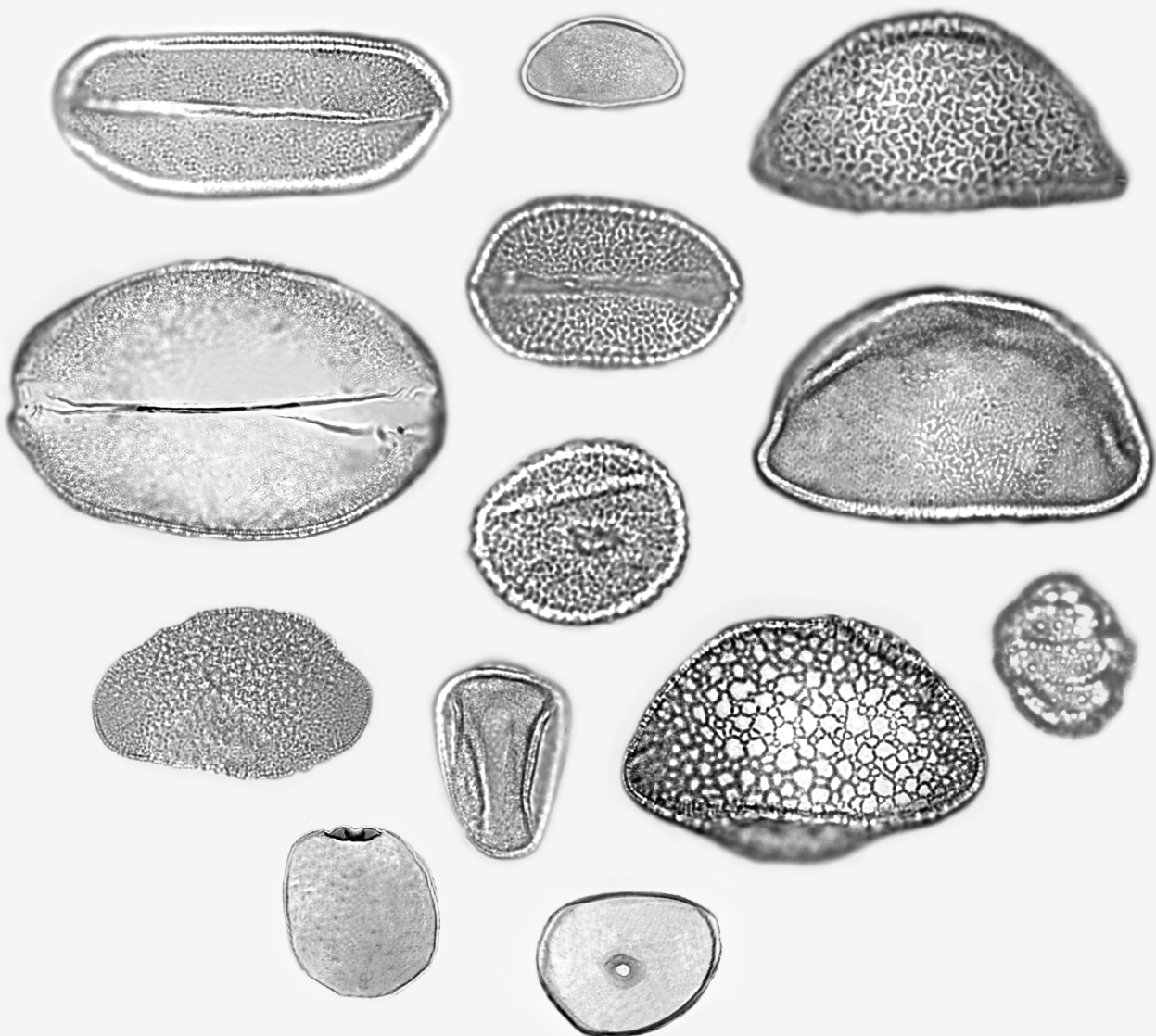


CATALOG OF ANGIOSPERM POLLEN GRAINS FROM THE RIO GRANDE DO SUL FLORA, SOUTHERN BRAZIL

VOL. 2
MONOCOTS

Maria Luisa Lorscheitter and Rinaldo Pires dos Santos



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2024



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Introduction

The characteristic monocot pollen is uniaperturate, with a distal polar monosulcate aperture, the anasulcus. This anasulcate pollen grain is also found in primitive dicots. Evidence suggests that monosulcate is the most primitive pollen of angiosperms (Walker 1974).

Monocot pollen grains are uniaperturate or of uniaperturate-derivate type, only very rarely triaperturate (Cronquist 1981).

A considerable body of evidence, including pollen, indicates that monocots originated at a particularly early date and that their ancestors were among the most primitive monosulcate pollen dicots (Takhtajan 1969).

Cronquist (1981, p. 1033) noted, “The monocots are more primitive than the bulk of dicots in mostly having uniaperturate pollen, but several of the archaic families of dicots also have uniaperturate pollen, so there is no problem here. The fossil pollen record suggests that the origin of monocotyledons from primitive dicotyledons in Aptian-Albian was the first significant dichotomy in the evolutionary diversification of angiosperms.”

According to APG IV (Byng *et al.* 2016) and APP (Cole *et al.* 2017), the monosulcate pollen, along with other features, brings monocots closer to the most primitive group of dicots (ANA GRADE and MAGNOLIIDS), among which pollen of this type also predominates.

The other common aperture in monocot pollen is the ulcus (pore), which is found in the distal polar position, the ana-ulcerate grain. This circular uniaperturate-derived type is primitive, as indicated by its position at the distal pole.

The exine's resistance permits the preservation of many pollen types in appropriate sediments for qualitative and quantitative palynological analyses (Birks & Birks 1980; Birks & Gordon 1985; Berglund 1986). Pollen grains are thus excellent tools with which to reconstruct the paleoenvironment and can indicate the sequence of past environments over geological time.

The palynology of Quaternary sediments profiles, which aims to reconstitute the paleoenvironment of the last millennia in the Coastal Plain and the East Plateau of Rio Grande do Sul, was conducted at the Laboratory of Palynology, Department of Botany, Institute of Biosciences, Federal University of Rio Grande do Sul, UFRGS (Lorscheitter 1983; Lorscheitter & Romero 1985; Lorscheitter 1992, Roth & Lorscheitter 1993; Cordeiro & Lorscheitter 1994; Neves & Lorscheitter 1995; Lorscheitter 1997; Lorscheitter & Dillenburg 1998; Lorscheitter 2003; Leal & Lorscheitter 2007; Leonhardt & Lorscheitter 2010; Scherer & Lorscheitter 2014; Spalding & Lorscheitter 2015; Masetto & Lorscheitter 2019; Roth *et al.* 2021). A reference collection of pollen from Rio Grande do Sul's current flora was essential

to identify the spores and pollen preserved in these sediments. This collection was increased in accordance with the need to identify new palynomorphs to paleoenvironment analysis.

The present study's objective was to report a catalog of angiosperm pollen photomicrographs from this reference collection, to support palynological research, particularly in Southern Brazil. The findings obtained also permit palynological observations regarding some evolutionary aspects of angiosperms.

Methods

The reference pollen of the current monocots presented here for paleoenvironmental analyