate, inconspicuous; amb circular; grains subprolate 40 - 48 x 30 - 40 µ.
PAN, Schmalzel 1031, MO; plate 47:476.

Carica papaya L.
Exine 2 µ thick; margo 1.5 µ wide; colpi long, containing ectexinic elements, PAD 5 - 7 µ; pores lalongate, 2.5 - 3.5 x 11 - 12 µ; amb circular; grains prolate-spheroidal to oblate-spheroidal 31 - 33 x 30 - 35 µ.
PAN, Schmalzel 423, MO; plate 47:477.

Jacaratia spinosa (Aubl.) A. DC.
Exine 1.5 µ thick; colpi long and narrow, margo absent; pores lalongate, 1.5 x 7.0 µ; amb circular; grains spheroidal, 26 - 29 µ.
ECU, Dodson 5413, KE 18275, MO; plate 47:478.

CARYOPHYLLACEAE

Monad; apolar-asymmetric; periporate; exine tectate, thick, sexine baculate; pores ca. 14, circular; grains spheroidal, 25 - 28 µ. *(1 genus, 1 species; additional reference: 199).*

Drymaria cordata (L.) R. & S.
Exine 2.5 µ thick, sexine 1.5 µ thick, baculate, densely columellate, nexine 1 µ thick; pores 3.0 - 3.5 µ diameter, pore edges irregular, interporium 7 - 8 µ; grains spheroidal, 25 - 28 µ.
PAN, Correa 1635, PMA; plate 47:479.

CELASTRACEAE

Monad; isopolar-radiosymmetric; tricolporate; exine semitectate; sexine reticulate; homobrochate, brochi 1 µ wide; colpi long, sharp; margo present; pores slightly lalongate; amb circular; grains subprolate, 20 - 21 x 17 - 20 µ. *(1 genus, 1 species; add. ref. : 99).*

Maytenus schippii Lund.
Exine 1 µ thick, homobrochate, muri simplicolumellate; colpi 15.0 x 1.5 µ; pores 2 x 8 µ, ovoid; amb circular; grains subprolate, 20 - 21 x 17 - 20 µ.
BCI, Croat 14656, MO; plate 47:480.

CHRYSOBALANACEAE (ROSACEAE)

Monad; isopolar-radiosymmetric; tricolpate, tricolporate; exine tectate, 2 - 3 µ thick; sexine scabrate, verrucate, rugulate; apertures indistinct; pores lalongate; amb circular to semiangular; grains suboblate to prolate-spheroidal, 16 - 41 x 21 - 48 µ. *(2 genera, 5 species).*

Key to genera and species:

1a. Tricolpate (subprolate, sexine verrucate)..... *Licania platypus*
1b. Tricolporate
  2a. Scabrate
    3a. ≤ 30 µ, suboblate..... *Hirtella americana*
    3b. > 30 µ, oblate-spheroidal..... *Hirtella racemosa*
  2b. Verrucate..... *Hirtella triandra*
  2c. Rugulate..... *Licania hypoleuca*

Hirtella americana L.
Tricolporate; exine 2 µ thick, sexine scabrate; colpi large 8 µ wide, PAD 6 µ; pores lalongate, 4 x 6 µ, having irregular edges; amb circular to semi-angular; grains suboblate, 20 - 22 x 25 - 27 µ.
BCI, Croat 7751, MO; plate 47:481.

Hirtella racemosa Lam.
Tricolporate; exine 2 µ thick; sexine scabrate; colpi indistinct, 18 x 1.0 - 1.5 µ, PAD 11 µ; pores inconspicuous, lalongate; grains having occasionally 4 or 5 apertures; amb circular, irregular; grains oblate-spheroidal to prolate-spheroidal, 38 - 41 x 31 - 46 µ.
BCI, DeSteven 1, BCI; plate 47:482.

Hirtella triandra Sw.
Tricolporate; exine 3 µ thick, sexine rugulate to verrucate; colpi 16 x 1.5 µ; pores lalongate, 3 x 10 µ, PAD 9 µ; amb circular, semi-ovoid; grains suboblate, 29 - 38 x 39 - 48 µ.
BCI, Schmalzel 277, MO; plate 47:483.

Licania hypoleuca Benth.
Tricolporate; exine 2.5 µ thick, sexine rugulate, exine displaying conspicuous stratification; apertures poorly defined, edges irregular; pores lalongate 3 x 7 µ; amb usually triangular; PAD 6 µ; grains suboblate, 16 - 18 x 21 - 25 µ.
PAN, Dressler 4722, MO; plate 47:484.

Licania platypus (Hemsl.) Fritsch
Tricolpate; exine 2 µ thick, sexine rugulate; colpi 24 x 1 µ displaying equatorial constriction, costa colpi 1.5 µ, PAD 8 µ; amb circular, semi-angular; grains subprolate, 29 - 32 x 26 - 31 µ.
BCI, Croat 8695, MO; plate 47:485.

COCHLOSPERMACEAE

Monad; isopolar-radiosymmetric; tricolporate; exine tectate; sexine psilate; colpi long, displaying strong equatorial constriction, fusing, forming bridge obscuring pores; pores circular; amb circular; grains prolate-spheroidal, 14.0 - 15.5 x 12.0 - 14.5 µ. *(1 genus, 1 species).*

Cochlospermum vitifolium (Willd.) Spreng.
Exine < 1 µ thick, sexine psilate; colpi sharp, long, displaying strong equatorial constriction, PAD 5 µ; pores circular 2 µ diameter, obscured by colpi; amb circular; grains prolate-spheroidal, 14.0 - 15.5 x 12.0 - 14.5 µ.
PAN, Schmalzel 357, MO; plate 48:48.

COMBRETACEAE

Monad; isopolar-radiosymmetric; heterocolpate (3 colpori alternating with 3 pseudocolpi); exine tectate 1.0 - 2.5 µ thick; sexine psilate, scabrate; colpi long, sharp and narrow; pores circular to lalongate; amb circular to hexalobate; grains oblate-spheroidal to subprolate, 17 - 41 x 15 - 42 µ *(2 genera, 7 species; additional reference: 99).*

Key to genera and species:

1a. Exine 2.5 µ thick..... *Combretum cacoucia*
1b. Exine < 2 µ thick
  2a. Polar axis ≤ 20 µ
    3a. Pores lalongate..... *Combretum decandrum*
    3b. Pores circular..... *Combretum laxum* var. *epiphyticum*
  2b. Polar axis > 20 µ
    4a. Oblate-spheroidal to prolate-spheroidal..... *Combretum laxum* var. *laxum*
    4b. Subprolate to prolate-spheroidal
      5a. Pores labrum type, colpi constricted at equator
        6a. PAD 9 µ, pores circular..... *Terminalia amazonia*
        6b. PAD 5 µ, pores lalongate..... *Terminalia chiriquensis**
      5b. Pores normal, colpi not constricted..... *Combretum fruticosum*

Combretum cacoucia Exell. in Sandw.
Exine 2.5 µ thick, sexine psilate, colpori long, 5 - 6 µ wide, displaying persistent scabrate membrane; PAD 5.5 - 6.0 µ; pores lalongate 5.0 - 8.5 x 7.5 - 10.5 µ; amb hexalobate; grains oblate- spheroidal, 30 - 41 x 27 - 42 µ.
PAN, Allen 3432, KE 16819, MO; plate 48:487.

Combretum decandrum Jacq.
Exine 1.5 μ thick, sexine psilate, pseudocolpi long, narrow, undifferentiated from colporate condition, the latter longer than pseudocolpi from polar view; PAD 1.5 μ, pores lalongate to circular, 3.0 x 5.5 μ; amb hexalobate; grains oblate-spheroidal to prolate-spheroidal, 18 - 20 x 15 - 20 μ.
PAN, Pittier 6607, KE 16822, MO; plate 48:488.

Combretum fruticosum (Loefl.) Stuntz.
Exine 1.5 μ thick, sexine psilate, colpori more evident than pseudocolpi; pores circular, 5 - 7 μ diameter to lolongate, 11 x 6 μ, edges irregular; amb hexalobate; grains prolate-spheroidal, 23 - 25 x 20 - 22 μ.
BCI, Schmalzel 249, MO; plate 48:489.

Combretum laxum Jacq. var *epiphyticum* (Pitt.) Croat
Exine 2 μ thick, sexine psilate; pseudocolpate and colporate conditions indistinguishable; pores obscured by colpi; amb circular hexalobate; grains oblate-spheroidal to subprolate, 14 - 16 x 12.5 - 16.0 μ.
PAN, Callen 376, MO; no plate.

Combretum laxum Jacq. var. *laxum* Enum. Syst.
Exine 1.5 - 2.0 μ thick, sexine scabrate; colpori long, sharp, 2 μ wide, almost uniting at poles, PAD 2 - 3 μ, pseudocolpi protuberant, shorter than colpi; pores circular 4 μ diameter; amb circular hexalobate; grains prolate-spheroidal to subprolate, 18 - 22 x 16 - 18 μ.
BCI, Schmalzel 957, MO; plate 48:490.

Terminalia amazonia (J. F. Gmel.) Exell
Exine 1.5 - 2.0 μ thick, sexine psilate; colpori as long as pseudocolpi, sharp 1.5 μ wide, presenting strong equatorial constriction forming bridge, PAD 9 μ; pores circular 4 μ diameter; amb circular hexalobate; grains subprolate, 21 - 23 x 15 - 20 μ.
BCI, Croat 5407, KE 16807, MO; plate 48:491.

Terminalia chiriquensis Pitt. (*Terminalia oblonga* (R. & P.) Steud.)
Exine 1.5 - 2.0 μ thick, sexine slightly scabrate; colpori and pseudocolpi of same length, colpori displaying equatorial constriction; costa colpi 1.5 μ wide, PAD 5 μ; pores slightly lalongate 4 x 5 μ, labrate; amb circular hexalobate; grains subprolate to prolate-spheroidal, 21 - 23 x 17 - 19 μ.
PAN, Tyson et al. 3128, MO; plate 48:492.

COMPOSITAE (ASTERACEAE)

Monad; isopolar-radiosymmetric to apolar-asymmetric; tricolporate, 4-colporate, fenestrate; exine tectate; sexine echinate, echinulate, psilate; exine densely columellate; amb circular to polygonal; grains oblate-spheroidal to subprolate, 11 - 45 x 11 - 46 μ. *(33 genera, 43 species; additional references: 165, 167, 175).*

Key to genera and species:

1a. Fenestrate (periporate)
  2a. Echini ≤ 1 μ long
    3a. Grains ≥ 30 μ
      4b. Exine > 3 μ thick ..... *Elephantopus mollis*
      4b. Exine < 3 μ thick..... *Spiracantha cornifolia*
    3b. Grains < 30 μ..... *Pseudoelephantopus spicatus*
  2b. Echini 2.0 - 2.5 μ
    5a. Grains < 35 μ..... *Vernonia canescens**
    5b. Grains > 35 μ
      6a. Lacunae > 6 μ wide..... *Rolandra fruticosa*
      6b. Lacunae < 6 μ wide
        7a. 20 lacunae per grain, exine 2 μ thick..... *Vernonia cinerea*
        7b. 16 lacunae per grain, exine 3 μ thick..... *Vernonia patens*
1b. Stephanocolporate (4-colporate)
  8a. < 20 μ, echini 2 μ long..... *Erechtites hieracifolia cacalioides*
  8b. > 30 μ, echini 5 μ long..... *Tridax procumbens*
1c. Tricolporate
  9a. Pores circular
    10a. Grains > 30 μ, pores conspicuous
      11a. Pores ≥ 3 μ diameter
        12a. Pores 5 μ, echini 1.5 μ long..... *Emilia sonchifolia*
        12b. Pores 3.5 μ, echini 4 μ long..... *Heterocondylus vitalbae*
      11b. Pores < 3 μ diameter..... *Baltimora recta*
    10b. Grains < 30 μ, pores inconspicuous
      13a. 10 -15 μ..... *Fleischmannia microstemon*
      13b. 15 - 25 μ
        14a. Exine ≥ 3 μ thick..... *Mikania guaco*
        14b. Exine < 3 μ thick
          15a. Oblate-spheroidal..... *Mikania leiostachya*
          15b. Subprolate to prolate-spheroidal..... *Chromolaena odorata*
  9b. Pores lalongate
    16a. Grains < 20 μ
      17a. Exine ≤ 2 μ thick..... *Eclipta alba**
      17b. Exine > 2 μ thick
        18a. Echini ≤ 3 μ long
          19a. Oblate-spheroidal..... *Ayapana elata*

19b. Spheroidal ..... *Erechtites hieracifolia*
18b. Echini > 3 µ long ..... *Mikania hookeriana*
16b. Grains 20 - 30 µ
19a. Echini ≥ 3 µ long
20a. Echini 3 - 4 µ long, exine ≤ 2 µ thick
21a. Pores 4 x 9 µ ..... *Pluchea odorata*
21b. Pores 1 - 3 x 5 - 6 µ
22a. Colpi deep
23a. Grains 20 - 25 µ ..... *Mikania micrantha*
23b. Grains 25 - 30 µ ..... *Eleutheranthera ruderalis*
22b. Colpi superficial ..... *Melampodium divaricatum*
20b. Echini 4.0 - 5.5 µ long, exine ≥ 2 µ thick
24a. Grains ≤ 28 µ ..... *Mikania hookeriana*
24b. Grains > 28 µ
25a. Exine 2.5 µ thick ..... *Neurolaena lobata*
25b. Exine 3 µ thick ..... *Spilanthes alba*
19b. Echini < 3 µ long
26a. Prolate-spheroidal to spheroidal
27a. Exine 3 - 4 µ thick ..... *Hebeclinium macrophyllum*
27b. Exine 1.5 - 3.0 µ thick ..... *Baccharis trinervis*
26b. Oblate-spheroidal
28a. Echini ≤ 2 µ long
29a. Exine 1 µ thick ..... *Fleischmannia sinclarii*
29b. Exine 3 µ thick ..... *Koanophyllon wetmorei*
28b. Echini > 2 µ long
30a. Pores 4 µ diameter
31a. Exine 1.5 µ thick ..... *Clibadium surinamense*
31b. Exine 2 µ thick ..... *Mikania tonduzii*
30b. Pores 10 µ diameter ..... *Conyza apurensis*
16c. > 30 µ
32a. Exine ≥ 8 µ thick ..... *Calea prunifolia**
32b. Exine < 8 µ thick
33a. Echini usually > 5 µ long
34a. Exine ≥ 2.5 µ thick
35a. Pores ≤ 6 µ diameter ..... *Clibadium asperum**
35b. Pores 8 - 10 µ diameter ..... *Wedelia trilobata*
34b. Exine < 2.5 µ thick
36a. Grains occasionally 4-aperturate ..... *Tridax procumbens*
36b. Grains always 3-aperturate
37a. Echini 4 - 5 µ long ..... *Melanthera aspera*
37b. Echini 5 - 6 µ long ..... *Wulffia baccata*
33b. Echini < 5 µ long
38a. Echini < 0.5 µ long, grains prolate-spheroidal ..... *Chaptalia nutans*
38b. Echini 3.0 - 4.5 µ long, grains oblate-spheroidal
39a. Exine > 2.5 µ thick
40a. Pores up to 7 µ diameter ..... *Verbesina gigantea*
40b. Pores 11 µ diameter ..... *Conyza bonariensis*
39b. Exine 2 µ thick
41a. Echini 3 µ long, colpi 4 µ wide ..... *Synedrella nodiflora*
41b. Echini 4 µ long, colpi 6 µ wide ..... *Schistocarpha oppositifolia**

Ayapana elata (Steetz) K. & R.
Isopolar-radiosymmetric, tricolporate; exine 2.5 µ thick, sexine echinate, echini sharp, conical 3 µ long x 4 µ wide at base, sexine strongly columellate, apertures obscured by sculpturing; amb circular; grains oblate-spheroidal, 16 - 17 x 19 - 22 µ.
BCI, Croat 4830, MO; plate 48:493.

Baccharis trinervis (Lam.) Pers.
Isopolar-radiosymmetric, tricolporate; exine 1.5 - 3.0 µ thick, sexine echinate, echini sharp, conical 3 µ long; colpi 5 µ wide; PAD 4 µ; pores lalongate, inconspicuous; amb circular; grains prolate-spheroidal, 23 - 24 x 21 - 22 µ.
PAN, Schmalzel 1049, MO; plate 48:494.

Baltimora recta L.
Isopolar-radiosymmetric, tricolporate; exine 4 - 5 µ thick, sexine echinate, echini 4 - 5 µ long, conical 4 µ wide at base; colpi moderately long, pores circular 2 µ diameter; amb circular; grains spheroidal, 33 - 36 x 35 - 41 µ.
PAN, Tyson et al. 2813, MO; plate 48:495.

Calea prunifolia HBK (*C. jamaicensis* (L.) L.)
Isopolar-radiosymmetric, tricolporate; exine 8 µ thick, sexine echinate, echini sharp, conical 6 x 3.5 µ; colpi inconspicuous; pores lalongate, prominent; amb circular; grains oblate-spheroidal, 33 - 38 x 35 - 40 µ.
PAN, Croat 6629, MO; plate 48:496.

Chaptalia nutans (L.) Polak
Isopolar-radiosymmetric, tricolporate, exine 3 - 4 µ thick, sexine micro-echinate, echini < 0.5 µ; colpi moderately long, narrow, margo 2 µ wide; pores lalongate 3 - 6 x 12 - 18 µ; amb circular; grains prolate-spheroidal, 38 - 44 x 33 - 38 µ.
BCI, Schmalzel 830, MO; plate 48:497.

Chromolaena odorata (L.) King & Robinson
Isopolar-radiosymmetric, tricolporate; exine 1.5 - 2.0 µ thick, sexine echinate, echini 1.5 µ high x 2.5 µ; colpi 3 µ wide; pores appearing circular, inconspicuous; amb circular; grains subprolate to prolate-spheroidal, 20.0 - 22.5 x 16.0 - 18.5 µ.
PAN, McCovicle C139, MO; plate 48:498

Clibadium asperum (Aubl.) DC. (*Clibadium surinamense* L.)
Isopolar-radiosymmetric, tricolporate; exine 3 µ thick, sexine echinate, echini 5 - 6 µ long x 4 µ; colpi 3 µ wide; pores lalongate, 2.5 x 6 µ; amb circular; grains prolate-spheroidal to oblate-spheroidal, 31 - 32 x 33 - 38 µ.
PAN, Blum et al. 2662, KE 17775, MO; plate 48:499.

Clibadium surinamense L.
Isopolar-radiosymmetric, tricolporate; exine 1.5 µ thick, sexine echinate, echini 2.5 - 3.0 µ long x 2.0 - 2.5 µ, conical; colpi moderately long; pores lalongate 4 µ wide; amb circular; grains oblate-spheroidal, 23 - 24 x 20.0 - 24.5 µ.
PAN, Lazor 5244, MO; plate 48:500.

Conyza apurensis HBK
Isopolar-radiosymmetric, tricolporate; exine 1.5 - 2.0 µ thick, sexine tectate, echinate, echini 2.5 - 3.0 µ high, sharp, distal 2.5 µ amorphous, bases granular 3 µ wide; colpi long 3 µ wide; pores lalongate 2.5 x 10 µ, constricted at colpi; amb circular; grains oblate-spheroidal, 23 - 26 x 25 - 27µ.
PAN, Tyson 4025, KE 17772, MO; plate 48:501.

Conyza bonariensis (L.) Cronq.
Isopolar-radiosymmetric, tricolporate; exine 2.5 µ thick, sexine echinate, echini 3 µ long x 4 µ, echini sharp, bases granulate; colpi 4 µ wide; pores lalongate 3 - 5 x 11 µ; amb circular; grains oblate-spheroidal, 30 - 31 x 31 - 33 µ.
PAN, Dwyer 8722, KE 17773, MO; plate 48:502.

Eclipta alba (L.) Hassk. (*Eclipta prostrata* (L.) L.)
Isopolar-radiosymmetric, tricolporate; exine 1 µ thick, sexine echinate, echini sharp, 3 µ long x 4 µ wide, base conical; colpi long, inconspicuous; pores slightly lalongate 3.0 x 4.5 µ; amb circular; grains prolate-spheroidal, 17 - 18 x 15.5 - 17 µ
BCI, Schmalzel 893, MO; plate 48:503

Elephantopus mollis HBK
Apolar-asymmetric, fenestrate; exine 4 - 5 µ thick, sexine echinate, echini very short, ≤ 1 µ, arranged on interlacunar ridge, < 2 µ wide, 3 lacunae apparently serve as indistinct pores; grains spheroidal, 34 - 40 µ.
PAN, Schmalzel 1304 (p), PMA, Croat 8436 (d), MO; plate 48:504.

Eleutheranthera ruderalis (Sw.) Schultz-Bip.
Isopolar-radiosymmetric, tricolporate; exine 1.5 µ thick, sexine echinate, echini 2.5 - 4.0 µ long, conical at base; colpi 12 µ long, very narrow; pores appearing lalongate 2 µ; amb circular; grains spheroidal, 25 - 28 x 25 - 28 µ.
PAN, Tyson et al. 5481, MO; plate 49:505.

Emilia sonchifolia (L.) DC.
Isopolar-radiosymmetric, tricolporate; exine 2 µ thick, sexine echinate, echini 1.5 µ long; pores circular, 5 µ diameter; amb circular; grains spheroidal, 30 - 31 µ.
PAN, Tyson 5409, MO; plate 49:506.

Erechtites hieracifolia DC. var. *cacalioides* (Spreng) Griseb.
Isopolar-radiosymmetric, tricolporate or 4-colporate; exine 2 µ thick, sexine echinate, echini sharp, 2.0 x 2.5 µ, base conical; pores appearing lalongate, inconspicuous; amb circular; grains spheroidal, 15 - 17 µ.
PAN, Schmalzel 891, MO; plate 49:507.

Fleischmannia microstemon (Cass.) K. & R.
Isopolar-radiosymmetric, tricolporate; exine 1 µ thick, sexine echinate, echini sharp, short, 1 µ, conical at base; apertures inconspicuous; amb circular; grains spheroidal, 11.0 - 12.5 µ.
PAN, Busey 859, MO; plate 49:508.

Fleischmannia sinclairii (Benth.) King & H. Robinson
Isopolar-radiosymmetric, tricolporate; exine 1 µ thick, sexine echinate, echini sharp, 2 µ long; colpi 3 µ wide; pores lalongate, 1 - 2 x 7 µ; amb circular; grains oblate-spheroidal, 21 - 22 x 23 - 24 µ.
PAN, Croat 9377 MO; plate 49:509.

Hebeclinium macrophyllum (L.) DC.
Isopolar-radiosymmetric, tricolporate; exine 3 - 4 µ thick, sexine echinate, echini sharp 2.5 µ , conical, 2.5 - 3.0 µ wide at base; colpi inconspicuous; pores lalongate, 1.5 x 5.0 µ; amb circular; grains spheroidal, 21 - 24 µ.
PAN, Wedel 1680, KE 17768, MO; plate 49:510.

Heterocondylus vitalbae (DC.) K. & R.
Isopolar-radiosymmetric, tricolporate; exine 2 µ thick, sexine echinate, echini 4 µ high x 3 - 5 µ wide; pores circular, 3.5 µ diameter; amb circular; grains spheroidal, 30 - 31 µ.
PAN, D'Arcy 10784, MO; plate 49:511.

Koanophyllon wetmoreí (B. L. Robinson) King & H. Robinson
Isopolar-radiosymmetric, tricolporate; exine 3 µ thick, sexine echinate 1 µ high; colpi long, 3 µ wide, PAD 3 µ; pores lalongate, 2 x 6 µ; amb circular; grains oblate-spheroidal, 24 x 23 - 26 µ.
BCI, Schmalzel 293, MO; plate 49:512.

Melampodium divaricatum (L. C. Rich.) DC.
Isopolar-radiosymmetric, tricolporate; exine 1.5 µ thick, sexine echinate, echini 3 x 5 - 6 µ, apertures inconspicuous; amb circular; grains spheroidal to oblate-spheroidal, 20 - 21 x 20 - 21 µ.
BCI, Schmalzel 683 (p), PMA, Tyson 1088 (d), MO; plate 49:513.

Melanthera aspera (Jacq.) Small.
Isopolar-radiosymmetric, tricolporate; exine 2 µ thick, sexine echinate, echini often curving 4.0 - 5.5 µ long x 3 µ wide; colpi relatively short 5 µ wide; pores lalongate, 3.5 x 10 µ; amb circular; grains oblate-spheroidal, 30 - 33 x 32 - 35 µ.
PAN, Schmalzel 1266 (p), PMA, Croat 9177, MO (d); plate 49:514.

Mikania guaco H. & B.
Isopolar-radiosymmetric, tricolporate; exine 4 µ thick, sexine echinate, echini 2 µ long; colpi moderately long x 2 - 3 µ wide; pores circular, 2.5 µ diameter; amb circular; grains prolate to oblate-spheroidal, 17 - 21 x 15 - 23 µ.
PAN, Duke & Elliot 13692, KE 17771, MO; plate 49:515.

Mikania hookeriana DC.
Isopolar-radiosymmetric, tricolporate; exine 2.0 - 2.5 µ thick, sexine echinate, echini 3.5 - 5.0 µ long x 2.0 - 2.5 µ wide; pores lalongate 2 x 6 µ; amb circular; grains spheroidal to oblate-spheroidal, 25 - 26 x 28 - 29 µ.
PAN, Blum et al. 1964, MO; plate 49:516.

Mikania leiostachya Benth.
Isopolar-radiosymmetric, tricolporate; exine 2 µ thick, sexine echinate, echini short, 1.5 - 2.0 µ; colpi moderate in length; pores circular 3 µ diameter; amb circular; grains oblate-spheroidal, 18 x 21 - 24 µ.
BCI, Croat 6687 (p), PMA, Blum et al. 2625 (d), MO; plate 49:517.

Mikania micrantha HBK
Isopolar-radiosymmetric, tricolporate; exine 1.5 µ thick, sexine echinate, echini 3.5 - 5.0 µ long, base conical; pores lalongate, 1 x 4 µ; amb circular; grains spheroidal, 21 - 22 µ.
PAN, Croat 7346, MO; plate 49:518.

Mikania tonduzii B. L. Rob.
Isopolar-radiosymmetric, tricolporate; exine 2 µ thick, sexine echinate, echini 3 µ long; pores lalongate, 1.5 x 3.5 µ; amb circular; grains oblate-spheroidal, 22 x 22 - 24 µ.
PAN, Croat 7972, MO; plate 49:519.

Neurolaena lobata (L.) R. Br. Cass.
Isopolar-radiosymmetric, tricolporate; exine 2.5 µ thick, sexine echinate, echini sharp, 5 x 3 µ, base conical; colpi 4 µ wide, PAD 8 µ; pores lalongate, 3 x 9 µ; amb circular; grains oblate-spheroidal, 27 - 31 x 30 - 34 µ.
BCI, Schmalzel 307, MO; plate 49:520.

Pluchea odorata (L.) Cass.
Isopolar-radiosymmetric, tricolporate; exine 2 µ thick, sexine echinate, echini 4 µ long x 5.5 µ wide at base; colpi 4 µ wide; pores lalongate 4 x 9 µ; amb circular; grains spheroidal, 23 - 25 µ.
BEL, Liesner & Dwyer 1545, MO; plate 49:521.

Pseudoelephantopus spicatus (B. Juss.) C. F. Baker
Apolar-asymmetric, fenestrate, 26 - 28 lacunae; exine 1 µ thick, sexine micro-echinate, echini < 1 µ long, lacunae variable in form and size 6 x 5 µ, some appearing to be pores; grains spheroidal, 26 - 28 µ.
BCI, Schmalzel 860, MO; plate 49:522.

Rolandra fruticosa (L.) O. Kuntze
Apolar-asymmetric, fenestrate, > 20 lacunae per grain; exine 3 µ thick, sexine echinate, echini 2 x 1 µ, conical, pentagonal-hexagonal lacunae 6 - 8 x 4 - 6 µ, irregular; grains spheroidal, 40 - 45 µ.
BCI, Croat 7483, MO; plate 50:523.

Schistocarpha oppositifolia (O. Kuntze) Rydb. (*Schistocarpha eupatorioides* (Fenzl.) Kuntze)
Isopolar-radiosymmetric, tricolporate; exine 2 µ thick, sexine echinate, echini 4 µ long x 2.5 µ wide at base, frequently curved; colpi 6 µ wide; pores lalongate, 4 x 10 µ; amb circular; grains oblate-spheroidal, 33 - 35 x 35 - 40 µ.
BCI, Schmalzel 738, MO; plate 50:524.

Spilanthes alba L' Hér
Isopolar-radiosymmetric, tricolporate; exine 3 µ thick, sexine echinate, echini 5.5 µ long x 4 µ wide at base; colpori inconspicuous; amb circular; grains oblate-spheroidal, 28 x 32 - 35 µ.
PAN, Tyson 6967, PMA (p), KE 17774 (d), MO; plate 50:525.

Spiracantha cornifolia HBK
Apolar-asymmetric, fenestrate, lophate, 20 lacunae per grain; exine 2 µ thick, sexine echinulate, echini < 1 µ, muri 2 µ wide, some lacunae may serve as pores; grains spheroidal, 38 - 40 µ.
BCI, Croat 7460 (p), PMA, KE 17765, MO (d); plate 50:526.

Synedrella nodiflora (L.) Gaertn.
Isopolar-radiosymmetric, tricolporate; exine 2 µ thick, sexine echinate, echini sharp, 3 x 2 µ; colpi moderately long x 4 µ wide; pores lalongate, 3 - 5 x 9 µ; amb circular; grains oblate-spheroidal, 29 - 33 x 32 - 36 µ.
BCI, Schmalzel 943 (p), PMA, KE 18056 (d), MO; plate 50:527.

Tridax procumbens L.
Isopolar-radiosymmetric, tricolporate or stephanocolporate (4-colporate); exine 2 µ thick, sexine echinate, echini long, sharp 5 x 4 µ; pores lalongate, 4 - 6 x 10 µ; amb circular; grains oblate-spheroidal, 33 - 35 x 38 - 40 µ.
BCI, Croat 6025, MO; plate 50:528.

Verbesina gigantea Jacq.
Isopolar-radiosymmetric, tricolporate; exine 3 µ thick, sexine echinate, echini 4.5 µ long, bases wide; pores lalongate 1.5 - 6.0 x 6 - 7 µ; amb circular; grains oblate-spheroidal, 27 - 30 x 31 - 40 µ.
PAN, Croat 12994 (p), PAN, KE 18058, MO; plate 50:529.

Vernonia canescens HBK (*Vernonia arborescens* Sw)
Apolar-asymmetric, fenestrate; exine 2 - 3 µ thick, sexine echinate, echini arranged in two rows on interlacunar ridge, 2 µ long x 2 µ wide; lacunae 6 x 3 µ, muri 2 - 3 µ wide; grains suboblate-spheroidal, 28 - 31 µ.
BCI, Schmalzel 224 (p), PMA, Croat 8777 (d), MO; plate 50:530.

Vernonia cinerea (L.) Less.
Apolar-asymmetric, fenestrate; exine 2 µ thick, sexine echinate, echini 2.0 - 2.5 µ long, arranged in single row on interlacunar ridge, 2 - 3 µ wide, lacunae variable, 5 - 6 µ diameter, 20 per grains; grains spheroidal, 37 - 46 µ.
Virgin Islands, D'Arcy 4714, KE 17761, MO; plate 50:531

Vernonia patens HBK
Apolar-asymmetric, fenestrate, 16 lacunae per grain; exine 3 µ thick, sexine echinate, echini 2.5 µ long; lacunae 5 x 4 µ, 3 appear to serve as pores; grains spheroidal, 32 - 35 µ.
BCI, Schmalzel 309, MO; plate 50:532.

Wedelia trilobata (L.) Hitch.
Isopolar-radiosymmetric, tricolporate; exine 3 µ thick, sexine echinate, echini strongly separated 6 µ long, bases wide; colpi 10 µ wide; pores lalongate 3 - 5 x8 - 10 µ; amb circular; grains oblate-spheroidal, 32 - 39 x 33 - 44 µ.
PAN, Schmalzel 1022 (p), PMA, KE 18059 (d), MO; plate 50:533.

Wulffia baccata (L. f.) O. Kuntze
Isopolar-radiosymmetric, tricolporate; exine 2 µ thick, sexine echinate, echini sharp, 5 - 6 µ long, occasionally curved; colpi moderately short; pores lalongate, 4.5 x 10 µ; amb circular; grains oblate-spheroidal, 30 x 34 µ.
BCI, Schmalzel 861 (p), PMA, Blum et al. 408 (d), MO; plate 50:534.

CONNARACEAE

Monad; isopolar-radiosymmetric; tricolpate; tricolporate; exine tectate; sexine reticulate, homobrochate, brochi always < 1 µ; colpi usually constricted at equator; amb circular; grains oblate-spheroidal to subprolate, 20 - 28 x 19 - 27 µ. (*3 genera, 4 species; additional reference: 11*).

Key to genera and species:

1a. Tricolpate
  2a. Spheroidal ..... *Cnestidium rufescens*
  2b. Prolate-spheroidal to subprolate ..... *Connarus panamensis*
1b. Tricolporate
  3a. Subprolate, pores lolongate ..... *Connarus turczaninowii*
  3b. Oblate-spheroidal to prolate-spheroidal, pores circular ..... *Rourea glabra*

Cnestidium rufescens Planch.
Tricolpate; exine 1.5 µ thick; colpi short, deep, indistinct, PAD 7 µ, sexine simplicolumellate, muri < 0.5 µ; grains spheroidal, 21 - 27 µ.
BCI, Schmalzel 471, MO; plate 50:535.

Connarus panamensis Griseb.
Tricolpate, occasionally tricolporate, pores apparently aspidate (covered by ectexinic membrane); exine 1.5 µ thick at poles, 2 µ at equator; colpi 18 x ≤ 1 µ, apices sharp; PAD 8 µ; costa colpi 2 µ; grains subprolate, 21 - 25 x 20 - 22 µ.
BCI, Schmalzel 1292, MO; plate 50:536.

Connarus turczaninowii Triana
Tricolporate; exine 2 µ thick, muri simplibaculate; colpi large, long, wide 30 x 3 µ, PAD 5 µ; pores lolongate 7 x 5 µ; costa colpi 3 µ; grains prolate to subprolate, 23.5 - 28 x 19 - 22 µ.
BCI, M. Aide, no voucher, BCI; plate 50:537.

Rourea glabra HBK
Tricolporate; exine 2 µ thick; apertures indistinct; colpi 18 x 2 µ; pores circular, 3 µ diameter, PAD 6 µ; grains oblate-spheroidal to prolate-spheroidal, 20 - 21 x 19 - 23 µ.
BCI, Putz 774, MO; plate 50:538.

CONVOLVULACEAE

Monad; isopolar-radiosymmetric when tricolpate and stephanocolpate, apolar-asymmetric when pericolpate and periporate; exine tectate, variable in size 4 - 30 µ thick; sexine echinate, baculate, verrucate; colpi usually deep, wide; pores always circular, porate grains always echinate; amb circular; grains oblate-spheroidal to prolate-spheroidal, large to very large, 55 - 200 µ. (*6 genera, 10 species; additional references: 6, 163*).

Key to genera and species:

1a. Tricolpate
  2a. Exine 5 - 8 µ thick, grains prolate to prolate-spheroidal, colpi 15 µ wide..... *Iseia luxurians*
  2b. Exine 3.5 µ thick, grains spheroidal, colpi 30 µ wide..... *Operculina codonantha*
1b. Stephanocolpate (6-colpate), grains oblate-spheroidal..... *Merremia umbellata*
1c. Pericolpate
  3a. 5 - 8 colpate, sexine baculate, grains 55 - 65 µ..... *Maripa panamensis*
  3b. 15 - 20 colpate, sexine verrucate, grains 78 - 105 µ..... *Aniseia martinicensis*
1d. Periporate, echinate
  4a. Grains ≥ 160 µ, echini rounded..... *Ipomoea quamoclit*
  4b. Grains < 160 µ, echini bottle-shaped
    5a. Pores ca. 150 per grain..... *Ipomoea batatas*
    5b. Pores < 100 per grain
      6a. Exine 20 - 26 µ thick (including echini)..... *Ipomoea squamosa*
      6b. Exine 18 µ thick (including echini)
        7a. Pores 10 - 12 µ diameter, ca. 80 per grain..... *Ipomoea phillomega*
        7b. Pores 6 - 8 µ diameter, ca. 100 per grain..... *Ipomoea tiliacea*

Aniseia martinicensis (Jacq.) Choisy
Apolar-asymmetric, pericolpate 15 - 20 colpi per grain; exine 8 µ thick, sexine verrucate; colpi 20 x 7 µ displaying irregular edge, persistent verrucate membrane; grains appearing prolate-spheroidal, 78 - 105 µ.
BCI, Woodworth & Vester 704, KE 18175, MO; plate 50:539.

Ipomoea batatas (L.) Poir.
Apolar-asymmetric, periporate ca. 150 pores per grain; exine 15 - 18 µ (including echini), sexine echinate, echini bottle-shaped 10 x 6 µ, surface baculate between echini; pores circular, 5 - 8 µ diameter, interporium 5 - 6 µ, distribution irregular; grains spheroidal, 100 - 160 µ.
PAN, Davidson 1368, KE 18176, MO; plate 51:540.

Ipomoea phillomega (Vell.) House
Apolar-asymmetric, periporate; ca. 80 pores per grain; exine 18 µ thick (including echini), sexine echinate, echini bottle-shaped 12 µ long, small echini present at the base of larger echini, surface baculate between echini; pores circular to slightly ovoid, 9 - 12 x 13 µ, interporium variable, distribution irregular; grains spheroidal, 116 - 130 µ.
PAN, Croat, no voucher, KE 18177, MO; plate 51:541.

Ipomoea quamoclit L.
Apolar-asymmetric, periporate, 140 - 150 pores per grain; exine 27 - 30 µ thick (including echini), sexine echinate, echini usually rounded 13 x 9 µ, surface baculate-verrucate between echini; pores circular, 7 µ diameter, appearing evenly distributed; grains spheroidal, 160 - 200 µ.
BCI, Croat 4153, KE 18178, MO; plate 51:542.

Ipomoea squamosa Choisy
Apolar-asymmetric, periporate, ca. 100 pores per grain; exine 20 - 26 µ (including echini); sexine echinate, echini bottle-shaped 12 x 9 µ, surface between echini baculate-verrucate; pores circular, 9 - 10 µ diameter, distributed evenly; grains spheroidal, 110 - 145 µ.
PAN, Kennedy et al. 2309, KE 18179, MO; plate 51:543.

Ipomoea tiliacea (Willd.) Choisy
Apolar-asymmetric, ca. 100 pores per grain; exine 18 µ thick (including echini), sexine echinate, echini bottle-shaped, 11 x 8 µ, surface baculate-verrucate between echini; pores circular, 6 - 8 µ diameter, distributed evenly; grains spheroidal, 110 - 155 µ.
PAN, Croat 12433, KE 18180, MO; plate 51:544.

Iseia luxurians (Moric.) O'Don.
Isopolar-radiosymmetric, tricolpate; exine 5 - 8 µ thick, sexine baculate; colpi deep, long 15 µ wide, PAD 35 µ; grains prolate to prolate-spheroidal, 74 - 78 x 76 - 84 µ.
PAN, Croat, no voucher, KE 18181, MO; plate 51:545.

Maripa panamensis Hemsl.
Apolar-asymmetric, pericolpate, 5 - 8 colpi per grains; exine 4 - 5 µ thick, sexine baculate, densely columellate; colpi slightly variable 15 x 1 µ; PAD 15 µ; grains spheroidal, 55 - 65 µ.
BCI, Woodworth & Vester 503, KE 18182, MO; plate 52:546.

Merremia umbellata (L.) Hall. f.
Isopolar-radiosymmetric, stephanocolpate, 6 colpi per grain; exine 7 - 8 µ thick, densely baculate; colpi 43 x 1 µ, PAD 19 - 26 µ, adjacent colpi occasionally uniting at polar area; amb circular to hexalobate; grains oblate-spheroidal, 83 - 89 x 76 - 109 µ.
CR, no voucher, CR (p), PMA, Gentry 6706, KE 18183 (d); plate 52:547.

Operculina codonantha (Benth.) Hall. f.
Isopolar-radiosymmetric, tricolpate; exine 3.5 µ thick, sexine baculate; colpi very compressed 3 x 5 µ; colpi deep 30 µ wide, edges formed by small scabrae, PAD 15 µ; amb circular trilobate; grains usually oblate-spheroidal, 81 - 85 µ.
ECU, Dodson & Clendenin 11047, MO; plate 52:548.

CUCURBITACEAE

Monad and tetrad; isopolar-radiosymmetric and apolar-asymmetric; grains inaperturate, triporate, periporate, tricolporate; exine tectate to semitectate, variable thickness; sexine psilate, echinate, striate, reticulate; amb circular (monad), tetragonal (tetrad); grains suboblate to subprolate (monad); grain sizes variable. *(8 genera, 15 species; additional references: 89, 94).*

Key to genera and species:

1a. Grains arranged in tetrads (tetragonal)
- 2a. Tetrad ≥ 120 µ, grains appearing inaperturate, reticulate
  - 3a. Tetrad 120 - 160 µ, brochi 1.0 - 1.5 µ
    - 4a. Grains 50 - 60 x 70 - 80 µ, exine 3 µ thick ..... *Gurania makoyana*
    - 4b. Grains 65 - 70 x 95 - 105 µ, exine 2 µ thick ..... *Gurania coccinea*
  - 3b. Tetrad > 160 µ, brochi 2 - 3 µ ..... *Gurania megistantha*
- 2b. Tetrad < 120 µ, grains periporate (5-porate), psilate
  - 5a. Pores annulate, grains psilate ..... *Psiguria bignoniacea*
  - 5b. Pores not annulate, grains psilate to slightly reticulate ..... *Psiguria warscewiczii*

1b. Grains appearing as monads
- 6a. Tricolporate
  - 7a. Sexine striate
    - 8a. Prolate, grains > 30 µ, pores 4 - 5 µ diameter ..... *Fevillea cordifolia*
    - 8b. Subprolate, grains < 30 µ, pores 1.5 - 2.0 µ diameter
      - 9a. 26 - 28 x 19 - 21 µ ..... *Sicydium tamnifolium*
      - 9b. 23 - 25 x 19 - 22 µ ..... *Sicydium corlaceum*
  - 7b. Reticulate
    - 10a. > 50 µ
      - 11a. Pores 20 µ in diameter, exine 4.5 µ thick, grains > 60 µ ..... *Momordica charantia*
      - 11b. Pores 8 µ in diameter, exine 2.0 - 2.5 µ thick, grains ≤ 60 µ ..... *Posadaea sphaerocarpa*
    - 10b. < 50 µ
      - 12a. Exine > 2 µ thick ..... *Melothria pendula*
      - 12b. Exine < 2 µ thick ..... *Melothria trilobata*
- 6b. Triporate or periporate (often echinate)
  - 13a. Triporate, reaching 200 µ, pores 20 - 30 µ diameter ..... *Cayaponia glandulosa*
  - 13b. Periporate, reaching 150 µ, pores 14 - 20 µ diameter
    - 14a. 5 - 6 porate, grains usually 90 - 115 µ ..... *Cayaponia granatensis*
    - 14b. 10-porate, grains usually 116 - 150 µ ..... *Cayaponia racemosa*

Cayaponia glandulosa (Poepp. & Endl.) Cogn. in A. DC.
Monad, apolar-asymmetric, triporate; exine 0.5 - 2.0 µ thick, semitectate, sexine echinate, echini pilate, 5.5 - 6.0 x 2 - 3 µ, surface between echini slightly scabrate, exine very thin; pores circular, 20 - 30 µ, covered by thin ectexinic-echinate membrane; grains spheroidal, 118 - 201 µ.
PAN, Tyson et al. 4506, MO; plate 53:549.

Cayaponia granatensis Cogn. in A. DC.
Monad, apolar-asymmetric, periporate (5-6 porate); exine semitectate, 2.5 µ thick, sexine microbaculate to echinate, echini variable in form and size, 4 - 10 x 2 - 6 µ; pores circular, 14 - 15 µ diameter, frequently covered by thin ectexinic membrane; grains spheroidal, 96 - 116 µ.
BCI, Foster 2208, MO; plate 53:550.

Cayaponia racemosa (P. Mill.) Cogn. in A. DC.
Monad, apolar-asymmetric, periporate (10-porate); exine 3 µ thick, semitectate, sexine echinate, echini conical, variable in form and size, 6 - 8 x 2.5 - 3.0 µ, surface between echini scabrate; pores circular, 18 - 20 µ diameter, grains usually spheroidal, 115 - 150 µ.
PAN, Tyson 1858, MO; plate 53:551.

Fevillea cordifolia L.
Monad, isopolar-radiosymmetric, tricolporate; exine 2 µ thick, tectate, sexine striate, striae longitudinally parallel < 1 µ deep, tightly appressed; colpi long, costa colpi 2.5 µ, occasionally uniting in polar area (syncolporate), PAD 10 µ; pores obscured by colpi, slightly lalongate to circular, 4 - 5 µ diameter; amb circular; grains prolate, 32 - 35 x 23 - 26 µ.
BCI, Croat 11918, MO; plate 53:552.

Gurania coccinea Cogn.
Tetragonal tetrad, 120 - 140 µ long; grains apolar-bilateral, inaperturate; exine 2 µ thick, semitectate, sexine reticulate, homobrochate, brochi 1 - 2 µ wide, muri simplibaculate, indistinct openings (pores?) at angles of contact; grains oblate, 65 - 70 x 95 - 105 µ.
BCI, Foster 2789, MO; plate 53:553.

Gurania makoyana (Lem.) Cogn.
Tetragonal tetrad, 135 - 150 µ long; grains apolar-bilateral, apparently inaperturate; exine 3 µ thick, semitectate, sexine reticulate, homobrochate, brochi 1 µ wide, muri simplibaculate, apparent apertures at angles of contact; grains oblate, 50 - 60 x 70 - 80 µ
BCI, Croat 8991, MO; plate 53:554.

Gurania megistantha J. D. Sm.
Tetragonal, tetrad, 160 - 175 µ long; grains apolar-bilateral, apparently inaperturate; exine 1.5 - 2.0 µ thick, semitectate, sexine reticulate, homobrochate, brochi 2 - 3 µ high, muri simplibaculate, apparent apertures at angles of contact; grains oblate, 70 - 75 x 100 µ.
BCI, Schmalzel 940, MO; plate 53:555.

Melothria pendula L.
Monad, isopolar-radiosymmetric, tricolporate; exine 2 - 4 µ thick, semitectate, sexine striate, reticulate, homobrochate, brochi < 1 µ wide; colpi moderately long displaying verrucae near pores; pores circular to irregular, 4 - 5 x 7 µ; amb semi-angular; grains prolate to oblate-spheroidal, 38 - 51 x 51 - 53 µ.
BCI, Schmalzel 183, MO; plate 53:556.

Melothria trilobata Cogn.
Monad, isopolar-radiosymmetric, tricolporate; exine 1.5 - 2.0 µ thick, semitectate, sexine reticulate, homobrochate, brochi 1.5 µ wide, muri simplibaculate, colpi 30 x 1 µ, margo inconspicuous 1.5 - 2.0 µ wide; endexinic pores inconspicuous, appearing circular 3.5 µ diameter; amb circular; grains subprolate to prolate-spheroidal, 40 - 45 x 38 - 41 µ.
PAN, Duke 5769, MO; plate 53:557.

Momordica charantia L.
Monad, isopolar-radiosymmetric, tricolporate; exine semitectate 4.5 µ thick, sexine reticulate, homobrochate, brochi 2 - 3 µ high, muri simplibaculate; colpi moderately long, PAD 15 µ; pores circular to irregular, 20 µ diameter; amb circular; grains spheroidal to oblate, 63 - 71 x 68 - 79 µ.
PAN, Schmalzel 857, MO; plate 54:558.

Posadaea sphaerocarpa Cogn.
Monad, isopolar-radiosymmetric, tricolporate; exine semitectate, 2.0 - 2.5 µ thick, sexine reticulate, homobrochate, brochi 1.0 - 2.5 µ wide, muri simplibaculate; colpi relatively short, wide, sharp 35 x 8 µ; pores slightly lalongate to circular 8 µ diameter; amb circular, grains prolate-spheroidal to spheroidal, 50 - 57 x 45 - 49 µ.
VEN, Steyermark 11987, MO; plate 54:561.

Psiguria bignoniacea (P. & E.) Wunderlin
Tetrahedral tetrad, 90 - 120 µ long; grains apolar-asymmetric, periporate, 5 pores per grain; exine 1.5 µ thick, sexine psilate; pores circular 8 µ diameter, displaying persistent ectexinic membrane at angles of contact; grains oblate-spheroidal to suboblate, 61 - 78 µ.
BCI, Croat 8485, MO; plate 54:559.

Psiguria warscewiczii (Hook. f.) Wunderlin
Tetragonal tetrad, 110 - 120 µ long; grains apolar-asymmetric, periporate, 5 pores per grain; exine 1.5 µ thick, semitectate, sexine psilate to slightly microreticulate, homobrochate; pores 7 µ diameter, slightly protuberant, displaying fine ectexinic membrane; grains suboblate, 70 - 82 µ.
BCI, Schmalzel 726, MO; plate 54:560.

Sicydium coriaceum Cogn. in A. DC.
Monad, isopolar-radiosymmetric, tricolporate, striate; exine 1.5 - 2.0 µ thick, sexine densely columellate, endexine having fine, persistent membrane, striae narrow, longitudinally parallel < 0.5 µ wide; colpi as long as grains, sharp, 3 µ wide, PAD 3 - 4 µ; pores circular, 3 µ diameter; amb circular; grains subprolate, 23 - 25 x 19 - 22 µ.
COL, H. Smith 1898, NY; no plate.

Sicydium tamnifolium (HBK) Cogn.
Monad, isopolar-radiosymmetric, tricolporate; exine 1.0 - 1.5 µ thick, tectate, sexine striate, striae longitudinally parallel, tightly appressed; colpi 22 x 2 µ, costa colpi 1.5 µ; pores circular, 1.5 - 2.0 µ diameter; amb circular-trilobate; grains subprolate, 26 - 28 x 19 - 21 µ.
PAN, Tyson 1641, MO; plate 54:562.

DILLENIACEAE

Monad; isopolar-radiosymmetric; tricolporate; exine tectate to semitectate, 1 - 5 µ thick; sexine rugulate, reticulate; colpi displaying equatorial constriction; pores inconspicuous, covered by verrucate membrane; amb circular; grains oblate-spheroidal to prolate-spheroidal, 15 - 38 x 14 - 34 µ. (*4 genera, 9 species*).

Key to genera and species:

1a. Rugulate
  2a. ≥ 20 µ, spheroidal to prolate-spheroidal
    3a. 20 - 25 µ, exine 1 µ thick, pores not protuberant ..... *Tetracera volubilis*
    3b. 26 - 35 µ, exine 1.5 µ thick, pores protuberant ..... *Doliocarpus major*
  2b. < 20 µ, oblate-spheroidal ..... *Saurauia laevigata*
1b. Reticulate
  4a. Heterobrochate ..... *Doliocarpus dentatus*
  4b. Homobrochate
    5a. Pores lalongate ..... *Davilla nitida*
    5b. Pores circular
      6a. Pores ≤ 5 µ diameter ..... *Tetracera hydrophila*
      6b. Pores > 5 µ diameter
        7a. Oblate-spheroidal ..... *Tetracera portobellensis*
        7b. Spheroidal to prolate-spheroidal
          8a. Pores lalongate ..... *Doliocarpus multiflorus*
          8b. Pores circular ..... *Doliocarpus olivaceus*

Davilla nitida (Vahl.) Kub.
Exine 5 μ thick, semitectate, sexine reticulate, homobrochate, brochi 2 μ wide; colpi 11 μ wide, covered by persistent scabrate membrane, PAD 6 μ; pores slightly lalongate 10 x 11 μ; amb circular; grains spheroidal, 32 - 41 μ.
BCI, Croat 13163, KE 18258, MO; plate 54:563.

Doliocarpus dentatus (Aubl.) Standl.
Exine 2.5 - 3.0 μ thick, semitectate, sexine reticulate, heterobrochate, brochi variable ≤ 1.5 μ wide, diminishing toward apertures; pores circular 5 μ diameter; amb circular; grains prolate-spheroidal, 28 - 31 μ.
PAN, Lewis et al. 722A, KE 18259, MO; plate 54:564.

Doliocarpus major Gmel.
Exine 1.0 - 1.5 μ thick, tectate, sexine rugulate, rugulae 1 μ wide; colpi displaying persistent scabrate membrane; pores circular, 7 μ diameter; amb circular; grains spheroidal, 26 - 34 μ.
BCI, Knight 69-56, KE 18260, MO; plate 54:565.

Doliocarpus multiflorus Standl.
Exine 1.5 - 2.5 μ thick, semitectate, sexine reticulate, homobrochate, brochi 1 μ wide, muri simplibaculate; colpi displaying moderate equatorial constriction; pores appearing lalongate, 5 μ wide; amb circular; grains prolate-spheroidal, 28 - 29 μ.
PAN, Dwyer 8486, KE 18261, MO; plate 55:566.

Doliocarpus olivaceus Standl.
Exine 2.0 - 2.5 μ thick, semitectate, sexine reticulate, homobrochate, brochi 1 μ wide, muri simplibaculate; colpi moderately long, displaying persistent scabrate membrane; pores usually circular 6 μ diameter; amb circular; grains spheroidal, 26 - 32 μ.
BCI, Croat 14873, KE 18262, MO; plate 55:567.

Saurauia laevigata Tr. & Pl.
Exine 1.0 - 1.5 μ thick, tectate, sexine rugulate; colpi inconspicuous, displaying persistent scabrate membrane; pores lalongate 2.5 - 3.0 x 6.5 - 7.0 μ; amb circular; grains oblate-spheroidal, 14 - 15 x 14 - 16 μ.
PAN, Schmalzel 672, MO; plate 55:568.

Tetracera hydrophila Tr. & Pl.
Exine 3 μ thick, semitectate, sexine reticulate, homobrochate, brochi < 1 μ wide; colpi displaying persistent verrucate membrane, PAD 3 μ; pores circular, 3.5 μ diameter; amb circular; grains prolate-spheroidal, 37 x 33 μ.
PAN, Wedel 1759, KE 18264, MO; plate 55:569.

Tetracera portobellensis Beurl.
Exine 2.5 μ thick, semitectate, sexine slightly reticulate, homobrochate, evidently interrupted, displaying free bacula; colpi moderately long, displaying persistent verrucate membrane; pores protuberant, circular 6 μ diameter; amb circular; grains oblate-spheroidal, 25 - 29 x 31 - 33 μ.
BCI, Croat 7729, KE 18289, MO; plate 55:570.

Tetracera volubilis L.
Exine 1 μ thick, tectate, sexine rugulate; colpi sharp, displaying equatorial constriction covering pores, PAD 6 μ; pores appearing circular 3 μ diameter; amb circular; grains prolate-spheroidal, 23.0 - 23.5 x 21 - 24 μ.
BCI, Schmalzel 967, MO; plate 55:571.

EBENACEAE

Monad; isopolar-radiosymmetric; tricolporate; exine tectate; sexine psilate; colpi as long as grain; pores lalongate; amb circular; grains subprolate to prolate-spheroidal, 52 - 63 x 48 - 58 μ. (*1 genus, 1 species; additional references: 7, 160*).

Diospyros artanthifolia Mart.
Exine 2.0 - 2.5 μ thick; sexine psilate to slightly scabrate; colpi 3 μ wide, PAD 12 μ; pores lalongate 4 x 10 μ; amb circular; grains subprolate to prolate-spheroidal, 52 - 63 x 48 - 58 μ.
BCI, Croat 14657, KE 18095, MO; plate 55:572.

ELAEOCARPACEAE

Monad; isopolar-radiosymmetric; tricolporate; exine tectate to semitectate; sexine psilate, reticulate, scabrate; colpi long, sharp; pores circular to lalongate in "H" form; amb circular; grains oblate-spheroidal to prolate-spheroidal 9 - 15 μ. (*2 genera, 3 species*).

Key to genera and species:

1a. Reticulate, homobrochate (grains ≤ 15 μ, pores circular)..... *Muntingia calabura*
1b. Psilate
  2a. Oblate-spheroidal ≤ 12 μ, exine ≤ 1 μ thick..... *Sloanea terniflora*
  2b. Prolate-spheroidal > 12 μ, exine > 1 μ thick..... *Sloanea zuliaensis*

Muntingia calabura L.
Exine semitectate, 1.5 μ thick, sexine reticulate, homobrochate, brochi < 1 μ wide, muri simplibaculate; colpi long, sharp 3 μ wide, frequently displaying equatorial constriction, hiding pores, PAD 3 μ; pores circular, 3 μ diameter; amb circular; grains prolate-spheroidal, 13 - 15 x 11.5 - 13.5 μ.
PAN, Croat 9170, MO; plate 55:573.

Sloanea terniflora (DC) Standl.
Exine 1 μ thick, tectate, sexine psilate to slightly scabrate; colpi indistinct, long, sharp, PAD 2.5 μ; pores appearing rectangular, lalongate, angles projecting outwards in "H" form, 2.5 - 3.0 x 2.5 - 5.0 μ; amb semi-angular; grains oblate-spheroidal, 10.5 - 12.0 x 9.0 - 10.5 μ.
BCI, Schmalzel 674, MO; plate 55:574.

Sloanea zuliaensis Pitt.
Exine 1.5 - 2.0 μ thick, tectate, sexine psilate to microscabrate; apertures long, almost uniting at poles, margo 1.5 μ thick; pores lalongate 1 x 7 μ, displaying "H" form; amb circular; grains displaying polar depressions viewed from equator, prolate-spheroidal, 14 - 15 x 13.0 - 14.5 μ.
BCI, Foster 1384, PMA; plate 55:575.

ERYTHROXYLACEAE

Monad; isopolar-radiosymmetric; tricolporate, sometimes 4-colporate; exine semitectate; sexine reticulate, homobrochate, brochi < 1 μ, endosexine strongly columellate; colpi long, sharp, narrow, occasionally syncolporate, pores lalongate; amb circular; grains subprolate 39 - 48 x 30 - 40 μ. *(1 genus, 2 species; additional reference: 124).*

Key to species:

1a. Polar axis 41 - 48 μ, brochi≥ 1 μ wide, pores usually inconspicuous..... *Erythroxylum panamense*
1b. Polar axis 39 - 42 μ, brochi < 1 μ wide, pores conspicuous..... *Erythroxylum multiflorum**

Erythroxylum multiflorum Lund. (*Erythroxylum skutchii* Standl.)
Exine 3 μ thick, sexine reticulate, homobrochate, brochi < 1 μ wide, endosexine strongly columellate; colpi 36 x 2 μ, costa colpi 2 μ, margo interrupted near pores (exitus digitatus); pores lalongate, zonorate, 3 μ wide; PAD 10 μ; amb circular; grains subprolate, 39 - 42 x 30 - 36 μ.
BCI, Foster 1189, PMA; plate 55:576.

Erythroxylum panamense Turcz.
Exine 2.5 - 3.0 μ thick, sexine reticulate, homobrochate, brochi ≥ 1 μ wide, endosexine strongly columellate; colpi long, occasionally uniting at poles (syncolporate) 39 x 1 μ, costa colpi 2.0 - 2.5 μ forming exitus digitatus; pores inconspicuous; amb circular; grains subprolate, 41 - 48 x 34 - 40 μ.
BCI, Schmalzel 924, MO; plate 55:577.

EUPHORBIACEAE

Monad; isopolar-radiosymmetric, tectate, tricolpate, tricolporate stephanocolporate and apolar, asymmetric, intectate, inaperturate; sexine psilate, reticulate, clavate, gemmate, baculate, scabrate; exine variable 1 - 17 μ thick; colpi variable in size and form, short to very long; pores generally lalongate, opercula present (*Adelia, Alchornea*) and costa transversalis (*Dalechampia*); amb generally circular; grains oblate to prolate, usually subprolate and spheroidal, 19 - 325 x 12 - 325 μ *(19 genera, 30 species; additional references: 14, 32, 55, 129, 130, 133, 135, 139, 159).*

Key to genera and species:

1a. Inaperturate
  2a. Clavate
    3a. > 250 μ, exine > 15 μ thick, clavae 9 - 10 μ high..... *Manihot esculenta*
    3b. 35 - 80 μ, exine 1.5 - 3.0 μ thick, clavae 1.5 - 3.0 μ high
      4a. Clavae arranged in "*Croton*" pattern
        5a. Exine 1.5 μ thick, grains 53 - 60 μ..... *Codiaeum variegatum*
        5b. Exine 2 μ thick, grains 61 - 75 μ..... *Croton hirtus*
      4b. Clavae distributed irregularly, abundant
        6a. Exine 2.5 μ thick, grains 36 - 49 μ..... *Croton billbergianus*
        6b. Exine 3 μ thick, grains 65 - 81 μ..... *Croton panamensis**
  2b. Gemmate
    7a. Gemmae arranged in groups of 3, elements 5 μ high, exine 6 μ thick..... *Jatropha curcas*
    7b. Gemmae distributed irregularly, 1.5 μ high, exine 2 μ thick..... *Garcia nutans*
1b. Tricolpate, scabrate, exine 2 μ thick, grains ca. 28 μ..... *Omphalea diandra*
1c. Tricolporate or tricolpodiporate
  8a. Psilate
    9a. Exine 1.0 - 1.5 μ thick, grains < 15 μ..... *Acalypha arvensis*
    9b. Exine 2 μ thick, grains 19 - 22 μ
      10a. Suboblate, pores 3 x 4 μ..... *Acalypha diversifolia*
      10b. Oblate, pores 2 x 3 μ..... *Acalypha macrostachya*
  8b. Scabrate
    11a. Exine 2.5 - 5.0 μ thick, grains spheroidal ca. 22 μ, colpi operculate..... *Alchornea latifolia*
    11b. Exine 3.0 - 3.5 μ thick, grains ca. 78 μ, colpi lacking opercula..... *Hura crepitans*
  8c. Baculate
    12a. Colpori normal, exine 4 μ thick, grains prolate ca. 74 x 52 μ..... *Sapium caudatum*
    12b. Colpori having 2 pores (colpodiporate), exine 3 μ thick, grains ca. 27 μ..... *Phyllanthus acuminatus*
  8d. Reticulate
    13a. Amb circular, exine 5 - 9 μ thick
      14a. Amb circular, exine 5 - 9 μ thick
        15a. >106 x >91 μ, colpi 50 μ long, costa 15 μ wide..... *Dalechampia cissifolia*

15b. <102 x <91 µ, colpi 40 µ long, costa 12 µ wide..... *Dalechampia dioscoreifolia*
14b. Amb angular, exine 9 - 10 µ thick..... *Dalechampia tiliifolia*
13b. < 90 µ, pores lalongate, colpi < 40 µ long, narrow
16a. > 50 µ, exine 4 - 5 µ thick
17a. Ca. 52 x 42 µ, colpi 40 µ long, pores 8 x 14 µ..... *Poinsettia heterophylla**
17b. Ca. 62 x 55 µ, colpi 70 µ long, pores 5 x 20 µ..... *Mabea occidentalis*
16b. < 50 µ, exine 1.5 - 2.5 µ
18a. Amb angular, prolate..... *Hyeronima laxiflora**
18b. Amb circular, subprolate to suboblate
19a. > 30 µ
20a. Spheroidal to suboblate, colpi operculate, grains 35 x 39 µ..... *Adelia triloba*
20b. Subprolate, not operculate pores lalongate, grains 34 x 27 µ. *Chamaesyce thymifolia*
19b. < 30 µ
21a. Colpi having opercula, brochi < 1 µ wide..... *Alchornea costaricensis*
21b. Colpi normal, brochi > 1 µ wide
22a. Pores circular, grains heterobrochate..... *Margaritaria nobilis*
22b. Pores lalongate, grains homobrochate
23a. Ca. 21 X 18 µ..... *Chamaesyce hirta*
23b. Ca. 26 x 20 µ
24a. Colpi without margines
25a. Pores 3 x 6 µ, exine variable..... *Phyllanthus amarus*
25b. Pores 2 x 8 µ, exine uniform..... *Drypetes standleyi*
24b. Colpi with margines
26a. Pores 3 x 6 µ..... *Chamaesyce hyssopifolia*
26b. Pores ca. 1.8 x 7.0 µ..... *Chamaesyce hypericifolia*
1d. Stephanocolporate (4 - 5 colporate)
27a. Pores lalongate, ca. 3 x 4 µ..... *Acalypha diversifolia*
27b. Pores lalongate, 2 x 3 µ..... *Acalypha macrostachya*

Acalypha arvensis Poepp.
Isopolar-radiosymmetric, tricolporate, tectate; exine 1.0 - 1.5 µ thick, sexine psilate; apertures inconspicuous, colpi short, sharp, poorly defined; pores having small costa, appearing lalongate, PAD 6 - 8 µ; amb circular; grains suboblate, 11.5 - 13 x 13 - 15 µ.
PAN, Woodson & Schery 821, KE 18388, MO; plate 56:578.

Acalypha diversifolia Jacq.
Isopolar-radiosymmetric, tricolporate and stephanocolporate (3-5 colporate); exine tectate 2 µ thick, psilate to slightly scabrate, sexine psilate; colpi very narrow, short; pores lalongate, 3.0 x 4.0 - 4.5 µ, often ovoid and conspicuous, costa pori present; amb circular; grains suboblate, 19 - 21 x 20 - 23 µ.
PAN, Duke 10740, KE 18389, MO; plate 56:579.

Acalypha macrostachya Jacq.
Isopolar-radiosymmetric, tricolporate and stephanocolporate (3-4 colporate), normally 4-colporate; exine tectate 2 µ thick, sexine slightly scabrate; colpi inconspicuous, narrow, very short; pores protuberant, lalongate, 2 x 3 µ, displaying costa pori 4 µ thick; amb circular; grains suboblate to oblate, 19 - 22 x 22 - 26 µ.
PAN, Duke 8031, KE 18390, MO; plate 56:580.

Adelia triloba (Müll. Arg.) Hemsl.
Isopolar-radiosymmetric, tricolporate; exine semitectate, 2µ thick (sexine 1µ, nexine 1 µ), sexine reticulate, homobrochate, brochi 1 µ wide, muri < 0.5 µ wide, simplibaculate; colpi large, deep, sharp 6 µ wide at centers; pores as long as middle of colpi, covered by small operculum 4 µ wide, PAD 12 µ; amb semi-angular; grains spheroidal to slightly suboblate, 34 - 36 x 37 - 40 µ.
BCI, Croat 13160, KE 18391, MO; plate 56:581.

Alchornea costaricensis Pax & Hoffm.
Isopolar-radiosymmetric, tricolporate; exine semitectate, 1.5 - 2.0 µ thick, sexine reticulate, homobrochate, brochi < 5 µ wide; colpi operculate, narrow, long, sharp, displaying costa; pores endexinic, appearing lalongate, lacking conspicuous opercula; amb circular; grains slightly suboblate, 24.5 - 27.0 x 26 - 27 µ.
BCI, Croat 14814, KE 18392, MO; plate 56:582.

Alchornea latifolia Sw.
Isopolar-radiosymmetric, tricolporate; exine scabrate, tectate, 2.5 µ thick at poles, 5 µ thick at intercolpium, sexine scabrate; colpi 13 µ long x 2 µ wide, opercula of same dimensions as colpi; pores endexinic, lalongate, sharp, almost zonorate; amb circular; grains oblate-spheroidal, 21 - 24 x 21 - 23 µ.
BCI, Croat 4871, MO; plate 56:583.

Chamaesyce hirta (L.) Millsp.
Isopolar-radiosymmetric, tricolporate; exine semitectate 2 µ thick, sexine reticulate, homobrochate, brochi < 1 µ wide, muri and lumina fine, muri simplibaculate, bacula conspicuous; colpi straight, long, sharp; pores lalongate, sharp 3 x 6 µ; amb circular; grains subprolate, 20 - 23 x 17 - 20 µ.
PAN, Stern et al. 63, KE 18394 (p), BCI, Schmalzel 184, MO (d); plate 56:584.

Chamaesyce hypericifolia (L.) Millsp.
Isopolar-radiosymmetric, tricolporate; exine semitectate, 2 µ thick, sexine reticulate, homobrochate, brochi < 1 µ wide, muri < 0.5 µ wide, simplibaculate, bacula homogeneous, lumina 0.5 - 1.0 µ wide; colpi long, sharp, 2.5 µ wide; pores lalongate, sharp 1.5 - 2.0 x 7 - 8 µ, costa colpi present (margo); amb circular; grains subprolate, 25 - 28 x 21 - 23 µ.
PAN, Florez 24, PMA; plate 56:585.

Chamaesyce hyssopifolia (L.) Small
Isopolar-radiosymmetric, tricolporate; exine semitectate, 2.0 - 2.5 µ thick, sexine reticulate, homobrochate, brochi very fine < 1 µ; colpi straight, long, sharp; pores endexinic, ovoid, lalongate, 3 x 6 µ, costa colpi 2 µ forming fine margo; amb circular; grains subprolate, 25 - 26 x 19 - 21 µ.
PAN, Burch et al. 1155, PMA; plate 56:58.

Chamaesyce thymifolia (L.) Millsp.
Isopolar-radiosymmetric, tricolporate; exine tectate, 2 µ thick, sexine reticulate, homobrochate, brochi ca. 1 µ high, muri simplibaculate, bacula conspicuous, scattered; colpi long, 28 x 5 µ, costa colpi 2 µ, forming inconspicuous margo; pores lalongate, endexinic 8 x 16 µ, covered by colpi, PAD 5 µ; amb circular; grains subprolate, 33 - 35 x 26 - 28 µ.
BCI, Schmalzel 1308, MO; plate 56:587.

Codiaeum variegatum (L.) Blume
Apolar-radiosymmetric, inaperturate, exine intectate, 1.5 µ thick; sexine clavate, clavae homogeneous, triangular in shape 1.5 x 1.5 µ, circular in median view, compressed, arranged in rosettes of 6, each clava forming part of adjacent rosettes, surface between clavae scabrate; grains spheroidal, 53 - 60 µ.
BCI, Croat 7037, MO; plate 56:588.

Croton billbergianus Müell. Arg.
Apolar-radiosymmetric, inaperturate; exine intectate, 2.5 µ thick, sexine clavate, clavae homnogeneous, triangular to circular, 2.5 µ high x 1.5 - 2.0 µ wide, strongly compressed, lacking arrangement in rosettes; grains spheroidal, 36 - 49 µ.
PAN, Folsom & Edwards 3392, KE 18397 (p), BCI, Schmalzel 615 (d), MO; plate 56:589.

Croton hirtus L'Hér.
Apolar-radiosymmetric, inaperturate; exine intectate, 2 µ thick; sexine clavate, clavae ca. 1.5 µ wide x 2.0 µ high, varying slightly in width, separate, scarcely forming rosettes; grains spheroidal, 60 - 75 µ.
BCI, Schmalzel 616, MO; plate 56:590.

Croton panamensis (Klotzch) Müll. Arg. in DC. (*Croton pyriticus* Croiz.)
Apolar-radiosymmetric, inaperturate; exine intectate, 3 µ thick, sexine clavate, clavae circular to semitriangular 3 µ high x 2.5 µ wide, lacking arrangement in rosettes, clavae strongly compressed, irregular and varying in size; grains spheroidal 65 - 81 µ.
BCI, Croat 5608, MO; plate 56:591.

Dalechampia cissifolia Poepp. subsp. *panamensis* (Pax & Hoffm.) Webster
Isopolar-radiosymmetric, tricolporate; exine semitectate 5 - 6 µ thick, sexine reticulate, heterobrochate; lumina 18 µ wide at polar areas, diminishing to 1 µ near apertures; colpi 50 µ long; pores lalongate, crassimarginate, 15 µ, united (zonorate), displaying costa transversalis; amb circular; grains subprolate, 106 - 132 x 91 - 96 µ.
PAN, Schmalzel 369, MO; plate 57:592.

Dalechampia dioscoreifolia Poepp in Poepp & Endl.
Isopolar-radiosymmetric, tricolporate; exine semitectate, 8 - 9 µ thick, sexine reticulate (per-reticulate), heterobrochate, brochi wide, ca. 7 µ, diminishing to < 1 µ near apertures, muri 1 µ wide, simplibaculate, bacula thick, 6.0 x 1.0 - 1.5 µ; colpi very narrow, short, blunt, 40 µ long; pores endexinic, zonorate, displaying costa transversalis, forming costa transversalis ca. 12 µ wide; amb circular; grains subprolate, 95 - 102 x 83 - 91 µ.
PAN, Croat 8937, MO; plate 57:593.

Dalechampia tiliifolia Lam.
Isopolar-radiosymmetric, tricolporate; exine semitectate, 9 - 10 µ thick, sexine reticulate (per-reticulate), heterobrochate, brochi 18 µ wide at poles, diminishing to < 1 µ near apertures, muri 2 µ wide, simplibaculate, bacula 6 x 2 µ, conspicuous; colpi 50 - 55 µ - 120 µ.
PAN, Tyson et al. 2783, KE 18398, MO; plate 57:594.

Drypetes standleyi Webster
Isopolar-radiosymmetric, tricolporate; exine semitectate, 1.5 µ thick, sexine reticulate, homobrochate, brochi 1 µ wide, muri simplibaculate, bacula short, homogeneous; colpi as long as grain, 1.0 - 1.5 µ wide; pores lalongate 2 - 3 x 8 µ, becoming aspidate, PAD 4 µ; amb circular; grains subprolate, 26 - 27 x 23 µ.
BCI, Croat 14849, NY; plate 57:595.

Garcia nutans Vahl. in Rohr.
Apolar-radiosymmetric, inaperturate; exine intectate, 2 µ thick, sexine gemmate, gemmae usually subtriangular, resembling clavae, short, dispersed, not arranged in rosettes; grains spheroidal, 57 - 64 µ.
MEX, Matuda 3568, KE 18399, MO; plate 57:596.

Hura crepitans L.
Isopolar-radiosymmetric, tricolporate; exine tectate, 3.0 µ thick to 3.5 µ at apertures, sexine scabrate, scabrae distributed irregularly, conspicuous < 1 µ wide, sexine strongly columellate; colpi long, sharp, moderately large 28 x 4 µ; pores lalongate, endexinic, sharp 30 x 11 µ, presenting small costa pori 2 - 3 µ thick; amb circular; grains subprolate, 77 - 82 x 70 - 78 µ.
PAN, Folsom 2926, KE 18400, MO; plate 58:597.

Hyeronima laxiflora (Tul.) Müll. Arg. (*H. alchorneoides* (Allemão) JDL-LZ)
Isopolar-radiosymmetric, tricolporate (approaching syncolporate condition); exine semitectate, 2 µ thick, thickening near apertures, sexine reticulate, homobrochate, brochi < 1 µ wide, muri very fine, simplibaculate, lumina circular; colpi as long as grain, narrow; pores lalongate, 1.5 x 6.0 µ, parallel, sharp, costa pori 2 µ wide; amb angular; grains prolate, 25 - 28 x 12 - 14 µ
BCI, N. Murphy, no voucher, BCI; plate 58:598..

Jatropha curcas L.
Apolar-radiosymmetric, intectate, inaperturate; exine intectate, 6 µ thick; sexine gemmate, gemmae thick, 5 x 3 µ, apparently consisting of 3 united bacula, distribution irregular, surface between gemmae scabrate; grains spheroidal, 72 - 91 µ.
PAN, Burch et al. 1258, KE 18402, MO; plate 58:599.

Mabea occidentalis Benth.
Isopolar-radiosymmetric, tricolporate; exine semitectate, 4 µ thick, sexine reticulate (per-reticulate), heterobrochate, brochi 1 µ wide, diminishing toward apertures, muri simpli- to multibaculate, bacula short; colpi long, wide, blunt, 70 x 3 - 6 µ; pores endexinic, lalongate, sharp 5 x 20 µ, PAD 15 µ; amb circular; grains subprolate to spheroidal, 60 - 65 x 50 - 60 µ.
VEN, Steyermark et al. 120448, KE 18403 (p), BCI, Schmalzel 102 (d), MO; plate 58:600.

Manihot esculenta Crantz.
Apolar-radiosymmetric, inaperturate; exine intectate, 17 µ thick (nexine ca. 6.5 µ), sexine clavate, clavae triangular (*Croton* pattern) 9 µ high x 8 - 10 µ wide, united in groups of 6 forming rosettes ca. 30 µ wide, each clava forming part of various rosettes, usually 3; grains spheroidal, gigantic, 290 - 325 µ.
PAN, D'Arcy 9485, KE 18404, MO; plate 58:601.

Margaritaria nobilis L. f.
Isopolar-radiosymmetric, tricolporate; exine semitectate, 2 µ thick, sexine reticulate, heterobrochate, brochi reduced gradually toward apertures, 1 µ wide, muri < 1 µ wide, simpli- and duplobaculate, short < 1 µ high, resembling scabrae; colpi long, sharp ca. 3 µ wide; pores appearing circular, 5 µ diameter, PAD 6 µ; amb circular; grains subprolate, 25 - 27 x 22 - 25 µ.
PAN, Stern et al. 919, KE 18405, MO; plate 58:602.

Omphalea diandra L.
Isopolar-radiosymmetric, tricolpate; exine tectate 2 µ thick, sexine scabrate, strongly columellate; colpi deep, large, sharp 2 µ wide; PAD 10 µ; amb circular; grains spheroidal to prolate spheroidal, 28 - 29 x 27 - 28 µ.
PAN, Croat 8125, MO; plate 58:603.

Phyllanthus acuminatus Vahl.
isopolar-radiosymmetric, tricolpodiporate; exine intectate, 3 µ thick (nexine 1 µ thick), sexine strongly baculate, bacula thick, 2 x 1 µ, compressed; colpi inconspicuous, as long as grain; pores apparently circular, 1 µ diameter, one at each extreme of colpi, costa pori present; amb circular; grains spheroidal, 26 - 28 µ.
PAN, Tyson 7272, KE 18406, MO; plate 58:604.

Phyllanthus amarus H. Schum. & Thonn.
Isopolar-radiosymmetric, tricolporate; exine tectate, 1.2 µ thick (equatorial) to 2.0 µ thick (poles), sexine reticulate, homobrochate, brochi , 0.5 µ wide, muri simplibaculate, bacula 1 µ high; colpi long, narrow, sharp, as long as grains, 1 µ wide, costa colpi 2 µ thick; pores lalongate, apices acute, 3 x 6 µ; amb circular; grains subprolate to prolate, 27 - 28 x 21 - 23 µ.
PAN, Bosquez 27, PMA; plate 58:605.

Poinsettia heterophylla (L.) Klotzch & Garcke (*Euphorbia heterophylla* L.)
Isopolar-radiosymmetric, tricolporate; exine semitectate, 5 µ thick (nexine 2 µ thick) sexine reticulate, heterobrochate sexine, nexine 2 µ thick, brochi variable 3 - 15 µ wide, muri ca. 1 µ thick, simplibaculate, bacula 3.0 x 1.5 µ; colpi long, deep, blunt, 40 x 3 µ, displaying narrow edge; pores endexinic, lalongate, elliptical, 8 x 14 µ, PAD 18 µ; amb circular; grains subprolate, 50 - 54 x 41 - 43 µ
BCI, Schmalzel 845, MO; plate 58:606.

Sapium caudatum Pitt. (*Sapium aucuparium* Jacq.)
Isopolar-radiosymmetric, tricolporate; exine semitectate, 4 µ thick (nexine 1.5 µ thick), sexine baculate, bacula abundant, compressed, long 2.5 x 1.0 - 1.5 µ; colpi long, narrow, blunt, 60 x 2 µ; pores endexinic, long, 6 x 18 µ, zonorate; grains prolate, 73 - 75 x 50 - 53 µ.
PAN, Croat 10428, MO; plate 59:607.

FLACOURTIACEAE

Monad, isopolar, radiosymmetric, tectate and semitectate, tricolporate and stephanocolporate (4-colporate), sexine psilate, baculate and reticulate (homobrochate); exine ≤1 - 6 µ thick, sexine micro-scabrate, baculate, columellate; colpi moderately long but narrow, frequently displaying exitus digitatus; pores circular to lalongate, endexinic; grains spheroidal to subprolate 13 - 48 x 13 - 45 µ. (*8 genera, 15 species; additional reference: 49*).

Key to genera and species:

1a. Tricolporate
  2a. Psilate, sculpturing lacking
    3a. Subprolate
      4a. Exine 3 µ thick, pores circular 6 µ diameter, grains > 38 µ ..... *Casearia corymbosa*
      4b. Exine 1 µ thick, pores lalongate 1 x 3 µ, grains < 25 µ ..... *Casearia sylvestris*
    3b. Spheroidal
      5a. Pores lalongate, 1 x 6 µ, exine 2.5 - 6.5 µ thick, grains ca. 29 µ ..... *Casearia aculeata*
      5b. Pores lalongate, 5 x 10 µ, exine 2 - 3 µ thick, grains > 30 µ ..... *Casearia arborea*
  2b. Sculpturing present ..... *Casearia commersoniana*
    6a. Baculate, bacula 2 µ high, colpi long, narrow 38 x 1 µ ..... *Laetia thamnia*
    6b. Reticulate, homobrochate
      7a. ≥ 30 µ
        8a. Ca. 45 µ, exine 2.5 µ thick, pores lalongate ..... *Xylosma oligandrum*
        8b. Ca. 30 µ, exine 2 µ thick, pore = operculum
      7b. < 30 µ

9a. Exine < 1 μ thick, pores circular ..... *Banara guianensis*
9b. Exine 1.0 - 1.5 μ thick, pores lalongate
10a. Ca. 20 μ ..... *Laetia procera*
10b. Ca. 15 μ
11a. PAD 5 μ ..... *Tetrathylacium johansenii*
11b. PAD < 2 μ
12a. Subprolate, costa colpi 1.5 μ ..... *Hasseltia floribunda*
12b. Spheroidal, lacking costa colpi ..... *Lindackeria laurina*
1b. Stephanocolporate (4-colporate)
13a. Reticulate, exine 1 μ thick ..... *Laetia procera*
13b. Psilate, exine 1.5 - 4.0 μ thick
14a. Subprolate, pores circular
15a. Ca. 40 μ, pores normal, exine 1.5 μ thick ..... *Casearia guianensis*
15b. Ca. 32 μ, pores annulate, exine ≥ 2.5 μ thick ..... *Zuelania guidonia*
14b. Spheroidal, pores lalongate
16a. Ca. 32 μ, pores 5 x 10 μ ..... *Casearia arborea*
16b. Ca. 25 μ, pores 1.0 x 1.5 μ ..... *Casearia arguta*

Banara guianensis Aubl.
Isopolar-radiosymmetric, tricolporate; exine semitectate, < 1 μ thick, sexine reticulate, homobrochate, brochi very fine (microreticulate), muri simplibaculate, bacula homogeneous, small < 1 μ; colpi long, 16 x 1 μ, displaying costa, bifurcate at level of pores; pores endexinic, appearing circular to slightly lalongate, 2.5 μ, PAD 5 - 6 μ; amb circular; grains subprolate, 20 - 22 x 14 - 16 μ.
PAN, Dwyer 8577, MO; plate 59:608.

Casearia aculeata Jacq.
Isopolar-radiosymmetric, tricolporate; exine tectate, very thick, 2.5 μ thick at poles to 6.5 μ thick at equator, sexine psilate, displaying costa colpi; colpi long; pores inconspicuous, lalongate, sharp 1 x 6 μ; amb circular; grains spheroidal, 28 - 30 x 28 - 29 μ.
CR, Linares 104, PAO 155; plate 59:609.

Casearia arborea (L. C. Rich.) Urban
Isopolar-radiosymmetric, 3 - 4 colporate, usually 4-colporate; exine tectate, 2 μ thick at poles, 3 μ thick at equator, sexine psilate; colpi 28 x 3 μ, displaying costa colpi; pores lalongate, sharp 5 x 10 μ, PAD 15 μ; amb circular to angular; grains spheroidal, 30 - 33 x 30 - 32 μ.
CR, Linares 89, PAO; plate 59:611.

Casearia arguta HBK
Isopolar-radiosymmetric, 4-colporate; exine tectate, 3 μ thick, sexine psilate; colpi long, narrow, 3 μ wide, displaying thick costa colpi; amb circular; grains spheroidal, 25 - 26 x 24 - 26 μ.
CR, Linares 29, PAO 1631; plate 59:610.

Casearia commersoniana Camb. in St.-Hill.
Isopolar-radiosymmetric, tricolporate; exine intectate, 2 μ thick, nexine extremely thin, sexine baculate, bacula abundant, compressed, homogeneous, 2 x <1 μ wide; colpi long, narrow, 38 x 1 μ; pores endexinic, lalongate, sharp 3 x 8 μ; amb circular; grains subprolate, 40 - 42 x 29 - 31 μ.
BCI, Schmalzel 1032, MO; plate 59:612.

Casearia corymbosa HBK
Isopolar-radiosymmetric, tricolporate; exine tectate, 3 μ thick, sexine psilate; colpi long and thin, 30 x 1 μ displaying costa 3 μ wide, forming exitus digitatus; pores endexinic, circular 6 μ diameter; amb circular; grains subprolate, 44 - 48 x 38 - 41 μ.
BCI, Croat 9638, MO; plate 59:613.

Casearia guianensis (Aubl.) Urban
Isopolar-radiosymmetric, 4-colporate; exine tectate, 1.5 μ thick, sexine psilate; colpi narrow, short 20 x 1 μ, costa colpi 3 μ wide, forming exitus digitatus; pores circular, 3.5 μ diameter; amb circular; grains prolate-spheroidal, 40 - 47 x 37 - 42 μ.
PAN, Croat 5549, MO; plate 59:614

Casearia sylvestris Sw.
Isopolar-radiosymmetric, tricolporate; exine tectate, < 1 μ thick, sexine psilate; colpi long, narrow; pores lalongate, 1 x 3 μ, crassimarginate; amb circular; grains prolate to subprolate, 20 - 25 x 13 - 20 μ.
BCI, Schmalzel 209, MO; plate 59:615.

Hasseltia floribunda HBK
Isopolar-radiosymmetric, tricolporate; exine semitectate,1.0 - 1.5 μ thick, sexine reticulate, homobrochate, brochi < 1 μ high, lumina < 0.5 μ wide, muri very narrow; colpi long, narrow 16 x 1 μ, displaying costa 1.0 - 1.5 μ wide; pores endexinic, lalongate, narrow, inconspicuous, 1 x 5 μ ; amb circular; grains subprolate to prolate, 16 - 17 x 12 - 13 μ.
BCI, Croat 4809, MO; plate 59:616.

Laetia procera (Poepp. & Endl.) Eichl in Mart.
Isopolar-radiosymmetric, tricolporate and 4-colporate; exine tectate, microreticulate, 1 μ thick, sexine scabrate, homobrochate, brochi < 1 μ high; colpi long, narrow; pores endexinic, lalongate, 3 x 5 μ; amb circular; grains spheroidal, 20 - 22 x 19 - 21 μ.
COL, Shepard 699, MO; plate 59:617.

Laetia thamnia L.
Isopolar-radiosymmetric, tricolporate; exine semitectate, 2.5 μ thick, sexine reticulate, homobrochate, brochi < 1 μ high, muri simplibaculate, bacula < 1 μ wide; colpi as long as grain 3 μ wide, PAD 12 μ; pores ovate, 8 x 12 μ; amb circular; grains spheroidal, 40 - 45 x 39 - 45 μ.
JAM, Proctor 34871, KE 18244, MO; plate 59:618.

Lindackeria laurina Presl.
Isopolar-radiosymmetric, tricolporate; exine tectate, < 1 µ thick, sexine reticulate, homobrochate; colpi long, blunt, reaching within 2 µ of poles; pores conspicuous, circular to transversely parallel; amb circular; grains spheroidal, 14 - 17 x 14 - 16 µ.
PAN, Lao et al. 18, KE 18245 (p), BCI, Schmalzel 205 (d), MO; plate 59:619.

Tetrathylacium johansenii Standl.
Isopolar-radiosymmetric, tricolporate; exine semitectate, reticulate 1.5 µ thick, sexine reticulate, homobrochate, brochi 1 µ high, muri simplicolumellate; colpi as long as grain 1.5 µ wide; pores endexinic, lalongate, 1.5 x 4.0 µ, PAD 5 µ; amb circular; grains spheroidal to oblate-spheroidal, 13 - 15 µ.
BCI, Croat 15049, KE 18246 (p), BCI, Schmalzel 628 (d), MO; plate 59:620.

Xylosma oligandrum Donn. Sm.
Isopolar-radiosymmetric, tricolporate; exine tectate 2 µ thick, sexine reticulate, homobrochate, brochi 1 µ high, muri narrow < 1 µ, simplibaculate; colpi thick 20 x 1 µ, occasionally syncolporate; pores with operculum as wide as colpi, 3 µ wide, PAD 8 - 10 µ; amb circular; grains usually spheroidal to subprolate, 31 - 34 x 28 - 34 µ.
BCI, Schmalzel 1312, MO; plate 59:621.

Zuelania guidonia (Sw.) Britt. & Millsp.
Isopolar-radiosymmetric, 4-colporate; exine tectate, 2.5 µ thick at poles to 4 µ thick at equator, sexine psilate; colpi displaying costa, 2 µ wide, forming exitus digitatus; colpi narrow, 22 x 1 µ; pores endexinic, circular 3 µ diameter, appearing annulate (annulus 1.5 µ thick); amb circular; grains subprolate, 32 - 36 x 28 - 32 µ.
BCI, Schmalzel 286, MO; plate 60:622.

GENTIANACEAE

Monad and tetrad; apolar-asymmetric; triporate, tricolporate; exine tectate, semitectate, and intectate; sexine psilate, baculate, reticulate; colpi inconspicuous; pores lolongate and lalongate; tetrads 45 - 68 µ; tetragonal, crossed and linear; grains, when monad, suboblate to oblate, dimorphic, 10 - 13 x 12 - 18 µ and 22 - 26 x 33 - 38 µ. *(4 genera, 6 species; additional references: 138, 112, 113).*

Key to genera and species:

1a. Grains arranged in tetrads
  2a. Tetragonal or crossed, 45 - 57 µ
    3a. Grains triporate, reticulate ..... *Chelonanthus alatus*
    3b. Grains tricolporate, baculate
      4a. Exine 7 µ thick, grains ca. 38 x 52 µ ..... *Coutoubea spicata*
      4b. Exine 2 µ thick, grains ca. 26 x 38 µ ..... *Schultesia lisianthoides*
  2b. Linear, > 60 µ, grains triporate, reticulate ..... *Schultesia lisianthoides*
1b. Grains appearing as monads (triporate)
  5a. Exine < 0.5 µ thick ..... *Voyria truncata*
  5b. Exine < 1 µ thick
    6a. Pores 1.0 - 1.5 µ diameter ..... *Voyria alba*
    6b. Pores 2.5 - 3.0 µ diameter ..... *Voyria tenella*

Chelonanthus alatus (Aubl.) Pulle.
Tetragonal tetrad 45 - 57 µ, tetrad size variable; grains apolar-asymmetric, appearing triporate; exine semitectate, 2.0 - 2.5 µ thick, sexine reticulate, heterobrochate, brochi 0.5 - 3 µ wide, muri 1 - 2 µ wide, muri simplibaculate, bacula 1 - 4 µ; pores circular, 8 - 10 µ diameter; amb circular to subangular; grains oblate, 22 x 33 µ.
BCI, Schmalzel 225, MO; plate 60:623.

Coutoubea spicata Aubl.
Tetrad, tetragonal or crossed, 65 µ long; grains apolar, bilateral, tricolporate; exine intectate, 7 µ thick (nexine 1.5 µ thick), sexine baculate, bacula variable in size 4 µ high x 2 µ wide to < 1 µ high, diminishing toward apertures and proximal areas; apertures at junctions of grains; colpi long 28 x 3 µ; pores inconspicuous, appearing circular 6 µ diameter, displaying irregular edges; grains 38 µ long x 52 µ wide.
PAN, Schmalzel 1258, MO; plate 60:627.

Schultesia lisianthoides (Griseb.) Benth & Hook. ex Hemsl.
Tetrad, linear-rectangular, occasionally tetrahedral 45 - 68 µ; grains apolar-asymmetric, tricolporate; exine intectate, 2 µ thick, sexine baculate, dense bacula conspicuous 1.5 µ high x 0.5 - 1.0 µ wide; colpi short 2 µ wide, PAD 17 µ; pores slightly lalongate, 2 x 4 - 6 µ, apertures uniting grains at vertices; grains oblate, 26 x 38 µ.
PAN, Tyson 6088, MO; plate 60:624.

Voyria alba (Standl.) L. O. Wms. (*V. corymbosa* Splitg.)
Monad, apolar-asymmetric, triporate; exine tectate, < 1 µ thick, (ca. 0.8 µ), sexine psilate; pores circular 1.0 - 1.5 µ diameter, interporium 8 µ; grains suboblate, 10 - 12 x 12 - 14 µ.
BCI, Schmalzel 17, MO; no plate.

Voyria tenella Hook.
Monad, apolar-asymmetric, appearing triporate although only 1 pore conspicuous; exine tectate, 1 µ thick, sexine psilate; pores circular, 2.5 - 3.0 µ diameter; grains suboblate, 10 - 13 x 13 - 18 µ.
PAN, Schmalzel 117, MO; plate 60:625.

Voyria truncata (Standl.) Standl. & Steyerm.
Monad, apolar-asymmetric, triporate; exine 0.5 μ thick, sexine psilate; pores circular, 1.5 - 2.0 μ diameter, costa pori (annulus?) 0.5 - 1.0 μ wide, interporium 6 μ; grains suboblate, 10 - 12 x 13 - 15 μ.
PAN, Dressler 5152, PMA; plate 60:626.

GESNERIACEAE

Monad; isopolar-radiosymmetric; tricolpate; exine tectate to semitectate; sexine psilate, scabrate, reticulate; colpi as long as grains always covered by fine scabrate membrane; amb circular; grains prolate to oblate-spheroidal, 23 - 70 x 20 - 70 μ *(8 genera, 10 species).*

Key to genera and species:

1a. Reticulate
  2a. Homobrochate, brochi ≤ 1.5 μ wide
    3a. Exine 2 μ thick, grains < 30 μ ..... *Diastema racemiferum*
    3b. Exine ≥ 2.5 μ thick, grains > 30 μ
      4a. 35 - 40 μ ..... *Codonanthe crassifolia*
      4b. 50 - 70 μ ..... *Codonanthe uleana*
  2b. Heterobrochate, brochi > 1.5 μ wide
    5a. ≤ 45 μ, spheroidal, margo present ..... *Columnea purpurata*
    5b. > 45 μ, subprolate to spheroidal, margo absent ..... *Nautilocalyx panamensis*
1b. Psilate to scabrate
  6a. ≥ 40 μ
    7a. Prolate ..... *Columnea billbergiana*
    7b. Spheroidal ..... *Drymonia serrulata*
  6b. < 40 μ
    8a. Scabrate; brevitricolpate ..... *Chrysothemis friedrichsthaliana*
    8b. Psilate; colpi long
      9a. ≥ 25 μ ..... *Kohleria tubiflora*
      9b. < 25 μ ..... *Besleria laxiflora*

Besleria laxiflora Benth.
Exine tectate, 1 μ thick, sexine psilate; colpi 3 - 5 μ wide, displaying persistent granular membrane, PAD 3 - 4 μ; amb circular; grains subprolate to spheroidal, 23 - 25 μ.
PAN, Wedel 2453, KE 18102, MO; plate 60:628.

Chrysothemis friedrichsthaliana (Hanst.) H. E. Moore
Exine tectate, 1.5 μ thick, sexine scabrate, brevitricolpate; colpi 6 μ wide, displaying persistent granular membrane, PAD 12 μ; amb circular; grains spheroidal, 35 - 41 x 35 - 41 μ.
BCI, Schmalzel 109 (p), Sullivan 31, KE 18103 (d), MO; plate 60:629.

Codonanthe crassifolia (Focke) Mort. in Standl.
Exine semitectate, 2.5 μ thick, sexine reticulate, homobrochate, brochi 1 μ wide, muri simplibaculate < 0.5 μ wide, lumina displaying ectexinic process; colpi sharp, as long as grain, 3 μ wide; amb circular; grains appearing suboblate, 35 - 40 μ wide, susceptible to damage by acetolysis.
BR, Prance et al. 11935, NY; no plate.

Codonanthe uleana Fritsch.
Semitectate; exine 2.5 μ thick, reticulate, homobrochate, brochi 1 μ wide, muri < 0.5 μ wide, lumina displaying ectexinic elements, muri simplibaculate, bacula 1 μ high; colpi inconspicuous, appearing as long as grain; amb circular; grains appearing suboblate, 50 - 70 μ wide; susceptible to damage by acetolysis.
COL, Davis 95, 169132 COL; no plate.

Columnea billbergiana Beurl.
Exine intectate, 1.0 - 1.5 μ thick, sexine scabrate; colpi moderately long, tending toward syncolpate condition, always displaying persistent granular membrane; amb circular; grains prolate, 45 - 58 x 33 - 45 μ.
BCI, Croat 10088 (p), PAN, Mori & Kallunki 5149 (d), KE 18105, MO; plate 60:630.

Columnea purpurata Hanst.
Exine intectate, 2 μ thick, sexine reticulate, heterobrochate, murus wider than lumen, brochi 2 μ wide, muri densely columellate, columellae clustered at extremes of muri; colpi 10 μ wide, relatively short, displaying persistent scabrate membrane, margo 6 μ wide; amb circular; grains spheroidal, 33 - 43 μ.
PAN, Porter et al. 4872, KE 18106, MO; plate 60:631.

Diastema racemiferum Benth.
Exine intectate, 2 μ thick, sexine reticulate, homobrochate, brochi 1.0 - 1.5 μ wide, muri simplibaculate; colpi 3 μ wide, moderately long; amb circular; grains prolate-spheroidal to oblate-spheroidal, 28 - 29 μ.
PAN, Duke 14464, KE 17187, MO; plate 61:632.

Drymonia serrulata (Jacq.) Mart.
Exine tectate, 1.0 - 1.5 thick, sexine scabrate, colpi distinct, short 12 μ wide, displaying dense, persistent scabrate membrane, PAD 12 μ; amb circular; grains spheroidal, 38 - 47 μ.
PAN, Schmalzel 1152 (p), PMA, Dwyer & Elias 7501 (d), KE 18108, MO; plate 61:633.

Kohleria tubiflora (Cav.) Hanst.
Exine tectate, 1.0 - 1.5 µ thick, sexine scabrate; colpi moderately long, displaying persistent scabrate membrane, PAD 3 - 4 µ; amb circular; grains subprolate to prolate-spheroidal, 31 - 36 x 20 - 32 µ.
BCI, Croat 6417 (p), BCI, Croat 11977 (d), KE 18109, MO; plate 61:634.

Nautilocalyx panamensis (Seem.) Seem.
Exine semitectate, 2.5 µ thick, sexine reticulate, heterobrochate, lumina 3 µ wide in polar area and intercolpium, diminishing gradually toward apertures; muri baculate; colpi moderately long 10 µ wide, displaying persistent scabrate membrane, PAD 7 µ; amb circular; grains subprolate to spheroidal, 45 - 52 x 43 - 49 µ.
PAN, Schmalzel 1095 (p), BCI Croat 6195 (d), KE 18110, MO; plate 61:635.

GUTTIFERAE (CLUSIACEAE)

Monad, isopolar-radiosymmetric, (except *Mammea* & *Symphonia* = apolar-asymmetric); tectate, tricolporate, syncolporate, triporate, stephanoporate, inaperturate; exine tectate and semi-tectate, 1 - 7 µ thick, sexine psilate, scabrate, echinate, verrucate, foveolate, reticulate; colpi long and narrow; pores circular to lalongate; grains oblate to subprolate, 18 - 104 µ (*10 genera, 14 species; additional reference: 9*).

Key to genera and species:

1a. Inaperturate (foveolate, exine 5 µ thick, grains spheroidal ca. 95 µ)..... *Mammea americana*
1b. Porate
  2a. Triporate, echinate, exine 1 µ thick..... *Tovomitopsis nicaraguensis**
  2b. Stephanoporate (5 - 6 porate), psilate, exine 6 - 7 µ thick..... *Symphonia globulifera*
1c. Tricolporate
  3a. Psilate (exine ca. 1.5 µ thick, grains subprolate; pores lalongate)..... *Rheedia edulis**
  3b. Scabrate
    4a. Amb angular, grains oblate 18 - 21 x 23 - 27 µ..... *Havetiopsis flexilis*
    4b. Amb circular, grains spheroidal to subprolate ca. 22 µ
      5a. Exine 1 µ thick, colpi having persistent ectexinic membrane..... *Clusia odorata*
      5b. Exine 2 µ thick, colpi normal having costa colpi..... *Tovomita longifolia*
  3c. Foveolate, foveolae < 1.0 - 2.5 µ diameter, pores 5 x 12 µ..... *Tovomita stylosa*
  3d. Verrucate, verrucae <1 µ wide, pores 6 µ diameter..... *Marila laxiflora*
  3e. Reticulate
    6a. Pores lalongate 4 x 8 µ, colpi having exitus digitatus..... *Calophyllum longifolium*
    6b. Pores 4 - 6 µ diameter, colpi common type
      7a. Subprolate ca. 37 µ, pores 5 - 6 µ diameter. ..... *Vismia macrophylla*
      7b. Spheroidal to oblate-spheroidal ca. 26 µ, pores 4 µ diameter
        8a. Exine 1.5 µ thick, colpi 18 µ long, PAD 4 µ..... *Vismia baccifera*
        8b. Exine 2.5 µ thick, colpi 30 µ long, PAD 8 µ..... *Vismia billbergiana*
1d. Syncolporate (tricolporate)
  9a. Lalongate, 2 x 6 µ, colpi lacking equatorial constriction..... *Rheedia acuminata**
  9b. Lalongate, 4 x 10 µ, colpi having equatorial constriction..... *Rheedia edulis**

Calophyllum longifolium Willd.
Isopolar-radiosymmetric, tricolporate; exine semitectate, 2 µ thick, sexine reticulate, homobrochate, brochi 1 µ high, muri simplibaculate, bacula conspicuous, 1.5 µ high, muri < 0.5 µ wide; colpi displaying costa and long, narrow exitus digitatus 25 x 1 µ; pores endexinic, lalongate, PAD 6 - 8 µ; amb circular; grains subprolate, 35 - 39 x 29 - 33 µ.
BCI, Foster 1480, MO; plate 61:636.

Clusia odorata Seem. (*Clusia minor* L.)
Isopolar-radiosymmetric, tricolporate; exine tectate, 1 µ thick, columellae inconspicuous, sexine appearing granulate; colpi 2 µ wide and long, having persistent granular membrane; pores circular to elliptical, 4 x 2 µ, crassimarginate 2 µ thick; amb circular; grains spheroidal, 22 - 23 µ.
BCI, Schmalzel 203, MO; plate 61:637.

Havetiopsis flexilis Spruce ex Pl. & Tr.
Isopolar-radiosymmetric, tricolporate; exine tectate, 1 µ thick, sexine scabrate; colpi short, sharp, inconspicuous; pores endexinic, displaying costa, appearing transversely parallel, 'drop' type, PAD 12 - 15 µ; amb angular; grains oblate, 18 - 21 x 23 - 27 µ.
BCI, Croat 14844, KE 18251, MO; plate 61:638.

Mammea americana L.
Apolar-asymmetric, inaperturate; exine semitectate, 5 µ thick, , sexine foveolate, foveolae irregular, formed by abundant baculi, appressed, 3 µ high x 2 µ wide; amb circular; grains large, spheroidal, 87 - 104 µ.
VEN, Weff & Ruiz 690, KE 18252, MO; plate 61:639.

Marila laxiflora Rusby
Isopolar-radiosymmetric, tricolporate; exine tectate, 2 µ thick at poles to 4 µ at equator, displaying costa colpi, sexine verrucate, verrucae abundant, very short, irregular; colpi as long as grain 2 µ wide; pores endexinic, appearing circular 6 µ diameter; amb circular; grains spheroidal, 44 - 51 µ.
PAN, Croat 15437, KE 18253, MO; plate 61:640.

Rheedia acuminata (R. & P.) Planch & Tr. (*Garcinia madruno* (HBK) Hammel)
Isopolar-radiosymmetric, , syncolporate; exine tectate, 2 µ thick, sexine psilate; colpi as long as grain, 1 - 2 µ wide, united at poles, costa 2.0 - 2.5 µ thick; pores endexinic, lalongate, inconspicuous, 2 x 6 µ; amb circular; grains thick, prolate to subprolate, variable in size, 33 - 39 x 22 - 33 µ.
CR, Burger & Matta 4715, PAN; plate 61:641.

Rheedia edulis (Seem.) Planch & Tr. (*Garcinia intermedia* (Pittier) Hammel)
Isopolar-radiosymmetric, tricolporate and syncolporate; exine tectate 1.5 - 2.0 µ thick, sexine scabrate; colpi long, 2 µ wide, constricted at equator, uniting at poles; pores endexinic, transversely elliptical, 4 x 10 µ, PAD = 2 - 4 µ; amb circular; grains subprolate, 30 - 37 x 22 - 30 µ.
BCI, Foster 2184, PAN; plate 61:642.

Symphonia globulifera L. f
Isopolar-radiosymmetric, stephanoporate (5 - 6 porate); exine tectate 6 - 7 µ thick, sexine psilate; pores circular 13 - 15 µ diameter, displaying irregular margin formed by endexinic bacula; amb circular; grains spheroidal, 62 - 75 µ.
PAN, Correa & Dressler 1205, PMA; plate 62:643.

Tovomita longifolia (L. C. Rich.) Hochr.
Isopolar-radiosymmetric, tricolporate; exine tectate, 2 µ thick, sexine slightly scabrate; colpi long, curved, and almost uniting at poles, costa colpi present; pores appearing transversely elliptical; amb circular to trilobate; grains spheroidal to subprolate, 21 - 24 x 20 - 23 µ.
BCI, Croat 14016, MO; plate 62:644.

Tovomita stylosa Hemsl.
Isopolar-radiosymmetric, tricolporate; exine semitectate, 2.5 µ thick; sexine foveolate, foveolae irregular, 1.0 - 2.5 µ wide; colpi 20 x 1 µ, costa colpae interrupted at pores (exitus digitatus); pores endexinic, lalongate 5 x 12 µ, almost united, PAD = 8 - 10 ; amb circular; grains prolate-spheroidal, 31 - 33 x 28 - 30 µ.
BCI, Schmalzel 691, MO; plate 62:645.

Tovomitopsis nicaraguensis Oerst. ex Planch & Tr. (*Chrysobalanus* sp. B. Hammel, pers. commun.)
Isopolar-radiosymmetric, triporate (?); exine intectate 1 µ thick, sexine echinate, echini arranged irregularly, very fine and sharp ca 0.5 µ high; pores appearing circular, very small < 1 µ diameter; amb circular; grains oblate, 18.5 - 22 µ wide.
PAN, Foster 2708, PAN; plate 62:646.

Vismia baccifera (L.) Tr. & Planch.
Isopolar-radiosymmetric, tricolporate; exine semitectate,1.5 µ thick, sexine reticulate, heterobrochate, brochi diminishing toward apertures 0.5 - 1.0 µ high, muri narrow, simplicolumellate, lumi containing small columellae; colpi 18 x 2 - 3 µ; pores endexinic, circular 4 µ diameter, PAD 4 µ; amb circular; grains spheroidal to oblate-spheroidal, 19 - 21 x 19 - 22 µ.
BCI, Schmalzel 35, MO; plate 62:647.

Vismia billbergiana Beurl.
Isopolar-radiosymmetric, tricolporate (syncolporate); exine semitectate, 2.5 µ thick, sexine reticulate, homobrochate, brochi 1.5 - 2.0 µ high, muri simplibaculate, thin, lumina containing small ectexinic processes; colpi sharp 30 x 2.0 - 2.5 µ; pores circular 4 µ diameter, PAD 8 µ; amb circular; grains spheroidal to oblate-spheroidal 29 - 32 x 29 - 33 µ.
PAN, Correa & Dressler 633, PAN; plate 62:648.

Vismia macrophylla Kunth in HBK
Isopolar-radiosymmetric, tricolporate; exine semitectate 1.5 - 2.0 µ thick, sexine reticulate, homobrochate, brochi 1 µ high, muri multibaculate; colpi long, sharp 30 x 2 µ, displaying costa colpi, occasionally uniting at poles; pores endexinic, appearing circular 5 - 6 µ diameter; amb circular; grains subprolate 38 - 43 x 30 - 37 µ.
BCI, Croat 5322, MO; plate 62:649.

HIPPOCRATEACEAE

Polyad (16 grains) and monad; apolar-bilateral and isopolar-radiosymmetric; grains tricolporate, stephanocolporate, triporate; exine tectate; sexine psilate, reticulate; pores circular to slightly lalongate; margo present, inconspicuous; amb circular to semi-angular; grains prolate to oblate; monad size 12 - 35 x 15- 30µ, polyad 43 - 50µ (*5genera,5species; additional references: 64, 190, 200*).

Key to genera and species:

1a. Grains arranged in tetrads or polyads
  2a. Tetragonal tetrad, 27 - 30 µ, grains psilate, tricolporate..... *Hylenaea praecelsa*
  2b. Linear polyad, 4 tetrads united, 43 - 50 µ (16 grains) grains reticulate, triporate..... *Hippocratea volubilis*
1b. Grains appearing as monads (3 - 4 colporate)
  3a. Reticulate, prolate to subprolate..... *Prionostemma aspera*
  3b. Psilate, grains oblate
    4a. Pores slightly lalongate ≤ 4 µ, occasionally 4 apertures..... *Anthodon panamense*
    4b. Pores lalongate > 4 µ, always tricolporate..... *Tontelea richardii*

Anthodon panamense A. C. Smith
Monad, isopolar-radiosymmetric, tricolporate, occasionally 4-colporate; exine tectate, 1.5 µ thick, sexine psilate; colpi short, wide; pores lalongate 3 x 4 µ; amb semiangular; grains oblate to oblate-spheroidal, 18 - 21 x 24 - 31 µ.
BCI, Woodworth & Vestal 715, KE 18340 (p), BCI, Schmalzel 649 (d), MO; plate 62:650.

Hippocratea volubilis L.
Polyad, formed by 4 tetragonal tetrads, 43 - 50 µ; isolated grains apolar-bilateral, triporate; exine semitectate, 1.5 µ thick, sexine reticulate, heterobrochate, brochi variable 1 - 3 µ wide, muri < 1 µ wide, simplibaculate, brochus diminishing toward apertures; pores circular 1.0 - 1.5 µ diameter; grains suboblate, 12 x 15 µ.
BCI, Schmalzel 509, MO; plate 62:651

Hylenaea praecelsa (Miers) A. C. Smith
Tetragonal tetrad, occasionally cross tetrad, 27 - 30 µ; isolated grains apolar-bilateral, tricolporate; exine tectate, 2 µ thick; sexine psilate, densely columellate; colpi inconspicuous, short, narrow; pores endexinic; grains oblate to suboblate, 18 - 20 µ.
BCI, Croat 7873, NY; plate 62:652.

Prionostemma aspera (Lam.) Miers.
Monad, isopolar-radiosymmetric, tricolporate; exine semitectate, 2 µ thick, sexine reticulate, heterobrochate, brochi <1 - 4 µ, diminishing toward apertures and poles; colpi long, sharp, margo 1 µ wide, PAD 5 µ; pores circular 8 µ diameter, annulus present, indistinct; amb circular; grains prolate to subprolate, 31 - 35 x 37 - 30 µ..
BCI, Croat 7675, MO; plate 62:653

Tontelea richardii (Peyr) A. C. Smith
Monad, isopolar-radiosymmetric, tricolporate; exine 2.5 µ thick, sexine psilate, endosexine densely columellate; colpi wider than pores; pores lalongate 3 - 6 x 5 - 8 µ; amb semi-angular; grains oblate, 20 x 25 µ.
BCI, Schmalzel 733 (p), BCI, Croat 8285, KE 18348 (d), MO; plate 62:654.

HUMIRIACEAE

Monad; isopolar-radiosymmetric; tricolporate; exine semitectate; sexine reticulate; homobrochate; colpi long, sharp, displaying ectexinic membrane, thick margo present; pores lalongate; amb circular; grains prolate-spheroidal to spheroidal, 30 - 33 x 25 - 30 µ. (*1 genus, 1 species*).

Vantanea occidentalis Cuatr.
Exine 3 µ thick, brochi 1 µ wide, muri thick, simplibaculate, bacula short; colpi evidently covered by ectexinic membrane, margo 3 µ thick; pores lalongate 4 - 5 x 6 - 10 µ; amb circular; grains prolate-spheroidal to spheroidal 30 - 33 x 25 - 30 µ.
COL, Gentry & Renteria 24054, MO; plate 62:655.

LABIATAE (LAMIACEAE)

Monad; isopolar-radiosymmetric; stephanocolpate (6-colpate); exine tectate; sexine reticulate; homobrochate and heterobrochate; lophoreticulate; 6 equatorial colpi; colpi large, deep; amb circular-hexalobate; grains subprolate to oblate-spheroidal; grain size 17 - 35 x 17 - 31 µ. (*3 genera, 5 species*).

Key to genera and species:

1a. Lophate (lopho-reticulate), exine ≥ 2.5 µ thick, grains ≥ 30 µ ..... *Coleus blumei*
1b. Reticulate, exine < 2.5 µ thick, grains < 30 µ
  2a. Heterobrochate ..... *Hyptis mutabilis*
  2b. Homobrochate
    3a. ≤ 20 µ ..... *Hyptis brevipes*
    3b. > 20 µ
      4a. Exine 1.5 µ thick, grains prolate-spheroidal ..... *Hyptis capitata*
      4b. Exine 2.5 µ thick , grains oblate-spheroidal ..... *Salvia occidentalis*

Coleus blumei Benth. (*Solenostemon scutellarioides* (L.) Coll.)
Exine 1.5 µ thick at equator, 3.0 µ at poles; grains lophoreticulate, brochi 1.5 - 2.0 µ wide; colpi very narrow < 1 µ wide, as long as polar axis; amb circular-hexalobate; grains subprolate, 32 - 35 x 24 - 28 µ.
PAN, Lewis et al. 2514, MO; plate 63:656.

Hyptis brevipes Poit.
Exine 1.0 - 1.5 µ thick, homobrochate, brochi < 1 µ wide, muri simplibaculate; colpi narrow, PAD 5 µ; amb usually ovoid; grains prolate-spheroidal to oblate-spheroidal, 17 - 23 x 17 - 20 µ.
PAN, Correa & Heines 244, PMA; plate 63:657.

Hyptis capitata Jacq.
Exine 1.5 µ thick, homobrochate, brochi < 1 µ wide; muri simplibaculate; colpi long, wide, deep, PAD 5 µ between adjacent colpi; amb circular-hexalobate; grains subprolate to prolate-spheroidal, dimorphic, 22 - 24 x 19 - 21 µ.
BCI, Croat 7080, MO; plate 63:658.

Hyptis mutabilis (A. Rich.) Briq.
Exine 2 µ thick, heterobrochate, brochi < 1.0 - 1.5 µ wide, muri simplibaculate, lumina containing ectexinic elements; colpi wide, deep; amb circular-hexalobate; grains prolate-spheroidal to oblate-spheroidal, 25 - 32 x 29 - 31 µ.
PAN, Croat 7461, MO; plate 63:659.

Salvia occidentalis Sw.
Exine 2.5 µ thick, homobrochate, brochi 1 µ wide, muri simplibaculate, bacula 1.5 µ high; colpi deep and large, PAD 10 µ; amb hexalobate, lateral lobes larger than central lobes; grains oblate-spheroidal, 25 - 26 x 28 - 31 µ.
BCI, Croat 6943, MO; plate 63:660.

LACISTEMATACEAE

Monad; isopolar-radiosymmetric; tricolporate; exine tectate; sexine reticulate; homobrochate; colpi narrow, as long as grains; pores lalongate; amb circular; grains prolate to spheroidal; grain size small, 16 - 22 x 11 - 16 µ. *(1 genus, 2 species).*

Key to genera and species:

1a. Exine 1 µ thick, grains prolate-spheroidal to spheroidal..... *Lacistema aggregatum*
1b. Exine 1.5 - 2.0 µ thick, grains prolate to subprolate..... *Lozania pittieri*

Lacistema aggregatum (Beg.) Rusby
Exine 1 µ thick, brochi < 1 µ wide, sexine densely columellate; colpi long, PAD 4 µ; pores lalongate 2 x 8 µ, costa pori present; amb circular; grains prolate-spheroidal to spheroidal, 16 x 13 - 16 µ.
BCI, Schmalzel 458, MO; plate 63:661.

Lozania pittieri (S. F. Blake) L. B. Smith
Exine 1.5 - 2.0 µ thick, brochi < 1 µ wide; colpi long 1.0 - 1.5 µ wide, appearing with operculum and constricted at equator; pores lalongate 2 x 8 µ, occasionally zonorate (costa transversalis); amb circular; grains prolate to subprolate, 19 - 22 x 11 - 14 µ.
BCI, Foster 2364, MO; plate 63:662.

LAURACEAE

Monad, apolar-asymmetric; inaperturate; intectate; sexine echinate, echini sharp, conical < 1 µ high; exine < 0.5 µ thick; grains spheroidal; grain size 15 - 43 µ; grains fragile, highly susceptible to damage by acetolysis. Species not readily distinguishable. *(5 genera, 11 species; additional reference: 196).*

Key to genera and species *(based on fresh material)*:

1a. Grains < 20 µ..... *Ocotea cernua*
1b. Grains 20 - 30 µ..... *Beilschmiedia pendula, Nectandra cissiflora, N. purpurascens *, N. savannarum Ocotea oblonga, Phoebe mexicana **
1c. Grains 31 - 43 µ..... *Nectandra globosa, Ocotea pyramidata*, O. skutchii*, Persea americana*

Beilschmiedia pendula (Sw.) Hemsl.
Exine including ornamentation 1 µ thick, echini sharp; grains spheroidal, 25 - 28 µ.
BCI, Croat 12928, MO; plate 63:663.

Nectandra cissiflora Nees.
Exine including ornamentation 1 µ thick, echini ,sharp, distributed evenly on surface, grains spheroidal, 25 - 28 µ.
CR, Hammel 11168, MO; plate 63:664.

Nectandra globosa (Aubl.) Mez.
Exine 1 µ thick, echini < 0.5 µ; grains spheroidal, 30 - 33 µ.
BCI, Croat 7188, MO; plate 63:665.

Nectandra purpurascens (R. & P.) Mez. (*Nectandra fuscobarbata* (Mez.) Allen)
Exine < 0.5 µ thick; grains spheroidal, 25 - 26 µ.
BCI, Schmalzel 1252, MO; plate 63:666.

Nectandra savannarum (Standl. & Steyerm.) C. K. Allen
Exine < 0.5 µ thick; grains spheroidal, 28 - 29 µ.
BCI, Foster 960, MO; plate 63:667.

Ocotea cernua (Meisn.) Mez.
Exine < 0.5 µ thick; grains spheroidal, 15 - 16 µ.
BCI, Croat 15559, MO; plate 63:672.

Ocotea oblonga (Meisn.) Mez.
Exine < 0.5 µ thick; grains spheroidal, 24 - 26 µ.
BCI, Croat 16515, MO; plate 63:668.

Ocotea pyramidata Nees (*O. puberula* Nees)
Exine < 0.5 µ thick; grains spheroidal, 30. 5 - 33.0 µ.
PAN, Correa 4515, MO; plate 63:673.

Ocotea skutchii C. K. Allen (*O. whiteii* (Woods.))
Exine < 0.5 µ thick; grains spheroidal, 30 - 32 µ.
BCI, Croat 9780, MO; plate 63:669.

Persea americana P. Mill.
Exine ≤ 0.5 µ thick; grains spheroidal, 37 - 43 µ.
BCI, Croat 4162, MO; plate 63:670.

Phoebe mexicana Meisn. in DC. (*Phoebe cinnamomifolia* (Knuth) Nees)
Exine ≤ 0.5 µ thick; grains spheroidal, 25 - 27 µ.
BCI, Croat 14287, MO; plate 63:671.

LECYTHIDACEAE

Monad; isopolar-radiosymmetric; tricolpate, tricolporate; exine tectate; sexine scabrate, reticulate; colpi long, sharp, almost uniting at poles; pores circular to lalongate; colpi always displaying equatorial constriction; amb circular; grains oblate-spheroidal to subprolate; grain size, 18 - 26 x 16 - 25 µ. (*3 genera, 4 species*).

Key to genera and species:

1a. Tricolpate, sexine reticulate ..... *Gustavia fosteri*
1b. Tricolporate, sexine scabrate
  2a. Exine 2 µ thick, oblate-spheroidal to prolate-spheroidal, pores lalongate ..... *Gustavia superba*
  2b. Exine 1.0 - 1.5 µ thick, prolate-spheroidal to subprolate, pores circular
    3a. ≥ 20 µ, PAD 2 - 3 µ ..... *Couratari panamensis*
    3b. < 20 µ, PAD 6 µ ..... *Grias fendleri* *

Couratari panamensis Standl.
Tricolporate; exine tectate, 1.5 µ thick, sexine scabrate; colpi long, displaying equatorial constriction, PAD 3 µ; pores circular 7 µ diameter; amb circular; grains subprolate, 20 - 22 x 17 - 19 µ.
BCI, Schmalzel 679 (p), BCI, Croat 11081, KE 18242 (d), MO; plate 63:674.

Grias fendleri Seem. (*Grias cauliflora* L.)
Tricolporate; exine tectate, 1.0 - 1.2 µ thick, sexine scabrate, colpi long, sharp, displaying equatorial constriction, PAD 6 µ; pores circular 6 µ diameter; amb circular; grains subprolate to spheroidal, 18 - 20 x 16 - 18 µ.
BCI, Schmalzel 490, MO; plate 63:675.

Gustavia fosteri Mori
Tricolpate; exine 1.5 - 2.0 µ thick, sexine reticulate, homobrochate, brochi < 1 µ wide, muri simplicolumellate; colpi short, 18 x 2 µ, displaying strong equatorial constriction, occasionally forming a bridge, costa colpi < 1 µ, apparently lacking pores; amb circular; grains subprolate, 24 - 26 x 19 - 21 µ.
BCI, R. Foster no voucher; plate 63:676.

Gustavia superba (HBK) Berg.
Tricolporate; exine 2 µ thick, sexine reticulate; colpori narrow, moderately long, PAD 5 µ, colpi displaying equatorial constriction; pores inconspicuous, lalongate 6 x 10 µ; amb circular; grains oblate-spheroidal to prolate-spheroidal, 20 - 26 x 20 - 25 µ.
BCI, Shattuck 790, KE 18266, MO; plate 63:677.

LEGUMINOSAE

Caesalpinioideae

Monad; isopolar-radiosymmetric; tricolporate to syncolporate; exine tectate; sexine psilate, baculate, reticulate, verrucate, rugulate, granulate; colpi frequently having margo, generally large, sharp, long, occasionally uniting at poles, usually displaying equatorial constriction; PAD variable; pores circular to lalongate, frequently annulate; amb circular; grains suboblate to prolate; grain size, 23 - 100 x 19 - 82 µ. (*11 genera, 17 species; additional references: 48, 100, 151, 162, 168, 186, 198*).

Key to genera and species:

1a. Tricolporate
  2a. Psilate to scabrate
    3a. < 32 µ ..... *Cynometra bauhiniaefolia*
    3b. > 32 µ
      4a. Pores with operculum ..... *Bauhinia guianensis*
        5a. Colpi 1.5 µ wide ..... *Bauhinia reflexa*
        5b. Colpi 2 - 10 µ wide
      4b. Pores without operculum
        6a. Psilate, pores 7 - 9 µ in diameter ..... *Hymenaea courbaril*
        6b. Scabrate, pores 5 µ in diameter ..... *Cassia obtusifolia**
  2b. Baculate ..... *Browned macrophylla*
  2c. Striate-reticulate ..... *Peltogyne purpurea*
  2d. Granulate
    7a. Oblate-spheroidal ..... *Swartzia simplex* var. *grandiflora*
    7b. Prolate-spheroidal to subprolate
      8a. Pores circular 2 µ diameter, exine ca. 1 µ thick ..... *Cassia reticulata**
      8b. Pores lalongate 5 x 3 µ, exine 2.0 - 2.5 µ ..... *Swartzia simplex* var. *ochnacea**
  2e. Reticulate
    9a. ≤ 30 µ
      10a. Pores circular, annulus present, homobrochate ..... *Schizolobium parahybum*
      10b. Pores lalongate, lacking annulus, heterobrochate ..... *Tachigalia versicolor*
    9b. > 30 µ
      11a. Oblate-spheroidal, heterobrochate ..... *Cassia fruticosa* *

11b. Subprolate, homobrochate..... *Cassia undulata**
2f. Verrucate, grains < 30 µ, oblate-spheroidal..... *Prioria copaifera*
1b. Syncolporate or heteropolar
12a. Psilate (grains 40 - 60 µ, subprolate)..... *Bauhinia reflexa*
12b. Baculate
13a. Grains ≥ 50 µ, bacula > 1 µ high..... *Brownea macrophylla*
13b. Grains < 50 µ, bacula < 1 µ high..... *Swartzia panamensis*
12c. Reticulate, grains > 80 µ, subprolate..... *Caesalpinia pulcherrima*
12d. Granulate, grains < 30 µ, oblate-spheroidal..... *Swartzia simplex* var. *grandiflora*

Bauhinia guianensis Aubl.
Tricolporate; exine tectate, 2 µ thick, ca. 7 µ in margo, sexine psilate; colpi moderately long 1.5 µ wide; pores circular, 5 µ diameter; amb circular; grains subprolate, 45 - 60 x 36 - 43 µ.
BCI, Schmalzel 583 (p), PAN, Tyson 3544 (d), MO; plate 63:678.

Bauhinia reflexa Schery
Tricolporate, resembling syncolporate condition; exine tectate, 2 µ thick, sexine psilate; colpi 2 - 10 µ wide, usually uniting at poles, frequently displaying equatorial constriction; pores circular, 5 µ diameter; amb circular to rectangular; grains subprolate, 47 - 60 x 40 - 45 µ.
BCI, Croat 5651, MO; plate 63:679.

Brownea macrophylla Linden
Tricolporate, appearing syncolporate; exine intectate, 2.5 - 3.0 µ thick, sexine baculate; apertures indistinct, colpi 70 - 73 x < 1 µ, edges displaying conspicuous curved thickenings; pores circular 8 µ diameter; amb circular; grains prolate, 84 - 93 x 50 - 60 µ.
BCI, Schmalzel 446, MO; plate 64:680.

Caesalpinia pulcherrima (L.) Sw.
Tricolporate to syncolporate; exine 3 - 4 µ thick, sexine reticulate, homobrochate, muri wider than lumina; colpi 30 µ wide at equator, displaying persistent baculate membrane, margo 3 µ wide; pores lolongate to circular, 15 x 12 µ; amb circular; grains subprolate, 97 - 100 x 81 - 82 µ.
PAN, Tyson 1125, MO; plate 64:683.

Cassia fruticosa Mill (*Senna dariensis* var. *gatunensis* (Britt. & Rose))
Tricolporate; exine semitectate, 2 µ thick, sexine reticulate, heterobrochate, lumina < 0.5 µ wide; colpi narrow, PAD 7 - 8 µ; pores circular, endexinic, 9 µ diameter; amb semi-angular; grains oblate-spheroidal, 40 - 48 µ.
BCI, Schmalzel 202, MO; plate 64:681.

Cassia obtusifolia L. (*Senna obtusifolia* (L.))
Tricolporate; exine semitectate, 1.5 µ thick, sexine rugulate; colpi moderately long 30 µ, displaying equatorial constriction, PAD 5 µ; pores circular 5 µ diameter; amb circular; grains prolate-spheroidal to oblate-spheroidal, 28 - 37 x 28 - 32 µ.
MEX, Calderón 1559, PMA (p), PAN, Blum et al. 1956, MO (d); plate 64:682.

Cassia reticulata Willd. (*Senna reticulata* (Willd.) Irwin & Barneby)
Tricolporate; exine tectate, 1 µ thick, sexine granulate; colpi inconspicuous; margo present, pores circular 2 µ diameter, apertures protuberant; amb semi-angular; grains subprolate to prolate-spheroidal, 28 - 29 x 27 - 30 µ.
BCI, Schmalzel 261 (d), PAN, Blum et al. 2791, MO (d); plate 64:684.

Cassia undulata Benth. in Hook. (*Senna undulata* (Benth.) Irwin & Barneby)
Tricolporate; exine semitectate, 2.5 µ thick, sexine reticulate, homobrochate, brochi < 1 µ, muri simplibaculate; colpi long and narrow 35 x 1 - 2 µ, curving, margo 2 µ wide; pores appearing lalongate 8 µ wide, PAD 16 µ; amb circular; grains subprolate, 43 - 47 x 35 - 44 µ.
BCI, Schmalzel 122, MO; plate 64:685.

Cynometra bauhiniaefolia Benth. in Hook.
Tricolporate; exine tectate, 1.0 - 1.5 µ thick, sexine psilate; colpi 24 x 1 µ, usually uniting at poles, margo 1 µ wide; pores inconspicuous; amb circular; grains prolate-spheroidal to spheroidal, 29 - 32 x 29 - 31 µ.
BCI, Foster 2932, MO; plate 64:686.

Hymenaea courbaril L.
Tricolporate; exine 2 µ thick, sexine psilate; colpi moderately long, 5 µ wide; pores lolongate, 7 - 9 x 5 µ; amb circular; grains subprolate to oblate-spheroidal, 35 - 46 x 36 - 38 µ.
PAN, Tyson 6255, PMA (p), PAN, Croat 10209, MO (d); plate 64:687.

Peltogyne purpurea Pitt.
Tricolporate; exine intectate, 4.0 - 4.5 µ thick, sexine baculate, resembling striate condition; colpi sharp 30 x 5 - 6 µ, costa colpi 2 µ wide, displaying equatorial constriction; pores lalongate to circular, 5 x 6 µ, bacula isodiametric 3 x 1 µ, abundant, reticulate, PAD 10 - 12 µ; amb circular; grains subprolate, 39 - 46 x 29 - 37 µ.
CR, Allen 5608, KE 9096, MO; plate 64:688.

Prioria copaifera Griseb.
Tricolporate; exine semitectate, 1.5 µ thick, sexine verrucate-perforate; colpi long, displaying equatorial constriction, curving, edges thickened, costa colpi 2.5 µ; pores lolongate, 7 x 5 µ, covered by constriction, PAD 5 µ, verrucae variable in form and size; amb circular; grains subprolate, 26 - 29 x 19 - 22 µ.
BCI, Schmalzel 1176, MO; plate 64:689.

Schizolobium parahybum (Vell.) S. F. Blake
Tricolporate; exine semitectate, 1.5 µ thick, sexine reticulate, homobrochate, brochi 1 µ wide, muri simplibaculate; colpi short, wide; pores protuberant, circular 4 µ diameter, annulus 1.5 µ thick; amb circular; grains oblate-spheroidal, 17 .5 - 20.0 x 19 - 21 µ.
BCI, Zetek 6018, MO; plate 64:690.

Swartzia panamensis Benth. in Mart.
Syncolporate (tricolporate); exine intectate, 1.5 - 2.0 µ thick, sexine slightly baculate; colpi displaying persistent scabrate membrane, margo 2 µ wide, interrupted at equator; pores appearing lalongate 5 µ wide; amb circular; grains subprolate, 31 - 33 x 26 - 30 µ.
PAN, Schmalzel 1153, MO; plate 65:691.

Swartzia simplex (Sw.) Spr. var. ***grandiflora*** (Raddi.) Cowan
Syncolporate (tricolporate) exine tectate, 1.5 - 2.0 µ thick, sexine granulate; colpi long, wide 7 µ, displaying persistent verrucate membrane; pores distinctly protuberant, circular to moderately lalongate, 5 - 6 µ diameter; amb circular; grains oblate-spheroidal, 25 - 27 µ.
BCI, Zetek 5081, MO; plate 65:692.

Swartzia simplex (Sw.) Spr. var. ***ochnacea*** (A. DC.) Cowan (***S. simplex*** var.***continentalis*** (Urban))
Tricolporate; exine tectate, 2.0 - 2.5 µ thick, sexine granulate; colpi as long as grains 4 - 5 µ wide, displaying narrow verrucate membrane, costa colpi 2 µ thick, PAD 5 µ; pores lalongate, 3 x 5 µ; amb circular; grains subprolate, 23 - 27 x 19 - 25 µ
BCI, Schmalzel 512, MO; plate 65:693.

Tachigalia versicolor Standl. & L. O. Wms.
Tricolporate; exine semitectate, 2.0 - 2.5 µ thick, sexine reticulate, heterobrochate, brochi 1 µ wide, narrow at apertures, muri simplibaculate; colpi as long as grain x 4 µ wide, PAD 6 µ; pores lolongate, 6 x 4 µ; amb circular; grains suboblate, 23 - 27 x 27 - 30 µ.
BCI, Croat 9575, MO; plate 65:694.

Mimosoideae

Monad, tetrad and polyad; isopolar-radiosymmetric and apolar-asymmetric; exine tectate to intectate; sexine baculate, scabrate, microreticulate, psilate, verrucate, rugulate, foveolate; grains tricolporate, syncolporate, monoporate, periporate, inaperturate; monads 38 - 43 x 31 - 40 µ, prolate to subprolate; tetrads tetragonal and crossed 9 - 32 x 11 - 25; polyads 30 - 225 µ, having 16, 20 , 24, 28, 32, 36, 40 and 44 grains. (*9 genera, 36 species; additional references: 12, 62, 63, 192, 198).*

Key to genera and species:

1a. Grains appearing as monads (excluding isolated grains of polyads)
  2a. Tricolporate
    3a. Scabrate, pores annulate, exine 2.5 µ thick ..... *Entada monostachya*
    3b. Baculate, pores lacking annulus, exine 1.5 - 2.5 µ thick ..... *Adenopodia polystachya*
  2b. Syncolporate (scabrate); prolate; 38 - 43 x 31 - 40 µ ..... *Entada monostachya*
1b. Grains arranged in tetrads
  4a. Regular-tetragonal tetrads, 9 x 11 µ, grains inaperturate, psilate ..... *Mimosa* (2 spp.)
  4b. Crossed (square) tetrad, 27 - 32 x 20 - 25 µ, 1-4 apertures, grains reticulate ..... *Mimosa pigra*
1c. Grains arranged in large polyads (*fresh material only*)
  5a. 16 grains per polyad
    6a. Inaperturate
      7a. Polyad > 50 µ, grains 20 - 24 µ ..... *Inga fagifolia*
      7b. Polyad < 50 µ, grains 10 - 14 µ ..... *Acacia* (2 spp.)
    6b. Aperturate
      8a. Tricolporate, sexine baculate ..... *Leucaena multicapitula*
      8b. Periporate (4 - 8 pores), sexine psilate, verrucate or rugulate
        9a. Polyads ≥ 75 µ
          10a. Polyads 75 - 90 µ
            11a. Grains > 22 µ
              12a. Exine 2.5 - 3.0 µ thick, pores 4 µ ..... *Inga umbellifera*
              12b. Exine 1 µ thick, pores 3 µ ..... *Pithecellobium rufescens*
            11b. Grains < 22 µ ..... *Inga ruiziana*
          10b. Polyads 90 - 120 µ ..... *Pithecellobium* (8 spp.)
            12a. Verrucate ..... *Inga punctata*
            12b. Psilate
          10c. Polyads > 120 µ ..... *Inga vera spuria*
            13a. Grains > 38 µ ..... *Inga pauciflora*
            13b. Grains < 38 µ
        9b. Polyads < 75 µ ..... *Inga marginata*
          14a. Grains having ≤ 5 pores
          14b. Grains having > 5 pores ..... *Inga quaternata*
            15a. Polyads < 65 µ ..... *Inga* (2 spp.)
            15b. Polyads > 65 µ
  5b. 20 grains per polyad
    16a. Polyads < 100 µ
      17a. Polyads 90 - 110 µ ..... *Pithecellobium dinizii*
        18a. Exine 1.5 - 2.0 µ thick ..... *Inga punctata*
        18b. Exine 2.5 - 3.5 µ thick ..... *Inga pezizifera*
      17b. Polyads < 90 µ
    16b. Polyads > 110 µ

18a. Polyads 111 - 150 µ ..... *Inga* (3 spp.)
18b. Polyads > 150 µ ..... *Inga* (2 spp.)
5c. 24 grains per polyad
19a. Polyads ≤ 110 µ ..... *Pithecellobium dinizii*
19b. Polyads > 110 µ ..... *Inga* (5 spp.)
5d. 28 grains per polyad
20a. Polyads < 110 µ
21a. 4-porate, verrucate ..... *Pithecellobium dinizii*
21b. 5 - 7 porate, psilate ..... *Enterolobium schomburgkii*
20b. Polyads > 110 µ ..... *Inga* (5 spp.)
5e. 32 - 36 grains per polyad
22a. Polyads ≤ 120 µ ..... *Enterolobium &Albizia gauchapele*
22b. Polyads > 120 µ ..... *Inga* (6 spp.)
5f. 40 - 44 grains per polyad
23a. Polyads ≤ 150 µ ..... *Inga cocleensis*
23b. Polyads > 150 µ ..... *Inga mucuna*

Acacia acanthophylla (Britt. & Rose) Standl.
Polyad 26 x 23 x 12 µ, 16 grains, symmetric arrangement 4 - 8 - 4; form elliptical to circular; isolated grains apolar-asymmetric, inaperturate; exine tectate, 1 µ thick, sexine psilate; grains oblate, 8 x 10 µ.
PAN, Allen 961, NY; plate 65:695.

Acacia glomerosa Benth.
Polyad, 39 x 36 x 22 µ, 16 grains, symmetric arrangement 4 - 8 - 4; form elliptical to circular; individual grains tectate, psilate, apolar-asymmetric, inaperturate; exine tectate, 1.5 µ thick, thickening distally, sexine psilate; grains oblate-spheroidal to spheroidal, 13 - 14 x 12 - 13 µ.
PAN, Nee 7564, PAN; plate 65:696.

Acacia hayesii Benth.
Polyad, 30 x 28 µ,16 grains, form elliptical to circular, symmetric arrangement; individual grains inaperturate, apolar-asymmetric; exine tectate, 1 µ thick, sexine psilate; grains oblate, 10 µ.
MEX, Ventura 14061, MO; plate 65:697.

Acacia melanoceras Beurl.
Polyad, 16 grains, 24 x 21 x 11 µ, form circular, symmetric arrangement; individual grains apolar-asymmetric, inaperturate; exine tectate, 1 µ thick, sexine psilate; grains oblate-spheroidal to spheroidal, 10 - 11 x 11 - 12 µ.
PAN, Hayes 977, NY (p), PAN, Schmalzel, no voucher (d); plate 65:698.

Acacia riparia HBK
Polyad, 31 - 35 x 19 - 20 µ, 16 grains, form usually circular, symmetric arrangement; individual grains apolar-asymmetric, inaperturate; exine tectate, 1 µ thick, sexine psilate; grains oblate-spheroidal to spheroidal, 10 - 11 x 11 - 12 µ.
BCI, Foster 1333, MO; plate 65:699.

Adenopodia polystachya (L.) J. Dixon
Monad, isopolar-radiosymmetric, tricolporate; exine semitectate, 1.5 µ thick at equator to 2.5 µ thick at poles, sexine baculate; colpi 30 x 2.5 µ, costa colpi 4 µ; pores circular to lolongate 6 µ diameter; bacula < 1 µ high, uniform distribution; amb circular; grains prolate to subprolate, 39 - 43 x 31 - 34 µ.
BCI, Schmalzel 1111, MO; plate 65:700.

Albizia gauchapele Record
Polyad,124 - 137 x 100 - 110 x 100 µ, 32 grains; form circular to elliptical, symmetric arrangement; individual grains foveolate, apolar-asymmetric, periporate; exine semitectate, 3.5 µ thick, sexine psilate to perforate; pores 5 - 8, circular, 5 µ diameter; amb irregular; grains oblate-spheroidal, 27 - 28 x 29 - 30 µ.
PAN, Croat 6757, MO; plate 65:701.

Entada monostachya DC.
Monad, isopolar-radiosymmetric; tricolporate, occasionally syncolporate, exine tectate, 2.5 µ thick, sexine scabrate; colpi moderately long 5 µ wide, usually uniting at poles; pores circular to lolongate, 5 µ diameter, annulus 1.5 - 2.0 µ wide; amb semi-angular; grains subprolate, 38 - 43 x 31 - 40 µ.
BCI, Schmalzel 501, MO; plate 65:702.

Enterolobium cyclocarpum (Jacq.) Griseb.
Polyad, 90 - 112 x 85 - 94 µ, 32 grains, occasionally 28 or 36, grain arrangement irregular, form ovoid; individual grains apolar-asymmetric, periporate; exine tectate, 2 µ thick, sexine psilate; pores 4 - 6, circular, 4 - 5 µ diameter, aspidate; grains oblate 22 - 25 x 26 - 30 µ.
PAN, Schmalzel 409, MO; plate 65:703.

Enterolobium schomburgkii Benth.
Polyad, 90 - 110 µ, 32 grains; amb usually elliptical, grain arrangement irregular; individual grains tectate, psilate, apolar-asymmetric, inaperturate; exine tectate, 1 µ thick, sexine psilate; grains oblate, 23 - 25 longx 24 - 28 µ wide x 17 µ high.
PAN, Lao & Holdridge 37, PAN; no plate.

Inga cocleensis Pitt.
Polyad, 135 - 160 x 105 - 130 µ, 32 grains, occasionally 28 or 40, symmetric arrangement; form ovoid; individual grains apolar-asymmetric, periporate; exine intectate, 3 µ thick distally, sexine scabrate to verrucate; pores 6 - 8, circular 5 - 7 µ diameter, covered by ectexinic membrane; grains oblate, 24 - 26 x 25 - 28 µ.
PAN, Correa et al. no voucher, PAN; plate 65:704.

Inga fagifolia Benth.
Polyad, 63 - 69 µ, 16 grains, symmetric arrangement; form usually circular; individual grains apolar-asymmetric, inaperturate; exine tectate, 2 µ thick, sexine psilate; grains oblate, 20 - 22 x 22 - 24 µ.
BCI, Croat 5537, MO; plate 65:705.

Inga goldmanii Pitt.
Polyad, 168 - 195 x 112 - 150 µ, 32 grains, symmetric arrangement; form ovoid; individual grains apolar-asymmetric, inaperturate; exine tectate, 3.0 - 5.5 µ thick distally; pores 8, circular 6 µ diameter, covered by ectexinic membrane; amb indistinct; grains oblate, 22 - 28 x 34 - 38 µ.
BCI, Croat 12594, MO; plate 65:706.

Inga hayesii Benth.
Polyad, 115 - 135 x 105 - 120 µ, 20 to 24 grains, symmetric arrangement; form ovoid; individual grains intectate, rugulate apolar-asymmetric, inaperturate; exine intectate, 3 µ thick distally, sexine rugulate; pores 5 - 9 per grain, circular 4 - 5 µ diameter, covered by ectexinic membrane; grains oblate, 32 - 34 x 36 - 39 µ.
PAN, Croat 10142, MO; plate 65:707.

Inga marginata Willd.
Polyad, 66 - 69 x 63 - 66 µ, 16 grains, symmetric arrangement; form circular; individual grains apolar-asymmetric, periporate; exine semitectate, 1.5 µ thick, sexine gemmate; pores 4 - 5 per grain; grains oblate, 19 - 20 µ.
BCI, Croat 8185, MO; plate 65:708.

Inga minutula (Schery) Elias
Polyad, 136 - 160 x 115 - 130 x 70 µ, 24 to 28 grains, symmetric arrangement; form ovoid; individual grains tectate, psilate, apolar-asymmetric, inaperturate; exine semitectate, 2.5 µ thick, sexine verrucate; grains oblate, 32 - 36 x 38 - 42 µ.
PAN, Schmalzel 918, MO; plate 65:709.

Inga mucuna Walp. & Duch. in Walp.
Polyad, 180 - 225 x 145 - 150 µ, 32, 36, 40 or 44 grains, arrangement irregular; form usually elliptical; individual grains apolar-asymmetric, periporate; exine semitectate, 2.5 - 3.5 µ thick, sexine psilate to verrucate; pores 8 - 12, circular 5 - 7 µ diameter; amb irregular, indistinct; grains oblate, 30 - 34 x 38 - 42 µ.
BCI, Croat 6858, MO; plate 66:710.

Inga multijuga Benth.
Polyad, 185 - 205 x 135 - 145 µ, 20, 24, 28 or 32 grains, arrangement irregular; form elliptical; individual grains tectate, psilate, apolar-asymmetric, periporate; exine tectate, 2.5 µ thick distally, sexine psilate; pores 7 - 10 per grain, circular, 3.5 - 5.5 µ diameter, covered by thin ectexinic membrane; grains oblate, 28 - 32 µ.
PAN, Schmalzel 117, MO; plate 66:711.

Inga pauciflora Walp. & Duchass.
Polyad, 125 - 142 x 110 - 125 µ, 16, 20 or 24 grains, symmetric arrangement; form ovoid; individual grains apolar-asymmetric, periporate; exine intectate, 3 µ thick distally, sexine rugulate; pores 7 per grain, circular, 5 - 7 µ diameter, covered with ectexinic elements; grains oblate, 30 - 34 x 34 - 36 µ.
BCI, Croat 8442, MO; plate 66:712.

Inga pezizifera Benth.
Polyad, 65 - 71 x 65 - 71 x 36 µ, 16 grains, symmetric arrangement; form elliptical to circular; individual grains apolar-asymmetric, periporate; exine intectate, 2 µ thick, sexine verrucate; pores 6 , inconspicuous, 2 µ diameter; grains oblate, 16 - 18 x 16 - 20 µ.
BCI, Croat 14881, MO; plate 66:713.

Inga punctata Willd.
Polyad, 100 - 118 x 88 - 94 µ, 16, 20 or 24 grains, symmetric arrangement; form usually circular; individual grains apolar-asymmetric, periporate; exine intectate, 2.5 - 3.5 µ, sexine verrucate; pores 4- 7 per grain, circular 6 - 7 µ diameter, covered by fine ectexinic membrane; grains oblate 30 - 34 x 32 - 36 µ.
PAN, Croat 12439, MO; plate 66:714.

Inga quaternata Poepp
Polyad, 56 - 62 x 56 - 62 x 35 µ, 16 grains, ocasionally 20, symmetric arrangement; form usually circular; individual grains apolar-asymmetric, periporate ; exine intectate, 2.5 µ thick, sexine verrucate; pores 6 per grain circular 2.5 µ diameter; grains oblate, 16 - 20 x 18 - 22 µ.
BCI, Croat 11983, MO; plate 66:715.

Inga ruiziana G. Don.
Polyad, 64 - 81 x 64 - 81 µ, 16 grains, symmetric arrangement; form elliptical to circular; individual grains apolar-asymmetric, periporate; exine intectate,1.5 - 2.5 µ thick, sexine rugulate; pores 6 - 8 per grain, 3.5 µ diameter, covered by fine ectexinic membrane; grains oblate, 16 - 20 x 18 - 22 µ.
PAN, Gentry 1773, MO; plate 66:716.

Inga sapindoides Willd.
Polyad, 198 - 231 x 135 - 191 µ, 20, 28 or 32 grains, symmetric arrangement; form elliptical; individual grains apolar-asymmetric, periporate; exine intectate, 2.0 - 2.5 µ thick, sexine verrucate; pores 6 - 7 per grain, circular, 5 - 6 µ diameter, covered by fine ectexinic membrane; grains oblate, 35 - 37 x 38 - 43 µ.
BCI, Croat 8412, MO; plate 66:717.

Inga spectabilis (Vahl.) Willd.
Polyad, 155 - 165 x 109 - 114 µ, 32 grains, symmetric arrangement; form elliptical; individual grains apolar-asymmetric, periporate; exine intectate, 3 µ thick, sexine verrucate; pores 8 per grain, circular, 7 µ diameter; grains oblate 29 - 32 µ.
PAN, Croat 15044, MO; plate 66:718.

Inga thibaudiana DC.
Polyad, 140 - 165 x 112 - 125 µ, 24, 28 or 32 grains, symmetric arrangement; form elliptical to circular; individual grains, apolar-asymmetric, periporate; exine intectate, 3.0 - 3.5 µ thick, sexine verrucate; pores 8 per grain, circular, 7 µ diameter, covered by fine ectexinic membrane; grains oblate, 31 - 33 µ.
PAN, Gentry 1943, MO; plate 66:719.

Inga umbellifera (Vahl) Steud.
Polyad, 89 - 97 x 75 - 89 µ, 16 grains, symmetric arrangement; form circular; individual grains apolar-asymmetric, periporate; exine intectate, 2.5 - 3.0 µ thick, sexine verrucate; pores 5 - 6 per grain, circular 4 µ diameter, covered by fine ectexinic membrane; grains oblate, 25 - 27 x 25 - 27 µ.
PAN, Croat 8121, MO; plate 66:720.

Inga vera Willd. subsp. *spuria* (Willd.) J. León
Polyad, 115 - 150 µ, 16 - 20 grains, arrangement irregular; form usually elliptical; individual grains apolar-asymmetric, periporate; exine intectate, 3.5 µ thick, sexine rugulate; pores 4 - 7 per grain, circular 7 µ diameter; grains oblate, 41 - 43 µ.
PAN, Croat 14099, MO; plate 66:721.

Leucaena multicapitula Schery
Polyad, 90 - 140 µ, 16 grains, symmetric arrangement in 4 groups of 4 grains each; form elliptical to irregular; individual grains tricolporate, isopolar-radiosymmetric; exine intectate, 1.5 - 2.0 µ thick, sexine baculate; colpi moderately long 1 µ wide, PAD 7 µ; pores lolongate 3 x 5 µ; amb circular; grains suboblate, 35 - 36 x 40 - 41 µ.
PAN, Tyson 4169, MO; plate 66:722.

Mimosa casta L.
Tetragonal tetrad, 9 - 11 µ; individual grains intectate, scabrate, apolar-bilateral, inaperturate; exine intectate, < 0.5 µ thick, sexine psilate to scabrate; pores apparently at angles of contact between grains, inconspicuous; grains oblate, 5 x 10 µ.
BCI, Croat 12821, MO; plate 66:724.

Mimosa pigra L.
Crossed tetrad, 27 - 32 x 20 - 25 µ; individual grains apolar-asymmetric, inaperturate, appearing monoporate; exine semitectate, 0.8 µ thick, sexine microreticulate, homobrochate, brochi < 1 µ high; pores at distal pole; grains oblate 10 - 11 x 12 - 14 µ
BCI, Schmalzel 946, MO; plate 66:725.

Mimosa pudica L.
Tetragonal tetrad, 9 - 11 µ; grains apolar-bilateral, inaperturate; exine tectate, < 0.5 µ thick, sexine scabrate; grains 5 x 10 µ.
BCI, Croat 7001, MO; plate 66:726.

Pithecellobium dinizii Ducke
Polyad, 90 - 110 x 90 - 108 µ, 16, 20, 24 or 28 grains, symmetric arrangement; form usually elliptical; individual grains apolar-asymmetric, periporate; exine intectate, 1.5 - 2.0 µ thick, sexine verrucate; pores 4, inconspicuous; grains oblate, 27 - 29 µ
PAN, Lewis et al., no voucher, MO; plate 66:723.

Pithecellobium hymeneaefolium (H. & B.) Benth. in Hook.
Polyad, 110 - 115 µ, 16 grains, symmetric arrangement; form usually circular; individual grains apolar-asymmetric, periporate; exine intectate, 3.5 - 4.0 µ thick, sexine verrucate; pores 6 - 7, circular 5 µ diameter, covered by fine ectexinic membrane; grains oblate, 27 - 29 x 36 - 41 µ.
BCI, Schmalzel 636, MO; plate 67:729.

Pithecellobium macradenium Pitt.
Polyad, 89 - 99 x 89 - 96 µ, 16 grains, symmetric arrangement; form circular; individual grains apolar-asymmetric, periporate; exine intectate, 2 µ thick, sexine verrucate; pores 6 per grain, circular, inconspicuous, covered by fine ectexinic membrane; amb indistinct; grains oblate, 26 - 29 µ.
BCI, Croat 7774, MO; plate 67:727.

Pithecellobium rufescens (Benth.) Pitt., non Mohl. (1966)
Polyad, 79 - 82 x 72 - 76 µ, 16 grains, symmetric arrangement; form circular to elliptical; individual grains tectate, apolar-asymmetric, periporate; pores 4 - 6, circular, 3 µ diameter; exine intectate, 1 µ thick, sexine verrucate; grains oblate, 23 - 26 µ.
BCI, Schmalzel 728, MO; plate 67:728.

Papilionoideae

Monad; isopolar-radiosymmetric; tricolpate, stephanocolpate, syncolpate and parasyncolpate, triporate, tricolporate, syncolporate; exine semitectate, tectate and intectate; sexine psilate, baculate, reticulate, verrucate, scabrate, granulate; exine 1 - 6 μ thick; apertures indistinct; pores circular, lolongate and lalongate; amb usually circular; grains oblate to prolate; grains 13 - 92 x 14 - 96 μ. *(28 genera, 60 species; additional references: 66, 72, 95, 96, 97, 156, 171, 198).*

Key to genera and species:

1a. Tricolpate
- 2a. Oblate to oblate-spheroidal
  - 3a. Grains 65 - 75 μ, baculate-verrucate, exine 3.5 - 4.0 μ thick, oblate-spheroidal. *Canavalia dictyota*
  - 3b. Grains 80 - 85 μ, scabrate, exine 5 - 6 μ thick, grains oblate. *Dioclea wilsonii*
- 2b. Prolate to subprolate
  - 4a. Exine intectate < 2.5 μ, verrucae conspicuous > 2 μ high
    - 5a. PAD 16 μ. *Desmodium adscendens*
    - 5b. PAD 11 μ
      - 6a. Exine 2 μ thick, grains > 40 μ. *Desmodium axillare* var.*acutifolium*
      - 6b. Exine 1.5 - 2.0 μ thick, grains < 40 μ. *Desmodium triflorum*
  - 4b. Exine tectate, > 2.5 μ, verrucae < 1 μ high
    - 7a. PAD < 7 μ, costa colpi 4 μ. *Desmodium canum**
    - 7b. PAD > 7 μ, costa colpi 6 μ. *Desmodium axillare* var.*stoloniferum*
- 2c. Spheroidal. *Indigofera mucronata**

1b. Stephanocolpate (5 - 6 colpate)
- 8a. Psilate, grains > 55 μ. *Clitoria javitensis*
- 8b. Scabrate, grains < 55 μ. *Clitoria rubiginosa*

1c. Syncolpate
- 9a. Parasyncolpate
  - 10a. Amb circular, sexine reticulate, exine 1.0 - 1.5 μ thick. *Crotalaria cajanifolia**
  - 10b. Amb angular, sexine verrucate, exine 4 μ thick. *Cymbosema roseum*
- 9b. Not parasyncolpate, sexine baculate, exine 3.5 - 4.0 μ thick. *Canavalia dictyota*

1d. Triporate (sexine reticulate)
- 11a. Grains < 40 μ
  - 12a. Suboblate, muri uniform. *Erythrina costaricensis*
  - 12b. Oblate-spheroidal to prolate-spheroidal, muri per-reticulate. *Erythrina fusca*
- 11b. Grains > 40 μ
  - 13a. 40 - 60 μ
    - 14a. Ca. 40 μ, prolate-spheroidal, pores 8 μ in diameter. *Phaseolus peduncularis*
    - 14b. Ca. 58 μ, oblate-spheroidal to spheroidal, pores 12 μ in diameter. *Phaseolus trichocarpus*
  - 13b. 70 - 100 μ. *Vigna vexillata*

1e. Tricolporate
- 15a. Psilate
  - 16a. Oblate to oblate-spheroidal
    - 17a. Grains 50 - 70 μ, pores lolongate, exine 5 μ thick. *Dioclea reflexa*
    - 17b. Grains 15 - 20 μ
      - 18a. Pores circular, exine 1.5 - 2.0 μ thick. *Andira inermis*
      - 18b. Pores lalongate, exine 1.0 - 1.5 μ thick. *Teramnus uncinatus, T. volubilis*
  - 16b. Subprolate to prolate-spheroidal
    - 19a. Grains > 20 μ, exine 2 μ thick. *Dalbergia brownei*
    - 19b. Grains < 20 μ, exine 1 μ thick. *Machaerium milleflorum*
      - 20a. Subprolate. *Dalbergia monetaria*
      - 20b. Prolate-spheroidal
        - 21a. 12 - 13 μ, pores lalongate, 4 x 5 μ. *Machaerium ripartium*
        - 21b. 14 - 15 μ, pores circular, 3 μ diameter. *Myroxylon balsamum*
- 15b. Scabrate
  - 22a. Grains > 30 μ
    - 23a. 30 - 50 μ, exine < 3 μ thick
      - 24a. Suboblate. *Dioclea guianensis*
      - 24b. Prolate-spheroidal. *Dipteryx panamensis**
    - 23b. 80 - 85 μ, exine 5 - 6 μ thick. *Dioclea wilsonii*
  - 22b. Grains < 30 μ, pores circular or transversely parallel
    - 25a. Exine 2.0 μ thick; PAD 5 μ; equatorial constriction absent. *Dalbergia monetaria*
    - 25b. Exine 2.5 - 3.0 μ thick; PAD 10 μ; equatorial constriction present. *Ormosia macrocalyx*
- 15c. Baculate
  - 26a. 35 - 40 μ, exine 2.5 μ thick. *Ormosia coccinea*
  - 26b. 20 - 25 μ, exine 2.0 μ thick. *Vatairea erythrocarpa*
- 15d. Verrucate
  - 27a. Grains < 32 μ
    - 28a. Pores lalongate, exine 2.0 - 3.0 μ thick
      - 29a. Suboblate to oblate-spheroidal; PAD 15 μ. *Desmodium tortuosum*
      - 29b. Prolate-spheroidal to oblate-spheroidal; PAD 12 μ. *Desmodium scorpiurus*
    - 28b. Pores circular, exine 1.5 μ thick. *Desmodium wydlerianum*
  - 27b. Grains > 32 μ
    - 30a. Pores circular, PAD < 15 μ. *Desmodium axillare*
    - 30b. Pores lalongate, PAD > 15 μ
      - 31a. Exine 3 μ thick, margo 3.5 μ. *Desmodium cajanifolium*
      - 31b. Exine 2.5 μ thick, margo 4.0 μ. *Desmodium distortum*

15e. Reticulate
32a. Grains < 30 µ
33a. 18 - 30 µ
34a. Suboblate to oblate-spheroidal
35a. Pores circular, PAD < 6 µ ..... *Rhynchosia pyramidalis*
35b. Pores lalongate, PAD > 6 µ
36a. PAD 9 µ, grains 25 - 30 µ ..... *Lonchocarpus velutinus*
36b. PAD 12 µ, grains 22 - 24 µ ..... *Lonchocarpus pentaphyllus*
34b. Subprolate to prolate-spheroidal
37a. Pores circular
38a. Pores 8 µ diameter ..... *Pterocarpus rohrii*
38b. Pores 5 µ diameter
39a. PAD 7 µ, colpi 16 x 1 µ ..... *Machaerium kegelii*
39b. PAD 5 µ, colpi 20 x 1 µ ..... *Rhynchosia pyramidalis*
37b. Pores ovoid
40a. Pores lolongate ..... *Crotalaria retusa*
40b. Pores lalongate
41a. < 21 µ
42a. Colpi 18 µ long ..... *Machaerium arboreum*
42b. Colpi 16 µ long ..... *Machaerium seemannii*
41b. > 21 µ ..... *Machaerium microphyllum*
33b. Grains< 18 µ
43a. Oblate-spheroidal
44a. Pores circular, 5 µ diameter ..... *Calopogonium caeruleum*
44b. Pores lalongate, 4 x 6 µ ..... *Pterocarpus officinalis*
43b. Subprolate to prolate-spheroidal
45a. Pores circular, PAD > 6 µ ..... *Platymiscium pinnatum*
45b. Pores lalongate, PAD < 6 µ
46a. PAD 2 µ ..... *Dalbergia retusa*
46b. PAD 4 - 5 µ
47a. Grains displaying equatorial constriction ..... *Platypodium elegans*
47b. Equatorial constriction absent
48a. Pores 5 x 8 µ ..... *Aeschynomene ciliata*
48b. Pores 4 x 6 µ
49a. Grains 16 - 17 µ (polar axis) ..... *Aeschynomene sensitiva*
49b. Grains 13 - 14 µ (polar axis) ..... *Machaerium floribundum*
32b. Grains > 30 µ
50a. Polar axis 45 - 60 µ
51a. Pores circular, grains heterobrochate
52a. Pores vestibulate, 7 µ diameter; exine 1.5 µ thick ..... *Centrosema pubescens*
52b. Pores common type, 15 µ diameter; exine 3 µ thick ..... *Cajanus bicolor*
51b. Pores lolongate, grains homobrochate, PAD 30 - 32 µ ..... *Calopogonium mucunoides*
50b. Polar axis 60 - 90 µ
53a. Suboblate, heterobrochate, exine 5 µ thick ..... *Mucuna rostrata*
53b. Subprolate, homobrochate, exine 3 - 4 µ thick ..... *Mucuna mutisiana*
1f. Syncolporate (suboblate, 20 - 25 µ, reticulate) ..... *Aeschynomene americana*

Aeschynomene americana L. var. *glandulosa* (Poir.) Rudd.
Syncolporate; exine semitectate, 2.5 µ thick at equator, 2.0 µ at poles, sexine reticulate, homobrochate, brochi < 1 µ wide, muri simplibaculate; colpi 22 x 6 µ; pores slightly lalongate 6 x 8 µ; amb circular; grains suboblate, 19 - 22 x 22 - 26 µ.
PAN, Blum & Tyson 1953, KE 18441, MO; plate 67:730.

Aeschynomene ciliata J. Vogel
Tricolporate; exine semitectate,, 1 µ thick, sexine reticulate, homobrochate, brochi < 1 µ wide, muri simplibaculate; colpi sharp, 12 x 2 µ, PAD 5 µ; pores lalongate 5 x 8 µ; amb circular; grains prolate-spheroidal, 15 - 17 x 14 - 16 µ.
PAN, Schmalzel 888, MO; plate 67:731.

Aeschynomene sensitiva Sw.
Tricolporate; exine semitectate, 1.0 - 1.2 µ thick, sexine reticulate, homobrochate, brochi < 1 µ wide, muri simplibaculate; colpi sharp 12 x 2 µ, PAD 4 - 5 µ; pores lalongate 4 x 6 µ; amb circular; grains subprolate to prolate-spheroidal,16 - 17 x 14 - 16 µ.
PAN, Croat 10019, PAN; plate 67:732.

Andira inermis (W. Wright) HBK
Tricolporate; exine tectate, 1.5 - 2.0 µ thick, sexine psilate; colpi 13 x 5 µ, PAD 4 µ; pores slightly protuberant 5 µ diameter; amb circular; grains oblate-spheroidal to spheroidal, 15 - 16 µ.
PAN, Croat 34321, KE 18443, MO; plate 67:733.

Cajanus bicolor DC.
Tricolporate; exine semitectate, 3 µ thick, sexine reticulate, heterobrochate, muri < 1 µ wide, lumina variable 2 - 6 µ wide, diminishing toward apertures; colpi 45 x 15 µ, covered by fine ectexinic membrane except at pore areas, edges indistinct; pores circular 15 µ diameter; annulus 2 µ wide, granulate; amb circular; grains oblate-spheroidal to prolate-spheroidal, 53 - 56 x 53 - 59 µ.
PAN, Gonzalez 18, KE 18444, MO; plate 67:734.

Calopogonium caeruleum (Benth.) Sauv.
Tricolporate; exine semitectate, < 1 µ thick, sexine reticulate, homobrochate, brochi < 1 µ wide, muri simplibaculate; colpi narrow, as long as grains; pores circular, 5 µ diameter; grains spheroidal to oblate-spheroidal, 12 - 13 x 12 - 14 µ.
BCI, Hladick 136, MO; plate 67:735.

Calopogonium mucunoides Desv.
Tricolporate; exine tectate, 3 µ thick sexine reticulate, homobrochate, brochi < 1 µ wide, muri simplicolumellate; colpi short, narrow, curved 30 x < 0.5 µ, margo 4 µ wide; pores circular to lolongate, 14 - 15 µ diameter, PAD 30 - 32 µ; amb circular; grains prolate-spheroidal, 51- 54 x 46 - 50 µ.
PAN, Schmalzel 1234, MO; plate 67:736.

Canavalia dictyota Piper.
Tricolpate; exine semitectate, 3.5 - 4.0 µ thick, sexine baculate-verrucate; colpi displaying strong equatorial constriction, 15 µ wide x 50 µ long, edge indistinct, margo large 6 µ thick, verrucae 5 µ wide, approaching baculate condition; amb semi-angular; grains oblate to oblate-spheroidal, 65 - 68 x 68 - 73 µ.
BCI, Schmalzel 1236, MO; plate 67:738.

Centrosema pubescens Benth.
Tricolporate; exine semitectate, 1.5 µ thick, sexine reticulate, heterobrochate, muri < 0.5 µ wide, lumina variable 2 - 6 µ wide, usually containing ectexinic elements, brochi diminishing toward poles; colpi 35 x 3 µ, frequently displaying equatorial constriction, margo thick, 2.0 - 2.5 µ wide, costa colpi 4 µ; pores inconspicuous, appearing circular 7 µ diameter, occasionally forming vestibulum; amb circular; grains subprolate to prolate, 45 - 50 x 35 - 38 µ.
BCI, Schmalzel 622, MO; plate 67:737.

Clitoria javitensis HBK
Stephanocolpate (5 - 6 colpate); exine tectate, 2 µ thick, sexine psilate; colpi 32 µ long, occasionally oblique at poles, displaying persistent verrucate membrane; amb usually hexagonal; grains oblate, 43 - 48 x 56 - 70 µ.
BCI, Schmalzel 258, MO; plate 68:739.

Clitoria rubiginosa Adr. Juss. in Pers. (*Clitoria falcata* Lam.)
Stephanocolpte (4 - 6 colpate); exine tectate, 2 µ thick, sexine scabrate; colpi short, width variable 15 x 8 µ, PAD 6 µ between adjacent colpi; amb circular to semi-hexagonal; grains oblate, 49 - 53 µ.
HON, Sanders 667, MO; plate 68:740.

Crotalaria cajanifolia HBK
Syncolpate (parasyncolpate); exine semitectate, 1.0 - 1.5 µ thick, sexine reticulate, homobrochate, brochi < 1 µ wide; colpi forming small triangle at poles, margo 2 µ wide; amb circular; grains prolate, 30 - 32 x 20 - 22 µ.
PAN, Schmalzel 1000, MO; plate 68:742.

Crotalaria retusa L.
Tricolporate; exine semitectate, 1 µ thick, sexine reticulate, homobrochate, brochi < 1 µ wide; colpi 20 x 2 µ; pores circular to lolongate 7 x 4 µ, usually displaying equatorial constriction; amb circular; grains subprolate, 25 - 26 x 18 - 19 µ.
PAN, Schmalzel 235, MO; plate 68:741.

Cymbosema roseum Benth.
Syncolpate (parasyncolpate); exine semitectate, 4 µ thick, sexine granulate-verrucate; colpi inconspicuous in equatorial view, 4 µ wide in polar view, margo large 7 µ wide; amb angular; grains oblate, 49 x 51 - 63 µ.
BCI, Croat 8304, MO; plate 68:744.

Dalbergia brownei (Jacq.) Urban.
Tricolporate; exine tectate 2 µ thick, sexine psilate; colpi moderately long 1 µ wide, apices irregular; pores lalongate 4.5 x 6.0 µ, frequently displaying slight projection; amb circular; grains prolate-spheroidal, 20 - 22 x 20 - 21 µ.
BCI, Schmalzel 928, MO; plate 68:743.

Dalbergia monetaria L. f.
Tricolporate; exine tectate 2 µ thick, sexine scabrate to psilate, densely columellate; colpi sharp 24 x 1 µ, margo 2.5 µ wide, interrupted at equator, PAD small; pores appearing rectangular 2 x 4 µ; amb circular; grains subprolate, 28 - 30 x 20 - 24 µ.
PERU, Revilla 663, PMA; plate 68:745.

Dalbergia retusa Hemsl.
Tricolporate; exine semitectate, 1 µ thick (nexine 0.3 µ); sexine reticulate, homobrochate, muri and lumina < 1 µ; colpi sharp, as long as grain, 2 µ wide, pores lalongate 4 x 6 µ, PAD 2 µ; amb circular; grains prolate-spheroidal to spheroidal, 14 - 15 x 13 - 14 µ.
BCI, Schmalzel 533, MO; plate 68:746.

Desmodium adscendens (Sw.) DC.
Tricolpate; exine intectate, 2.0 - 2.5 µ thick, sexine densely verrucate, verrucae 2 - 5 µ high; colpi long, narrow, sharp 40 x 1 µ, PAD 16 µ; amb circular; grains subprolate, 44 - 61 x 42 - 57 µ.
BCI, Croat 11060, MO; plate 68:747.

Desmodium axillare (Sw.) DC
Tricolporate; exine semitectate, 3.5 µ thick, sexine verrucate, verrucae variable, 2 - 15 µ high x 2 - 4 µ wide; colpi 30 - 36 x 1 µ, displaying curving edge, PAD 11 µ, margo 3 µ wide; inconspicuous pores appearing at equator, ca. 10 µ wide; amb circular; grains subprolate, 48 - 51 x 33 - 42 µ.
PAN, Taylor 73, PMA; plate 68:748.

Desmodium axillare (Sw.) DC. var.*acutifolium* (Kuntze) Urban
Tricolpate; exine intectate, 2 µ thick, sexine verrucate, verrucae variable, 1 - 5 µ; colpi long and sharp 10 µ wide, PAD 11 µ; amb circular ; grains spheroidal, 40.0 - 42.5 µ.
BCI, Croat 11797, MO; plate 68:749.

Desmodium axillare (Sw.) DC. var.*stolonifera* (Poir) Schubert
Tricolpate; exine intectate, 3 µ thick, sexine verrucate, verrucae < 1 µ high; colpi 32 x < 1 µ, PAD 12 - 16 µ, costa colpi 6 µ wide; amb circular ; grains prolate, 53 - 63 x 39 - 45 µ.
BCI, Croat 11264, MO; plate 68:750.

Desmodium cajanifolium (HBK) DC.
Tricolporate; exine intectate, 3 µ thick, sexine verrucate, verrucae wide, small; colpi 30 x 1 µ, displaying equatorial constriction, margo 3.5 µ wide, PAD 18 µ; pores scarcely distinct, frequently circular 10 µ diameter, also displaying lalongate pores, 8 x 12 µ; amb circular; grains prolate-spheroidal to oblate-spheroidal, 44 - 47 x 41 - 48 µ.
PAN, Croat 12871, MO; plate 69:751.

Desmodium canum (J. F. Gmel.) Schinz & Thell. (*Desmodium incanum* DC.)
Tricolpate; exine tectate 3 µ thick, sexine verrucate, usually retipilate, densely columellate; colpi 36 x 1 µ, margo 4 µ thick, PAD 6 - 7 µ; pores very poorly defined, apparent in slight break in colpi at equator; amb circular; grains subprolate, 50 - 54 x 37 - 49 µ.
BCI, Croat 5414, MO; plate 69:752.

Desmodium distortum (Aubl.) Macbr.
Tricolporate; exine intectate, 2.5 µ thick, sexine densely verrucate, verrucae homogeneous; colpi 28 - 30 x 1 µ, margo 4 µ thick, PAD 20 µ; colpi with equatorial constriction; pores lalongate, 10 x 14 µ; amb circular; grains prolate-spheroidal, 49 - 51 x 43 - 49 µ.
PAN, Schmalzel 376, MO; plate 69:753.

Desmodium scorpiurus (Sw.) Desv.
Tricolporate; exine intectate, 2.0 - 2.5 µ thick, sexine verrucate, verrucae homogeneous; colpi 26 x 2 µ, displaying equatorial constriction, margo 2 µ wide, PAD 12 µ; pores lalongate 10 x 16 µ; amb circular; grains prolate-spheroidal to oblate-spheroidal 29 - 31 x 29 - 32 µ.
PAN, Taylor 2, PMA; plate 69:755.

Desmodium tortuosum (Sw.) DC.
Tricolporate; exine intectate, 3 µ thick, sexine verrucate, verrucae homogeneous; colpi 15 x 6 µ, PAD 15 µ; pores slightly lalongate 6 x 7 µ; amb circular to semi-angular; grains suboblate to oblate-spheroidal, 23 - 25 x 28 - 31 µ.
PAN, Duke 4620, MO; plate 69:754.

Desmodium triflorum (L.) DC.
Tricolpate; exine tectate 1.5 - 2.0 thick, sexine verrucate, verrucae homogeneous; colpi long, sharp 10 µ wide, costa colpi present; pores apparently lacking; amb circular; grains prolate-spheroidal, 31 - 33 x 29 - 30 µ.
BCI, Hladick 87, MO; plate 69:756.

Desmodium wydlerianum Urb.
Tricolporate; exine intectate, 1.5 µ thick, sexine verrucate; colpi wide, sharp 22 x 8 µ, costa colpi 3 µ wide; pores circular 8 µ diameter, PAD 11 µ; amb circular; grains spheroidal to oblate-spheroidal, 28 - 29 x 29 - 30 µ.
BCI, Croat 5884 PMA (p), Tyson 1774, MO (d); plate 69:757.

Dioclea guianensis Benth.
Tricolporate; exine tectate 2.5 - 3.0 µ thick, sexine scabrate; colpi scarcely evident, 5 µ wide; pores inconspicuous, appearing united at poles, circular, 5 µ diameter, PAD 15 µ; amb angular; grains suboblate, 37 - 39 x 44 - 47 µ.
PAN, Croat 7147 (p), PMA, Correa 493 (d), MO; plate 69:758.

Dioclea reflexa Hook. f.
Tricolporate; exine tectate, 5 µ thick, sexine psilate; colpi as long as grain x 5 µ wide; pores lolongate, 18 x 12 µ, PAD 15 µ; amb angular; grains oblate, 50 - 52 x 66 - 70 µ.
BCI, Schmalzel 262 (p), Schmalzel 317 (d), MO; plate 69:759.

Dioclea wilsonii Standl.
Tricolporate; exine tectate, 5 - 6 µ thick, sexine scabrate; colpi inconspicuous in equatorial view, sharp, 15 µ wide, margo appearing 3 µ wide; pores endexinic, inconspicuous, PAD 16 µ; amb semi-angular; grains oblate, 81 - 86 µ.
BCI, Schmalzel 923, MO; plate 70:760.

Dipteryx panamensis (Pitt.) Record & Mell. (*D. oleifera* (Bentham))
Tricolporate; exine tectate, 2 µ thick, sexine scabrate; colpi 24 x 1 µ, displaying equatorial constriction, apices sharp, margo 2 µ wide, PAD 12 µ; pores lalongate 8 x 10 µ; amb circular; grains prolate-spheroidal, 30 - 33 x 29 - 32 µ.
BCI, Schmalzel 626, MO; plate 70:761.

Erythrina costaricensis Micheli
Triporate; exine semitectate 1.5 - 2.0 µ thick, sexine reticulate, heterobrochate, brochi 2 - 8 µ wide, diminishing toward apertures, muri < 1 µ wide, formed of small granules; pores circular 8 µ diameter, vestibulum conspicuous; amb angular; grains suboblate, 30 - 32 x 34 - 35 µ.
BCI, Croat 7623 (p) BCI, Schmalzel 94 (d), MO; plate 70:762.

Erythrina fusca Lour.
Triporate; exine semitectate, 2 µ thick, sexine reticulate, heterobrochate, brochi 2 - 8 µ wide, diminishing toward apertures, muri < 0.5 µ wide, simplicolumellate, lumina containing ectexinic elements; pores circular, 8 - 9 µ diameter, small vestibulum present; annulus apparent; amb angular; grains prolate-spheroidal to oblate-spheroidal, 33 - 37 x 34 - 36 µ.
PAN, Schmalzel 428, MO; plate 70:763.

Indigofera mucronata Spreng. ex DC. (*Indigofera jamaicensis* Spr.)
Tricolpate; exine tectate 1.0 - 1.5 µ thick, sexine psilate; colpi large, sharp, long; amb circular; grains spheroidal, 31 - 35 µ.
CR, Skutch 3936, NY (p), PAN, Schmalzel 1194, MO (d); plate 70:764.

Lonchocarpus pentaphyllus (Poir.) DC.
Tricolporate; exine semitectate, 2 µ thick, sexine reticulate, homobrochate, brochi < 1 µ wide; colpi 16 x 2 µ, displaying equatorial constriction, PAD 12 µ; pores circular to slightly lalongate, 8 - 9 µ diameter, recessed; amb circular; grains oblate-spheroidal, 23 - 24 x 22 - 23 µ
BCI, Schmalzel 748, MO; plate 70:765.

Lonchocarpus velutinus Seem.
Tricolporate; exine semitectate, 1.5 µ thick, sexine reticulate, homobrochate, brochi < 1 µ wide; colpi sharp, 16 x 4 µ, displaying equatorial constriction, PAD 9 µ; pores slightly lalongate, 8 x 10 µ; amb circular-semi-angular; grains suboblate, 24 - 26 x 28 - 31 µ.
BCI, Schmalzel 377, MO; plate 70:766.

Machaerium arboreum (Jacq.) Vogel
Tricolporate; exine semitectate, 2 µ thick, sexine reticulate, homobrochate, brochi < 1 µ wide; colpi 18 x 1.5 µ, costa colpi 2 µ wide, PAD 12 µ; pores lalongate-ovoid, 3 x 6 µ; amb circular; grains subprolate, 19 - 21 x 17 - 20 µ.
BCI, Foster 1301, MO; plate 70:767.

Machaerium floribundum Benth.
Tricolporate; exine semitectate, 1 µ thick, sexine reticulate, homobrochate, brochi < 1 µ wide; colpi long, sharp, narrow; pores circular, slightly lalongate, 2 x 4 µ; amb circular; grains prolate-spheroidal, 13 - 14 x 12 - 13 µ.
BEL, Shipp 1362, MO; plate 70:768.

Machaerium kegelii Meisn.
Tricolporate; exine semitectate, 1.5 µ thick, sexine reticulate, homobrochate, brochi < 1 µ wide, muri simplibaculate; colpi 16 x 1 µ; pores slightly lalongate to circular, 5 µ diameter; amb circular; grains subprolate, 22 - 26 x 17 - 19 µ.
BCI, Schmalzel 473, MO; plate 70:769.

Machaerium microphyllum (E. Meyer) Standl.
Tricolporate; exine semitectate, 2 µ thick, sexine reticulate, homobrochate, brochi < 1 µ; colpi 20 x 1 µ, costa colpi 2 µ wide, PAD 4 µ; pores slightly lalongate, 5 x 7 µ; amb circular; grains subprolate, 23 - 24 x 17 - 20 µ.
PAN, Schmalzel 1262, MO; plate 70:770.

Machaerium milleflorum Pitt.
Tricolporate; exine tectate 1 µ thick, sexine psilate; colpi 10 x 1 µ, costa colpi 1 µ wide; pores lalongate 3 x 5 µ; amb circular; grains subprolate, 13 - 15 x 10 - 12 µ.
PAN, Schmalzel 1383, MO; plate 70:771.

Machaerium riparium Brandegee
Tricolporate; exine tectate 1 µ thick, sexine psilate to slightly scabrate; colpi long, narrow 1 µ wide; pores slightly lalongate 4 x 5 µ; amb circular; grains prolate-spheroidal, 12 - 13 x 11 - 13 µ.
MEX, Breedlove 34026, MO; plate 70:772.

Machaerium seemannii Seem.
Tricolporate; exine semitectate, 1.5 - 2.0 µ thick, sexine slightly reticulate, homobrochate, brochi < 1 µ wide, muri simplibaculate; colpi 16 x 2 µ; pores lalongate to circular, 4.5 x 6.0 µ; amb circular; grains prolate-spheroidal, 19 - 22 x 18 - 20 µ.
BCI, Schmalzel 448, MO; plate 70:773.

Mucuna mutisiana (HBK) DC.
Tricolporate; exine tectate, 3 µ thick at equator, 4 µ at poles, sexine reticulate, homobrochate, brochi 1 µ wide, muri < 0.5 µ wide, simplibaculate, lumina containing sexinic elements; colpi 55 x 3 µ, displaying equatorial constriction, margo 2 µ wide, costa colpi 8 µ wide, PAD 18 µ; pores lolongate 16 x 8 µ; amb angular; grains subprolate, 76 - 81 x 60 - 70 µ.
BCI, Schmalzel 195, MO; plate 70:774.

Mucuna rostrata Benth.
Tricolporate; exine semitectate, 5 µ thick, sexine reticulate, heterobrochate, brochi 1 - 8 µ wide, diminishing toward poles, lumina containing abundant sexinic elements, muri 1 - 2 µ wide; colpi 60 x 6 µ, edge curving slightly, displaying equatorial constriction, vestige of margo 5 µ thick, PAD 20 µ; pores obscured by colpus, 11 µ wide, vestibulum indistinct; amb angular; grains suboblate, 68 - 70 x 74 - 86 µ.
PAN, Pittier 2450, KE 14867, MO; plate 71:775.

Myroxylon balsamum (L.) Harms. var.*pereirae* (Royle) Harms.
Tricolporate, frequently stephanocolporate (4-colporate); exine tectate, 1 µ thick, sexine psilate to scabrate; colpi long, sharp, displaying equatorial constriction, PAD 3 µ; pores obscured by colpus, circular 3 µ diameter; pseudo-vestibulum formed by ectexine extruding near pores; amb circular; grains prolate-spheroidal to spheroidal, 14 - 15 x 12.5 - 15.0 µ.
MEX, Gillis 11016, MO; plate 71:776.

Ormosia coccinea (Aubl.) Jackson var. *subsimplex* (Benth.) Rud.
Tricolporate; exine tectate 2.5 µ thick, sexine punctitegillate, bacula abundant; colpi 24.0 x 1.5 µ, displaying equatorial constriction, PAD 10 µ, costa colpi 2 µ; pores appearing circular, 16 µ diameter; amb circular; grains subprolate, 36 - 37 x 28 - 30 µ.
BCI, Schmalzel 310, MO; plate 71:777.

Ormosia macrocalyx Ducke
Tricolporate; exine tectate 2.5 - 3. µ thick, sexine scabrate; colpi long, deep, sharp 6 µ wide, displaying equatorial constriction PAD 10 µ; pores indistinct, appearing circular 10 µ diameter; amb semi-angular; grains laterally compressed, subprolate, 24 - 27 x 20 - 23 µ.
PAN, Gentry 8751, MO; plate 71:778.

Phaseolus peduncularis HBK
Triporate; exine semitectate, 2.5 - 3.0 μ thick; sexine reticulate, heterobrochate, per-reticulate (lophoreticulate), brochi 2 - 8 μ wide, muri 1 μ wide, lumina containing sexinic elements; pores 8 μ diameter, annulus present; amb circular; grains prolate-spheroidal, 44 - 45 x 42 - 44 μ.
BCI, Schmalzel 902, MO; plate 71:784.

Phaseolus trichocarpus C. Wright
Triporate; exine semitectate, 3.0 - 3.6 μ thick; sexine reticulate (per-reticulate), heterobrochate, brochi 4 - 10 μ wide, diminishing toward apertures, muri 1. 2 μ wide, lumina containing sexinic elements; pores circular 12 μ diameter, annulus present; amb circular; grains oblate-spheroidal to spheroidal, 57 - 58 x 56 - 59 μ.
PAN, Schmalzel 1036, MO; plate 71:785.

Platymiscium pinnatum (Jacq.) Dugand
Tricolporate; exine semitectate, 1 μ thick, sexine reticulate, homobrochate, brochi < 1 μ wide; colpi sometimes uniting at poles, forming small triangle, 16 x 1.5 μ, displaying equatorial constriction, PAD 7 μ; pores circular 6 μ diameter; amb circular; grains subprolate, 18 x 14 - 16 μ.
BCI, Schmalzel 573, MO; plate 71:779.

Platypodium elegans Vogel
Tricolporate; exine semitectate, 1 μ thick, sexine reticulate, homobrochate, brochi < 1 μ wide; colpi sharp sometimes uniting at poles, forming small triangle, 12 x 2 μ, displaying equatorial constriction, PAD 4 μ; pores lalongate 3 x 6 μ; amb circular; grains subprolate to prolate-spheroidal, 14 - 16 x 12 - 14 μ.
BCI, Schmalzel 619, MO; plate 71:780.

Pterocarpus officinalis Jacq.
Tricolporate; exine semitectate, 1.0 - 1.5 μ thick, sexine reticulate, homobrochate, brochi < 1 μ wide; colpi long, sharp, 2 μ wide, displaying persistent ectexinic membrane, margo 1 μ wide, PAD 5 μ; pores lalongate 4 x 6 μ, inconspicuous; amb circular; grains oblate-spheroidal, 13 - 14 x 12 - 15 μ.
PAN, Croat 15091, MO; plate 71:781.

Pterocarpus rohrii Vahl.
Tricolporate; exine semitectate, 2 μ thick, sexine reticulate, homobrochate, brochi < 1 μ wide, muri simplibaculate; colpi 16 x 3 μ, displaying equatorial constriction, costa colpi 1.5 μ, PAD 7 μ; pores circular 8 μ diameter; amb circular; grains prolate-spheroidal, 19 - 21 x 18.0 - 19.5 μ.
BCI, DeSteven 11, BCI; plate 71:782.

Rhynchosia pyramidalis (Lam.) Urban
Tricolporate; exine semitectate, 2 μ thick, sexine reticulate, homobrochate, brochi 1 μ wide; colpi sometimes uniting at poles, forming small triangle, 20 x 1 μ, usually displaying equatorial constriction, costa colpi 2 μ, PAD 5 μ; pores circular 5 μ diameter; amb circular; grains oblate-spheroidal to prolate-spheroidal, 25 - 27 μ.
BCI, Foster 2173, PMA; plate 71:783.

Teramnus uncinatus (L.) Sw.
Tricolporate; exine tectate, 1.5 μ thick, sexine psilate to slightly scabrate; colpi long, convex, PAD 5 μ; pores slightly lalongate 4 x 5 μ, aperture indistinct; amb circular; grains spheroidal to oblate-spheroidal, 15 - 16 x 14.5 - 16.0 μ.
PAN, Tyson 5240, MO; plate 71:786.

Teramnus volubilis Sw.
Tricolporate; exine tectate 1 μ thick, sexine psilate; colpi as long as grain, widening at equator; pores lalongate, 3 x 5 μ, forming costa aequatorialis; amb circular; grains suboblate, 12.5 - 14.0 x 14 - 16 μ.
PAN, D'Arcy 13458, MO; plate 71:787.

Vatairea erythrocarpa Ducke
Tricolporate; exine semitectate, 2 μ thick, sexine baculate, bacula < 1 μ high; colpi 18 x 2 μ, displaying gradual widening at equator, tenuitas present, margo 2.5 μ thick, PAD 4 μ; pores lalongate ,3 x 6 μ; amb circular; grains subprolate, 20 - 25 x 18 - 22 μ.
BCI, Foster 2933, MO; plate 71:788.

Vigna vexillata (L.) A. Rich in Sagra
Triporate; exine tectate to semitectate, 4 μ thick, sexine reticulate (per-reticulate), heterobrochate, brochi 18 - 28 μ wide, muri narrow, 1 - 2 μ wide; pores circular, 18 μ diameter, covered by gemmate ectexinic elements; amb circular, semi-angular; grains oblate-spheroidal, 73 - 92 x 84 - 96 μ.
PAN, Croat 9056, MO; plate 71:789.

LENTIBULARIACEAE

Monad; isopolar-radiosymmetric; 14-17 colporate; exine tectate; sexine psilate; colpi deep, reaching poles; pores fused, zonorate; amb circular to multilobate; grains prolate to oblate, grains 26 - 75 x 28 - 76 μ. (*1 genus, 2 species*).

Key to species:

1a. 17-colporate, equatorial axis > 50 μ, intercolpium 10 μ..... *Utricularia foliosa*
1b. 14-colporate, equatorial axis < 50 μ, intercolpium 2.5 - 3.0 μ..... *Utricularia obtusa*

Utricularia foliosa L.
17-colporate; exine 2 μ thick, intercolpium 10 μ; amb circular; grains prolate to oblate, 50 - 75 x 50 - 76 μ.
PAN, Bartlett & Lasser 16601, KE 18101, MO; plate 72:790.

Utricularia obtusa Sw.
14-colporate; exine < 1 µ thick, intercolpium 2.5 - 3.0 µ; amb circular-lobate; grains oblate-spheroidal to suboblate, 26 - 33 x 28 - 38 µ.
PERU, Diaz et al. 1212 (p), BCI, Schmalzel 505 (d), MO; plate 72:791.

LOGANIACEAE

Monad; isopolar-radiosymmetric; tectate; tricolpate, tricolporate, syncolpate; exine 1.0 - 2.5 µ thick; sexine psilate to scabrate, microreticulate to granulate; nexine conspicuous, ca. 0.5 µ; colpi as long as grains, wide, deep, margo present, PAD variable; pores lalongate; amb circular; grains oblate to subprolate; grains 26-54x 23-65µ *(2 genera, 6 species; additional references: 136, 189).*

Key to genera and species:

1a. Tricolporate (scabrate, oblate, 25 - 35 µ, pores lolongate)..... *Strychnos brachistantha*
1b. Parasyncolpate
  2a. Oblate, 35 - 45 µ x 45 - 50 µ, exine 2.5 µ thick..... *Strychnos panamensis*
  2b. Subprolate, 30 - 35 x 20 - 30 µ, exine 1.0 - 1.5 µ thick..... *Strychnos darienensis*
1c. Tricolpate
  3a. Subprolate, sexine scabrate..... *Strychnos darienensis*
  3b. Oblate, subprolate, or spheroidal, sexine psilate
    4a. Equatorial axis > 52 µ..... *Spigelia humboldtiana*
    4b. Equatorial axis < 52 µ
      5a. Oblate, exine 2.5 µ thick, amb circular..... *Strychnos panamensis, S. toxifera*
      5b. Suboblate to spheroidal, exine 2.0 µ thick, amb angular..... *Spigelia anthelmia*

Spigelia anthelmia L.
Tricolpate; exine 2.0 µ thick, sexine psilate; colpi 9 µ wide, costa colpi 2 µ, PAD 22 - 25 µ, margo present; amb semi-angular; grains suboblate-oblate spheroidal, 36 - 49 x 45 - 53 µ.
PAN, Correa et al. 1594, PMA; plate 72:792.

Spigelia humboldtiana Cham. & Schlechter
Tricolpate; exine 1.5 - 2.0 µ thick, sexine psilate to scabrate; colpi 9 µ wide, margo present, PAD 18 µ; amb semi-angular; grains suboblate, 42 - 54 x 52 - 65 µ.
PAN, Mori & Kallunki 5461, PMA; plate 72:793.

Strychnos brachistantha Standl.
Tricolporate; exine 1.5 µ thick, sexine scabrate, columellae small; colpi 5 µ wide; pores lolongate, 9 x 7 µ; amb semi-angular; grains oblate, 26 - 27 x 31 - 36 µ.
BEL, Gentry 7765, KE 18093, MO; plate 72:794.

Strychnos darienensis Seem.
Parasyncolpate and tricolpate; exine 1.0 - 1.5 µ thick, sexine scabrate; colpi 25 - 28 x 1 µ, uniting at poles; amb circular, semi-angular; grains subprolate, 30 - 35 x 23 - 28 µ.
BCI, Schmalzel 278, MO; plate 72:795.

Strychnos panamensis Seem.
Parasyncolpate and tricolpate; exine 2.5 µ thick, sexine reticulate, homobrochate, brochi < 1 µ wide, lumina 0.5 µ wide; colpi 10 µ wide; amb semi-angular; grains oblate 35 - 43 x 48 - 51 µ.
BCI, Croat 10229, KE 18094, MO; plate 72:796.

Strychnos toxifera Benth.
Tricolpate; exine 1.0 - 1.5 µ thick, sexine psilate; colpi 12 µ long x 8 µ wide, aperture simple; amb circular; grains spheroidal, 35 µ.
BCI, Croat 7278, MO; no plate.

LORANTHACEAE

Monad; isopolar to heteropolar, asymmetric to radiosymmetric; tectate; tricolpate, tricolporate, periporate, syncolpate, syncolporate; exine variable; sexine psilate to scabrate; amb circular to angular-semilobate; grains usually oblate, 15 - 46 x 21 - 46 µ. *(4 genera, 6 species; additional reference: 50).*

Key to genera and species:

1a. Poles displaying tri-annulate configuration (grains tricolpate, oblate)..... *Oryctanthus* (3 spp.)
1b. Poles not tri-annulate (apertures conspicuous)
  2a. Periporate (diplodemicolpate); pores 8 - 10, half at each pole..... *Phthirusa pyrifolia*
  2b. Tricolporate or syncolporate (prolate; sexine scabrate; amb circular)..... *Phoradendron quadrangulare*
  2c. Syncolpate (oblate, sexine psilate, amb angular)..... *Struthanthus orbicularis*

Oryctanthus alveolatus (HBK) Kuijt.
Isopolar-radiosymmetric, tricolpate; exine tectate, 2.0 µ thick (sexine 1 µ, nexine 1 µ), sexine psilate, slightly granulate, thickening at poles and forming 3 radii of 7 x 2 µ, bifurcated, structurally complex; colpi 10 x 3 - 6 µ, costa colpi conspicuous, 1.5 µ wide; grains seen from polar view apparently oblate to spheroidal, 33 - 38 µ.
BCI, Schmalzel 732, MO; plate 72:797.

Oryctanthus cordifolius (Presl.) Urban
Isopolar-radiosymmetric, tricolpate; exine tectate, 4 μ thick, sexine psilate to granulate, 3 radii 8 x 2 μ, forming cells ca. 8 μ wide; colpi inconspicuous; pores 4 μ diameter; amb circular; grains appearing spheroidal to oblate, 35 - 40 μ.
PAN, Bartlett & Lasser 16405, MO; plate 72:798.

Oryctanthus occidentalis (L.) Eichl. in Mart.
Isopolar-radiosymmetric, tricolpate; exine tectate, external layer apparently 2 - 4 μ thick, sexine psilate, 3 radii 7 μ long x 2.5 - 3.0 μ wide, forming cells 12 μ diameter having margins 0.8 μ thick; colpi inconspicuous, 7 x 3 μ, appearing interrupted medially by ectexinic constriction; amb circular; grains spheroidal, 42 - 45 μ.
BCI, Schmalzel 974, MO; plate 72:799.

Phoradendron quadrangulare (HBK) Krug. & Urban
Isopolar-radiosymmetric, syncolporate, tricolporate; exine tectate, 2 μ thick at equator (sexine 1 μ, nexine 1 μ), sexine scabrate; colpi large, as long as grain x 1.0 - 1.5 μ wide, sharp at terminus but usually united at poles, constricted at equator, costa colpi 2.5 μ; pores endexinic, circular, 3 μ diameter; amb circular to subtriangular; grains prolate to subprolate, 24 - 26 x 20 - 21 μ.
GUA, Ortiz 1879, PMA; plate 72:800.

Phthirusa pyrifolia (HBK) Eichl. in Mart.
Isopolar-radiosymmetric, periporate (diplodemicolpate) , 3 pores at each pole; exine tectate 1 - 2 μ thick, sexine granulate, baculate, columellae abundant; pores at each angle of grain, 8 - 10 per grain, ovate, 4 x 3 μ, interporium 10 μ; amb semilobate; grains oblate to peroblate, 16 x 27 - 32 μ.
BCI, Schmalzel 973, MO; plate 72:801.

Struthanthus orbicularis (HBK) Blume in R. & S.
Isopolar-radiosymmetric, syncolpate (tricolpate); exine tectate 2 μ thick, sexine slightly striate, nexine as thick as sexine; colpi 3 μ wide, united at poles to form triangle, costa colpi 1.5 μ, club type, conspicuous granules extended almost to poles; amb angular, semilobate; grains oblate to peroblate 15 - 20 x 24 - 27 μ.
PAN, Croat 14449, MO; plate 73:802.

LYTHRACEAE

Monad; isopolar, radiosymmetric; tectate; tricolporate and syncolporate; exine 1 - 2 μ thick; sexine scabrate; colpi long, sharp, narrow; pores circular, lolongate and lalongate; amb circular to semi-angular; grains oblate to prolate, 16 - 48 x 13 - 36 μ *(3 genera, 3 species; additional references: 26, 61, 155).*

Key to genera and species:

1a. Tricolporate or syncolporate, sexine striate..... *Cuphea carthagenensis*
1b. Tricolporate, sexine lacking projections
  2a. Polar axis < 30 μ, grains subprolate, pores circular..... *Adenaria floribunda*
  2b. Polar axis > 30 μ, grains prolate, pores lalongate..... *Lafoensia punicifolia*

Adenaria floribunda HBK
Tricolporate; exine 1 - 2 μ, sexine psilate; colpi 16 x 1 μ, displaying equatorial constriction; pores 4 μ diameter; amb semi-angular; grains subprolate 16 - 20 x 13 - 17 μ.
BCI, Schmalzel 620, MO; plate 73:803.

Cuphea carthagenensis (Jacq.) Macbr.
Syncolporate; exine 1 μ thick, sexine striate; pores lolongate 5 x 3 μ, labrum type; amb semi-angular; grains oblate, 19 x 27 - 31 μ.
PAN, Tyson 2143, KE 18269, MO; plate 73:804.

Lafoensia punicifolia DC.
Tricolporate; exine 1.5 μ, sexine scabrate; pores operculate, lalongate 6 x 9 μ; amb circular; grains prolate, 36 - 48 x 26 - 36 μ.
PAN, Dwyer 7131, KE 18270, MO; plate 73:805.

MALPIGHIACEAE

Monad; isopolar-radiosymmetric and apolar-asymmetric; tricolporate, stephanocolporate, periporate, pericolporate, extraporate; exine 1.5 - 8.0 μ thick, tectate and semitectate; sexine psilate, scabrate, verrucate, reticulate to foveolate; pores 6 to 10 per grain, colpi resembling pseudocolpi and not well defined in periaperturate grains; amb circular; grains spheroidal when periaperturate and prolate-spheroidal to oblate-spheroidal when triaperturate, 13 - 81 x 12 - 81 μ. *(10 genera, 20 species; additional reference: 80).*

Key to genera and species:

1a. Tricolporate, sexine reticulate
  2a. 20 - 23 μ, pores circular, 6 μ diameter..... *Spachea membranacea*
  2b. 13 - 18 μ, pores lalongate
    3a. Prolate-spheroidal to spheroidal, exine 1.5 μ thick..... *Byrsonima crassifolia*
    3b. Oblate-spheroidal to spheroidal, exine 2.0 μ thick..... *Byrsonima spicata*
1b. Stephanocolporate (4-colporate)..... *Spachea membranacea*
1c. Periporate
  4a. Verrucate
    5a. > 48 μ, exine 6 μ thick, pores having regular arrangement..... *Tetrapteris macrocarpa*

5b. < 48 µ, exine 1.5 µ thick, pores scattered ..... *Mascagnia hippocrateoides*
4b. Psilate
6a. > 34 µ
7a. Exine 3 µ thick, grains 34 - 38 µ, 6 - 8 porate ..... *Bunchosia cornifolia*
7b. Exine 5 - 8 µ thick, grains 35 - 50 µ, 6-porate ..... *Tetrapteris discolor*
6b. < 34 µ
8a. Exine 2.0 - 2.5 µ thick, pores 2 µ diameter ..... *Hiraea quapara*
8b. Exine 3 µ thick, pores 5 - 10 µ diameter ..... *Stigmaphyllon lindenianum*
1d. Pericolporate
9a. Exine > 4 µ thick
10a. 70 - 80 µ ..... *Stigmaphyllon hypargyreum*
10b. 36 - 58 µ
11a. Exine 7 µ thick ..... *Stigmaphyllon ellipticum*
11b. Exine 4 - 5 µ thick
12a. Pores 10 per grain ..... *Malpighia romeroana*
12b. Pores 6 per grain
13a. Ca. 56 µ, pores 8 - 9 µ diameter ..... *Stigmaphyllon puberum*
13b. Ca. 39 µ, pores 5 µ diameter ..... *Tetrapteris seemannii*
9b. Exine < 4 µ thick
14a. > 30 µ
15a. Exine 2 µ thick
16a. Pores always 6 per grain, 7 µ diameter ..... *Hiraea reclinata*
16b. Pores 6 - 8 per grain, variable diameter, 6 - 10 µ ..... *Banisteriopsis cornifolia**
15b. Exine 2.5 - 3.5 µ thick
17a. Grains ca. 51 µ, pores 8 - 10 µ diameter ..... *Hiraea faginea*
17b. Grains ca. 41 µ, pores 3.5 - 7.0 µ diameter
18a. Interporium 15 µ ..... *Mascagnia nervosa*
18b. Interporium 18 µ ..... *Hiraea grandifolia*
14b. < 30 µ ..... *Heteropteris laurifolia*
1e. Extraporate (pores free and appearing as colpi, forming rows) ..... *Tetrapteris macrocarpa*

Banisteriopsis cornifolia (HBK) C. B. Robinson ex Small (***Banisteriopsis wurdackii*** B. Gates)
Stephanocolporate (6-8 colporate); exine tectate, 2 µ thick, sexine psilate; colpi 18 x 6 µ; pores 6 - 10 µ diameter, interporium 15 µ; amb circular; grains spheroidal, variable in size, 40 - 51 µ.
PAN, Gentry 6350, KE 18411, MO; plate 73:806.

Bunchosia cornifolia HBK
stephanocolporate (6-8 colporate); exine tectate, 3 µ thick, sexine granulate; pores 6 - 7 µ diameter, interporium 15 µ; grains spheroidal, 34 - 38 µ.
PAN, Tyson & Blum 4013, KE 18412, MO; plate 73:807

Byrsonima crassifolia (L.) HBK
Tricolporate; exine semitectate, 1.5 µ thick, sexine reticulate, homobrochate, brochi < 1 µ wide, muri simplibaculate; colpi 10 x 1 µ, PAD relatively short; pores lalongate 1.5 x 5 - 6 µ; grains prolate-spheroidal to oblate-spheroidal, 13 - 14 x 12 - 13 µ.
BCI, Schmalzel 647, MO; plate 73:808.

Byrsonima spicata (Cav.) HBK
Tricolporate; exine semitectate, 2 µ thick, sexine reticulate, homobrochate; colpi 10 x 1 µ; PAD relatively short; pores lalongate 2.5 x 5.0 µ; grains spheroidal to oblate-spheroidal, 16 - 18 x 16.5 - 18.0 µ.
BCI, Croat 11133, KE 18414, MO; plate 73:809.

Heteropteris laurifolia (L.) Adr. Juss.
Stephanocolporate (6-colporate); exine tectate, 2 µ thick, sexine psilate; pores circular 5 µ diameter, interporium 15 µ; grains spheroidal, 26 - 28 µ.
PAN, Schmalzel 1398, MO; plate 73:810.

Hiraea faginea (Sw.) Niedenzu
Stephanocolporate (6-colporate); exine semitectate, 3.0 - 3.5 µ thick, sexine foveolate; colpi variable; pores circular, 8 - 10 µ diameter, regular arrangement, interporium 25 µ; grains spheroidal, 48 - 54 µ.
PAN, Stern et al. 898, KE 18416, MO; plate 73:811.

Hiraea grandifolia Standl. & Wms.
Stephanocolporate (6-colporate); exine tectate, 2.5 µ thick, sexine granulate; colpi variable; pores circular, 5.0 - 7.5 µ diameter, regular arrangement, interporium 18 µ; grains spheroidal, 38 - 42 µ.
BCI, Croat 12697, MO; plate 73:812

Hiraea quapara (Aubl.) Morton
Periporate (6-porate); exine tectate, 2.0 - 2.5 µ, sexine psilate to scabrate; pores circular, 2 µ diameter, regular arrangement; amb circular; grains spheroidal, 23.5 - 26 µ.
PAN, Tyson et al. 4518, KE 18417, MO; plate 73:813.

Hiraea reclinata Jacq.
Stephanocolporate (6-colporate); exine tectate, 2 µ thick, sexine psilate; colpi variable; pores circular, 7 - 8 µ diameter, interporium 17 - 18 µ, regular arrangement; grains spheroidal, 36 - 39 µ.
BCI, Schmalzel 295, MO; plate 73:814.

Malpighia romeroana Cuatr.
Periporate (10-porate); exine tectate, 5 µ thick, sexine psilate; colpi variable; pores circular, 8 µ diameter, interporium 18 µ, irregular arrangement; grains spheroidal, 41 - 58 µ.
BCI, Croat 5985, KE 18419, MO; plate 74:815.

Mascagnia hippocrateoides (Tr. & Planch) Niedenzu
Periporate (6-porate); exine tectate, 1.5 µ thick, sexine verrucate; colpi (if present) inconspicuous; pores circular, 6 µ diameter, irregular arrangement; grains spheroidal, 44 - 48 µ.
BCI, Croat 14845, KE 18420, MO; plate 74:816.

Mascagnia nervosa Niedenzu
Periporate (6-porate); exine tectate, 3 µ thick, sexine psilate; colpi variable; pores circular, 3.5 - 4.0 µ diameter, regular arrangement, interporium 15 µ; grains spheroidal, 38 - 43 µ.
BCI, Montgomery 125, KE 18421, MO; plate 74:817.

Spachea membranacea Cuatr.
3-4 colporate; exine semitectate, 1.5 µ thick, sexine reticulate, homobrochate, bochi < 1 µ wide; colpi 15 x 6 µ; pores circular, 6 µ diameter; grains prolate-spheroidal, 20 - 23 x 20 - 23 µ.
BCI, Schmalzel 709, MO; plate 74:818

Stigmaphyllon ellipticum (HBK) Juss.
Stephanocolporate (6-colporate); exine tectate, 7 µ thick, sexine psilate to verrucate, verrucae 3 - 4 x 10 - 12 µ; pores circular, 5 µ diameter; amb circular; grains spheroidal, 47 - 51 µ.
BCI, Schmalzel 1307, MO; plate 74:819.

Stigmaphyllon hypargyreum Tr. & Planch.
Periporate (>7-porate); exine tectate, 4 µ thick, sexine scabrate; pores circular, 6 µ diameter, irregular arrangement; grains spheroidal, 70 - 81 µ.
BCI, Croat 7226, MO; plate 74:821.

Stigmaphyllon lindenianum Juss.
Periporate (6-porate); exine tectate, 3 µ thick, sexine scabrate; pores circular, 5 - 10 µ diameter, regular arrangement; grains spheroidal, 25 -34 µ.
PAN, Croat 10146, MO; plate 74:820.

Stigmaphyllon puberum (Rich.) Juss.
Periporate (6-porate); exine tectate, 5 µ thick, sexine psilate; colpi variable; pores circular, 8 - 9 µ diameter, regular arrangement; grains spheroidal, 55 - 57 µ.
BCI, Croat 11303, MO; plate 74:822.

Tetrapteris discolor (G. Meyer) DC.
Periporate (6-porate); exine tectate, 5 - 8 µ thick, sexine psilate; pores circular, 5 - 9 µ diameter, regular arrangement; grains spheroidal, 35 - 50 µ.
PAN, Steiner, no voucher, BCI; plate 75:824.

Tetrapteris macrocarpa Johnston
Periporate (6-porate); exine tectate, 6 µ thick, sexine verrucate, verrucae 6 - 7 µ, elliptic areas reticulate; pores circular, 6 µ diameter, appearing annulate, resembling extraporate type; grains spheroidal, 48 - 55 µ.
BCI, Johnson & Foster, no voucher, BCI; plate 75:825.

Tetrapteris seemannii Tr. & Planch.
Stephanocolporate (6-colporate); exine tectate, 4 µ thick, sexine psilate; colpi variable, pores circular, 5 µ diameter, regular arrangement; grains spheroidal, 36 - 42 µ.
PAN, Gentry 1778, MO; plate 74:823.

MALVACEAE

Monad; apolar, asymmetric; tectate; periporate (30 - 80 pores); exine thick; sexine echinate, microbaculate, displaying large conical or sharp echini, nexine columellate; pores circular, 4 - 8 µ diameter; grain form circular; grains spheroidal, large to very large, 70 - 266 µ. (*5 genera, 10 species; additional references: 25, 57, 126, 149, 158, 203).*

Key to genera and species:

1a. > 200 µ
  2a. Echini > 30 µ high ..... *Pavonia rosea**
  2b. Echini < 30 µ high
    3a. Exine < 12 µ thick (including ornamentation) ..... *Pavonia dasypetala**
    3b. Exine > 12 µ thick (including ornamentation) ..... *Pavonia paniculata*
1b. 130 - 190 µ
  4a. 140 - 165 µ, > 60 pores, echini < 20 µ high ..... *Abelmoschus moschatus*
  4b. 165 - 185 µ, < 60 pores, echini > 20 µ high ..... *Hibiscus* spp.
1c. 70 - 129 µ
  5a. Echini conical, > 10 µ, pores > 6 µ in diameter ..... *Hampea appendiculata*
  5b. Echini sharp, < 10 µ, pores < 6 µ in diameter
    6a. < 90 µ ..... *Sida rhombifolia*

6b. > 90 µ..... *Sida acuta*

Abelmoschus moschatus Medic.
60 - 65 pores; exine 3 - 5 µ thick, sexine echinate, echini 18 - 20 µ high, conical, 7 µ wide at base, separated by 25 - 30 µ; pores circular 7.5 µ diameter, interporium 25 µ; grains spheroidal, 142 - 167 µ.
PAN, Duke 4159, MO; plate 75:826..

Hampea appendiculata (Donn. Sm.) Standl. var. *longicalyx* Fryx.
< 30 pores; exine 2 - 4 µ thick, sexine echinate, echini 13 - 14 µ high, separated by 15 µ, surface between echini baculate, 5 µ wide at base; pores circular 6 - 7 µ diameter, interporium 20 µ; grains spheroidal, 95 - 120 µ.
BCI, Croat 12945, MO; plate 75:827

Hibiscus bifurcatus Cav.
Ca. 50 pores; exine 5 µ thick, sexine echinate, surface granulate, echini 22 - 25 µ high, 8 - 12 µ wide at base; pores circular, 4 - 6 µ diameter, interporium 17 - 35 µ; grains spheroidal, 165 - 182 µ.
BCI, Croat 4254, MO; plate 75:828.

Hibiscus rosa-sinensis L.
> 50 pores; exine 5 - 6 µ thick, sexine echinate, echini 21 - 23 µ high, surface granulate; pores circular, 5 µ diameter, interporium 22 - 25 µ; grains spheroidal, 175 - 180 µ..
PAN, Tyson 5323, MO; plate 75:829.

Hibiscus sororius L. f.
< 30 pores; exine 5 - 6 µ thick, sexine echinate, echini 23 µ high, surface granulate; pores circular, 7 µ diameter, interporium 25 µ; grains spheroidal, 165 - 182 µ
PAN, Croat 5273, MO; plate 75:830.

Pavonia dasypetala Turcz. (*Lopimia dasypetala* (Turcz.) Standl.)
> 70 pores; exine 10 µ thick, sexine echinate, echini 28 x 10 µ, separated by 15 µ, surface microbaculate; pores circular, 8 µ diameter, interporium 30 µ; grains spheroidal, 205 - 232 µ.
BCI, Croat 4330, MO; plate 76:831.

Pavonia paniculata Cav.
> 80 pores; exine 14 µ thick, sexine echinate, echini 27 x 8 µ, separated by 28 µ, surface microbaculate; pores circular, 8 µ diameter, interporium 21 µ; grains spheroidal, 204 - 237 µ.
PAN, Croat 12908, MO; plate 76:832.

Pavonia rosea Schlechter (Steud.) [*P. schiedeana* Steud.)
Ca. 80 pores; exine 12 µ thick, sexine echinate, echini 35 x 10 µ, separated by 40 µ, surface microbaculate; pores circular, 7 µ diameter, interporium 28 µ; grains spheroidal, 223 - 266 µ.
PAN, Dwyer 2107, KE 18297, MO; plate 76:833.

Sida acuta Burm. F.
< 30 pores; exine 4 - 6 µ thick, sexine echinate, echini 7 µ high, base 8 µ wide, apices separated by 11 µ; pores circular, 5 - 6 µ diameter, interporium 25 µ; grains spheroidal, 93 - 114 µ.
BCI, Schmalzel 983 (p), PMA, Tyson et al. 3773 (d); plate 76:834.

Sida rhombifolia L.
< 30 pores; exine 4 µ thick, sexine echinate, microbaculate, echini 4 x 4 µ, separated by 8 µ; pores circular, 4 µ diameter, interporium 12 µ; grains spheroidal, 70 - 85 µ.
BCI, Schmalzel 899, MO; plate 76:835.

MARCGRAVIACEAE

Monad; isopolar, radiosymmetric; tectate; tricolporate; exine variable between apex and aperture; sexine psilate, microreticulate; colpi displaying equatorial constriction; pores lalongate; amb circular; grains oblate-spheroidal and prolate-spheroidal; grains 18 - 29 µ. (*2 genera, 2 species; additional references: 9, 132).*

Key to genera and species:

1a. Oblate-spheroidal, exine 1.5 µ thick at poles, sexine microreticulate..... *Marcgravia nepenthoides*
1b. Prolate-spheroidal, exine 2.5 µ thick at poles, sexine psilate..... *Souroubea sympetala*

Marcgravia nepenthoides Seem.
Exine 1.5 µ thick, sexine microreticulate; colpi as long as grain x 1 µ, displaying equatorial constriction; pores 3 x 7 µ, costa pori 3 µ, club type; grains variable, oblate-spheroidal, 18 - 23 x 19 - 28 µ.
BCI, Croat 7033, KE 18255, MO; plate 76:836.

Souroubea sympetala Gilg.
Exine 2.5 µ thick, sexine psilate; colpi as long as grain x 1 µ, displaying equatorial constriction; pores 3 x 7 µ, costa pori 5 µ; grains prolate-spheroidal, 28 - 29 x 26 - 29 µ.
BCI, Croat 7841, KE 18256, MO; plate 76:837.

MELASTOMATACEAE

Monad; isopolar, radiosymmetric; tectate and semitectate; heterocolpate, heterosyncolpate, hetero-para-syncolpate (3 colpori alternating with 3 pseudocolpi); exine 1 - 2 µ thick; sexine psilate, granulate, rugulate, baculate, verrucate and striate; colpori usually longer than pseudocolpi, frequently displaying equatorial constriction; amb circular to semilobate or semiangular; grains usually prolate-spheroidal to subprolate, 10 - 34 x 8 - 37 µ. (*14 genera, 35 species*).

Key to genera and species:

1a. Hetero-para-syncolpate ..... *Miconia hondurensis*
1b. Heterosyncolpate
  2a. Psilate
    3a. 12.0 - 13.5 x 13.5 - 14.0 µ, amb semiangular ..... *Adelobotrys adscendens*
    3b. 20.0 - 21.5 x 17.0 - 18.5 µ, amb circular ..... *Clidemia capitellata*
  2b. Verrucate ..... *Arthrostema alatum*
1c. Heterocolpate
  4a. Baculate ..... *Henriettea succosa*
  4b. Striate ..... *Schwackaea cupheoides*
  4c. Granulate
    5a. Exine ≤ 1 µ thick
      6a. PAD < 8 µ
        7a. PAD 3 µ ..... *Clidemia octona*
        7b. PAD 7 µ ..... *Bellucia grossularioides*
      6b. PAD > 8 µ ..... *Miconia nervosa*
    5b. Exine > 1 µ thick
      8a. Oblate-spheroidal to prolate-spheroidal, colpori longer than pseudocolpi *Clidemia purpureo-violacea**
      8b. Prolate-spheroidal, colpori as long as pseudocolpi ..... *Clidemia septuplinervia*
  4d. Rugulate
    9a. Oblate-spheroidal to spheroidal
      10a. < 28 µ, colpi lacking equatorial constriction ..... *Miconia serrulata*
      10b. > 28 µ, colpi displaying equatorial constriction ..... *Mouriri myrtilloides parvifolia*
    9b. Subprolate to prolate
      11a. >20 µ
        12a. Exine < 1.5 µ thick, pores lalongate 5 x 11 µ ..... *Aciotis levyana*
        12b. Exine > 1.5 µ, pores subcircular 4 - 5 µ diameter ..... *Topobea praecox*
      11b. < 20 µ ..... *Miconia shattuckii*
  4e. Psilate
    13a. < 12 µ ..... *Leandra dichotoma*
    13b. 12 - 15 µ
      14a. Exine < 1 µ thick ..... *Clidemia collina*
      14b. Exine > 1 µ
        15a. Colpori displaying equatorial constriction ..... *Miconia lateriflora, M. lonchophylla*
        15b. Colpori lacking equatorial constriction
          16a. Pores circular, 3.5 µ diameter ..... *Miconia borealis**
          16b. Pores lalongate, 2 x 6 µ ..... *Miconia lacera, M. prasina*
    13c. 16 - 20 µ
      17a. Colpori displaying equatorial constriction ..... *Tibouchina longifolia*
      17b. Colpori lacking equatorial constriction ..... *Miconia* (4 spp.), *Clidemia dentata, Ossaea quinquenervia, Conostegia* (4 spp.)
    13d. > 20 µ
      18a. Exine 1 µ thick ..... *Miconia elata*
      18b. Exine 1.5 µ thick ..... *Miconia impetiolaris*

Aciotis levyana Cogn.
Heterocolpate; exine tectate, 1.5 µ thick, sexine rugulate, slightly striate; pseudocolpi 18 x 1.5 µ; pores lalongate, 5 x 11 µ; amb circular; grains subprolate, 27 - 29 x 20 - 22 µ.
PAN, Croat 13179, MO; plate 76:838.

Adelobotrys adscendens (Sw) Tr.
Heterosyncolpate; exine tectate, 1 µ thick, sexine psilate; pseudocolpi 8.0 x 0.5 µ, joined at poles; pores lalongate, 2 x 4 µ; amb semiangular; grains oblate-spheroidal to spheroidal, depressed at poles, 12.0 - 13.5 x 13.5 - 14.0 µ.
PAN, Dressler & Butcher, MO; plate 76:839.

Arthrostema alatum Tr.
Heterosyncolpate; exine semitectate, 1.5 µ thick, sexine slightly verrucate; colpori indistinct, PAD ca. 10 µ; pores lalongate, 2.5 x 6.0 µ; amb circular; grains subprolate, depressed at poles, 23 - 25 x 18 - 20 µ.
BCI, Foster 2355, MO; plate 76:840.

Bellucia grossularioides (L.) Tr.
Heterocolpate; exine tectate,1 µ thick, sexine granulate; pseudocolpi large, PAD 7 µ; pores transversely parallel, 2 x 6 µ; amb hexalobate; grains subprolate, 19 - 20 x 16 - 18 µ.
PAN, Lasser 5292, MO; plate 76:841.

Clidemia capitellata (Bonpl.) D. Don ex DC.
Heterosyncolpate; exine tectate, 1.5 µ thick, sexine psilate; colpi displaying equatorial constriction; pores circular, 4 µ diameter; amb circular; grains subprolate, 20.0 - 21.5 x 17.0 - 18.5 µ.
BCI, Schmalzel 981, MO; plate 76:842.

Clidemia collina Gleason
Heterocolpate; exine tectate, ca. 0.8 µ thick, sexine psilate; pseudocolpi 8 x 2 µ, displaying equatorial constriction; amb circular; grains prolate-spheroidal, 14.0 - 14.5 x 12.0 - 12.5 µ.
PAN, Croat 27232, KE 18219, MO; plate 76:843.

Clidemia dentata D. Don
Heterocolpate; exine tectate, 1.5 µ thick, sexine psilate; colpori as long as pseudocolpi, 12 x 1 µ, PAD 8 µ; pores lalongate 2.5 x 4.0 µ; amb circular; grains prolate-spheroidal, 16.0 - 16.5 x 15 µ.
PAN, Tyson & Chu 1960, MO; plate 76:844.

Clidemia octona (Bonpl.) D. Don
Heterocolpate; exine tectate, 1 µ thick, sexine granulate; colpi and pseudocolpi as long as grain, PAD 3 µ; amb hexalobate; grains subprolate ,17.5 - 19.5 x 15.0 - 16.5 µ.
PAN, Croat 6150, MO; plate 76:845.

Clidemia purpureo-violacea Cogn. (*C. discolor* (Triana) Cogn.)
Heterocolpate; exine tectate, 1.5 µ thick, sexine granulate; colpori longer and wider than pseudocolpi x 3.5 µ wide, PAD 8 µ; pores lalongate 8.0 x 2.5 µ; amb hexalobate; grains oblate-spheroidal to prolate-spheroidal, 18.5 - 23.0 x 16 - 22 µ.
PAN, Lewis et al. 5563, MO; plate 76:846.

Clidemia septuplinervia Cogn.
Heterocolpate; exine tectate, 1.5 µ thick, sexine granulate; pores lalongate 2.5 x 6.0 µ; amb hexalobate; grains subprolate, 18 - 21 x 15.0 - 17.5 µ.
PAN, D'Arcy 10618, KE 18220, MO; plate 76:847.

Conostegia bracteata Tr.
Heterocolpate; exine tectate, 0.6 µ thick, sexine psilate; pseudocolpi and colpori as long as grain; pores lalongate, 2 x 8 µ; amb hexalobate; grains subprolate to prolate-spheroidal, 15.5 - 18.5 x 13.5 - 15.5 µ.
PAN, Gentry 1380, MO; plate 76:848.

Conostegia cinnamomea (Beurl.) Wurdack
Heterocolpate; exine tectate, 1 µ thick, sexine psilate; colpori longer than pseudocolpi, PAD 5 µ; pores lalongate, 1 x 6 µ; amb hexalobate; grains prolate-spheroidal, 16.5 - 17.5 x 16.5 µ.
PAN, Webster 16893, KE 18221, MO; plate 76:849.

Conostegia speciosa Naud.
Heterocolpate; exine tectate, 1 µ thick, sexine psilate; colpori as long as grain; pores lalongate, 2 x 7 µ; amb hexagonal; grains subprolate to prolate-spheroidal ,15.0 - 17.5 x 13.0 - 14.5 µ.
PAN, Blum 1501, MO; plate 76:850.

Conostegia xalapensis (Bonpl.) D. Don
Heterocolpate; exine tectate, 1 µ thick, sexine psilate; colpori as long as grain x 2 µ wide, PAD 6 µ; pores lalongate, 4 x 6 µ; amb circular; grains spheroidal, 14.5 x 13.5 - 14.5 µ.
BCI, Schmalzel 380, MO; plate 76:851.

Henriettea succosa (Aubl.) DC.
Heterocolpate; exine tectate, 1.5 µ thick, sexine baculate; colpori inconspicuous, pseudocolpi 9.0 x 0.5 µ wide; pores lalongate; amb hexagonal; grains prolate, 22.5 - 23.5 x 14 - 17 µ.
PAN, Croat 15172, MO; plate 77:852.

Leandra dichotoma (D. Don.) Cogn.
Heterocolpate; exine tectate, < 1 µ, sexine psilate; pseudocolpi as long as grain x 2 µ wide; colpori inconspicuous; amb circular to semi-angular; grains prolate-spheroidal, 10.0 - 11.5 x 9.5 - 10.5 µ.
PAN, Croat 11277 (p), BCI, Foster 2875 (d), MO; plate 77:853.

Miconia affinis DC.
Heterocolpate; exine tectate, 1 µ thick, sexine psilate; colpori as long as grain x 1 µ wide, displaying equatorial constriction, PAD 5.2 µ; pores 2 µ wide; amb hexalobate; grains subprolate, 17.5 - 19.5 x 14.5 - 15.5 µ.
PAN, Croat 5696, MO; plate 77:854.

Miconia argentea (Sw.) DC.
Heterocolpate; exine tectate, 1 µ thick, sexine psilate; colpori 14 x 1 µ wide, displaying equatorial constriction, PAD 4 µ; amb hexalobate; grains prolate, 14 - 16 x 10.0 - 10.5 µ.
PAN, Croat 5362, MO; plate 77:855.

Miconia borealis Gleason (*Miconia minutiflora* (Bonpl.) DC.)
Heterocolpate; exine tectate, 1 µ thick, sexine psilate; pseudocolpi and colpi 13.0 x 1.5 µ, PAD 8 µ; pores circular 3.5 µ diameter; amb slightly hexalobate; grains subprolate to prolate, 20.5 - 24.0 x 16.0 - 17.5 µ.
PAN, Schmalzel 889, MO; plate 77:856.

Miconia elata (SW.) DC.
Heterocolpate; exine tectate,1 µ thick, sexine psilate; pseudocolpi as long as grain x 1 µ; colpori inconspicuous, displaying equatorial constriction; amb hexalobate; grains prolate to subprolate, 20.5 - 24.0 x 16.0 - 17.5 µ.
PAN, Croat 15228, MO; plate 77:857.

Miconia hondurensis J. D. Sm.
Heterosyncolpate; exine tectate, 1 µ thick, sexine psilate; pseudocolpi as long as grain x 2.5 µ wide, colpori displaying equatorial constriction; pores lalongate 3.5 x 6.0 µ; amb hexagonal; grains prolate, 19.5 - 21.0 x 13.5 - 14.5 µ.
PAN, Croat 13800, MO; plate 77:858.

Miconia impetiolaris (Sw.) D. Don.
Heterocolpate; exine tectate, 1.5 µ thick, sexine psilate; pseudocolpi longer than colpori, pseudocolpi 2.5 µ wide, PAD 7 µ; pores lalongate 2.5 x 8.0 µ; amb hexagonal; grains oblate-spheroidal to spheroidal, 20.5 - 21.5 x 20.5 - 23.0 µ.
PAN, Kennedy 2260, KE 18223, MO; plate 77:859.

Miconia lacera (Bonpl.) Naud.
Heterocolpate; exine tectate, 1.5 µ thick, sexine psilate; pseudocolpi as long as colpori; pores lalongate 2 x 6 µ ; amb circular; grains prolate-spheroidal, 12.5 - 13.0 x 11 - 12 µ.
PAN, Knight 6945, MO; plate 77:860.

Miconia lateriflora Cogn.
Heterocolpate; exine tectate, 1 µ thick, sexine psilate; pseudocolpi as long as grain x1.5 µ wide, colpori displaying equatorial constriction; pores lalongate 1.5 x 6.0 µ; amb hexagonal; grains subprolate, 14.5 - 15.0 x 11.5 - 12.5 µ.
BCI, Croat 10822, MO; plate 77:861.

Miconia lonchophylla Naud.
Heterocolpate; exine tectate, 1 µ thick, sexine psilate; pseudocolpi as long as grain x 2 µ wide, colpori displaying equatorial constriction; amb hexagonal; grains subprolate, 13.5 - 15.5 x 11.5 µ.
BCI, Croat 14609, MO; plate 77:862.

Miconia nervosa (Smith) Tr.
Heterocolporate; exine tectate, 1 µ thick, sexine granulate; pseudocolpi as long as grain x 2 µ wide; pores lalongate, 1.0 x 0.5 µ; amb hexagonal; grains prolate-spheroidal, 16.5 - 18.5 x 15.5 - 16.5 µ.
PAN, Croat 6639, MO; plate 77:863.

Miconia prasina (Sw.) in DC.
Heterocolpate; exine tectate, 1 µ thick, sexine psilate, apertures inconspicuous; PAD 3 µ; amb circular; grains subprolate to prolate, 12.5 - 14.5 x 8.5 - 12.0 µ.
PAN, Croat 14591(p), PAN 5380 (d), MO; plate 77:864.

Miconia rufostellulata Pitt.
Heterocolpate; exine tectate, 0.8 µ thick, sexine psilate; pseudocolpi as long as grain x 2 µ wide, colpori displaying equatorial constriction; amb circular; grains subprolate to prolate, 16.5 - 18.5 x 11.5 - 14.0 µ.
PAN, Croat 13943, MO; plate 77:865.

Miconia serrulata (DC.) Naud.
Heterocolpate; exine tectate, 2 µ thick, sexine rugulate; pseudocolpi as long as grain x 2 µ wide, PAD 9 µ; pores lalongate 3.0 x 10.0 µ; amb hexalobate; grains oblate-spheroidal to spheroidal, 22.5 - 25.0 x 22 - 28 µ.
PAN, Clewell & Tyson 3220, KE 18224, MO; plate 77:866.

Miconia shattuckii Standl.
Heterocolpate; exine tectate, 1.5 µ thick, sexine rugulate; pseudocolpi inconspicuous, colpori displaying equatorial constriction, PAD 8 µ; pores lalongate 3 x 6 µ; amb hexalobate; grains subprolate, 16.5 - 19.5 x 15.5 - 16.5 µ.
BCI, Croat 12190, KE 18225, MO; plate 77:867.

Mourtri myrtilloides (SW.) Poir. subsp.*parvifolia* Benth (Morley)
Heterocolpate; exine tectate, 2 µ thick, sexine rugulate; pseudocolpi as long as grain x 2 µ wide, colpori displaying equatorial constriction; pores (colpus transversalis) lalongate 1 x 12 µ; amb circular; grains oblate-spheroidal, 29.5 - 33.5 x 34.5 - 37.0 µ.
BCI, Croat 6230, KE 18226, MO; plate 77:868.

Ossaea quinquenervia (P. Mill.) Cogn. In A. DC.
Heterocolpate; exine tectate, 1 µ thick, sexine psilate, colpori long, narrow pseudocolpi inconspicuous; pores lalongate, 6 x 8 µ. amb hexagonal; grains prolate-spheroidal, 15.5 - 16.5 x 13.5 - 15.5 µ.
BCI, Croat 10764, KE 18228, MO; plate 77:869.

Schwackaea cupheoides (Benth.) Cogn. ex Durand.
Heterocolpate, syncolpate, exine semitectate, 1 µ thick, sexine striate; pseudocolpi 16 x 1 µ, colpi displaying equatorial constriction; pores lalongate, 3 x 7 µ; amb circular; grains subprolate, 21 - 23 x 15 - 19 µ.
PAN, Blum & Dwyer 2142, MO; plate 77:870.

Tibouchina longifolia (Vahl.) Baill.
Heterocolpate; exine tectate, 1 µ thick, sexine psilate; pseudocolpi as long as grain x 1.5 µ wide, colpori displaying equatorial constriction, PAD 5 µ; pores lalongate, 2 x 6 µ; amb hexagonal; grains prolate-spheroidal to spheroidal, 15.5 - 16.5 x 14.0 - 16.5 µ.
PAN, Croat 4611, MO; plate 77:871.

Topobea praecox Gleason
Heterocolpate; exine 2 µ thick, sexine rugulate; pseudocolpi 18 x 1 µ, colpori displaying equatorial constriction; pores lalongate 4 x 5 µ; amb hexalobate; grains subprolate to prolate, 22.5 - 25.5 x 17.5 - 20.0 µ.
PAN, Croat 5372, MO; plate 77:872.

MELIACEAE

Monad; isopolar, radiosymmetric; tectate and semitectate; tricolporate, stephanocolporate (4 - 6 colporate), frequently 4-colporate; exine 1.5 - 3.0 µ thick; sexine psilate, granulate, reticulate; colpi long, sharp, narrow; pores usually transversely elliptical; grains oblate to prolate, 26.0 - 45.5 x 22.0 - 51.5 µ. *(3 genera, 7 species; additional reference: 49).*

Key to genera and species:

1a. Tricolporate
- 2a. Psilate, pores circular ..... *Guarea grandifolia*
- 2b. Granulate, pores transversely ovoid < 7 µ ..... *Trichilia pleeana*
- 2c. Reticulate, pores transversely ovoid > 7 µ ..... *Trichilia cipo*

1b. Stephanocolporate
- 3a. 4-colporate
  - 4a. Spheroidal, > 45 µ ..... *Guarea glabra*
  - 4b. Oblate-spheroidal, < 45 µ
    - 5a. Exine < 2 µ thick, colpi < 15 µ long, pores circular ..... *Guarea grandifolia*
    - 5b. Exine > 2 µ thick, colpi > 15 µ long, pores transversely parallel ..... *Cedrela odorata*
  - 4c. Subprolate
    - 6a. exine < 2 µ thick ..... *Trichilia hirta*
    - 6b. exine > 2 µ thick ..... *Trichilia pallida*
- 3b. 5 - 6 colporate ..... *Cedrela odorata*

Cedrela odorata L.
Stephanocolporate (4 - 6 colporate); exine tectate, 2 µ thick, sexine psilate; colpi 20 x 2 µ, costa colpi 4 µ, PAD 14 - 16 µ; pores lalongate, 2 x 8 µ; amb circular; grains oblate-spheroidal to spheroidal, 34 - 41 x 37 - 45 µ.
CR, no voucher, KE 18423, MO; plate 77:873.

Guarea grandifolia DC.
Tricolporate and stephanocolporate (3 - 4 colporate); exine tectate, 1.5 µ thick, sexine reticulate; colpi 8 x 3 µ; pores circular, 5 µ diameter, costa pori 4 µ, annulus 2 µ; amb circular; grains oblate-spheroidal, 33 - 43 x 34 - 46 µ.
PAN, Croat 11300, MO; plate 77:874.

Guarea glabra Vahl
Stephanocolporate (4-colporate); exine tectate, 2 µ thick, sexine psilate; colpi 10.0 x 2.5 µ, annulate; pores lalongate, 2 x 8 µ, annulus 0.5 µ, small vestibulum present; amb circular; grains spheroidal, 44.0 - 51.5 x 44.0 - 51.5 µ.
PAN, Blum & Tyson 2335, KE 18424, MO; plate 77:875.

Trichilia hirta L.
Stephanocolporate (4-colporate); exine tectate, 1.5 µ thick, sexine psilate; colpi 27 x 2 µ, costa colpi 3.5 µ, PAD 16 µ; pores lalongate 3 x 10 µ; amb circular; grains subprolate to prolate-spheroidal, 37.0 - 45.5 x 34 - 38 µ.
BCI, Croat 15099, KE 18426, MO; plate 77:876.

Trichilia pallida Sw.
Stephanocolporate (4-colporate); exine tectate, 2.0 - 2.5 µ thick, sexine psilate; colpi 23 x 1 µ, PAD 14 µ; pores lalongate 4 x 8 µ, interporium 11 µ; amb circular; grains subprolate 37 - 43 x 30 - 36 µ.
BCI, Croat 14847, MO; plate 77:878.

Trichilia pleeana (A. Juss.) C. DC.
Tricolporate; exine tectate, 1.5 - 2.0 µ thick, sexine granulate; colpi 20 x 2 µ, PAD 11 µ; pores lalongate 1 x 7 µ, costa pori 3 µ; amb circular; grains subprolate, 26 - 29 x 22 - 25 µ.
PAN, Croat 5153, MO; plate 77:879.

Trichilia cipo (Adr. Juss.) C. DC in Mart.
Tricolporate; exine semitectate, 3 µ thick, sexine reticulate, homobrochate, brochi < 1 µ wide; colpi 28 x 1 µ, costa colpi 2.5 µ; pores lalongate 2 x 10 µ; amb semi-hexagonal; grains prolate, 40 - 43 x 29 - 31 µ.
BR, KE 18425, MO; plate 77:877.

MENISPERMACEAE

Monad; isopolar-radiosymmetric; intectate and semitectate; tricolpate; exine 1.0 - 1.5 µ; sexine baculate, reticulate, reticulum heterobrochate to homobrochate, simplicolumellate, columellae conspicuous, isodiametric, appearing as bacula; colpi long, occasionally appearing syncolpate; amb circular; grains spheroida 14 - 17 µ. *(4 genera, 7 species; additional reference: 94).*

Key to genera and species:

1a. Semitectate, reticulate
- 2a. Exine < 1.5 µ thick, grains < 16 µ
  - 3a. Brochus 1 - 2 µ wide ..... *Odontocarya tamnoides*
  - 3b. Brochus < 1 µ wide ..... *Abuta racemosa*
- 2b. Exine > 1.5 µ thick, grains > 16 µ
  - 4a. Spheroidal ..... *Abuta panamensis*
  - 4b. Prolate-spheroidal
    - 5a. Lumina < 1 µ wide ..... *Chondrodendron tomentosum*
    - 5b. Lumina 1 - 2 µ wide ..... *Odontocarya truncata*

1b. Intectate, baculate

6a. Exine < 1 µ, grains > 18 µ..... *Cissampelos pareira*
6b. Exine ca. 1.5 µ, grains < 18 µ..... *Cissampelos tropaeolifolia*

Abuta panamensis (Standl.) Kruk. & Barneby
Tricolpate; exine semitectate, 1.5 µ thick, sexine reticulate, homobrochate, muri simplibaculate, bacula 1 µ, lumina < 1 µ wide, colpi inconspicuous; amb circular; grains spheroidal, 16 - 17 µ.
PAN, Gentry 6228, PMA; plate 78:880.

Abuta racemosa (Thunb.) Tr. & Pl.
Exine semitectate, 1 µ thick, sexine reticulate, homobrochate, muri simplibaculate, lumina < 1 µ wide, colpi inconspicuous, PAD 10 µ; amb circular; grains spheroidal, 14 - 16 µ.
BCI, Foster 2318, PMA; plate 78:881.

Chondrodendron tomentosum R. & P.
Exine semitectate, 1.5 µ thick, sexine reticulate, homobrochate, muri simplibaculate, lumina < 1 µ wide; colpi 16 x 2.5 µ, PAD 4 µ; amb circular; grains prolate-spheroidal, 16 - 19 x 14 - 18 µ.
BCI, Foster 1388, PMA; plate 78:882.

Cissampelos pareira L.
Exine intectate, 1 µ thick, sexine baculate (appearing reticulate); colpi as long as grain x 2 µ wide, resembling syncolpate type; amb circular; grains prolate-spheroidal to spheroidal, 19 x 18 - 19 µ.
BCI, Croat 6393, MO; plate 78:883.

Cissampelos tropaeolifolia DC.
Exine intectate, 1.5 µ thick, sexine baculate (appearing reticulate), bacula < 1 µ high, bacula isodiametrical; colpi poorly defined, narrow 10 - 12 x 1 µ, PAD 8 µ; amb circular; grains prolate-spheroidal, 16 - 18 µ.
BCI, Croat 9265, MO; plate 78:884.

Odontocarya tamnoides (DC.) Miers. var.***canescens*** (Miers.) Barneby
Exine tectate, 1 µ thick, sexine reticulate, heterobrochate, brochi 1 - 2 µ wide, muri simplibaculate, < 1 µ high; colpi as long as grain x < 1 µ, PAD 4 µ; amb circular; grains prolate-spheroidal to spheroidal, 13 - 15 x 12 - 14 µ.
BCI, Croat 5640, MO; plate 78:885.

Odontocarya truncata Standl.
Exine semitectate, 1.5 - 2.0 µ thick, sexine reticulate, homobrochate; lumina 2 µ wide; colpi 14 x 1 µ; amb circular; grains prolate-spheroidal, 17 - 18 x 17 - 18 µ.
BCI, Foster 1417, PMA; plate 78:886.

MENYANTHACEAE

Monad; isopolar-radiosymmetric; semitectate, parasyncolpate (3-colpate); exine 2 - 3 µ thick, sexine verrucate; amb semi-angular; grains suboblate, 40 - 45 x 50 - 52 µ. *(1 genus, 1 species).*

Nymphoides indica (L.) O. Kuntze
3 - 4 colpate (parasyncolpate); exine 2 - 3 µ thick; sexine verrucate to granulate, semitectate, verrucae conspicuous 2 - 3 µ high; colpi 5 µ wide, margo present, small triangle formed by union of colpi at apices, PAD 13 µ; amb semi-angular; grains suboblate, 40 - 45 x 50 - 52 µ.
JAM, Harris 11642, KE 18092, MO; plate 78:887.

MONIMIACEAE

Monad; apolar-asymmetric; tectate; inaperturate; exine 1.0 - 1.5 µ thick; sexine scabrate; amb circular; grains spheroidal, 9.5 - 22 µ *(1 genus, 2 species).*

Key to genera and species:

1a. Exine ca. 1.5 µ thick, scabrae uniform, dense..... *Siparuna guianensis*
1b. Exine ca. 1.0 µ thick, scabrae thick and fine, scattered..... *Siparuna pauciflora*

Siparuna guianensis Aubl.
Exine ca. 1.5 µ thick, sexine scabrate, scabrae 1 µ wide, abundant; amb circular; grains spheroidal, dimorphic, 16 - 23 µ, 9.5 - 13.5 µ.
PAN, Croat 14594, MO; plate 78:888.

Siparuna pauciflora (Beurl.) A. DC. in DC.
Exine ca. 1 µ thick, sexine scabrate, scabrae < 1 µ wide, poorly separated; amb circular; grains spheroidal, 16 - 22 µ.
PAN, Tyson & Blum 3678, MO; plate 78:889.

MORACEAE

Monad; apolar to isopolar; bilateral to radiosymmetric; tectate; usually diporate and triporate, rarely 4-5 porate; exine 1. - 2 µ thick; sexine psilate to granulate or scabrate; pores always circular 1 - 3 µ diameter; amb variable, usually ellipsoid to circular; grains usually oblate, occasionally prolate 6 - 22 µ. Species difficult to distinguish. *(14 genera, 32 species; additional references: 10, 94, 134).*

Key to genera and species:

1a. Diporate (see also key to the *Ficus*, below)
- 2a. Psilate
  - 3a. Exine 1.5 - 2.0 µ thick, pores ca. 3 µ in diameter ..... *Artocarpus altilis*
  - 3b. Exine < 1 µ thick, pores < 2.5 µ in diameter ..... *Ficus* spp. (see below)
- 2b. Sculpturing present, inconspicuous, scabrate
  - 4a. Subprolate to prolate
    - 5a. 12 - 14 µ, pores 2.5 - 3.0 µ in diameter ..... *Cecropia insignis*
    - 5b. 6.5 - 12.0 µ, pores 2 µ in diameter ..... *Cecropia peltata, C. obtusifolia*
  - 4b. Oblate-spheroidal
    - 6a. Pores 1.0 - 1.5 µ in diameter, normal type, amb elliptical ..... *Brosimum alicastrum*
    - 6b. Pores 2.5 µ in diameter, drop type, amb circular ..... *Trophis racemosa*
- 2c. Sculpturing present, conspicuous to inconspicuous, granulate
  - 7a. Long axis < 10 µ
    - 8a. Subprolate to prolate, pores circular, ca. 2 µ diameter ..... *Cecropia longipes*
    - 8b. Oblate-spheroidal, pores circular, ca. 1 µ diameter ..... *Coussapoa magnifolia**
  - 7b. Long axis > 10 µ
    - 9a. Amb angular ..... *Maquira costaricana*
    - 9b. Amb elliptical ..... *Sorocea affinis*
    - 9c. Amb circular
      - 10a. Exine < 1 µ thick ..... *Pourouma guianensis**
      - 10b. Exine > 1 µ thick
        - 11a. Long axis 16.0 - 18.5 µ, oblate-spheroidal ..... *Olmedia aspera**
        - 11b. Long axis 14 - 16 µ, suboblate ..... *Perebea xanthochyma*

1b. Triporate
- 12a. Psilate
  - 13a. Amb circular ..... *Castilla elastica*
  - 13b. Amb elliptical ..... *Ficus* spp. (see below)
- 12b. Granulate
  - 14a. Amb angular ..... *Maquira costaricana*
  - 14b. Amb circular
    - 15a. Long axis 14 - 16 µ ..... *Perebea xanthochyma*
    - 15b. Long axis 16.0 - 18.5 µ
      - 16a. Oblate-spheroidal, exine ca. 1.5 µ thick ..... *Olmedia aspera*
      - 16b. Suboblate to oblate-spheroidal, exine 1.0 - 1.5 µ thick ..... *Poulsenia armata*

1c. Stephanoporate (4 - 5 porate) ..... *Maquira costaricana*

1d. Periporate (20-porate) ..... *Dorstenia contrajerva*

Key to the *Ficus*:: Diporate, rarely triporate

1a. Long axis > 15 µ
- 2a. Index formae 0.64 - 0.74 ..... *F. citrifolia*
- 2b. Index formae 0.45 - 0.63
  - 3a. Pores circular, > 1.5 µ diameter ..... *F. nymphaeaefolia* & *F. paraensis*
  - 3b. Pores circular, < 1.5 µ diameter ..... *F. obtusifolia, F. popenoei, F. trigonata*

1b. Long axis < 15 µ
- 4a. Index formae 0.67 - 0.92 ..... *F. insipida, F. maxima, F. retusa, F. yoponensis*
- 4b. Index formae 0.48 - 0.67
  - 5a. Pores > 1.5 µ in diameter ..... *F. bullenei* & *F. colubrinae*
  - 5b. Pores < 1.5 µ in diameter ..... *F. costaricana, F. dugandii, F. perforata, F. pertusa*

Artocarpus altilis (Park.) Fosb.
Diporate; exine 1.5 - 2.0 µ thick, sexine psilate; pores 3 µ diameter; amb circular; grains oblate-spheroidal, 17 - 20 x 19 - 22 µ.
BCI, Schmalzel 937, MO; plate 78:890.

Brosimum alicastrum Sw. subsp. ***boliviensis*** (Pitt.) C. Berg.
Diporate; exine 1 µ thick, sexine psilate, slightly scabrate; pores 1.0 - 1.5 µ diameter; amb elliptical; grains subprolate to oblate-spheroidal, 13 - 14 x 14 - 15 µ.
VEN, Bretheler 3972 (p), PAN, Kennedy & Dressler 2922, MO; plate 78:891.

Castilla elastica Cerv.
Triporate; exine < 1 µ thick, sexine psilate; pores 2 µ diameter; amb circular; grains suboblate, 10.0 - 11.5 x 13.0 - 14.5 µ.
PAN, Allen 276, MO; plate 78:892.

Cecropia insignis Liebm.
Diporate; exine 1 µ thick, sexine scabrate; pores 2.5 - 3.0 µ diameter, labrum type; amb elliptical; grains subprolate to prolate, 13 - 14 x 9 - 11 µ.
BCI, Sagers, no voucher, BCI; plate 78:893.

Cecropia longipes Pitt.
Diporate; exine 1 µ thick, sexine granulate; pores 2 µ diameter; amb circular; grains subprolate to prolate, 9.0 - 10.5 x 6.5 - 8.0 µ.
BCI, Schmalzel 617, MO; plate 78:894.

Cecropia obtusifolia Bertol.
Diporate; exine < 1 µ, sexine psilate to granulate; pores 1 µ diameter; amb circular; grains subprolate 7 - 8 x 5.0 - 6.5 µ.
BCI, Croat 7127, MO; no plate.

Cecropia peltata L.
diporate; exine ca. 0.5 µ thick , sexine scabrate; pores 2 µ diameter, usually labrum type; amb circular; grains subprolate, 10 - 11 x 6.5 - 8.0 µ.
PAN, Schmalzel 516, MO; plate 78:895

Coussapoa magnifolia Trec. (*Coussapoa asperifolia* (Trecul.) subsp. *magnifolia* (Treud.)Akkermans & Berg)
Diporate; exine ca. 0.5 µ, sexine granulate; pores 1 µ diameter; amb circular; grains oblate-spheroidal, 7.5 - 9.0 x 8.0 - 9.5 µ.
PAN, Schmalzel 367, MO; plate 78:896.

Dorstenia contrajerva L.
Periporate (20 pores); exine 2 µ thick, sexine granulate; pores 1.5 - 2.0 µ diameter on the top of an aspis (shield-shaped); amb circular; grains oblate-spheroidal to spheroidal, 17 - 19 x 18.0 - 19.5 µ.
BCI, Foster 2791, MO; plate 78:897.

Ficus bullenei I. M. Johnston
Diporate; exine ca. 0.7 µ thick, sexine psilate; pores 2 µ diameter, vestibulum 3 µ wide; amb elliptical; ind. formae 0.50 - 0.62, grains oblate, 7 - 8 µ x 12.5 - 14.5 µ.
PAN, A. Herre, no voucher, BCI; plate 78:898.

Ficus citrifolia Mill.
Diporate and triporate; exine ca. 0.7 µ thick, sexine psilate; pores 2.0 - 2.5 µ diameter; amb elliptical and angular, ind. formae 0.65 - 0.74, grains oblate, 11.0 - 13.5 x 15.0 - 18.5 µ.
BCI, Schmalzel 1303, MO; plate 78:899.

Ficus colubrinae Standl.
Diporate and triporate; exine ca. 0.5 µ thick, sexine psilate; pores 1.5 - 2.0 µ diameter; amb elliptical and angular, ind. formae 0.48 - 0.68, grains oblate, 6.0 - 7.5 x 10.5 - 13.0 µ.
BCI, A. Herre, no voucher, BCI; plate 78:900.

Ficus costaricana (Liebm.) Miq.
Diporate; exine ca. 0.5 µ thick, sexine psilate; pores 1 µ diameter; amb elliptical, index formae 0.52 - 0.70; grains oblate, 6.5 - 7.5 x 10.0 - 13.5 µ.
BCI, A. Herre, no voucher, BCI; plate 78:901.

Ficus dugandii Standl.
Diporate; exine ca. 0.5 µ thick, sexine psilate; pores 1.0 - 1.5 µ diameter ; amb elliptical, ind. formae 0.50 - 0.63; grains oblate, 7 - 8 x 12 - 14 µ.
BCI, A. Herre, no voucher, BCI; plate 78:902.

Ficus insipida Willd.
Diporate and triporate; exine ca. 0.7 - 1.0 µ thick, sexine psilate; pores 1.5 - 2.0 µ diameter; amb elliptic, ind. formae 0.67 - 0.88; grains suboblate, 8 - 10 x 10.5 - 13.5 µ.
BCI, Schmalzel 804, MO; plate 78:903.

Ficus maxima P. Mill
Diporate and triporate; exine 1.0 µ thick, sexine psilate; pores 1.5 µ diameter; amb elliptical, index formae 0.64 - 0.92; grains suboblate to oblate-spheroidal, 9 - 12 x 13.0 - 14.5 µ.
BCI, A. Herre, no voucher, BCI; plate 78:904.

Ficus nymphaeaefolia P. Mill.
Diporate; exine ca. 0.6 µ thick, sexine psilate; pores 2.0 µ diameter; amb elliptical, ind. formae 0.49 - 0.63; grains oblate, 8.0 - 9.5 x 15.0 - 17.5 µ.
BCI, A. Herre, no voucher, BCI; plate 78:905.

Ficus obtusifolia HBK
Diporate; exine ca. 0.6 - 0.8 µ thick, sexine psilate; pores 1.0 - 1.5 µ diameter; amb elliptical, index formae 0.46 - 0.63; grains oblate, 9 - 11 x 16.0 - 19.5 µ.
BCI, Schmalzel 975, MO; plate 78:906.

Ficus paraensis (Miq.) Miq.
Diporate; exine ca. 0.5 µ thick, sexine psilate; pores 1.5 - 2.0 µ diameter; amb elliptical, index formae 0.44 - 0.67; grains peroblate to oblate, 8 - 10 x 15 - 19 µ.
BCI, A. Herre, no voucher, BCI; plate 78:907.

Ficus perforata L.
Diporate, triporate; exine ca. 0.5 µ thick, sexine psilate; pores 1.0 - 1.5 µ diameter; amb elliptical, ind. formae 0.58 - 0.73; grains oblate, 6.5 - 8.0 x 10 - 13 µ.
BCI, A. Herre, no voucher, BCI; plate 78:908.

Ficus pertusa L. f.
Diporate, triporate; exine ca. 0.6 µ thick, sexine psilate; pores 1.5 µ diameter; amb elliptic, ind. formae 0.47 - 0.62; grains oblate, 7 - 9 x 13 - 16 µ.
BCI, Schmalzel 1180, MO; plate 78:909.

Ficus popenoei Standl.
Diporate, triporate; exine ca. 0.3 µ thick, sexine psilate; pores 1.5 µ diameter; amb elliptical, index formae 0.47 - 0.66; grains oblate, 9 - 11 x 16 - 20 µ.
BCI, A. Herre, no voucher, BCI; plate 78:910.

Ficus retusa L.
Diporate; exine ca. 0.8 µ thick, sexine psilate; pores 1.0 - 1.5 µ diameter; amb elliptical, index formae 0.85 - 0.96; grains oblate, 11 - 12 x 12 - 13 µ.
IN, Govindarajalus, PCM 6696, 19698 (E), HIFP; no plate.

Ficus trigonata L.
Diporate, triporate; exine ca. 0.5 µ thick, sexine psilate; pores 1.0 - 1.2 µ diameter; amb elliptic to apiculate, ind. formae 0.48 - 0.63; grains oblate, 7.5 - 9.5 x 15 - 17 µ.
PAN, Schmalzel 1191, MO; plate 78:911.

Ficus yoponensis Desv.
Diporate; exine ca. 0.4 - 0.5 µ thick, sexine psilate; pores 2 µ diameter, drop type; amb elliptical, index formae 0.73 - 0.92; grains suboblate to oblate-spheroidal, 7.5 - 11 x 11 - 13 µ.
BCI, A. Herre, no voucher, BCI; plate 78:912.

Maquira costaricana (Standl.) C. C. Berg.
2 - 5-porate; exine 1.0 µ thick, sexine granulate; pores 2.0 µ diameter, interporium 11 µ; amb angular; grains suboblate, 10 - 11 x 13.0 - 14.5 µ.
BCI, Croat 9786, MO; plate 78:913.

Olmedia aspera R. & P. (*Trophis caucana* (C. C. Berg))
Diporate, triporate; exine 1.5 µ thick, sexine granulate; pores 2 µ diameter, drop type; amb circular; grains oblate-spheroidal, 14.0 - 16.5 x 16.0 - 18. 5 µ.
BCI, Schmalzel 1114, MO; plate 78:914.

Perebea xanthochyma Karst.
Diporate, triporate; exine 1.5 µ thick, sexine granulate; pores 1.5 - 2.0 µ diameter; amb circular; grains suboblate, 10.0 - 12.5 x 14 - 16 µ.
PAN, Lao et al. 24, MO; plate 78:915.

Poulsenia armata (Miq.) Standl.
Triporate; exine 1.0 - 1.5 µ thick, sexine granulate; pores 2.0 µ diameter; amb circular; grains suboblate to oblate-spheroidal, 13 - 16 x 16.0 - 18.5 µ.
BCI, Croat 5897, MO; plate 78:916.

Pourouma guianensis Aubl. (*P. bicolor* C. Martius)
Diporate; exine tectate, 1 µ thick at equator, 0.7 µ thick at poles, sexine psilate, uniformly granulate; pores circular, 1.2 µ diameter; amb circular; polar axis indefinite; grains dimorphic: prolate to subprolate, 12 - 14 x 9 - 13 µ, or grains oblate to prolate-spheroidal, 9 - 13 x 11 - 13 µ.
BCI, Croat 8097, MO; plate 78:917.

Sorocea affinis Hemsl.
Diporate; exine 1 µ thick, sexine granulate; pores 1.0 - 1.5 µ diameter; amb elliptical; grains suboblate, 9.5 - 10.5 x 12.0 - 13.5 µ.
BCI, Schmalzel 675, MO; plate 78:918.

Trophis racemosa (L.) Urban
Diporate; exine 1 µ thick, sexine scabrate; pores 2.5 µ diameter, drop type; amb circular; grains oblate-spheroidal, 14 - 16 x 16.0 - 17.5 µ.
BCI, Foster 988, MO; plate 78:919.

MYRISTICACEAE

Monad; isopolar, bilateral; tectate and semitectate; monocolpate, appearing inaperturate; exine 2.0 - 2.5 µ thick, variable at equator and poles, sexine reticulate or scabrate; colpi long, sharp, narrow, edges indistinct; amb indistinct; grains prolate to subprolate, 22 - 36 x 15 - 29 µ. (*1 genus, 2 species; additional references: 92, 196).*

Key to genera and species:

1a. Scabrate, prolate, < 27 µ..... *Virola sebifera*
1b. Reticulate, subprolate, > 27 µ..... *Virola surinamensis*

Virola sebifera Aubl.
Monocolpate; exine tectate, 2.0 - 2.5 µ thick at poles, 1.5 - 2.0 µ thick at equator, sexine scabrate, scabrae 0.5 µ wide; colpi 20 x 2 µ; grains prolate, 22 - 27 x 15 - 17 µ.
PAN, Nee 11025, PMA; plate 78:920.

Virola surinamensis (Rol.) Ward.
Monocolpate; exine semitectate, 2 µ thick; sexine reticulate, homobrochate, muri < 1 µ wide, simplibaculate, bacula 1.5 x 0.5 µ lumina 1 µ wide; grains subprolate, 33 - 36 x 27 - 29 µ.
BCI, Croat 8417, MO; plate 78:921.

MYRSINACEAE

Monad; isopolar-radiosymmetric; tectate and semitectate; tricolporate, occasionally displaying 4 apertures; sexine reticulate, rarely psilate; exine 1.0 - 2.5 µ thick; sexine psilate to scabrate, strongly columellate, usually homobrochate, brochi < 1 µ wide; colpi long x 1 - 2 µ, displaying equatorial constriction, PAD 4 - 8 µ; pores lalongate 1 - 3 x 8 - 10 µ; amb circular to semi-angular; grains oblate-spheroidal to subprolate 16 - 27 x 15 - 27 µ. *(3 genera, 5 species; additional reference: 161).*

Key to genera and species:

1a. Psilate to granulate..... *Ardisia pellucida*
1b. Reticulate
  2a. 4-colporate, aperture orientation 'crossed'..... *Ardisia fendleri*
  2b. Tricolporate, aperture orientation linear
    3a. Polar axis > 22 µ
      4a. Exine 1.5 µ, colpi lacking margo, constriction not forming bridge..... *Parathesis microcalyx*
      4b. Exine 2 µ thick, margo present, equatorial constriction forming bridge..... *Stylogyne standleyi*
    3b. Polar axis < 22 µ
      5a. Exine 1- 2.5 µ thick, PAD 7 µ, lumina having inner columellae, prolate..... *Ardisia fendleri*
      5b. Exine 1 µ thick, PAD 4 - 5 µ, lumina lacking columellae, oblate..... *Ardisia bartlettii*

Ardisia bartlettii Lund.
Tricolporate; exine semitectate,1 µ thick, sexine reticulate, homobrochate, brochi < 1 µ; colpi as long as grain x 2 µ, displaying equatorial constriction, PAD 4 - 5 µ; pores lalongate 2 x 8 µ; amb circular to semitriangular; grains prolate-spheroidal to suboblate, 18 - 21 x 17 - 26 µ.
PAN, Dressler & Williams 3967, KE 18096, MO; plate 79:922.

Ardisia fendleri Lund.
Tricolporate, 4-colporate; exine semitectate, 1.0 - 2.5 µ thick, sexine reticulate, homobrochate, brochi 0.5 µ, lumina displaying inner sexinic element; colpi 14 x 1 µ, PAD 7 µ; pores lalongate 1.5 - 2.0 x 8 µ; amb circular; grains spheroidal to prolate-spheroidal, 16 - 17 x 15 - 17 µ.
BCI, Croat 5560, MO; plate 79:923.

Ardisia pellucida Oerst.
Tricolporate; exine tectate, 1.5 µ thick, sexine psilate, columellate; colpi 10 - 15 x 1 µ, displaying equatorial constriction; pores lalongate 2 - 3 x 8 - 10 µ; amb trilobate; grains oblate-spheroidal to suboblate, 23 - 24 x 23 - 27 µ.
BCI, D'Arcy 3906, KE 18203, MO; plate 79:924.

Parathesis microcalyx Donn. Sm
Tricolporate; exine semitectate, 1.5 µ thick, sexine reticulate, heterobrochate, lumina < 1 - 2 µ wide; colpi 20 x 2 µ, costa colpi 2µ, PAD 4 µ; pores 1.0 - 1.5 x 8 µ; amb circular; grains subprolate to oblate-spheroidal, 22 - 26 x 18 - 26 µ.
BCI, Croat 9576, KE 18204, MO; plate 79:925.

Stylogyne standleyi Lund.
Tricolporate; exine semitectate, 2 µ thick, sexine reticulate, heterobrochate, lumina < 1 - 3 µ wide, displaying single columella; colpi as long as grain x 2 µ, margo 1 µ, PAD 8 µ; pores lalongate 2 x 7 - 8 µ; amb circular; grains subprolate to prolate-spheroidal, 23 - 27 x 19 - 24 µ.
BCI, Knight 653, KE 18205, MO; plate 79:926.

MYRTACEAE

Monad; isopolar-radiosymmetric; tectate; tricolporate, 4-colporate, syncolporate and parasyncolporate; sexine scabrate; exine 0.5 - 2.3 µ thick, sexine scabrate to granulate; colpi sharp, narrow, occasionally uniting at poles, forming small triangles; pores indistinct, lalongate or circular, size variable; amb angular or semi-angular; grains peroblate to suboblate 10 - 19 x 16 - 29 µ. *(6 genera, 15 species; additional reference: 58).*

Key to genera and species:

1a. Tricolporate
  2a. Exine < 1 µ thick
    3a. Grains 8 - 13 µ..... *Psidium anglohondurensis*
    3b. Grains 13 - 24 µ..... *Calycolpus warszewiczianus*
  2b. Exine > 1 µ thick
    4a. Pores circular
      5a. Vestibulum present..... *Aulomyrcia zetekiana*
      5b. Vestibulum absent
        6a. Pores 3 - 4 µ in diameter..... *Eugenia nesiotica , E. oerstedeana*
        6b. Pores < 3 µ in diameter
          7a. PAD 10 µ..... *Eugenia principium*
          7b. PAD 7 µ..... *Eugenia coloradensis, E. venezuelensis*
    4b. Pores lalongate
      8a. Vestibulum present, pores indistinct..... *Myrcia fosteri, M. gatunensis*
      8b. Vestibulum absent, pores conspicuous..... *Psidium guajava*
1b. Syncolporate
  9a. Pores circular to lolongate
    10a. Pores circular, 2 µ diameter..... *Eugenia venezuelensis*
    10b. Pores lolongate, 4 x 3 µ..... *Eugenia galalonensis*

9b. Pores lalongate, 1 - 3 x 3 - 6 µ..... *Myrcia fosteri*
1c. Parasyncolporate
11a. Pores lalongate,1.5 x 7.0 µ..... *Syzygium jambos*
11b. Pores circular, 1.0 - 1.5 µ diameter
12a. Exine 1.0 - 1.5 µ thick..... *Eugenia principium*
12b. Exine > 1.5 µ thick..... *Eugenia uniflora*
1d. Stephanocolporate (4-colporate)
13a. Pores lalongate, 2 x 7 µ, PAD 8 - 10 µ..... *Psidium guajava, P. friedrichsthalianum*
13b. Pores circular, 4 µ diameter, PAD < 8 µ..... *Aulomyrcia zetekiana*

Aulomyrcia zetekiana (Standl.) Amshoff
Tricolporate, 4-colporate; exine 1.5 µ thick, sexine scabrate to granular; margo 1 µ wide, PAD 6 - 7 µ; pores circular, 4 µ diameter; amb angular; grains oblate to suboblate, 14 - 19 x 22 - 23 µ.
BCI, R. Foster, no voucher, BCI; plate 79:927.

Calycolpus warszewiczianus Berg.
Tricolporate; exine 0.5 - 1.0 µ thick, sexine scabrate to granular; PAD 5 µ; pores lalongate to circular, 2.5 - 6 µ diameter, annulus 1 µ wide; amb semi-angular; grains oblate to suboblate, 13 - 17 x 18 - 24 µ.
BCI, Schmalzel 206, MO; plate 79:928.

Eugenia coloradensis Standl.
Tricolporate; exine 1 µ thick, sexine slightly scabrate; colpi as long as grain x 1 µ, PAD 7 µ; pores circular, 2.5 µ diameter; amb semi-angular; grains oblate 12 - 14 x 19 - 21 µ.
BCI, Croat 15103, KE 16801, MO; plate 79:929.

Eugenia galalonensis (Griseb.) Klug & Urban
Syncolporate; exine < 1 µ thick, sexine granulate; colpi very narrow, as long as grain, joined at apices; pores lolongate to circular, 4 x 3 µ, having irregular edges; amb angular; grains oblate, 8 - 12 x 11 - 17 µ.
CUBA, Ekman 18173, NY; plate 79:930.

Eugenia nesiotica Standl.
Tricolporate; exine 1.0 - 1.3 µ thick, sexine scabrate; PAD 8 - 12 µ; pores circular, 4 µ diameter; amb semi-angular; grains suboblate, 14 - 15 x 19 - 23 µ.
BCI, Zetek 3835, KE 18230, MO; plate 79:931.

Eugenia oerstedeana Berg.
Tricolporate; exine 1 µ thick, sexine scabrate; pores circular 4 µ diameter; amb semi-angular; grains suboblate, 11 - 14 x 18 - 20 µ.
PAN, Tyson & Blum 3898, KE 18231, MO; plate 79:934.

Eugenia principium McVaugh
Tricolporate, parasyncolporate; exine 1 µ thick, sexine scabrate; PAD 10 µ; pores circular, 1 µ diameter; amb semi-angular; grains suboblate, 17 x 18 - 22 µ.
PAN, Duke 8130, KE 18232, MO; plate 79:935.

Eugenia uniflora L.
Parasyncolporate; exine 1 µ thick, nexine 0.5 - 1. µ thick, sexine scabrate; colpi as long as grain x 1 µ wide, PAD 6 - 7 µ; pores circular, 1.5 µ diameter; amb semi-angular; grains oblate, 20 - 23 µ.
HON, Molino 31625, PMA; plate 79:932.

Eugenia venezuelensis Berg.
Tricolporate, syncolporate; exine 1 µ thick, sexine scabrate; PAD 7 µ; pores circular 2 µ diameter; amb angular; grains oblate to peroblate, 11 - 13 x 19 - 26 µ.
PAN, Seibert 406, KE 18233, MO; plate 79:933.

Myrcia fosteri Croat
Tricolporate, syncolporate; exine 1.5 µ thick, sexine scabrate; PAD 4.5 µ; pores 2.5 - 3 x 6.5 µ, vestibulum 6 x 1.5 µ; amb subangular; grains suboblate to oblate, 10 - 16 x 19 - 21 µ.
PAN, Croat 15238, KE 18234, MO; plate 79:936.

Myrcia gatunensis Standl.
Tricolporate; exine 1.5 µ thick, sexine scabrate to granular; PAD 10 µ; pores lalongate, 1 x 5 µ, vestibulum present; amb angular; grains oblate, 10 - 17 x 22 - 29 µ.
BCI, Knight 561, KE 18235, MO; plate 79:937.

Psidium anglohondurensis(Lund.) McVaugh.
Tricolporate; exine 0.5 µ thick, sexine psilate; colpi as long as grain x 2 µ, PAD 3 µ; pores inconspicuous; amb angular; grains oblate, 8.0 - 9.5 x 12 - 13 µ.
PAN, LAO 194, MO; plate 79:938.

Psidium friedrichsthalianum (Berg.) Niedenzu
Tricolporate, 4-colporate; exine 1 µ thick, sexine scabrate; colpi 14 x 2 µ, PAD 10 - 13 µ; pores slightly lalongate to circular, 3 x 4 µ; amb semi-angular; grains oblate, 17 - 18 x 21.5 - 23.5 µ.
CR, CR 100247; plate 79:939.

Psidium guajava L.
Tricolporate, 4-colporate; exine 1.5 - 2.0 µ thick, sexine scabrate; PAD 10 µ; pores lalongate 2.5 x 7.0 µ; amb semi-angular; grains suboblate to oblate, 12 - 16 x 24 - 31 µ.
PAN, Hunter & Allen 710, KE 18236, MO; plate 79:940.

Syzygium jambos (L.) Alston
Parasyncolporate; exine 1.2 - 2.3 µ thick, sexine scabrate; colpi joined at apices forming small triangle 2 µ wide, costa colpi 3 µ, PAD 3.5 µ; pores lalongate 1.5 x 7.0 µ; amb semi-angular; grains suboblate to oblate, 12 - 16 x 24 - 31 µ.
BCI, Croat 7413, KE 18237, MO; plate 79:941.

NYCTAGINACEAE

Monad; isopolar; radiosymmetric; tectate; tricolpate, 4-5 colpate; exine 2 - 3 µ thick, sexine microechinate to reticulate; endosexine strongly columellate; colpi conspicuous, short, wide, PAD large, 12 - 15 µ; amb circular; grains subprolate to suboblate 29 - 42 x 25 - 38 µ. *(3 genera, 3 species; additional references: 86, 116, 145, 160).*

Key to genera and species:

1a. Tricolpate
  2a. Echinulate
    3a. Exine 2.5 - 3.0 µ thick, long axis > 40 µ ..... *Guapira standleyana*
    3b. Exine 2 µ thick, long axis < 40 µ ..... *Pisonia aculeata*
  2b. Reticulate ..... *Neea amplifolia*
1b. Stephanocolpate (4 - 5 colpate) ..... *Guapira standleyana*

Guapira standleyana Woods.
Tricolpate, stephanocolpate (4- 5 colpate); exine tectate, 2.5 - 3.0 µ thick, sexine echinate, echini 0.6 µ high, endosexine columellate; colpi 25 x 2.5 µ, PAD 12 µ (20 µ when 4-colpate, 9 µ when 5-colpate); amb circular; grains subprolate, 39 - 42 x 30 - 34 µ.
BCI, Croat 4915, MO; plate 79:942.

Neea amplifolia J. D. Sm.
Tricolpate; exine semitectate, 2.0 - 2.5 µ thick, sexine reticulate, homobrochate, muri simplibaculate, lumina 1 µ; colpi 22 x 3 µ, PAD 15 µ; amb circular; grains suboblate to subprolate, 29 - 35 x 25 - 38 µ.
PAN, Croat 12182, MO; plate 79:943.

Pisonia aculeata L.
Tricolpate; exine tectate, 2 µ thick, sexine echinate, echini < 0.3 µ high, endosexine columellate; colpi 20 x 1 - 5 µ, PAD 12 µ; amb circular; grains subprolate, 32 - 40 x 25 - 31 µ.
BCI, Croat 5374, MO; plate 79:944.

NYMPHAEACEAE

Monad; apolar, asymmetric; tectate; inaperturate resembling monocolpate form; exine 1.5 - 2.0 µ thick; psilate; colpi (if present) indistinct; amb variable; grains spheroidal to perprolate variable; grains 29 - 52 x 16 - 38 µ, susceptible to damage by acetolysis. *(1 genus, 2 species).*

Key to species:

1a. Psilate, variable in form, exine 2 µ thick ..... *Nymphaea ampla*
1b. Scabrate, exine 1.5 µ thick ..... *Nymphaea blanda*

Nymphaea ampla (Salisb.) DC.
Exine 2 µ thick, sexine psilate; grains perprolate to suboblate, dimorphic, 47 - 52 x 16 - 20 µ; 29 - 31 x 34 - 37 µ.
PAN, Schmalzel 1033, MO; plate 79:945.

Nymphaea blanda G. Meyer
Exine 1.5 µ thick, sexine scabrate, appearing monocolpate; grains spheroidal, 33 - 38 µ.
BCI, Croat 12232, MO; plate 79:946.

OCHNACEAE

Monad; isopolar; radiosymmetric; tectate; tricolporate; psilate; colpi moderately large; pores lalongate; amb circular, subtriangular; grains spheroidal to prolate-spheroidal 12.5 - 20.0 µ. *(2 genera, 2 species; additional references: 9, 105, 161).*

Key to genera species:

1a. Oblate-spheroidal, > 15 µ; amb subangular ..... *Ouratea lucens*
1b. Prolate-spheroidal, < 15 µ; amb circular ..... *Cespedezia macrophylla*

Cespedezia macrophylla Seem.
Exine 1.4 µ thick, sexine psilate; colpi long, PAD 1.5 µ; pores lalongate, 1.5 x 4 µ; amb circular; grains prolate-spheroidal, 12.5 - 14.5 x 11 - 13 µ.
BCI, Schmalzel 478, MO; plate 79:947.

Ouratea lucens (HBK) Engler
Occasionally 4-colporate; exine 2 µ thick, sexine psilate, endosexine granulate; colpi long, PAD 2 µ; pores lalongate 1 x 2 µ; amb subangular; grains oblate-spheroidal, 15 - 18 x 16 - 20 µ.
BCI, Schmalzel 1129, MO; plate 79:948.

OLACACEAE

Monad; isopolar; radiosymmetric; tricolpate, occasionally 4-colpate; exine tectate and semitectate, 1.0 - 1.5 µ thick, sexine psilate, verrucate and scabrate; margo thick; grains displaying greater size and density of sexine elements near one pole; amb circular; grains oblate-spheroidal to prolate-spheroidal, 15.0 - 20.5 x 17 - 21.5 µ. (*1 genus, 3 species*).

Key to species:

1a. Psilate, grains prolate-spheroidal, > 19 µ..... *Heisteria concinna*
1b. Verrucate, grains oblate-spheroidal, > 19 µ..... *Heisteria costaricensis*
1c. Scabrate, grains oblate-spheroidal, < 19 µ..... *Heisteria longipes*

Heisteria concinna Standl.
Tricolpate, occasionally syncolpate; exine tectate, 1.5 µ thick, sexine psilate; colpi as long as grain x 2 µ, PAD 5 µ; amb circular; grains prolate-spheroidal to spheroidal, 19.0 - 20.5 x 17 - 19 µ.
BCI, Croat 12559, MO; plate 80:949.

Heisteria costaricensis J. D. Sm.
Tricolpate; exine semitectate, 1.5 µ thick, sexine verrucate, verrucae 1 - 3 µ high, sexine scabrate; colpi 18.0 x 1.5 µ, margo 2 µ, costa colpi 2 µ, PAD 7 µ; amb semi-angular; grains oblate-spheroidal, < 19 x 19.0 - 21.5 µ.
BCI, Croat 10316, MO; plate 80:950.

Heisteria longipes Standl. (*He. cyanocarpa* Poep.)
Tricolpate; exine tectate, 1 µ thick, sexine scabrate, scabrae 0.5 µ high; colpi 12 x 1 µ, margo 1.5 µ; amb circular; grains oblate-spheroidal to spheroidal, 15 - 16 x 17 - 18 µ.
BCI, Croat 14466, MO; plate 80:951.

ONAGRACEAE

Tetragonal tetrad or monad (after acetolysis); tetrads variable 80 - 120 µ; apertures in contact areas of grains; amb semiangular; monad; heteropolar;-radiosymmetric; tricolporate, 4-colporate; exine tectate, 1.5 - 8.0 µ thick, sexine verrucate near apertures, rugulate in intercolpium, nexine thinner than sexine, 1 µ thick; colpi inconspicuous, narrow, short, sharp, endexinic; pores distinctive, aspidate, circular to somewhat lalongate, 4 - 7 µ diameter, annuli 2.5 - 6.0 µ wide, vestibula 5 - 13 µ; amb semi-angular to angular; viscin threads present, 100 - 250 µ long; grains suboblate to oblate 43 - 70 x 53 - 90 µ. (*1 genus, 5 species; additional reference: 182*).

Key to species:

1a. Grains arranged in tetrads ..... *Ludwigia helminthorrhiza*
  2a. Tetrad > 100 µ.....
  2b. Tetrad < 100 µ ..... *Ludwigia decurrens*
    3a. 4-colporate.....
    3b. Tricolporate
      4a. Viscin threads > 200 µ long, abundant ..... *Ludwigia leptocarpa*
        5a. Equatorial axis 75 - 85 µ..... *Ludwigia decurrens*
        5b. Equatorial axis 50 - 70 µ..... *Ludwigia octovalvis, L. torulosa*
      4b. Viscin threads < 200 µ long, scarce.....
1b. Grains appearing as monads
  6a. 4-colporate ..... *Ludwigia decurrens*
    7a. Equatorial axis 50 - 70 µ, oblate, viscin threads 200 - 250 µ long..... *Ludwigia helminthorrhiza*
    7b. Equatorial axis 75 - 90 µ, suboblate, viscin threads ca. 100 µ long.....
  6b. Tricolporate
    8a. Equatorial axis < 75 µ
      9a. Annuli ca. 3 µ wide ..... *Ludwigia decurrens*
      9b. Annuli 5 - 6 µ wide..... *Ludwigia octovalvis*
        10a. Abundant viscin threads..... *Ludwigia torulosa*
        10b. Scarce viscin threads.....
    8b. Equatorial axis > 75 µ ..... *Ludwigia helminthorrhiza*
      11a. Pores < 5 µ wide..... *Ludwigia leptocarpa*
      11b. Pores 6 - 7 µ .....

Ludwigia decurrens Walt.
Tricolporate, tetracolporate; exine 2.5 - 3.0 µ thick, 10 µ at apertures, sexine verrucate; colpi inconspicuous; pores circular 6 µ diameter, annulus 3 µ, aspidate, vestibulum 10 - 12 µ x 8 - 10 µ; amb angular to semi-angular; grains oblate, 43 - 45 x 53 - 68 µ; tetrad 84 - 95 µ, viscin threads 200 - 250 µ long.
PAN, Gutierrez 32, PMA; plate 80:952.

Ludwigia helminthorrhiza (Mart.) Hara
Tricolporate, tetracolporate; exine 3 µ thick, 8 µ at apertures, sexine verrucate; colpi 12 x 1 µ; pores 4.5 x 5.0 µ diameter, vestibulum 7 - 10 µ; amb semi-angular; grains suboblate, 60 - 70 x 78 - 90 µ; tetrad 110 - 120 µ, viscin threads 100 µ long.
PAN, Fairchild 2042, KE 18214, MO; plate 80:953.

Ludwigia leptocarpa (Nutt.) Hara
Tricolporate; exine 3 - 4 thick, sexine verrucate; colpi inconspicuous; pores 6 - 7 µ diameter, annulus 2.5 - 5.0 µ wide, vestibulum 7 - 10 µ; amb semi-angular; grains suboblate, 50 x 75 - 85 µ; tetrad 95 - 100 µ, viscin threads abundant, 150 - 200 µ long.
PAN, Schmalzel 740 (p), BCI, Croat 11299, KE 18215 (d), MO; plate 80:954.

Ludwigia octovalvis (Jacq.) Raven
Tricolporate; exine 1.5 - 2.5 µ thick, sexine verrucate; colpi long x 1 µ wide; pores circular, 6 µ diameter, annulus 5 µ wide, vestibulum 5 µ; amb semi-angular; grains suboblate, 43 - 63 x 69 - 76 µ; tetrad 80 - 110 µ, viscin threads abundant.
PAN, Croat 15392, KE 18216, MO; plate 80:955.

Ludwigia torulosa (Arn.) Hara
Tricolporate; exine 2.5 - 3.5 thick, sexine verrucate; colpi 12 x 1 µ; pores 4 µ diameter, annulus 6 µ wide, vestibulum 13 µ; amb semi-angular; grains suboblate, 43 - 55 x 63 - 73 µ; tetrad 80 - 90 µ, viscin threads scarce.
BR, Barrett 837, KE 18217, MO; plate 80:956.

OXALIDACEAE

Monad; isopolar; radiosymmetric; intectate; tricolpate; exine 2.0 - 2.5 µ thick, sexine baculate; colpi long, sharp, wide; amb circular; grains subprolate, 21 - 22 x 16 - 18 µ. *(1 genus, 1 species).*

Averrhoa carambola L.
Tricolpate; exine 2.0 - 2.5 µ thick, sexine baculate, bacula 1.0 - 1.5 µ high; colpi 16 x 4 µ, PAD 6 µ; amb circular; grains subprolate, 21 - 22 x 16 - 18 µ.
BCI, Croat 9195, MO; plate 80:957.

PASSIFLORACEAE

Monad; isopolar-radiosymmetric; semitectate; stephanocolpate and stephanocolporate (6 - 12 apertures); amb circular; exine 2 - 12 µ thick; nexine occasionally well differentiated, bacula 1 - 10 µ high x 1 - 3 µ wide, sexine reticulate (per-reticulate), lophate, heterobrochate, brochi variable, muri 1 - 3 µ thick, simpli-, dupli- to multibaculate, lumina having irregular edges, 2 - 18 µ wide, sexinic process into lumina; grains typical for this family often appear triradial in polar view, supporting 3 - 9 pre-opercula (free intercolpium areas), pre-operculum formed by joining of pairs of adjacent colpi, appearing as a continuous longitudinal ring, displaying a large hollow on the triradial axis; arms of triradial axis 8 - 24 µ wide, pre-operculum (when free) 30 - 58 x 7 - 58 µ; grains oblate to subprolate, 25 - 104 x 40 - 110 µ. *(1 genus, 11 species; additional references: 70, 128).*

Key to genera and species:

1a. Stephanocolporate (also syncolpate), 6-colporate, operculum protruding..... *Passiflora auriculata*
1b. Stephanocolpate (also syncolpate), not as above
  2a. 12-colpate, with 9 pre-opercula
    3a. Lumina lacking sexinic process; muri 1.0 - 1.5 µ thick
      4a. Muri 1.0 - 1.5 µ thick, arms of triradial axis 9 µ wide, muri duplibaculate, grains subprolate to prolate-spheroidal..... *Passiflora biflora*
      4b. Muri < 1 µ thick, arms of triradial axis 15 µ wide, muri simplibaculate, grains oblate-spheroidal..... *Passiflora punctata*
    3b. Free sexinic process in lumina muri 3 µ thick..... *Passifllora coriacea*
  2b. 6-colpate, with 3 pre-opercula
    5a. Exine > 8 µ thick
      6a. Muri dupli- to multibaculate..... *Passiflora williamsii*
      6b. Muri simplibaculate
        7a. Arms of tri-radial axis 12 µ wide..... *Passiflora vitifolia*
        7b. Arms of tri-radial axis 16 - 21 µ wide
          8a. Subprolate..... *Passiflora ambigua*
          8b. Oblate-spheroidal to spheroidal
            9a. Exine 10 µ thick, grains 70 - 110 µ..... *Passiflora foetida*
            9b. Exine 8 µ thick, grains 60 - 80 µ..... *Passiflora menispermifolia*
    5b. Exine < 8 µ thick
      10a. Exine 3 µ thick, muri 1 µ wide, lumina 2 - 4 µ wide..... *Passiflora nitida*
      10b. Exine 7 µ thick, muri 1.5 - 2.0 µ wide, lumina 6 - 15 µ wide..... *Passiflora seemannii*

Passiflora ambigua Hemsl.
6-colpate and parasyncolpate, colpi in pairs, forming a longitudinal ring; exine 8 - 11 μ thick, nexine 2 μ thick, conspicuous, sexine reticulate, heterobrochate, per-reticulate, muri simplibaculate, bacula dimorphic, 8 μ high x 2 μ wide, and 2 - 3 μ high x 1 μ wide, brochi variable in size, muri 3 μ wide, simplibaculate, lumina displaying irregular margin 6 - 16 x 4 - 8 μ wide; colpi operculate, 58 - 75 x 46 - 56 μ wide, intercolpium 20 μ wide, operculum circular, 52 - 58 μ diameter; grains susceptible to damage by acetolysis, subprolate, 88 - 100 x 62 - 82 μ.
PAN, Wedel 2324, KE 18276, MO; plate 81:958.

Passiflora auriculata HBK
Syncolpate, stephanocolporate (6-colporate); exine 2 μ thick, sexine reticulate, heterobrochate, per-reticulate, bacula homogeneous, muri < 0.5 μ wide, simplibaculate, uneven, brochi variable, lumina 2 - 3 μ wide, margins irregular; colpi as long as grain, having continuous operculum, protuberant at pores, adjacent colpi united at poles, forming large pre-operculum (intercolpium), pre-opercula 30 μ long x 12 μ wide, appearing triradial in polar view, radii 8 - 9 μ wide; pores inconspicuous; amb circular; grains oblate, 25 - 28 x 40 - 44 μ.
PAN, Correa et al. 792, KE 18277, MO; plate 81:959.

Passiflora biflora Lam.
12-colpate; exine 4 μ thick, nexine 1.5 μ thick, sexine reticulate, heterobrochate, per-reticulate, brochi variable, muri 1.0 - 1.5 μ wide, duplibaculate, uneven, bacula homogeneous, 1.5 μ high, lumina 2 - 3 μ wide, edges irregular; colpi as long as grain, 2 μ wide, appearing tri-radial in polar view, groups of 4 colpi joined to form pre-opercula; radii 9 μ wide, pre-opercula as long as grain 7 - 8 μ wide; amb circular; grains susceptible to damage by acetolysis, subprolate to prolate-spheroidal, 55 - 59 x 47 - 52 μ.
PAN, Lewis et al. 36, KE 18278, MO; plate 81:960.

Passiflora coriacea Adr. Juss.
12-colpate; exine 4 - 5 μ thick, heterobrochate, nexine 1.0 - 1.5 μ thick, sexine reticulate, brochi variable, muri 3 μ wide, multibaculate, bacula 2.5 μ high, homogeneous, lumina 4 - 6 μ wide, having sexinic process; colpi as long as grain, 3 - 5 μ wide, appearing tri-radial in polar view, groups of 4 colpi joined to form pre-opercula, radii 15 μ wide, pre-opercula as long as grain, 12 - 15 μ wide; amb circular; grains susceptible to damage by acetolysis, oblate-spheroidal, 68 - 80 x 72 - 85 μ.
PAN, Semplel, KE 18279, no voucher, MO; plate 81:961.

Passiflora foetida L. var. *isthmia* Killip.
6-colpate; exine 10 μ thick, sexine reticulate, heterobrochate, brochi variable, muri simplibaculate 2 - 3 μ wide, bacula dimorphic, 10 x 1 μ when forming muri, 3 - 4 μ high x 1 μ wide when free in lumina, lumina variable, 10 - 15 μ wide, edges irregular; colpi forming continuous longitudinal ring, pre-opercula large, appearing tri-radial in polar view, radii 20 μ wide, opercula circular 55 - 65 μ, frequently appearing free; amb circular; grains susceptible to damage by acetolysis, oblate-spheroidal to spheroidal, 85 - 110 x 70 - 90 μ
PAN, Herrera 33, KE 18280, MO; plate 81:962.

Passiflora menispermifolia HBK
6-colpate; exine 8 μ thick, sexine reticulate, heterobrochate, muri simplibaculate, 2 μ wide, bacula dimorphic, 8 μ high x 2 μ wide when forming muri, 4 x 1.5 μ when free in lumina, lumina 8 - 15 μ wide; colpi forming continuous longitudinal ring, appearing triradial; radii 16 μ wide, in polar view, forming large, circular opercula, 48 - 58 μ diameter, frequently free; amb circular; grains susceptible to damage by acetolysis, oblate-spheroidal, 60 - 68 x 70 - 83 μ.
PAN, Gentry & Dwyer 3559, KE 18281, MO; plate 82:963.

Passiflora nitida HBK
6-colpate; exine 3 μ thick, nexine 1 μ thick, sexine reticulate (per-reticulate), heterobrochate, muri simplibaculate 1 μ wide, lumina 2 - 4 μ wide, edges irregular, irregular, occasional free bacula in lumina, bacula uniform, 1.5 μ high x 1 μ wide; colpi forming continuous longitudinal ring in polar view, pre-opercula forming tri-radial axis, radii 16 μ wide, opercula 48 - 56 μ long, frequently free; amb circular; grains susceptible to damage by acetolysis, oblate-spheroidal, 55 - 69 x 60 - 75 μ.
PAN, Fulsom 2559, KE 18282, MO; plate 82:964.

Passiflora punctata L.
12-colpate; exine 4 μ thick, nexine 1.5 μ thick, sexine reticulate (per-reticulate), heterobrochate, muri baculate, bacula uniform, 2.5 μ high x 1 μ wide, lumina 2 - 3 μ wide; 3 groups of 3 similar opercula, seen in polar view, forming tri-radial axis, radii 15 μ wide, amb circular; grains oblate-spheroidal, 51 - 69 x 53 - 71 μ.
BCI, Croat 8214, KE 18283, MO; plate 82:965.

Passiflora seemannii Griseb.
6-colpate; exine 7 μ thick, sexine reticulate (per-reticulate), heterobrochate, muri simplibaculate, 1.5 - 2.0 μ wide, bacula dimorphic, 6 μ high x 2 μ wide at muri, 2 μ high x 1 μ wide when free in lumina; 3 groups of 2 bacula forming large pre-opercula seen in polar view, radii of tri-radial axis 24 μ wide, lumina 8 - 15 x 6 - 10 μ wide, opercula 40 - 50 μ diameter, frequently free; amb circular; grains susceptible to damage by acetolysis, spheroidal, 68 - 90 μ.
PAN, Gentry 6697, KE 18284, MO; plate 82:966.

Passiflora vitifolia HBK
6-colpate; exine 12 μ thick, sexine reticulate (per-reticulate), heterobrochate, muri simplibaculate, 2 μ wide; bacula dimorphic, 10 μ high x 2 μ wide at muri, 5 μ high x 1 μ wide when free in lumina, lumina 8 - 18 μ wide, forming a tri-radial axis of 3 large pre-opercula seen from polar view, radii of tri-radial axis 12 μ wide, muri irregular, simplibaculate 2 μ wide, opercula 50 - 60 μ diameter, frequently free; amb circular; grains susceptible to damage by acetolysis, spheroidal, 81 - 96 μ.
PAN, Wedel 1487, KE 18285, MO; plate 82:967.

Passiflora williamsii Killip.
6-colpate; exine 8 μ thick, sexine reticulate (per-reticulate), heterobrochate, muri irregular, dupli- to multibaculate, 2 - 3 μ wide, bacula 6 μ high x 2 μ wide, forming tri-radial axis of 3 large pre-opercula in polar view, radii 16 μ wide, lumina 6 - 14 μ wide, persistent sexinic processes (bacula) variable in size; opercula 40 - 50 μ diameter, frequently free; amb circular; grains susceptible to damage by acetolysis, sub-oblate to oblate-spheroidal, 60 - 73 x 72 - 81 μ.
PAN, Tyson 6892, MO; plate 82:968.

PHYTOLACCACEAE

Monad; 38 - 40 porate, 12-colpate, tricolporate; apolar-asymmetric and isopolar-radiosymmetric; exine tectate, 1.5 - 2.5 µ thick; sexine baculate or granular; amb frequently circular; grains usually spheroidal, 23 - 33 µ. *(4 genera, 4 species; additional reference: 15).*

Key to genera and species:

1a. Periporate, spheroidal, 38 - 40 pores..... *Microtea debilis*
1b. Pericolpate, spheroidal
  2a. Sexine psilate, exine 1.5 - 2.0 µ thick, 10-colpate..... *Rivina humilis*
  2b. Sexine baculate, exine 2.0 - 2.5 µ thick, 12-colpate..... *Petiveria alliacea*
1c. Tricolporate, oblate-spheroidal, sexine psilate..... *Phytolacca rivinoides*

Microtea debilis Sw.
38 - 40 porate; exine 2 µ thick, sexine granular, columellate; pores circular, 2.5 µ diameter, interporium 4 µ; amb circular; grains spheroidal, 23 - 35 µ.
CR, Raven 20865, KE 17613, MO; plate 83:969.

Petiveria alliacea L.
12-colpate; exine 2.0 - 2.5 µ thick, sexine baculate; colpi 10 x 1 µ; grains spheroidal, 27 - 33 µ.
BCI, Croat 12231, MO; plate 83:970.

Phytolacca rivinoides Kunth & Bouché
Tricolporate; exine 1.5 µ thick, sexine psilate, columellate; PAD 7 µ; pores lolongate, 3 x 2 µ, interporium 7 µ; amb circular; grains oblate-spheroidal, 14.5 - 23.0 x 21 - 23 µ.
PAN, Knapp 1688, MO; plate 83:971.

Rivina humilis L.
10-colpate; exine 1.5 - 2.0 µ thick, sexine psilate; colpi inconspicuous; grains spheroidal, 23 - 28 µ.
PAN, Kennedy 3236, MO; plate 83:972.

PIPERACEAE

Monad; apolar-bilateral and isopolar-radiosymmetric; inaperturate and monocolpate; tectate; exine 0.5 - 1.5 µ thick, sexine psilate, scabrate or verrucate; endosexine granular; colpi inconspicuous, displaying abundant scabrae on edges; grain form circular; grains spheroidal to subprolate, 5 - 16 µ; species difficult to distinguish. *(3 genera, 30 species).*

Key to genera and species:

1a. Inaperturate
  2a. < 10 µ..... *Peperomia cordulata, P.ciliolibractea, P. glabella, P. mameiana, P.obscurifolia*
  2b. > 10 µ..... *Peperomia killipi, P. macrostachya, P. obtusifolia, P. rotundifolia*
1b. Aperturate, monocolpate
  3a. Verrucate, grains < 10 µ..... *Pothomorphe peltata*
  3b. Psilate or scabrate
    4a. > 12 µ
      5a. Psilate..... *Piper arieianum, P. cordulatum, P. darienense, P. pubistipulum,*
      5b. Scabrate..... *Piper auritum, P. culebranum*, P. imperiale*
    4b. < 12 µ..... *Piper aequale, P. arboreum, P. carrilloanum, P. dilatatum, P. grande, P.hispidum, P. marginatum, P. perlasense, P. reticulatum, P. villiramulum, P.viridicaule, P.peracuminatum, P. pseudogaragaranum*

Peperomia ciliolibractea C. DC.
Inaperturate, apolar-asymmetric; exine 1 µ thick, sexine verrucate, verrucae <1 µ; grains spheroidal, 7 - 9 µ.
BCI, Croat 6309, MO; plate 83:973.

Peperomia cordulata C. DC.
Inaperturate, apolar-asymmetric; exine <1 µ thick, sexine verrucate, gemmae < 1 µ; grains spheroidal, 4.5 - 6.5 µ.
BCI, Croat 7770, MO; plate 83:974.

Peperomia glabella (Sw.) A. Dietr.
Inaperturate, apolar-asymmetric; exine 1 µ thick, sexine verrucate, appearing rugulate; grains spheroidal, 8 - 10 µ.
BCI, Croat 7135, MO; plate 83:975.

Peperomia killipi Trel.
Inaperturate, apolar-asymmetric; exine 1.5 µ thick, sexine verrucate, verrucae 1 µ; grains spheroidal, 9.5 - 11.0 µ.
BCI, Schmalzel 22, MO; plate 83:976.

Peperomia macrostachya (Vahl.) A. Dietr.
Inaperturate, apolar-radiosymmetric; exine 1.2 µ, sexine verrucate; grains spheroidal, 9 - 16 µ.
BCI, Croat 8796, MO; plate 83:977.

Peperomia mameiana C. DC. ex Schroeder
Inaperturate, apolar-asymmetric; exine 1 µ thick, sexine verrucate, verrucae wide; grains spheroidal, 8.5 - 10 µ.
BCI, Foster 2865, MO; plate 83:978.

Peperomia obscurifolia C. DC.
Inaperturate, apolar-asymmetric; exine <1 µ thick, sexine verrucate, appearing rugulate; grains spheroidal, 8 - 10 µ.
BCI, Croat 10997, MO; plate 83:979.

Peperomia obtusifolia (L.) A. Dietr.
Inaperturate, apolar-asymmetric; exine 1 µ thick, sexine verrucate; grains spheroidal, 9 - 12 µ.
BCI, Foster 1227, PMA; plate 83:980.

Peperomia rotundifolia (L.) HBK
Inaperturate, apolar-asymmetric; exine 1 µ thick, sexine verrucate; grains spheroidal, 10 - 11 µ.
BCI, Croat 9446, MO; plate 83:981.

Piper aequale Vahl
Monocolpate, heteropolar-bilateral; exine <1 µ thick, sexine granular near colpi; colpi 8 x 2 µ; grains suboblate, 6 - 7 x 9 - 10 µ.
BCI, Croat 11829, MO; plate 83:982.

Piper arboreum Aubl.
Monocolpate, heteropolar-bilateral; exine 1 µ thick, sexine scabrate, appearing granular; colpi 8.0 x 1.5 µ; grains suboblate, 10 - 12 x 8.0 - 8.5 µ.
PAN, Schmalzel 1012, MO; plate 83:983.

Piper arieianum C. DC.
Monocolpate, heteropolar-bilateral; exine <1 µ thick, psilate; costa colpi 1 µ; grains suboblate, 10 - 12 x 14.5 - 18.0 µ.
BCI, Croat 14574, MO; plate 83:984.

Piper auritum HBK
Monocolpate, heteropolar-bilateral; exine <1 µ thick, sexine granular; colpi 12 x 1 µ, edges wavy; grains suboblate, 12 - 14 x 9 - 10 µ
PAN, Croat 4730, MO; plate 83:985.

Piper carrilloanum C. DC.
Monocolpate, heteropolar-bilateral; exine <1 µ thick, sexine scabrate; colpi 9 x 1 µ; grains oblate in lateral view, 'kidney-shaped', 8.5 - 10.5 x 6 - 7 µ
BCI, Croat 7096A, MO; plate 83:986.

Piper cordulatum C. DC.
Monocolpate, heteropolar-bilateral; exine <1 µ thick, sexine psilate; colpi 12 x 1.5 µ; grains oblate-spheroidal, 12 - 16 x 9 - 12 µ
BCI, Schmalzel 1280, MO; plate 83:987.

Piper culebranum C. DC. (*P. colonense* C.D.C.)
Monocolpate, heteropolar-bilateral; exine 1.0 - 1.5 µ thick, sexine granular; colpi 12 x 1 µ, margo large; grains suboblate dimorphic, 13 - 15 x 9.5 - 12.5 µ; 22 x 13 µ.
PAN, Croat 10221, MO; plate 83:988.

Piper darienense C. DC.
Monocolpate, heteropolar-bilateral; exine ca. 0.5 µ thick, sexine psilate; colpi 12 x 1.5 µ; grains suboblate, 8.5 - 11.0 x 12.5 - 15.0 µ.
BCI, Croat 5752, MO; plate 83:989.

Piper dilatatum Rich.
Monocolpate, heteropolar-bilateral; exine <1 µ thick, sexine granular; colpi indistinct, edges tortuose; grains oblate-spheroidal, 9 - 10 x 8 - 9 µ.
PAN, Schmalzel 865, MO; plate 83:990.

Piper grande Vahl.
Monocolpate, heteropolar-bilateral; exine <1 µ thick, sexine scabrate; grains suboblate-spheroidal, 6.5 - 8.0 x 9 - 10 µ.
BCI, Croat 7099, MO; plate 83:991.

Piper hispidum Sw.
Monocolpate, heteropolar-bilateral; exine 1.2 - 1.5 µ thick, sexine granular; colpi surrounded by conspicuous bacula; grains suboblate, 7.5 - 9.5 x 8 - 9 µ.
PAN, Schmalzel 762, MO; plate 83:992.

Piper imperiale (Miq.) C. DC.
Monocolpate, heteropolar-bilateral; exine <1 µ thick, sexine granular; colpi indistinct; grains suboblate, 8 - 10 x 12 - 14 µ.
PAN, Correa et al. 2874, PMA; plate 83:993.

Piper marginatum Jacq.
Monocolpate, heteropolar-bilateral; exine 1 µ thick, sexine granular; grains oblate-spheroidal, 8.5 - 10.0 x 9 - 11 µ.
PAN, Schmalzel 28, MO; plate 83:994.

Piper peracuminatum C. DC.
Monocolpate, heteropolar-bilateral; exine <1 µ thick, sexine granular; grains suboblate-spheroidal, 8.5 - 9.5 x 10 - 12 µ.
PAN, Lewis 2772, MO; plate 83:995.

Piper perlasense Yunck.
Monocolpate, heteropolar-bilateral; exine 1 µ thick, sexine granular; colpi 8 x 1 µ; grains spheroidal, 8 - 9 x 8.0 - 8.5 µ.
BCI, Croat 8429, MO; plate 83:996.

Piper pseudo-garagaranum Trel.
Monocolpate, heteropolar-bilateral; exine <1 µ thick, sexine granular; grains spheroidal, 7 - 8 x 8.5 - 9.0 µ.
PAN, Nee 9331, MO; plate 83:997.

Piper pubistipulum C. DC.
Monocolpate; heteropolar-bilateral; exine 1 µ thick, sexine psilate; colpi 12 x <1 µ; grains oblate-spheroidal, 10.0 - 11.5 x 14 - 17 µ.
BCI, Croat 10884, MO; plate 83:998.

Piper reticulatum L.
Monocolpate, heteropolar-bilateral; exine ca. 0.5 µ thick, sexine scabrate; colpi short, amb circular; grains oblate-spheroidal, 10 - 10.5 x 9 - 10 µ.
BCI, Croat 5336,MO; plate 83:999.

Piper villiramulum C. DC.
Monocolpate, heteropolar-bilateral; exine 1 µ thick, sexine scabrate; grains suboblate, 8 - 10 x 11 - 12 µ.
BCI, Croat 9400, MO; plate 83:1000.

Piper viridicaule Trel.
Monocolpate, heteropolar-bilateral; exine 1 µ thick, sexine scabrate; grains suboblate, 8.5 - 10.0 x 10 - 12 µ.
BCI, Lazor 2192, MO; plate 83:1001.

Pothomorphe peltata (L.) Miq.
Monocolpate, heteropolar-bilateral; exine 1 µ thick, sexine verrucate; colpi short; grains oblate-spheroidal, 7.0 - 9.5 x 9 - 11 µ.
BCI, Schmalzel 644, MO; plate 83:1002.

POLYGALACEAE

Monad; isopolar; radiosymmetric; tectate; stephanocolporate (8 - 14 colporate); exine 1.5 - 3.0 µ thick; sexine psilate; pores lalongate or circular, zonorate; amb circular; grains subprolate to oblate-spheroidal, 22 - 55 x 24 - 38 µ. (*2 genera, 3 species; additional references: 4, 76, 161*).

Key to genera and species:

1a. Polar axis > 50 µ, oblate-spheroidal..... *Securidaca diversifolia*
1b. Polar axis < 50 µ, subprolate
  2a. 8 - 10 colporate, PAD 4.5 µ..... *Polygala paniculata*
  2b. 10 - 14 colporate, PAD 8 µ..... *Securidaca tenuifolia*

Polygala paniculata L.
8 - 10 colporate; exine 1.5 - 2.0 µ thick, sexine psilate; colpi long, narrow, PAD 4.5 µ; pores lalongate, 2 µ wide, zonorate, costa pori 3 µ thick; amb circular; grains subprolate, 30 - 33 x 24 - 27 µ.
PAN, Croat 11988, MO; plate 83:1003.

Securidaca diversifolia (L.) Blake
11 - 12 colporate; exine 2 µ thick, sexine psilate; colpi long x 5 µ wide; PAD 3 µ; pores lalongate, 4 x 5 µ, resembling zonorate condition, costa pori 2.5 µ thick; amb circular; grains oblate-spheroidal, 22 - 26 x 24.5 - 27.0 µ.
PAN, Schmalzel 1384, MO; plate 83:1004.

Securidaca tenuifolia Chodat
10 - 14 colporate; exine 3 µ thick, sexine psilate; colpi 40 long x 1.5 µ wide, PAD 8 µ; pores circular, 7 - 8 µ diameter, resembling zonorate condition, costa pori 3 µ thick; amb circular; grains subprolate, 50 - 55 x 34 - 38 µ.
PAN, Duke 5512, KE 18409, MO; plate 83:1005.

POLYGONACEAE

Monad; isopolar-radiosymmetric, tricolporate, stephanocolporate, and apolar-radiosymmetric, periporate; exine semitectate, 2 - 5 µ thick; sexine baculate and reticulate, muri multibaculate; colpi long, narrow, sharp; pores lalongate to lolongate, and circular, 2 - 4 µ diameter, PAD 8 µ; amb circular; grains spheroidal to prolate, 32 - 60 x 24 - 60 µ. (*3 genera, 8 species; additional reference: 120*).

Key to genera and species:

1a. Tricolporate
  2a. Reticulate, homobrochate..... *Coccoloba manzanillensis*
  2b. Baculate
    3a. Long axis > 42 µ..... *Triplaris cumingiana*
    3b. Long axis < 42 µ
      4a. Prolate..... *Coccoloba coronata*
      4b. Subprolate to prolate-spheroidal..... *Coccoloba parimensis*
1b. Periporate, reticulate
  5a. < 47 µ; exine 6 µ thick..... *Polygonum hydropiperoides*
  5b. > 47 µ; exine 5 µ thick
    6a. Pores 4 µ diameter..... *Polygonum acuminatum*
    6b. Pores 2 µ diameter..... *Polygonum punctatum*
1c. 4-colporate, reticulate, pores lalongate..... *Coccoloba acuminata*

Coccoloba acuminata HBK
4-colporate; isopolar-radiosymmetric; exine 1.5 - 2.0 µ thick, sexine reticulate, homobrochate, brochi 1 µ wide; colpi 20 x 2 µ; pores lalongate 1.5 x 5 - 6 µ, costa pori 2 µ; amb circular; grains prolate-spheroidal, 23.0 - 23.5 x 22.0 - 22.5 µ.
BCI, Croat 6030, MO; plate 83:1006.

Coccoloba coronata Jacq.
Tricolporate; isopolar-radiosymmetric; exine 2.5 - 3.0 µ thick, sexine baculate, bacula 2 x 1 µ; colpi 30 x 2, PAD 8 µ; pores lalongate, 3 x 5, forming colpus transversalis; amb circular; grains prolate, 32 - 43 x 24 - 31 µ.
PAN, Croat 11962, MO; plate 83:1007.

Coccoloba manzanillensis Beurl.
Tricolporate; isopolar-radiosymmetric; exine 2 µ thick, sexine reticulate, homobrochate, muri 1 µ wide, lumina 1 µ wide; colpi 32.0 x 1.5 µ; pores lalongate, 2 x 6 µ, forming colpus transversalis; amb circular; grains subprolate to prolate-spheroidal, 35 - 38 x 29 - 32 µ.
BCI, Schmalzel 254, MO; plate 83:1008.

Coccoloba parimensis Benth.
Tricolporate; isopolar-radiosymmetric; exine 3 µ thick, sexine baculate, bacula 2 x 1 µ; colpi 32 x 1 - 2 µ, displaying equatorial constriction, PAD 8 µ; pores lalongate, 2 x 6 µ; amb circular; grains subprolate to prolate-spheroidal, 34 - 42 x 29 - 35 µ.
BCI, Foster 838, PMA; plate 83:1009.

Polygonum acuminatum HBK
20-porate; apolar-radiosymmetric; exine 5 µ thick, sexine reticulate, heterobrochate, muri 3.5 µ wide, displaying 5 - 6 bacula (multibaculate); pores 4 µ, PAD 10 µ; amb circular; grains spheroidal, 47 - 60 µ.
PAN, Lazor 2257, MO; plate 83:1010.

Polygonum hydropiperoides Michx.
20-porate; apolar-radiosymmetric; exine 6 µ thick, sexine reticulate, heterobrochate, brochi variable; pores 3 µ diameter; grains spheroidal, 44 - 47 µ.
PAN, Tyson 4581, MO; plate 84:1011.

Polygonum punctatum S. Elliott
20-porate; apolar-radiosymmetric; exine 5 µ thick, sexine reticulate, heterobrochate, pores 2 µ diameter; muri 2 - 3 µ wide, displaying 2 - 5 bacula; (multibaculate); grains spheroidal, 51 - 58 µ.
PAN, Croat 5247, MO; plate 84:1012.

Triplaris cumingiana Fischer & Meyer
Tricolporate; isopolar-radiosymmetric; exine 3 µ thick, sexine baculate, bacula 2 x 1 µ; colpi 38 x 2 µ, PAD 8 µ; pores lolongate 3.5 x 2.5 µ, costa pori 2 µ; amb circular; grains subprolate, 42 - 45 x 30 - 37 µ.
PAN, Holdridge 6467, MO; plate 84:1013.

PORTULACACEAE

Monad; apolar; asymmetric; pericolpate (15 - 18 colpate); exine intectate, 3 µ thick, sexine strongly echinate, echini dimorphic; colpi inconspicuous; amb circular; grains 79 - 91µ. *(1 genus, 1 species).*

Portulaca oleracea L.
Pericolpate (15 - 18 colpate); exine 3 µ thick, sexine strongly echinate, echini 2 x 1 µ and < 0.5 µ, resembling baculate condition; amb circular; grains suboblate to spheroidal, 79 - 91 µ.
PAN, D'Arcy 4974, MO; plate 84:1014.

PROTEACEAE

Monad, isopolar; radiosymmetric; triporate; exine semitectate, 2 µ thick, sexine reticulate, homobrochate, brochi < 1 µ wide, muri multicolumellate; pores circular, crassimarginate; amb angular; grains suboblate, 25 - 30 µ *(1 genus, 1 species; additional reference:: 169).*

Roupala montana Aubl.
Triporate; exine 2 μ thick, sexine reticulate, homobrochate; pores circular 4 μ diameter; costa pori 1 μ; grains suboblate, 19 - 26 x 25 - 30 μ.
PAN, Schmalzel 1331, MO; plate 84:1015.

RAFFLESIACEAE

Monad; isopolar; radiosymmetric; tectate; tricolpate; appearing inaperturate; exine < 1 μ thick, sexine psilate; colpi inconspicuous; costa colpi present; amb circular; grains subprolate, 20 - 21 x 16 - 18 μ. (*1 genus, 1 species*)

Apodanthes casearlae Poit.
Tricolpate; exine < 1 μ thick, sexine scabrate; colpi inconspicuous, 16 x 2 μ, costa colpi 2 μ thick; amb circular; grains subprolate, 19.5 - 21.0 x 16 - 18 μ.
PAN, Nee 6775, PMA; plate 84:1016.

RHAMNACEAE

Monad; isopolar; radiosymmetric; tectate; tricolporate; exine 1.0 - 1.5 μ thick, sexine psilate to scabrate; margo present; costa pori protruding, thick vestibulum; amb angular; grains oblate-spheroidal to suboblate, 15 - 25 x 17 - 31 μ. (*2 genera, 3 species; additional reference: 160*).

Key to genera and species:

1a. < 20 μ (pores circular, 4 μ diameter, PAD 5 μ)..... *Gouania lupuloides*
1b. > 20 μ
  2a. PAD 8 μ, sexine psilate..... *Colubrina glandulosa*
  2b. PAD 3 μ, sexine scabrate..... *Gouania adenophera*

Colubrina glandulosa Perk.
Exine 1.0 - 1.5 μ thick, sexine psilate; colpi long x 1 μ wide, margo present, PAD 8 μ; pores lalongate, inconspicuous; amb angular; grains suboblate, 22 - 24 x 26.5 - 28.0 μ.
PAN, Nee & Gentry 8632, KE 18313, MO; plate 84:1019.

Gouania adenophera Pilg.
Exine 1 μ thick, sexine scabrate; colpi long, x1 μ wide, margo present, PAD 3 μ; pores lalongate 3 x 6 μ, and sometimes appearing circular, 6 μ diameter, vestibulum present; amb angular; grains suboblate, 22 - 25 x 27 - 31 μ.
PAN, Tyson et al. 4519, KE 18316, MO; plate 84:1017.

Gouania lupuloides (L.) Urban
Exine 1.0 - 1.5 μ thick, sexine scabrate; colpi long x 1 μ wide, margo present, PAD 5 μ; pores circular 4 μ diameter, vestibulum present; amb angular; grains oblate-spheroidal, 15 - 17 x 17 - 19 μ..
BCI, Schmalzel 374, MO; plate 84:1018.

RHIZOPHORACEAE

Monad; isopolar; radiosymmetric; tricolporate; exine tectate, 1.5 μ thick; sexine microreticulate, homobrochate; colpi long, sharp; pores lalongate, occasionally zonorate, interporium usually very short, costa transversalis conspicuous, protuberant; amb circular; grains subprolate, 19 - 23 x 17 - 20 μ. (*1 genus, 1 species; additional reference: 84*).

Cassipourea elliptica (Sw.) Poir.
Tricolporate; exine 1.5 μ thick, sexine microreticulate, homobrochate; colpi 20 x 2 μ, PAD 3 - 4 μ; pores lalongate, 2 μ wide, approaching zonorate condition; amb circular; grains subprolate, 19 - 23 x 17 - 20 μ
BCI, Schmalzel 329, MO; plate 84:1020.

RUBIACEAE

Monad (except *Randia*: tetrad); generally isopolar; radiosymmetric; exine usually tectate, also semitectate and intectate; inaperturate, diporate, triporate, periporate, stephanoporate; tricolpate, stephanocolpate; tricolporate, stephanocolporate; exine variable, 1 - 4 μ; sexine usually reticulate to baculate, less frequently psilate, granular, scabrate, verrucate, echinate; colpi variable; pores (when present) displaying conspicuous annulus; amb usually circular; grains usually oblate-spheroidal, 10 - 102 x 12 - 80 μ. Certain genera, *Psychotria*, *Hoffmania*, *Cephaelis*, susceptible to damage by acetolysis. (*37 genera, 64 species* ; *additional references: 8, 77*).

Key to genera and species:

1a. Grains arranged in tetragonal tetrads (grains triporate, sexine psilate)..... *Randia armata*
1b. Grains appearing as monads
  2a. Inaperturate
    3a. Rugulate, occasionally perforate..... *Cephaelis tomentosa*
    3b. Baculate
      4a. Exine > 3 μ thick..... *Psychotria acuminata*
      4b. Exine < 3 μ thick

5a. > 60 µ
6a. Spheroidal ..... *Psychotria deflexa*
6b. Prolate-spheroidal ..... *Psychotria furcata*
5b. < 60 µ
7a. Exine ca. 2.5 µ thick ..... *Psychotria brachybotrya* & *P. pittieri*
7b. Exine ca. 2 µ thick ..... *Psychotria brachiata, P. capitata, P. racemosa*
3c. Reticulate
8a. > 60 µ ..... *Palicourea gutanensis*
8b. < 60 µ
9a. Exine > 3 µ thick
10a. Heterobrochate, brochi > 1.5 µ wide
11a. Brochi < 3 µ wide ..... *Psychotria marginata*
11b. Brochi 3 - 7 µ wide
12a. Exine 4 µ thick ..... *Guettarda foliacea*
12b. Exine 5 µ thick ..... *Chomelia spinosa*
10b. Homobrochate, brochi < 1.5 µ wide ..... *Psychotria micrantha*
9b. Exine < 3 µ thick
13a. < 30 µ ..... *Psychotria carthaginensis*
13b. 30 - 45 µ ..... *Psychotria horizontalis*
13c. > 45 µ ..... *Psychotria pubescens*
3d. Gemmate ..... *Psychotria uliginosa*
2b. Diporate (sexine verrucate) ..... *Coussarea curvigemmia*
2c. Triporate (pores always annulate)
14a. Reticulate
15a. Amb angular ..... *Alibertia edulis*
15b. Amb circular
16a. 15 - 22 µ, exine 1 µ thick ..... *Amaioua corymbosa*
16b. 43 - 50 µ, exine 3.5 µ thick ..... *Tocoyena pittieri*
14b. Verrucate ..... *Coussarea curvigemmia*
14c. Scabrate ..... *Faramea occidentalis*
14d. Psilate ..... *Randia armata*
2d. Stephanoporate (4-porate)
17a. > 25 µ, exine 2 µ, amb angular ..... *Alibertia edulis*
17b. < 25 µ, exine 1 µ, amb circular ..... *Amaioua corymbosa*
2e. Periporate
18a. Pores 5 - 7, grains 35 - 40 µ, psilate ..... *Randia formosa*
18b. Pore number uncertain, perforate, 45 - 50 µ ..... *Geophila repens*
2f. Tricolpate
19a. Echinate ..... *Coutarea hexandra*
19b. Granular or scabrate
20a. Spheroidal, < 25 µ, exine ca. 1.5 µ thick ..... *Diodia denudata*
20b. Suboblate, > 25 µ, exine ca. 2 µ thick ..... *Hamelia patens*
19c. Reticulate
21a. Homobrochate
22a. ≥49 µ ..... *Psychotria chagrensis*
22b. < 38 µ ..... *Psychotria psychotriaefolia*
21b. Heterobrochate
23a. < 25 µ ..... *Alseis blackiana*
23b. 25 - 50 µ
24a. PAD > 15 µ ..... *Psychotria grandis*
24b. PAD < 15 µ ..... *Psychotria emetica*
2g. Stephanocolpate
25a. 4 - 5 colpate
26a. Baculate, grains > 50 µ ..... *Cephaelis ipecacuanha*
26b. Reticulate, grains 25 - 50 µ ..... *Psychotria emetica*
25b. 6-colpate (sexine baculate, grains > 25 µ) ..... *Spermacoce tenuior*
25c. 7 - 9 colpate
27a. Suboblate, exine ca. 2.5 µ thick ..... *Borreria densiflora*
27b. Spheroidal to oblate-spheroidal, exine ca. 3 µ thick ..... *Spermacoce tenuoir*
25d. 10-colpate (sexine baculate, grains 30 - 38 µ) ..... *Diodia sarmentosa*
2h. Tricolporate ..... *Cosmibuena skinneri*
28a. Psilate ..... *Isertia haenkeana*
28b. Granulate
29a. Pores circular, 7 µ diameter ..... *Chiococca alba*
29b. Pores lalongate, ca. 4 x 10 µ
30a. > 25 µ, exine > 2 µ thick ..... *Antirhea trichantha*
30b. < 25 µ, exine < 2 µ thick ..... *Hoffmannia woodsonii*
28c. Rugulate
28d. Reticulate
31a. < 20 µ
32a. Exine ca. 1.5 µ thick ..... *Calycophyllum candidissimum*
33a. Pores lalongate ..... *Warszewiczia coccinea*
33b. Pores circular
32b. Exine ca. 2 µ thick ..... *Macrocnemum glabrescens*
34a. Suboblate, PAD 4 µ ..... *Pogonopus speciosus*
34b. Spheroidal to oblate-spheroidal, PAD 7 µ

32c. Exine ca. 2.5 μ thick ..... *Chimarrhis parviflora*
31b. 20 - 40 μ
35a. Prolate
36a. > 26 μ
37a. Prolate-spheroidal, exine 2 μ thick ..... *Hamelia axillaris*
37b. Prolate-spheroidal to subprolate, exine 3 μ thick ..... *Posoqueria latifolia*
36b. < 26 μ
38a. Prolate-spheroidal, PAD 7 μ, pores 5 μ diameter ..... *Genipa americana*
38b. Subprolate, PAD 12 μ, pores lalongate, 5 x 11 μ ..... *Oldenlandia corymbosa*
35b. Oblate
39a. Exine > 2.5 μ thick ..... *Faramea luteovirens, Pentagonia macrophylla, Psychotria limonensis*
39b. Exine < 2.5 μ thick
40a. Pores circular
41a. Pores ca. 5.0 μ diameter ..... *Genipa americana*
41b. Pores ca. 3.5 μ diameter ..... *Sabicea villosa*
40b. Pores lalongate
42a. Oblate-spheroidal, PAD 6 μ; colpi > 15 μ
43a. Homobrochate ..... *Ixora coccinea*
43b. Heterobrochte ..... *Alseis blackiana*
42b. Suboblate, PAD 16 μ, colpi < 15 μ ..... *Psychotria granadensis**
31c. > 40 μ
44a. Suboblate, exine 3.5 μ thick, colpi 20 μ long ..... *Manettia reclinata*
44b. Subprolate, exine 3 μ thick, colpi 40 μ long ..... *Posoqueria latifolia*
28e. Baculate ..... *Uncaria tomentosa*
2i. Stephanocolporate
45a. 4-colporate
46a. Granulate
47a. < 25 μ
48a. Subprolate ..... *Borreria ocimoides*
48b. Prolate-spheroidal ..... *Borreria laevis*
47b. > 25 μ ..... *Isertia haenkeana*
46b. Reticulate
49a. grains > 45 μ ..... *Manettia reclinata*
49b. grains < 45 μ
50a. Prolate-spheroidal ..... *Bertiera guianensis*
50b. Oblate-spheroidal ..... *Faramea luteovirens*
45b. 5-colporate ..... *Bertiera guianensis*
45c. 6-colporate
51a. Subprolate ..... *Borreria ocimoides*
51b. Prolate-spheroidal ..... *Borreria laevis*
45d. > 6 colporate
52a. 7 - 9 apertures
53a. < 20 μ ..... *Borreria laevis*
53b. > 20 μ ..... *Borreria densiflora*
52b. 9 or 16 apertures ..... *Borreria latifolia*

Alibertia edulis (A. Rich.) A. Rich.
Triporate, occasionally tetraporate; exine semitectate, 2 μ thick, sexine reticulate (per-reticulate), heterobrochate, muri 0.3 - 1.0 μ wide, simplibaculate, bacula variable in size; pores circular 3 μ diameter, annulus 4 μ wide; amb angular; grains suboblate, 24 - 27 x 30 - 33 μ.
BCI, Schmalzel 962, MO; plate 84:1021.

Alseis blackiana Hemsl.
Tricolporate; exine semitectate, 2 μ thick, sexine reticulate (per-reticulate), heterobrochate, muri simplibaculate, bacula variable in size, lumina 1μ wide; colpi 18.0 x 2.5 μ, PAD 6 μ; pores lalongate, 5 x 11 μ; amb circular; grains oblate-spheroidal, 19 - 20 x 20 - 21 μ.
BCI, Schmalzel 564, MO; plate 84:1022.

Amaioua corymbosa HBK
Triporate, occasionally tetraporate; exine semitectate, 1.2 μ thick, sexine reticulate, heterobrochate, muri < 1 μ, lumina 1.0 - 1.5 μ wide; interporium 10 μ; pores circular ,3 μ diameter, annulus 3 μ thick; amb circular; grains oblate-spheroidal, 15 - 19 x 16 - 22 μ.
PAN, Stimson 5328, MO; plate 84:1023.

Antirhea trichantha (Griseb.) Hemsl.
Tricolporate; exine tectate, 1.5 μ thick, sexine granulate; colpi 18 x 3 μ, displaying equatorial constriction, PAD 5 μ; pores lalongate 3 x 10 μ; amb circular; grains oblate-spheroidal, 17 - 18 x 18.0 - 20.5 μ.
PAN, LAO 497, KE 18063, MO; plate 84:1024.

Bertiera guianensis Aubl.
4 - 5 colporate; exine semitectate, 3 μ thick, sexine reticulate, homobrochate, muri simplibaculate, 1.5 μ high, lumina < 1 μ wide; PAD 10 μ; pores circular 6 μ diameter; amb circular; grains prolate-spheroidal, 35 - 43 x 34 - 37 μ.
PAN, Foster & Augspurger 2855, PMA; plate 84:1025.

Borreria densiflora DC.
Stephanocolporate (7 - 9 colporate); exine intectate, 2.5 µ thick, sexine slightly baculate, bacula < 1 µ high; colpi 7.0 x 0.5 µ, PAD 10 µ; costa pori apparent; amb circular; grains suboblate, 23.0 - 25.5 x 27 - 29 µ.
BCI, Schmalzel 987, MO; plate 84:1026.

Borreria laevis (Lam.) Griseb.
4, 6, 8-colporate; exine tectate, 2 µ thick, sexine granulate to scabrate; colpi 10 x 1 µ; pores lalongate; amb circular; grains prolate-spheroidal, 16.0 - 19.5 x 15.0 - 18.5 µ.
BCI, Schmalzel 945, MO; plate 84:1028.

Borreria latifolia (Aubl.) Schum
9, 16-colporate; exine semitectate, 2 µ thick, sexine granulate, granules ca. 0.5 µ, homogeneous; colpi 14 x < 1 µ, PAD 11 µ, pores lalongate; amb circular; grains spheroidal to prolate-spheroidal, 42.5 - 49.0 x 42 - 49 µ.
BCI, Schmalzel 944, MO; plate 84:1027.

Borreria ocimoides (Burm. f.) DC.
4-6 colporate; exine tectate, 2 µ thick, sexine granulate, slightly perforate, endosexine columellate; colpi 9 x 1 µ, PAD 7 µ; pores lalongate 1.5 x 10.0 µ; amb circular; grains subprolate, 17 - 23 x 15 µ.
BCI, Croat 8268, MO; plate 84:1029.

Calycophyllum candidissimum (Vahl.) DC.
Tricolporate; exine semitectate, 1.5 µ thick, sexine reticulate, homobrochate, brochi < 1 µ wide; colpi as long as grain x 2.5 µ, PAD 4 µ; pores lalongate 2 x 7 µ, transversely parallel; amb circular; grains spheroidal to oblate-spheroidal, 14 - 16 x 16 - 18 µ.
PAN, Tyson et al. 5125, MO; plate 85:1030.

Cephaelis ipecacuanha (Brot.) A. Rich.
3 - 5 colporate; exine intectate, 3 µ thick, sexine baculate, bacula isodiametric; colpi 20 x 8 µ; pores lalongate; amb circular; grains spheroidal, 53 - 58 µ.
PAN, Stern et al. 95, KE 18064, MO; plate 85:1031.

Cephaelis tomentosa (Aubl.) Vahl.
Inaperturate; exine semitectate, 1 µ, sexine rugulate, perforate; aperturates absent or inconspicuous; grains spheroidal to subprolate-spheroidal, 46 - 73 x 44 - 73 µ.
PAN, Schmalzel 858, MO; plate 85:1032.

Chimarrhis parviflora Standl.
Tricolporate; exine semitectate, 2.5 µ, sexine reticulate, homobrochate, muri simplibaculate, bacula 2 x 1 µ; colpi as long as grain x 3 µ wide; pores lalongate 5 x 10 µ; amb circular; grains spheroidal to oblate-spheroidal, 16.0 - 18.5 x 17 - 21 µ.
BCI, DeStephen 12, BCI; plate 85:1033.

Chiococca alba (L.) Hitchc.
Tricolporate; exine semitectate, 2.5 µ thick, sexine reticulate, heterobrochate, brochi 1 - 5 µ wide; colpi as long as grain x 6 µ wide, margo 6 µ thick; pores lalongate 4 x 10 µ; amb circular; grains suboblate to oblate-spheroidal, 27 - 30 x 30 - 34 µ.
PAN, Hammel 3757, KE 18065, MO; plate 85:1034.

Chomelia spinosa Jacq.
Inaperturate; exine semitectate, 5 µ thick, sexine reticulate (per-reticulate), heterobrochate, muri simplibaculate, 1.5 µ wide, brochi 1 - 5 µ wide; amb circular; grains spheroidal, 32 - 37 µ.
PAN, Tyson et al 4264, MO; plate 85:1035.

Cosmibuena skinneri (Oerst.) Hemsl.
Tricolporate; exine semitectate, 2.5 µ thick, sexine psilate, slightly scabrate; colpi 16.0 x 1.5 µ, PAD 12 µ; pores forming costa transversalis, annulus 2 µ; amb circular; grains oblate-spheroidal, 22 - 26 x 23 - 28 µ.
PAN, Ebinger 817, KE 18066, MO; plate 85:1036.

Coussarea curvigemmia Dwyer.
Diporate, triporate; exine intectate, 1.5 µ thick, sexine verrucate; pores 7 µ diameter, annulus 12 x 5 µ wide, interporium 11 µ; amb circular; grains oblate-spheroidal, 19 - 21 x 20 - 23 µ.
BCI, Schmalzel 83, MO; plate 85:1037.

Coutarea hexandra (Jacq.) Schum.
Tricolpate; exine semitectate, 3 µ, sexine echinate, echini short, conical, sharp; colpi 20 x 6 µ; amb circular; grains spheroidal, 37 - 45 µ.
PAN, Tyson & Bryde 547, MO; plate 85:1038.

Diodia denudata Standl.
Tricolpate; exine tectate, 1.5 µ thick, sexine scabrate; colpi apparently having opercula; amb circular; grains spheroidal, 17 - 24 µ.
PAN, Blum et al. 1747, MO; plate 85:1039.

Diodia sarmentosa Sw.
10-colpate; exine tectate, 3 µ thick, sexine baculate; colpi short, PAD 13 µ; amb circular; grains spheroidal, 30 - 38 µ.
PAN, Hammel 4352, MO; plate 85:1040.

Faramea luteovirens Standl.
Tricolporate, tetracolporate; exine semitectate, 3 µ thick, sexine reticulate (per-reticulate), heterobrochate, muri 1.5 - 2.0 µ, simplibaculate, bacula < 1 µ; colpi 16 x 5 µ, costa colpi 2 µ; pores circular (9 µ diameter, annulus 3 µ); amb circular; grains oblate-spheroidal, 29.5 - 37.0 x 35.5 - 40.0 µ.
PAN, Croat 5217, MO; plate 85:1041.

Faramea occidentalis (L.) A. Rich.
Triporate; exine tectate, 1.5 μ thick, sexine scabrate; pores circular 7 μ diameter, aspidate, annulus 2 μ wide, vestibulum 4 x 3 μ; amb semi-angular; grains oblate, 12 - 13 x 18 - 19 μ.
PAN, Blum et al. 2329, MO; plate 85:1042.

Genipa americana L.
Tricolporate; exine semitectate, 1.8 μ thick, sexine reticulate (per-reticulate), homobrochate, brochi < 0.5 μ; colpi 28 x 4 μ, PAD 7 μ; pores circular, 5 μ diameter, annulus 3 μ; amb circular; grains oblate-spheroidal to prolate-spheroidal, 22 - 27 x 23 - 27 μ.
BCI, Schmalzel 257, MO; plate 85:1043.

Geophila repens (L.) Johnston
Periporate; exine semitectate, 3 μ thick, sexine perforate; pore number uncertain, circular, 8 μ diameter, operculate; grains spheroidal, 45 - 50 μ.
PAN, Mori 7054, MO; plate 85:1044.

Guettarda foliacea Standl.
Inaperturate; exine semitectate, 4 μ thick, sexine reticulate (per-reticulate), heterobrochate, muri 1 μ wide, simplibaculate, bacula 3 x 1 μ, lumina 2 μ; grains spheroidal to prolate-spheroidal, 24 - 39 x 25 - 39 μ.
BCI, Knight, no voucher, BCI; plate 85:1045.

Hamelia axillaris Sw.
Tricolporate; exine semitectate, 2 μ thick, sexine reticulate, homobrochate; colpi 24 x 2 μ, costa colpi 2 μ, PAD 10 μ; pores lalongate 1 x 6 μ; amb circular; grains prolate-spheroidal to subprolate, 35 - 37 x 30 - 34 μ.
BCI, Schmalzel 1012, MO; plate 86:1046.

Hamelia patens Jacq.
Tricolpate; exine tectate, 2 μ, sexine scabrate, columellae abundant; colpi as long as grain x 6 μ wide, PAD 13 μ; amb circular; grains suboblate, 23 - 31 x 32 - 40 μ.
PAN, Tyson 1335, MO; plate 86:1047.

Hoffmannia woodsonii Standl.
Tricolporate; exine semitectate, 2 μ thick, sexine rugulate; colpi as long as grain x 3 μ wide, PAD 7 μ; pores circular 2.5 μ diameter; amb circular; grains oblate-spheroidal to spheroidal, 21 - 27 x 26 - 29 μ.
PAN, Croat 10125, MO; plate 86:1048.

Isertia haenkeana DC.
Tricolporate, tetracolporate; exine tectate, 1.5 - 3.5 μ thick, sexine granular; colpi 20 x 1 μ; PAD 16 μ; pores circular 7 μ diameter, appearing annulate; amb circular; grains oblate-spheroidal, 28 - 34 x 31 - 35 μ.
BCI, Schmalzel 29, MO; plate 86:1049.

Ixora coccinea L.
Tricolporate; exine semitectate, 2 μ thick, sexine reticulate, homobrochate, brochi < 1 μ wide; colpi 27 x 3 μ, PAD 6 μ; pores lalongate, 5 x 18 μ; amb circular; grains oblate-spheroidal, 22.0 - 23.5 x 25 - 27 μ.
PAN, Tyson et al. 3788, MO; plate 86:1050.

Macrocnemum glabrescens (Benth.) Wedd.
Tricolporate; exine semitectate, 2 μ thick, sexine reticulate, homobrochate, brochi < 1 μ wide; PAD 4 μ; pores forming costa transversalis, annulus 2 μ wide; amb circular; grains suboblate, 14 - 17 x 17 - 20 μ.
BCI, Schmalzel 1266, MO; plate 86:1051.

Manettia reclinata L.
Tricolporate, tetracolporate; exine semitectate, 3.5 μ thick, sexine reticulate (per-reticulate), homobrochate, muri simplibaculate, lumina 3 μ wide; colpi 20 x 1 μ, PAD 3 μ; pores lalongate, 9 μ wide; amb circular; grains suboblate, 44 - 54 x 51 - 61 μ.
PAN, Croat 12740, MO; plate 86:1053.

Oldenlandia corymbosa L.
Tricolporate; exine semitectate, 1.2 μ thick, sexine reticulate, homobrochate, brochi < 1 μ wide; PAD 12 μ; pores lalongate, 5 x 11 μ; amb circular; grains subprolate, 22 - 26 x 18 - 19 μ.
PAN, Lewis et al. 5365, MO; plate 86:1052.

Palicourea guianensis Aubl.
Inaperturate; exine semitectate, 3 μ thick, sexine reticulate (per-reticulate), heterobrochate, lumina variable, 2 - 4 x 2 - 7 μ wide; grains spheroidal to subprolate, 63 - 102 x 60 - 80 μ.
PAN, Tyson 3600, MO; plate 86:1054.

Pentagonia macrophylla Benth.
Tricolporate; exine semitectate, 3 μ thick, sexine reticulate (per-reticulate), heterobrochate, lumina 2 - 6 μ wide, muri simplibaculate, bacula 1 - 3 μ high; colpi 22 x 3 μ, PAD 14 μ; pores circular 12 μ diameter, annulus 6 μ wide; amb circular; grains oblate-spheroidal, 35 - 39 x 37 - 41 μ.
BCI, Schmalzel 1032, MO; plate 86:1055.

Pogonopus speciosus (Jacq.) K. Schum. in Mart.
Tricolporate; exine semitectate, 2 μ thick, sexine reticulate, homobrochate, brochi < 1 μ wide; colpi as long as grain x 2.5 μ wide, PAD 7 μ; pores lalongate 6 x 10 μ; amb circular; grains spheroidal to oblate-spheroidal, 17 - 19 x 18 - 20 μ.
PAN, Tyson 2629, MO; plate 86:1056.

Posoqueria latifolia (Rudge) R. & S.
Tricolporate; exine semitectate, 3 μ thick, sexine reticulate (per-reticulate), heterobrochate, muri 1.5 μ wide, simplibaculate, bacula 1.0 - 2.5 μ, lumina 2 x 3, 3 x 7 μ wide; colpi 40 x 12 μ, PAD 15 μ; pores lalongate 10 x 13 μ, annulate; amb circular; grains prolate-spheroidal to subprolate, dimorphic, 51 - 59 x 43 - 52 and 34 - 36 x 28 - 33 μ.
PAN, Schmalzel 618, MO; plate 86:1057.

Psychotria acuminata Benth.
Inaperturate; exine intectate, 4.5 μ thick, sexine per-reticulate, baculate, bacula dense, resembling per-reticulate condition; grains spheroidal to subprolate, 49.5 - 68.5 x 47.0 - 68.5 μ.
BCI, Croat 4525, MO; plate 86:1058.

Psychotria brachiata Sw.
Inaperturate; exine intectate, 2 μ thick, sexine baculate, bacula 2.0 x 0.5 μ; grains spheroidal to subprolate, 48 - 57 x 48 - 57 μ.
PAN, Croat 11231, MO; plate 87:1059.

Psychotria brachybotrya Müell. Arg.
Inaperturate; exine intectate, 2.5 μ thick, sexine baculate, bacula 2.0 x 0.5 μ; grains spheroidal to subprolate, 42 - 46 x 37 - 46 μ.
BCI, Croat 11132, MO; plate 87:1060.

Psychotria capitata R. & P.
Inaperturate; exine intectate, 2 μ thick, sexine baculate, bacula 2.0 x 0.5 μ; grains spheroidal to subprolate, 40 - 55 x 37 - 55 μ.
PAN, Croat 10985, MO; plate 87:1061.

Psychotria carthaginensis Jacq.
Inaperturate; exine semitectate, 2 μ thick, sexine reticulate (per-reticulate), heterobrochate, muri simplibaculate, bacula 1.5 x 0.7 μ high; grains dimorphic, spheroidal to subprolate, 30 - 38 x 27 - 38 μ, and spheroidal, ca. 27 μ.
BCI, Croat 10347, MO; plate 87:1062.

Psychotria chagrensis Standl.
Tricolpate; exine semitectate, 3 μ thick, sexine reticulate, homobrochate, lumina 1 μ wide, muri < 0.5 μ wide, colpi as long as grain x 12 μ wide, PAD 22 μ; amb circular; grains spheroidal, 49 - 54 μ.
PAN, Foster 1687, PMA; plate 87:1064.

Psychotria deflexa DC.
Inaperturate; exine intectate, 2.5 μ, sexine baculate, bacula 2 x < 1 μ high; grains spheroidal, 61 - 71 μ.
PAN, Tyson et al. 4320, KE 18072, MO; plate 87:1065.

Psychotria emetica L. f.
Tricolpate and 4-5 colpate; exine semitectate, 2 μ thick, sexine reticulate, homobrochate, brochi < 1 μ wide; colpi long x 12 μ wide, PAD 14 μ; amb circular; grains spheroidal to subprolate, 38 - 47 x 34 - 47 μ.
BCI, Croat 5817, MO; plate 87:1063.

Psychotria furcata DC.
Inaperturate; exine intectate, 2 μ thick, sexine baculate, bacula 2.0 x 0.5 μ high; grains prolate-spheroidal, 66 - 73 x 65 - 67 μ.
BCI, Foster 1046, PMA; plate 87:1066.

Psychotria granadensis Benth. (*P. tenuifolia* Swartz)
Tricolporate; exine semitectate, 2 μ thick, sexine reticulate, homobrochate, brochi < 1 μ wide; colpi 12 x 4 μ, PAD 16 μ; pores 5.5 x 4.0 μ; amb circular; grains suboblate, 20.5 - 23.0 x 26.5 - 30.0 μ.
BCI, White 123, KE 18073, MO; plate 87:1067.

Psychotria grandis Sw.
Tricolpate; exine semitectate, 2 μ thick, sexine reticulate, homobrochate, lumina > 1 μ wide, muri < 1 μ wide, simplibaculate bacula 1.0 x < 0.5 μ; PAD 25 μ; amb circular; grains prolate-spheroidal, 37 - 49 x 34 - 45 μ.
PAN, Croat 15090, MO; plate 87:1069.

Psychotria horizontalis Sw.
Inaperturate; exine semitectate, 2 μ thick, sexine reticulate, homobrochate, muri < 1 μ wide, lumina 1 μ wide, grains subprolate, 37 - 47 x 29 - 43 μ.
PAN, Aguilar 21, PMA; plate 87:1068.

Psychotria limonensis Krause
Tricolporate; exine semitectate, 2.5 μ to 3.0 μ thick, sexine per-reticulate, homobrochate; colpi as long as grain x 0.5 μ wide, PAD 10 μ to 18 μ; amb circular; grains dimorphic, oblate-spheroidal, 18 - 20 x 22 - 25 μ, and oblate-spheroidal to suboblate, 24 - 34 x 32 - 40 μ.
BCI, Schmalzel 682, MO; plate 88:1070.

Psychotria marginata Sw.
Inaperturate; exine semitectate, 4 μ thick, sexine reticulate (per-reticulate), heterobrochate, muri simplibaculate, bacula 2 x 2 μ high, lumina 2 - 3 μ; grains dimorphic, spheroidal, 43 - 51 μ, and suboblate, 27 - 28 x 33 - 34 μ.
BCI, DeStephen 238, BCI; plate 88:1071.

Psychotria micrantha HBK
Inaperturate; exine semitectate, 4 μ thick, sexine reticulate, homobrochate, brochi < 1 μ wide, muri simplibaculate, bacula isodiametric; grains spheroidal to prolate-spheroidal, 24 - 46 μ.
BCI, Foster 641, MO; plate 88:1072.

Psychotria pittieri Standl.
Inaperturate; exine intectate, 2.5 μ thick, sexine baculate, bacula 2 x 1 μ high; grains spheroidal to prolate-spheroidal, 43 - 53 μ.
BCI, Croat 9547, MO (p), PAN, Correa & Dressler 1902, PMA (d); plate 88:1073.

Psychotria psychotriaefolia (Seem.) Standl.
Tricolpate exine semitectate, 2 μ thick, sexine reticulate, homobrochate, muri < 1 μ wide, lumina 1 μ wide; colpi as long as grain, PAD 11 μ; grains spheroidal to prolate-spheroidal, 27 - 38 μ.
PAN, Duke et al. 3655, MO; plate 88:1074.

Psychotria pubescens Sw.
Inaperturate; exine semitectate, 3 μ thick, sexine reticulate, homobrochate, muri and lumina < 1 μ wide; grains spheroidal to subprolate, 46 - 61 μ.
PAN, Croat 11227, MO; plate 88:1075.

Psychotria racemosa (Aubl.) Raeuschel
Inaperturate; exine intectate, 2 μ thick, sexine baculate, bacula isodiametric; grains spheroidal, 41 - 57 μ
BCI, Croat 10842, MO; plate 88:1076.

Psychotria uliginosa Sw.
Inaperturate; exine intectate, 2 μ thick, sexine gemmate, gemmae 1.0 - 2.5 μ wide; grains spheroidal, 28 - 31 μ.
CR, CR 70547; plate 88:1077.

Randia armata (Sw.) DC.
Tetragonal tetrad; grains triporate; exine tectate, intectate 1 μ thick, sexine psilate; pores circular, 5 μ diameter, crassimarginate, annulus 2 μ wide, interporium 17 μ; grains subprolate, 38 x 32 μ, tetrad 50 x 55 μ.
PAN, Croat 14859, MO; plate 88:1078.

Randia formosa (Jacq.) Schum.
Periporate (5 - 7 porate); exine semitectate, 1 μ thick, sexine psilate; pores circular, 4 - 5 μ diameter, protuberant, annulus 3.5 μ wide, costa pori 4 μ, interporium 10 μ; amb circular; grains spheroidal, 36 - 41 μ.
PAN, Schmalzel 824, MO; plate 88:1079.

Sabicea villosa Willd. ex R. & S.
Tricolporate; exine semitectate, 2 μ thick, sexine reticulate, homobrochate, brochi < 1 μ wide; colpi inconspicuous; pores circular, 3. 5 μ diameter; amb circular; grains spheroidal to suboblate, 17 - 24 μ.
PAN, Luteyn & Kennedy 1798, KE 18075, MO; plate 88:1081.

Spermacoce tenuior L.
Stephanocolpate (6 - 7 colpate), occasionally appearing porate, exine semitectate, 3 μ thick, sexine baculate, bacula 2 μ high; colpi 8.0 x < 0.5 μ, PAD 10 μ; amb circular; grains spheroidal to oblate-spheroidal, 26 - 32 μ.
PAN, Gentry & Tyson 1631, MO; plate 88:1080

Tocoyena pittieri (Standl.) Standl.
Triporate; exine semitectate, 3.5 μ thick, sexine reticulate (per-reticulate), heterobrochate, muri simplibaculate, bacula 2 μ high, lumina wide pores dimorphic, 18 x 13 μ; 12 x 7 μ, annulus 3 μ, interporium 22 μ; amb circular; grains oblate-spheroidal, 43 - 45 x 44 - 50 μ.
PAN, Croat 4636, MO; plate 88:1082.

Uncaria tomentosa (Willd.) DC.
Tricolporate; exine semitectate, 1.2 μ, sexine baculate, bacula < 1 μ high; colpi 11 x 2 μ; pores circular, 2 μ diameter; amb circular; grains spheroidal to oblate-spheroidal, 10.5 - 15.0 x 12 - 15 μ.
PAN, Croat 14477, MO; plate 89:1083.

Warszewiczia coccinea (Vahl.) Klotzsch.
Tricolporate; exine semitectate, 1 μ thick, sexine reticulate, homobrochate, brochi < 1 μ high; colpi 12 x 2 μ, PAD 3 μ; pores circular, 2 μ diameter, annulus 2 μ; amb circular; grains oblate-spheroidal, 13.5 - 16.0 x 15 - 17 μ.
BCI, Schmalzel 30, MO; plate 89:1084.

RUTACEAE

Monad; isopolar; radiosymmetric tricolporate, tetracolporate; exine semitectate, 1.5 - 3.0 μ thick; sexine reticulate, homobrochate and heterobrochate; muri always simplibaculate; bacula isodiametric, short; colpi long, narrow, sharp; costa colpi present; pores always transversely parallel, inconspicuous (endexinic); amb circular to angular; grains oblate-spheroidal to prolate, 16 - 44 x 15 - 41 μ. *(2 genera, 10 species).*

Key to genera and species:

1a. Tricolporate
  2a. Polar axis < 30 μ
    3a. Oblate-spheroidal..... *Zanthoxylum setulosum*
    3b. Subprolate
      4a. Pores lalongate, conspicuous, 3 x 6 μ..... *Zanthoxylum procerum*
      4b. Pores transversely parallel, inconspicuous, 1 x 7 μ..... *Zanthoxylum belizense*
  2b. Polar axis > 30 μ *Z. panamense*
    5a. Spheroidal to subprolate, 33 - 37 μ, PAD 10 μ..... *Citrus limon*
    5b. Prolate, 37 - 44 μ, PAD 7 μ..... *Citrus aurantifolia*
1b. Tetracolporate

6a. Exine < 2 μ thick, grains oblatespheroidal..... *Citrus reticulata*
6b. Exine > 2 μ, grains prolate-spheroidal to prolate
7a. Prolate..... *Citrus aurantifolia*
7b. Prolate-spheroidal to subprolate
8a. Exine 2 - 3 μ thick, reticulum homobrochate..... *Citrus sinensis, C. grandis*
8b. Exine 2.0 - 2.5 μ thick, reticulum heterobrochate..... *Citrus limon, C. aurantium*

Citrus aurantifolia (Christman) Swingle
Tricolporate, tetracolporate; exine 2.5 - 3.0 μ thick, sexine reticulate, heterobrochate, simplibaculate, bacula 0.5 μ high, muri 0.5 μ, lumina 1 - 3 μ wide; colpi 35 x 2 μ, costa colpi 5 μ, PAD 7 μ; pores lalongate, 2 x 8 μ; amb circular to angular; grains prolate, 37 - 44 x 28 - 35 μ.
BCI, Croat 9190, KE 18434, MO; plate 89:1085.

Citrus aurantium L.
Tetracolporate; exine 2.0 - 2.5 μ, sexine reticulate, heterobrochate, simplibaculate , bacula 0.5 x 0.5 μ high, muri 0.5 μ wide, lumina 1 - 3 μ wide; colpi 24 x 2 μ, costa colpi 3 μ, PAD 8 - 10 μ; pores lalongate, 2 x 6 - 8 μ; amb circular (tetralobate); grains subprolate, 29 - 35 x 24 - 28 μ.
MEX: Martinez 1285, PMA; plate 89:1086.

Citrus grandis (L.) Osbeck
Tetracolporate; exine 2 μ thick, sexine reticulate, homobrochate, brochi < 1 μ, muri simplibaculate; colpi as long as grain x 2 μ wide; pores lalongate, 4 x 12 μ; amb circular; grains prolate-spheroidal, 29.0 - 31.5 x 27 - 30 μ.
IN, #4837, HIFP; plate 89:1087.

Citrus limon (L.) Burm. f.
Tricolporate, tetracolporate; exine 2.0 - 2.5 μ thick, sexine reticulate, heterobrochate, simplibaculate, bacula 1.0 x 0.5 high, muri 1 μ, lumina 1 - 3 μ wide; colpi 30 x 1 μ, costa colpi 2.5 - 3.0 μ thick, PAD 10 μ; pores lalongate 1.5 x 8 - 10 μ; amb circular; grains spheroidal to subprolate, 33 - 37 x 30 - 35 μ.
PAN, Schmalzel 1352, MO; plate 89:1088.

Citrus reticulata Blanco
Tetracolporate; exine 1.5 - 2.0 μ thick, sexine reticulate, homobrochate, simplibaculate, bacula 1.0 x 0.5 μ, muri < 0.5 wide, lumina 1 μ wide; colpi 32 x 1, costa colpi 3 μ thick, PAD 9 μ; pores lalongate to transversely parallel, 1 x 11 μ; amb circular; grains oblate-spheroidal, 31 - 41 x 32 - 41 μ.
BCI, Croat 14870, KE 18436, MO; plate 89:1089.

Citrus sinensis (L.) Osbeck
Tetracolporate; exine 3 μ thick, sexine reticulate, homobrochate, simplibaculate, bacula 1.0 x 1.5 μ, brochi 1 μ wide; colpi 30 x 1 μ, costa colpi 2.5 μ, PAD 12 μ; pores lalongate, 1 x 7 μ; grains prolate to subprolate, 33 - 39 x 28 - 34 μ.
BCI, Schmalzel 1282, MO; plate 89:1090.

Zanthoxylum belizense Lund.
Tricolporate; exine 1.5 μ thick, sexine reticulate, homobrochate, muri simplibaculate, brochi < 1 μ wide, bacula 1.0 x 0.5 μ high; colpi 12 x < 1 μ wide, costa colpi 2 μ thick, PAD 5 μ; pores lalongate to transversely parallel, 1 x 7 μ; amb circular; grains subprolate, 18 - 20 x 16 - 19 μ.
BCI, Croat 12497, MO; plate 89:1091.

Zanthoxylum panamense P. Wils.
Tricolporate; exine 2 μ thick, sexine striate-reticulate, homobrochate, simplibaculate, brochi < 1 μ wide, bacula 1.0 x 0.5 μ high; colpi 14 x < 1 μ, costa colpi 2 μ, PAD 5 μ; pores lalongate to transversely parallel, 1 x 6 μ; amb circular; grains subprolate, 18 - 20 x 15 - 18 μ.
BCI, Schmalzel 980, MO; plate 89:1092.

Zanthoxylum procerum J. D. Sm.
Tricolporate; exine 2 μ thick, sexine reticulate, simplibaculate, heterobrochate, muri < 0.5 μ wide, lumina 1 μ, bacula 1.5 x 0.5 μ high; colpi 16 x < 1 μ, costa colpi 2 μ thick, PAD 5 μ; pores lalongate 3 x 6 μ; amb circular; grains subprolate, 21 - 22 x 17 - 18 μ.
BCI, Croat 5847, MO; plate 89:1093.

Zanthoxylum setulosum P. Wils
Tricolporate; exine 2 μ thick, sexine reticulate, simplibaculate, homobrochate, muri 0.5 μ wide, lumina 1 μ wide, bacula 1.0 x < 0.5 μ high; colpi 16 x < 2 μ, costa colpi 2 μ thick, PAD 5 μ; pores transversely parallel, < 0.5 x 7 μ; amb circular; grains oblate - spheroidal, 16 - 18 x 17 - 19 μ.
CR, Linares 92, PAO 697; plate 89:1094.

SAPINDACEAE

Monad; isopolar-radiosymmetric and heteropolar; tricolporate, triporate, syncolporate, stephanoporate (4-porate); exine tectate and semitectate; sexine reticulate, scabrate, foveolate, perforate, psilate; endosexine usually densely columellate; colpi (syncolporate type) very narrow; costa colpi (tricolporate type); pores circular, annulate (syncolporate and triporate types) to lalongate (tricolporate type), pores usually forming vestibulum and covered by fine ectexinic membrane; amb variable, circular, semi-angular, subangular, semilobate; grains prolate-spheroidal to peroblate, usually oblate, 12 - 43 x 23 - 66 μ.
(6 genera, 25 species; additional references: 98, 101).

Key to genera and species:

1a. Tricolporate
- 2a. > 30 µ, pores lalongate, protruding, 2.5 x 6 µ ..... *Talisia princeps*
- 2b. < 30 µ, pores lalongate, normal condition, 5 x 8 µ ..... *Thinouia myriantha*

1b. Syncolporate (*Cupania* &*Serjania*)
- 3a. Scabrate
  - 4a. Exine > 2.5 µ thick, grains oblate ..... *Cupania cinerea*
  - 4b. Exine < 2.5 µ thick, grains suboblate
    - 5a. Exine 1 µ thick, pores 4 µ diameter ..... *Cupania rufescens*
    - 5b. Exine 2 µ thick, pores 7 µ diameter ..... *Cupania sylvatica*
- 3b. Foveolate-perforate
  - 6a. Exine 5 µ thick, amb semilobate ..... *Serjania rhombea*
  - 6b. Exine < 2 µ thick, amb semi-angular
    - 7a. Pores 5 µ diameter, equatorial axis 33 - 40 µ ..... *Serjania circumvallata*
    - 7b. Pores 6 - 7 µ diameter, equatorial axis 60 - 66 µ ..... *Serjania decapleuria*
  - 6c. Reticulate (homobrochate), exine 3 µ thick, amb semi-angular ..... *Serjania cornigera*
  - 6d. Psilate
    - 8a. Amb angular
      - 9a. Pores 2 - 3 µ diameter
        - 10a. Equatorial axis > 35 µ ..... *Serjania paucidentata*
        - 10b. Equatorial axis < 35 µ ..... *Serjania pluvialiflorens*
      - 9b. Pores > 5 - 6 µ diameter
        - 11a. Pores lacking annulus ..... *Cupania latifolia*
        - 11b. Pores annulate
          - 12a. Annulus 2 µ thick ..... *Serjania atrolineata*
          - 12b. Annulus 2.5 - 3.0 µ thick ..... *Serjania mexicana*
    - 8b. Amb semilobate ..... *Serjania trachygona*

1c. Triporate
- 13a. Reticulate (homobrochate)
  - 14a. Pores 2 - 3 µ diameter ..... *Allophylus psilospermus*
  - 14b. pores 7 - 8 µ diameter ..... *Paullinia pinnata*
- 13b. Foveolate, grains dimorphic ca. 32 x 56 µ and 22 x 30 µ ..... *Paullinia baileyi*
- 13c. Scabrate-perforate
  - 15a. Pores < 5 µ diameter
    - 16a. Oblate ca. 22 x 38 µ ..... *Paullinia rugosa*
    - 16b. Peroblate ca. 16 - 20 x 30 - 41 µ
      - 17a. Pores 5 µ diameter ..... *Paullinia fuscescens*
      - 17b. Pores 3 µ diameter ..... *Paullinia glomerulosa*
  - 15b. Pores 6 - 7 µ diameter
    - 18a. Oblate to peroblate ca. 28 x 48 µ ..... *Paullinia bracteosa*
    - 18b. Suboblate ca. 24 x 33 µ ..... *Paullinia fibrigera*
- 13d. Psilate
  - 19a. Amb circular, pores inconspicuous, atrium type ..... *Talisia nervosa*
  - 19b. Amb angular, pores conspicuous, vestibulate ..... *Paullinia turbacensis*

1d. Tetraporate
- 20a. Reticulate
  - 21a. Pores 2 - 3 µ diameter, grains oblate ..... *Allophylus psilospermus*
  - 21b. Pores 7 - 8 µ diameter, grains suboblate ..... *Paullinia pinnata*
- 20b. Foveolate ..... *Paullinia baileyi*

Allophylus psilospermus Radlk.
3 - 4 porate; exine semitectate, 2.5 µ thick, sexine reticulate, homobrochate, brochi < 5 µ wide, endosexine densely columellate, columellae formed by small bacula, sexine easily differentiated from nexine; pores circular, 2 - 3 µ diameter; grains predominantly triporate; amb semi-angular; grains oblate, 15 - 25 x 30 - 35 µ.
BCI, Croat 5031, MO; plate 89:1095.

Cupania cinerea P. & E.
Tricolporate, syncolporate, heteropolar; exine tectate, 3 - 4 µ thick, scabrate, sexine densely columellate; colpi narrow < 1 µ wide; pores circular, 6 µ diameter, forming small vestibulum; grains oblate, 18 - 20 x 37 µ.
PAN, Clewell & Tyson 3263, KE 18319, MO; plate 89:1096.

Cupania latifolia HBK
Tricolporate, syncolporate, heteropolar; exine tectate, 1.5 - 2.0 µ thick, sexine psilate, densely columellate, sexine easily differentiated from nexine; colpi narrow 1 µ wide; pores atrium type, 6 µ diameter; amb angular; grains oblate, 37 µ wide (polar view).
PAN, Lazor 5488, MO; plate 89:1097.

Cupania rufescens Tr. & Pl.
Tricolporate, syncolporate, heteropolar; exine tectate, 1 µ thick, sexine scabrate, endosexine densely columellate; colpi narrow; pores 4 µ diameter, atrium type, covered by fine, granulate sexinic membrane; amb angular; grains suboblate, 20 - 22 x 30 - 35 µ.
BCI, Foster 2163, PMA; plate 89:1098.

Cupania sylvatica Seem.
Syncolporate; exine tectate, 2 µ thick, sexine scabrate, endosexine densely columellate; colpi narrow, 2 µ wide; pores circular, 7 µ diameter, covered by fine ectexinic membrane; amb angular; grains suboblate to oblate, 26 - 29 x 40 - 43 µ.
BCI, Croat 13481, KE 18321, MO; plate 89:1099.

Paullinia baileyi Standl.
Triporate, occasionally 4 aperturate; exine tectate, 2 µ thick, sexine scabrate, endosexine densely columellate; pores circular, 9 µ diameter, covered by fine ectexinic membrane, costa pori (annulus) 3 µ thick; amb angular; grains oblate, dimorphic, 25 x 35 and 35 x 60 µ.
PAN, von Wedel 2292, KE 18322, MO; plate 89:1100.

Paullinia bracteosa Radlk.
Triporate; exine tectate, 2 µ thick, sexine scabrate, endosexine densely columellate; pores 6- 7 µ diameter, covered by fine ectexinic membrane, costa pori (annulus) 4 µ thick; amb angular; grains oblate to peroblate, 28 x 48 µ.
PAN, Kennedy et al. 3055, KE 18323, MO; plate 90:1101.

Paullinia fibrigera Radlk.
Triporate; exine tectate, 2.5 µ thick, sexine scabrate, slightly perforate, endosexine densely columellate; pores 7 µ diameter, annulate; amb angular to semilobate; grains suboblate, 24 x 33 - 35 µ.
PAN, Schmalzel 953, MO; plate 90:1102.

Paullinia fuscescens HBK var. *glabrata* Croat
Triporate; exine tectate, 2 µ thick, sexine scabrate to perforate, endosexine densely columellate, sexine differentiated from nexine; pores 5 µ diameter, covered by fine ectexinic membrane, costa pori (annulus) 3 - 4 µ thick, appearing to form vestibulum; amb angular; grains oblate, 16 x 30 µ.
PAN, Burch et al. 1121, KE 18325, MO; plate 90:1103.

Paullinia glomerulosa Radlk.
Triporate; exine tectate, 2.5 µ thick, sexine scabrate, perforate, densely columellate; pores 3 µ diameter, covered by fine sexinic membrane, appearing as atrium type; costa pori 3 µ thick (annulus); amb angular; grains oblate to peroblate, 20 x 41 µ.
BCI, Croat 6224, KE 18326, MO; plate 90:1104.

Paullinia pinnata L.
3 - 4 porate; exine tectate, 2.0 - 2.5 µ thick, sexine reticulate, homobrochate, brochi < 1 µ wide, endosexine densely columellate, columellae formed by bacula, nexine easily differentiated from sexine; pores 7 - 8 µ diameter, covered by fine ectexinic membrane; costa pori (annulus) 2.5 µ thick; amb angular-irregularly concave (when triaperturate) to rhomboidal (when 4-porate); grains suboblate, 20 - 27 x 35 - 40 µ.
BCI, Foster 1059, PMA; plate 90:1105.

Paullinia rugosa Benth. ex Radlk.
Triporate; exine tectate, 1.5 - 2.0 µ thick, sexine scabrate, endosexine slightly columellate, sexine differentiated from nexine; pores 5 µ diameter; costa pori (annulus) 2 µ wide; amb angular; grains suboblate, 22 x 38 µ.
BCI, Croat 6036, MO; plate 90:1106.

Paullinia turbacensis HBK
Triporate; exine tectate, 2 µ thick, sexine psilate; pores 2.5 µ diameter, forming vestibulum; costa pori (annulus) 2.5 - 3.0 µ wide; amb angular; grains oblate to peroblate, 12 x 25 µ.
BCI, Croat 7324, KE 18327, MO; plate 90:1107.

Serjania atrolineata Sauv. & Wright
Tricolporate, syncolporate, heteropolar; exine tectate, 1.5 - 2.0 µ thick, sexine slightly scabrate; colpi very narrow; pores 5 - 6 µ diameter, costa pori (annulus) 2 µ wide; amb subangular; grains suboblate, 25 - 27 x 40 - 47 µ.
PAN, Dwyer et al 5158, KE 18329, MO; plate 90:1108.

Serjania circumvallata Radlk.
3 - 4 colporate, syncolporate, heteropolar; exine tectate, 1.5 - 2.0 µ thick, sexine foveolate to perforate, endosexine slightly columellate; colpi very narrow; pores 5 µ diameter, costa pori (annulus) 2 µ wide; amb semiangular-convex; grains oblate to peroblate, predominantly 3-aperturate, < 20 x 33 - 40 µ.
BCI, Schmalzel 334, MO; plate 90:1109.

Serjania cornigera Turcz.
Tricolporate, syncolporate, heteropolar; exine tectate, 3 µ thick, sexine reticulate, homobrochate, brochi 1.0 - 1.5 µ wide, endosexine columellate; colpi narrow, edges tortuous; pores 6 - 15 µ diameter, endexinic, costa pori (annulus) 5 µ wide; amb semitriangular; grains variable in size and form, predominantly suboblate, 43 - 56 µ.
PAN, Gentry 6534, KE 18328, MO; plate 90:1110.

Serjania decapleuria Croat
Tricolporate, syncolporate; exine tectate, 1.5 - 2.0 µ thick, sexine foveolate, endosexine strongly columellate, sexine easily differentiated from nexine; colpi narrow; pores 6- 7 µ diameter, appearing vestibulate, covered by fine sexinic membrane, costa pori (annulus) 2 µ wide; amb angular; grains oblate to peroblate, 33 x 60 µ.
BCI, Croat 12955, KE 18331, MO; plate 90:1111.

Serjania mexicana (L.) Willd.
Tricolporate, syncolporate; exine tectate, 1.5 µ thick, sexine psilate, endosexine slightly scabrate; colpi narrow; pores 5 µ diameter, covered by fine ectexinic membrane, vestibulate, costa pori (annulus) 2.5 - 3.0 µ wide; amb angular; grains variable in size, suboblate, 23 x 40 µ.
BCI, Croat 8285, KE 18332, MO; plate 90:1112.

Serjania paucidentata DC.
Tricolporate, syncolporate; exine tectate, 1.5 - 2.0 µ thick, sexine psilate; pores inconspicuous 2 - 3 µ diameter, vestibulate, costa pori (annulus) 1.5 µ wide; amb angular-convex; grains suboblate, 17 x 27 - 30 µ.
BCI, Woodworth & Vestal 582, KE 18333, MO; plate 90:1114.

Serjania pluvialiflorens Croat
Tricolpcrate, syncolporate; exine tectate, 2 μ thick, sexine scabrate, endosexine columellate; colpi narrow; pores 2 μ diameter, vestibulate, costa pori (annulus) 2 μ wide; amb angular; grains suboblate, 23 x 36 μ.
PAN, Croat 12421, MO; plate 90:1113.

Serjania rhombea Radlk.
Tricolporate, syncolporate; exine tectate, 5 μ thick, sexine foveolate, endosexine strongly columellate, sexine differentiated from nexine; colpi narrow; pores 6 μ diameter, vestibulate, covered by fine ectexinic membrane, costa pori (annulus) 3 μ wide; amb semilobate; grains oblate to peroblate, 30 - 66 μ.
PAN, Nee 8574, KE 18334, MO; plate 91:1115.

Serjania trachygona Radlk.
Tricolporate, syncolporate; exine tectate, 2 μ thick, sexine psilate, endosexine slightly scabrate; colpi narrow, appearing on one hemisphere; pores 5 μ diameter; amb semilobate; grains suboblate to oblate, 18 x 33 μ.
PAN, Gentry 6700, KE 18335 (p), BCI, Schmalzel 263 (d), MO; plate 91:1116.

Talisia nervosa Radlk.
Triporate; exine tectate, 2 μ thick, sexine psilate; colpi apparently present; pores deep atrium type, 2.0 - 2.5 μ diameter; amb circular to semilobate; grains oblate, 20 x 29 μ.
PAN, Blum & Dwyer 2101, KE 18336, MO; plate 91:1117.

Talisia princeps Oliv.
Tricolporate; exine tectate, 2 μ thick, sexine psilate; colpi as long as grain, costa colpi present; pores lalongate, 2.5 x 6.0 μ, protruding; amb circular; grains prolate-spheroidal, 35 x 30 μ.
BCI, Zetek 3570, KE 18337, MO; plate 91:1118.

Thinouia myriantha Tr. & Planch.
Tricolporate; exine tectate, 1 μ thick, sexine scabrate; colpi inconspicuous; pores lalongate, 5 x 8 μ; amb circular; grains prolate-spheroidal to oblate-spheroidal, 25 - 28 x 23 - 26 μ.
GU, Klug 4102, KE 18338, MO; plate 91:1119.

SAPOTACEAE

Monad; isopolar-radiosymmetric; 2,3,4-colporate; exine tectate, variable, 1 - 3 μ thick at poles, 2 - 4 μ thick at equator, sexine psilate to slightly scabrate; colpi narrow, variable in length; pores semiprotuberant, occasionally forming vestibulum, lalongate, 1.0 - 3.5 x 4 - 10 μ, frequently covered by ectexinic membrane, forming equatorial ring (costa pori); amb angular to circular; grains oblate to subprolate, 17 - 42 x 12 - 35 μ. (*6 genera, 3 species).*

Key to genera and species:

1a. Dicolporate..... *Pouteria stipitata*
1b. Tricolporate
  2a. Subprolate, amb semitriangular
    3a. Exine 1 μ thick , not variable, colpi < 12 μ long..... *Chrysophyllum cainito*
    3b. Exine variable, 2 μ at poles, 3 - 4 μ at equator, colpi > 12 μ long..... *Pouteria unilocularis**
  2b. Oblate, amb circular
    4a. Polar axis 29 - 34 μ, sexine psilate at poles, scabrate at equator..... *Cynodendron panamense*
    4b. Polar axis 19 - 23 μ, sexine completely psilate..... *Pouteria stipitata*
1c. 4-colporate
  5a. Suboblate, PAD 14 μ, interporium 10 μ..... *Pouteria fossicola*
  5b. Oblate, PAD 9 μ, interporium 12 μ..... *Pouteria sapota*

Chrysophyllum cainito L.
Tricolporate; exine 1 μ thick, sexine psilate; colpi 10 x 1 μ; pores 1.0 - 1.5 x 6.0 μ, protuberant, costa pori 2 μ; amb angular; grains subprolate, 17 - 20 x 12 - 16 μ.
PAN, Castillo 23, PMA; plate 91:1120.

Cynodendron panamense (Pitt.) Aubreville
Tricolporate; exine variable, 1.5 - 2.0 thick at poles, 2.5 - 3.0 μ thick at equator; colpi 22 x 2 μ, PAD 5 μ; pores 2 x 6 μ, club type, costa pori 2 μ; amb circular; grains oblate, 29 - 34 x 20 - 23 μ.
BCI, Knight, no voucher; BCI; plate 91:1121.

Pouteria fossicola Cronq.
Tetracolporate; exine variable, 2.5 - 3.0 μ thick at poles, 3 - 4 μ thick at equator, sexine psilate; colpi 22 x 1 μ, PAD 14 μ; pores 3 x 8 - 10 μ, club type, interporium 10 μ, ectexinic membrane covering pores; amb circular; grains suboblate, 40 - 42 x 31 - 35 μ.
PAN, Dressler 3811, PMA; plate 91:1122.

Pouteria sapota (Jacq.)Moore & Stearn.
Tetracolporate; exine variable, 2 μ thick at poles, 4 μ thick at equator, sexine psilate; colpi as long as grain x < 1 μ wide, PAD 9 μ; pores protuberant, 3.5 x 8.0 - 9.0 μ, covered by thin sexinic membrane, displaying vestibulate condition, 4 x 10 μ, interporium 12 μ; amb angular; grains oblate, 38 - 41 x 29 - 32 μ.
PAN, LAO 108, PMA; plate 91:1123.

Pouteria stipitata Cronq.
Dicolporate, tricolporate; exine variable, 1.0 - 1.5 µ thick at poles, 2.0 - 2.5 µ thick at equator, sexine psilate; pores protuberant, club type 1.5 -2.0 x 5 µ, interporium 8 µ; amb circular; grains oblate, 19 - 23 x 15 - 18 µ.
BCI, Croat 10293, PMA; plate 91:1124.

Pouteria unilocularis (J. D. Sm.) Baehnl. (*P. reticulata*
Tricolporate; exine variable, 2 µ thick at poles, 3 - 4 µ thick at equator, sexine psilate; colpi 14 x 1 - 2 µ, costa colpi 2 µ; pores 1.5 x 4.0 µ; amb angular; grains subprolate, 19 - 21 x 15 - 17 µ.
PAN, Croat 49844, PMA; plate 91:1125.

SAXIFRAGACEAE

Monad; isopolar; radiosymmetric; intectate; tricolporate; exine 1.0 - 1.5 µ thick, sexine reticulate; pores lalongate, 2 x 4 µ; amb circular to hexagonal; grains subprolate, 16 - 19 x 14 - 16 µ. *(1 genus, 1 species).*

Hydrangea peruviana Moric.
Tricolporate; exine semitectate, 1.0 - 1.5 µ thick, sexine reticulate, simplicolumellate, heterobrochate, bacula 1.0 x 0.5 µ; PAD 3 µ; pores 4 x 2 µ; amb circular; grains subprolate, 16 - 19 x 14 - 16 µ.
VEN, Gentry et al. 11061, PMA; plate 91:1126.

SCROPHULARIACEAE

Monad; isopolar; radiosymmetric; tectate and semitectate; tricolpate, 4-colpate, tricolporate; sexine psilate and reticulate to scabrate; amb circular; grains subprolate to prolate-spheroidal, 10 - 25 x 9 - 24 µ. *(5 genera, 6 species).*.

Key to genera and species:

1a. Reticulate
  2a. Tricolporate..... *Bacopa salzmannii*
  2b. Colpate
    3a. Tricolpate, sexine heterobrochate, margo absent..... *Lindernia crustacea*
    3b. 4-colpate, homobrochate, margo present..... *Lindernia diffusa*
1b. Psilate
  4a. Tricolpate
    5a. Oblate-spheroidal, > 14 µ, PAD 2 µ..... *Mecardonia procumbens*
    5b. Prolate-spheroidal, < 14 µ, PAD 3 µ..... *Stemodia verticillata*
  4b. Tricolporate..... *Scoparia dulcis*

Bacopa salzmannii (Benth.) Wettst.
Tricolporate; exine semitectate, 2 µ thick, sexine reticulate, homobrochate, brochi < 1 µ wide, muri simplibaculate, bacula 1 µ high; colpi as long as grain x 4 µ wide, appearing syncolporate; PAD 1 - 2 µ, costa colpi 1 thick, colpi displaying slight equatorial constriction; pores endexinic, appearing lolongate 6 x 3 µ, amb circular; grains subprolate to prolate 31 - 33 x 24 - 26 µ.
PAN, Pittier 2456, NY; plate 91:1127.

Lindernia crustacea (L.) Müell.
Tricolpate; exine semitectate, 2 µ thick, twice as thick as nexine, sexine reticulate, heterobrochate, brochi 1 µ wide; colpi long, deep, PAD 3 µ; amb circular; grains subprolate, 25 - 28 x 21 - 24 µ.
PAN, Nee & Hansen 14076, KE 18140, MO; plate 91:1128.

Lindernia diffusa (L.) Wettst.
Tetracolpate; exine semitectate, 1.5 µ thick, sexine reticulate, baculate, homobrochate, brochi < 1 µ wide, muri simplibaculate; colpi 12 x 1 µ, margo 1.5 µ thick; amb circular; grains oblate-spheroidal, 23 - 27 x 20.0 - 23.5 µ.
BCI, Schmalzel 984, MO; plate 91:1129.

Mecardonia procumbens (P. Mill.) Small.
Tricolpate; exine tectate, 1 µ thick, sexine psilate; PAD 2 µ; amb circular; grains oblate-spheroidal, 14 - 16 x 16 - 17 µ.
PAN, Tyson 3506, KE 18139, MO; plate 91:1130.

Scoparia dulcis L.
Tricolporate; exine tectate, 1 µ thick, sexine psilate, PAD 2 µ; pores lalongate 1.5 x 3 µ; amb circular; grains oblate-spheroidal, 18 x 18 - 21 µ.
PAN, Nee 10167, KE 18138, MO; plate 91:1131.

Stemodia verticillata (P. Mill.) Hassl.
Tricolpate; exine tectate, < 1 µ thick, sexine psilate; PAD 3 µ, amb circular; grains prolate-spheroidal, 10.5 - 12.5 x 8.5 - 11.0 µ.
CR, Tonduz 9621, CR 75518; plate 91:1132.

SIMAROUBACEAE

Monad; isopolar; radiosymmetric; tricolporate; exine semitectate and intectate 1.0 - 2.5 µ thick, sexine striate, reticulate, or verrucate; pores circular to lalongate; PAD conspicuous; amb circular; grains spheroidal to prolate, 14 - 38 x 9.5 - 38.0 µ. *(3 genera, 3 species).*

Key to genera and species:

1a. Grains < 20 µ, pores small
  2a. Sexine striate, prolate, pores circular ..... *Picramnia latifolia*
  2b. Sexine verrucate, spheroidal, pores lalongate ..... *Simarouba amara*
1b. Grains > 20 µ, pores large, 10 µ ..... *Quassia amara*

Picramnia latifolia Tul.
Tricolporate; exine intectate, 1 µ thick; sexine striate, striae longitudinal; colpi as long as grain x 2.5 µ wide, PAD 3 µ; pores circular 2.5 µ diameter; amb circular; grains prolate, 14 - 18 x 9.5 - 11.0 µ.
BCI, Foster 2089, PMA; plate 91:1133.

Quassia amara L.
Tricolporate, appearing syncolporate; exine semitectate, 2.5 µ thick, sexine reticulate (per-reticulate), homobrochate; PAD 21 µ; pores circular 10 µ diameter; amb circular; grains spheroidal, 38 µ.
BCI, Schmalzel 265, MO; plate 91:1134.

Simarouba amara Aubl. var. *typica* Cronq.
Tricolporate; exine intectate, 2 µ thick, sexine verrucate, verrucae variable in size, micro-echini between verrucae; colpi long, < 1 µ wide; pores lalongate; amb circular; grains prolate-spheroidal to spheroidal, 15 - 17 x 14 - 17 µ.
BCI, Schmalzel 507, MO; plate 91:1135.

SOLANACEAE

Monad; isopolar-radiosymmetric; tricolporate to syncolporate, stephanocolporate and stephanocolpate; exine tectate and semitectate, < 1.0 - 6.0 µ thick; sexine psilate, reticulate, rugulate, endosexine occasionally granulate; colpi generally long and narrow, occasionally uniting at poles, appearing syncolporate, costa colpi conspicuous, generally forming exitus digitatus; colpi frequently displaying equatorial constriction; pores lalongate, uniting at edges and zonorate (costa equatorialis), aspidate type, resembling vestibulate type; amb circular; grains subprolate to oblate, 12 - 47 x 12 - 52 µ. *(9 genera, 25 species; additional references: 108, 137, 160).*

Key to genera and species:

1a. Tricolporate
  2a. Sexine sculptured, exine variable in thickness
    3a. Reticulate, grains prolate-spheroidal, pores lalongate 2 x 12 µ ..... *Capsicum annuum*
    3b. Rugulate, grains oblate-spheroidal, pores forming ring (zonorate) ..... *Cestrum nocturnum*
  2b. Sexine psilate, exine uniform in thickness
    4a. Oblate (oblate to oblate-spheroidal)
      5a. Equatorial axis > 30 µ
        6a. Pores operculate, PAD 4 µ ..... *Cestrum latifolium*
        6b. Pores vestibulate, PAD 15 - 18 µ ..... *Markea ulei*
      5b. Equatorial axis < 30 µ
        7a. Grains 24 - 28 µ ..... *Solanum ochraceo-ferrugineum**
        7b. Grains 13 - 19 µ
          8a. Exine < 1 µ thick ..... *Solanum arboreum*
          8b. Exine 1.5 µ thick
            9a. Endosexine granulate, grains 13 - 15 µ ..... *Solanum argenteum*
            9b. Endosexine psilate, grains 15 - 19 µ ..... *Solanum hayesii*
    4b. Prolate (subprolate to spheroidal)
      10a. Exine 1.0 - 3.0 µ thick
        11a. Subprolate to prolate-spheroidal
          12a. Costa colpi present
            13a. Costa colpi forming exitus digitatus, exine 2 µ thick ..... *Solanum asperum*
            13b. Costa colpi forming margo, exine 1.5 µ thick ..... *Cestrum megalophyllum*
          12b. Costa colpi absent
            13a. Subprolate, exine < 1.5 µ thick ..... *Solanum jamaicense*
            13b. Prolate-spheroidal, exine ≥1.5 µ thick ..... *Solanum subinerme*
        11b. Spheroidal
          15a. Exine 3 µ thick ..... *Cestrum racemosum*
          15b. Exine 1.5 - 2.0 µ thick
            16a. 36 - 39 µ ..... *Cyphomandra hartwegii*
            16b. 23 - 25 µ ..... *Physalis angulata*
      10b. Exine < 1.5 µ thick
        17a. < 15 µ
          18a. Pores 2.5 x 6.0 µ, protruding ..... *Cyphomandra allophylla*
          18b. Pores 1.5 x 3.0 µ, common type ..... *Lycianthes synanthera*
        17b. > 15 µ
          19a. 24 - 26 µ
            20a. Pores zonorate ..... *Physalis pubescens*
            20b. Pores lalongate ..... *Solanum lancaeifolium*
          19b. 15 - 21 µ
            21a. Pores lalongate, oblongate 2 x 4 µ ..... *Lycianthes maxonii*
            21b. Pores lalongate to transversely parallel
              22a. Pores 1 - 2 x 7 - 8 µ ..... *Solanum rugosum, Witheringia solanacea*
              22b. Pores zonorate, ring 2 µ wide

23a. 15 - 17 µ..... *Solanum umbellatum*
23b. 20 - 21 µ..... *Solanum antillarum**
1b. Syncolporate
24a. Sexine rugulate, exine > 3 µ thick, grains oblate-spheroidal..... *Cestrum nocturnum*
24b. Sexine psilate, exine < 3 µ thick, grains prolate spheroidal
25a. > 20 µ..... *Solanum lancaeifolium*
25b. < 20 µ..... *Solanum umbellatum*
1c. 4-colporate, spheroidal, ca. 24 µ, exine 1.5 - .02 µ thick..... *Physalis angulata*
1d. 5 - 6 colporate, suboblate, 44 - 52 µ, exine 1.5 µ thick..... *Browallia americana*

Browallia americana L.
5 - 6 colporate; exine 1.5 µ thick, sexine rugulate, endosexine granulate, rugulae 1 µ thick, having irregular orientation; pores inconspicuous; colpi conspicuous, short, sharp 14 x 6 µ; amb circular, appearing hexalobulate; grains suboblate, 44 - 47 x 50 - 52 µ.
PAN, Tyson 7125, PMA; plate 92:1136.

Capsicum annuum L.
Tricolporate; exine variable 3 µ thick, at intercolpium and 6 µ thick at apertures, sexine reticulate, homobrochate, brochi < 1 µ wide; colpi as long as grain x 1 µ, costa colpi 1.5 µ; PAD 12 µ; pores lalongate, 2 x 12 µ, protruding, vestibulate, zonorate, amb circular; grains prolate-spheroidal, 32 - 34 x 29 - 31 µ.
PAN, Croat 22522, KE 18143, MO; plate 92:1137.

Cestrum latifolium Lam.
Tricolporate; exine 3 - 5 µ thick, sexine psilate to slightly scabrate; colpi as long as grain x 2 - 3 µ wide, displaying continuous operculum: PAD 4 µ; pores lalongate, zonorate, ring 4 µ wide; amb circular; grains oblate-spheroidal to spheroidal, 37 - 39 x 38 - 43 µ.
PAN, Woods et al. 5080, MO; plate 92:1138.

Cestrum megalophyllum Dun. in DC.
Tricolporate; exine 1.5 µ thick, sexine psilate to slightly scabrate; colpi 36 x 1 µ, costa colpi forming a conspicuous margo; pores lalongate, zonorate, ring ca. 5 µ wide; amb circular; grains prolate-spheroidal to spheroidal, 46 - 51 x 40 - 44 µ.
BCI, Croat, MO; plate 92:1139.

Cestrum nocturnum L.
Tricolporate and syncolporate; exine 3 - 6 µ thick, sexine rugulate, rugulae short, irregular; colpi as long as grain x 2 µ wide, frequently united at polar area; pores lalongate, zonorate, ring 4 µ wide; amb circular; grains oblate-spheroidal to spheroidal 28 - 33 x 30 - 32 µ.
PAN, Lewis et al. 814, PMA, plate 92:1140.

Cestrum racemosum R. & P.
Tricolporate; exine 3 µ thick, sexine psilate, endosexine densely columellate; colpi as long as grain, narrow, 1 µ wide; PAD 8 µ; pores lalongate, zonorate, ring 4 µ wide; amb circular; grains spheroidal, 29 - 32 µ
PAN, D'Arcy 10330, PMA; plate 92:1141.

Cyphomandra allophylla (Miers.) Hemsl.
Tricolporate; exine 0.5 µ thick, sexine psilate; colpi as long as grain, narrow; pores lalongate, 2.5 x 5.0 µ, appearing protuberant; amb circular; grains prolate-spheroidal, 12 - 14 x 12 - 13 µ.
PAN, Herrera 10, PMA; plate 92:1142.

Cyphomandra hartwegii (Miers.) Walp.
Tricolporate; exine 1.5 µ thick, sexine psilate, endosexine slightly scabrate; colpi 36 x 2 - 3 µ, sharp; pores lalongate, forming continuous ring (costa aequatorialis) 5 µ wide, appearing as protuberant aperture from polar view; amb circular; grains spheroidal, 36 - 39 µ.
PAN, Hammel 6010, KE 18149, MO; 92:1144.

Lycianthes maxonii Standl.
Tricolporate; exine < 1 µ thick, sexine psilate; colpi as long as grain, narrow, inconspicuous; pores slightly lalongate, ca. 2 x 4 µ; amb circular; grains subprolate to prolate-spheroidal, 18 - 20 x 17 - 19 µ.
BCI, Croat 6307, MO; plate 92:1143.

Lycianthes synanthera (Sendt.) Bitter.
Tricolporate; exine < 1 µ thick, sexine psilate, endosexine slightly scabrate; colpi long and narrow; pores lalongate, 1.5 x 3 µ; amb circular; grains prolate-spheroidal to spheroidal, 11.0 - 13.5 x 11.0 - 14.5 µ
PAN, Mori 6640, PMA (p), BCI, Tyson et al. 3966, MO (d); plate 92:1145.

Markea ulei (Damm.) Cuatr.
Tricolporate; exine 2 µ thick, sexine psilate, endosexine slightly scabrate; colpi as long as grain x 1 µ; PAD 15 - 18 µ; pores lalongate 7 µ high, forming vestibulum (aspidate type) at junction with colpi, ca. 5 µ high x 10 µ wide; amb circular; grains oblate , 26 - 27 x 36 - 37 µ.
PAN, Nee 7271, PMA; plate 92:1146.

Physalis angulata L.
3 - 4 colporate; exine 1.5 - 2.0 µ thick, sexine psilate; colpi as long as grain x 1 µ, resembling syncolporate type, costa colpi 2 µ wide, colpi displaying slight membrane; pores lalongate 3 x 10 µ, zonorate, amb circular; grains spheroidal, 23 - 25 µ.
PAN, Tyson 6710, KE 18151, MO; plate 92:1147.

Physalis pubescens L.
Tricolporate; exine 1 μ thick, sexine psilate; colpi as long as grain , narrow costa colpi 2 μ thick, forming exitus digitatus, colpi appearing frequently united at poles; pores lalongate, forming a conspicuous, continuous ring 2 μ wide (zonorate), appearing vestibulate from polar view; amb circular, grains prolate-spheroidal to spheroidal, 24 - 25 x 23 - 25 μ.
BCI, Schmalzel 885, MO; plate 92:1148.

Solanum antillarum O. E. Schulz in Urban (*Solanum nudum* non H. & B. ex Dun.)
Tricolporate; exine 1 μ thick, sexine psilate; colpi as long as grain, narrow, costa colpi 1.5 μ thick, forming exitus digitatus, appearing constricted at equator; pores lalongate, forming continuous ring 2 μ wide (zonorate); amb circular; grains prolate-spheroidal, 20 - 21 x 19 - 20 μ.
PAN, Croat 8958, MO; plate 92:1149.

Solanum arboreum Dun.
Tricolporate; exine 1 μ thick, sexine psilate; colpi as long as grain, very narrow, < 1 μ wide, costa colpi < 1 μ thick; PAD 3 μ; pores lalongate to transversely parallel, 1 x 8 μ, slightly protuberant; amb circular; grains oblate-spheroidal to spheroidal, 16 - 18 x 17 - 18 μ.
PAN, Blum et al. 3988, PMA; plate 92:1150.

Solanum argenteum Poir.
Tricolporate; exine 1.5 μ thick, sexine psilate, endosexine slightly granulate; colpi long and narrow; PAD 2 μ; pores lalongate, 1.5 x 8.0 μ, appearing protuberant; amb circular; grains oblate-spheroidal to spheroidal, 13 - 14 x 14 - 15 μ.
PAN, D'Arcy 6045, PMA; plate 92:1151.

Solanum asperum L. C. Rich.
Tricolporate; exine 2 μ thick, sexine psilate; colpi as long as grain x 1 μ wide, appearing constricted at equator, costa colpi 2 μ thick, forming exitus digitatus; pores lalongate, endexinic, 2 x 10 μ, aspidate; amb circular; grains prolate-spheroidal to spheroidal, 22 - 24 x 19 - 21 μ.
PAN, Schmalzel 1121, MO; plate 92:1152.

Solanum hayesii Fern.
Tricolporate; exine 1.5 μ thick, sexine psilate; colpi long and narrow, constricted at equator; pores protuberant, having costa pori, lalongate, zonorate; amb circular; grains oblate-spheroidal to spheroidal, 15 - 19 x 17 - 19 μ.
PAN, Correa & Dressler 362, PMA (p), PAN, Blum et al. 1750, MO (d); plate 92:1153.

Solanum jamaicense P. Mill.
Tricolporate; exine 1. 2 μ thick, sexine psilate; colpi long and narrow; pores protuberant, having costa pori, lalongate, zonorate, ring 2 - 5 μ wide; amb circular; grains subprolate, 25 - 29 x 18 - 22 μ.
PAN, Kirkbride & Crebbs 14, PMA (p), PAN, Blum et al. 2495, MO (d); plate 92:1154.

Solanum lancaefolium Jacq.
Tricolporate to syncolporate; exine 1 μ thick, sexine psilate; colpi as long as grain, uniting at poles, displaying equatorial constriction, costa colpi 1.5 μ thick forming exitus digitus; pores lalongate, 2 x 11 - 15 μ, zonorate, protuberant from polar view; amb circular; grains subprolate to prolate-spheroidal, 25 - 26 x 22 - 24 μ.
BCI, Croat 9027, MO (p), PAN, Croat 12539, MO (d); plate 92:1155.

Solanum ochraceo-ferrugineum (Dun.) Fern. (*Solanum rudepannum* Dun. in DC.)
Tricolporate; exine 1.0 - 1.5 μ thick, sexine psilate; colpi long and narrow, displaying irregular equatorial constriction; pores lalongate, 1.5 - 2.5 x 9 - 15 μ, protuberant from polar view, having costa pori, zonorate; amb circular; grains oblate-spheroidal, 24 - 27 x 26 - 28 μ.
PAN, Correa et al. 2773, PMA (p), PAN, Tyson 5523, MO (d); plate 93:1156.

Solanum rugosum Dun. in DC.
Tricolporate; exine < 1 μ thick, sexine psilate; colpi long and narrow, displaying equatorial constriction; pores protuberant from polar view, costa pori narrow, lalongate, 1 x 8 μ, zonorate; amb circular; grains spheroidal to prolate-spheroidal,19 - 21 x 18 - 19 μ.
PAN, Lazor 5536, MO; plate 93:1157.

Solanum subinerme Jacq.
Tricolporate; exine 1.5 - 2.0 μ thick, sexine psilate; colpi long and narrow, displaying equatorial constriction; pores protuberant from polar view, costa pori narrow, lalongate, 2 - 3 x 16 - 18 μ, zonorate; amb circular; grains prolate-spheroidal, 28 - 30 x 27 - 28 μ.
PAN, Correa et al. 5051, MO; plate 93:1158.

Solanum umbellatum P. Mill.
Tricolporate to syncolporate; exine 1 μ thick, sexine psilate, endosexine slightly granulate; colpi as long as grain x 1 μ wide, occasionally united at poles; PAD 4 μ, equatorial constriction present; pores lalongate, aspidate type, endexinicus, costa pori 2 μ, forming a continuous ring (costa aequatorialis); amb circular; grains prolate-spheroidal to spheroidal, 15 - 17 x 14 - 15 μ.
BCI, Schmalzel 898, MO; plate 93:1159.

Witheringia solanacea L'Hér.
Tricolporate; exine < 1 μ thick, sexine psilate; colpi long and narrow, displaying equatorial constriction; pores lalongate 2 x 7 μ, appearing to form continuous ring (costa aequatorialis); amb circular; grains prolate-spheroidal, 17 - 18 x 15 - 17 μ.
BCI, Schmalzel 240, MO; plate 93:1160.

STAPHYLEACEAE

Monad; isopolar-radiosymmetric; tricolporate; exine semitectate 3 μ thick, reticulate, homobrochate, muri simplibaculate; colpi long 5 μ wide, margo conspicuous; pores inconspicuous; amb angular; grains prolate-spheroidal, 24 - 28 x 24 - 26 μ.
(1 genus, 1 species).

Turpinia occidentalis (Sw.)G. Don. subsp. *breviflora* Croat
Tricolporate; exine 3 µ thick, sexine reticulate, homobrochate, brochi < 1 µ wide, muri simplibaculate, bacula conspicuous; colpi as long as grain x 5 µ wide, margo 1.5 µ thick, PAD 5 µ; pores circular, 3 - 4 µ diameter; amb angular; grains prolate-spheroidal, 26 - 28 x 24 - 26 µ.
BCI, Croat 4820, MO; plate 93:1161.

STERCULIACEAE

Monad; isopolar; radiosymmetric tectate; tricolporate, triporate, 4-colporate; sexine reticulate to baculate; amb circular; grains prolate-spheroidal to oblate-spheroidal, 15 - 45 x 16 - 43 µ. (*7 genera, 8 species; additional references: 28, 78).*

Key to genera and species:

1a. Triporate
  2a. Pores conspicuous, annulate, protuberant..... *Byttneria aculeata*
  2b. Pores inconspicuous, common type..... *Theobroma cacao*
1b. Colporate
  3a. 4 - 5 colporate..... *Waltheria glomerata*
  3b. 3-colporate
    4a. > 25 µ
      5a. Prolate-spheroidal
        6a. Pores 2 x 3 µ, grains < 33 µ..... *Sterculia apetala*
        6b. Pores 4 x 10 µ, grains > 33 µ..... *Melochia melissifolia*
      5b. Spheroidal..... *Melochia lupulina*
    4b. < 25 µ
      7a. Oblate-spheroidal, grains < 20 µ, pores lalongate..... *Guazuma ulmifolia*
      7b. Spheroidal, grains > 20 µ, pores circular..... *Herrania purpurea*

Byttneria aculeata Jacq.
Triporate; exine 1.0 - 1.5 µ thick, sexine reticulate, homobrochate; brochi < 1 µ wide; pores annulate (vestibulate), protuberant, circular, 3 µ diameter, vestibulum present, annulus 1.5 µ; amb circular; grains spheroidal, 16 - 21 µ.
BCI, Croat 6767, MO; plate 93:1162.

Guazuma ulmifolia Lam.
Tricolporate; exine 1 µ thick, sexine reticulate, homobrochate, brochi 1.5 µ wide; colpi as long as grain x 1 µ wide; pores lalongate, 1.5 x 4.0 µ; amb circular; grains oblate-spheroidal, 15 - 16 x 16 - 18 µ.
PAN, Schmalzel 1003, MO; plate 93:1163.

Herrania purpurea (Pitt.) R. E. Schult.
Tricolporate; exine 1.2 µ thick, sexine reticulate, homobrochate, brochi 1 µ wide; colpi long, narrow; pores circular; amb circular; grains spheroidal, 21 - 22 µ.
PAN, Croat 13798, MO; plate 93:1164.

Melochia lupulina Sw.
Tricolporate, resembling parasyncolporate type; exine 1.5 - 2.0 µ thick, sexine reticulate, homobrochate, brochi 1 µ wide, muri simplibaculate; colpi 25 x 1 µ, margo 2 µ thick; pores lalongate, 7 x 12 µ; amb circular; grains spheroidal, 37 - 43 µ.
PAN, Gentry 13453 (p), BCI, Croat 4838, MO (d); plate 93:1165.

Melochia melissifolia Benth.
Tricolporate, resembling parasyncolporate type; exine 1.5 µ thick, sexine reticulate, homobrochate, brochi < 1 µ wide; margo 1.5 µ thick; pores lalongate, 4 x 10 µ; amb circular; grains prolate-spheroidal, 41 - 45 x 32 - 36 µ.
BCI, Croat 12822, MO; plate 93:1169.

Sterculia apetala (Jacq.) Karst.
Tricolporate; exine 2 µ thick, sexine reticulate, homobrochate, brochi 1.5 µ wide; colpi as long as grain, x 1.5 µ wide; pores lalongate, 2 x 3 µ; amb circular; grains prolate-spheroidal, 33 x 25 - 30 µ.
PAN, Schmalzel 338, MO; plate 93:1166.

Theobroma cacao L.
Triporate; exine 2 µ thick, sexine reticulate, homobrochate, brochi < 1 µ wide; pores circular, inconspicuous; grains spheroidal, 18 - 23 µ.
PAN, Correa et al. 3434, PMA; plate 93:1168.

Waltheria glomerata Presl.
Stephanocolporate (4 - 5 colporate); exine 2.0 - 2.5 µ thick, sexine reticulate, homobrochate; colpi 25.0 x 2.5 µ, costa colpi 6 µ thick; pores 4 x 12 µ; amb circular; grains spheroidal, 33 - 36 µ.
PAN, Croat 9085, MO; plate 93:1167.

THEACEAE

Monad; isopolar-radiosymmetric; semitectate; tricolporate; sexine reticulate, homobrochate, brochi < 1 µ wide; colpi large, displaying equatorial constriction; pores lalongate, endexinic; amb semi-angular; grains spheroidal, 15 - 17 µ. (*1 genus, 1 species; additional reference: 9).*

Ternstroemia tepezapote Schlechter & Chan.
Tricolporate; exine 1 μ thick, sexine rugulate, homobrochate, brochi < 1 μ; colpi 12 x 1 μ, displaying equatorial constriction; pores lalongate 3 x 5 μ; amb semi-angular; grains spheroidal, 15 - 17 μ.
PAN, Dressler 3421, MO; plate 94:1170.

THEOPHRASTACEAE

Monad; isopolar; radiosymmetric; tricolporate; exine tectate, 1.5 - 2.0 μ thick; sexine scabrate; nexine thick, conspicuous, < 0.5 μ; colpi long, sharp, wide 20 x 2 - 5 μ, apparently possessing operculum; costa colpi 1.5 μ thick (margo), PAD 8 μ; amb circular; grains prolate-spheroidal to subprolate, 25 - 30 x 20 - 24 μ. (*1 genus, 1 species; additional reference: 3).*

Jacquinia macrocarpa Cav.
Tricolporate; exine 1.5 - 2.0 μ, sexine scabrate, endosexine columellate; colpi 20 x 2 - 5 μ, PAD 8 μ; pores 4 x 12 μ; amb circular; grains prolate-spheroidal to subprolate, 25 - 30 x 20 - 24 μ.
BCI, Schmalzel 90, MO; plate 94:1171.

TILIACEAE

Monad; isopolar; radiosymmetric; tricolporate; exine semitectate; sexine reticulate to baculate, muri simplibaculate; pores usually lalongate; amb circular-semi-angular; grains prolate, 33 - 72 x 22 - 50 μ. (*6 genera, 8 species).*

Key to genera and species:

1a. Polar axis > 50 ; baculate
- 2a. Exine 3 μ thick, pores lalongate, 5 x 12 μ..... *Corchorus siliquosus*
- 2b. Exine 3.5 thick, pores lalongate, 6 x 18 μ..... *Luehea speciosa*

1b. Polar axis < 50 μ; reticulate
- 3a. 30 - 40 μ
  - 4a. Homobrochate, pores circular, 3 μ diameter..... *Apeiba tibourbou*
  - 4b. Heterobrochate, pores oblong
    - 5a. Pores lalongate, 6 x 3 μ..... *Apeiba membranacea**
    - 5b. Pores lalongate, 3.5 x 4.0 μ..... *Luehea seemannii*
- 3b. 40 - 50 μ
  - 6a. Exine > 3 μ thick..... *Heliocarpus popayanensis**
  - 6b. Exine < 3 μ thick
    - 7a. Heterobrochate..... *Trichospermum mexicanum**
    - 7b. Homobrochate..... *Triumfetta lappula*

Apeiba membranacea Spruce ex Benth. (***Apeiba aspera*** Aubl.)
Tricolporate; exine 1.5 μ thick, sexine reticulate, heterobrochate, brochi ≥ 1 μ wide, muri simplibaculate, bacula < 1 μ high; colpi 18 x 2 μ; pores lalongate 6 x 3 μ; amb circular; grains prolate-spheroidal, 33 - 35 x 30 - 32 μ.
BCI, Schmalzel 55, MO; plate 94:1172.

Apeiba tibourbou Aubl.
Tricolporate; exine 1.0 - 1.5 μ thick, sexine reticulate, homobrochate, brochi < 1 μ wide, muri simplibaculate, bacula < 1 μ high; colpi 12 x 5 μ; pores circular 3 μ diameter; amb circular; grains prolate-spheroidal, 33 - 35 x 30 - 35 μ.
BCI, Schmalzel 313, MO; plate 94:1173.

Corchorus siliquosus L.
Tricolporate; exine 3 μ thick, sexine reticulate, heterobrochate, muri simplibaculate, bacula < 1 μ high; colpi 58 x 5 μ; pores lalongate, 5x 12 μ; amb circular; grains prolate, 63 - 72 x 46 - 50 μ.
PAN, Witherspoon 8781, KE 18311, MO; plate 94:1174.

Heliocarpus popayanensis HBK (***Heliocarpus americanus*** L.)
Tricolporate; exine 3 μ thick, sexine reticulate, heterobrochate, brochi < 2 μ wide, muri simplibaculate, bacula < 1 μ high; colpi 20 x 6 μ; pores lalongate 5 x 25 μ; amb circular; grains prolate, 46 - 51 x 32 - 35 μ.
PAN, Allen 2849, KE 18310, MO; plate 94:1175.

Luehea seemannii Tr. & Pl.
Tricolporate; exine 1.5 μ thick, sexine reticulate, heterobrochate, brochi 1.0 - 1.5 μ wide; colpi 25 x 2 μ; pores 3.5 x 4.0 μ; amb circular; grains prolate-spheroidal, 32 - 36 x 22 - 25 μ.
BCI, Schmalzel 1296, MO; plate 94:1176.

Luehea speciosa Willd.
Tricolporate; exine 3.5 μ thick, sexine reticulate, heterobrochate, brochi < 1 μ wide; colpi as long as grain x 4 μ wide; pores lalongate, 6 x 18 μ; amb hexagonal; grains prolate, 49 - 55 x 39 - 42 μ.
PAN, Bernal 4, KE 18308, MO; plate 94:1177.

Trichospermum mexicanum (DC.) Baill. (***Trichospermum galeottii*** (Turcz.) Kosterm.)
Tricolporate; exine 1.5 - 2.0 μ thick, sexine reticulate, heterobrochate, brochi 1 - 2 μ wide; colpi as long as grain x 1.5 μ wide; pores lalongate, 6 μ wide; amb circular; grains prolate-spheroidal, 45 - 51 x 35 - 40 μ.
PAN, D'Arcy 9299, KE 18307 (p), BCI, Croat 12844 (d), MO; plate 95:1178.

Triumfetta lappula L.
Tricolporate; exine 1.5 μ thick, sexine reticulate, homobrochate, brochi 1.5 μ wide; colpi 40 x 1 μ; pores lolongate, 4 μ wide; amb circular; grains prolate, 40 - 45 x 29 - 31 μ.
PAN, Croat 12853, MO; plate 95:1179.

TRIGONIACEAE

Monad; isopolar-radiosymmetric; stephanoporate (4-porate); exine tectate, 2 μ thick; sexine scabrate, verrucate pores circular, 8 - 14 μ diameter; amb circular; grains oblate, 30 - 38 x 41 - 51 μ. *(1 genus, 1 species).*

Trigonia floribunda Oerst. (*Trigonia rugosa* Benth.)
Tetraporate; exine 2 μ thick, sexine scabrate; pores circular, 8 - 14 μ diameter; amb circular; grains oblate, 30 - 38 x 41 - 51 μ.
BCI, Croat 16581, MO; plate 95:1180.

TURNERACEAE

Monad; isopolar-radiosymmetric; tricolporate; exine semitectate, 4 μ thick; sexine reticulate, heterobrochate, muri simplibaculate; colpi long; pores lolongate, 2/3 length of colpi; amb circular; grains oblate-spheroidal, 46 - 63 μ. (1 genus, 1 *species; additional reference: 2).*

Turnera panamensis Urban.
Tricolporate; exine 4.0 - 4.5 μ thick, sexine reticulate, heterobrochate, lumina < 1.5 μ; colpi ca. 20 μ, longer than pores; amb circular; grains oblate-spheroidal, 46 - 48 x 62 - 63 μ
BCI, Correa & Dressler 859, KE 18286, MO; plate 95:1181.

ULMACEAE

Monad; isopolar; radiosymmetric; 2-4 porate; exine tectate 2 μ thick, sexine scabrate; pores circular, common type 2.0 - 2.5 μ diameter; amb circular to elliptical (when triporate); grains oblate-spheroidal to spheroidal, 16 - 25 μ. *(2 genera, 3 species).*

Key to genera and species:

1a. Diporate..... *Trema micrantha*
1b. 3 - 4 porate
  2a. > 20 μ, pores 2.5 μ diameter..... *Celtis iguanaeus*
  2b. < 20 μ, pores 2 μ diameter..... *Celtis schippii*

Celtis iguanaeus (Jacq.) Sarg.
3 - 4 porate; exine 2 μ thick, sexine scabrate; pores 2.5 μ diameter, interporium 15 μ; amb circular; grains oblate-spheroidal, 18 - 22 x 20 - 25 μ.
BCI, Croat 14649, MO; plate 95:1182.

Celtis schippii Standl.
Tetraporate, exine 1.5 μ thick, sexine scabrate; pores 2.0 - 2.5 μ diameter; amb circular; grains oblate, 15 - 18 μ.
PERU, Tunqui 120; MO; plate 95:1183.

Trema micrantha (L.) Blume.
Diporate; exine 2 μ thick, sexine scabrate; pores 2 μ diameter; amb elliptical; grains oblate-spheroidal to spheroidal, 16 - 18 x 17 - 20 μ.
BCI, Schmalzel 869, MO; plate 95:1184.

UMBELLIFERAE (APIACEAE)

Monad; isopolar; radiosymmetric; tricolporate; exine tectate, 1 - 4 μ thick, sexine psilate to scabrate; endosexine densely columellate; colpi long, very narrow; pores lalongate, 2 - 4 x 7 - 8 μ, occasionally uniting to form ring (zonorate); amb circular; grains prolate, 31 - 45 x 18 - 25 μ. *(3 genera, 3 species; additional references: 20, 181, 183).*

Key to genera and species:

1a. Polar axis 40 - 45 μ, sexine psilate..... *Spananthe paniculata*
1b. Polar axis < 40 μ, sexine scabrate
  2a. Columellae not prominent, pores forming ring (zonorate)..... *Eryngium foetidum*
  2b. Columellae prominent, pores lalongate, 2 x 8 μ..... *Hydrocotyle umbellata*

Eryngium foetidum L.
Tricolporate; exine 2 - 4 μ thick; sexine scabrate; colpi 24 x 1, costa aequatorialis 2 μ thick; pores long x 2 μ wide forming equatorial ring (zonorate); amb circular; grains prolate, 31 - 39 x 18 - 23 μ
BCI, Croat 9188 (p), BCI Croat 8662 (d), KE 18206, MO; plate 95:1185.

Hydrocotyle umbellata L.
Tricolporate; exine 1 - 3 µ thick, sexine scabrate; colpi as long as grain x 2 µ wide; pores lalongate, 2 x 8 µ, costa pori 2 µ; amb circular; grains prolate, 33 - 36 x 18 - 22 µ.
PAN, Dwyer 11846, KE 18207, MO (p), PAN, Croat 807, PMA (d), MO; plate 95:1186.

Spananthe paniculata Jacq.
Tricolporate; exine 1.5 - 3.0 µ thick, sexine psilate, columellate; colpi as long as grain x 1 - 2 µ wide; pores lalongate 2 - 4 x 7 µ, protuberant, covered by ectexinic membrane; amb circular; grains prolate, 42 - 45 x 23 - 25 µ.
PAN, D'Arcy 6365, KE 18208, MO; plate 95:1187.

URTICACEAE

Monad; isopolar; radiosymmetric; diporate, triporate; exine tectate, 1.0 - 1.5 µ thick; sexine granulate, echinate; pores 1.5 - 2.5 µ, common type; amb circular (when triporate) to elliptical (diporate); grains suboblate to prolate, 8.5 - 19.0 x 8.5 - 21.0 µ. (*5 genera, 5 species*).

Key to genera and species:

1a. Diporate
  2a. Ornamentation absent, psilate ..... *Urera eggersii*
  2b. Ornamentation present
    3a. Echinate, amb elliptical ..... *Pilea microphylla*
    3b. Granulate, amb circular ..... *Boehmeria cylindrica*
1b. Triporate
  4a. Psilate ..... *Urera eggersii*, *Boehmeria cylindrica*
  4b. Granulate
    5a. Spheroidal or prolate, exine < 1 µ thick ..... *Myriocarpa yzabalensis**
    5b. Suboblate, exine 1.5 µ thick ..... *Pouzolzia obliqua*

Boehmeria cylindrica (L.) Sw.
Diporate, triporate; exine < 1 µ thick, sexine granulate, frequently resembling verrucate condition; pores 2 µ; amb circular; grains dimorphic, spheroidal 13 - 16 µ, or prolate, 16 - 19 x 11 - 13 µ.
BCI, Schmalzel 166, MO; plate 95:1188.

Myriocarpa yzabalensis (Donn. Sm.) Killip. (*M. longipes* Liebm.)
Triporate; exine 1 µ thick, sexine granulate; pores 1.5 - 2.0 µ diameter, aperture common type, interporium 10 µ; amb circular; grains spheroidal, 14 - 16 µ.
PAN, Schmalzel 1157, MO; plate 95:1189.

Pilea microphylla (L.) Liebm.
Diporate; exine 1 µ thick, sexine echinate, echini < 1 µ, dispersed; pores 2 µ diameter, costa pori 2 µ thick; amb elliptical; grains suboblate, 12 - 16 x 16 - 21 µ.
PAN, Lazor et al. 2431, MO; plate 95:1190.

Pouzolzia obliqua (Poepp.) Wedd.
Triporate; exine 1.5 µ thick, sexine granulate; pores inconspicuous, ca. 1.5 µ; amb circular; grains subprolate to spheroidal, 12 - 16 x 14 - 16 µ.
BCI, Croat 4584, MO; plate 95:1191.

Urera eggersii Hieron
Diporate, triporate; exine < 1 µ, sexine psilate; pores inconspicuous, < 1 µ diameter; amb circular; grains oblate-spheroidal, 8.5 - 10.5 µ.
PAN, Croat 12466, MO; plate 95:1192.

VERBENACEAE

Monad; isopolar; radiosymmetric; tricolpate to pericolpate, tricolporate; exine tectate and semitectate, 2 - 7 µ thick; sexine micro-echinate, psilate, verrucate-gemmate; amb circular to angular; grains oblate-spheroidal to spheroidal, variable in size, 25 - 200 µ. (*6 genera, 8 species*).

Key to genera and species:

1a. Tricolporate, < 30 µ, sexine psilate to granulate ..... *Lantana camara*
1b. Tricolpate, > 30 µ, sexine echinate, psilate or verrucate
  2a. > 150 µ, exine 7 µ thick, sexine verrucate ..... *Stachytarpheta jamaicensis*
  2b. 17.5 - 70 µ, exine < 7 µ thick, sexine not verrucate
    3a. Psilate ..... *Petrea aspera*
    3b. Echinate
      4a. Exine > 3.5 µ thick
        5a. Echini < 1.5 µ high ..... *Aegiphila elata*
        5b. Echini > 1.5 µ high ..... *Clerodendrum paniculatum*
      4b. Exine < 3.5 µ thick ..... *Aegiphila cephalophora*, *A. panamensis*
    3c. Reticulate, suboblate ..... *Vitex cooperi*

Aegiphila cephalophora Standl.
Tricolpate; exine 2 - 3 µ thick, sexine echinate, echini < 1 µ high, inter-echini distance > 3 µ ; colpi 12.0 - 15.0 µ long x 2.5 µ wide; amb circular; grains spheroidal, 40 - 51 µ.
BCI, Croat 11465, KE 18157, MO; plate 96:1194.

Aegiphila elata Sw.
Tricolpate; exine 3.5 µ thick, sexine echinate, echini 1.3 µ high, inter-echini distance 2.5 µ; colpi 14 - 15 µ long x 3 µ wide; amb circular; grains oblate-spheroidal, 45 - 63 µ.
BCI, Croat 5506, KE 18158, MO; plate 95:1193.

Aegiphila panamensis Moldenke
Tricolpate; exine 3 µ thick, sexine echinate, echini 1 µ high, inter-echini distance > 2.5 µ; colpi 14 - 16 µ long x 1 - 4 µ wide; amb circular; grains oblate-spheroidal, 46 - 52 µ.
PAN, Schmalzel 995 (p), BCI, Ebinger 243, KE 18159 (d); plate 96:1195.

Clerodendrum paniculatum L.
Tricolpate to pericolpate; exine 5 µ, sexine echinate, nexine columellate, echini 2 µ, inter-echini distance 5 µ; colpi as long as grain x 3 µ, PAD 10 - 13 µ; grains spheroidal, 55 - 71 µ.
BCI, Ebinger 40, KE 18160, MO; plate 96:1197.

Lantana camara L.
Tricolporate; exine1.5 - 3.5 µ thick, sexine psilate to granulate; PAD 5 µ; pores lalongate, 2 µ long x 10 µ high; amb circular; grains oblate-spheroidal, 23 - 25 x 25 - 30 µ.
BCI, Schmalzel, no voucher, BCI; plate 96:1196.

Petrea aspera Turcz.
Tricolpate, aspidate, apparently tricolporate; exine 3 µ thick, sexine psilate, endosexine columellate; pores present, aspidate, grains resembling tricolporate type; colpi 18 - 22 µ long x 10 µ wide, apices indistinct; amb semi-angular; grains oblate-spheroidal, 43 - 53 x 49 - 58 µ.
BCI, Croat 5731, KE 18161, MO; plate 96:1198.

Stachytarpheta jamaicensis (L.) Vahl.
Tricolpate; exine 7 µ thick, sexine verrucate to gemmate, verrucae 5 - 15 µ wide; colpi long, deep, PAD 45 µ, margo present; amb angular; grains oblate-spheroidal, 160 x 185 - 200 µ.
PAN, Mori & Kallunki 1949, KE 18162, MO; plate 96:1199.

Vitex cooperi Standl.
Tricolpate; exine semitectate, 1.5 - 2.0 µ thick, sexine reticulate, homobrochate, brochi < 1 µ wide, muri simplibaculate; colpi long, deep; amb circular; grains suboblate, 17.5 - 19.0 x 20.5 - 27.5 µ.
PAN, Liesner et al. 2501, MO; plate 96:1200.

VIOLACEAE

Monad; isopolar; radiosymmetric; tricolpate to syncolpate; exine tectate ,1.0 - 1.5 µ thick; sexine psilate to scabrate; colpi wide, deep; grains prolate to subprolate, 18 - 42 x 22 - 28 µ. *(2 genera, 3 species).*

Key to genera and species:

1a. Prolate to subprolate, sexine psilate
  2a. > 30 µ, occasionally syncolpate, margo 2 µ thick..... *Hybanthus prunifolius*
  2b. < 30 µ, margo absent..... *Rinorea sylvatica*
1b. Suboblate, sexine scabrate..... *Rinorea squamata*

Hybanthus prunifolius (Schult.) Schulze
Tricolpate to syncolpate; exine 1.0 - 1.5 µ thick, sexine psilate; colpi long, margo 2 µ thick; amb circular; grains prolate, 38 - 42 x 25 - 28 µ.
BCI, Schmalzel, no voucher, BCI; plate 96:1201

Rinorea squamata Blake
Tricolpate; exine 1.5 µ thick, sexine scabrate, endosexine columellate; colpi long, inconspicuous, PAD 10 µ; amb circular; grains suboblate, 18.0 - 19.5 x 22 - 25 µ.
PAN, Blake et al. 11327, PMA; plate 96:1202.

Rinorea sylvatica (Seem.) Kuntze
Tricolpate; exine 1 µ thick, sexine psilate; colpi long, PAD 10 µ; amb circular; grains subprolate, 25 - 27 x 22 - 24 µ.
BCI, Croat 7262, MO; plate 96:1203.

VITACEAE

Monad; isopolar; radiosymmetric; tectate to semitectate; tricolporate, sexine reticulate and scabrate; colpi displaying conspicuous margo; pores lalongate or circular; amb circular to semi-angular, grains prolate to subprolate, 26 - 49 x 21.5 - 36.0 µ. *(2 genera, 6 species; additional reference: 143).*

Key to genera and species:

1a. Colpi lacking margo, pores circular, amb semi-angular..... *Vitis tiliifolia*
1b. Colpi displaying margo, pores lalongate, amb circular
  2a. Polar axis 30 - 39 µ
    3a. Colpi < 25 µ long..... *Cissus erosa*
    3b. Colpi 30 - 40 µ long..... *Cissus rhombifolia, C. sicyoides*
  2b. Polar axis 40 - 50 µ
    4a. Exine 2 µ thick, grains subprolate, pores 3 x 6 µ..... *Cissus microcarpa*
    4b. Exine 3 µ thick, grains prolate, pores 5 x 8 µ..... *Cissus pseudosicyoides*

Cissus erosa Rich.
Tricolporate; tectate; exine 1.5 µ thick, sexine reticulate, homobrochate, brochi < 1 µ wide, muri simplibaculate; colpi 25.0 x 1.5 µ, margo 2 µ thick; pores lalongate 3 x 5 - 6 µ; amb circular; grains prolate, 37 - 41 x 23.5 - 28.0 µ.
PAN, Croat 37966 (p), KE 18304, PAN, Schmalzel 1223 (d), MO; plate 97:1204.

Cissus microcarpa Vahl.
Tricolporate; semitectate, exine 2 µ thick, sexine reticulate, homobrochate, brochi < 1 µ, muri baculate; colpi 40 x 2 µ, margo 2 µ thick; pores 3 x 6 µ; amb circular; grains subprolate, 40 - 43 x 30 - 35 µ.
PAN, Elias 7920, KE 18303 (p), BCI, Schmalzel 640 (d), MO; plate 97:1205.

Cissus pseudosicyoides Croat
Tricolporate; tectate; exine 3 µ thick, sexine reticulate, homobrochate, brochi < 1 µ wide, muri baculate; colpi 38.0 µ long x 1.5 µ wide, margo 3 µ thick; pores lalongate 5 x 8 µ; amb circular; grains prolate, 45 - 49 x 30 - 36 µ.
BCI, Schmalzel 1122, MO; plate 97:1206.

Cissus rhombifolia Vahl.
Tricolporate; tectate; exine 2 µ thick, sexine reticulate, homobrochate, brochi < 1 µ wide, muri baculate; colpi 40 µ long x 1 µ wide, margo 1.5 µ thick; pores lalongate 3 x 7 µ; amb circular; grains prolate, 38 - 42 x 31 - 35 µ.
PAN, Wendehake 32, KE 18300 (p), PAN, Schmalzel 856 (d), MO; plate 97:1207.

Cissus sicyoides L.
Tricolporate, syncolporate; tectate; exine 2 µ thick, sexine reticulate, homobrochate, brochi < 1 µ; endosexine baculate; colpi 30 x 1 µ wide, margo 1.0 - 1.5 µ thick; pores 3 x 5 µ; amb circular; grains prolate, 30 - 35 x 21.5 - 26.0 µ.
PAN, Nee 8562, KE 18301 (p), PAN, Schmalzel 886 (d), MO; plate 97:1208.

Vitis tiliifolia R. & S.
Tricolporate; tectate; exine 1.5 µ thick, sexine scabrate, endosexine columellate; colpi as long as grain x 2 µ, margo absent; pores sunken, circular 2 µ diameter; amb circular to hexagonal; grains subprolate, 26 - 28 x 22.5 - 26.0 µ.
BCI, Croat 4908, KE 18312, MO; plate 97:1209.

VOCHYSIACEAE

Monad; isopolar; radiosymmetric; tricolporate; exine tectate, variable, 2 - 4 µ thick; sexine foveolate; colpi long, narrow, margo conspicuous, 4 µ thick; pores lalongate; amb hexagonal; grains prolate to oblate-spheroidal, 28.6 - 33 x 28 - 34 µ. (*1 genus, 1 species; additional reference: 82).*

Vochysia ferruginea Mart.
Tricolporate; exine 2 - 4 µ thick, sexine foveolate, foveolae < 1 µ wide; colpi long, margo 4 µ thick, PAD 5 µ; pores lalongate 3.0 - 3.5 x 11 - 14 µ; amb angular; grains prolate-spheroidal to oblate-spheroidal, 28.6 - 33.0 x 28 - 34 µ.
BCI, Croat 5428, KE 18410, MO; plate 97:1210.

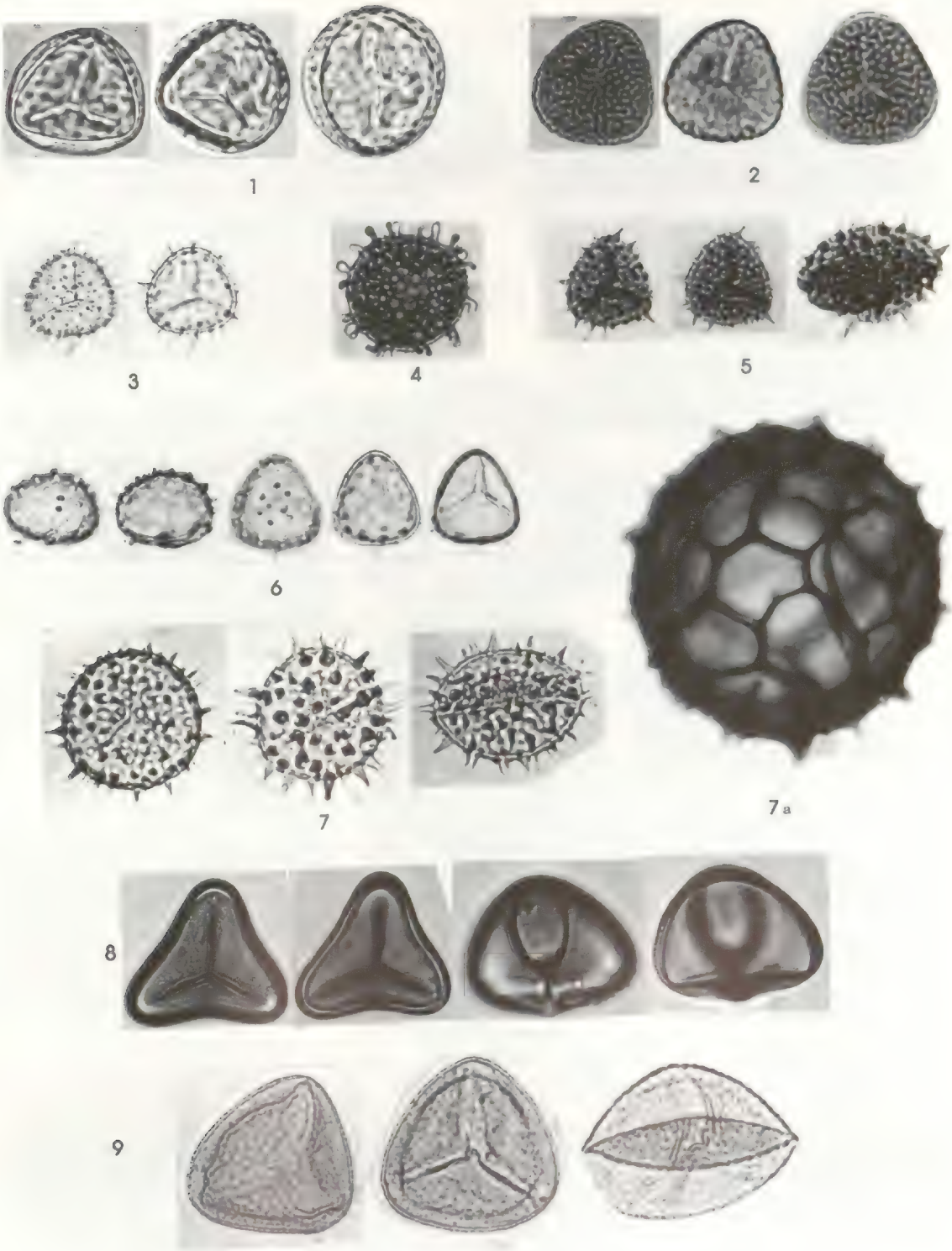

Plate 1. **CRYPTOGAMAE—LYCOPODOPHYTA;** LYCOPODIACEAE: *Lycopodium cernuum* (1), *L. dichotomum* (2); SELAGINELLACEAE: *Selaginella arthritica* (3), *S. exaltata* (4), *S. flagellata* (5), *S. haematodes* (6), *S. horizontalis* —microspore—(7) and —megaspore— (7a); PTEROPHYTA; CYATHEACEAE: *Cnemidaria ptetiolata* [*Cyathea petiolata*] (8), *Metaxya rostrata* (9)

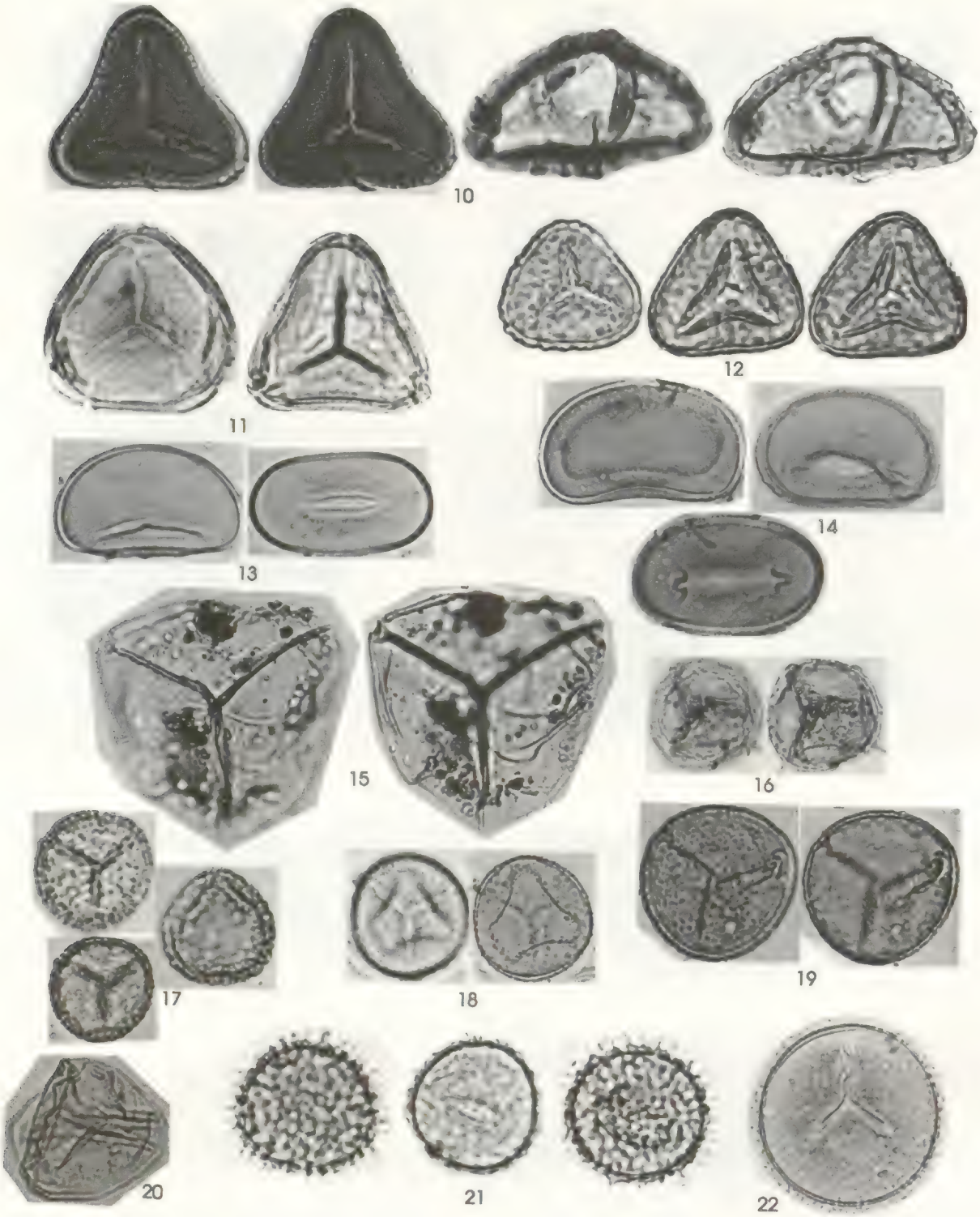

Plate 2. CYATHEACEAE: *Nephelea cuspidata* [*Alsophila cuspidata*] (10), *Trichopteris microdonta* [*Cyathea microdonta*] (11), *T. trichiata* [*Cyathea trichiata*] (12); GLEICHENIACEAE: *Dicranopteris flexuosa* (13), *Gleichenia bifida* [*Stichenus bifidus*] (14); HYMENOPHYLLACEAE: *Hymenophyllum brevifrons* (15), *Trichomanes ekmanii* (16), *T. godmannii* (17),*T. pinnatum* (18), *T. polypodioides* (19), *T. punctatum sphenoides* (20); MARATTIACEAE: *Danaea nodosa* (21); OPHIOGLOSSACEAE: *Ophioglossum reticulatum* (22)

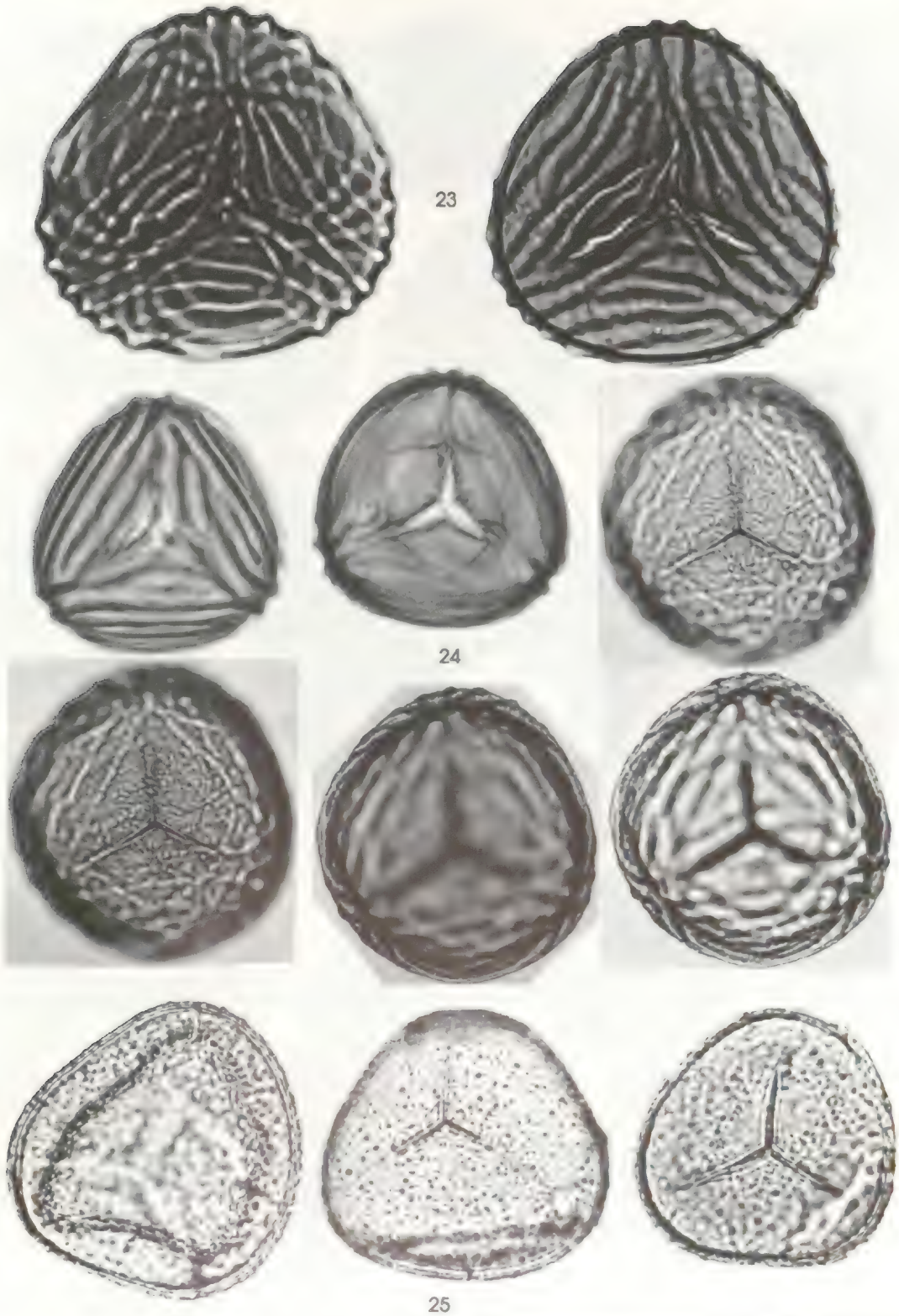

Plate 3. PARKERIACEAE: *Ceratopteris deltoidea* (23), *C. pteridoides* (24); POLYPODIACEAE: *Acrostichum aureum* (25)

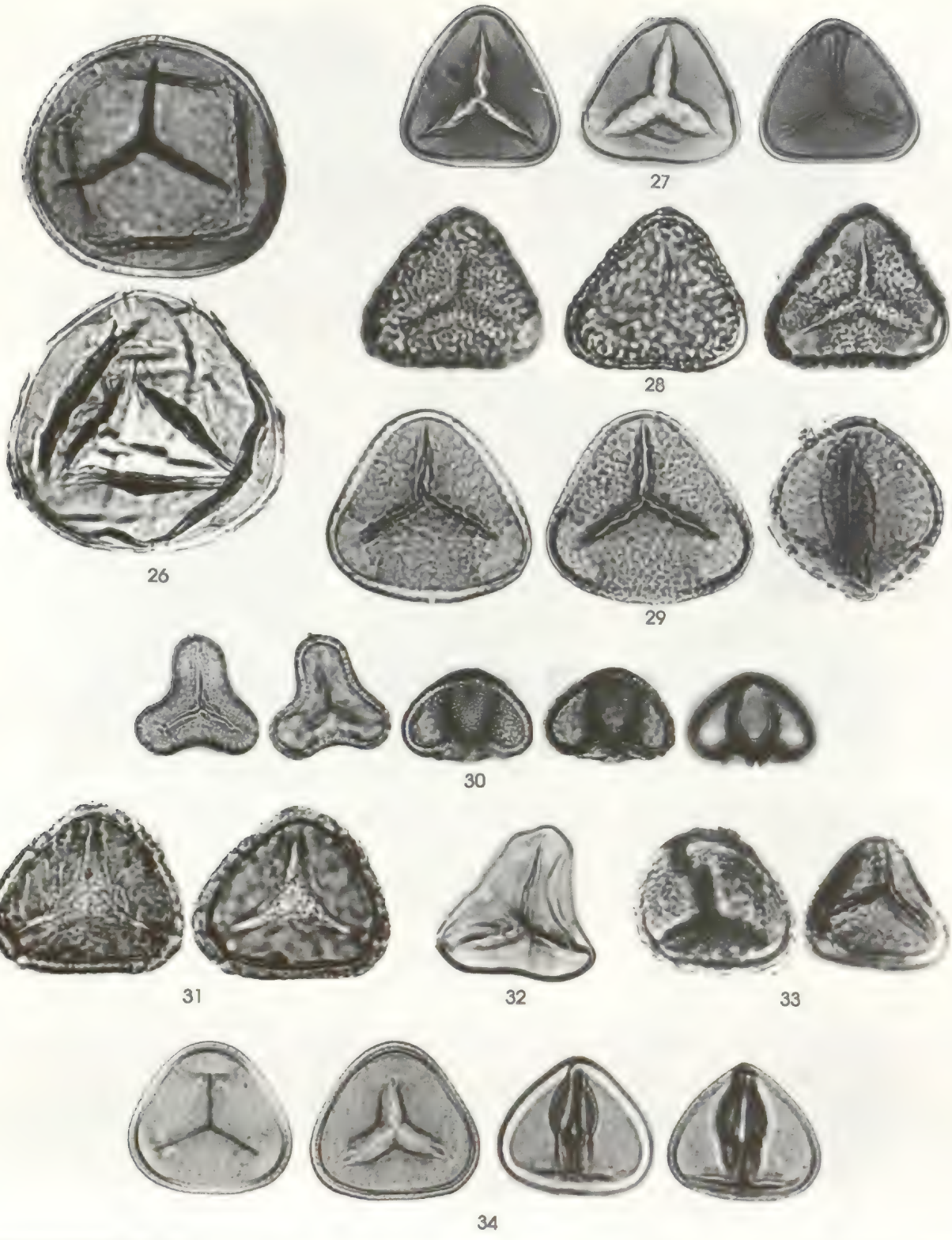

Plate 4. POLYPODIACEAE: *Acrostichum danaifolium* (26), *Adiantum decoratum* (27), *A. fructuosum* (28), *A. humile* (29), *A. lucidum* (30), *A. lunulatum* (31), *A. obliquum* (32), *A. pulverulentum* (33), *A. petiolatum* (34)

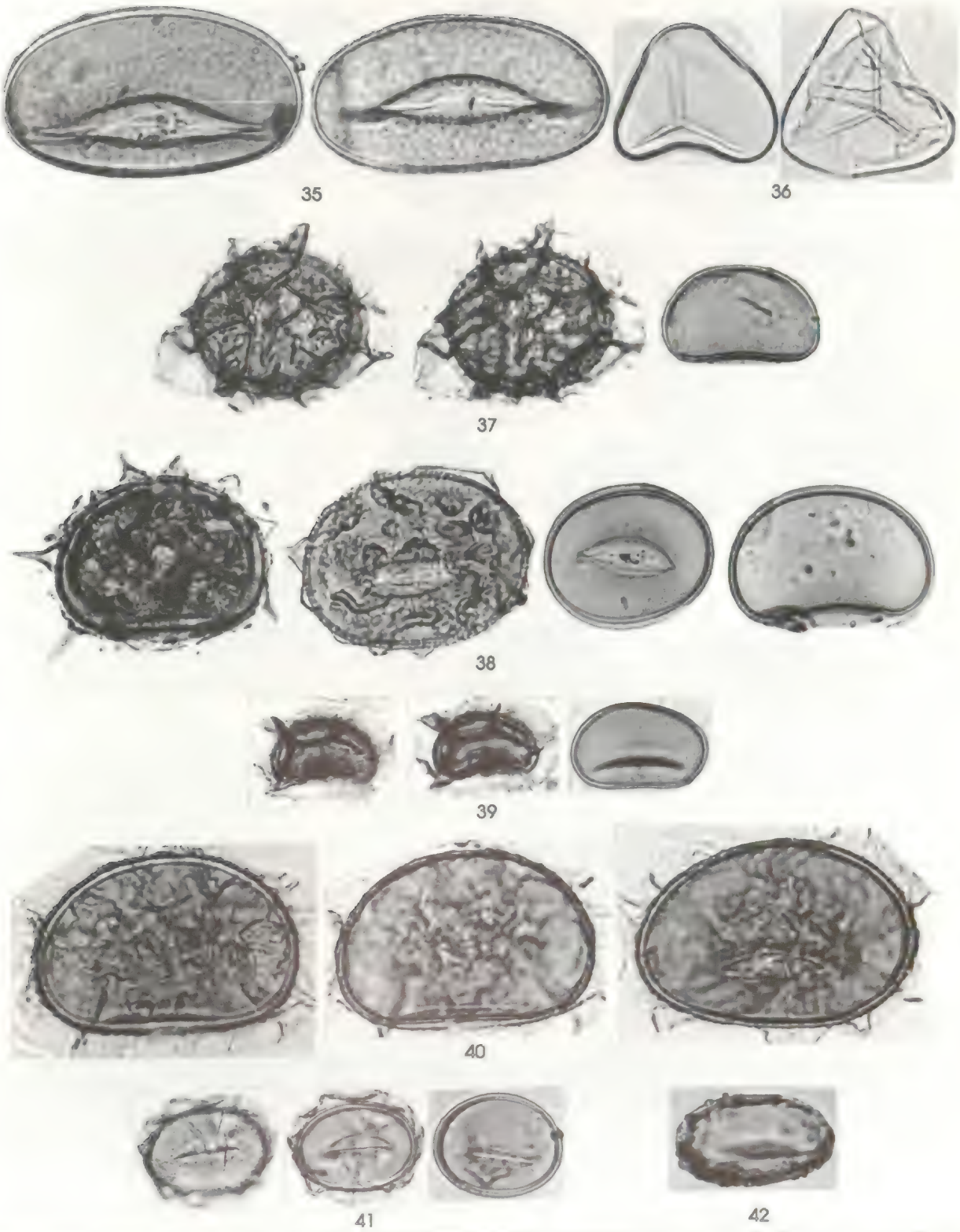

Plate 5. POLYPODIACEAE: *Ananthacorus angustifolius* [*Vittaria costata*] (35), *Anetium citrifolium* (36), *Asplenium delitescens* (37), *A. falcinellum* [*A. juglandifolium*] (38), *A. laetum* (39), *A. serratum* (40), *Blechnum occidentale* (41), *B. serrulatum* (42)

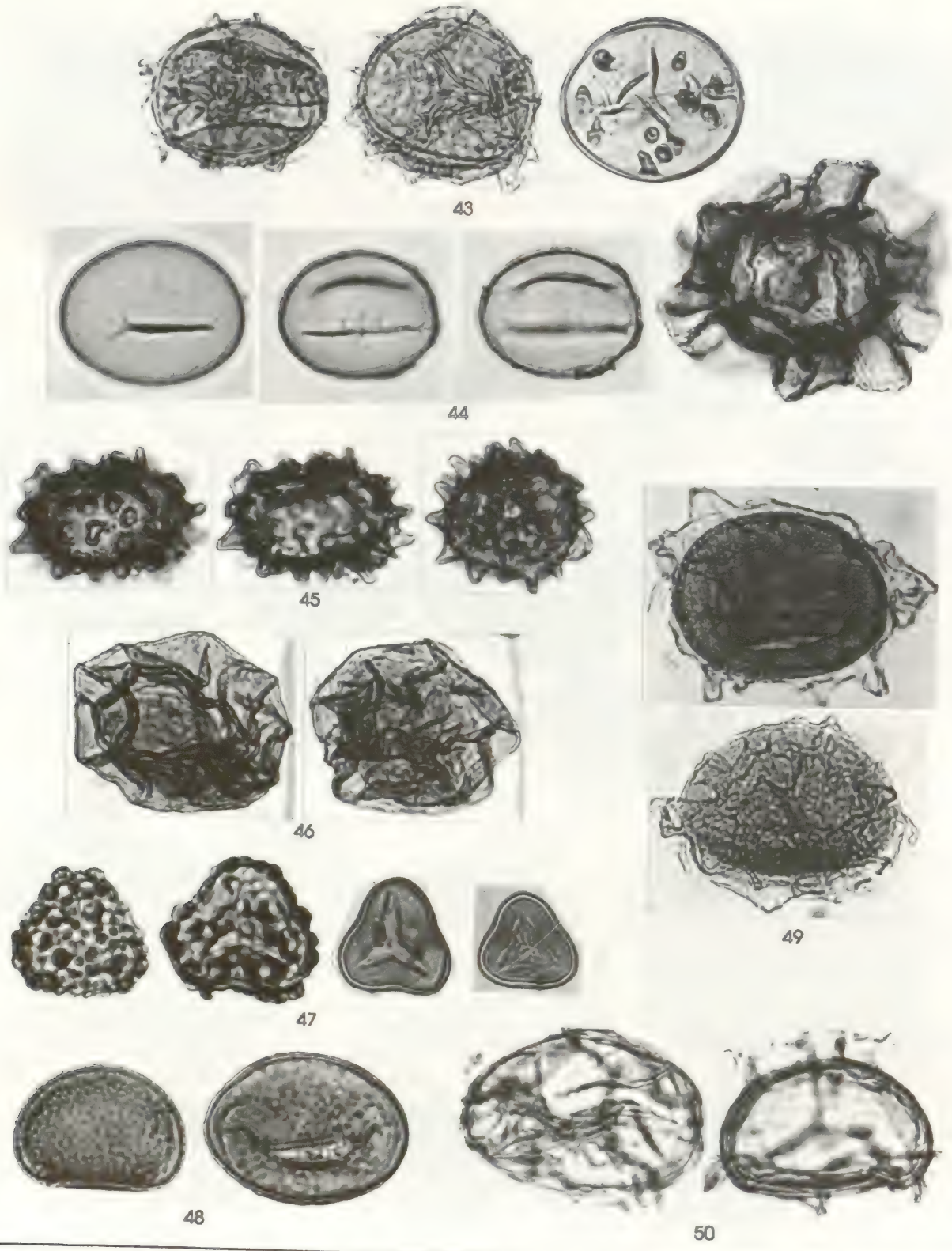

Plate 6. POLYPODIACEAE: *Bolbitis cladorrhizans* [*B. portoricensis*] (43), *B. nicotianifolia* (44), *Ctenitis sloanei* (45), *Cyclopeltis semicordata* (46), *Dennstaedtia cicutaria* (47), *Dicranoglossum panamense* (48), *Dictyoxiphium panamense* (49), *Diplazium grandifolium* (50)

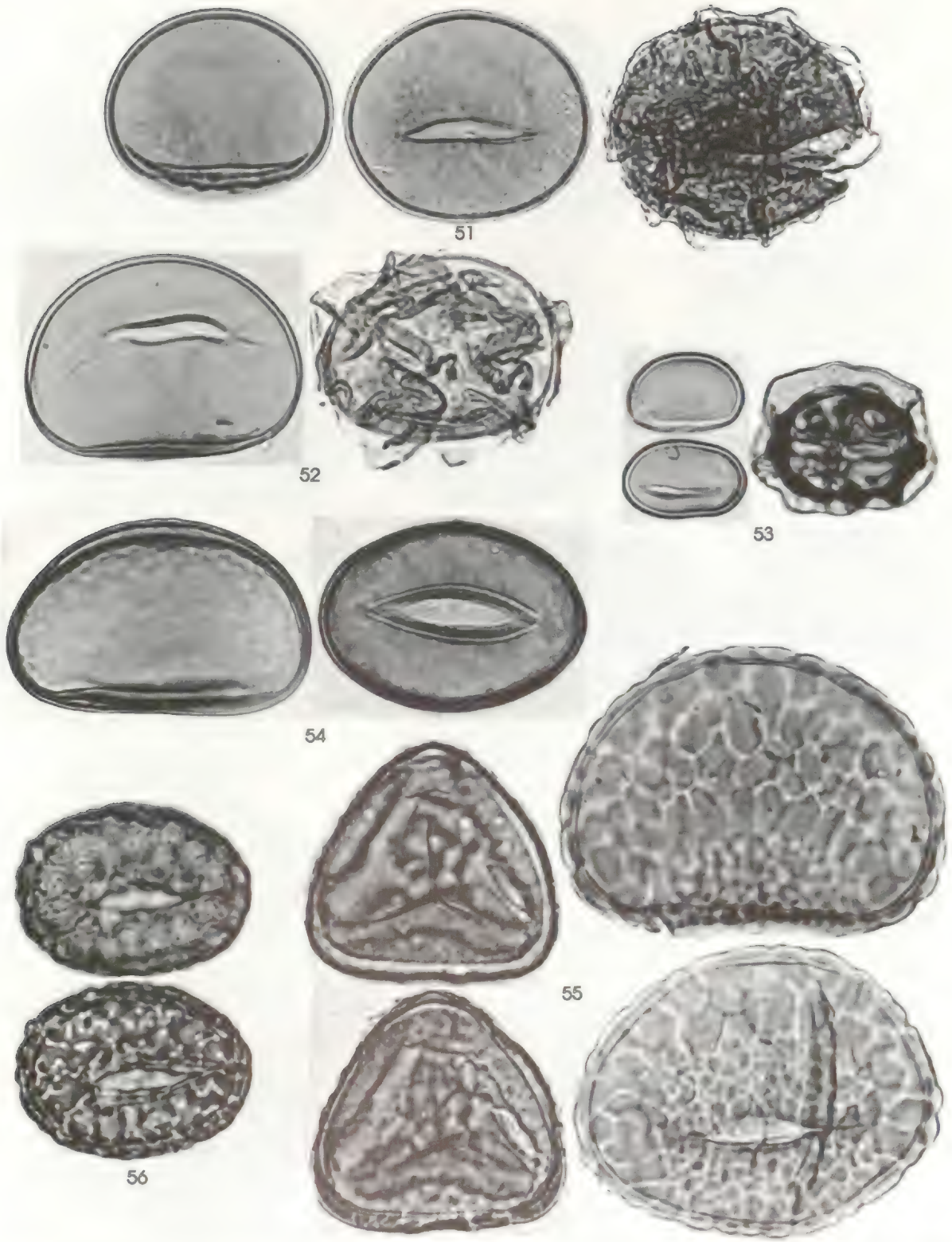

Plate 7. POLYPODIACEAE: *Elaphoglossum hayesii* (51), *E. sporadolepis* (52), *Hemidictyum marginatum* (53), *Lomariopsis vestita* [*L. fendleri*] (54), *Maxonia apiifolia dualis* (55), *Nephrolepis biserrata* (56)

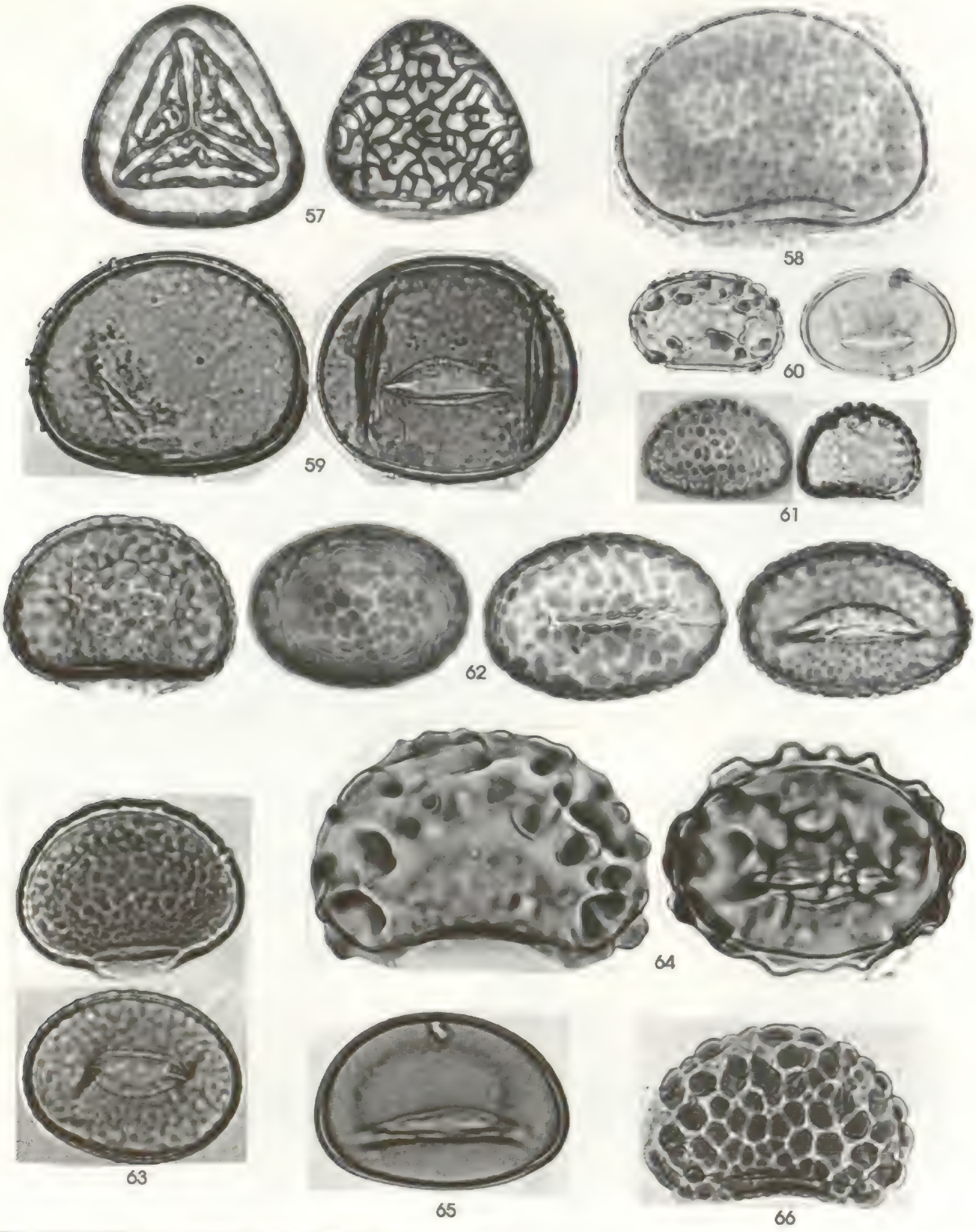

Plate 8. POLYPODIACEAE: *Pityrogramma calomelanos* (57), *Polypodium costaricense* (58), *P. crassifolium* [*Niphidium crassifolium*] (59), *Nephrolepis pendula* (60), *Polypodium ciliatum* [*Microgramma reptans*] (61), *P. hygrometricum* (62), *P. lycopodioides* (63), *P. maritimum* (64), *P. occultum* [*Campyloneurum occultum*] (65), *P. pectinatum* (66)

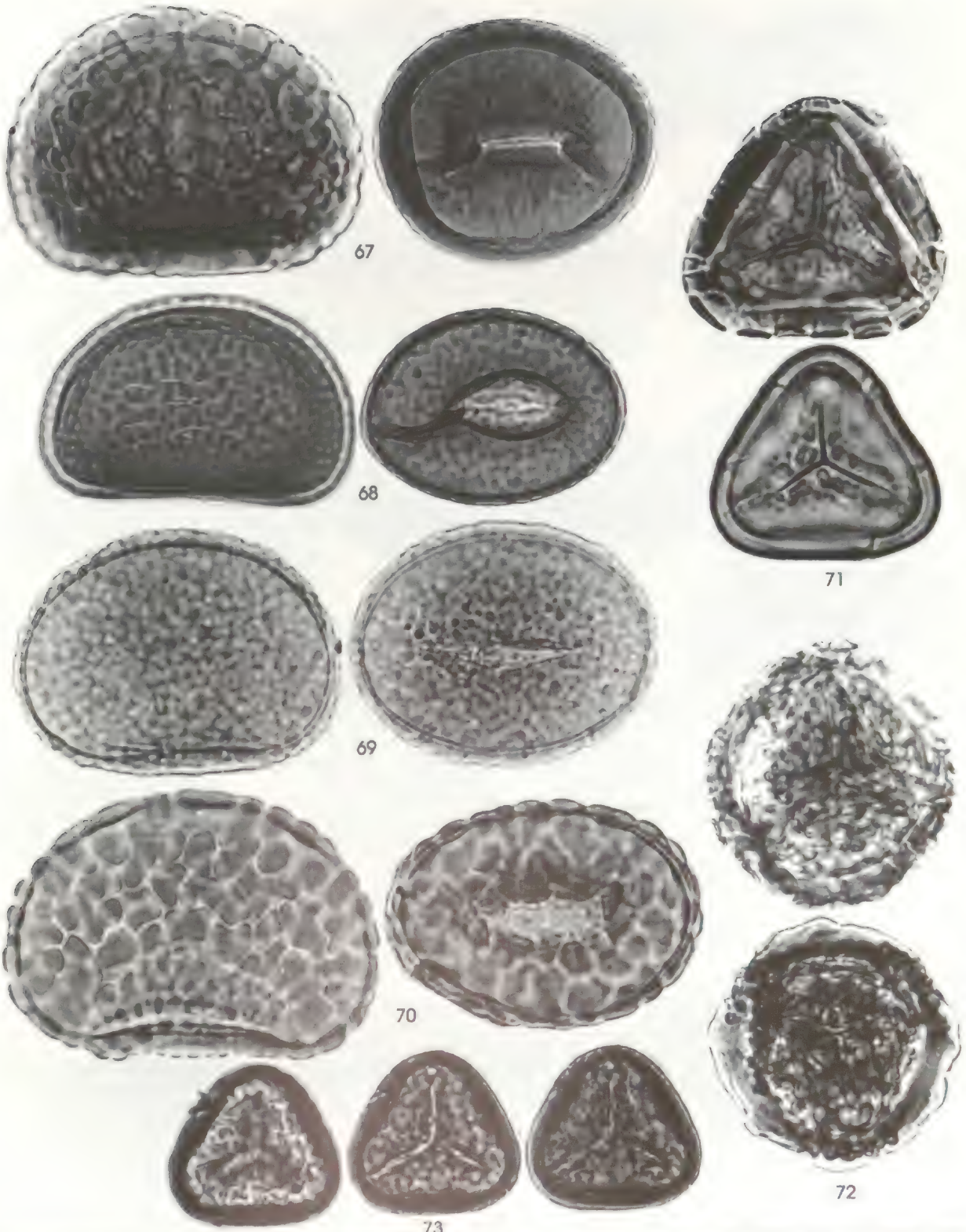

Plate 9. POLYPODIACEAE: *Polypodium percussum* [*Microgramma percussa*] (67), *P. phyllitidis* [*Campyloneurum phyllitidis*] (68), *P. polypodioides* (69), *P. triseriale* (70), *Pteris altissima* (71), *P. grandifolia* (72), *P. propinqua* (73)

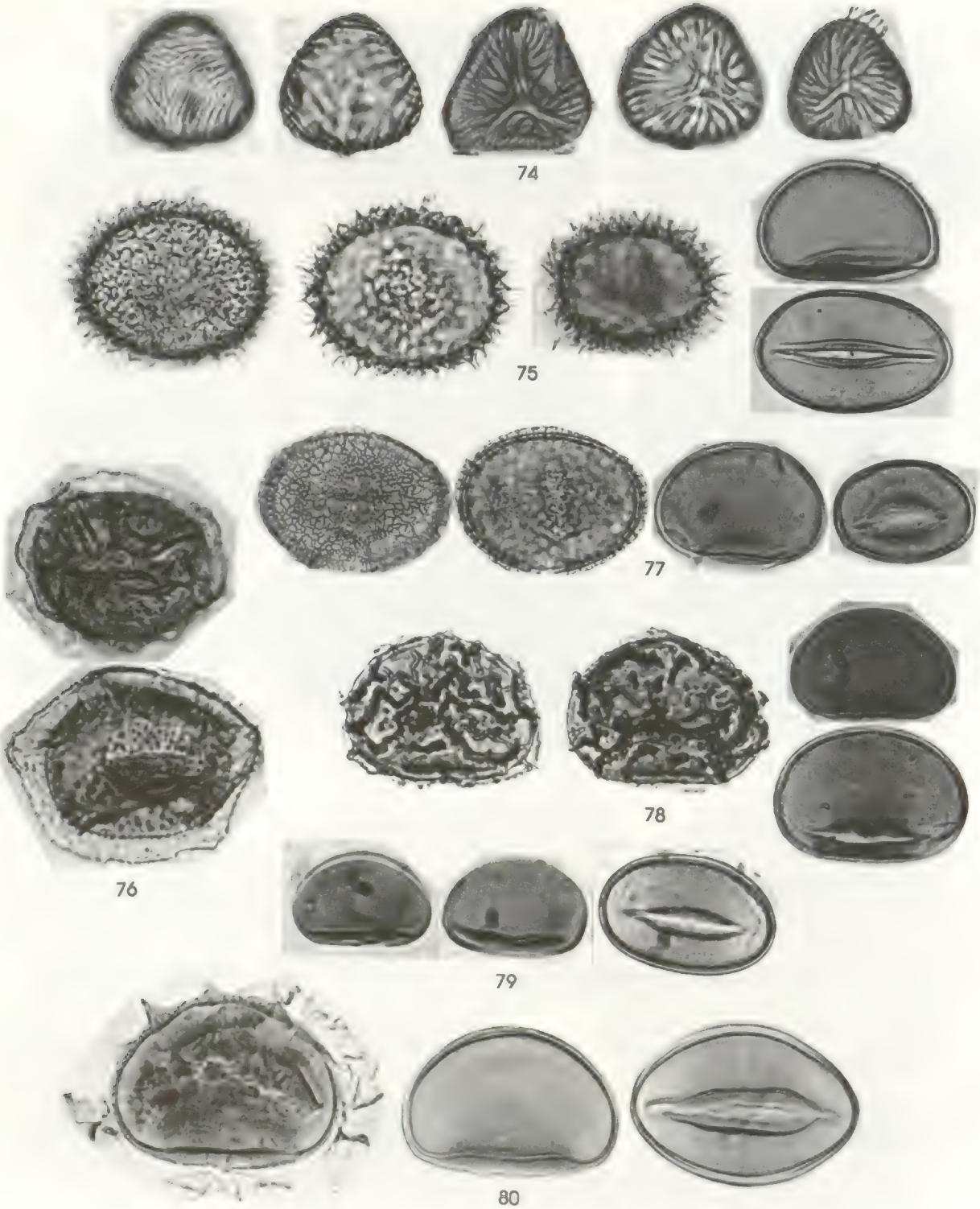

Plate 10. POLYPODIACEAE: *Saccoloma elegans* (74), *Tectaria euryloba* [*T. nicotianifolia*] (75), *T. incisa* (76), *Thelypteris balbisii* (77), *T. dentata* (78), *T. extensa* (79), *T. nicaraguensis* (80)

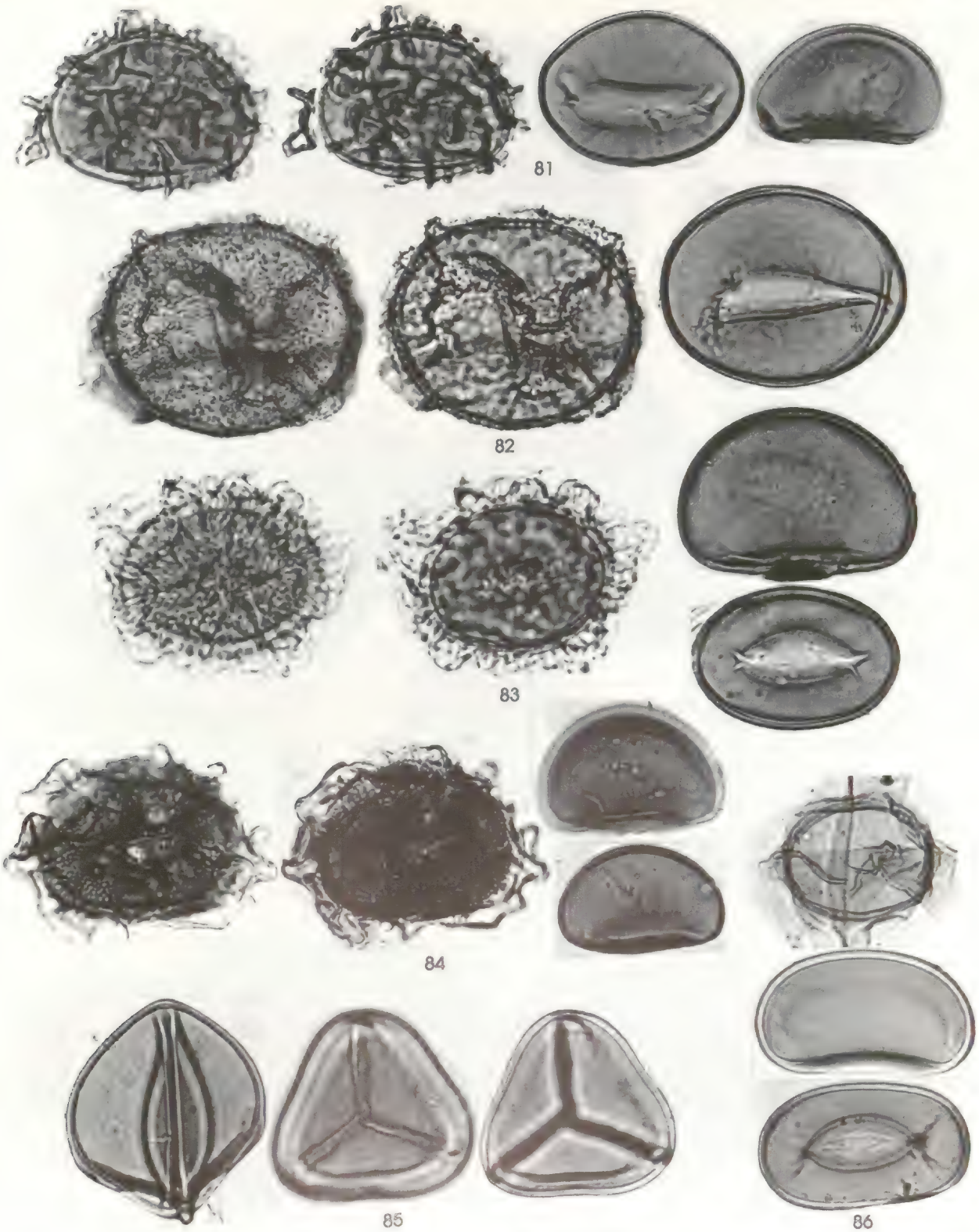

Plate 11. POLYPODIACEAE: *Thelypteris poiteana* (81), *T. serrata* (82), *T. torresiana* (83), *T. totta* (84), *Vittaria graminifolia* (85), *V. lineata* (86)

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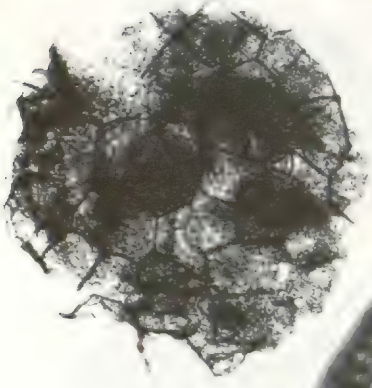

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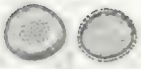

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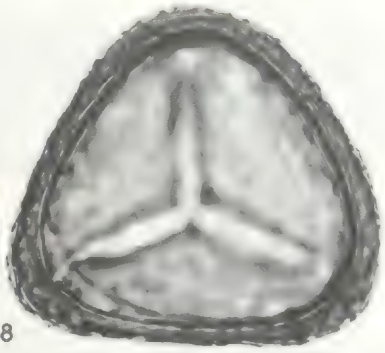

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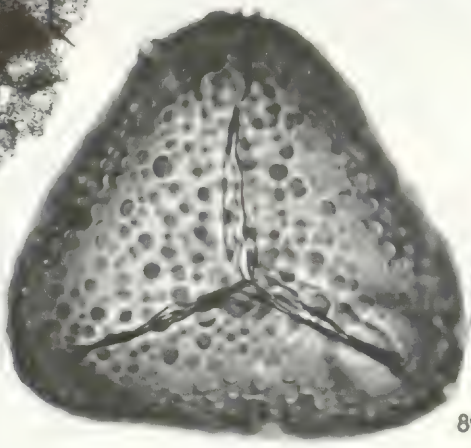

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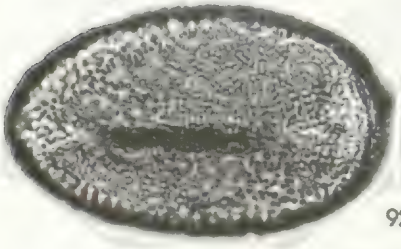

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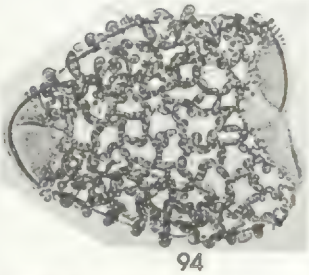

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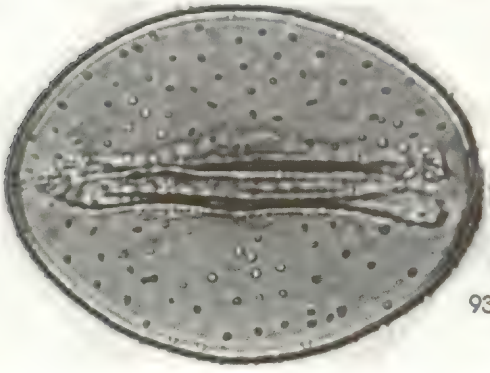

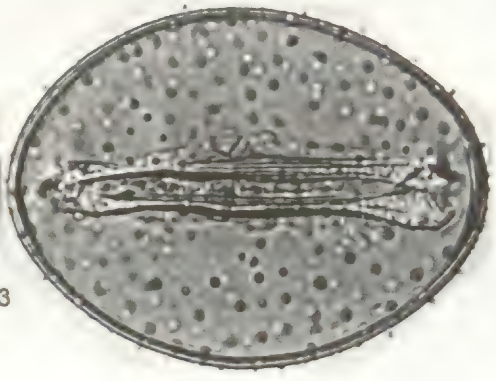

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Plate 12. SALVINIACEAE: *Salvinia radula* —microspore— (87) and —megaspore— (87a); SCHIZAEACEAE: *Lygodium venustum* (88), *L. radiatum* (89). **GYMNOSPERMAE—GNETOPHYTA**; GNETACEAE: *Gnetum leyboldii woodsonianum* (90). **ANGIOSPERMAE—MONOCOTYLEDONEAE;** ALISMATACEAE: *Sagittaria lancifolia* (91); AMARYLLIDACEAE: *Amaryllis belladonna* (92), *Crinum erubescens* (93), *Hymenocallis pedalis* [1/2x] (94)

Plate 13. ARACEAE: *Anthurium acutangulum* (95), *A. bakeri* (96), *A. bombacifolium* [*A. pentaphyllum bombacifolium*] (97), *A. brownii* (98), *A. clavigerum* (99), *A. flexile* (100), *A. littorale* [*A. durandii*] (101), *A. friedrichsthalii* (102), *A. gracile* (103), *A. ochranthum* (104), *A. scandens* (105), *A. tetragonum* [*A. salviniae*] (106), *Caladium bicolor* (107), *Dieffenbachia longispatha* (108), *D. oerstedii* (109), *D. pittieri* (110), *Homalomena wendlandii* (111), *Monstera adansonii lanlata* (112), *M. dubia* (113), *M. dilacerata* (114)

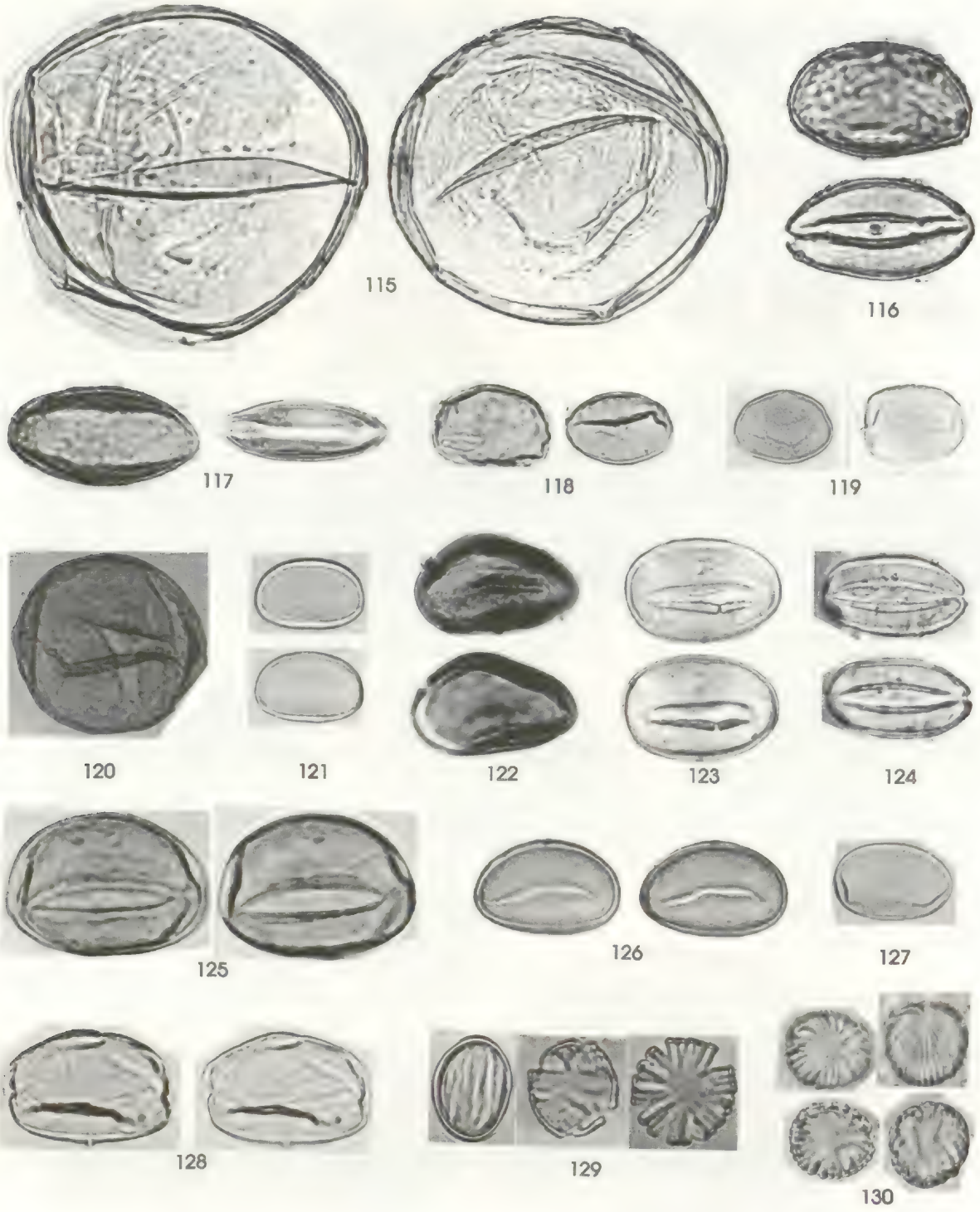


Plate 14. ARACEAE: *Montrichardia arborescens* (115), *Philodendron fragrantissimum* [*P. schottianum*] (116), *P. grandipes* (117), *P. guttiferum* [*P. aurantiifolium*] (118), *P. inaequilaterum* (119), *P. hederaceum* (120), *P. nervosum* [*P. lewisii*] (121), *P. panamense* (122), *P. pterotum* (123), *P. radiatum* (124), *P. scandens* (125), *P. tripartitum* (126), *Pistia stratiotes* (127), *Rhodospatha moritziana* (128), *Spathiphyllum friedrichsthalii* (129), *S. phryntifolium* (130)

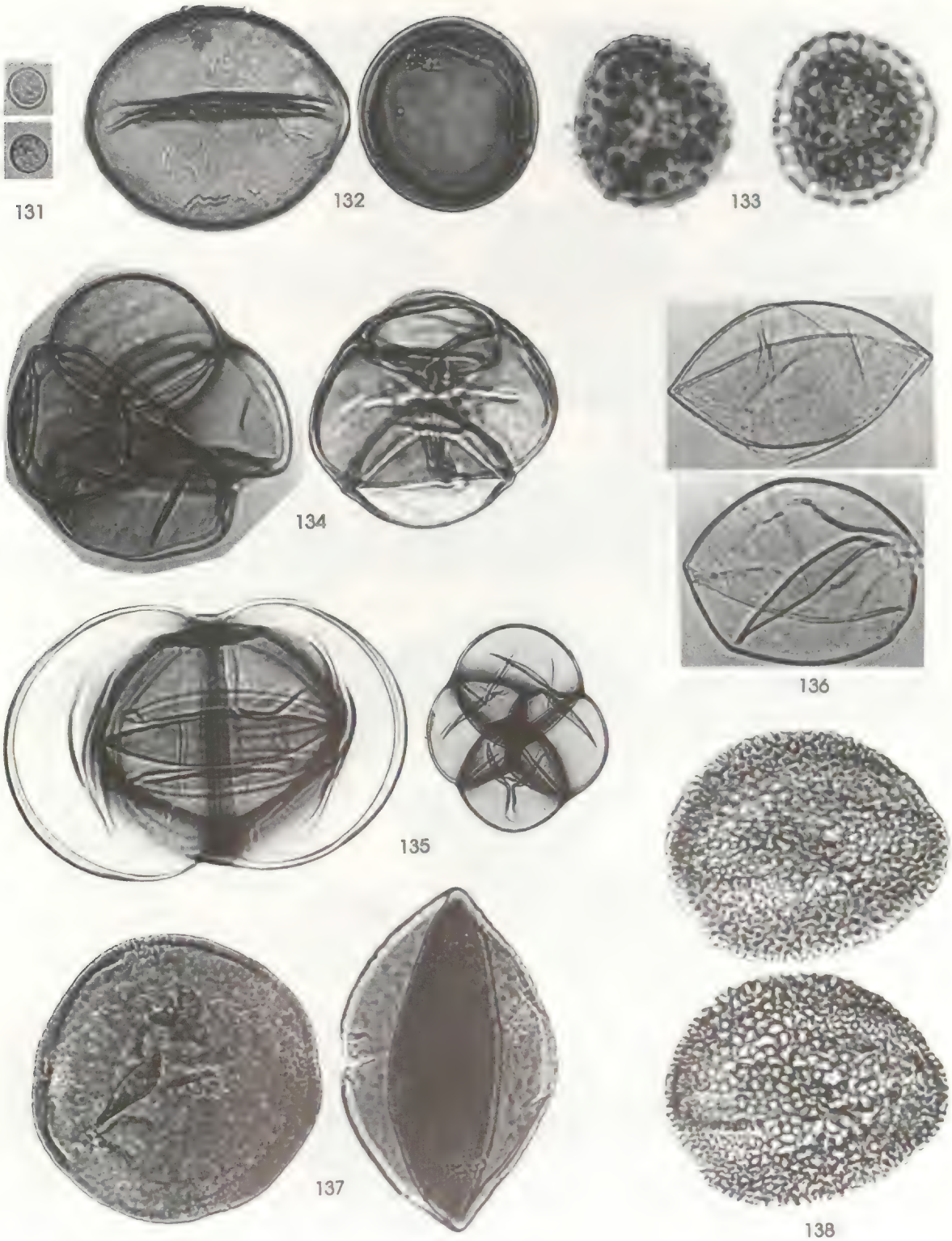


Plate 15. ARACEAE: *Stenospermation angustifolium* (131), *Syngonium erythrophyllum* (132), *S. podophyllum* (133), *Xanthosoma helleborifolium* (134), *X. pilosum* (1/2 x) (135); BROMELIACEAE: *Aechmea magdalenae* (136), *A. pubescens* (137), *A. setigera* (138)

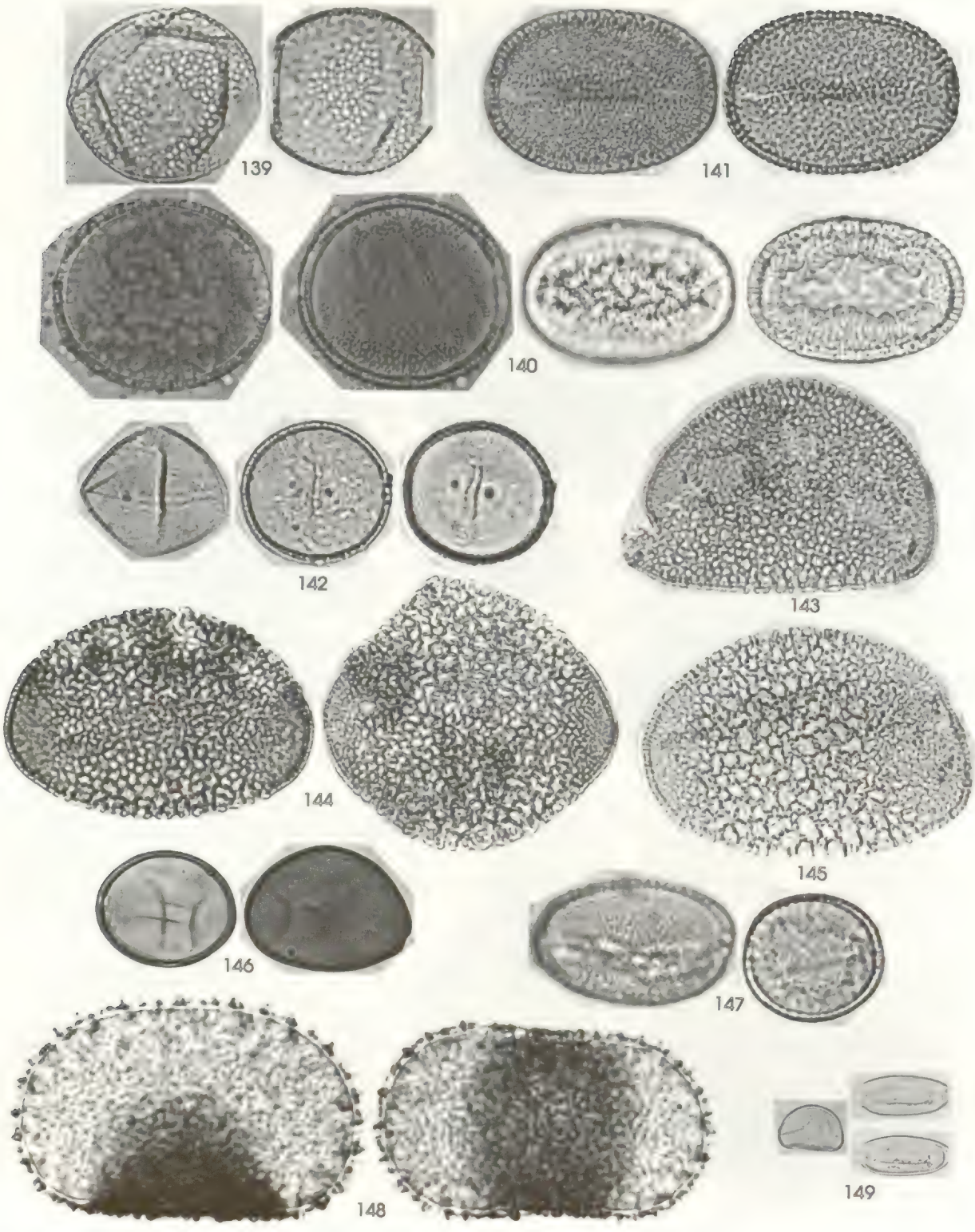


Plate 16. BROMELIACEAE: *Ananas comosus* (139), *Billbergia poiteana* (140), *Catopsis sessiliflora* (141), *Guzmania monostachia* (142), *Tillandsia bulbosa* (143), *Vriesea gladioliflora* (144), *V. heliconioides* (145); BURMANIACEAE: *Thismia panamensis* (146), COMMELINACEAE: *Campelia zanonia* (147), *Commelina erecta* (148), *Callisia ciliata* (149)

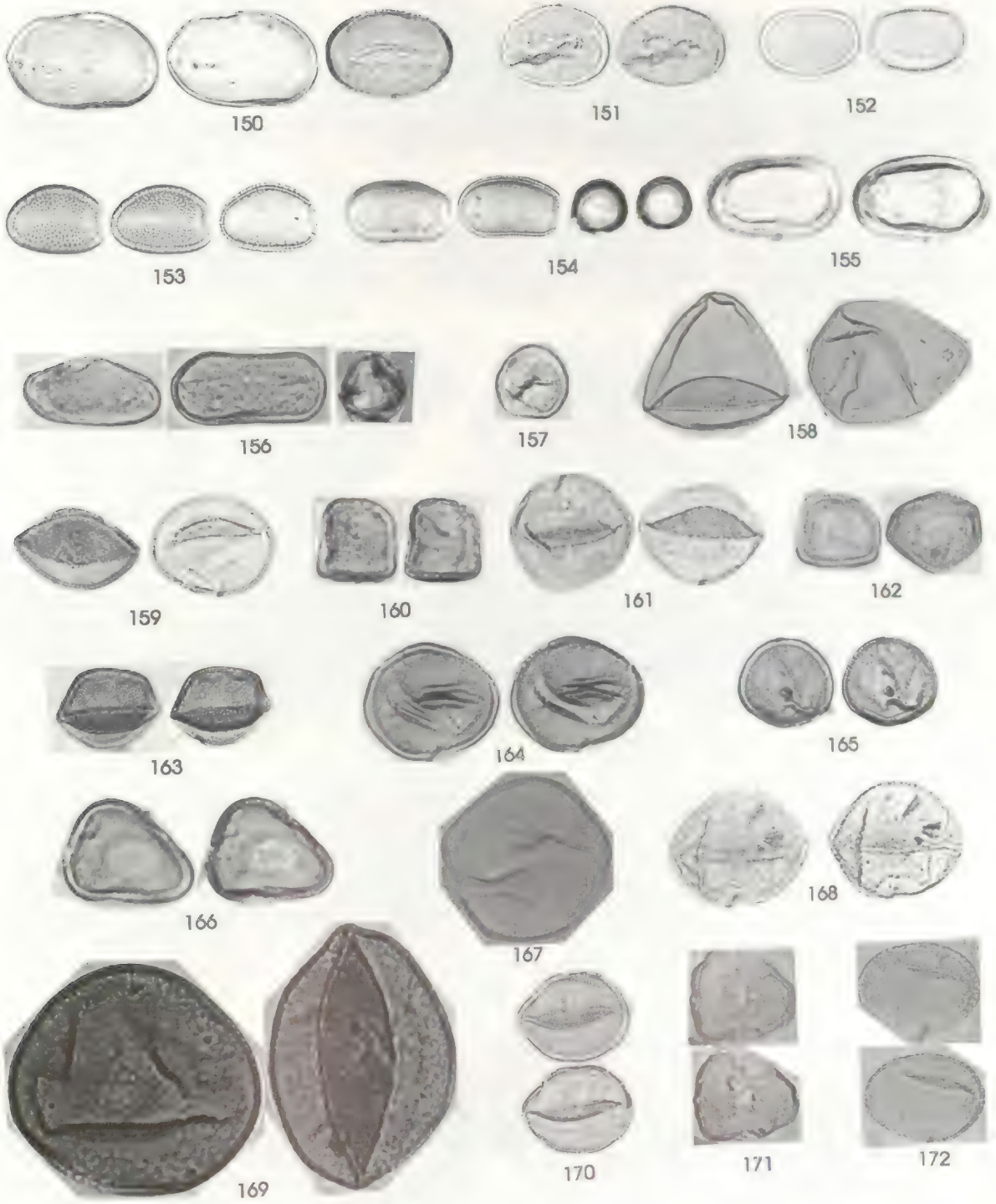


Plate 17. COMMELINACEAE: *Dichorisandra hexandra* (150), *Tripogandra serrulata* (151); CYCLANTHACEAE: *Asplundia alata* (152), *Carludovica drudei* (153), *C. palmata* (154), *Cyclanthus bipartitus* (155), *Ludovia integrifolia* (156); CYPERACEAE: *Calyptrocarya glomerulata* (157), *Cladium jamaicense* (158), *Cyperus densicaespitosus* [*Kyllinga pumila*] (159), *C. diffusus* (160), *C. giganteus* (161), *C. haspan* (162), *C. luzulae* (163), *C. odoratus* (164), *C. sesquiflorus* [*Kyllinga odorata*] (165), *C. tenuis* (166), *Eleocharis caribaea* [*E. geniculata*] (167), *Fimbristylis dichotoma* (168), *Fuirena umbellata* [1.5x] (169), *Rhynchospora cephalotes* (170), *R. corymbosa* (171), *R. nervosa* (172)

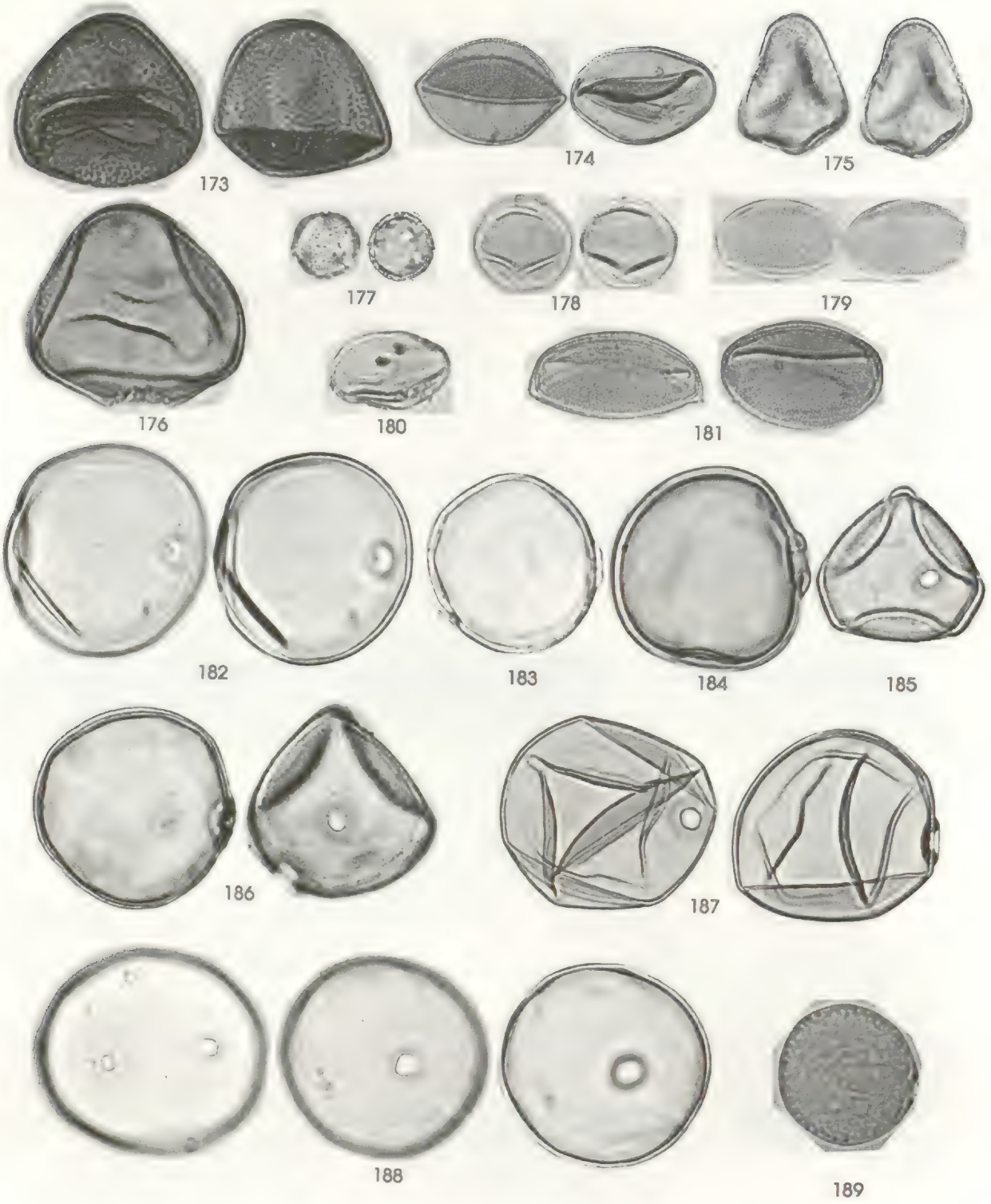


Plate 18. CYPERACEAE: *Scirpus cubensis* [*Oxycaryum cubense*] (173), *Scleria macrophylla* (174), *S. mitis* (175), *S. pterota* [*S. melaleuca*] [1.5x] (176); DIOSCOREACEAE: *Dioscorea alata* (177), *D. haenkeana* (178), *D. polygonoides* (179), *D. sapindoides* (180), *D. urophylla* (181); GRAMINEAE: *Andropogon bicornis* (182), *A. glomeratus* (183), *A. virginicus* (184), *Anthephora hermaphrodita* (185), *Axonopus compressus* (186), *Bambusa arundinacea* (187), *Cenchrus brownii* (188), *Chloris radiata* (189)

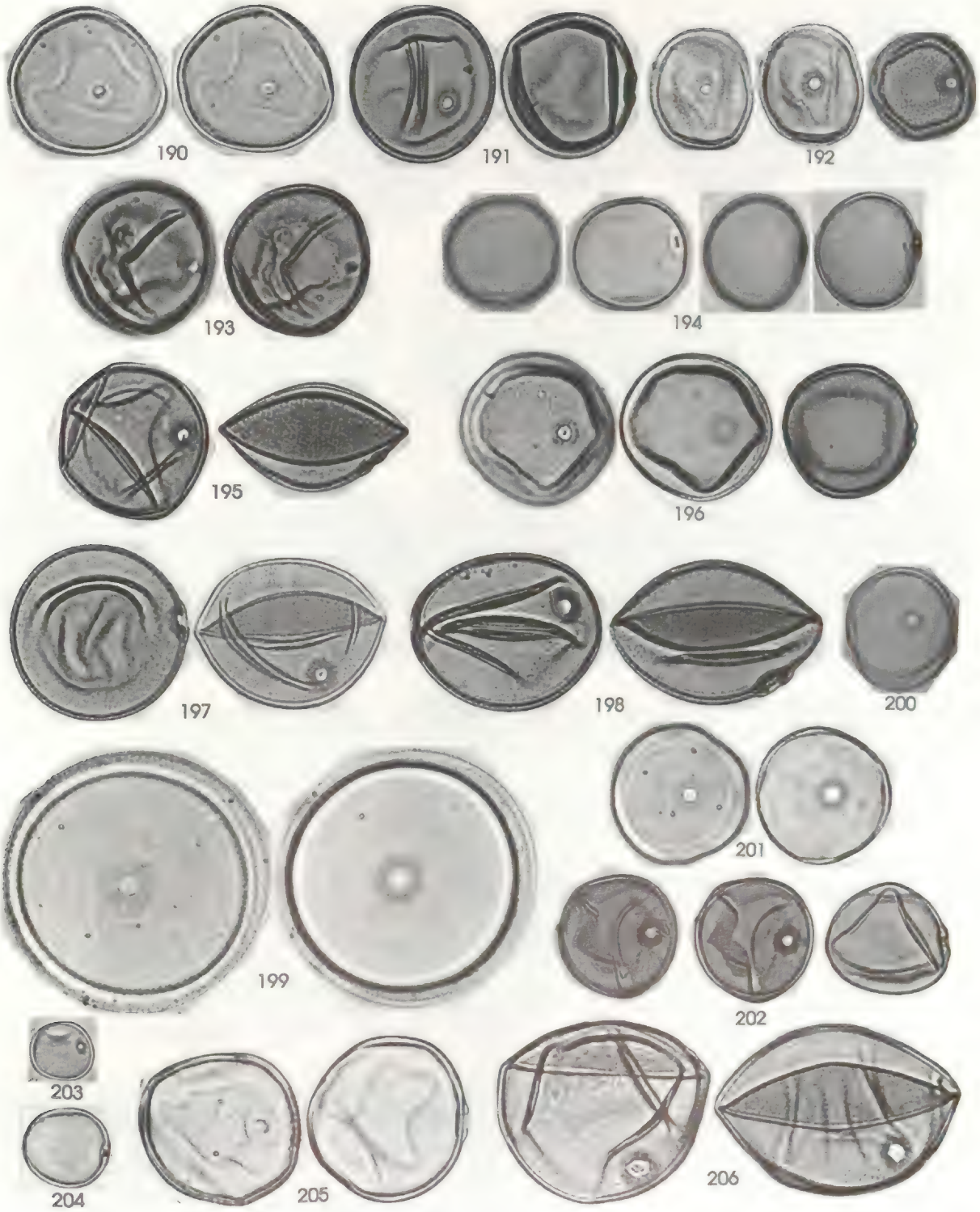


Plate 19. GRAMINEAE: *Cynodon dactylon* (190), *Digitaria ciliaris* (191), *Eleusine indica* (192), *Homolepis aturensis* (193), *Hyparrhenia rufa* (194), *Hymenachne amplexicaulis* (195), *Ichnanthus pallens* (196), *Ischaemum indicum* (197), *I. rugosum* (198), *Lasiacis procerrima* [1.5x] (199), *L. oaxacensis* (200), *Leptochloa virgata* (201), *Leersia hexandra* (202), *Lithachne pauciflora* (203), *Olyra latifolia* (204), *Oplismenus burmanni* (205), *O. hirtellus* (206)

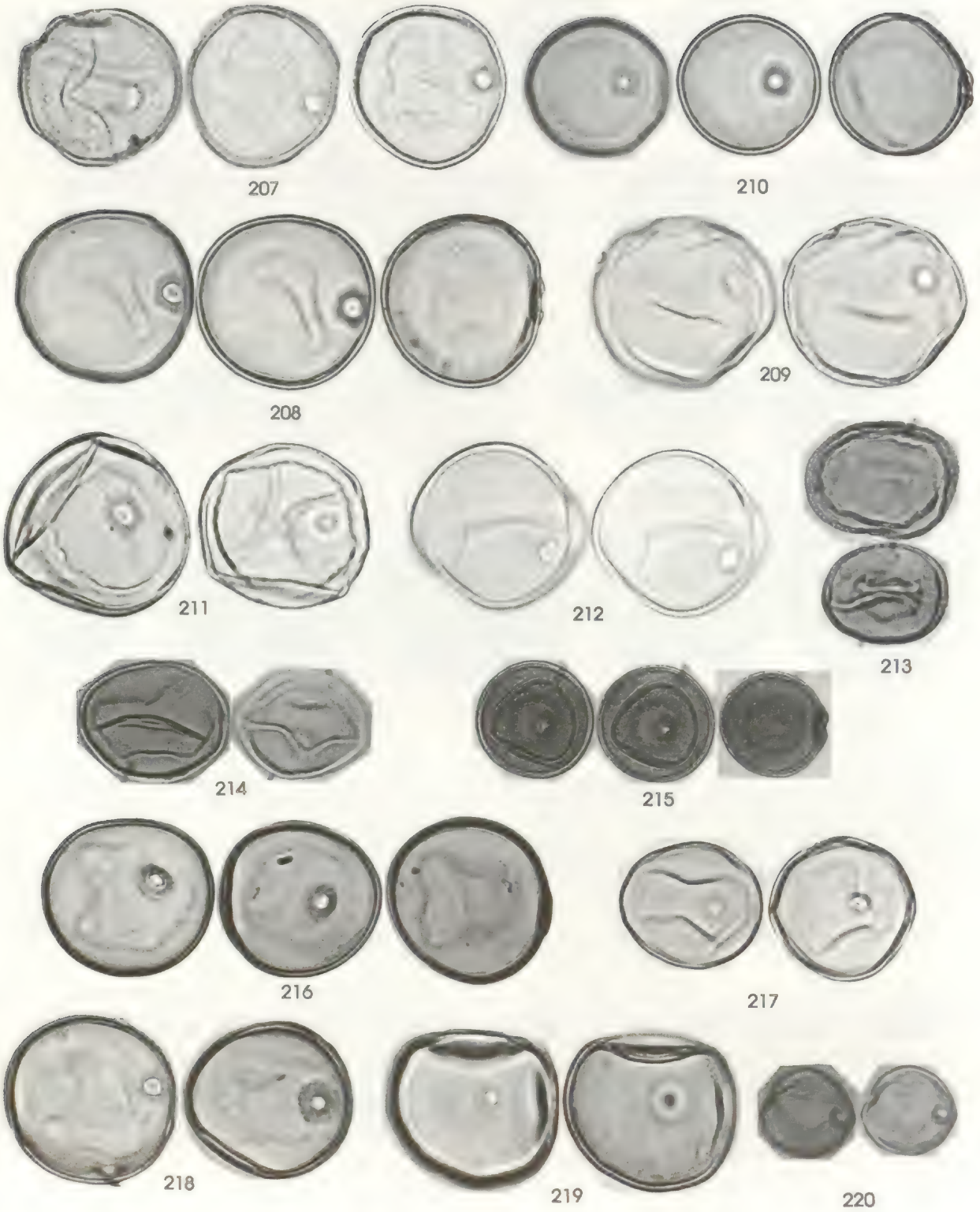


Plate 20. GRAMINEAE: *Orthoclada laxa* (207), *Oryza latifolia* (208), *Panicum fasciculatum* [*Brachiaria fasciculata*] (209), *P. grande* (210), *P. maximum* (211), *P. pilosum* (212), *P. polygonatum* (213), *P. pulchellum* (214), *Paspalidium geminatum* (215), *Paspalum notatum* (216), *P. paniculatum* (217), *P. plicatulum* (218), *P. virgatum* (219), *P. decumbens* (220)

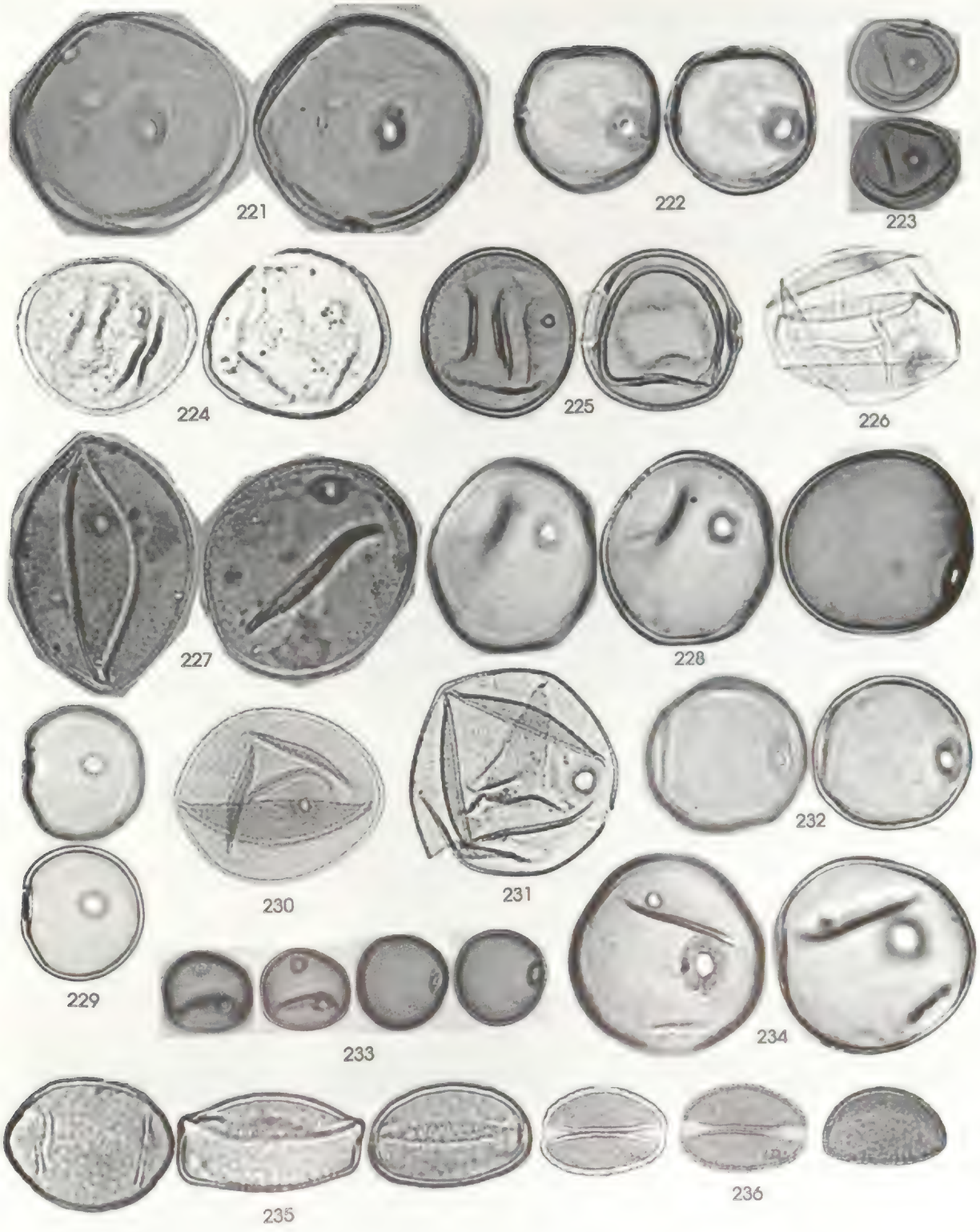


Plate 21. GRAMINEAE: *Paspalum conjugatum* (221), *Pharus latifolius* (222), *P. parvifolius* (223), *Phragmites australis* (224), *Polytrias amaura* (225), *Rhipidocladum racemiflorum* (226), *Saccharum officinarum* (227), *S. spontaneum* (228), *Schizachyrium microstachyum* (229), *Setaria geniculata* (230), *S. paniculifera* (231), *S. vulpiseta* (232), *Sporobolus indicus* (233), *Streptochaeta sodiroana* (234); HAEMODORACEAE: *Xiphidium caeruleum* (235); LILIACEAE: *Cordyline fruticosa* (236)

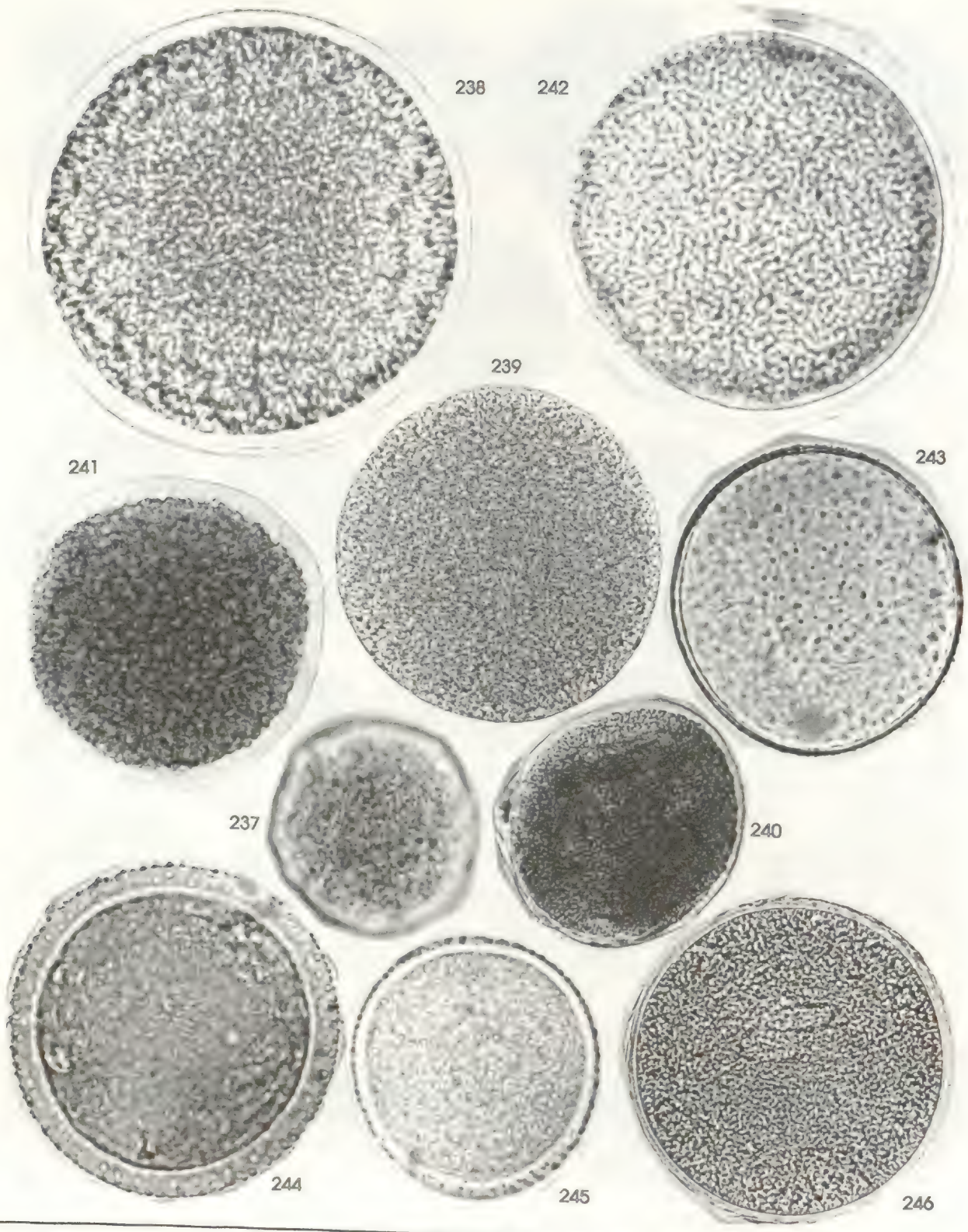


Plate 22. MARANTACEAE: *Calathea insignis* [1/2x] (237), *C. latifolia* (238), *C. lutea* [1/2x] (239), *C. marantifolia* [1/2x] (240), *Ischnosiphon leucophaeus* [1/2x] (241), *Stromanthe jacquinii* (242); MUSACEAE: *Heliconia irrasa* (243), *H. catheta* [*H. platystachys*] (244), *H. latispatha* (245), *Musa sapientum* (246)

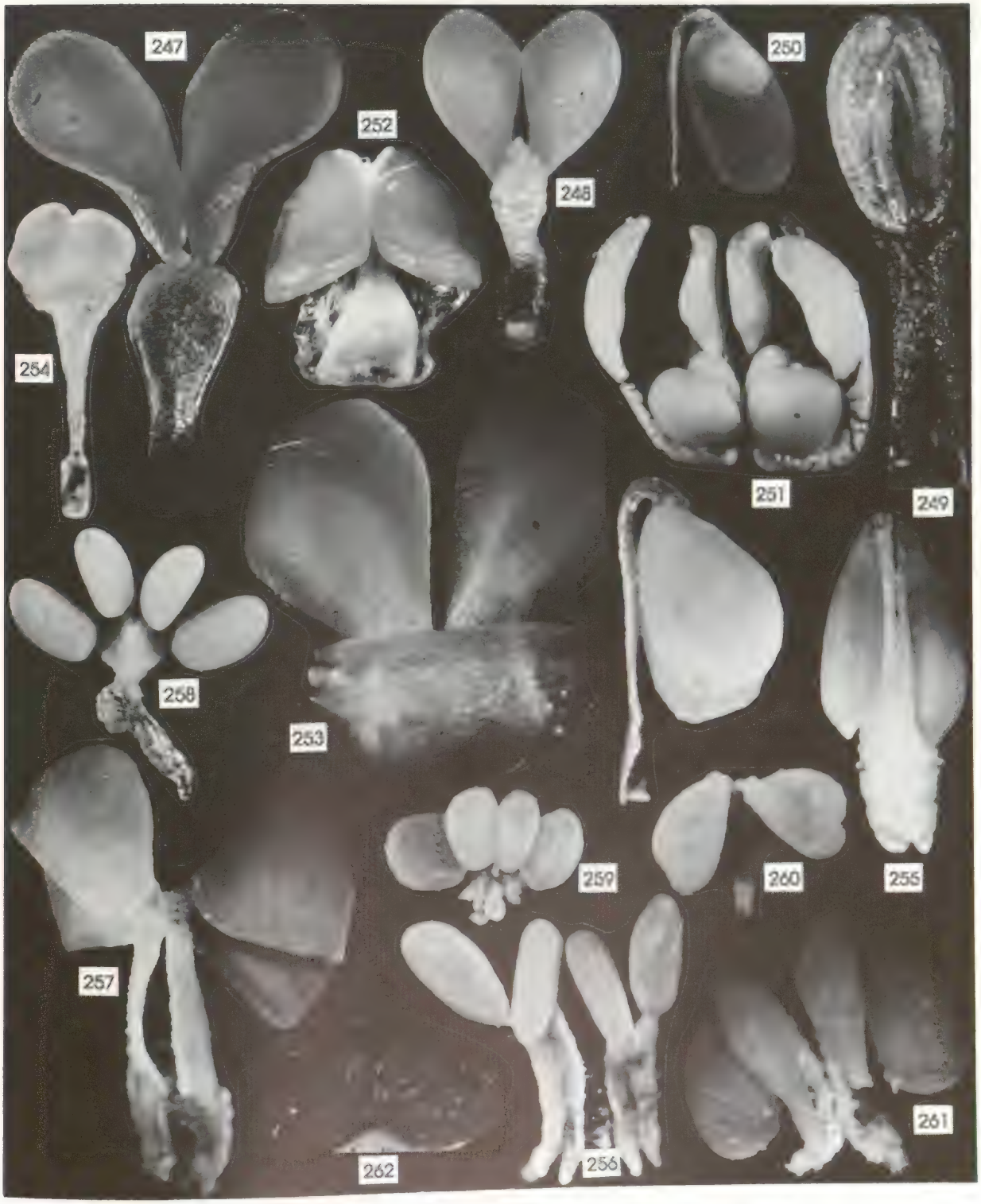


Plate 23. ORCHIDACEAE: *Aspasia epidendroides* (247), *Brassia maculata* (248), *Catasetum bicolor* [1/2 x] (249), *Cattleya skinneri* [*C. patinii*] (250), *Chysis maculata* [1/2 x] (251), *Coryanthes maculata* [1/2 x] (252), *Cochleanthes aromatica* (253), *Dichaea panamensis* (254), *Encyclia cordigera* (255), *E. pentotis* (256), *Epidendrum coronatum* (257), *E. difforme* (258), *E. nocturnum* (259), *E. stangeanum* [2x] (260), *E. schlechterianum* [2x] (261), *Eulophia alta* (262)

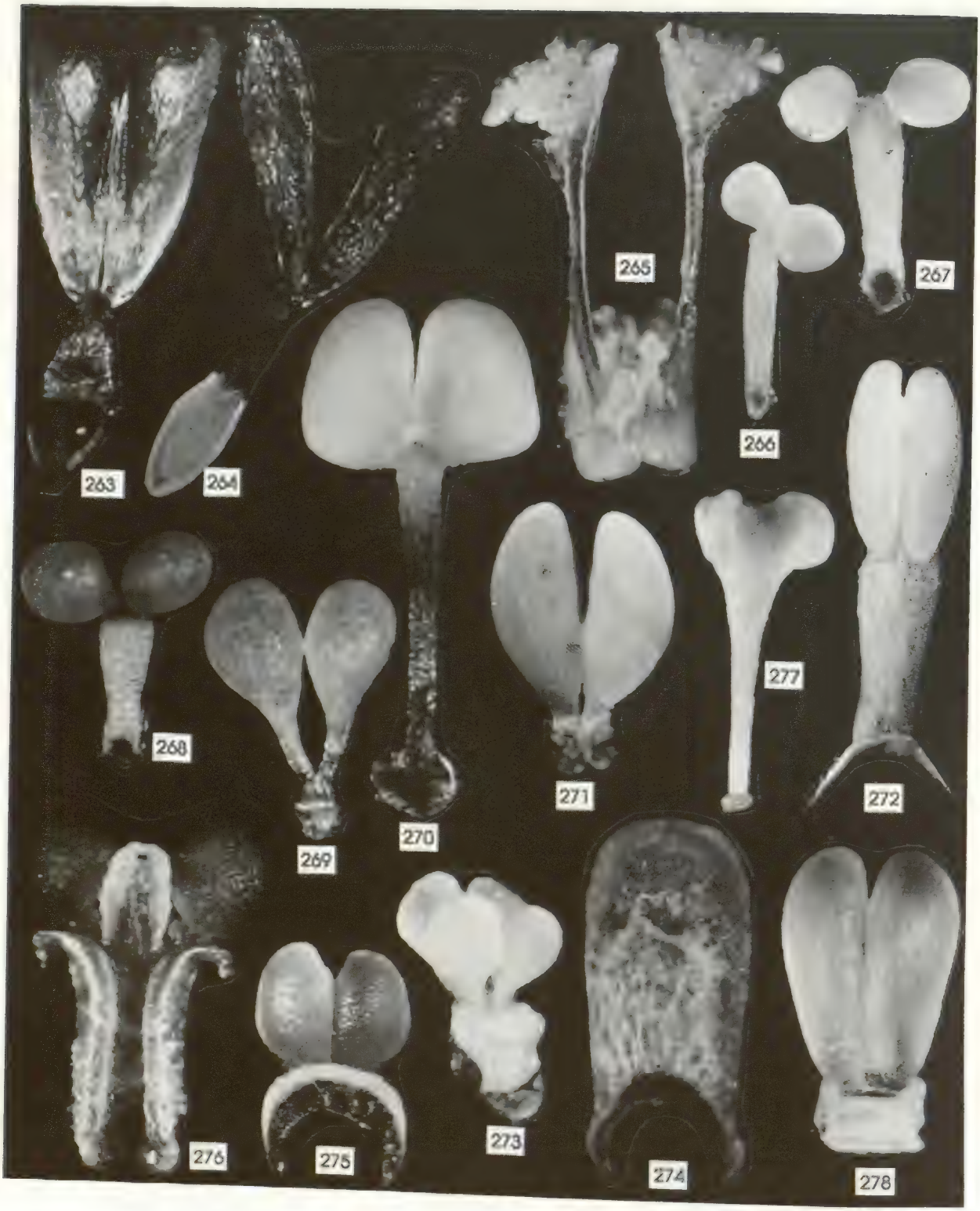


Plate 24. ORCHIDACEAE: *Gongora quinquenervis* (263), *G. tricolor* [*G. fulva*] (264), *Habenaria pauciflora* [*H. trifida*] (265), *Ionopsis satyrioides* [2x] (266), *I. utricularioides* [2x] (267), *Leochilus scriptus* (268), *Lockhartia oerstedii* [2x] (269), *Lycaste powellii* (270), *Masdevallia rolfeana* [2x] (271), *Maxillaria friedrichsthalii* [1/2 x] (272), *M. neglecta* [2x] (273), *M. uncata* (274), *M. variabilis* (275), *Mormodes roseum* (276), *Notylia barkeri* [2x] (277), *Oncidium ampliatum* [2x] (278)

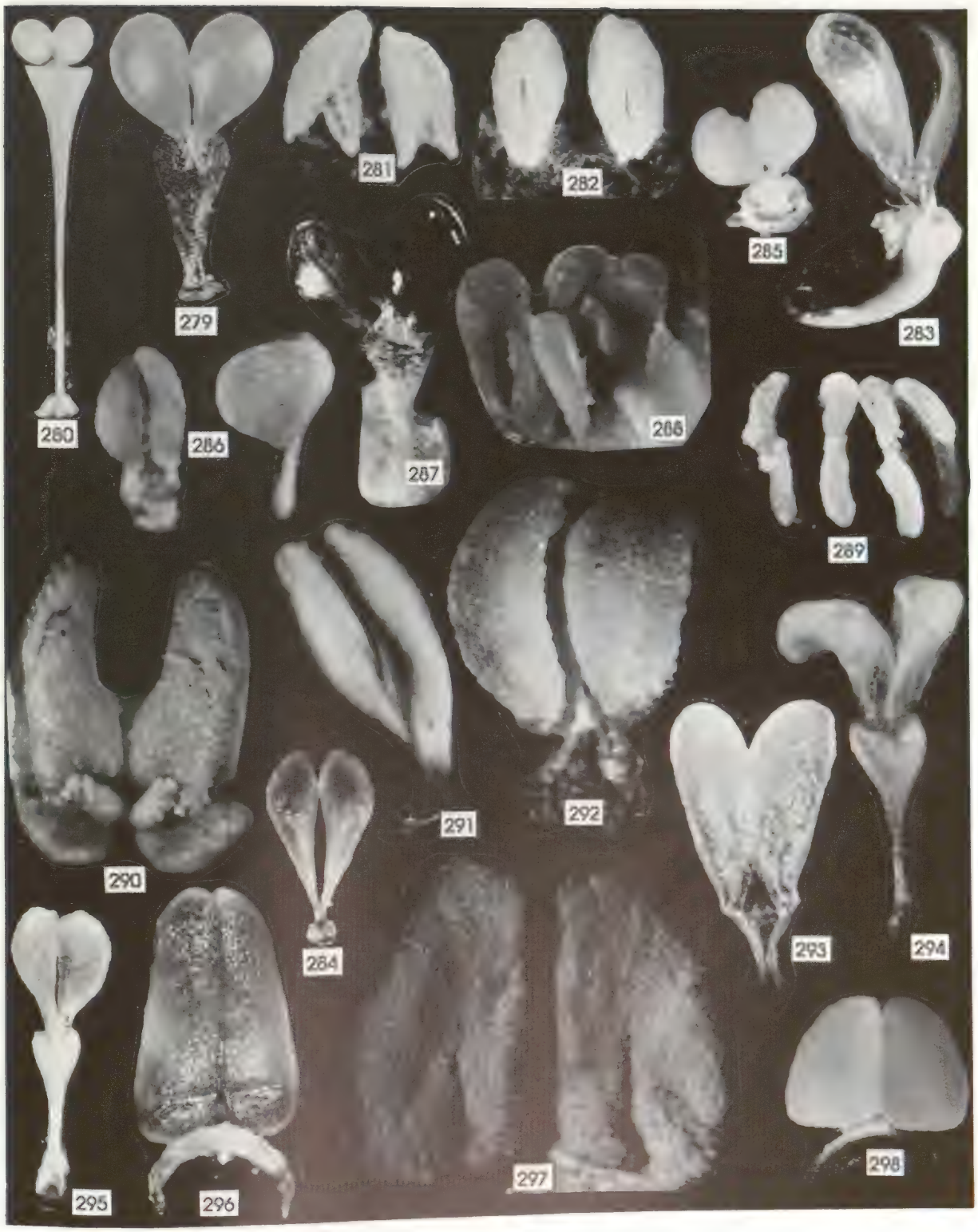


Plate 25. ORCHIDACEAE: *Oncidium stipitatum* (279), *Ornithocephalus powellii* [1/2 x] (280), *Palmorchis nitida* [2x] (281), *P. powellii* [2x] (282), *Peristeria elata* [1/2 x] (283), *Pleurothallis arietina* [2x] (284), *Polystachya masayensis* [2x] (285), *Scaphyglottis reedii* [2x] (286), *Sievekingia suavis* (287), *Sobralia fragrans* (288), *S. suaveolens* (289), *S. panamensis* [*S. fenzliana*] (290), *Spiranthes schappneri* (291), *Teuscheria picklana* [2x] (292), *Trichocentrum capistratum* (293), *Trichopilia maculata* (294), *T. subulata* (295), *Trigonidium egertonianum* [2x] (296), *Vanilla pompona* (297), *Xylobium foveatum* (298)

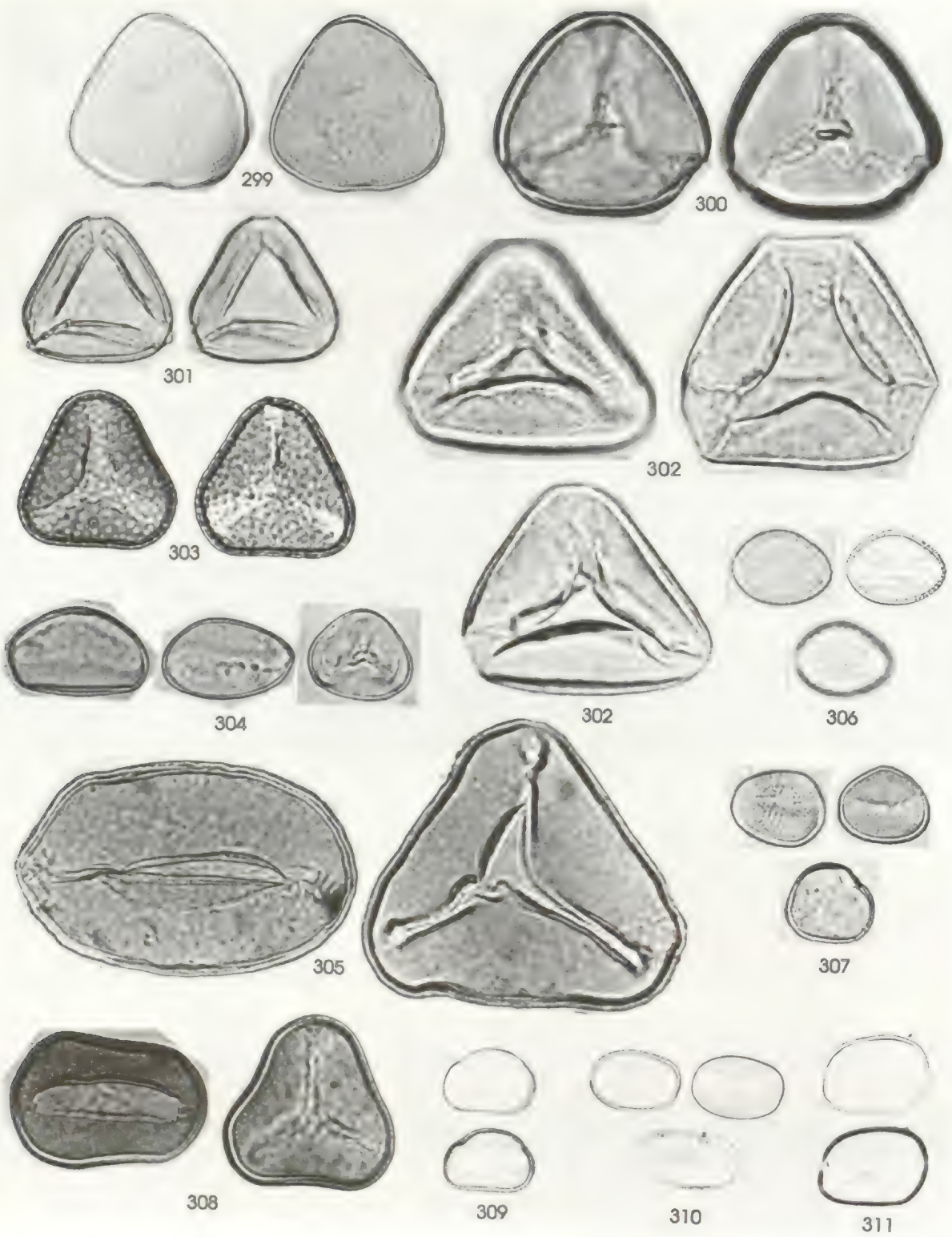


Plate 26. PALMAE: *Astrocaryum standleyanum* (299), *Bactris barronis* (300), *B. coloniata* (301), *B. gasipaes* (302), *B. major* (303), *Chamaedorea wendlandiana* [*C. tepejilote*] (304), *Cocos nucifera* (305), *Cryosophila warscewiczii* (306), *Desmoncus panamensis* (307), *Elaeis oleifera* (308), *Geonoma cuneata* (309), *G. interrupta* (310), *G. procumbens* (311)

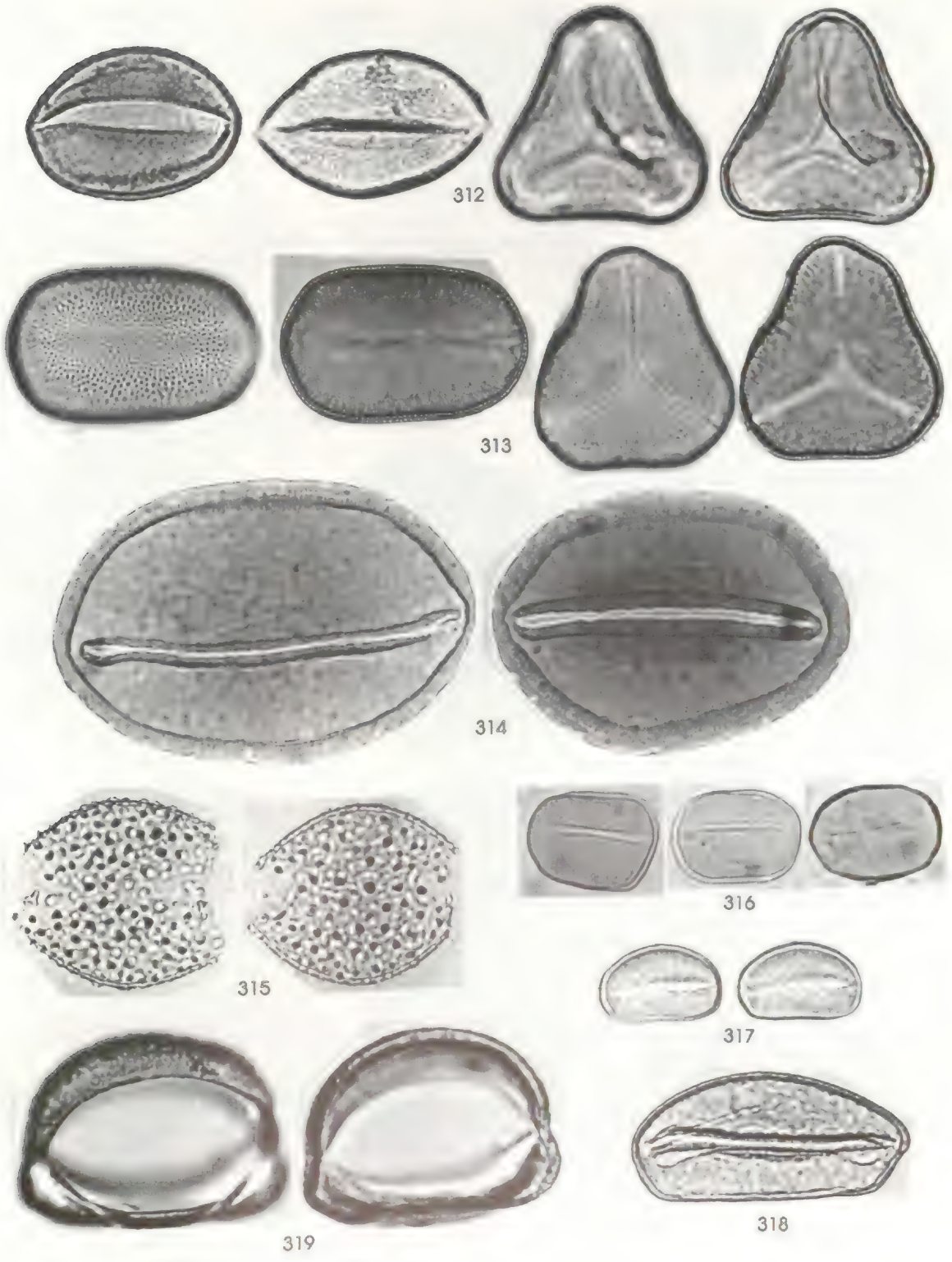


Plate 27. PALMAE: *Oenocarpus panamanus* [*O. mapora*] (312), *Phytelephas microcarpa* (313), *Scheelea zonensis* (314), *Socratea durissima* [*S. exorrhiza*] (315), *Synechanthus warscewiczianus* (316); PONTEDERIACEAE: *Eichhornia azurea* (317), *E. crassipes* (318), *Pontederia rotundifolia* (319)

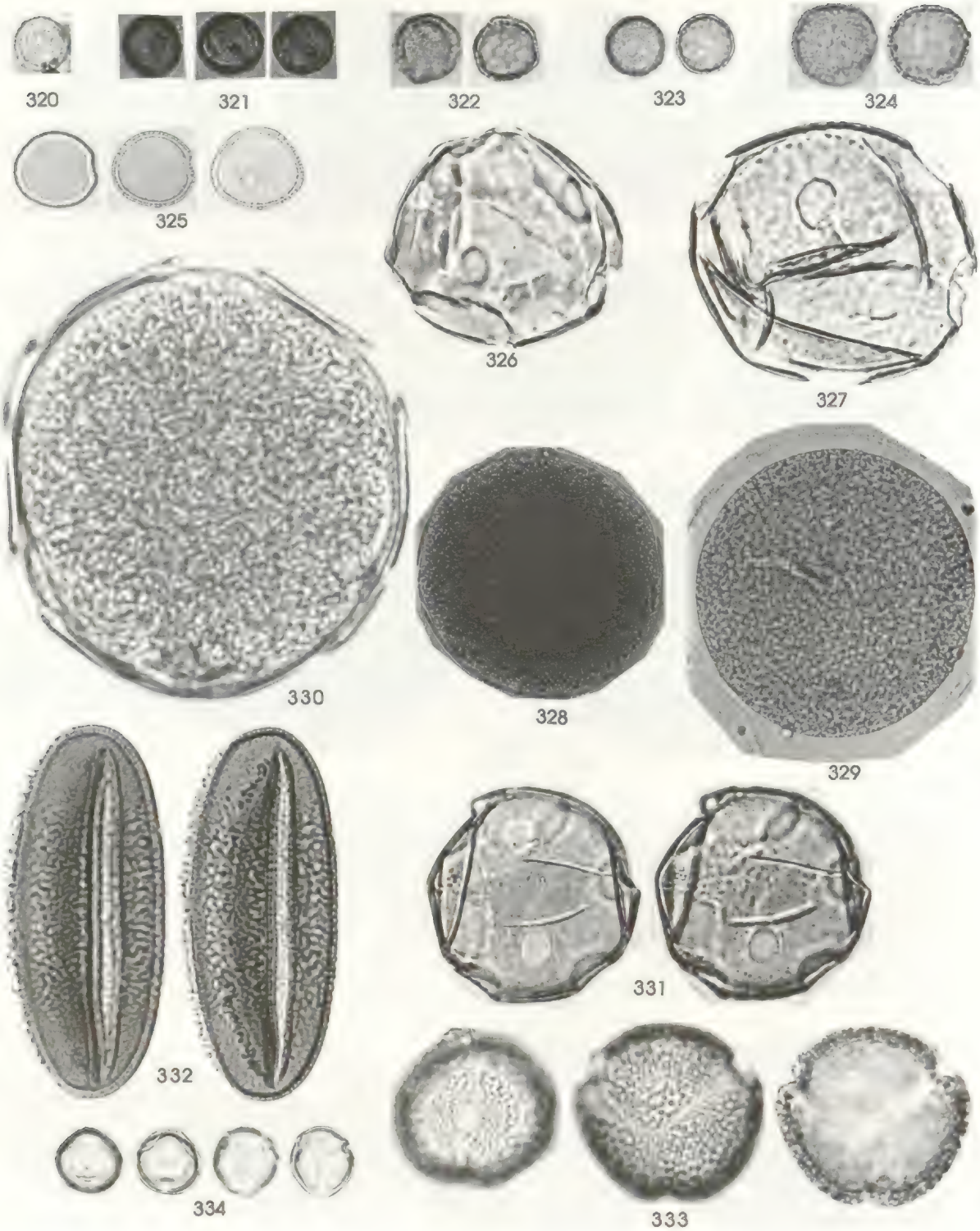


Plate 28. SMILACACEAE: *Smilax lanceolata* (320), *S. mollis* (321), *S. panamensis* (322), *S. spinosa* (323), *S. spissa* (324), TYPHACEAE: *Typha domingensis* (325); ZINGIBERACEAE: *Costus allennii* (326); *C. guanaiensis macrostrobilus* [1/2 x] (327), *C. laevis* (328), *C. pulverulentus* (329), *C. scaber* (330), *C. villosissimus* (331). **ANGIOSPERMAE—DICOTYLEDONEAE;** ACANTHACEAE: *Aphelandra sinclairiana* (332), *Blechum costaricense* (333), *Elytraria imbricata* (334)

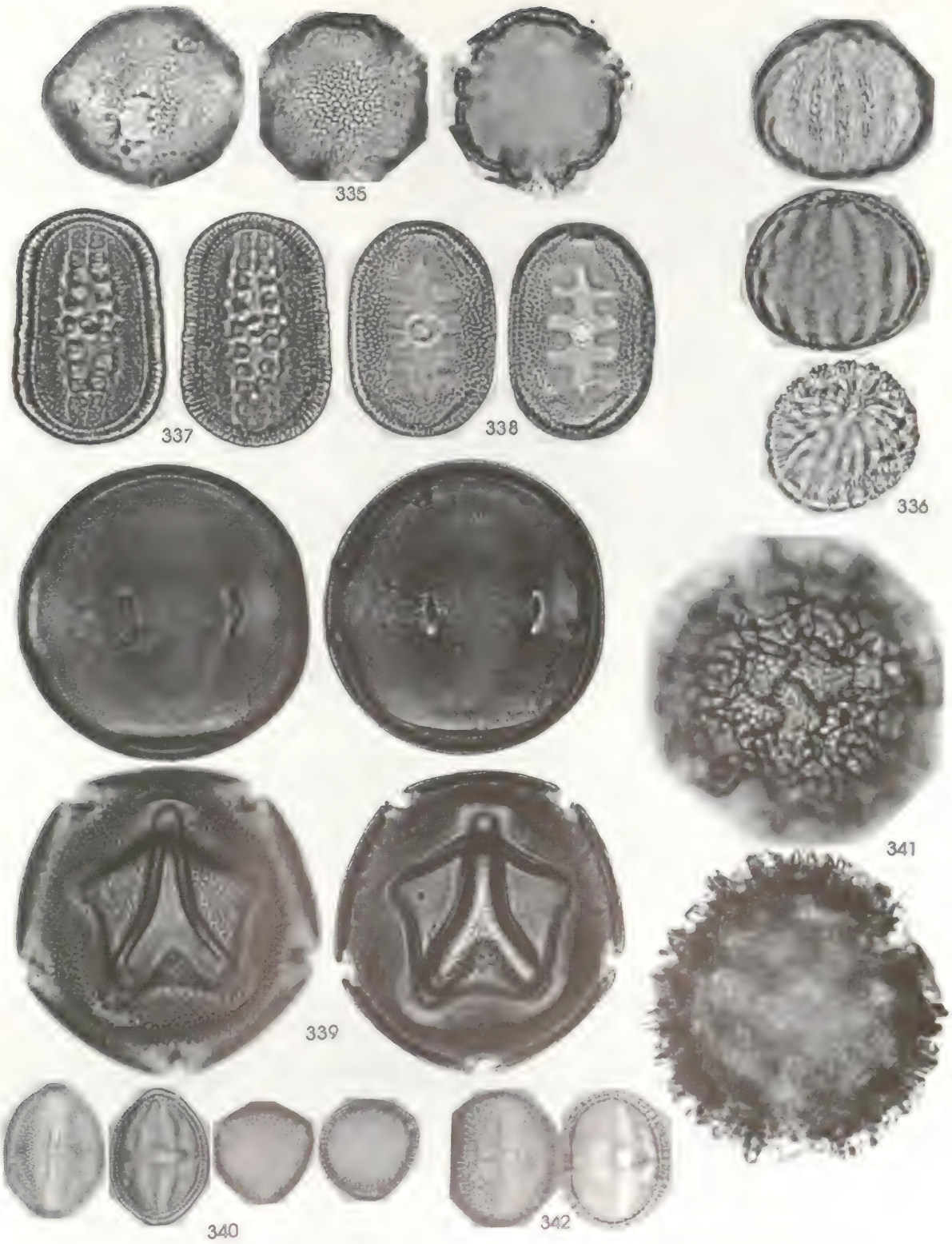


Plate 29. ACANTHACEAE: *Herpetacanthus panamensis* (335), *Hygrophila guianensis* [*H. costata*] (336), *Justicia graciliflora* (337), *J. pectoralis* (338), *Mendoncia gracilis* (339), *Nelsonia brunelloides* (340), *Ruellia metallica* (341), *Telostachya alopecuroidea* (342)

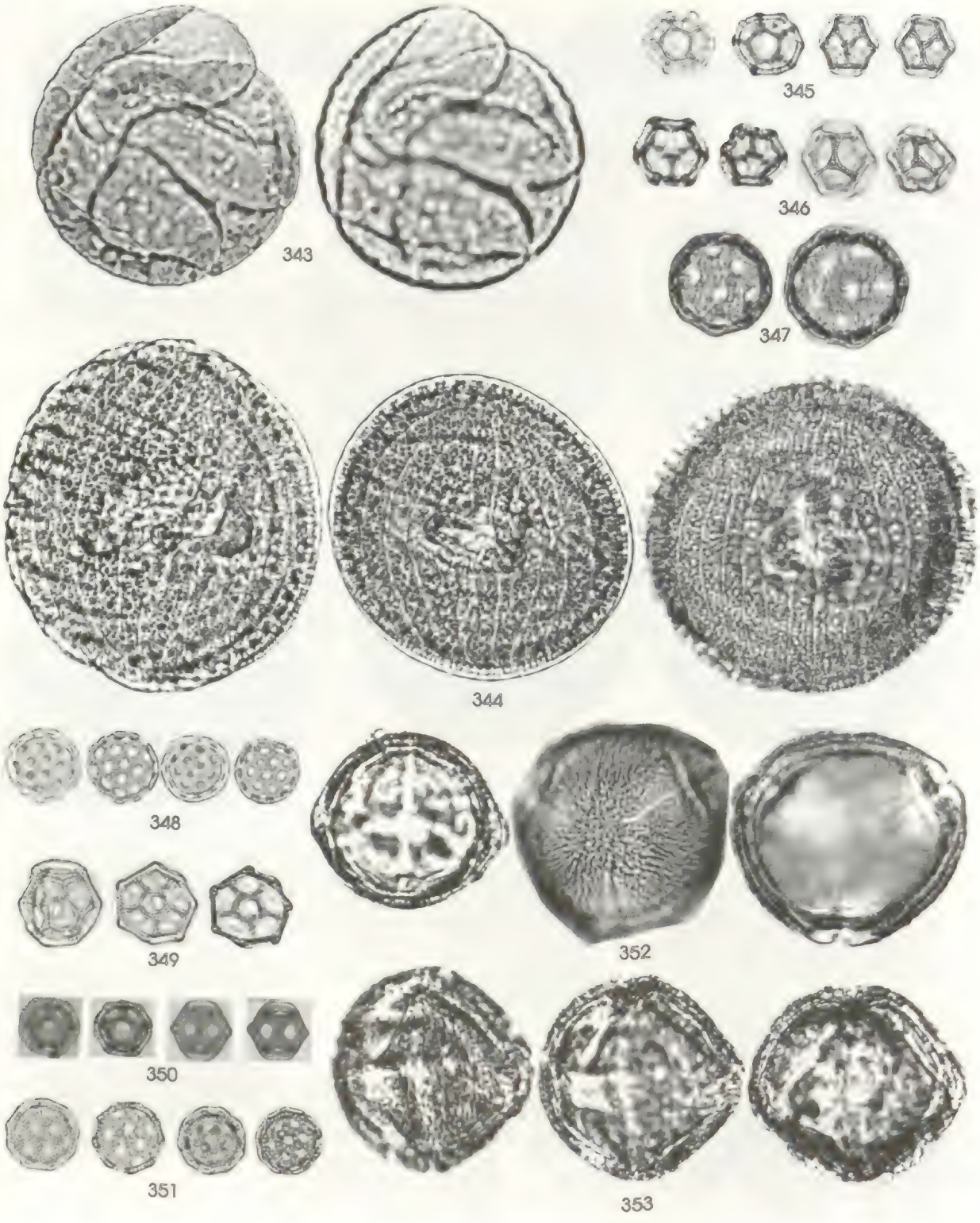


Plate 30. ACANTHACEAE: *Thunbergia erecta* (343), *Trichanthera gigantea* (344); AMARANTHACEAE: *Alternanthera ficoidea* [*A. paronychioides*] (345), *A. sessilis* (346), *Chamissoa altissima* (347), *Cyathula prostrata* (348), *Gomphrena decumbens* [*G. serrata*] (349), *Iresine angustifolia* (350); *I. celosia* [*I. diffusa*] (351); ANACARDIACEAE: *Anacardium excelsum* (352), *A. occidentale* (353)

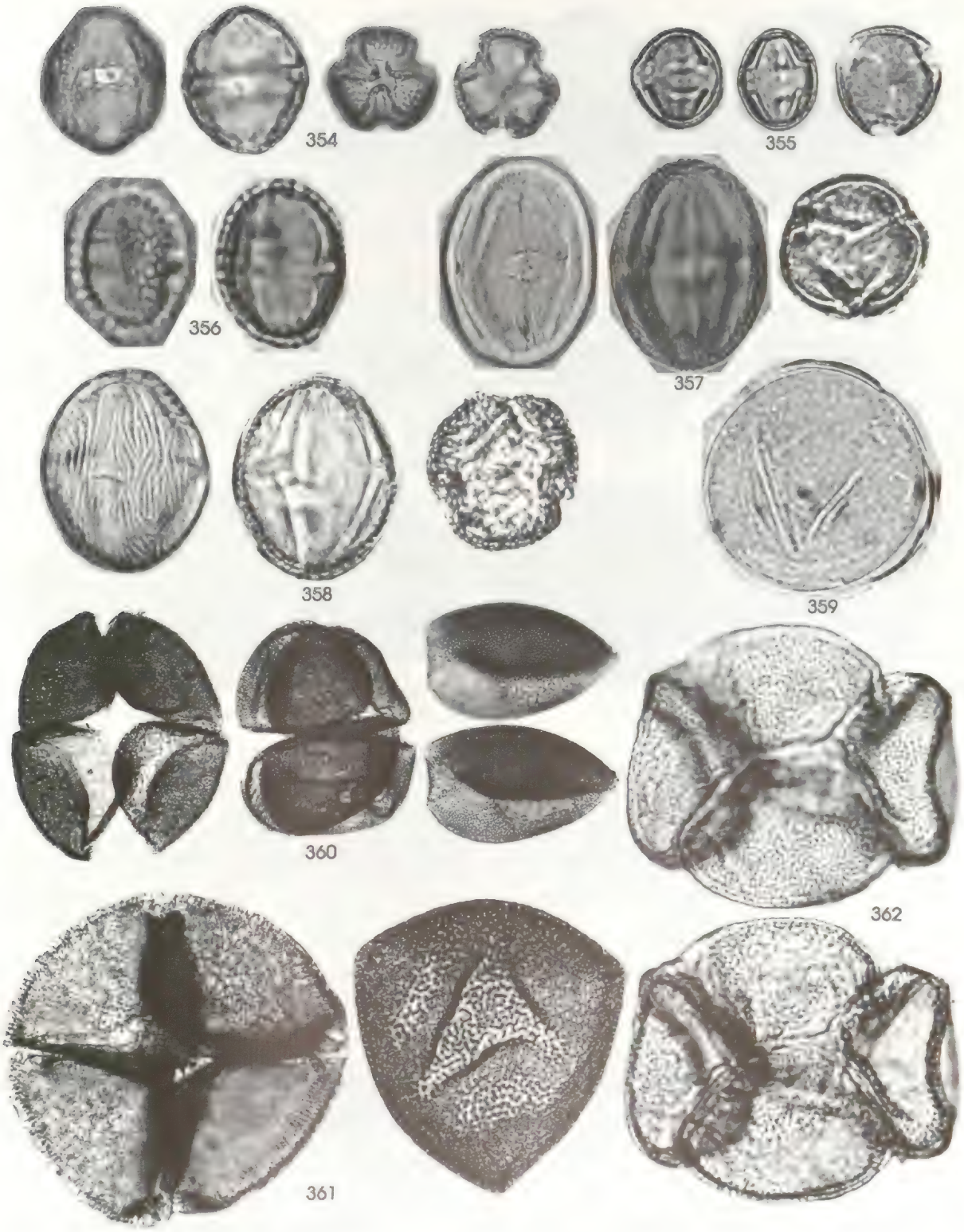
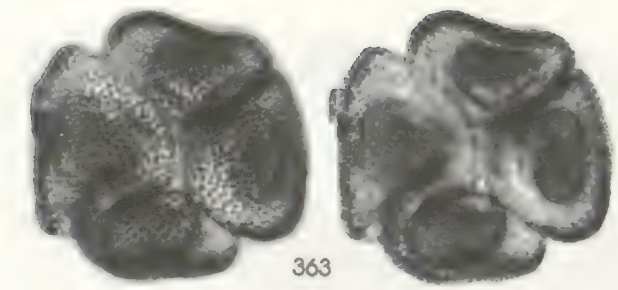
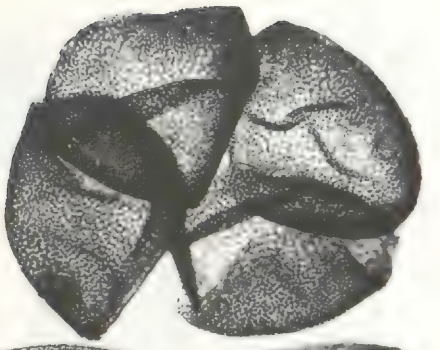
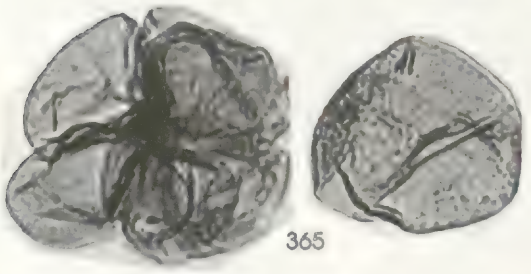
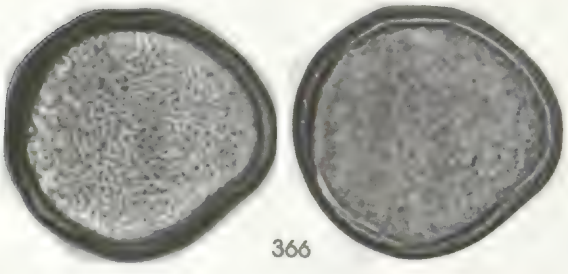


Plate 31. ANACARDIACEAE: *Astronium graveolens* (354), *Mangifera indica* (355), *Mosquitoxylum jamaicense* (356), *Spondias mombin* (357), *S. radlkoferi* (358); ANNONACEAE: *Anaxagorea panamensis* (359), *Annona acuminata* [1/2x] (360), *A. glabra* [1/2x] (361), *A. hayesii* (362)









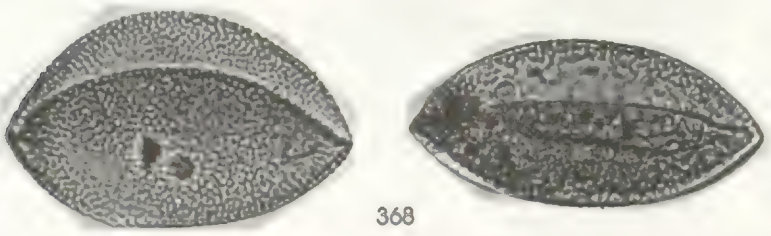


Plate 32. ANNONACEAE: *Annona muricata* [1/4x] (363), *A. spraguei* (364), *Crematosperma* sp. (365), *Desmopsis panamensis* (366), *Guatteria dumetorum* (367), *Unonopsis pittieri* (368), *Xylopia frutescens* (369)

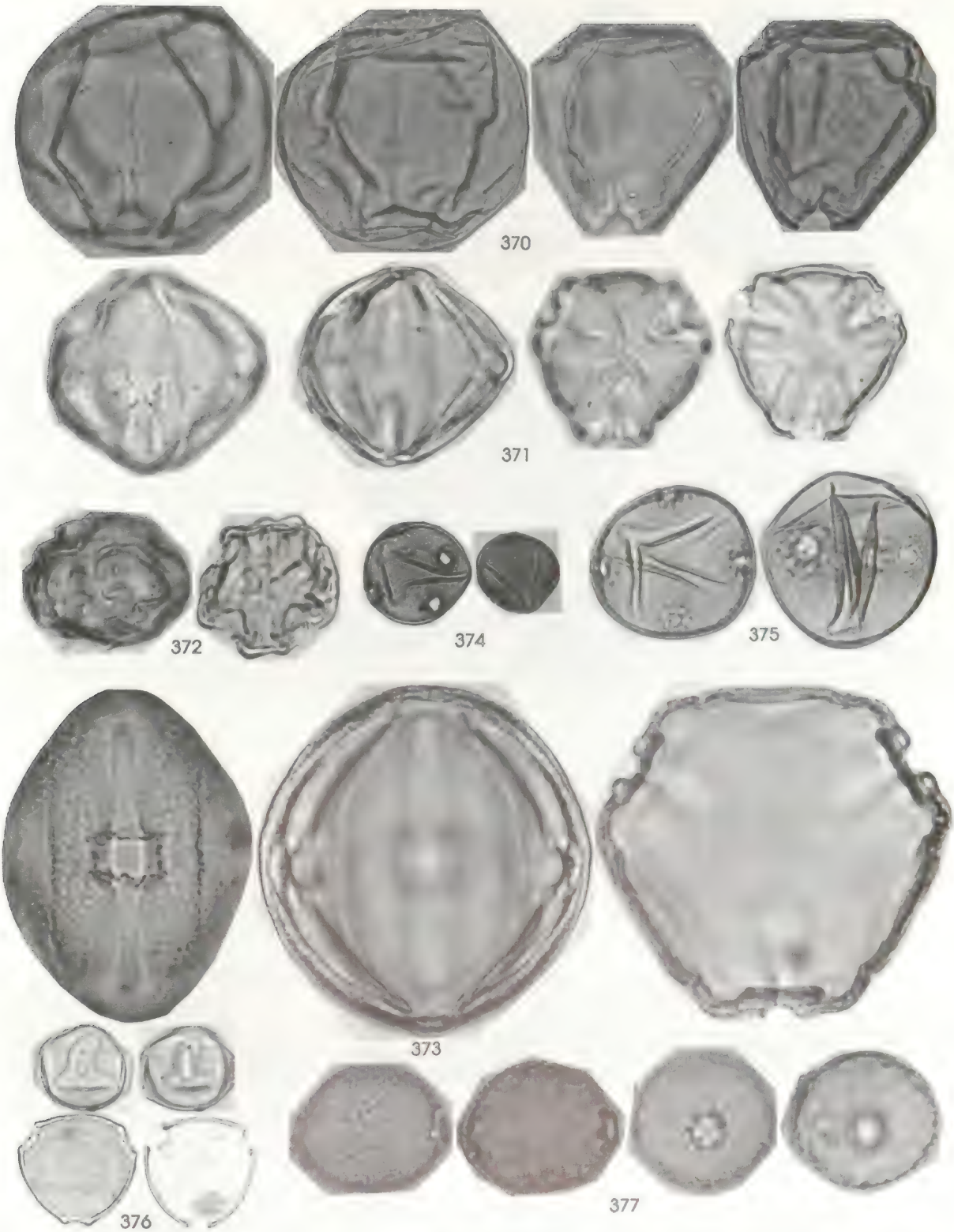


Plate 33. APOCYNACEAE: *Allamanda cathartica* (370), *Aspidosperma cruenta* (371), *A. megalocarpon* (372), *Catharanthus roseus* (373), *Forsteronia myrtantha* (374), *F. peninsularis* (375), *Lacmellea panamensis* (376), *Malouetia guatemalensis* (377)

Plate 34. APOCYNACEAE: *Mandevilla subsagittata* (378), *M. villosa* (379), *Mesechites trifida* (380), *Odontadenia macrantha* (381), *O. punticulosa* (382), *Prestonia acutifolia* (383)

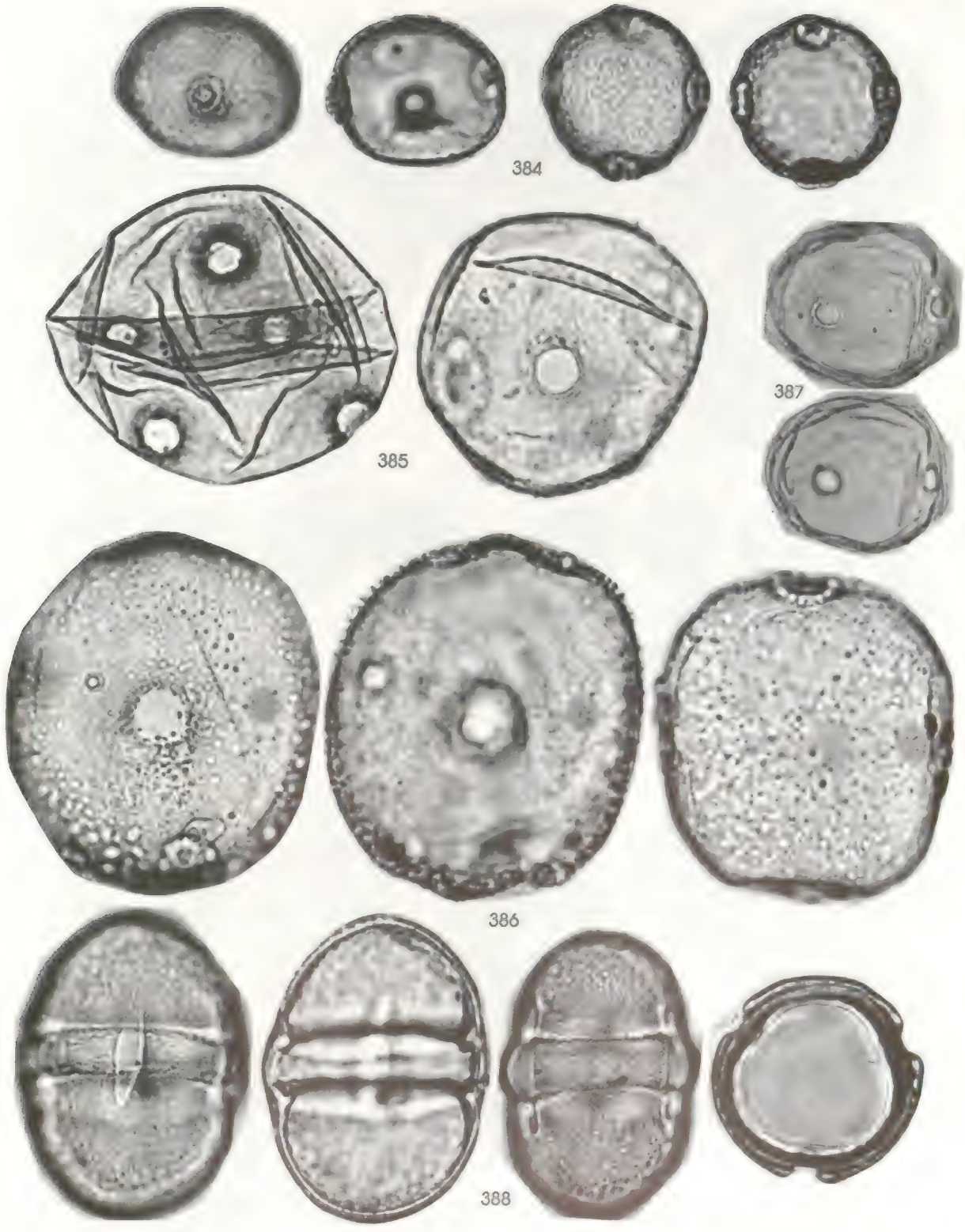


Plate 35. APOCYNACEAE: *Prestonia ipomaeifolia* (384), *P. obovata* (385), *P. portobellensis* (386), *Rhabdadenia biflora* [1/2x] (387), *Stemmadenia grandiflora* (388)

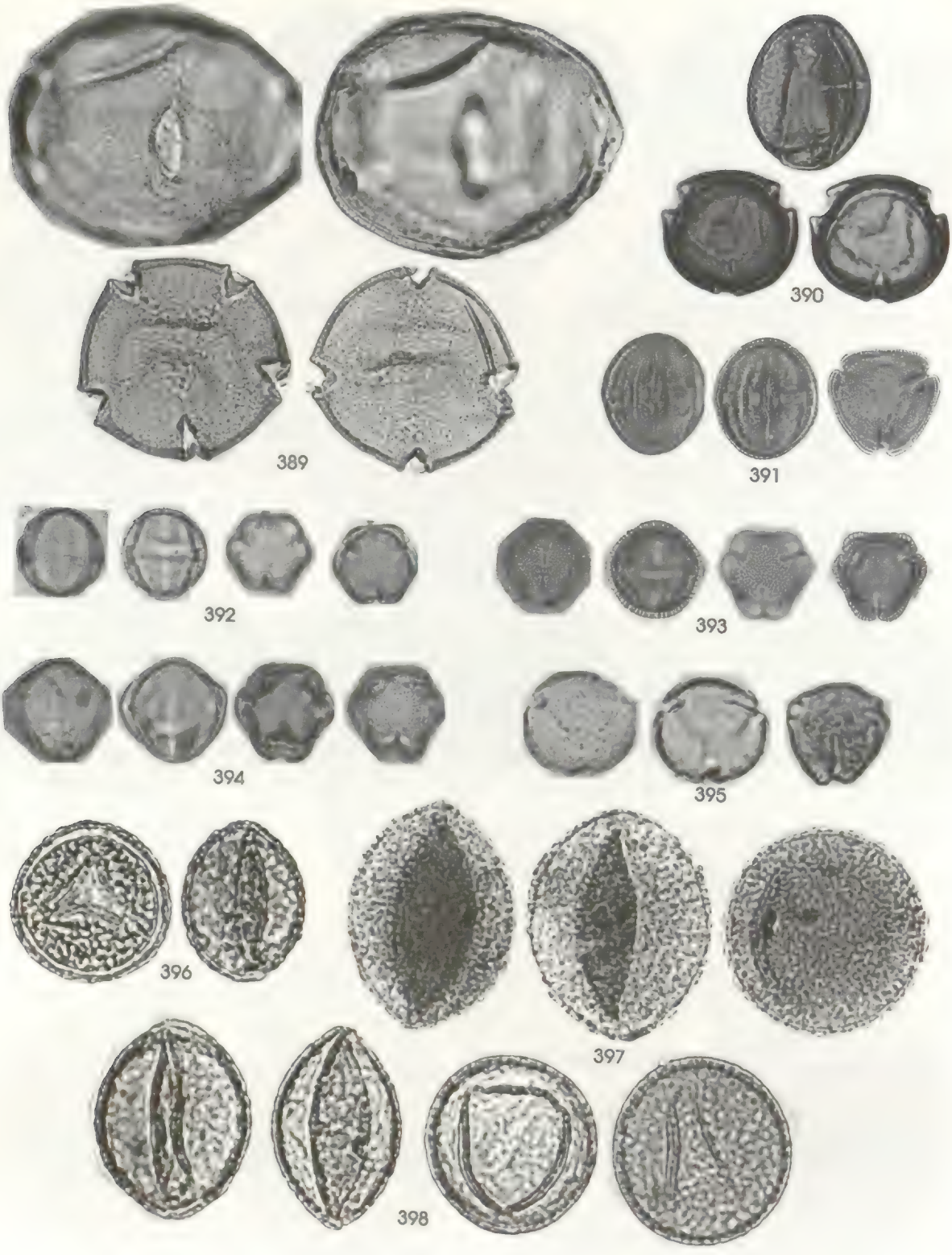


Plate 36. APOCYNACEAE: *Thevetia ahouai* (389), *Tabernaemontana arborea* (390); ARALIACEAE: *Dendropanax arboreus* (391), *D. stenodontus* (392), *Didymopanax morototoni* [*Schlefflera morototoni*] (393), *Oreopanax capitatus* (394), *Polyscias guilfoylei* (395); ARISTOLOCHIACEAE: *Aristolochia chapmaniana* [*A. tonduzii*] (396), *A. gigantea* [*A. cordiflora*] (397), *A. pilosa* (398)

Plate 37. ASCLEPIADACEAE: *Asclepias curassavica* (399), *Blepharodon mucronatum* (400), *Cynanchum cubense* (401), *C. recurvum* [*Tassadia obovata*] (402), *Fischeria funebris* [*F. blepharopetala*] (403), *Gonolobus allenii* (404), *Matelea pinquifolia* (405)

Plate 38. ASCLEPIADACEAE: *Marsdenia crassipes* (406), *Matelea trianae* (407), *M. viridiflora* [*M. denticulata*] (408), *Sarcostemma clausum* (409); BEGONIACEAE: *Begonia filipes* [*B. hirsuta*] (410), *B. guaduensis* (411), *B. patula* [*B. fischeri*] (412)

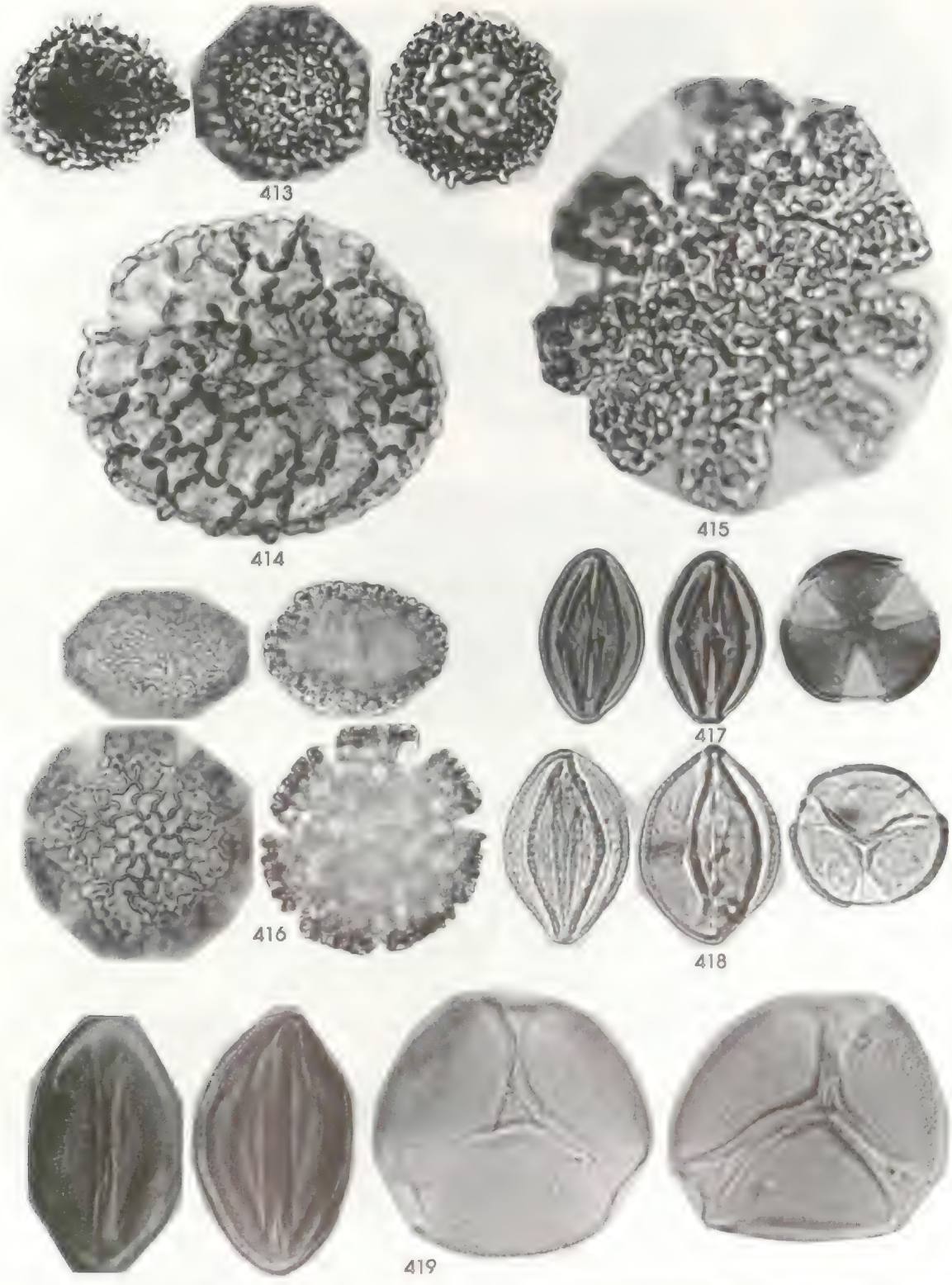


Plate 39. BIGNONIACEAE: *Adenocalymma apurense* (413), *A. arthropetiolatum* (414), *Amphilophium paniculatum* (415), *Anemopaegma chrysoleucum* (416), *Arrabidaea candicans* (417), *A. chica* (418), *A. corallina* (419)

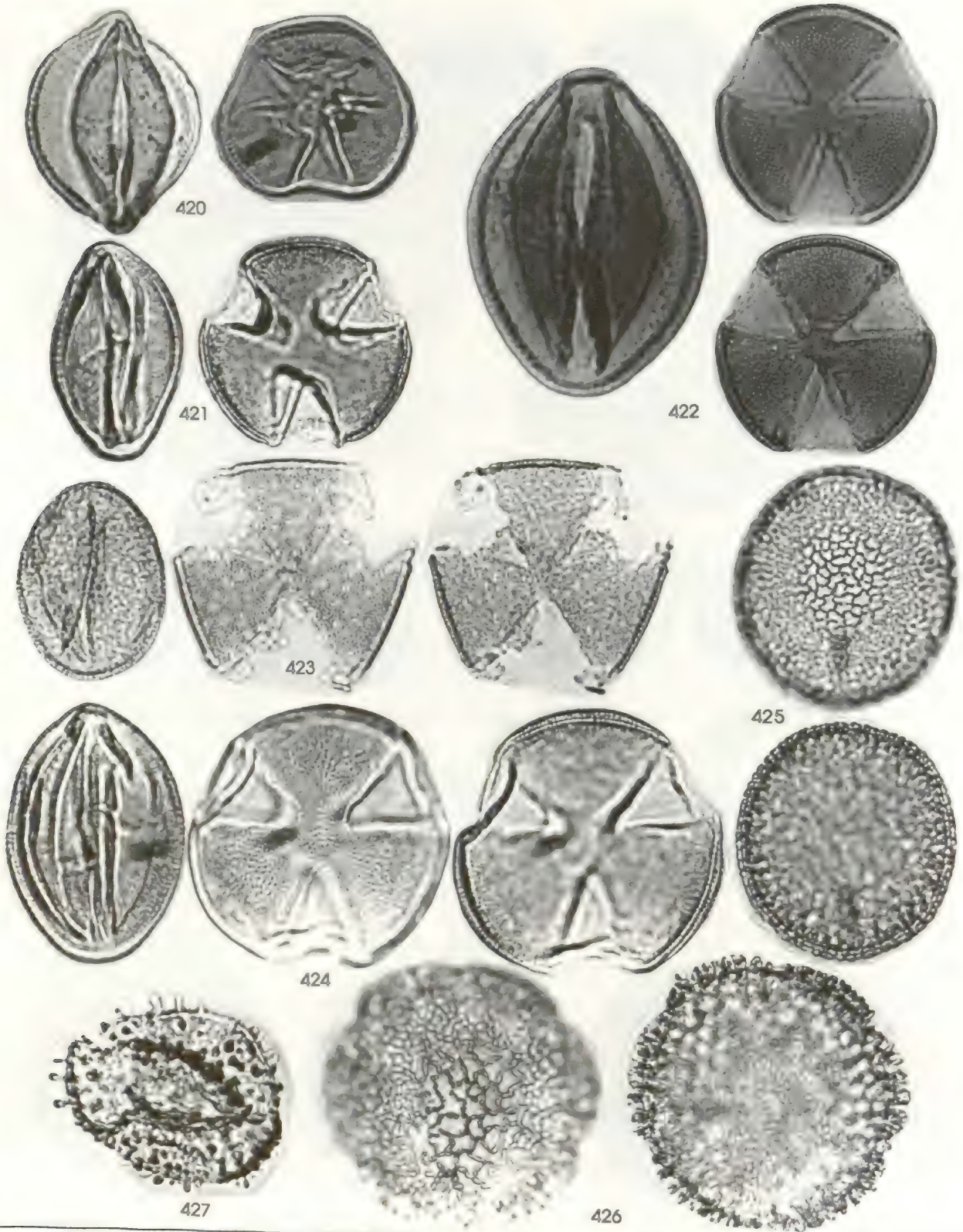


Plate 40. BIGNONIACEAE: *Arrabidaea florida* (420), *A. patellifera* (421), *A. verrucosa* (422), *Callichlamys latifolia* (423), *Ceratophytum tetragonolobum* (424), *Clytostoma binatum* (425), *Cydista aequinoctialis* (426), *C. heterophylla* (427)

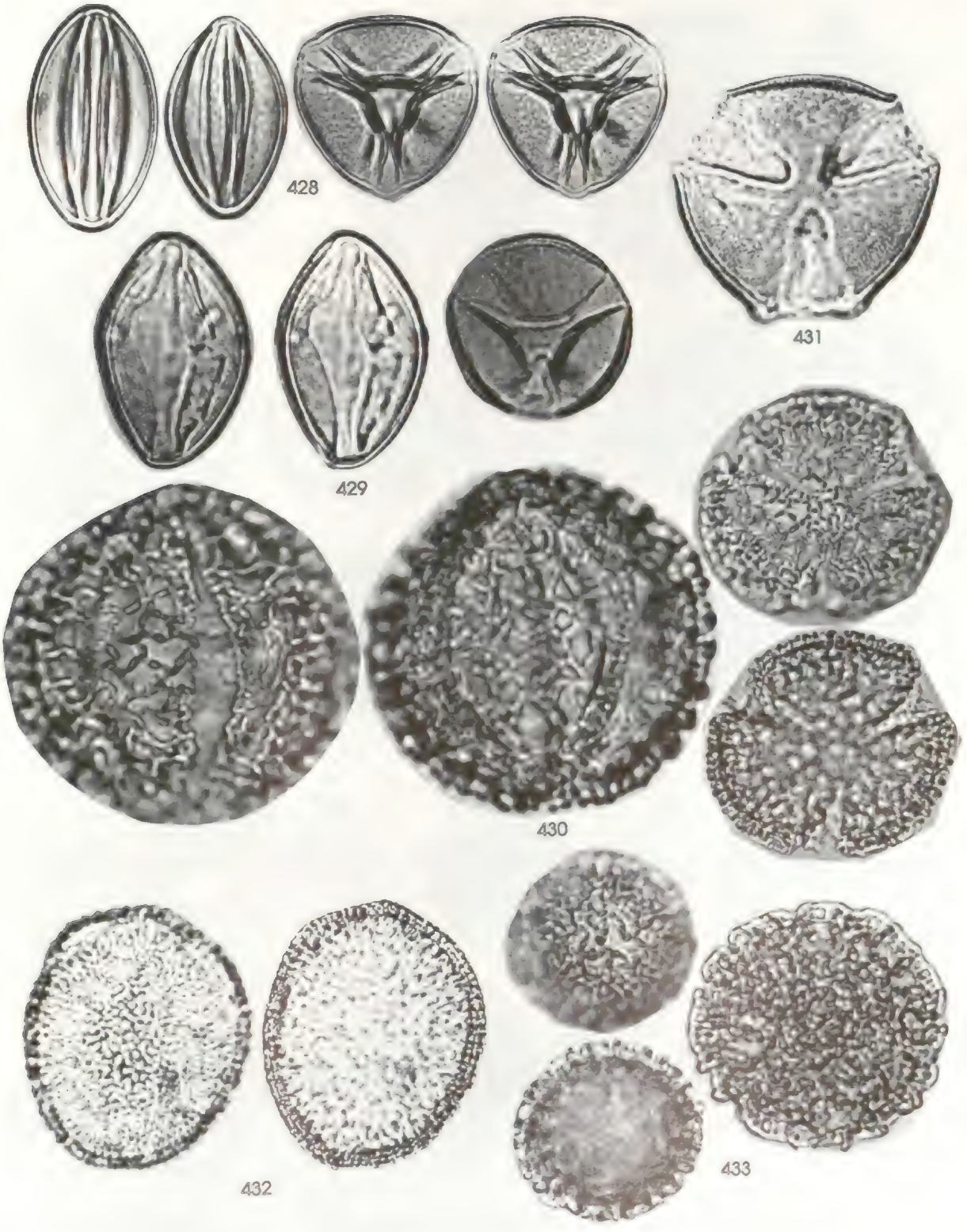


Plate 41. BIGNONIACEAE: *Jacaranda copaia spectabilis* (428), *Macfadyena unguis-cati* (429), *Martinella obovata* (430), *Paragonia pyramidata* (431), *Phryganocydia corymbosa* (432), *Pithecoctenium crucigerum* (433)

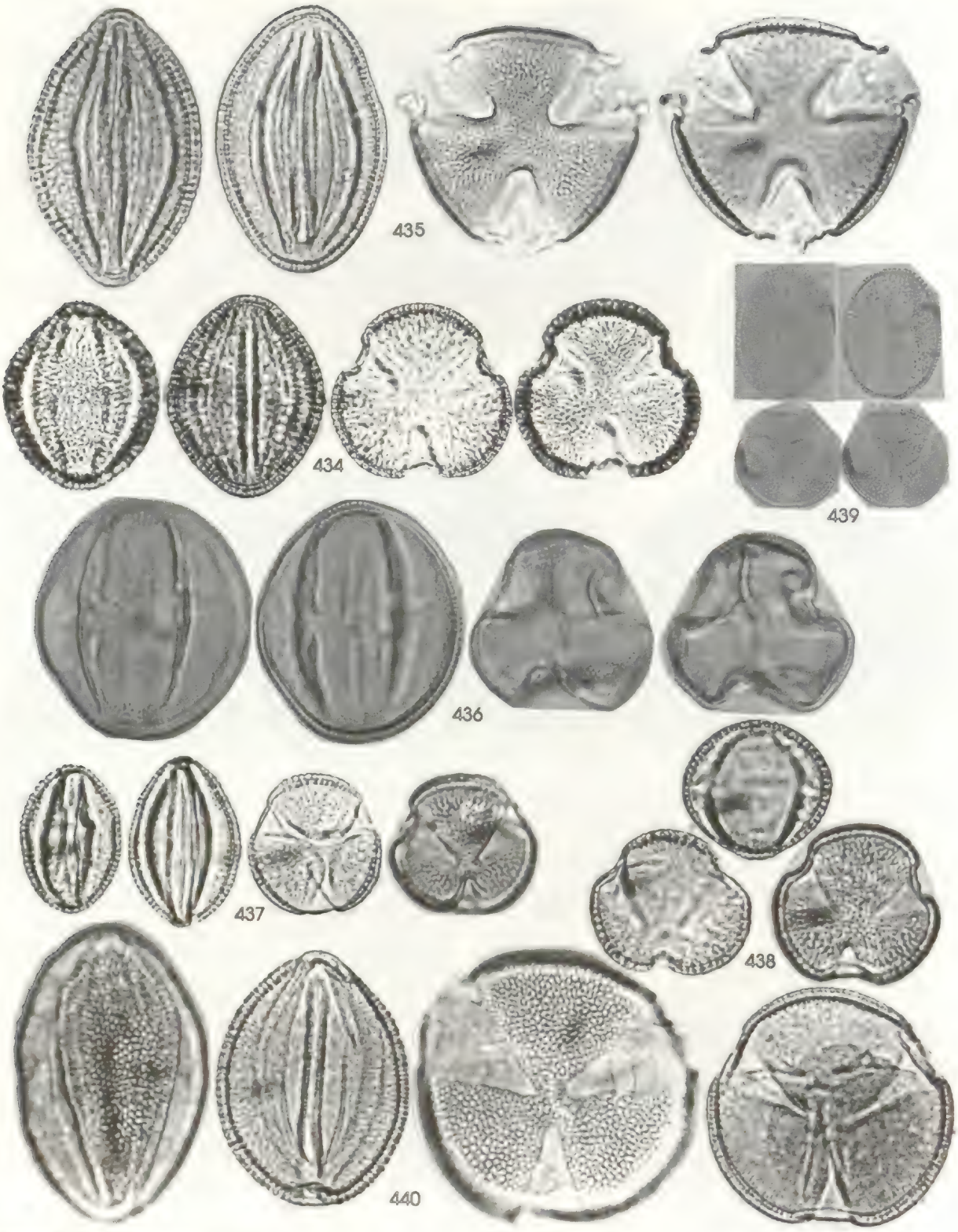


Plate 42. BIGNONIACEAE: *Pleonotoma variabilis* (435), *Spathodea campanulata* (434), *Stizophyllum riparium* (436), *Tabebuia guayacan* (437), *T. chrysantha* [*T. ochracea neochrysantha*] (438), *T. ochracea neocrysantha* (439), *T. rosea* (440)

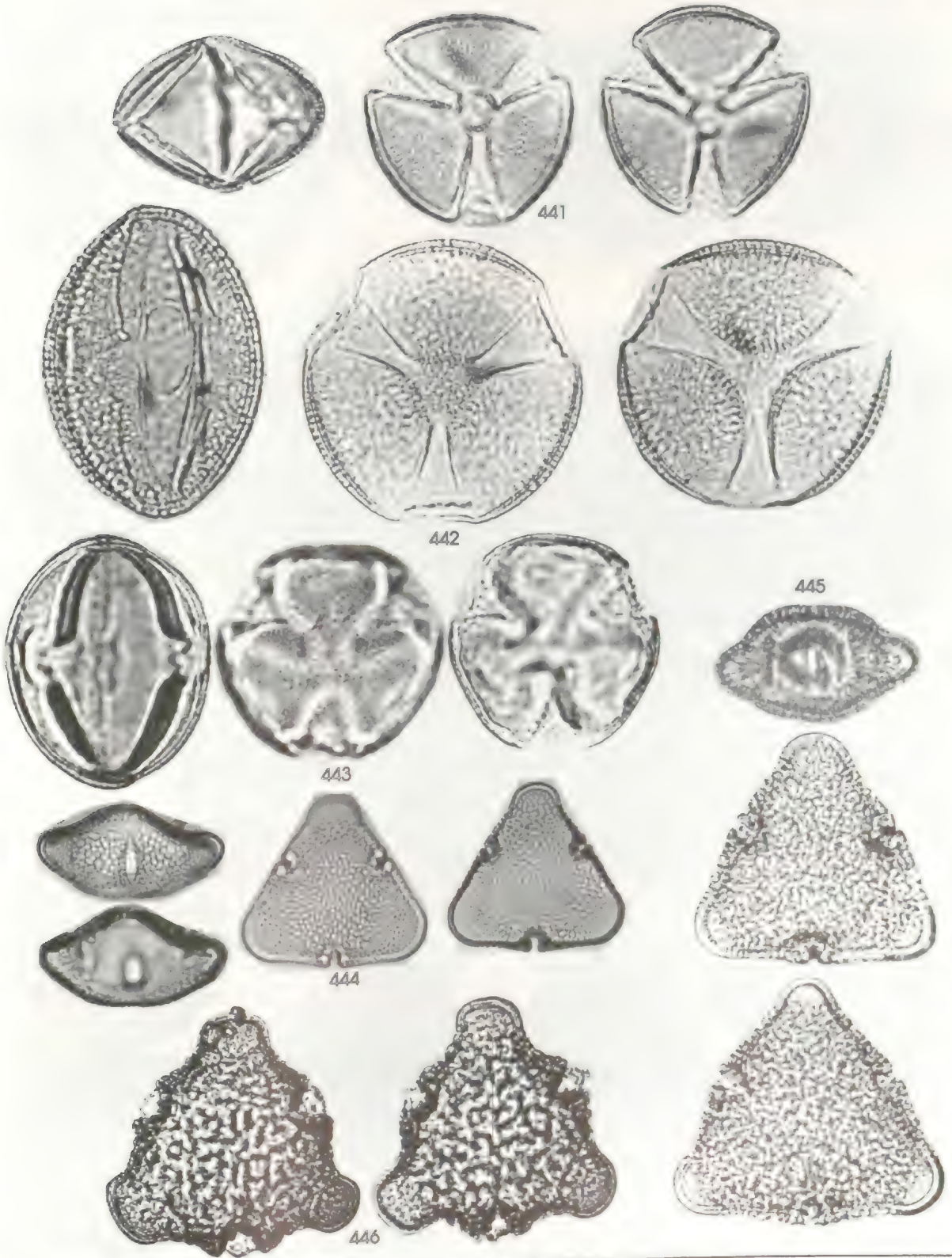


Plate 43. BIGNONIACEAE: *Tynannthus croatianus* (441), *Xylophragma seemannianum* (442); BIXACEAE: *Bixa orellana* (443); BOMBACACEAE: *Bombacopsis quinata* [*Pochota quinata*] (444), *B. sessilis* [*Pochota sessilis*] (445), *Cavanillesia platanifolia* (446)

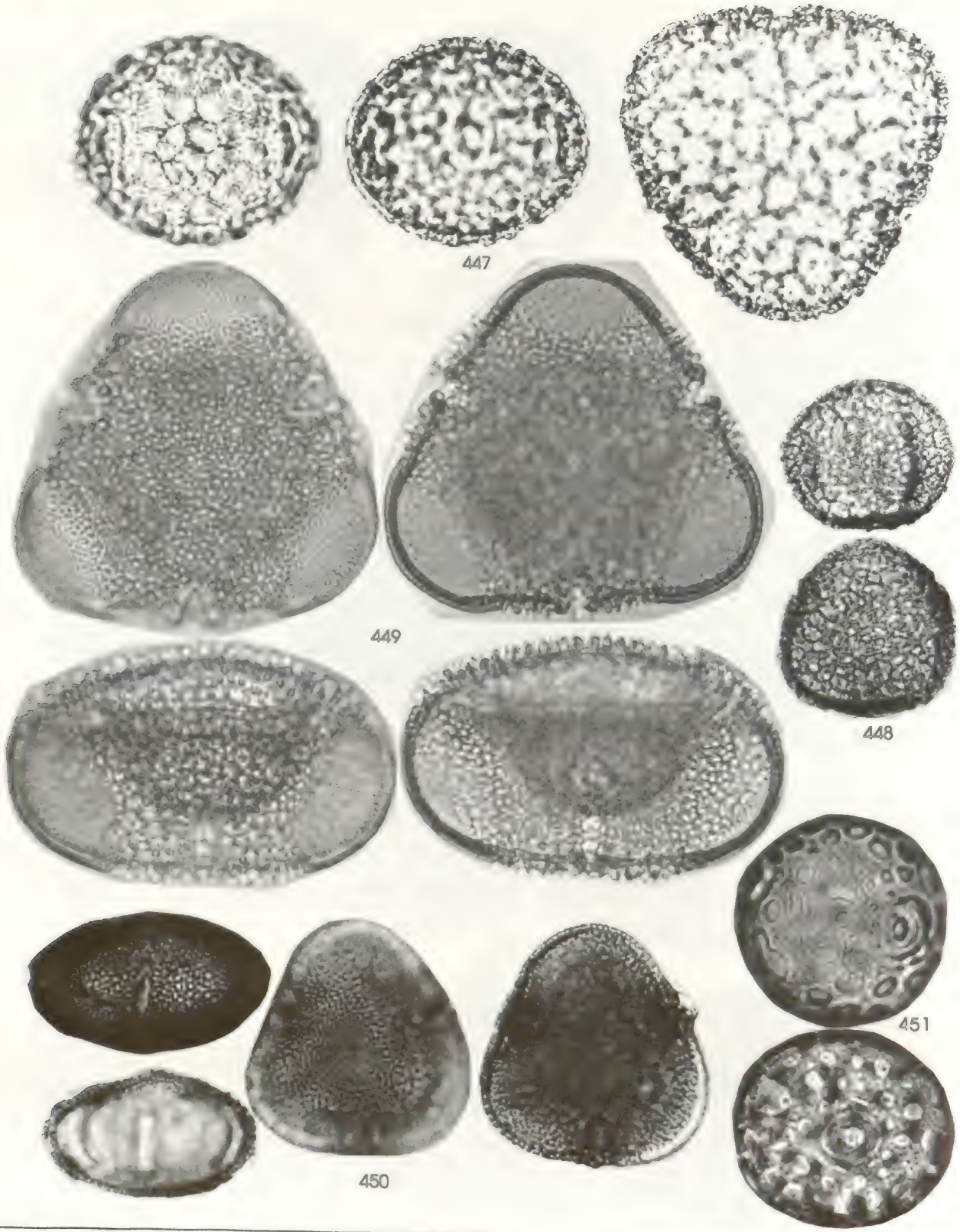


Plate 44. BOMBACACEAE: *Ceiba pentandra* (447), *Ochroma pyramidale* [1/2 x] (448), *Pachira aquatica* (449), *Pseudobombax septenatum* (450), *Quararibea asterolepis* (451)

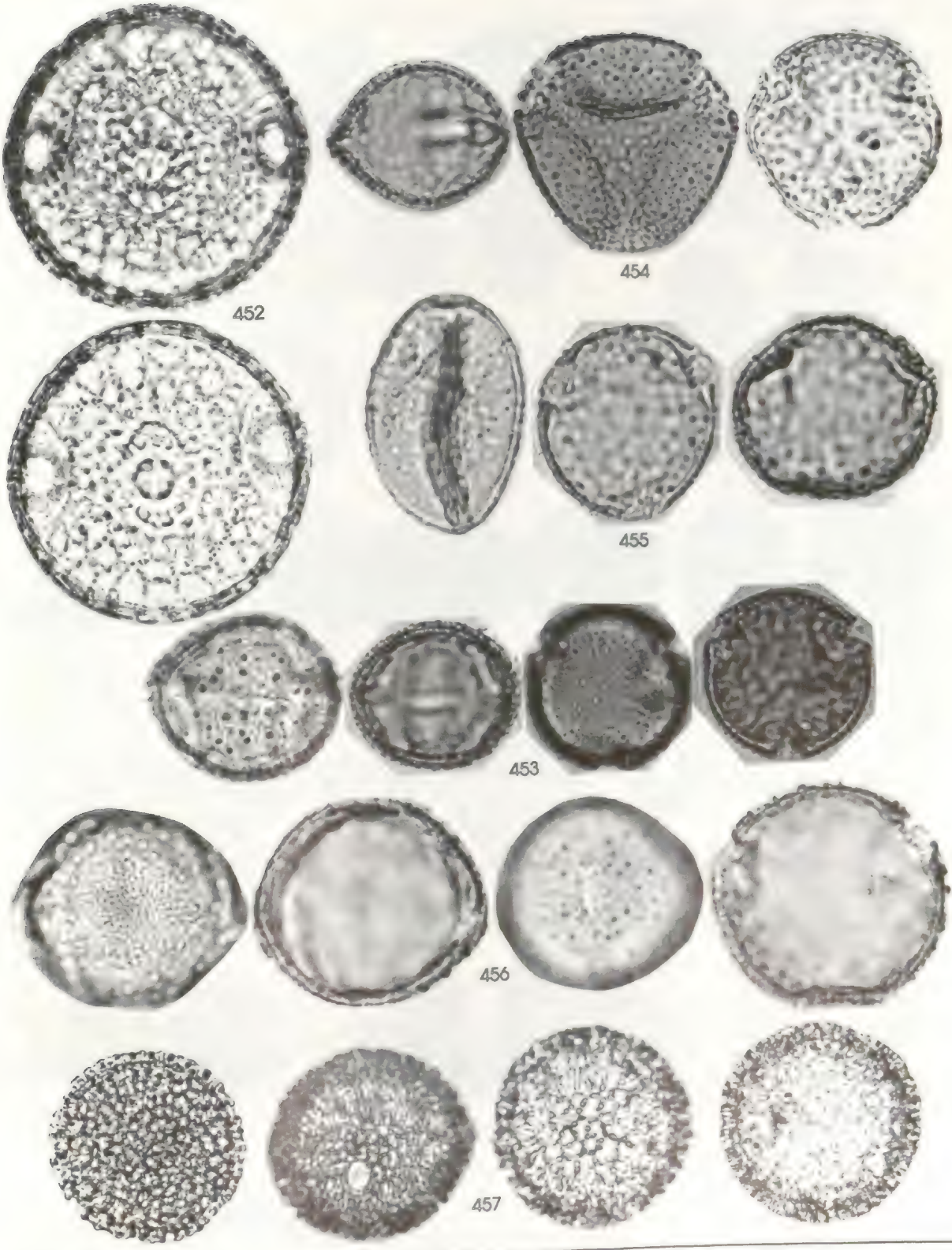


Plate 45. BOMBACACEAE: *Quararibea pterocalyx* (452); BORAGINACEAE: *Cordia alliodora* (453), *C. bicolor* (454), *C. panamensis* (455), *C. lasiocalyx* (456), *C. spinescens* (457)

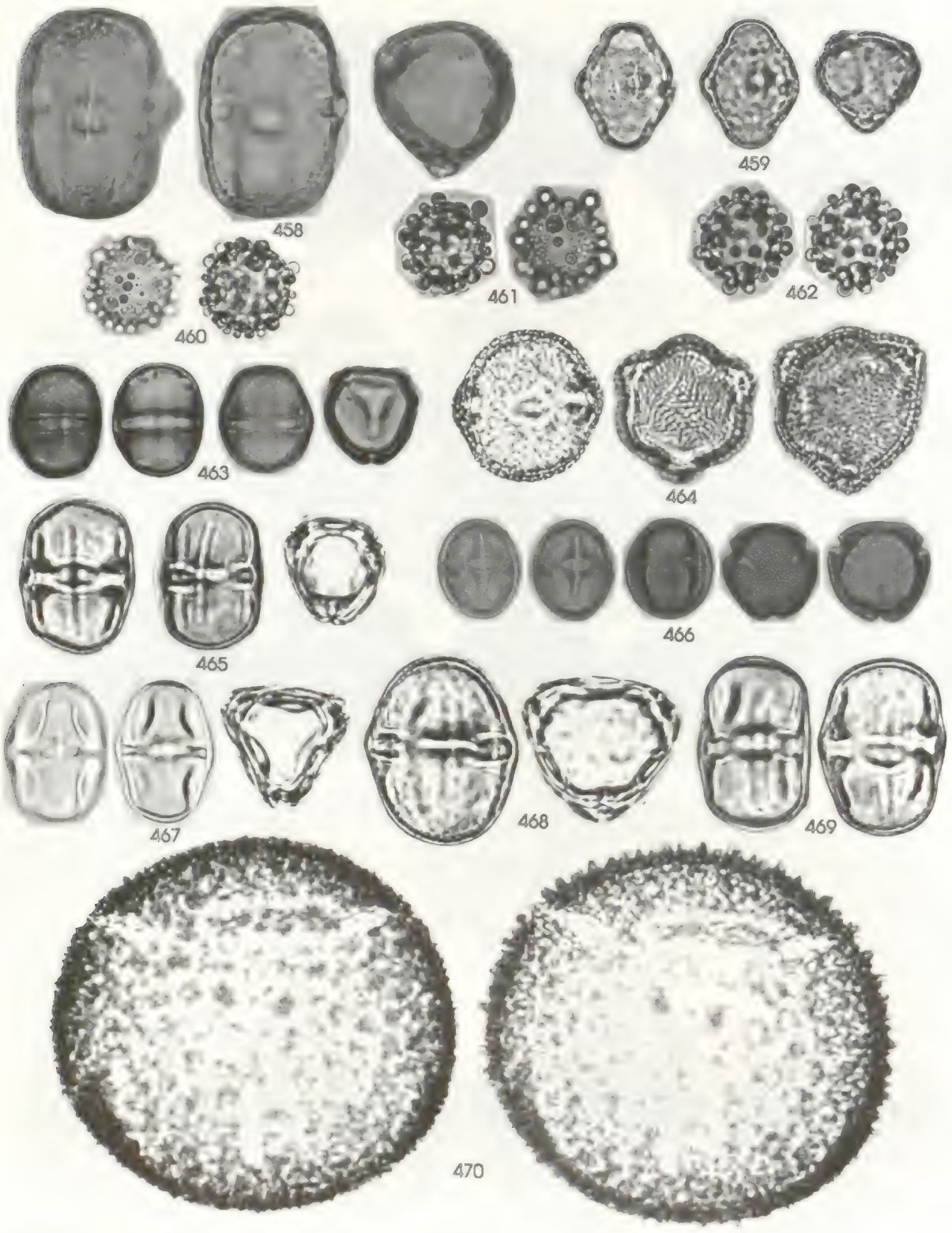


Plate 46. BORAGINACEAE: *Heliotropium indicum* (458), *Tournefortia angustiflora* (459), *T. bicolor* (460), *T. cuspidata* (461), *T. hirsutissima* (462), *T. maculata* (463); BURSERACEAE: *Bursera simaruba* (464), *Protium costaricense* (465), *P. tenuifolium sessiliflorum* (466), *Tetragastris panamensis* (467), *Trattinnickia aspera* (468), *Protium panamense* (469); CACTACEAE: *Epiphyllum phyllanthus* (470)

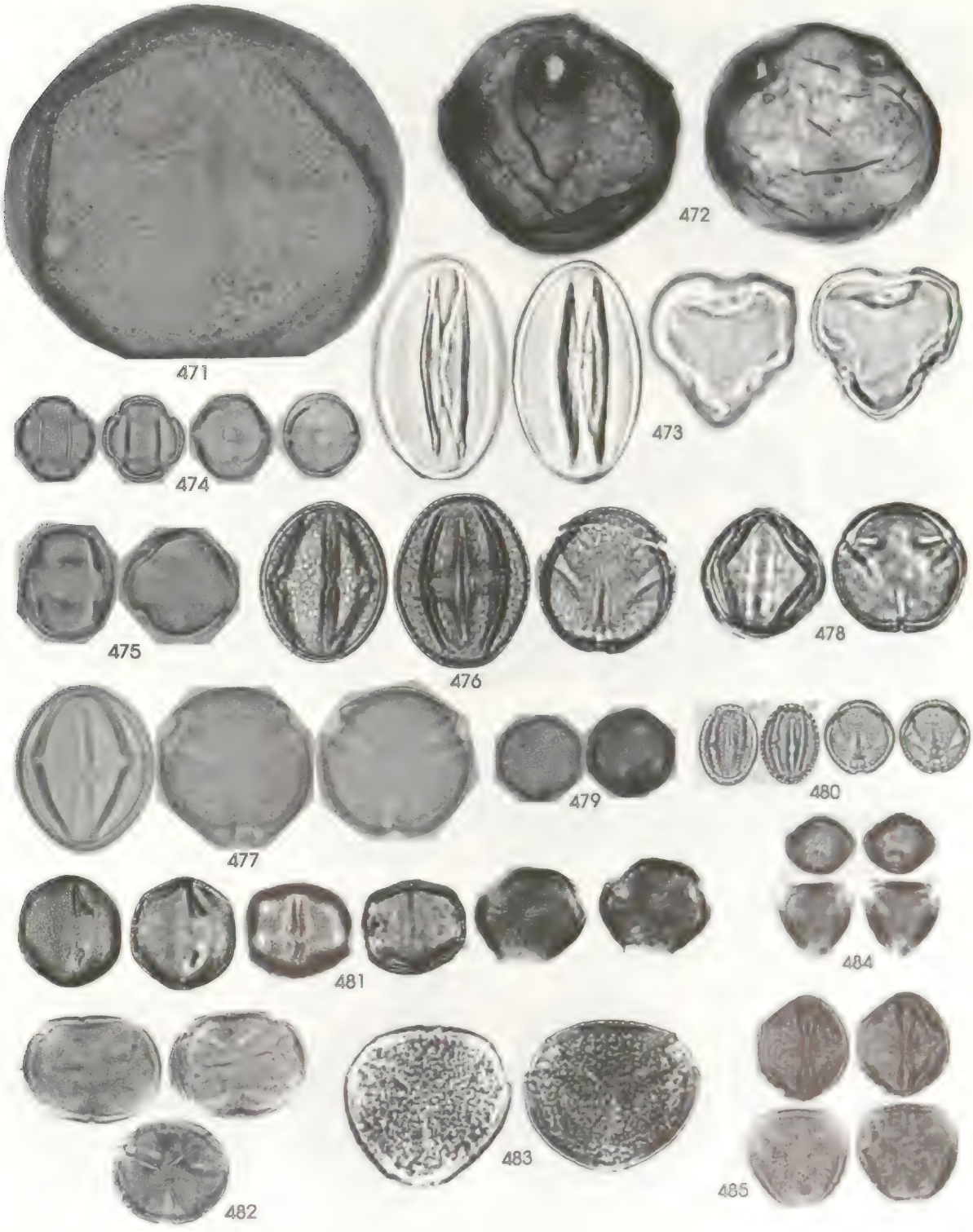


Plate 47. CACTACEAE: *Epiphyllum phyllanthus rubrocoronatum* (471), *Rhipsalis cassytha* [*R. baccifera*] (472); CAMPANULACEAE: *Centropogon cornutus* (473); CAPPARACEAE: *Capparis frondosa* (474), *Cleome parviflora* (475); CARICACEAE: *Carica caulifiora* (476), *Carica papaya* (477), *Jacaratia spinosa* (478); CARYOPHYLLACEAE: *Drymaria cordata* (479); CELASTRACEAE: *Maytenus schippii* (480); CHRYSOBALANACEAE [ROSACEAE]: *Hirtella americana* (481), *H. racemosa* (482), *H. triandra* (483), *Licania hypoleuca* (484), *L. platypus* (485)

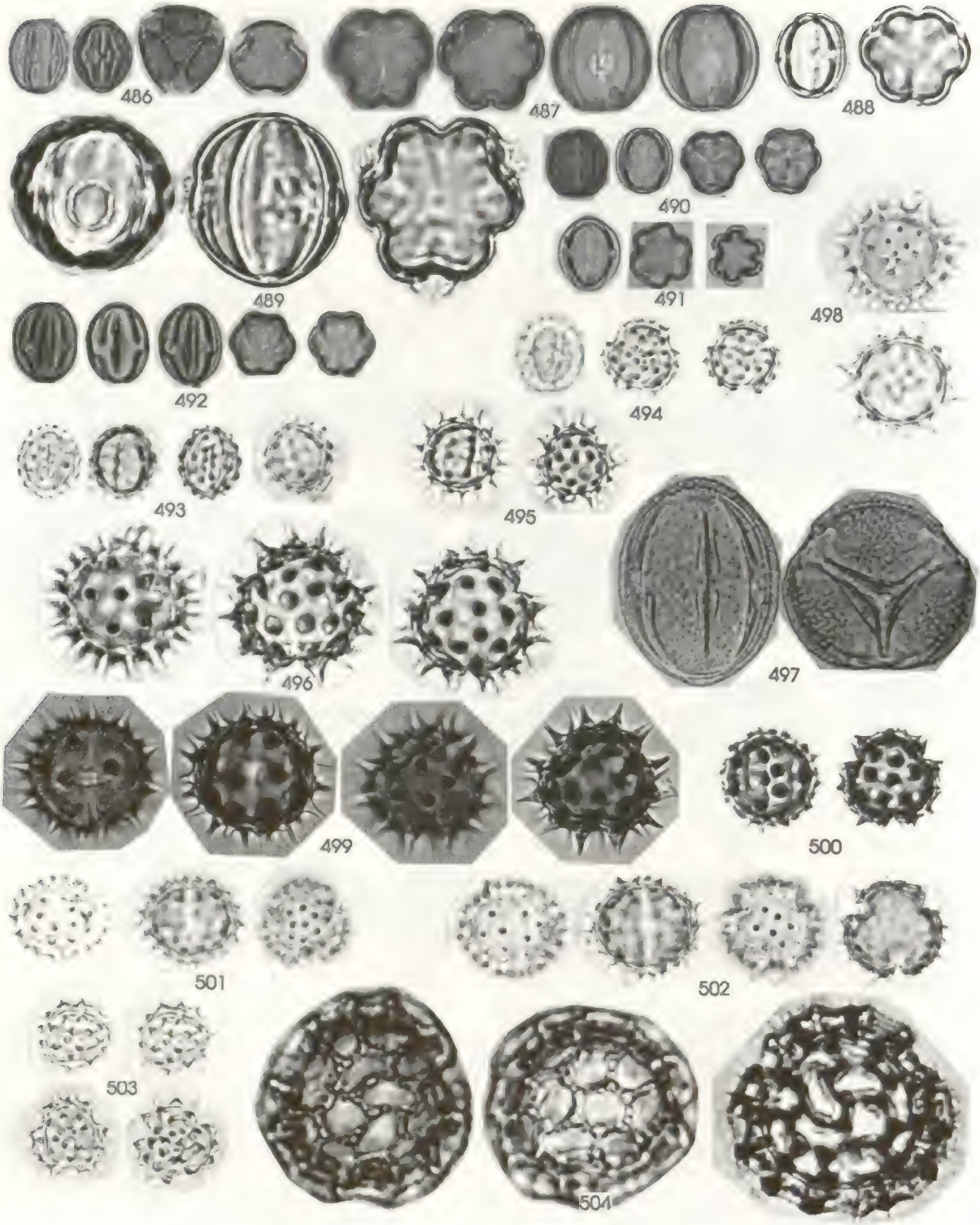


Plate 48. COCHLOSPERMACEAE: *Cochlospermum vitifolium* (486); COMBRETACEAE: *Combretum cacoucia* (487), *C. decandrum* (488), *C. fruticosum* (489), *C. laxum laxum* (490), *Terminalia amazonia* (491), *T. chiriquensis* [*T. oblonga*] (492); COMPOSITAE: *Ayapana elata odorata* (498), *Clibadium asperum* (499), *C. surinamense* [*C. asperum*] (500), *Conyza apurensis* (501), *C. bonariensis* (502), *Eclipta alba* [*E. prostrata*] (503), *Elephantopus mollis* (504)

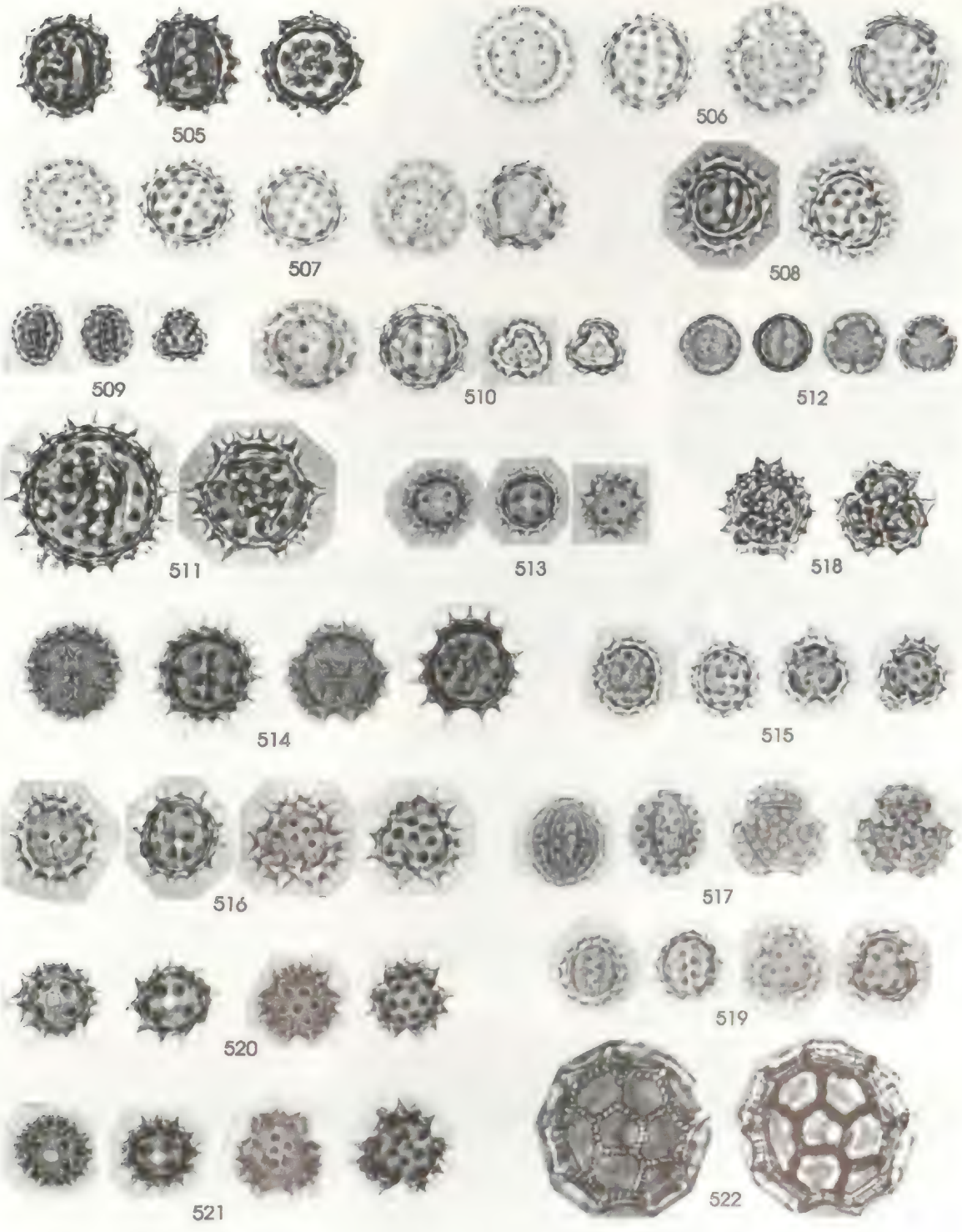


Plate 49. COMPOSITAE: *Eleutheranthera ruderalis* (505), *Emilia sonchifolia* (506), *Erechtites hieracifolia cacalioides* (507), *Fleischmannia microstemon* (508), *F. sinclairii* (509), *Hebeclinium macrophyllum* (510), *Heterocondylus vitalbae* (511), *Koanophyllon wetmorei* (512), *Melampodium divaricatum* (513), *Melanthera aspera* (514), *Mikania guaco* (515), *M. hookeriana* (516), *M. leiostachya* (517), *M. micrantha* (518), *M. tonduzii* (519), *Neurolaena lobata* (520), *Pluchea odorata* (521), *Pseudoelephantopus spicatus* (522)

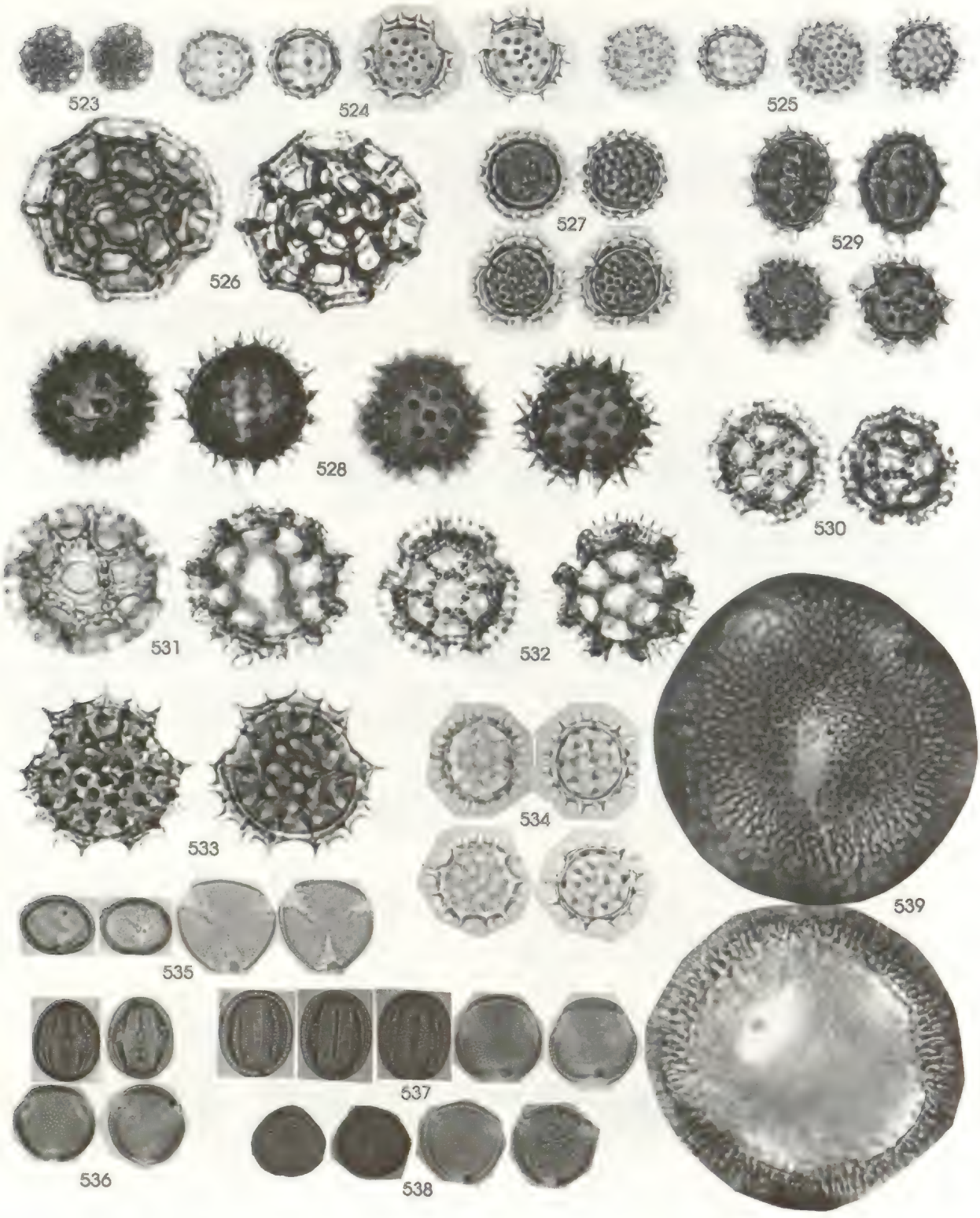


Plate 50. COMPOSITAE: *Rolandra fruticosa* (523), *Schistocarpha oppositifolia* [*S. eupatorioides*] (524), *Spilanthes alba* (525), *Spiracantha cornifolia* (526), *Synedrella nodiflora* (527), *Tridax procumbens* (528), *Verbesina gigantea* (529), *Vernonia canescens* [*V. arborescens*] (530), *V. cinerea* (531), *V. patens* (532), *Wedelia trilobata* (533), *Wulffia baccata* (534); CONNARACEAE: *Cnestidium rufescens* (535), *Connarus panamensis* (536), *C. turczaninowii* (537), *Rourea glabra* (538); CONVOLVULACEAE: *Aniseia martinicensis* (539)

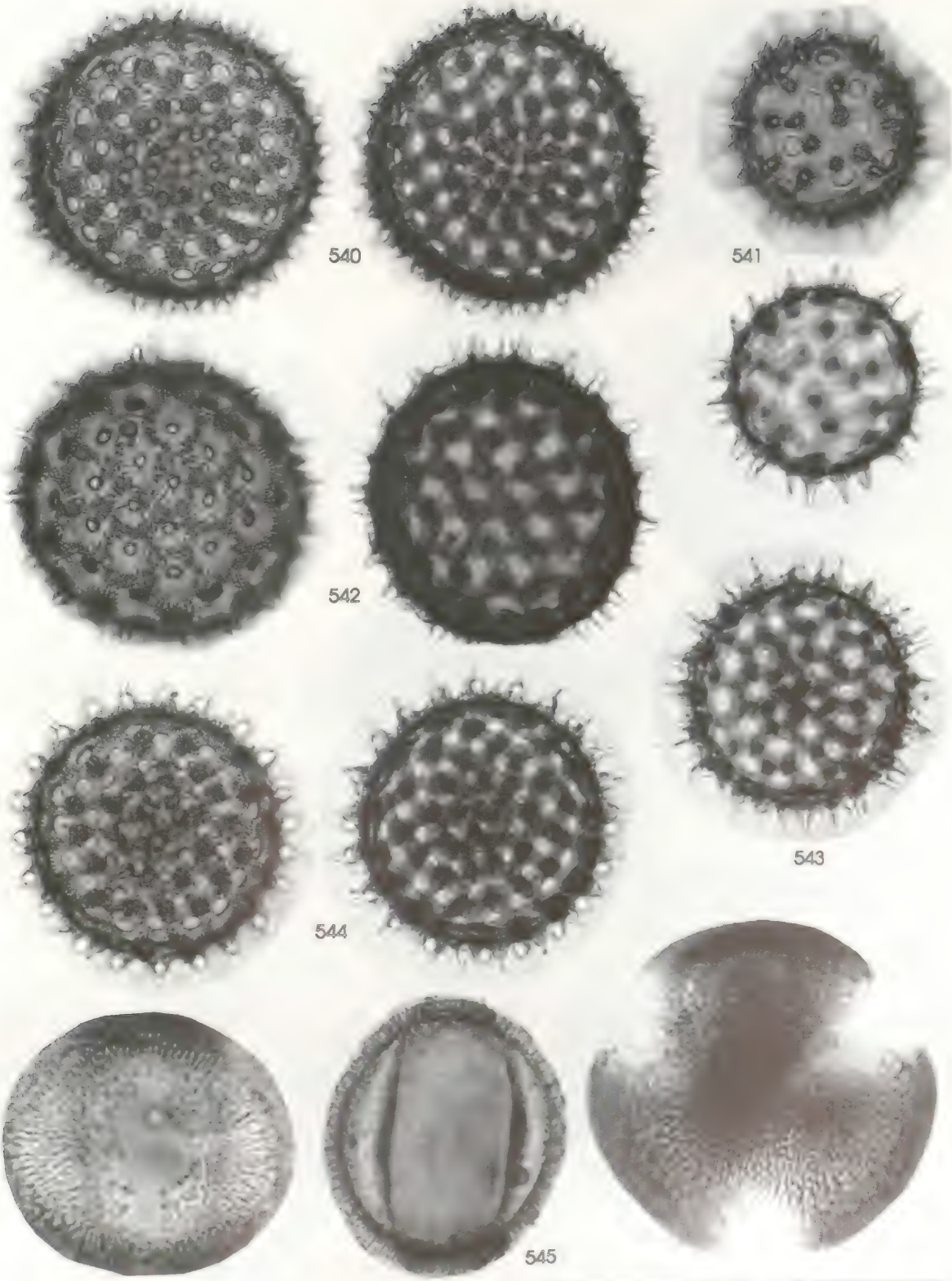


Plate 51. CONVOLVULACEAE: *Ipomoea batatas* (540), *I. phillomega* (541), *I. quamoclit* (542), *I. squamosa* (543), *I. tiliacea* (544), *Iseia luxurians* (545)

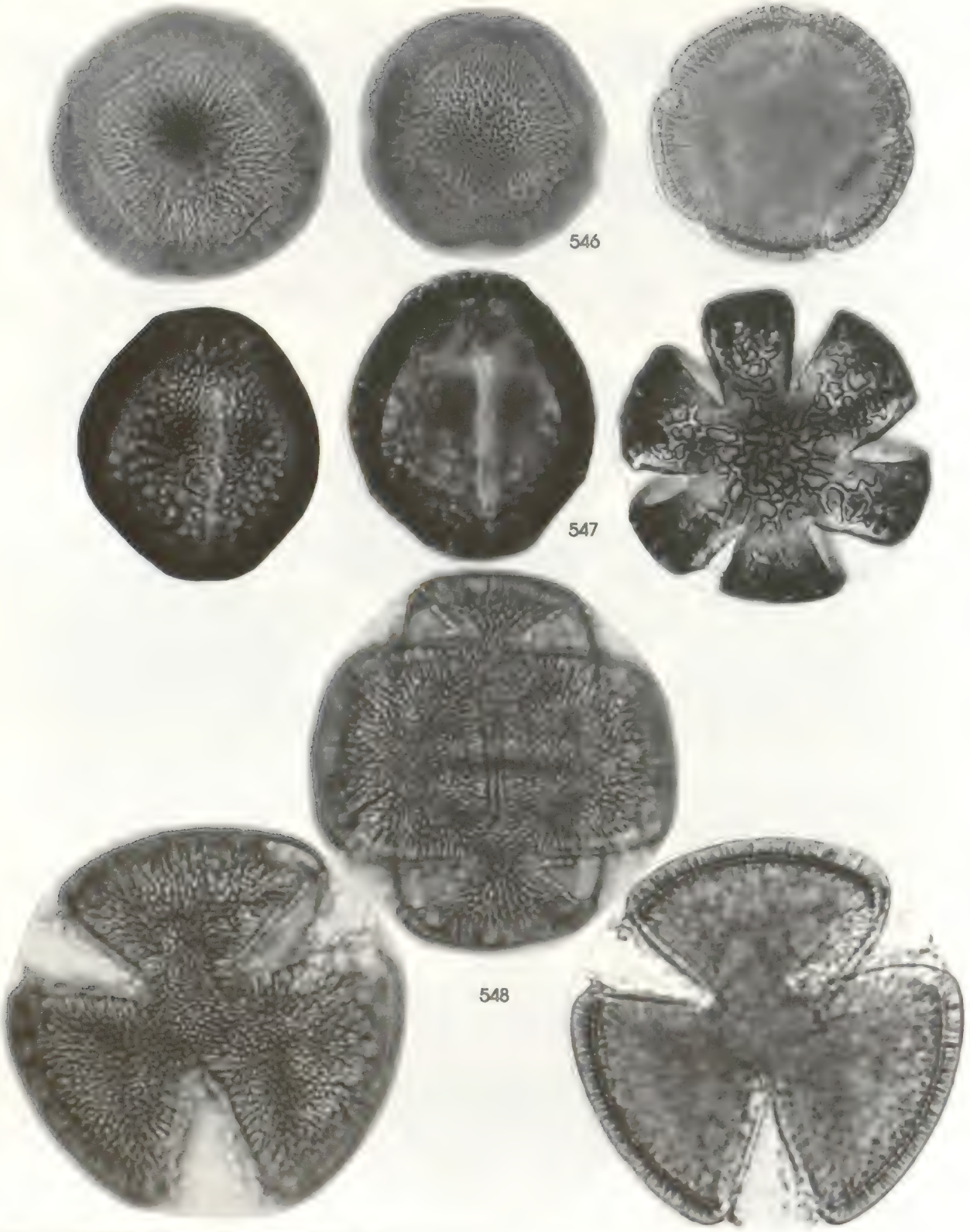


Plate 52. CONVOLVULACEAE: *Maripa panamensis* (546), *Merremia umbellata* (547), *Operculina codonantha* (548)

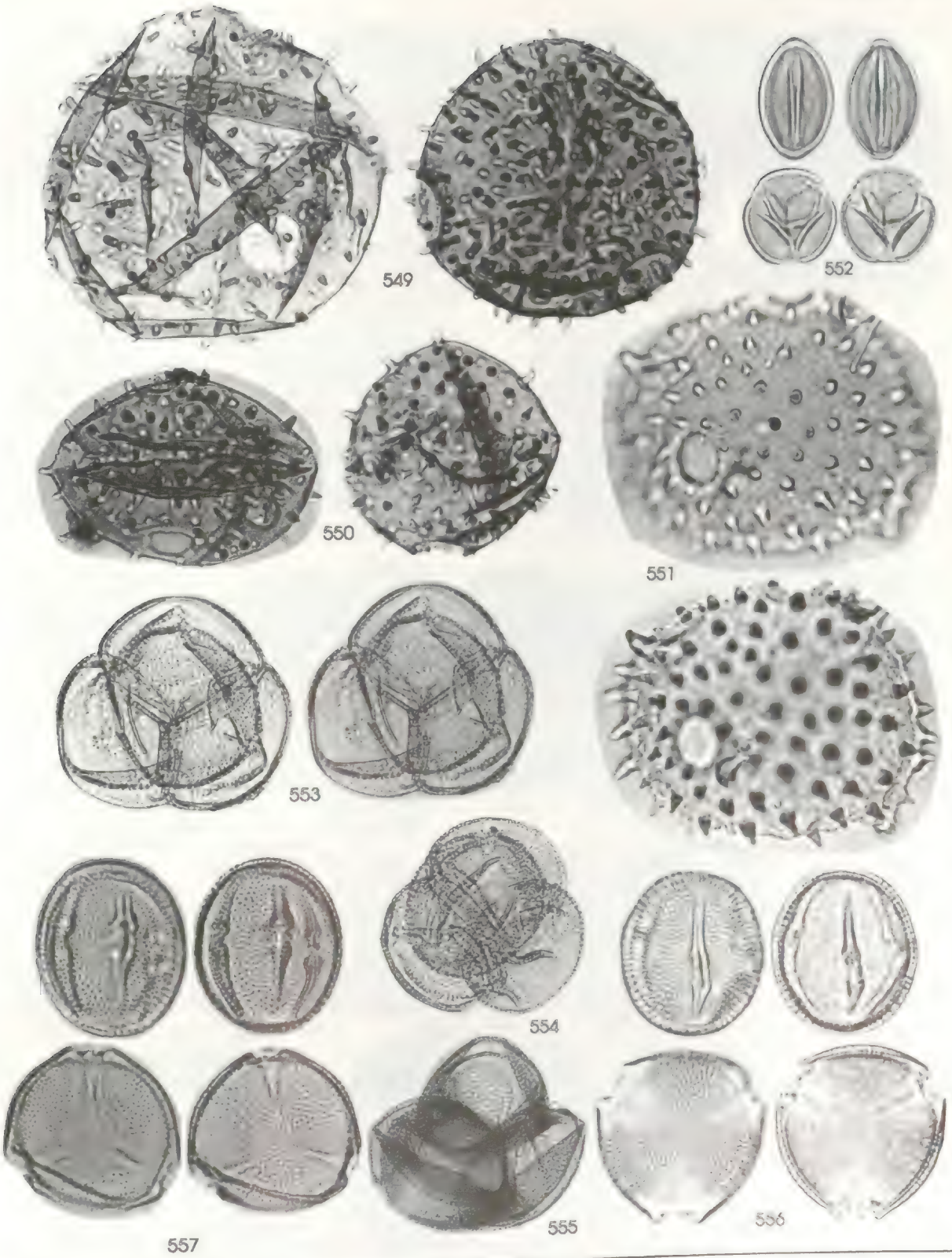


Plate 53. CUCURBITACEAE: *Cayaponia glandulosa* (549), *C. granatensis* (550), *C. racemosa* (551), *Fevillea cordifolia* (552), *Gurania coccinea* (553), *G. makoyana* (554), *G. megistantha* [2x] (555), *Melothria pendula* (556), *M. trilobata* (557)

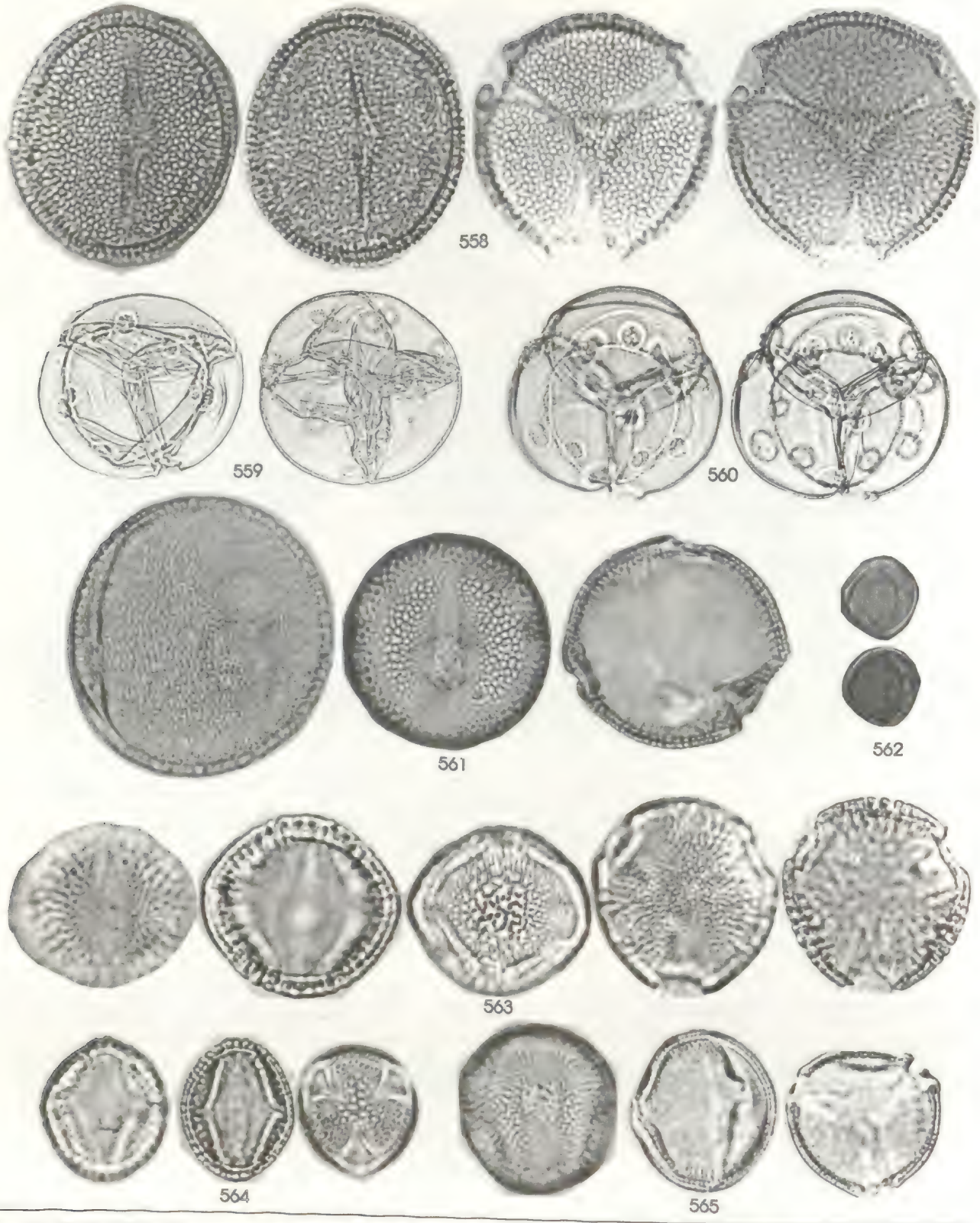


Plate 54. CUCURBITACEAE: *Momordica charantia* (558), *Psiguria bignoniacea* [1/2x] (559), *P. warscewiczii* [1/2x] (560), *Posadaea sphaerocarpa* (561), *Sicydium tamnifolium* (562); DILLENIACEAE: *Davilla nitida* (563), *Doliocarpus dentatus* (564), *D. major* (565)

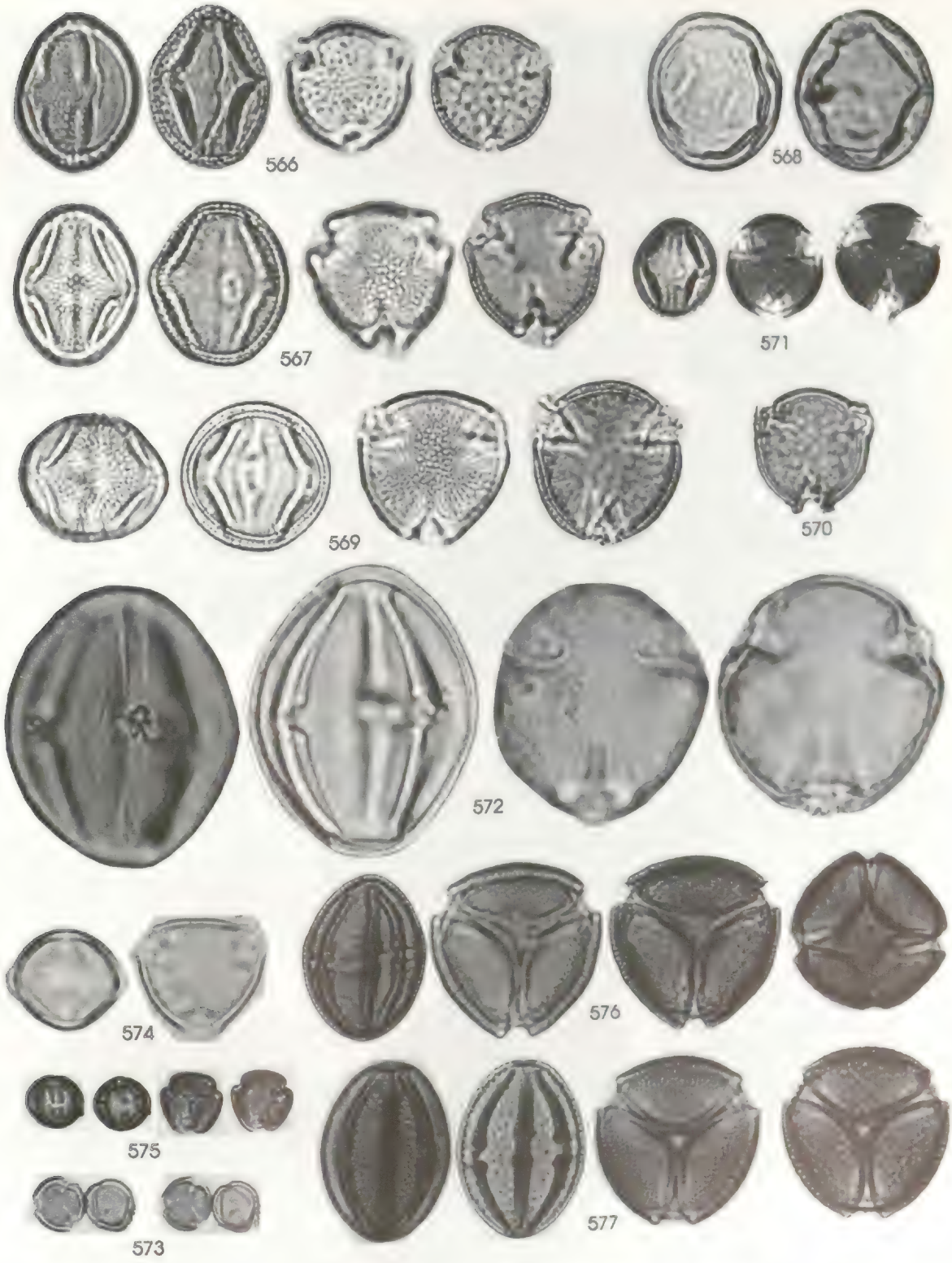


Plate 55. DILLENIACEAE: *Doliocarpus multiflorus* (566), *D. olivaceus* (567), *Saurauia laevigata* (568), *Tetracera hydrophila* (569), *T. portobellensis* (570), *T. volubilis* (571); EBENACEAE: *Diospyros artanthifolia* (572); ELAEOCARPACEAE: *Muntingia calabura* (573), *Sloanea terniflora* (574), *S. zuliaensis* (575); ERYTHROXYLACEAE: *Erythroxylum multiflorum* [*E. skutchii*] (576), *E. panamense* (577)

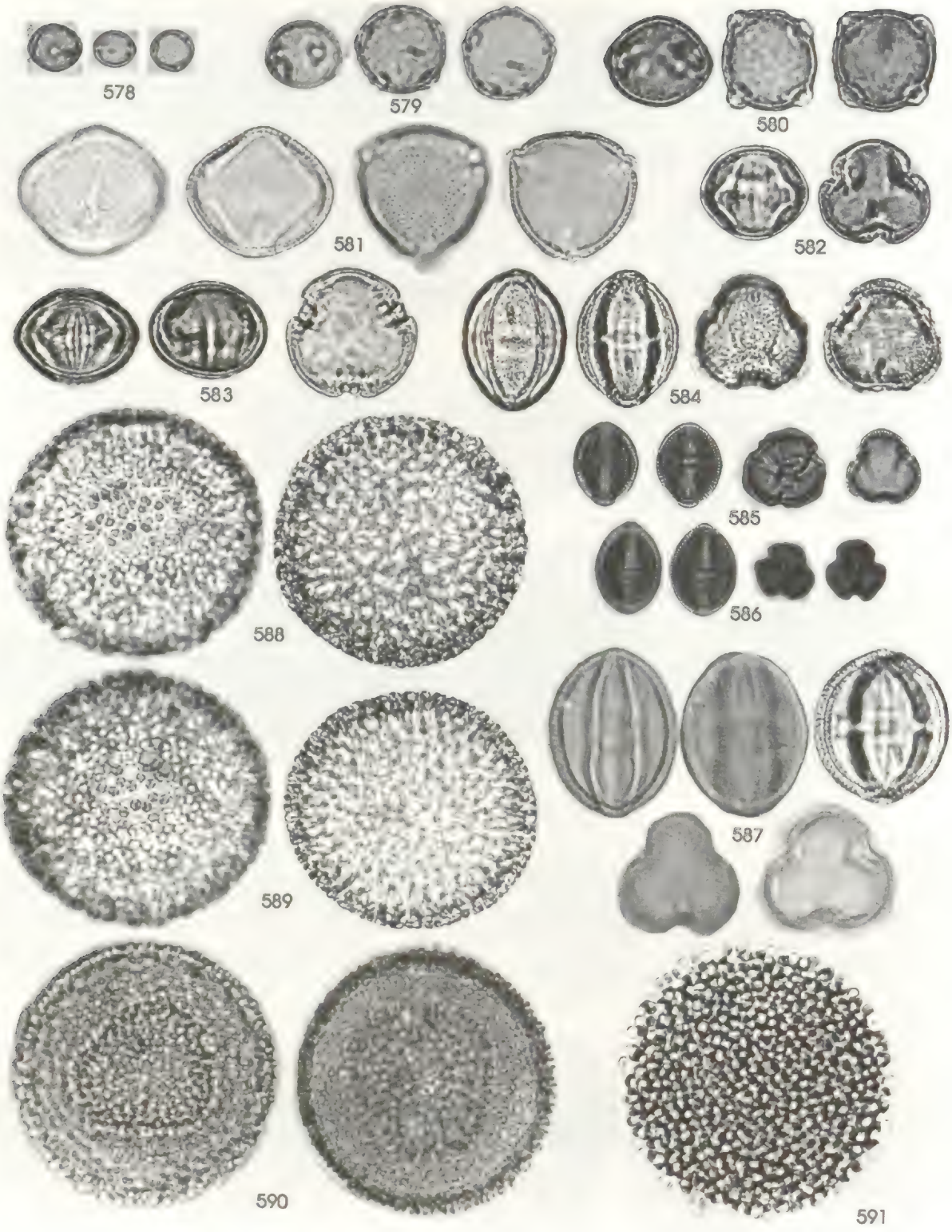


Plate 56. EUPHORBIACEAE: *Acalypha arvensis* (578), *A. diversifolia* (579), *A. macrostachya* (580), *Adelia triloba* (581), *Alchornea costaricensis* (582), *A. latifolia* (583), *Chamaesyce hirta* (584), *C. hypericifolia* (585), *C. hyssopifolia* (586), *C. thymifolia* (587), *Codiaeum variegatum* (588), *Croton billbergianus* (589), *C. hirtus* (590), *C. panamensis* [*C. pyriticus*] (591)

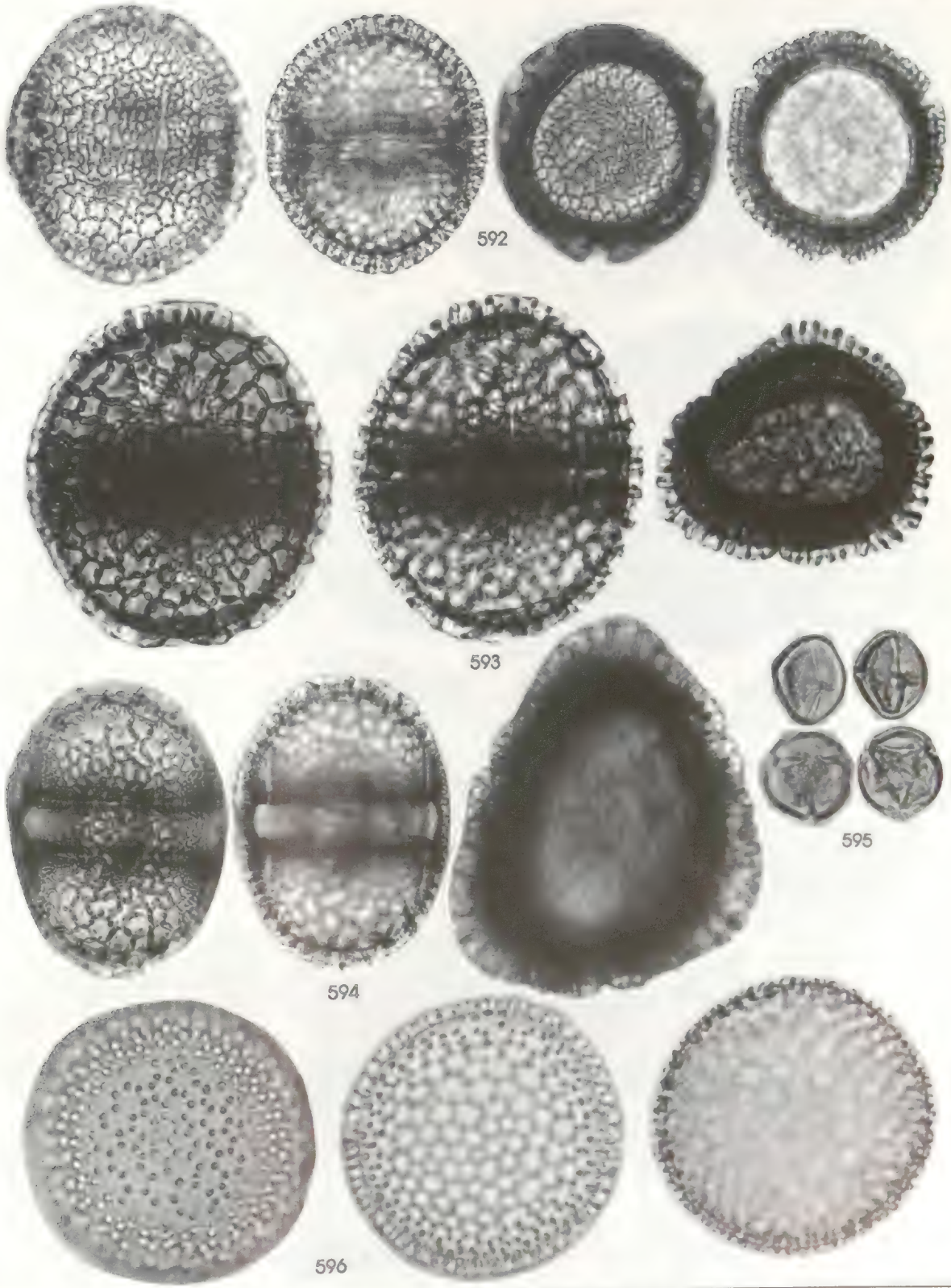


Plate 57. EUPHORBIACEAE: *Dalechampia cissifolia panamensis* (592), *D. dioscoreifolia* (593), *D. tiliifolia* (594), *Drypetes standleyi* (595), *Garcinia nutans* (596)

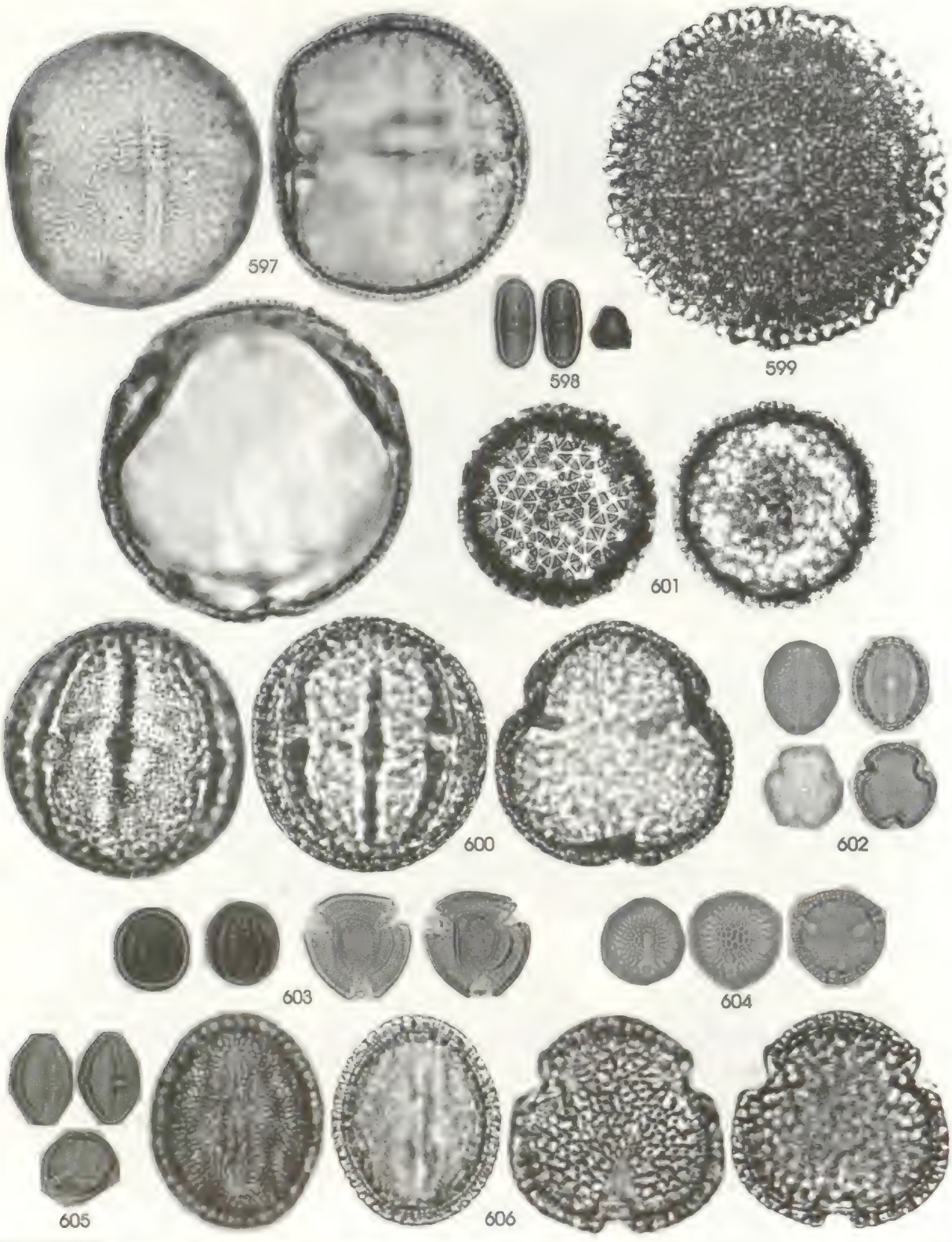


Plate 58. EUPHORBIACEAE: *Hura crepitans* (597), *Hyeronima laxiflora* [*H. alchorneoides*] (598), *Jatropha curcas* (599), Mabea *occidentalis* (600), *Manihot esculenta* [2x] (601), *Margaritaria nobilis* (602), *Omphalea diandra* (603), *Phyllanthus acuminatus* (604), *P. amarus* (605), *Poinsettia heterophylla* [*Euphorbia heterophylla*] (606)

Plate 59. EUPHORBIACEAE: *Saptum caudatum* [*S. aucupartum*] (607); FLACOURTIACEAE: *Banara guianensis* (608), *Casearia aculeata* (609), *C. arguta* (610), *C. arborea* (611), *C. commersoniana* (612), *C. corymbosa* (613), *C. guianensis* (614), *C. sylvestris* (615), *Hasseltia floribunda* (616), *Laetia procera* (617), *L. thamnia* (618), *Lindackeria laurina* (619), *Tetrathylacium johansenii* (620), *Xylosma oligandrum* (621)

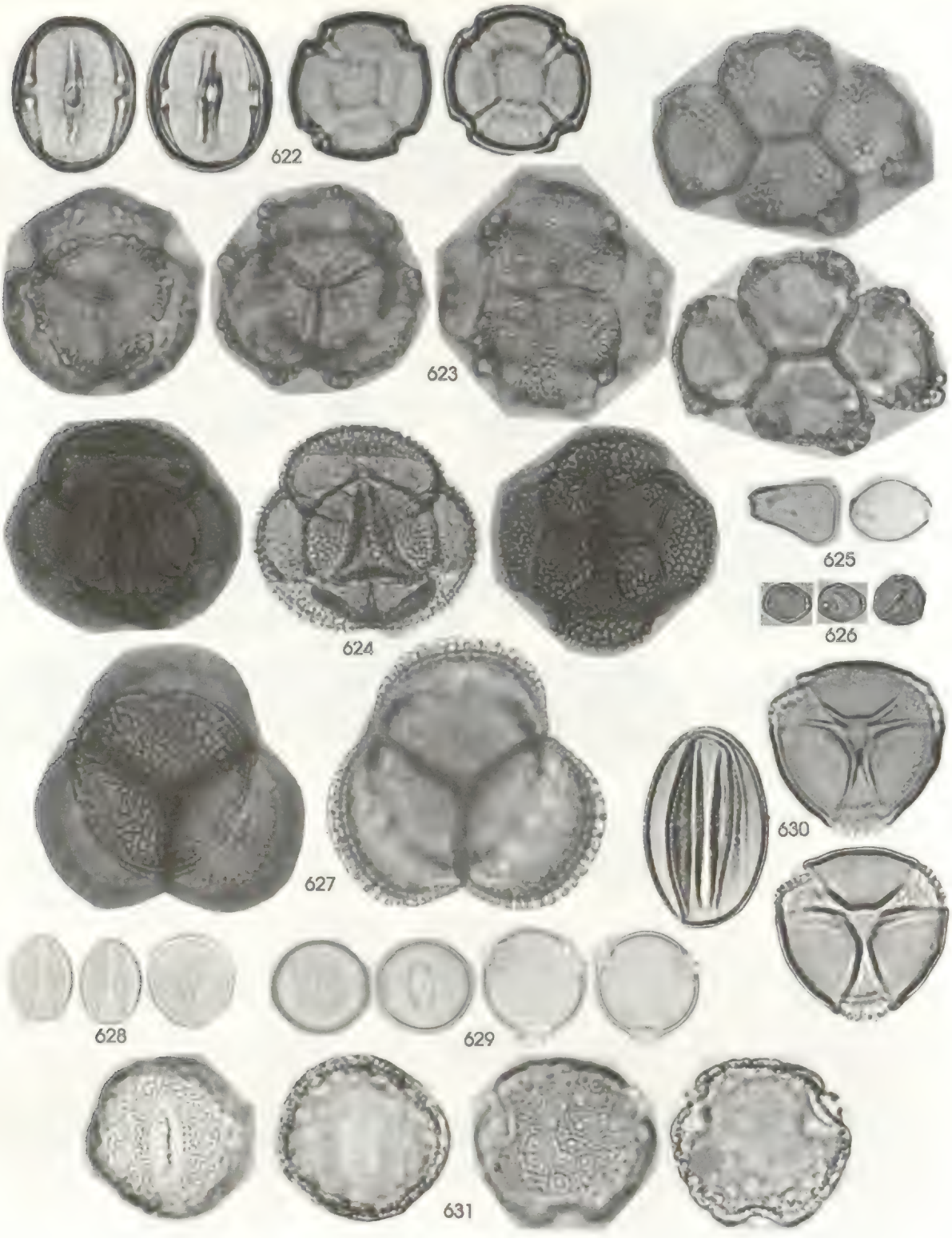


Plate 60. FLACOURTIACEAE: *Zuelania guidonia* (622); GENTIANACEAE: *Chelonanthus alatus* (623), *Schultesia lisianthoides* (624), *Voyria tenella* (625), *V. truncata* (626), *Coutobea spicata* (627); GESNERIACEAE: *Besleria laxiflora* (628), *Chrysothemis friedrichsthaliana* (629), *Columnea billbergiana* (630), *C. purpurata* (631)

Plate 61. GESNERIACEAE: *Diastema racemiferum* (632), *Drymonia serrulata* (633), *Kohleria tubiflora* (634), *Nautilocalyx panamensis* (635); GUTTIFERAE: *Calophyllum longifolium* (636), *Clusia odorata* (637), *Havetiopsis flexilis* (638), *Mammea americana* (639), *Marila laxiflora* (640), *Rheedia acuminata* [*Garcinia madruno*] (641), *R. edulis* [*Garcinia intermedia*] (642)

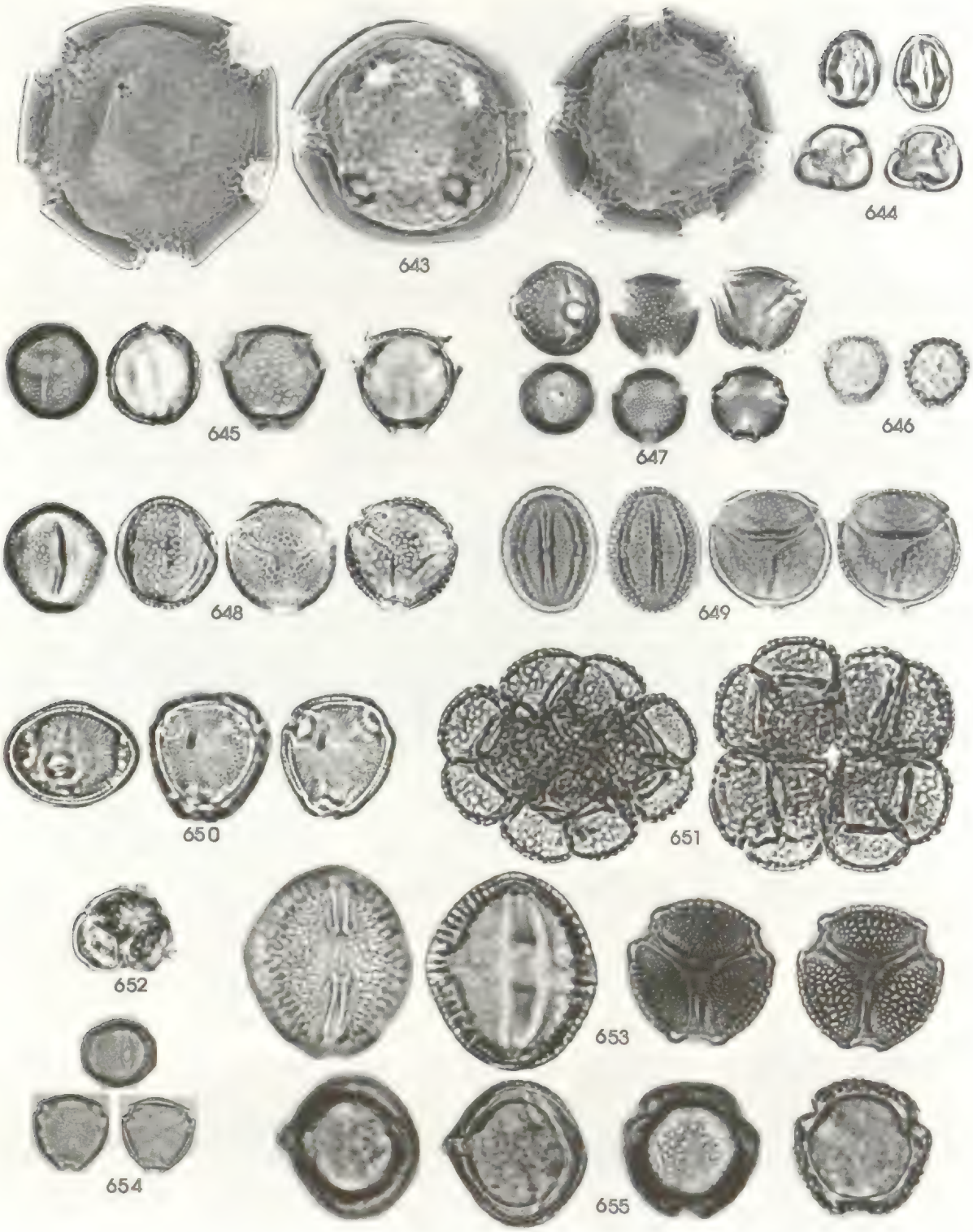


Plate 62. GUTTIFERAE: *Symphonia globulifera* (643), *Tovomita longifolia* (644), *T. stylosa* (645), *Tovomitopsis nicaraguensis* (646), *Vismia baccifera* (647), *V. billbergiana* (648), *V. macrophylla* (649); HIPPOCRATEACEAE: *Anthodon panamense* (650), *Hippocratea volubilis* (651), *Hylenaea praecelsa* (652), *Prionostemma aspera* (653), *Tontelea richardii* (654); HUMIRIACEAE: *Vantanea occidentalis* (655)

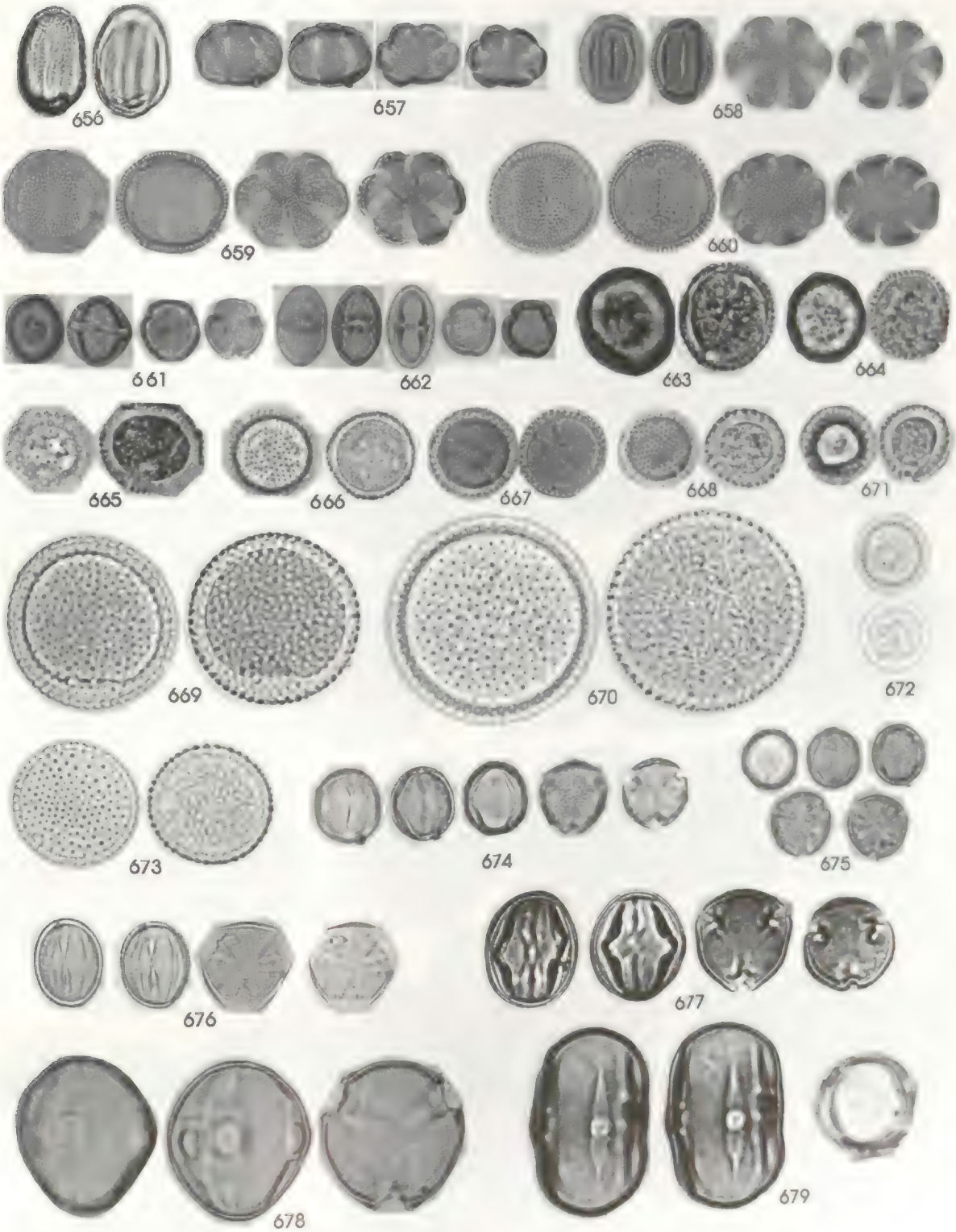


Plate 63. LABIATAE: *Coleus blumei* [*Solenostemon scutellarioides*] (656), *Hyptis brevipes* (657), *H. capitata* (658), *H. mutabilis* (659), *Salvia occidentalis* (660); LACISTEMATACEAE: *Lacistema aggregatum* (661), *Lozania pittieri* (662); LAURACEAE: *Beilschmiedia pendula* (663), *Nectandra cissiflora* (664), *N. globosa* (665), *N. purpurascens* [*N. fuscobarbata*] (666), *N. savannarum* (667), *Ocotea oblonga* (668), *O. skutchii* [*O. whitei*](669), *Persea americana* (670), *Phoebe mexicana* [*P. cinnamomifolia*] (671), *Ocotea cernua* (672), *O. pyramidata* [*O. puberula*] (673); LECYTHIDACEAE: *Couratari panamensis* (674), *Grias fendleri* [*G. cauliflora*] (675), *Gustavia fosteri* (676), *G. superba* (677); LEGUMINOSAE; CAESALPINIOIDEAE: *Bauhinia guianensis* (678), *B. reflexa* (679)

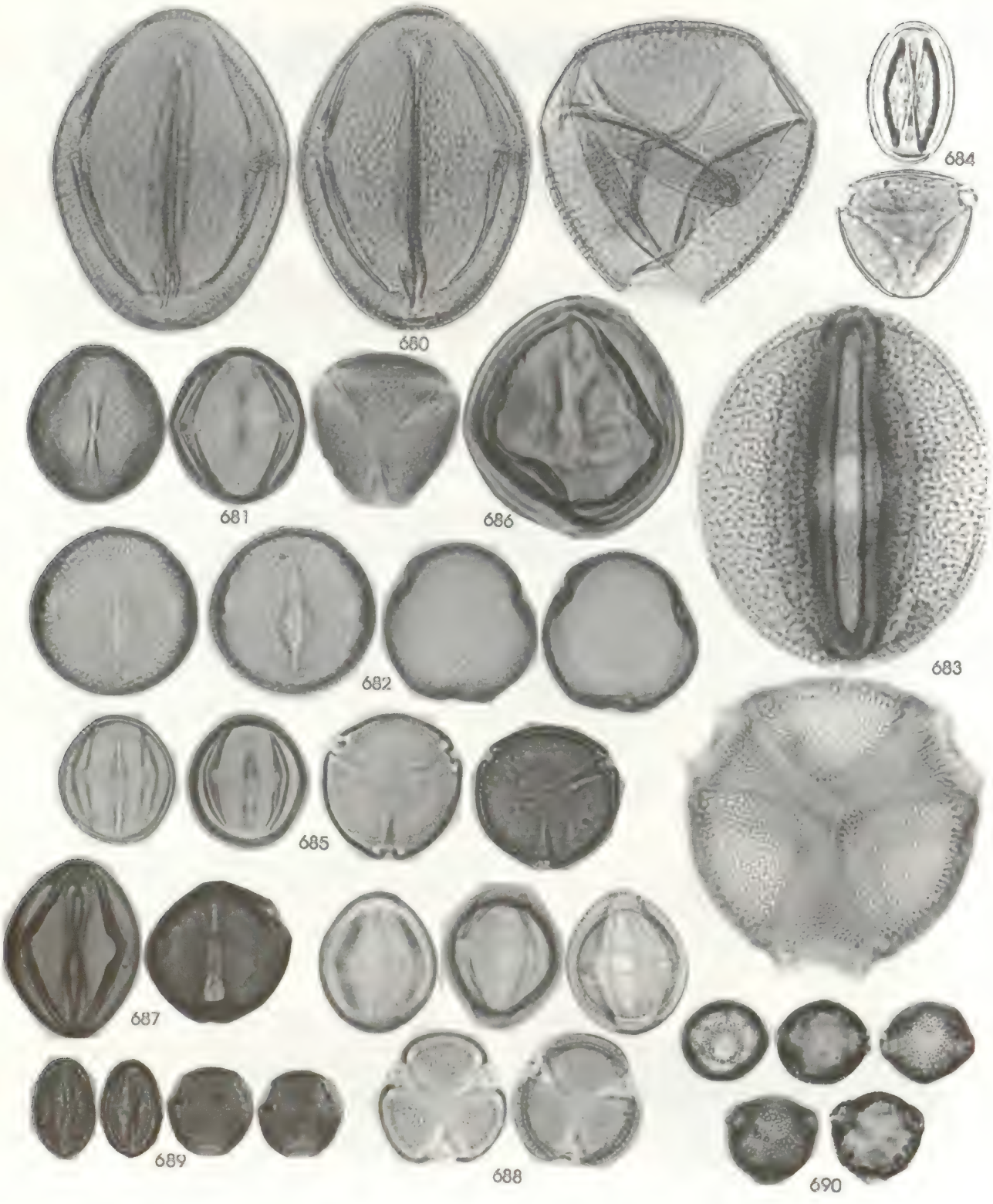


Plate 64. LEGUMINOSAE: CAESALPINIOIDEAE: *Brownea macrophylla* (680), *Cassia fruticosa* [*Senna dariensis gatunensis*] (681), *C. obtusifolia* [*Senna obtusifolia*] (682), *Caesalpinia pulcherrima* (683), *Cassia reticulata* [*Senna reticulata*] (684), *C. undulata* [*Senna undulata*] (685), *Cynometra bauhiniaefolia* [2x] (686), *Hymenaea courbaril* (687), *Peltogyne purpurea* (688), *Prioria copaifera* (689), *Schizolobium parahybum* (690)

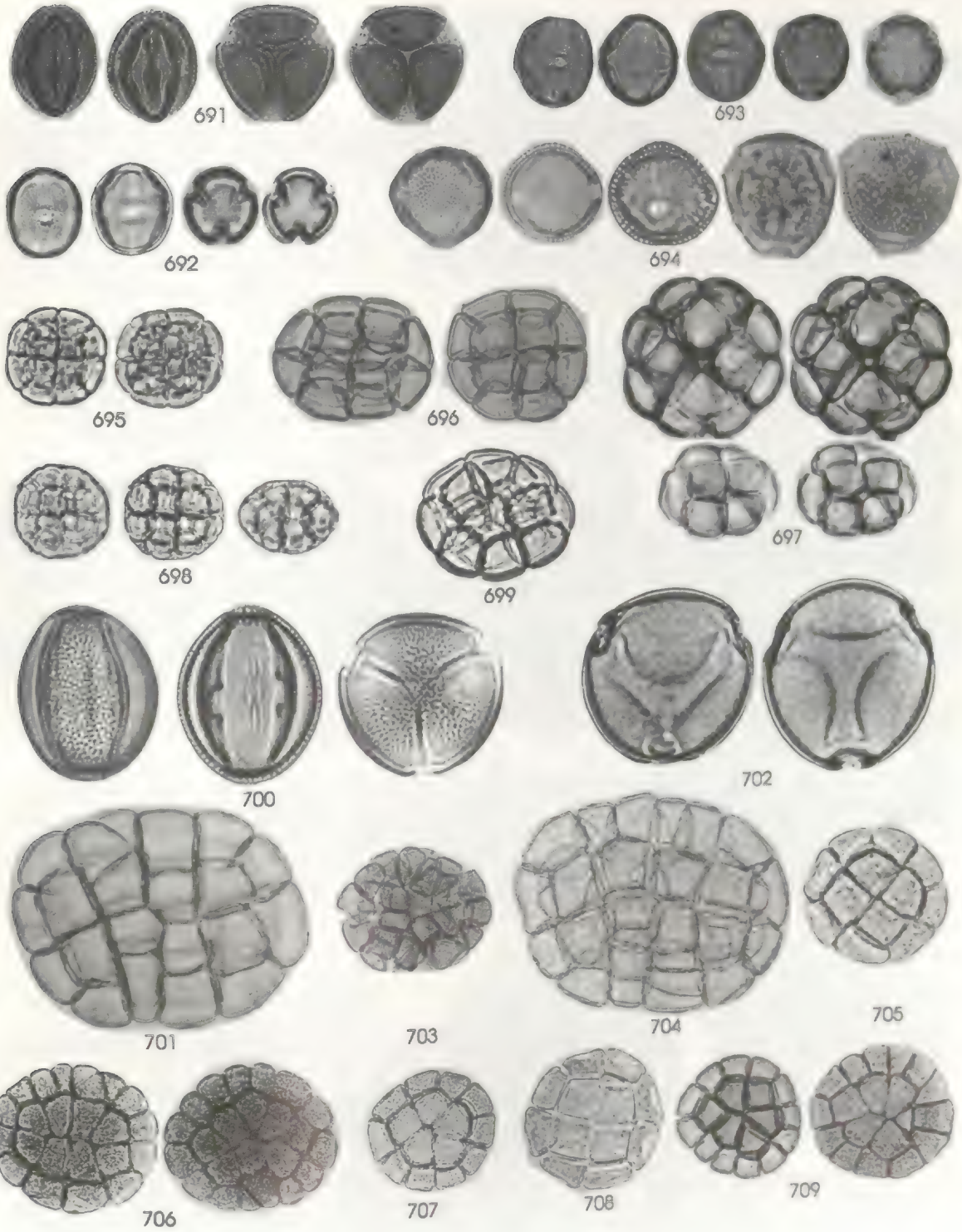


Plate 65. LEGUMINOSAE; CAESALPINIOIDEAE: *Swartzia panamensis* (691), *S. simplex grandiflora* (692), *S. simplex ochnacea* [*S. simplex continentalis*] (693), *Tachigalia versicolor* (694); MIMOSOIDEAE: *Acacia acanthophylla* (695), *A. glomerosa* (696), *A. hayesii* (697), *A. melanoceras* (698), *A. riparia* (699), *Adenopodia polystachya* (700), *Albizia gauchapele* [1/2x] (701), *Entada monostachya* (702), *Enterolobium cyclocarpum* (703), *Inga cocleensis* [1/2x] (704), *I. fagifolia* [1/2x] (705), *I. goldmanii* [1/4x] (706), *I. hayesii* [1/4x] (707), *I. marginata* [1/2x] (708), *I. minutula* [1/4x] (709)

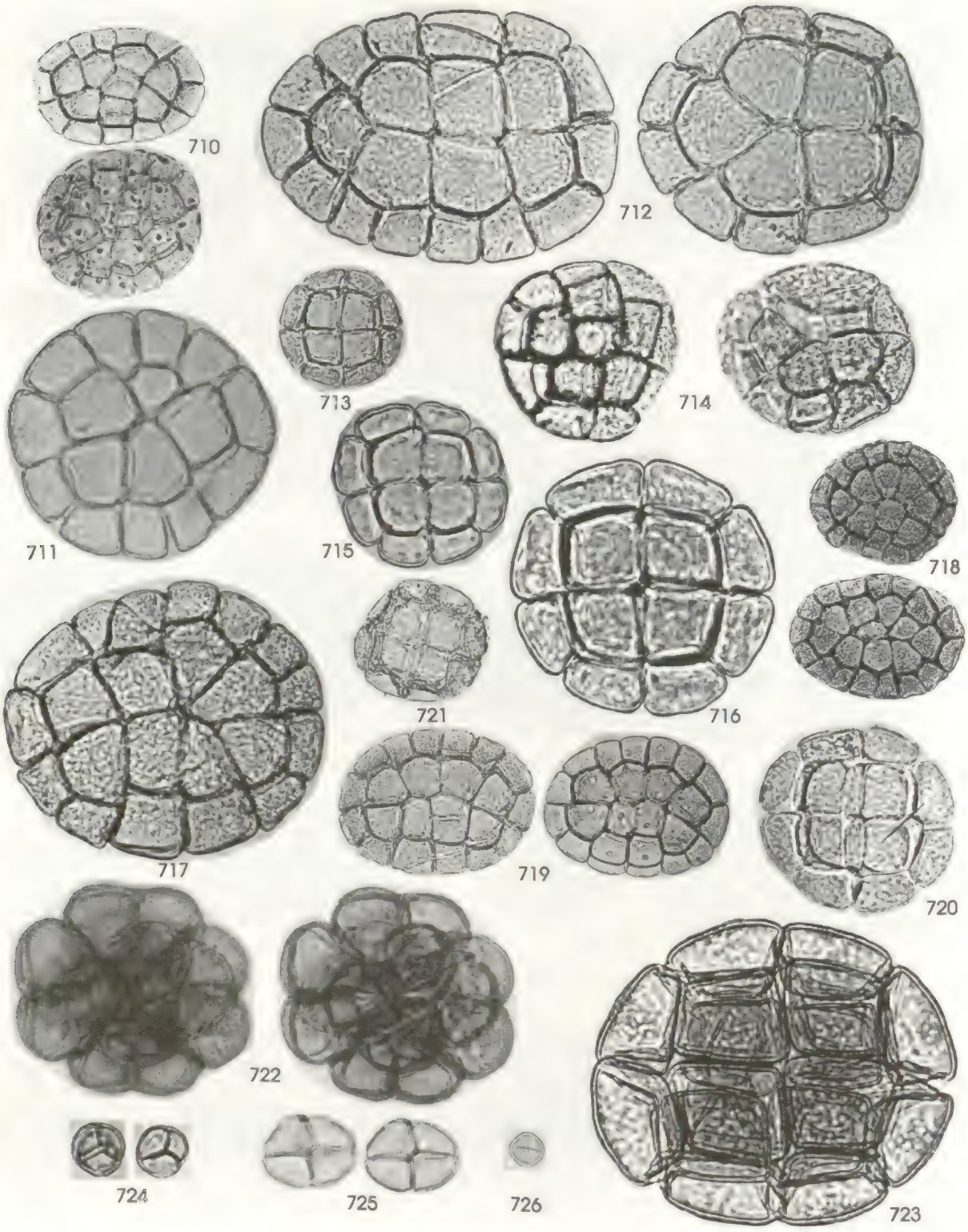


Plate 66. LEGUMINOSAE; MIMOSOIDEAE: *Inga mucuna* [1/4x] (710), *I. multijuga* [1/2x] (711), *I. pauciflora* [1/2x] (712), *I. pezizifera* [1/2x] (713), *I. punctata* [1/2x] (714), *I. quaternata* [1/2x] (715), *I. rutziana* (716), *I. sapindoides* (717), *I. spectabilis* [1/4x] (718), *I. thibaudiana* [1/4x] (719), *I. umbellifera* [1/2x] (720), *I. vera spuria* (721), *Leucaena multicapitula* [1/2x] (722), *Pithecellobium dinizii* (723), *Mimosa casta* (724), *M. pigra* (725), *M. pudica* (726)

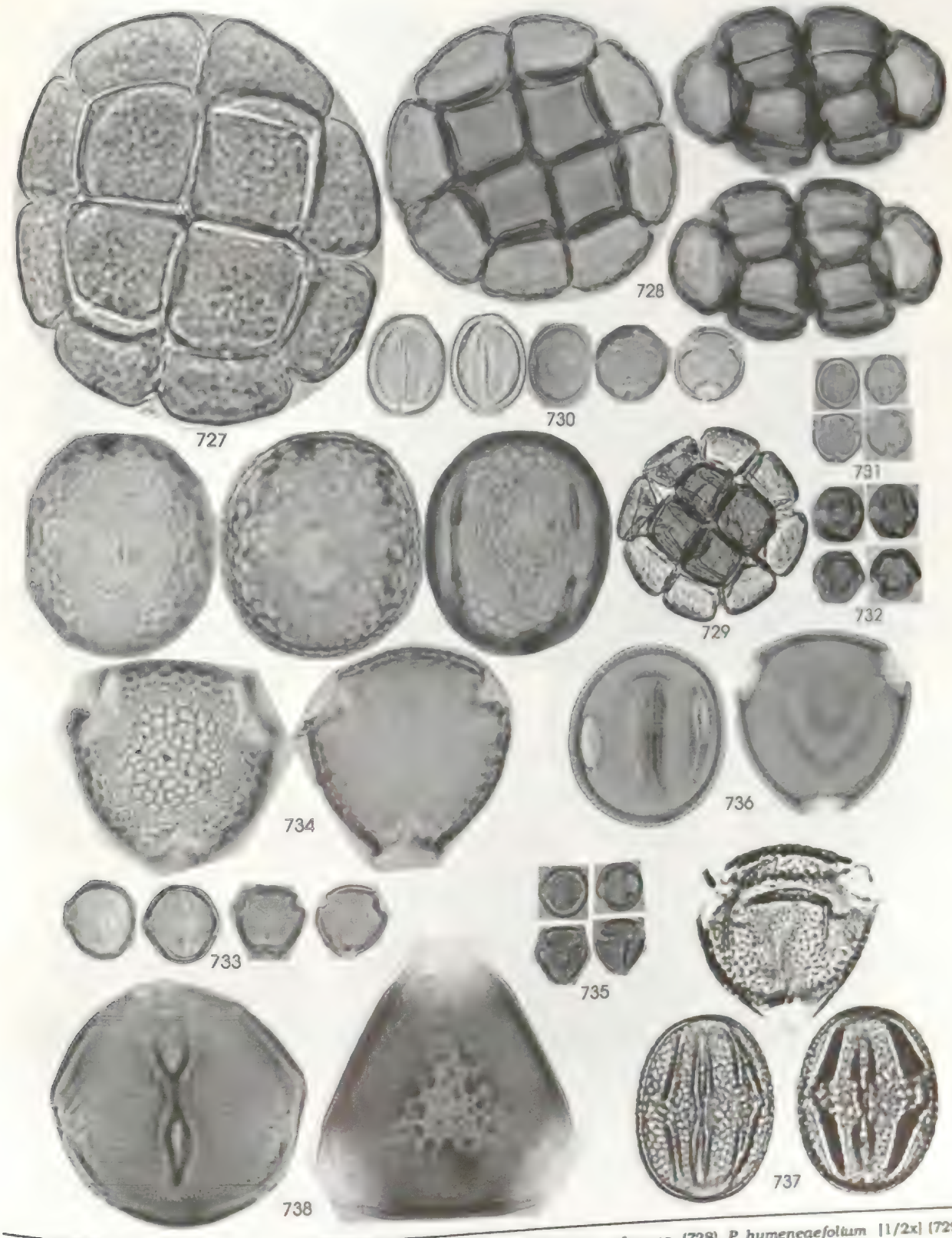


Plate 67. LEGUMINOSAE: MIMOSOIDEAE: *Pithecellobium macradenium* (727), *P. rufescens* (728), *P. hymeneaefolium* [1/2x] (729); PAPILIONOIDEAE: *Aeschynomene americana glandulosa* (730), *A. ciliata* (731), *A. sensitiva* (732), *Andira inermis* (733), *Cajanus bicolor* (734), *Calopogonium coeruleum* (735), *C. mucunoides* (736), *Centrosema pubescens* (737), *Canavalia dictyota* (738)

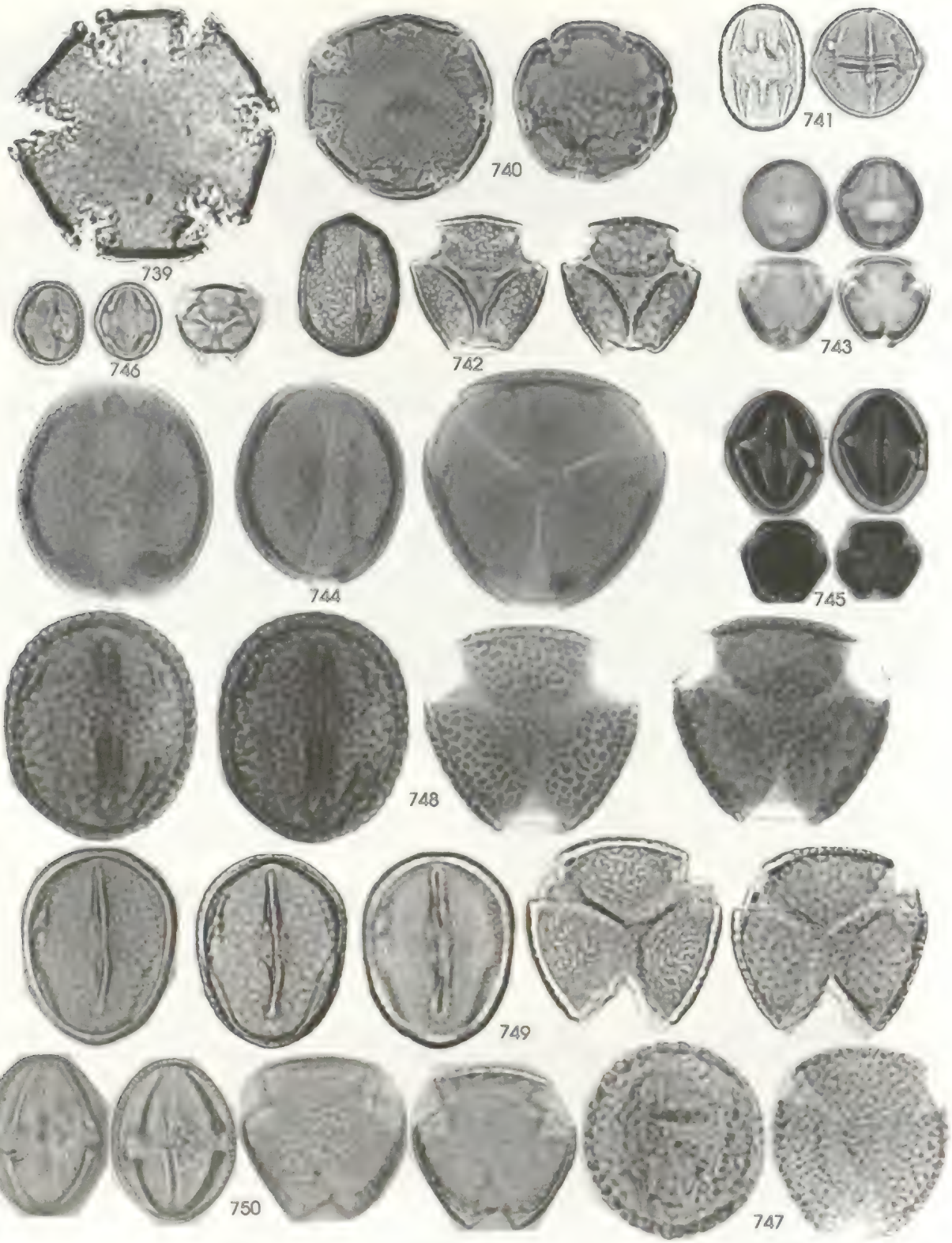


Plate 68. LEGUMINOSAE: PAPILIONOIDEAE: *Clitoria javitensis* (739), *C. rubiginosa* [*C. falcata*] (740), *Crotalaria retusa* (741), *C. cajanifolia* (742), *Dalbergia brownei* (743), *Cymbosema roseum* (744), *Dalbergia monetaria* (745), *D. retusa* (746), *Desmodium adscendens* (747), *D. axillare* (748), *D. axillare acutifolium* (749), *D. axillare stoloniferum* (750)

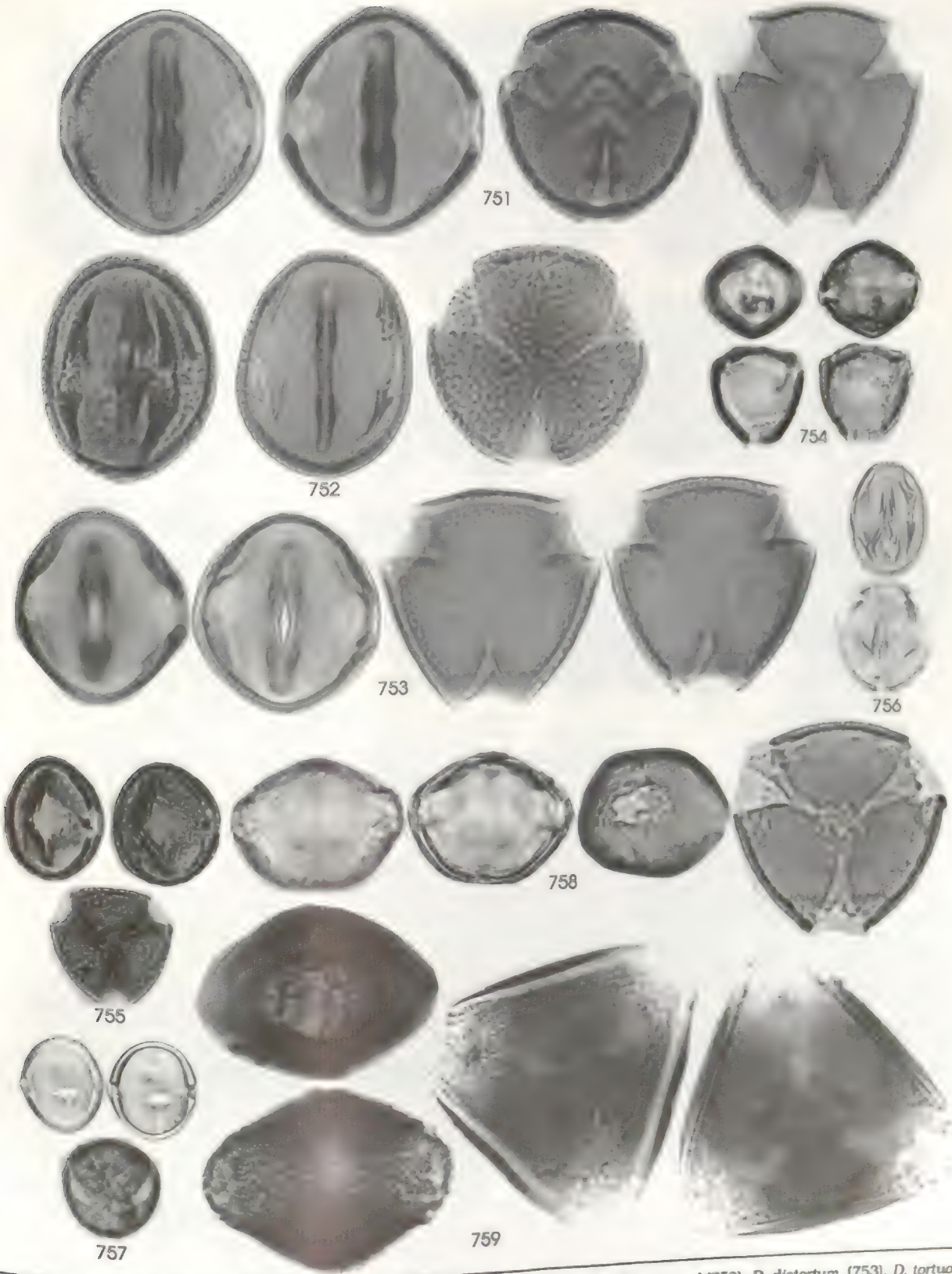


Plate 69. LEGUMINOSAE; PAPILIONOIDEAE: *Desmodium cajanifolium* (751), *D. canum* [*D. incanum*] (752), *D. distortum* (753), *D. tortuosum* (754), *D. scorpiurus* (755), *D. triflorum* (756), *D. wydlerianum* (757), *Dioclea guianensis* (758), *D. reflexa* (759)

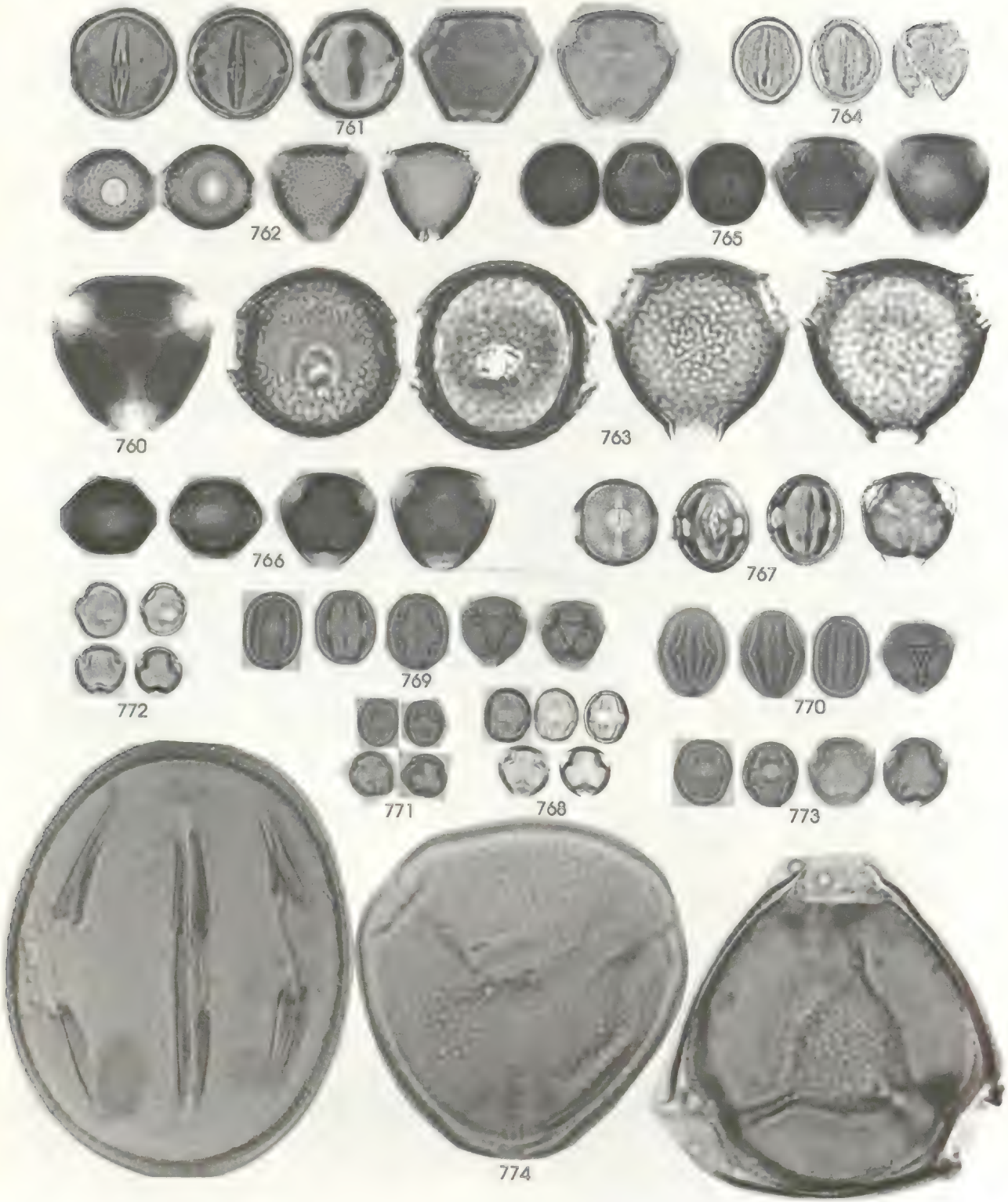


Plate 70. LEGUMINOSAE; PAPILIONOIDEAE: *Dioclea wilsonii* (760), *Dipteryx panamensis* [*D. oleifera*] (761), Erythrina *costaricensis* (762), *E. fusca* (763), *Indigofera mucronata* [*I. jamaicensis*](764), *Lonchocarpus pentaphyllus* (765), *L. velutinus* (766), *Machaerium arboreum* (767), *M. floribundum* (768), *M. kegelii* (769), *M. microphyllum* (770), *M. milleflorum* (771), *M. riparium* (772), *M. seemannii* (773), *Mucuna mutisiana* (774)

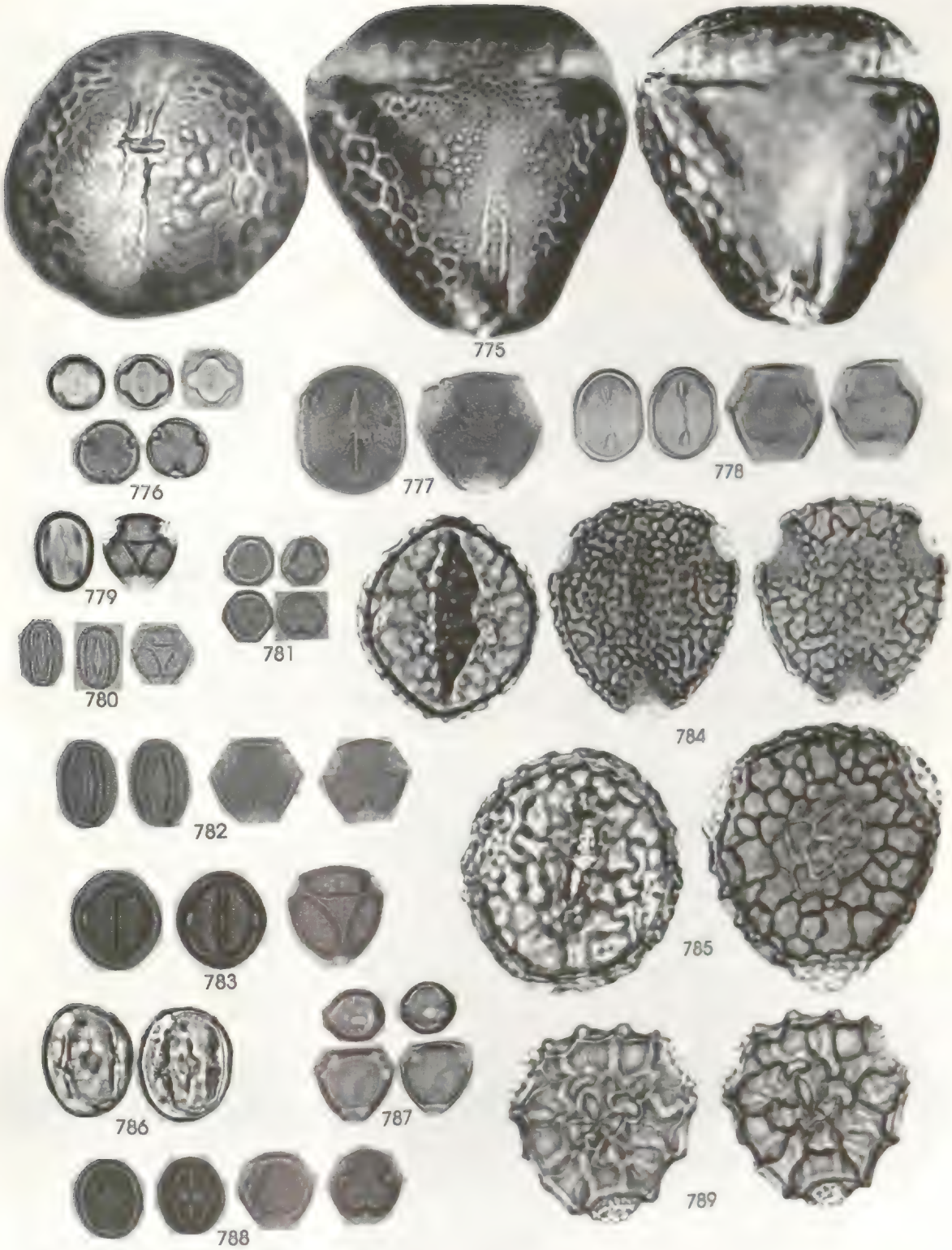


Plate 71. LEGUMINOSAE; PAPILIONOIDEAE: *Mucuna rostrata* (775), *Myroxylon balsamum pereirae* (776), *Ormosia coccinea subsimplex* (777), *O. macrocalyx* (778), *Platymiscium pinnatum* (779), *Platypodium elegans* (780), *Pterocarpus officinalis* (781), *P. rohrii* (782), *Rhynchosia pyramidalis* (783), *Phaseolus pedunculares* (784), *P. trichocarpus* (785), *Teramnus uncinatus* (786), *T. volubilis* (787), *Vatairea erythrocarpa* (788), *Vigna vexillata* [1/2x] (789)

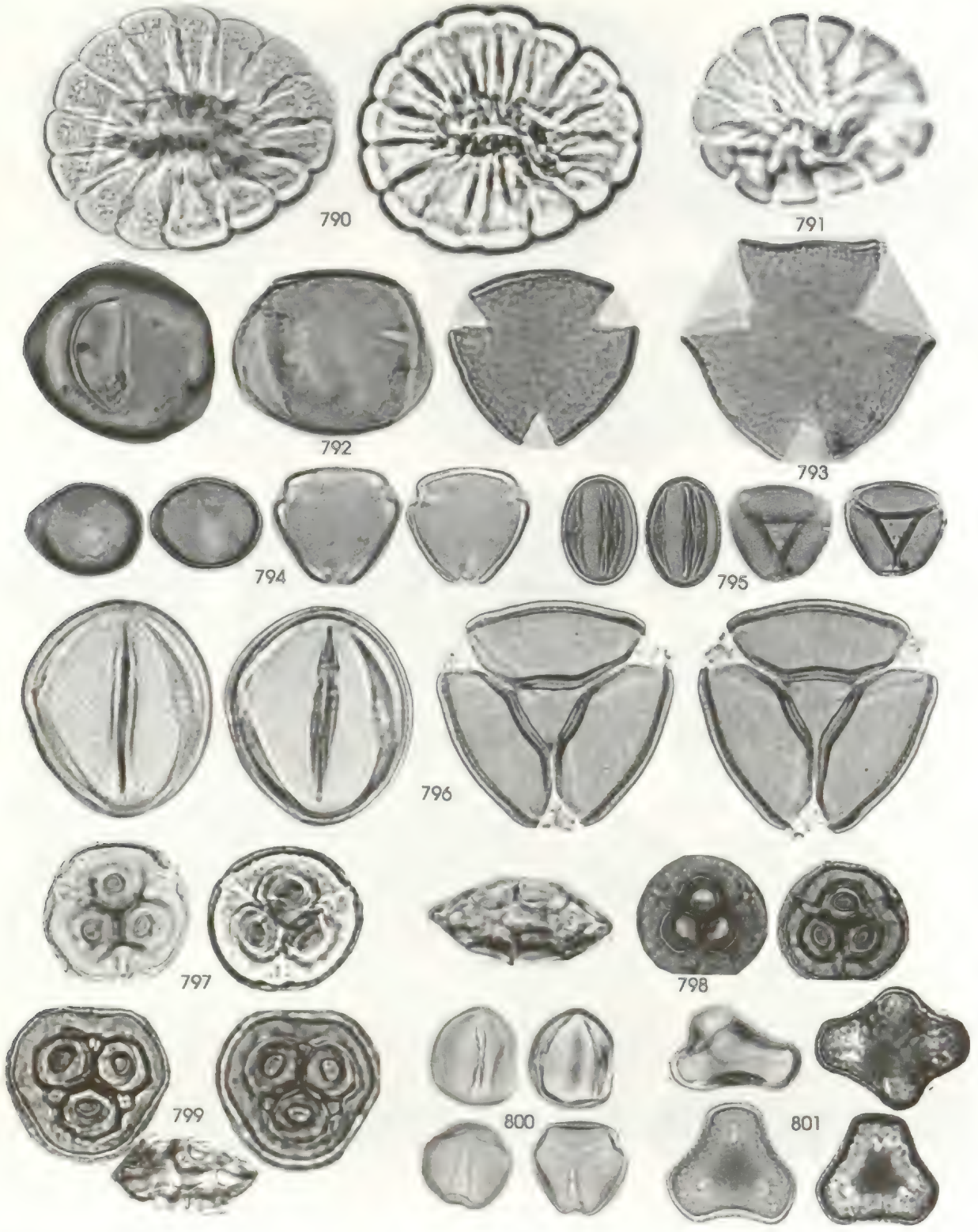


Plate 72. LENTIBULARIACEAE: *Utricularia foliosa* (790), *U. obtusa* (791); LOGANIACEAE: *Spigelia anthelmia* (792), *S. humboldtiana* (793), *Strychnos brachistantha* (794), *S. darienensis* (795), *S. panamensis* (796); LORANTHACEAE: *Oryctanthus alveolatus* (797), *O. cordifolius* (798), *O. occidentalis* (799), *Phoradendron quadrangulare* (800), *Phthirusa pyrifolia* (801)

Plate 73. LORANTHACEAE: *Struthanthus orbicularis* (802); LYTHRACEAE: *Adenaria floribunda* (803), *Cuphea carthagenensis* (804), *Lafoensia punicifolia* (805); MALPIGHIACEAE: *Banisteriopsis cornifolia* [*B. wurdackii*] (806), *Bunchosia cornifolia* (807), *Byrsonima crassifolia* (808), *B. spicata* (809), *Heteropteris laurifolia* (810), *Hiraea faginea* (811), *H. grandifolia* (812), *H. quapara* (813), *H. reclinata* (814)

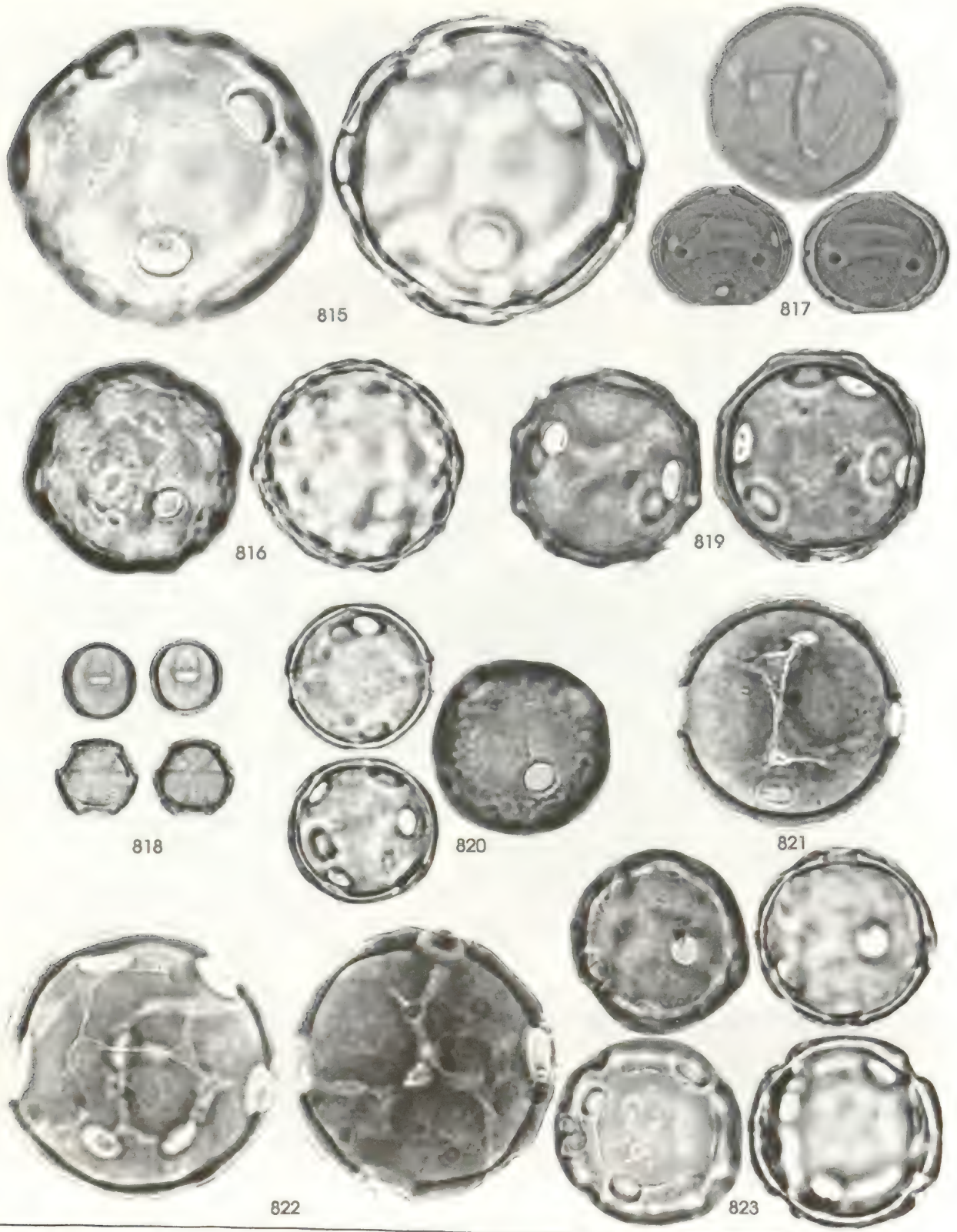


Plate 74. MALPIGHIACEAE: *Malpighia romeroana* (815), *Mascagnia hippocrateoides* (816), *M. nervosa* (817), *Spachea membranacea* (818), *Stigmaphyllon ellipticum* (819), *S. lindenianum* (820), *S. hypargyreum* (821), *S. puberum* (822), *Tetrapteris seemannii* (823)

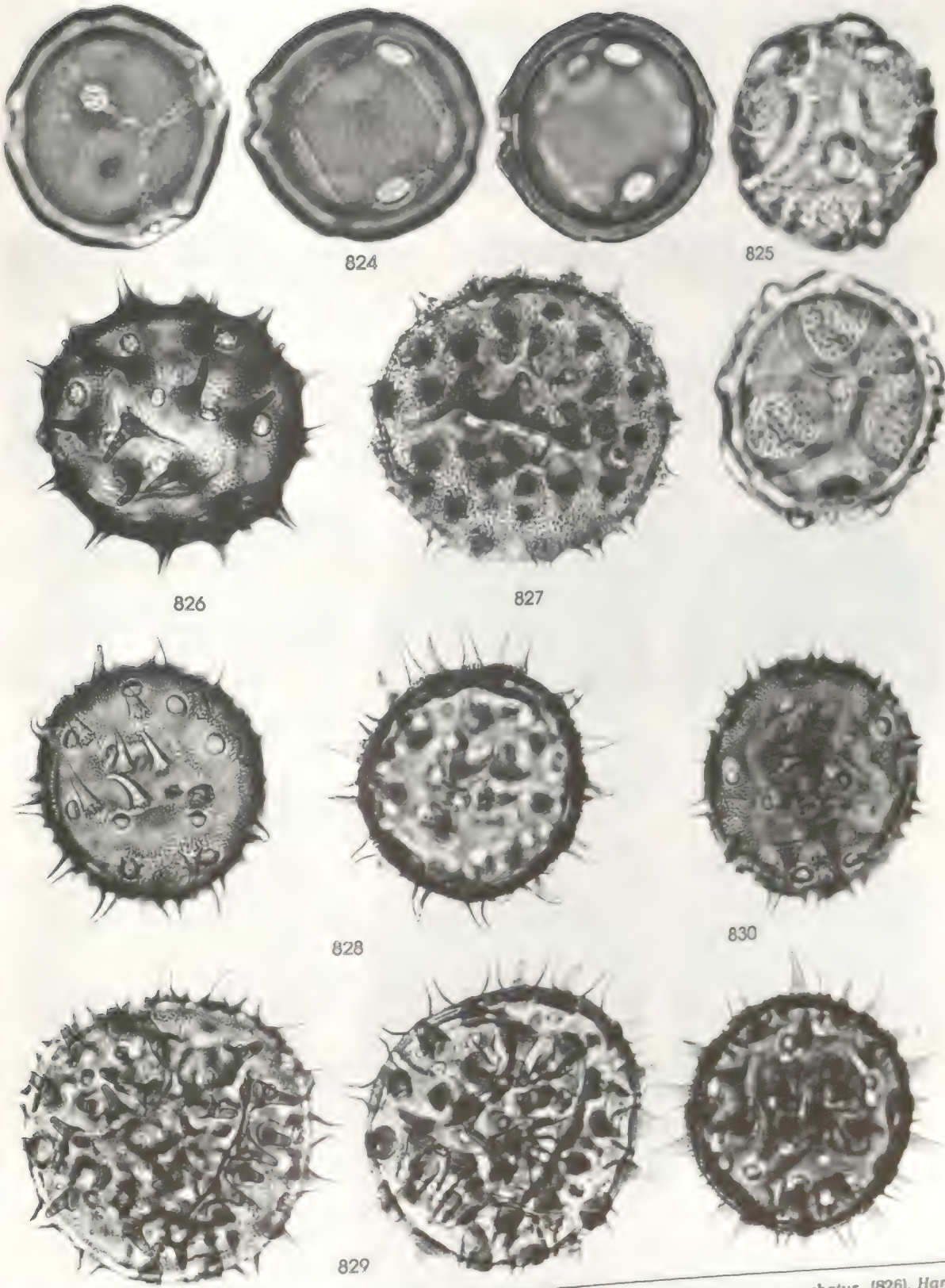


Plate 75. MALPIGHIACEAE: *Tetrapteris discolor* (824), *T. macrocarpa* (825); MALVACEAE: *Abelmoschus moschatus* (826), *Hampea appendiculata longicalyx* (827), *Hibiscus bifurcatus* (828), *H. rosa-sinensis* (829), *H. sororius* (830)

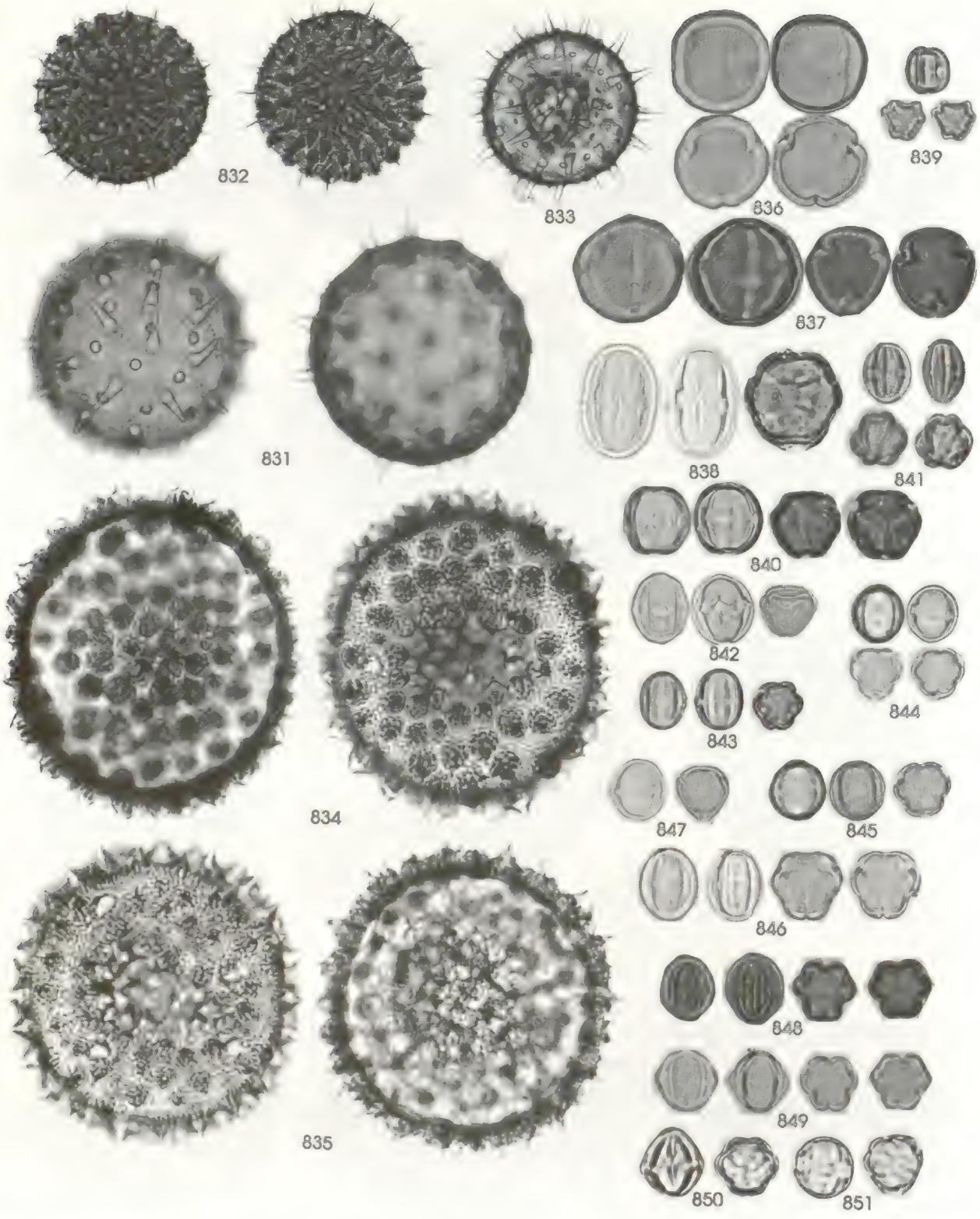


Plate 76. MALVACEAE: *Pavonia dasypetala* [*Lopimia dasypetala*] [1/4x] (831), *P. paniculata* [1/4 x] (832), *P. rosea* [*P. schiedeana*] [1/4x] (833), *Sida acuta* (834), *S. rhombifolia* (835); MARCGRAVIACEAE: *Marcgravia nepenthoides* (836), *Souroubea sympetala* (837); MELASTOMATACEAE: *Aciotis levyana* (838), *Adelobotrys adscendens* (839), *Arthrostema alatum* (840), *Bellucia grossularioides* (841), *Clidemia capitellata* (842), *C. collina* (843), *C. dentata* (844), *C. octona* (845), *C. purpureo-violacea* [*C. discolor*] (846), *C. septuplinervia* (847), *Conostegia bracteata* [2x] (848), *C. cinnamomea* (849), *C. speciosa* (850), *C. xalapensis* (851).

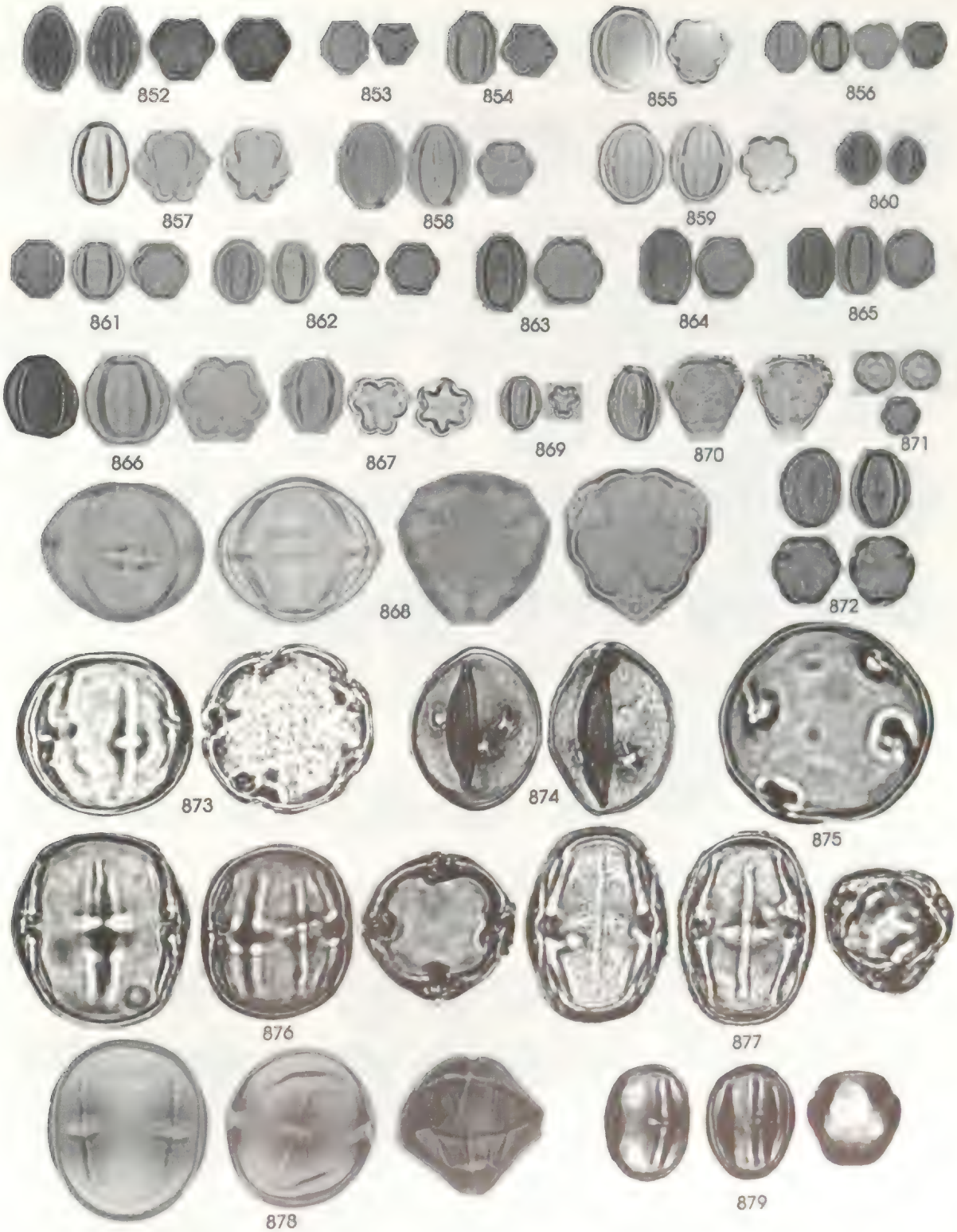


Plate 77. MELASTOMATACEAE: *Henriettea succosa* (852), *Leandra dichotoma* (853), *Miconia affinis* (854), *M. argentea* (855), *M. borealis* [*M. minutiflora*] (856), *M. elata* (857), *M. hondurensis* (858), *M. impetiolaris* (859), *M. lacera* (860), *M. lateriflora* (861), *M. lonchophylla* (862), *M. nervosa* (863), *M. prasina* (864), *M. rufostellulata* (865), *M. serrulata* (866), *M. shattuckii* (867), *Mouriri myrtilloides parvifolia* (868), *Ossaea quinquenervia* (869), *Schwackaea cupheoides* (870), *Tibouchina longifolia* (871), *Topobea praecox* (872); MELIACEAE: *Cedrela odorata* (873), *Guarea grandifolia* (874), *G. glabra* (875), *Trichilia hirta* (876), *T. cipo* (877), *T. pallida* (878), *T. pleeana* (879)

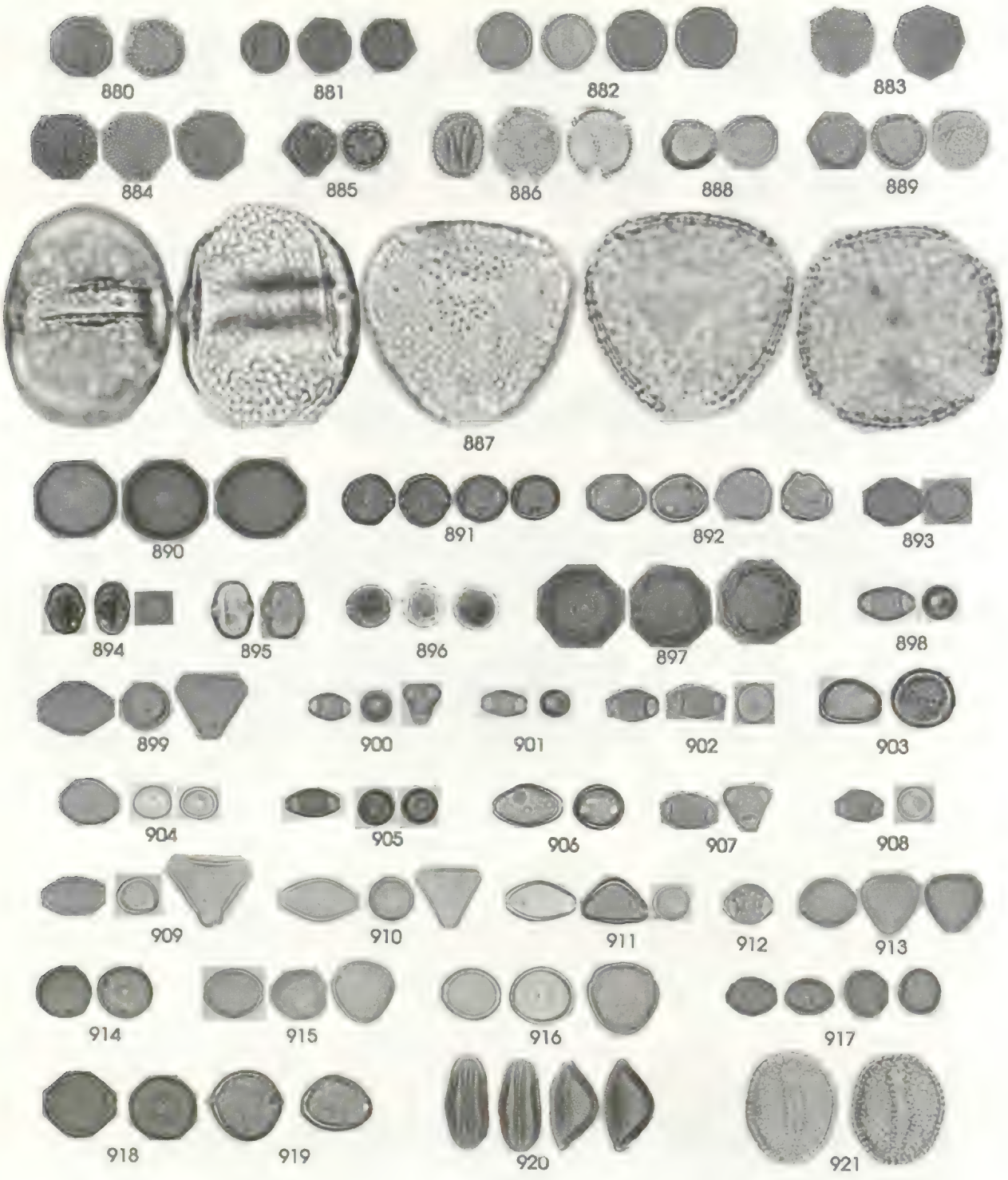


Plate 78. MENISPERMACEAE: *Abuta panamensis* (880), *A. racemosa* (881), *Chondrodendron tomentosum* (882), *Cissampelos pareira* (883), *C. tropaeolifolia* (884), *Odontocarya tamnoides canescens* (885), *O. truncata* (886); MENYANTHACEAE: *Nymphoides indica* (887); MONIMIACEAE: *Siparuna guianensis* (888), *S. pauciflora* (889); MORACEAE: *Artocarpus altilis* (890), *Brosimum alicastrum boliviensis* (891), *Castilla elastica* (892), *Cecropia insignis* (893), *C. longipes* (894), *C. peltata* (895), *Coussapoa magnifolia* [*C. asperifolia magnifolia*] *insipida* (903), *F. maxima* (904), *F. nymphaeaefolia* (905), *F. obtusifolia* (906), *F. paraensis* (907), *F. perforata* (908), *F. pertusa* (909), *F. popenoei* (910), *F. trigonata* (911), *F. yoponensis* (912), *Maquira costaricana* (913), *Olmedia aspera* [*Trophis caucana*] (914), *Perebea xanthochyma* (915), *Poulsenia armata* (916), *Pourouma guianensis* [*P. bicolor*] (917), *Sorocea affinis* (918), *Trophis racemosa* (919); MYRISTICACEAE: *Virola sebifera* (920), *V. surinamensis* (921)

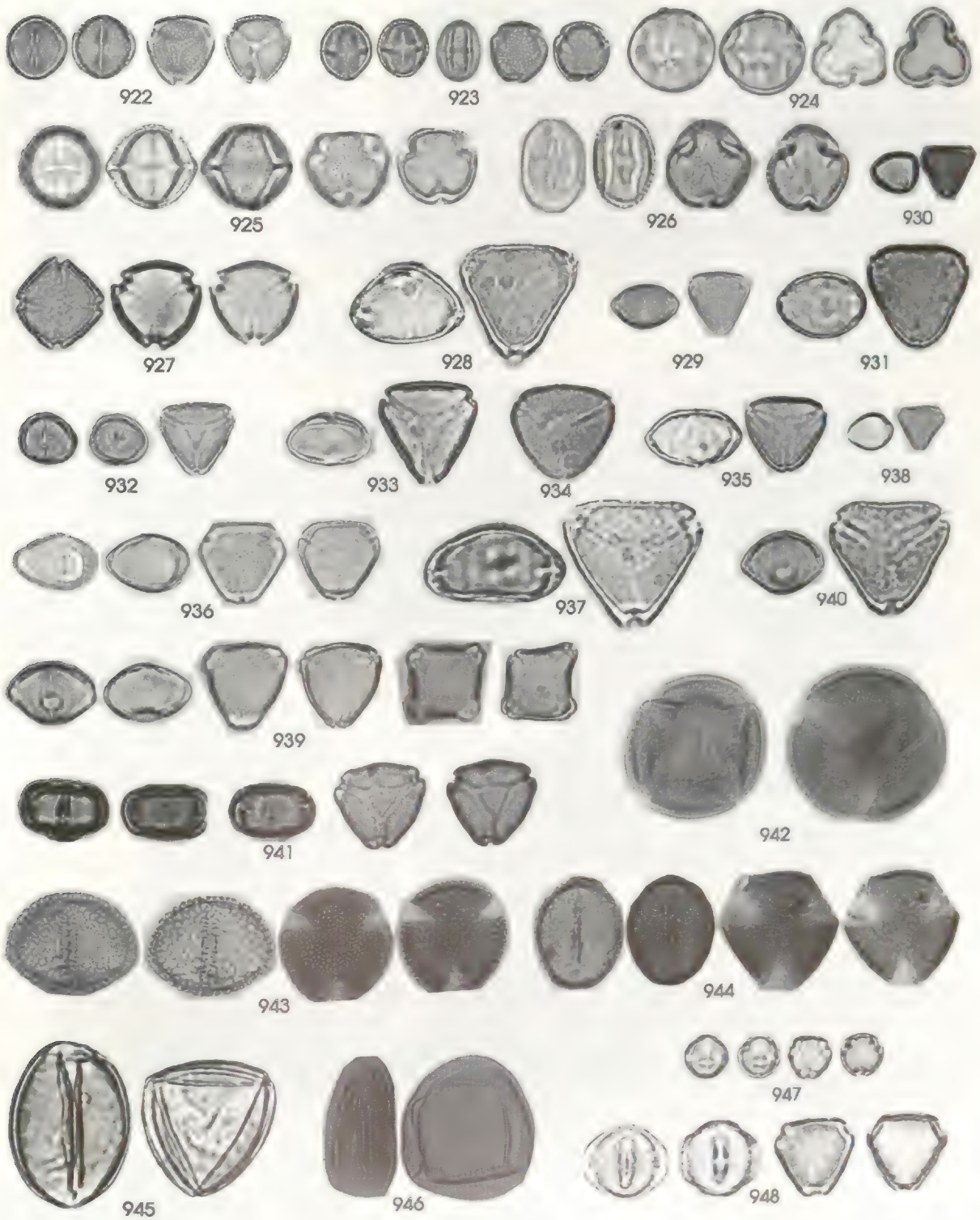


Plate 79. MYRSINACEAE: *Ardisia bartlettii* (922), *A. fendleri* (923), *A. pellucida* (924), *Parathesis microcalyx* (925), *Stylogyne standleyi* (926); MYRTACEAE: *Aulomyrcia zetekiana* (927), *Calycolpus warszewiczianus* (928), *Eugenia coloradensis* (929), *E. galalonensis* (930), *E. nesiotica* (931), *E. uniflora* (932), *E. venezuelensis* (933), *E. oerstedeana* (934), *E. principium* (935), *Myrcia fosteri* (936), *M. gatunensis* (937), *Psidium anglohondurensis* (938), *P. friedrichsthalianum* (939), *P. guajava* (940), *Syzygium jambos* (941); NYCTAGINACEAE: *Guapira standleyana* (942), *Neea amplifolia* (943), *Pisonia aculeata* (944); NYMPHAEACEAE: *Nymphaea ampla* (945), *N. blanda* (946); OCHNACEAE: *Cespedezia macrophylla* (947), *Ouratea lucens* (948)

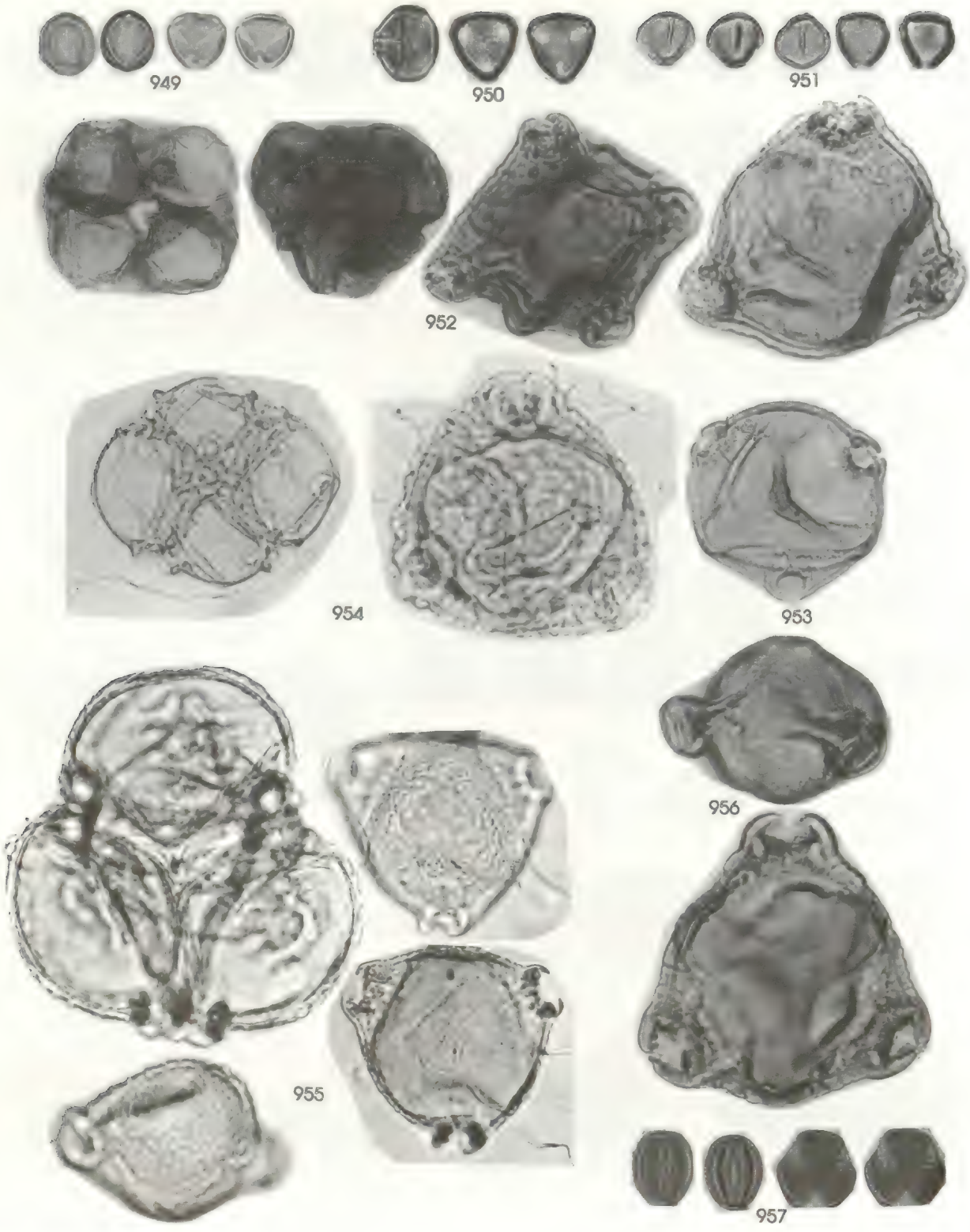


Plate 80. OLACACEAE: *Heisteria concinna* (949), *H. costaricensis* (950), *H. longipes* [*H. cyanocarpa*] (951); ONAGRACEAE: *Ludwigia decurrens* [1/2x] (952), *L. helminthorrhiza* (953), *L. leptocarpa* [1/2x] (954), *L. octovalvis* [1/2x] (955), *L. torulosa* (956); OXALIDACEAE: *Averrhoa carambola* (957)

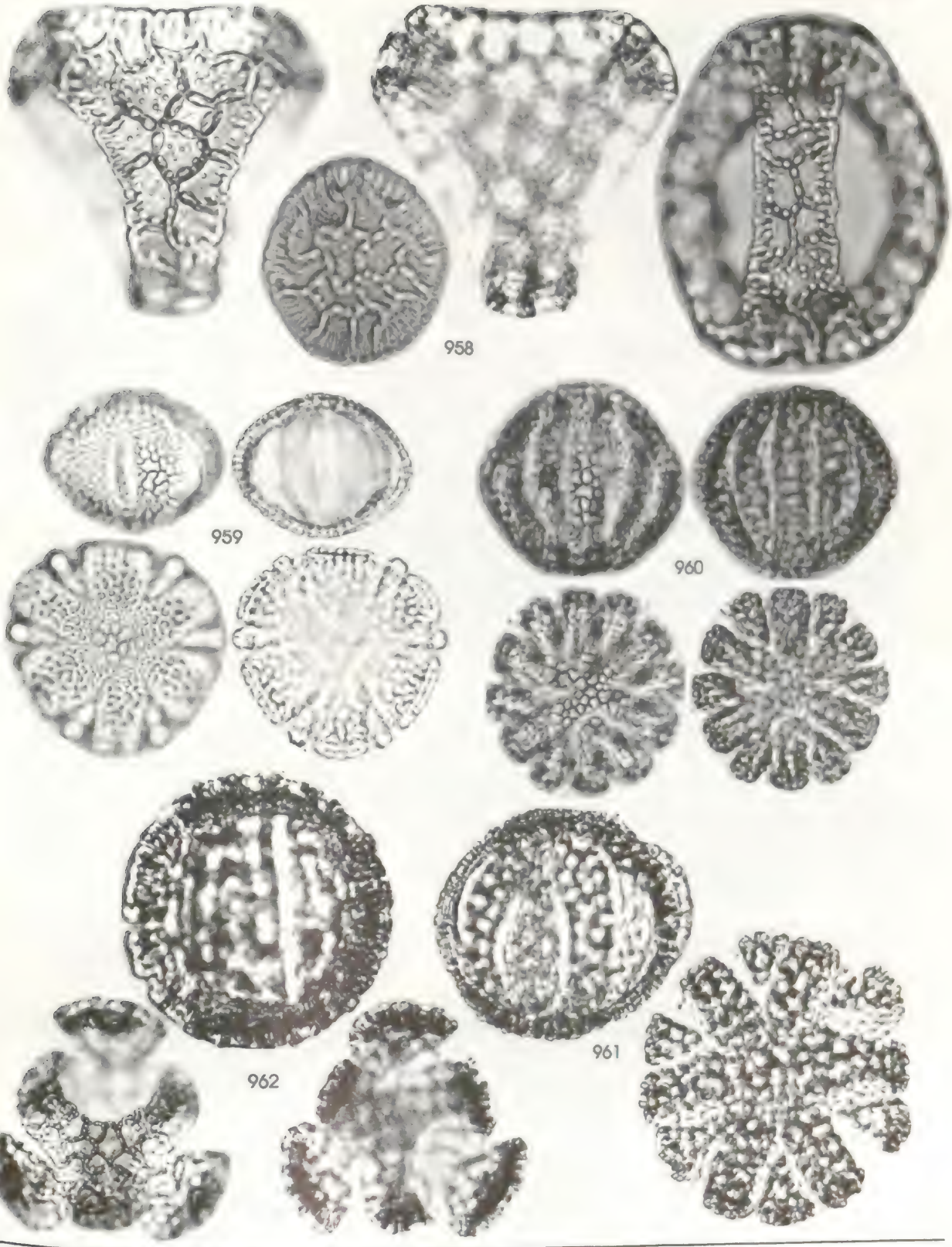


Plate 81. PASSIFLORACEAE: *Passiflora ambigua* (958), *P. auriculata* (959), *P. biflora* (960), *P. coriacea* (961), *P. foetida isthmia* [1/2x] (962)

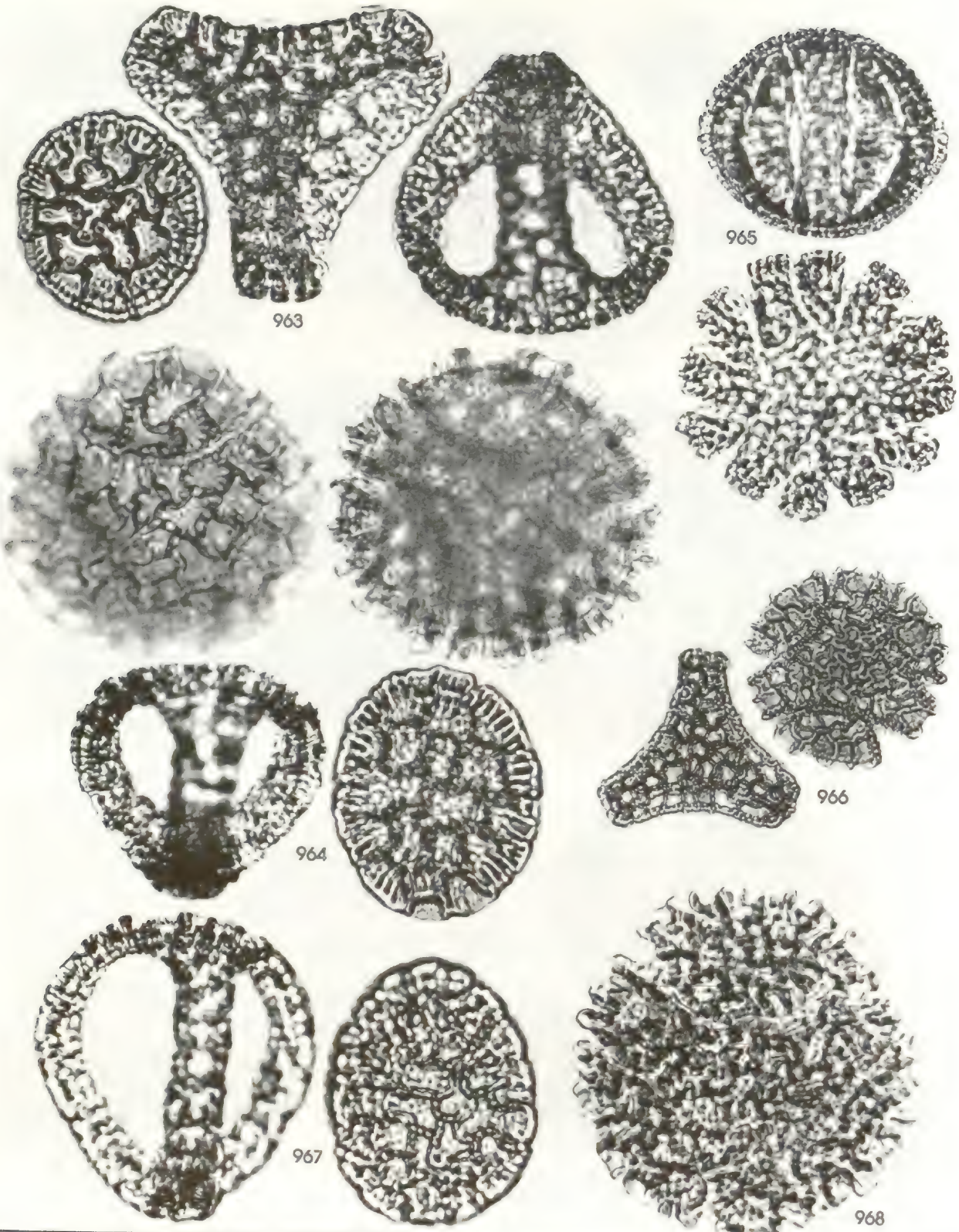


Plate 82. PASSIFLORACEAE: *P. menispermifolia* (963), *P. nitida* (964), *P. punctata* (965), *P. seemannii* [1/2x] (966), *P. vitifolia* (967), *P. williamsii* (968)

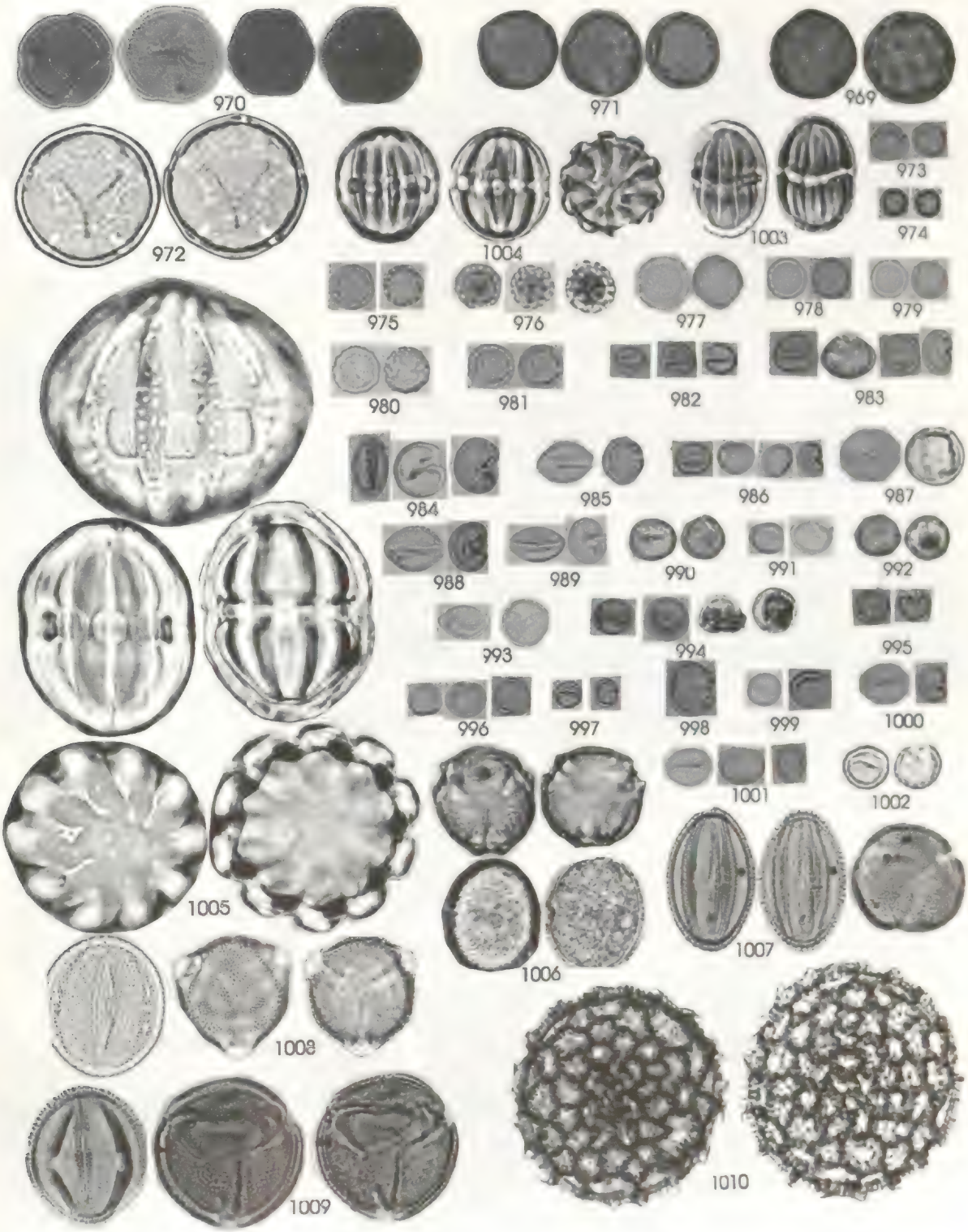


Plate 83. PHYTOLACCACEAE: *Microtea debilis* (969), *Petiveria alliacea* (970), *Phytolacca rivinoides* (971), *Rivina humilis* (972); PIPERACEAE: *Peperomia ciliolibractea* (973), *P. cordulata* (974), *P. glabella* (975), *P. killipi* (976), *P. macrostachya* (977), *P. mameiana* (978), *P. obscurifolia* (979), *P. obtusifolia* (980), *P. rotundifolia* (981), *Piper aequale* (982), *P. arboreum* (983), *P. arietanum* (984), *P. auritum* (985), *P. carrilloanum* (986), *P. cordulatum* (987), *P. culebranum* [*P. colonense*] (988), *P. darienense* (989), *P. dilatatum* (990), *P. grande* (991), *P. hispidum* (992), *P. impertale* (993), *P. marginatum* (994), *P. peracuminatum* (995), *P. perlasense* (996), *P. pseudo-garagaranum* (997), *P. pubistipulum* (998), *P. reticulatum* (999), *P. villiramulum* (1000), *P. viridicaule* (1001), *Pothomorphe peltata* (1002); POLYGALACEAE: *Polygala paniculata* (1003), *Securidaca diversifolia* (1004), *S. tenuifolia* [2x] (1005); POLYGONACEAE: *Coccoloba acuminata* (1006), *C. coronata* (1007), *C. manzanillensis* (1008), *C. parimensis* (1009), *Polygonum acuminatum* (1010)

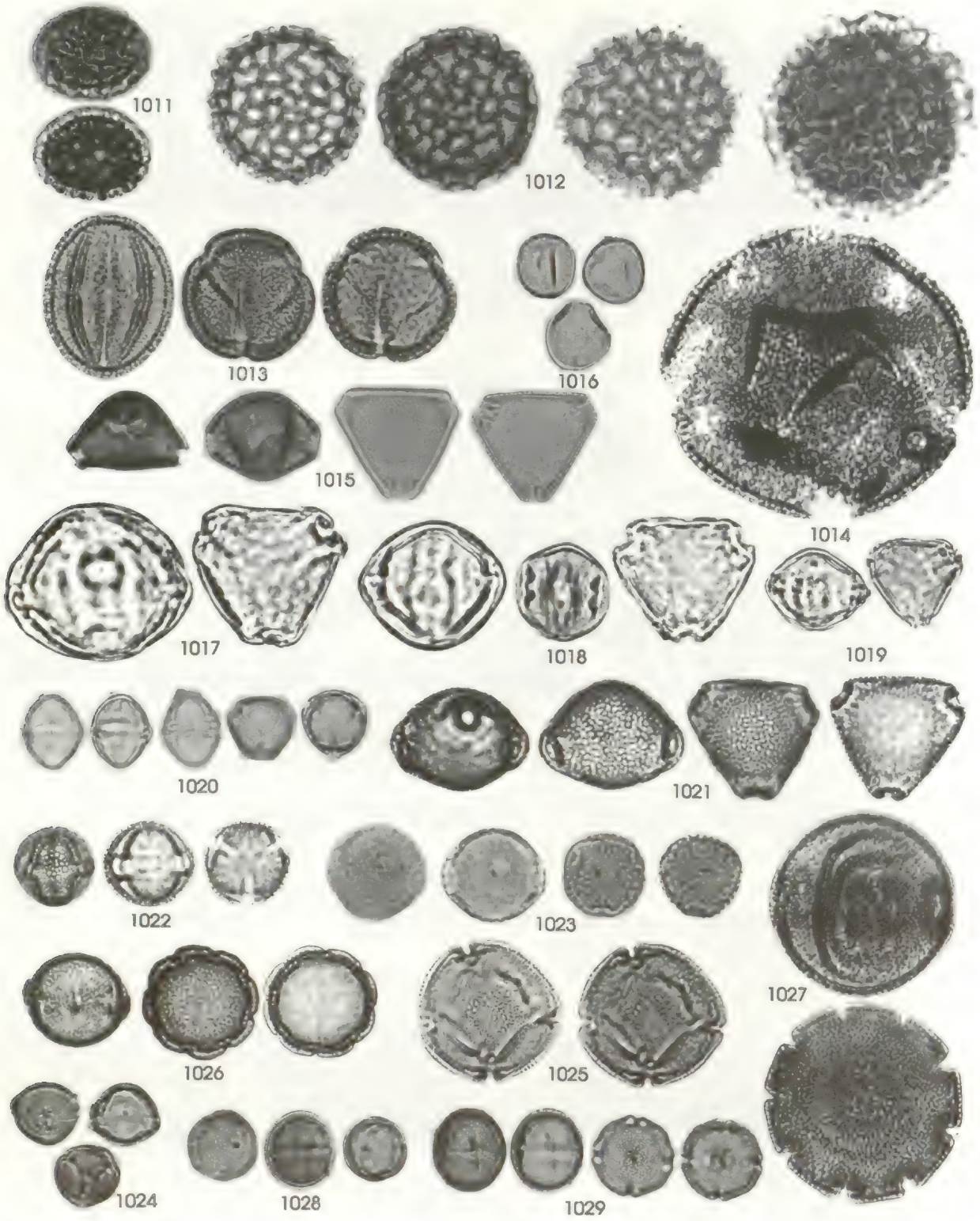


Plate 84. POLYGONACEAE: *Polygonum hydropiperoides* (1011), *P. punctatum* (1012), *Triplaris cumingiana* (1013); PORTULACACEAE: *Portulaca oleracea* (1014); PROTEACEAE: *Roupala montana* (1015); RAFFLESIACEAE: *Apodanthes casearíae* (1016); RHAMNACEAE: *Gouania adenophera* (1017), *G. lupuloides* (1018), *Colubrina glandulosa* (1019); RHIZOPHORACEAE: *Cassipourea elliptica* (1020); RUBIACEAE: *Alibertia edulis* (1021), *Alseis blackiana* (1022), *Amaioua corymbosa* (1023), *Antirhea trichantha* (1024), *Bertiera guianensis* (1025), *Borreria densiflora* (1026), *B. latifolia* (1027), *B. laevis* (1028), *B. ocimoides* (1029)

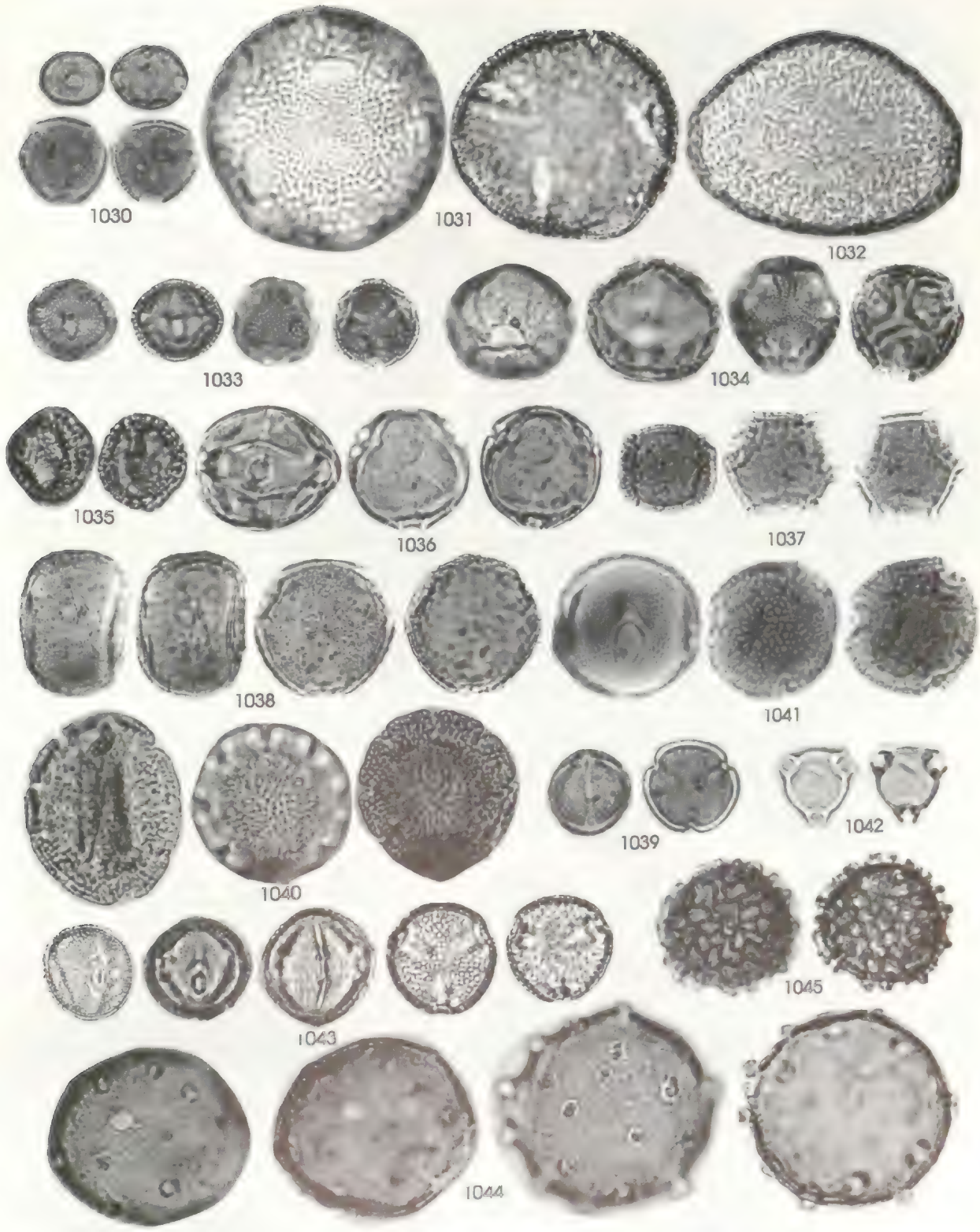


Plate 85. RUBIACEAE: *Calycophyllum candidissimum* (1030), *Cephaelis ipecacuanha* (1031), *C. tomentosa* (1032), *Chimarrhis parviflora* (1033), *Chiococca alba* (1034), *Chomelia spinosa* (1035), *Cosmibuena skinneri* (1036), *Coussarea curvigemmia* (1037), *Coutarea hexandra* (1038), *Diodia denudata* (1039), *D. sarmentosa* (1040), *Faramea luteovirens* (1041), *F. occidentalis* (1042), *Genipa americana* (1043), *Geophila repens* (1044), *Guettarda foliacea* (1045)

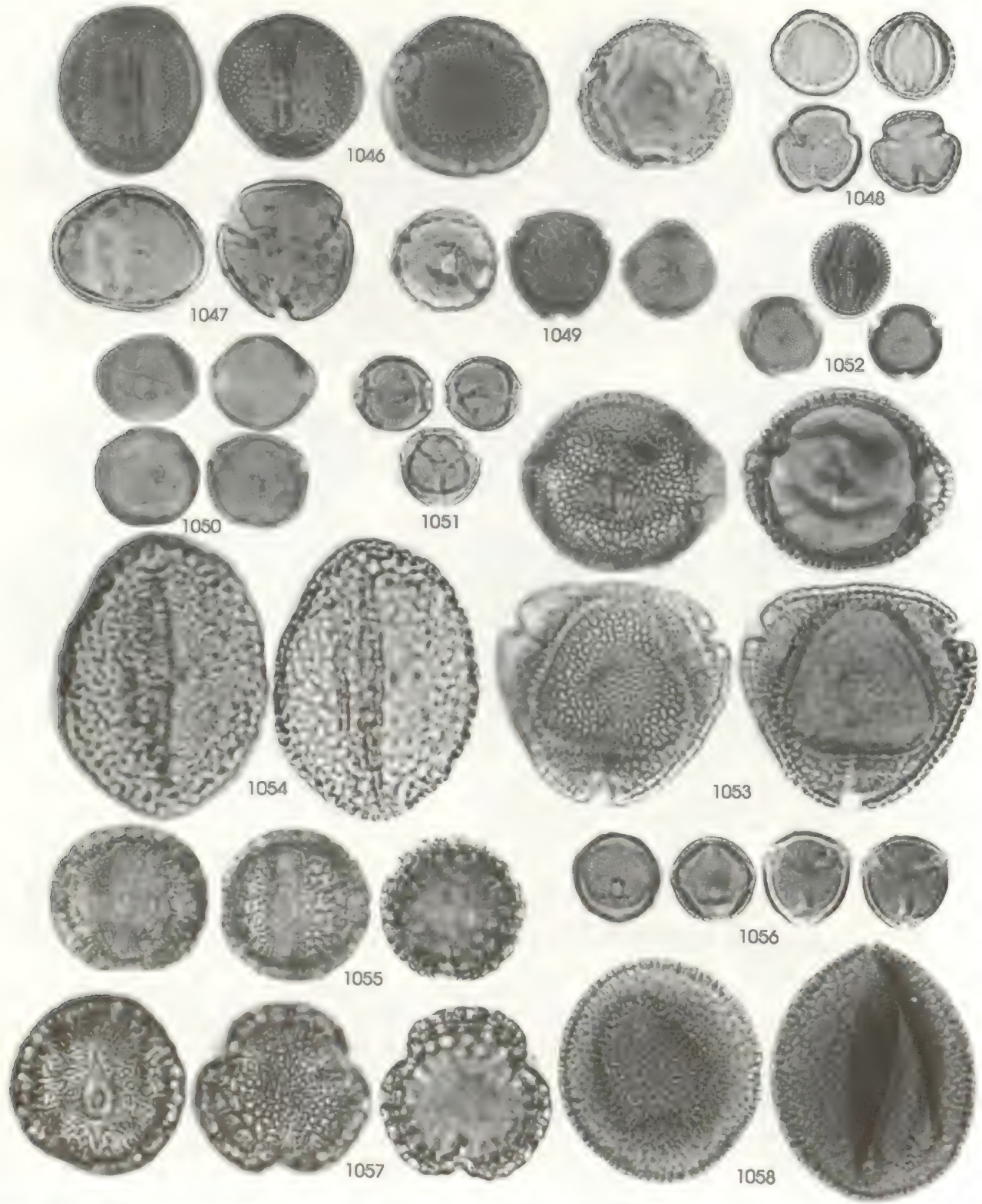


Plate 86. RUBIACEAE: *Hamelia axillaris* (1046), *H. patens* (1047), *Hoffmannia woodsonii* (1048), *Isertia haenkeana* (1049), *Ixora coccinea* (1050), *Macrocnemum glabrescens* (1051), *Oldenlandia corymbosa* (1052), *Manettia reclinata* (1053), *Palicourea gutanensis* (1054), *Pentagonia macrophylla* (1055), *Pogonopus speciosus* (1056), *Posoqueria latifolia* (1057), *Psychotria acuminata* (1058)

Plate 87. RUBIACEAE: *Psychotria brachiata* (1059), *P. brachybotrya* (1060), *P. capitata* (1061), *P. carthaginensis* (1062), *P. emetica* (1063), *P. chagrensis* (1064), *P. deflexa* (1065), *P. furcata* (1066), *P. granadensis* [*P. tenuifolia*] (1067), *P. horizontalis* (1068), *P. grandis* (1069)

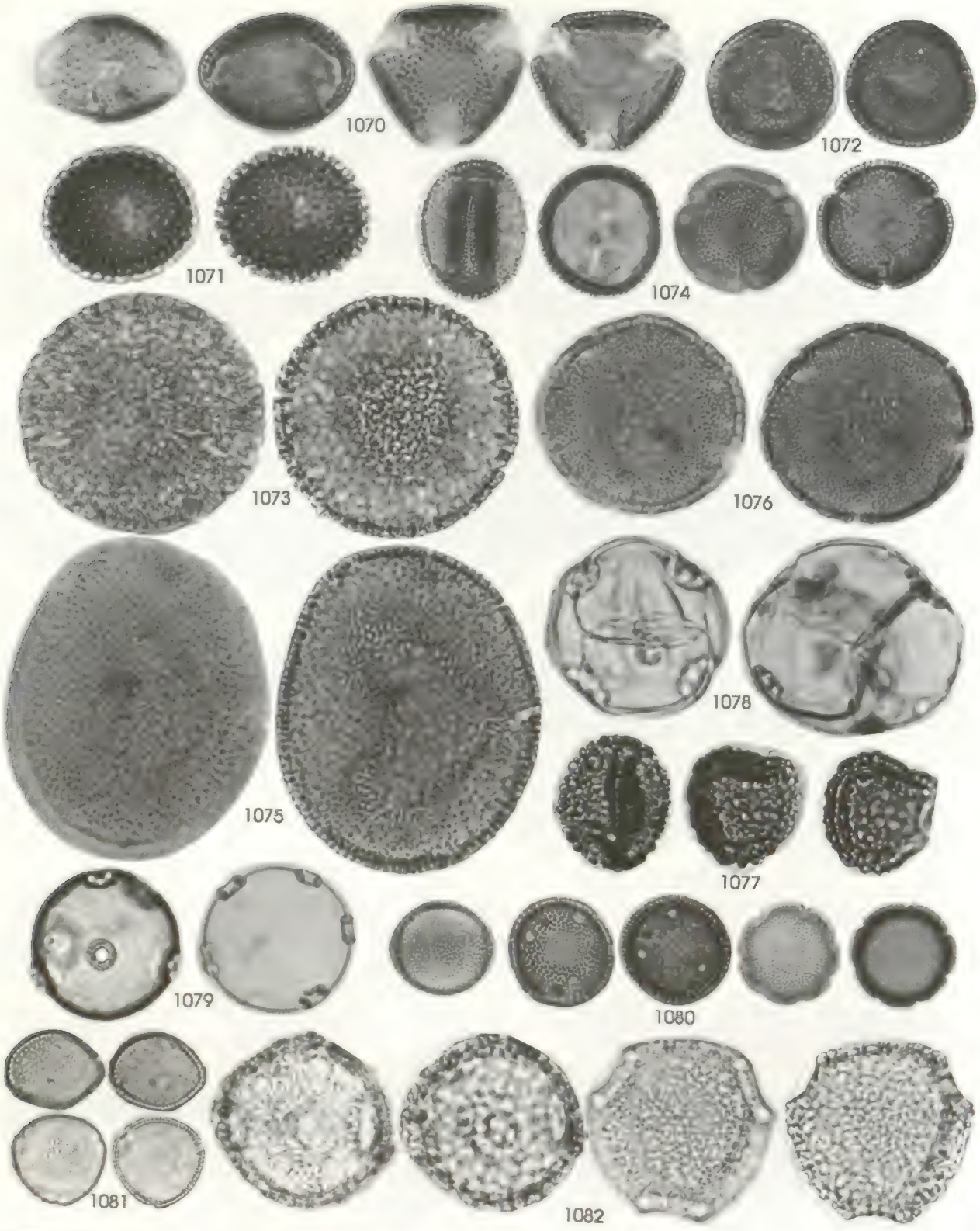


Plate 88. RUBIACEAE: *Psychotria limonensis* (1070), *P. marginata* (1071), *P. micrantha* (1072), *P. pittieri* (1073), *P. psychotriaefolia* (1074), *P. pubescens* (1075), *P. racemosa* (1076), *P. uliginosa* (1077), *Randia armata* (1078), *R. formosa* (1079), *Spermacoce tenuior* (1080), *Sabicea villosa* (1081), *Tocoyena pittieri* (1082)

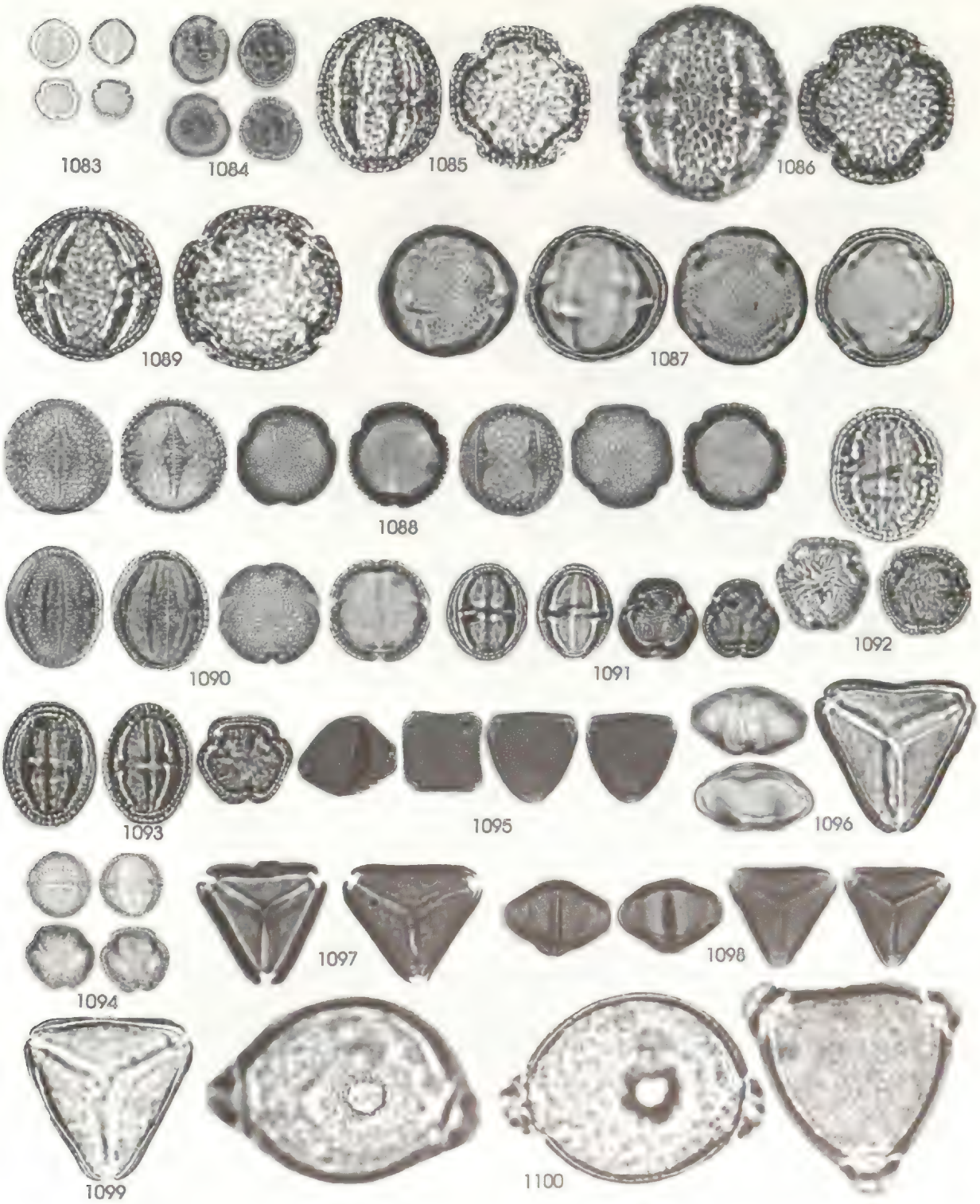


Plate 89. RUBIACEAE: *Uncaria tomentosa* (1083), *Warszewiczia coccinea* (1084); RUTACEAE: *Citrus aurantifolia* (1085), *C. aurantium* (1086), *C. grandis* (1087), *C. limon* (1088), *C. reticulata* (1089), *C. sinensis* (1090), *Zanthoxylum belizense* (1091), *Z. panamense* (1092), *Z. procerum* (1093), *Z. setulosum* (1094); SAPINDACEAE: *Allophylus psilospermus* (1095), *Cupania cinerea* (1096), *C. latifolia* (1097), *C. rufescens* (1098), *C. sylvatica* (1099), *Paullinia baileyi* (1100)

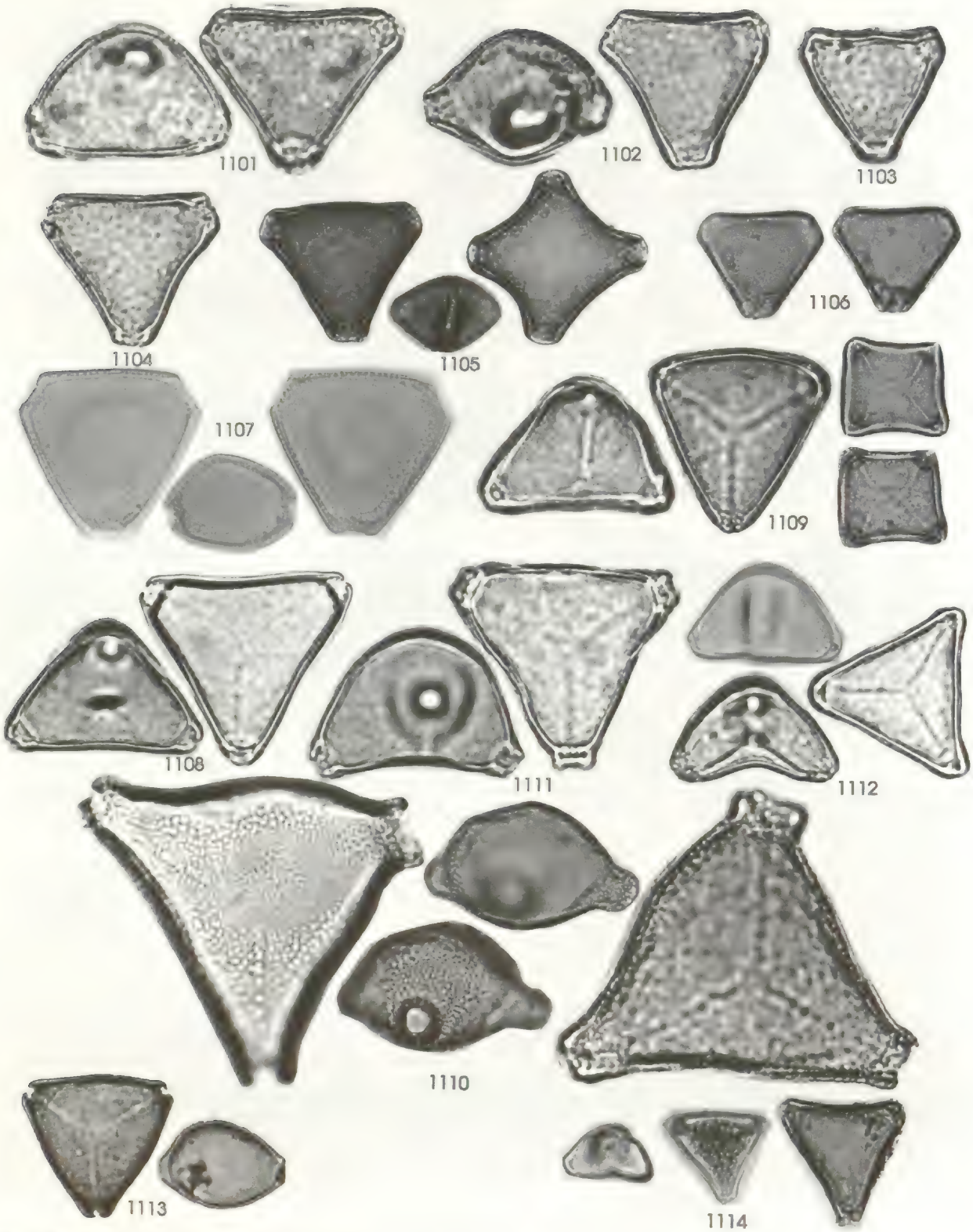


Plate 90. SAPINDACEAE: *Paullinia bracteosa* (1101), *P. fibrigera* (1102), *P. fuscescens glabrata* (1103), *P. glomerulosa* (1104), *P. pinnata* (1105), *P. rugosa* (1106), *P. turbacensis* (1107), *Serjania atrolineata* (1108), *S. circumvallata* (1109), *S. cornigera* (1110), *S. decapleuria* (1111), *S. mexicana* (1112), *S. pluvialiflorens* (1113), *S. paucidentata* (1114)

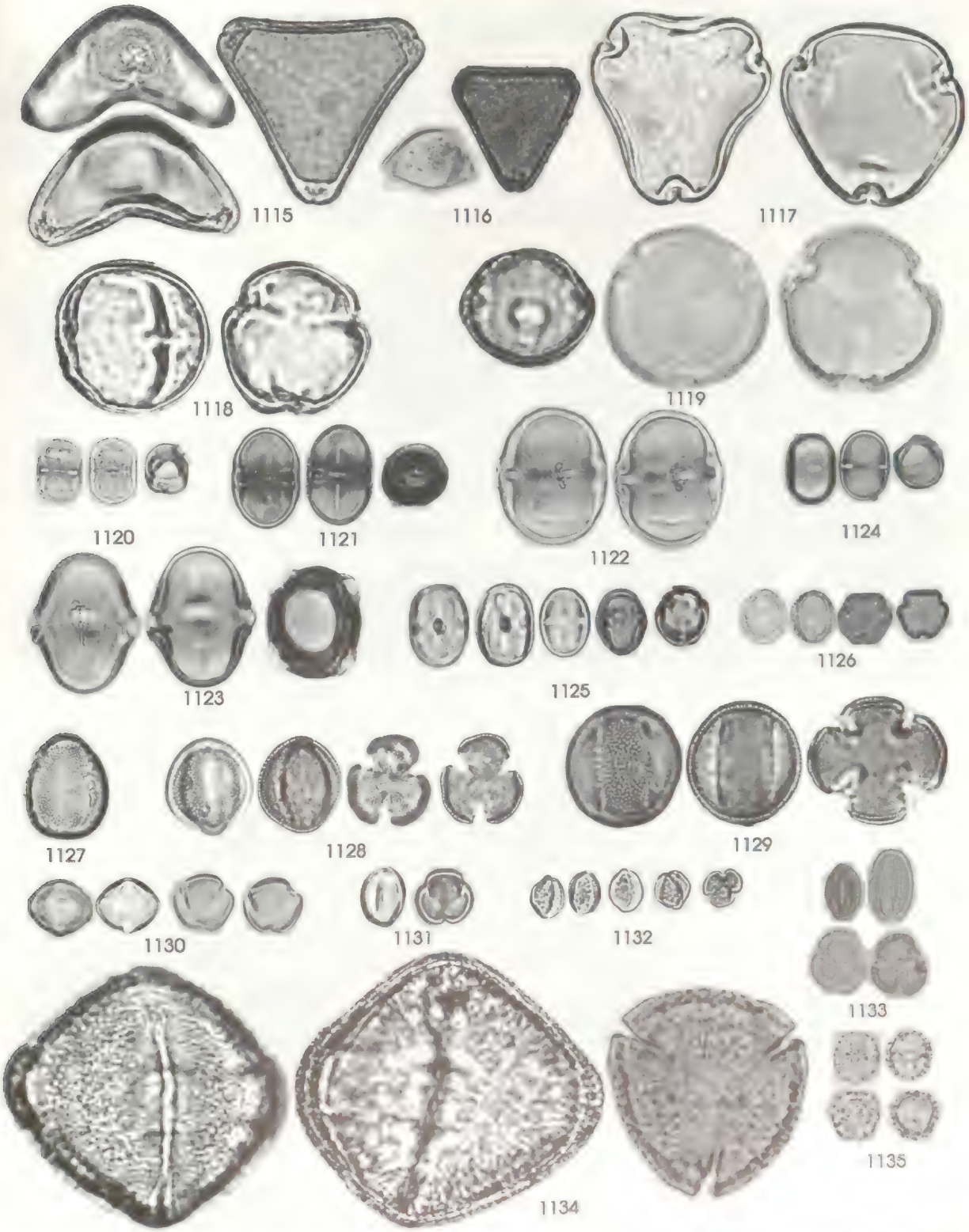


Plate 91. SAPINDACEAE: *Serjania rhombea* (1115), *S. trachygona* (1116), *Talisia nervosa* (1117), *T. princeps* (1118), *Thinouia myriantha* (1119); SAPOTACEAE: *Chrysophyllum cainito* (1120), *Cynodendron panamense* (1121), *Pouteria fossicola* (1122), *P. sapota* (1123), *P. stipitata* (1124), *P. unilocularis* [*P. reticulata*] (1125); SAXIFRAGACEAE: *Hydrangea peruviana* (1126); SCROPHULARIACEAE: *Bacopa salzmannii* (1127), *Lindernia crustacea* (1128), *L. diffusa* (1129), *Mecardonia procumbens* (1130), *Scoparia dulcis* (1131), *Stemodia verticillata* (1132); SIMAROUBACEAE: *Picramnia latifolia* (1133), *Quassia amara* (1134), *Simarouba amara typica* (1135)

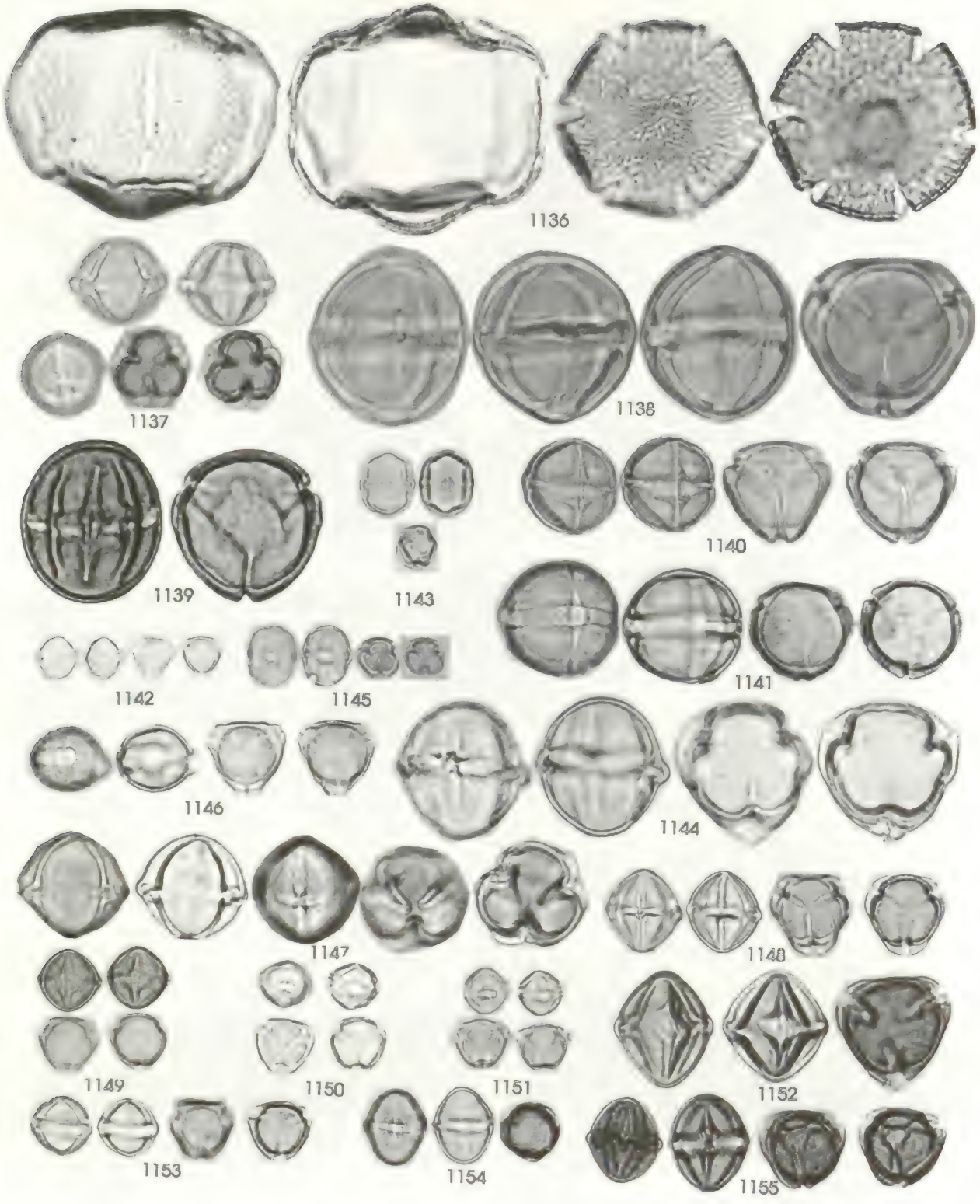


Plate 92. SOLANACEAE: *Browallia americana* [2x] (1136), *Capsicum annuum* (1137), *Cestrum latifolium* [2x] (1138), *C. megalophyllum* [2x] (1139), *C. nocturnum* (1140), *C. racemosum* [2x] (1141), *Cyphomandra allophylla* (1142), *Lycianthes maxonii* (1143), *C. hartwegii* [2x] (1144), *L. synanthera* (1145), *Markea ulei* (1146), *Physalis angulata* (1147), *P. pubescens* (1148), *Solanum antillarum* [*S. nudum*] (1149), *S. arboreum* (1150), *S. argenteum* (1151), *S. asperum* (1152), *S. hayesii* (1153), *S. jamaicense* (1154), *S. lancaefolium* (1155)

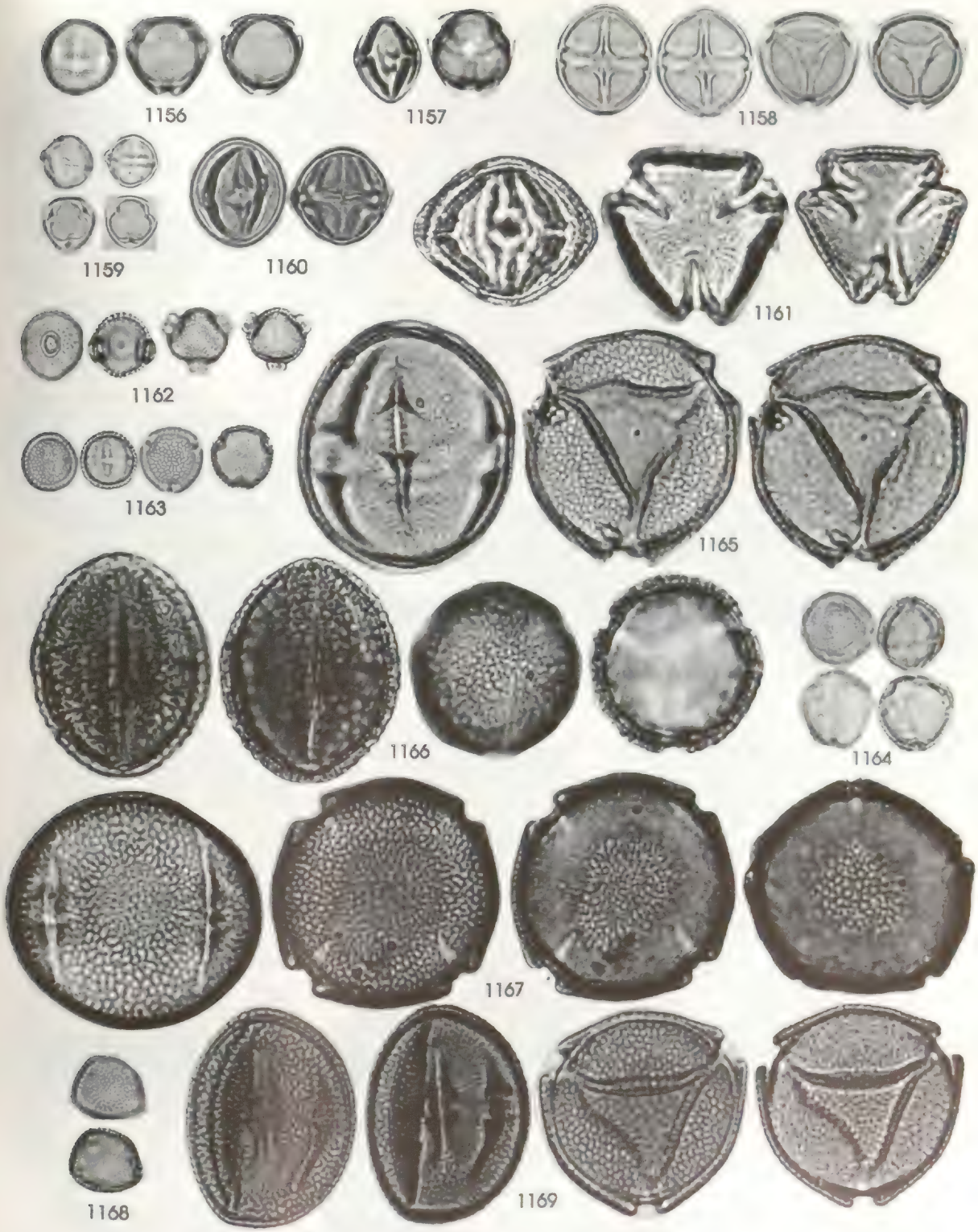


Plate 93. SOLANACEAE: *Solanum ochraceo-ferrugineum* [*S. rudepannum*] (1156), *S. rugosum* (1157), *S. subinerme* (1158), *S. umbellatum* (1159), *Witheringia solanacea* (1160); STAPHYLEACEAE: *Turpinia occidentalis brevíflora* (1161); STERCULIACEAE: *Byttneria aculeata* (1162), *Guazuma ulmifolia* (1163), *Herrania purpurea* (1164), *Melochia lupulina* (1165), *Sterculia apetala* (1166), *Waltheria glomerata* (1167), *Theobroma cacao* (1168), *Melochia melissifolia* (1169)

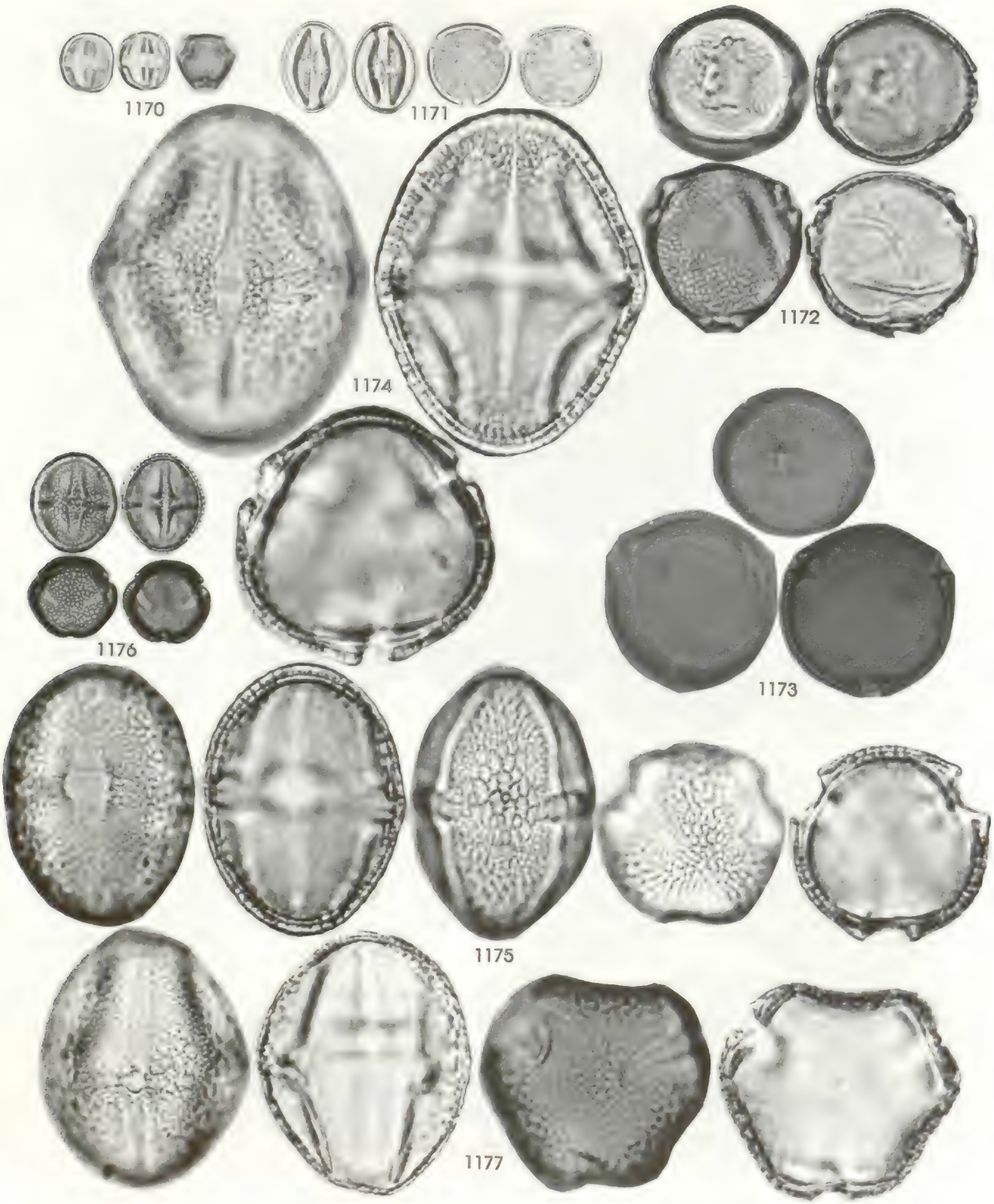


Plate 94. THEACEAE: *Ternstroemia tepezapote* (1170); THEOPHRASTACEAE: *Jacquinia macrocarpa* (1171); TILIACEAE: *Apeiba membranacea* [*A. aspera*] (1172), *A. tibourbou* (1173), *Corchorus siliquosus* (1174), *Heliocarpus popayanensis* [*H. americanus*] (1175), *Luehea seemannii* [1/2x] (1176), *L. speciosa* (1177)

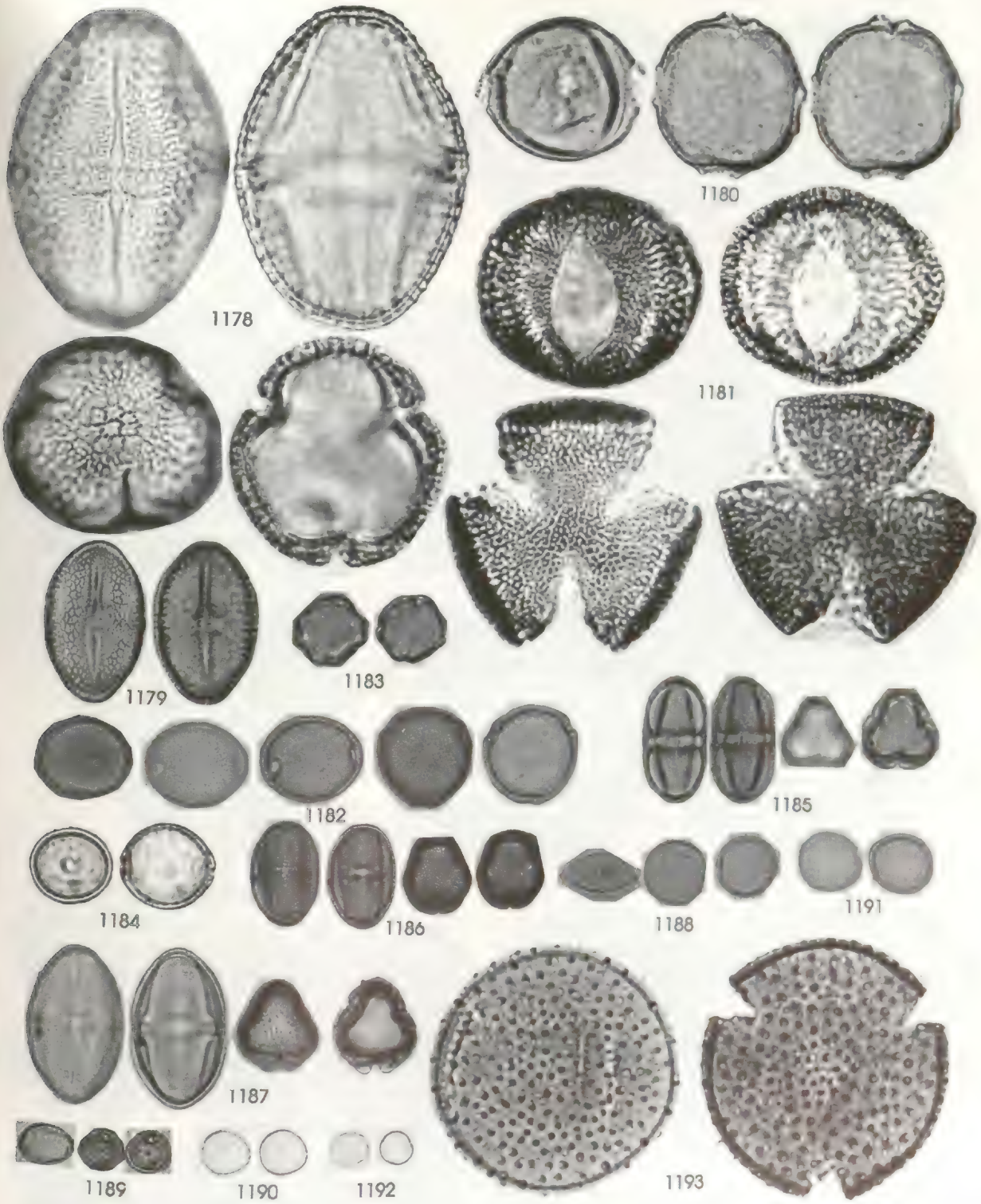


Plate 95. TILIACEAE: *Trichospermum mexicanum* [*T. galeottii*] (1178), *Triumfetta lappula* [1/2x] (1179); TRIGONIACEAE: *Trigonia floribunda* [*T. rugosa*] (1180); TURNERACEAE: *Turnera panamensis* (1181); ULMACEAE: *Celtis iguanaeus* (1182), *C. schippii* (1183), *Trema micrantha* (1184); UMBELLIFERAE: *Eryngium foetidum* (1185), *Hydrocotyle umbellata* (1186), *Spananthe paniculata* (1187); URTICACEAE: *Boehmeria cylindrica* (1188), *Myriocarpa yzabalensis* [*M. longipes*] (1189), *Pilea microphylla* (1190), *Pouzolzia obliqua* (1191), *Urera eggersii* (1192); VERBENACEAE: *Aegiphila elata* (1193)

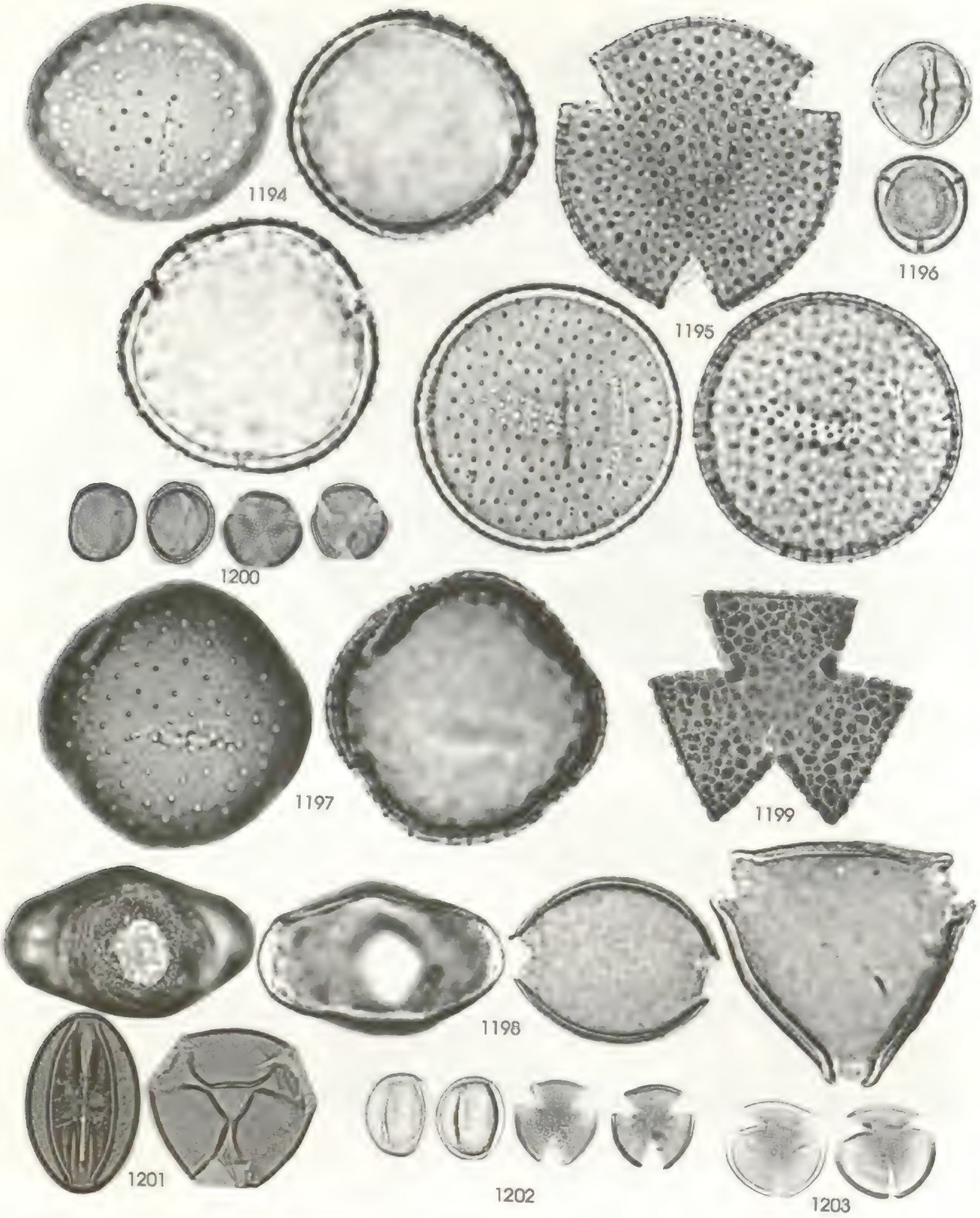


Plate 96. VERBENACEAE: *Aegiphila cephalophora* (1194), *A. panamensis* (1195), *Lantana camara* (1196), *Clerodendrum paniculatum* (1197), *Petrea aspera* (1198), *Stachytarpheta jamaicensis* [1/4x] (1199), *Vitex cooperi* (1200); VIOLACEAE: *Hybanthus prunifolius* (1201), *Rinorea squamata* (1202), *R. sylvatica* (1203)

Plate 97. VITACEAE: *Cissus erosa* (1204), *C. microcarpa* (1205), *C. pseudosicyoides* (1206), *C. rhombifolia* (1207), *C. sicyoides* (1208), *Vitis tiliifolia* (1209); VOCHYSIACEAE: *Vochysia ferruginea* (1210)

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GLOSSARY

acetolysis: a process of acetilation that removes the organic non-sporopollenin portion of pollen and spores.
amb (ambitus): the outline of a spore or pollen grain with the polar axis directed toward the observer.
annulus, annulate: a ringlike area around a pore.
aperture, aperturate: a furrow or pore providing an opening in the exine for growth of the pollen tube or endothallus.
apolar: a pollen grain or spore lacking discernible polarity, in which proximal and distal poles are not distinct.
aspis/aspidate: a grain bearing protuberant domes over the pores.
baculum/bacula baculate: surface sculpture like rods, ≥ 1 μ, in which the radiating elements are of a uniform thickness.
biconvex: a grain that is convex on opposite sides.
bilateral: a grain symmetrically arranged on both sides of the polar axis.
brevitricolpate: with short colpi.
brevitricolporate: with short colpori.
brochus/brochi, brochate: the meshes of a reticulum; the lumen and adjoining half of the muri.
caudicle: the connective element of a pollinarium extending from the base of a pollinium.
clava/clavae, clavate: surface sculpture like rods, < 1 μ, in which radiating elements are thicker at outer end than at base.
colpus/colpi: a germinal fold or furrow; a long and narrow opening in the exine of pollen of a seed plant.
colpoid: a colpuslike furrow.
colpoidorate: a colpuslike furrow with a median pore.
colporus/colpori: a germinal fold or furrow having one pore in its center.
columella/columellae,columellate: with small pillars, or rods, beneath the tectum.
commisure: a joint or seam; the line of dehiscence in the tetrad scar.
concavo-convex: concave and convex on opposite sides .
convex-planar: concave and flattened on opposite sides.
costa: a rib or thickening in the exine.
costa aequitorialis: two parallel costae surrounding the equator.
costa colpi: a costa surrounding a colpus.
costa pori: a costa or annulus surrounding a pore.
costa transversalis: a costa surrounding a transverse furrow.
crassimarginate: a thickening or flange of the exine at the margins of an aperture.
dicolpate: a grain with two colpi.
dicolporate: a grainwith two colpi each having one median pore.
diporate: a grain with two pores.
distal face: the part of a pollen grain or spore that is turned outward in the tetrad; in monocolpate grains, the face having a furrow or pore; in other grains the distal face is indistinguishable, and in spores it is the side opposite the tetrad scar.
echinus/echini,echinate: surface sculpture like pointed spines, ≥ 1 μ, the spines higher than wide.
echinulate: echini < 1 μ high.
elliptic-acute: shaped like an ellipse with more or less pointed ends.
equator: a line separating two hemispheres; that between the proximal and distal hemispheres of a spore, or between the two poles of a pollen grain.
equatorial diameter: the greatest diameter of an oblate pollen grain or spore, or the axis perpendicular to the polar axis.
exine: the outer layer of the pollen grain, consisting of an outermost sexine containing sculptural elements, and an inner nexine.
exitus digitus: a germinal aperture through which a pollen tube emerges.
extraporate: with two or more pores that are free from the colpi.
fenestra/fenestrae,fenestrate: surface sculpture pierced with holes, the lacunae at times occupying more area than the tectate part of the exine.
fossula/fossulae,fossulate: surface sculpture with grooves, but otherwise relatively smooth.
fovea/foveolae,foveolate: surface sculpture with pits ≥ 1 μ in diameter.
gemma/gemmae,gemmate: surface sculpture like rods, ≥ 1 μ, having diameter greater than height and the outer end thicker than the base.
granule/granular, granulate: sculpture with granules, frequently narrowest at their base.
heterobrochate: with brochi of distinctly different sizes.
heterocolpate: with some furrows having pores, other lacking pores, and no free pores present.
heterosyncolpate: with alternating colpi joining at the poles.
heteroparasyncolpate: with alternating colpi bifurcating and uniting at poles, isolating apocolpia of regular shape.
heteropolar: a pollen grain or spore in which the distal and proximal faces differ with regard to apertures.
homobrochate: with brochi of more or less uniform size.
inaperturate: surface lacking pores or furrows.
index formae: the ratio of the greatest to the smallest diameter of the equator, measured in polar view.
intectate: without a tectum; outer pollen wall elements free, not fused.
intercolpium: the area between edges of two colpi (only in bipolar grains).
interporium: the area between two pores or their annuli (only in bipolar grains).
intersubangular: on areas between the angles or corners of a grain, viewed from a pole.
isopolar: a grain in which there are no differences between the proximal and distal faces.
L/O analysis: analysis of grain sculpture by comparison of focus toward the outside of the grain and toward the inside of the grain.
labrum/labra: an unthickened extension of the exine at the pores.
lalongate: a broad, transversely elongate pore.
lateral view: an oblique view where both the equator and a pole are visible at the same time.
lolongate: a longitudinally elongate pore.
lophoreticulate: surface sculpture consisting of longitudinal ridges ≥ 1 μ high.
lumen/lumina: the space or meshes of a reticulum .
margo: *margines;* margin or edge surrounding a furrow, of distinctive thickness or sculpture.
microbaculate: with baculi < 1 μ.
micron, μ, or μm = 1/1000 part of a mm.
monad: any pollen grain or spores occurring singly.
monocolpate: see monosulcate.
monolete: a single, straight tetrad scar of a spore.
monoporate: a grain with one pore.
monosulcate: a grain with one sulcus.
murus/muri: low ridges separating the lumina of an ordinary reticulum.
mother cell: maternal cell or spore that divides to form other cells.

nexine: the inner, nonsculptured portion of the exine.
oblate: flattened at the poles, with a P/E ratio of 0.75 to 0.50.
operculum/opercula, operculate: a distinct thickening or lid over the pore membrane.
os/ora: equatorially arranged pores in a single colpus.
ornamentation: projections of the outer exine, usually consisting of regularly arranged elements.
P/E ratio: the ratio of the polar axis to the greatest equatorial diameter, used to define a grain's general form.
parasyncolpate: with colpi bifurcating and joining at the poles, isolating apocolpia of a regular shape.
parasyncolporate: with colpori bifurcating and joining at the poles, isolating apocolpia of a regular shape.
perforate: pierced through or having dots that look like holes.
pericolpate: with furrows more or less evenly distributed over a grain.
perine: in certain spores, the outmost layer, outside the exine.
periporate: with free pores distributed over the surface of a grain.
peroblate: very flattened, radiosymmetric, isopolar grains, with a P/E ratio < 0.5.
perprolate: with polar axis > 2x the equatorial diameter.
pilum/pila, pilate: with small rods having club-shaped heads.
polar area distance (PAD): the greatest distance between the ends of two furrows or colpi.
pole: extremities of the axis of symmetry in radiosymmetric grains; in the usual tetrahedral arrangement of grains in the mother cell, each grain has an inner and outer pole.
pollen: the multinucleate grains produced in anthers and containing the microgametophyte developed from the microspore.
pollinarium/pollinaria: consisting of two or more pollinia, each composed of agglutined pollen grains in sacs,the associated connectives, and a structure for fastening the pollinarium to a substrate.
pollinium/pollinia: the sac of pollen grains that composes part of the pollinarium.
polyad: pollen grains united in groups of > 8 .
polyplicate: with many colpoid grooves.
pore: a round aperture on the surface of the exine, through which the pollen tube may emerge.
prolate: with the polar axis 1.33 to 2x as long as the equatorial diameter.
proximal view: a view of the proximal surface of a pollen grain or spore, which faces the center of the tetrad.
pseudocolporus/pseudocolport: see pseudocolpus.
psilate: surface sculpture relatively smooth or unornamented.
punctitegillate: the outer surface of the exine displaying minute perforations.
radiosymmetric: with more than two vertical planes of symmetry.
reticulum/reticula,reticulate: surface sculpture of a network of anastomosing ridges (muri) enclosing small, frequently regular surfaces (lumina).
retipilate: having a reticuloid pattern with pila instead of muri.
rugula/rugular,rugulate: surface sculpture of elongate ridges, ≥ 1 μ, a length > 2x width, and of irregular distribution.
scabra/scabrae, scabrate: surface sculpture flecked, with minute pites and elevations, no dimension of which reaches 1 μ.
sclerine: the sporoderm, except for the intine.
sculpture: pattern in ornamentation of the exine.
semitectate: with the tectum developed only partly on the grain surface.
sexine: the outer part of the exine, the part that displays both projecting ornaments and internal or surface sculpturing.
spinule/spinula,spinulose: surface sculpture of small spines, not exceeding 3 μ.
spiraperturate: with furrows in spirals.
spore: the haploid microspore ocontaining the male gametophyte that is the product of division of the mother cell, in palynology, generally the equivalent of the pollen grain, which produces the fertilizing pollen tube.
square tetrad: a tetragonal tetrad.
stephanocolpate: having more than 3 meridional furrows and no pores (e.g. 5-colpate), equatorially arranged.
stephanocolporate: having more than 3 meridional furrows, each bearing a median pore (e.g. 5-colporate), equatorially arranged.
stephanoporate: having more than 3 pores and no furrows (e.g. 5-porate), equatorially arranged.
stipe: the portion of the pollinarium to which are attached the caudicles bearing pollinia; often connected to a basal viscidium.
stria/striae, striate: surface sculpture of long, narrow, more or less parallel grooves and ridges.
subprolate: with the polar axis 1.14 to 1.33x the equatorial diameter.
superposed: placed one on top of the other, as certain types of orchid pollinia.
syncolpate: with colpi joining at the poles.
syncolporate: with colpi, having median pores, joining at the poles.
tectum, tectate: the more or less continuous roof of a pollen grain formed by the sexinic portion of the exine and supported by columellae.
tetrad: a group of 4 grains formed by a mother cell.
tetragonal tetrad: the 4 grains appear in one plane; a square tetrad.
tetrahedral tetrad: the 4 grains arranged in a pyramid, each having a point of contact with the other three.
trichotomocolpate: with a germinal furrow having a 3-slit opening.
trichotomosulcate: with a 3-slit aperture.
tricolpate: a grain with 3 colpi.
tricolporate: a grain with 3 colpori.
trilete: a 3-radiate tetrad scar in a spore.
triporate: with 3 pores.
verruca/verrucae, verrucate: surface sculpture rodlike , ≥ 1 μ, wider than height, not constricted at base.
vestibulum: a compartment between the inner and outer exine at the pore.
viscidium: the basal portion of a pollinarium .
viscin, viscin threads: slender, often very long connectives on grains of Onagraceae.
zonorate: with an anastomosing ora, or series of pores, forming a continuous equatorial ring.

INDEX

§ *not included in the Flora of Barro Colorado Island, or necessarily from central Panama*

APPENDIX

Native plant species listed for Barro Colorado Island in Croat (1978) but not included in the present treatment of pollen and spores.

CRYPTOGAMAE - LYCOPODOPHYTA

SELAGINELLACEAE

1. Selaginella mollis A. Braun

CRYPTOGAMAE - PTEROPHYTA

GLEICHENIACEAE

2. Dicranopteris pectinata (Willd.)

HYMENOPHYLLACEAE

3. Trichomanes ovale (Fourn.) Wessels-Boer

POLYPODIACEAE

4. Adiantum seemannii Hook
5. Ctenitis protensa (Afz.) Copel
   var. funestra (Kunze) Proct.
6. Dryopteris sordida Max.
7. Elaphoglossum herminieri (Bory & Fée) Moore
8. Maxonia apiifolia (Sw.) Christensen
9. Polybotrya villosula H. Christ.
10. Polypodium costatum Kunze
11. Pteris pungens Willd.

ANGIOSPERMAE - MONOCOTYLEDONEAE

AMARYLLIDACEAE

12. Zephyranthes tubisphata Herb.

ARACEAE

13. Dracontium dreslerii Croat
14. Philodendron inconcinnum Schott.
15. Philodendron saggittifolium Liebm.
16. Syngonium sp. Schott

BROMELIACEAE

17. Tillandsia fasciculata Sw
18. Tillandsia monadelpha (E. Morr.) Baker
19. Tillandsia subulifera Mez
20. Vriesia ringens (Griseb.) Harms

CYPERACEAE

21. Hypolytrum schraderianum Nees in Mart.
22. Scleria eggersiana Boeck.

DIOSCOREACEAE

23. Discorea trifida L.f.

GRAMINEAE

24. Acroceras oryzoides Stapf in Prain
25. Andropogon leucostachyus HBK
26. Bambusa amplexifolia (Presl) Schlt. f.
27. Bambusa glaucescens (Willd.) Sieb. ex Munro
28. Bothriochloa intermedia (R. Br.) A. Camus
29. Ichnanthus brevivaginatus Swall.
30. Ichnanthus tenuis (Presl) Hitchc. & Chase
31. Lasiacis sorghoidea (Desv. ex Ham.) Hitchc. & Chase
    var. sorghoidea
32. Paspalum microstachyum Presl
33. Paspalum repens Bergius
34. Sacciolepis striata (L.) Nash
35. Streptochaeta spicata Schrad. ex Ness
36. Streptogyne americana C. E. Hubb. in Hook. f.

HYDROCHARITACEAE

37. Hydrilla verticillata (L. f.) Royle
38. Limnobium stoloniferum (G. Meyer) Griseb

MUSACEAE

39. Heliconia wagneriana O. G. Petersen in Mart.

ORCHIDACEAE

40. Brassia caudata (L.) Lindl.
41. Bulbophyllum pachyrrhachis (Reichb. f.) Griseb.
42. Campylocentrum micranthum (Lindl.) Maury
43. Campylocentrum pachyrrhizum (Reichb. f.) Rolfe
44. Catasetum viridiflavum Hook.
45. Caularthron bilamellatum (Reichb. f.) Schult.
46. Chysis aurea Lindl.
47. Cochleanthes lipscombiae (Rolfe) Garay
48. Dichaea trulla Reichb. f.
49. Dimerandra emarginata (G. Meyer) Hoehne
50. Elleanthus longibracteatus (Lindl. ex Griseb) Fawc.
51. Encyclia chacaoensis (Reichb. f.) Dressler
52. Encyclia chimborazoensis (Schlechter) Dressler
53. Encyclia triptera (Brongn.) Dressler
54. Epidendrum anceps Jacq.
55. Epidendrum imatophyllum Lindl.
56. Epidendrum lockhartioides Schlechter
57. Epidendrum radicans Pav. ex Lindl.
58. Epidendrum rigidum Jacq.
59. Epidendrum rousseauae Schlechter
60. Epidendrum sculptum Reichb. f.
61. Epidendrum strobiliferum Reichb. f.
62. Habenaria alata Hook. f.
63. Habenaria bicornis Lindl.
64. Habenaria repens Nutt.
65. Liparis elata Lindl.
66. Lockhartia acuta (Lindl.) Reichb. f.
67. Lockhartia pittieri Schlechter
68. Maxillaria alba (Hook.) Lindl.
69. Maxillaria camaridii Reichb. f.
70. Maxillaria crassifolia (Lindl.) Reichb. f.
71. Maxillaria powellii Schlechter
72. Mormodes powellii Schlechter
73. Notylia albida Klotzsch in Otto & Dietr.
74. Notylia pentachne Reichb. f.
75. Ornithocephalus bicornis Lindl. in Benth.
76. Pleurothallis brighamii S. Wats.
77. Pleurothallis grobyi Batem. ex Lindl.
78. Pleurothallis trachychlamys Schlechter
79. Pleurothallis verecunda Schlechter
80. Polystachya foliosa (Lindl.) Reichb. f.
81. Psygmorchis pusilla (L.) Dods. & Dressler
82. Scaphyglottis graminifolia (R. & P.) Poepp. & Endl.
83. Scaphyglottis longicaulis S. Wats.
84. Scaphyglottis prolifera Cogn. in Mart.
85. Sobralia rolfeana Schlechter
86. Spiranthes lanceolata (Aubl.) León
87. Stelis crescentiicola Schlechter
88. Triphora gentianoides (Sw.) Ames & Schlechter in Ames
89. Triphora mexicana (S. Wats.) Schlechter
90. Vanilla fragans (Salibs.) Ames

PALMAE

91. Bactris coloradensis Bailey
92. Desmoncus isthmius Bailey

ZINGIBERACEAE

93. Zingiber officinale Rosc.

ANGIOSPERMAE - DICOTYLEDONEAE

ACANTHACEAE

94. Mendoncia littoralis Leonard

ANNONACEAE

95. Guatteria amplifolia Tr. & Planch
96. Xylopia macrantha Tr. & Pl.

APOCYNACEAE

97. Ervatamia coronaria (Jacq.) Staph.
98. Forsteronia viridescens S. F. Blake

CERATOPHYLLACEAE

99. Ceratophyllum demersum L.

CUCURBITACEAE

100. Cayaponia denticulata Killip. ex C. Jeffrey

EUPHORBIACEAE

101. Acalypha wilkesiana L.
102. Phyllanthus urinaria L.

FLACOURTIACEAE

103. Xylosma chlorantum Donn. Sm.

GUTTIFERAE

104. Garcinia magnostana L.

LEGUMINOSAE - MIMOSOIDEAE

105. Pithecellobium barbourianum Standl.

LEGUMINOSAE - PAPILIONOIDEAE

106. Crotalaria vitellina J. Ker. in Lindl.

LORANTHACEAE

107. Phoradendron piperoides (H.B.K.) Trel.

MORACEAE

108. Coussapoa panamensis Pitt.
109. Ficus tonduzii Standl.
110. Pseudolmedia spuria (Sw.) Griseb.

PIPERACEAE

111. Peperomia ebingeri Yunck.
112. Piper aristolochiifolium (Trel.) Yunck.

POLYGONACEAE

113. Coccoloba acapulcensis Standl.

RUBIACEAE

114. Cephaelis discolor Polak
115. Chomelia psilocarpa Dwyer & Hayden
116. Diodia ocimifolia (Willd.) Bremekamp
117. Geophila croatii Steyerm.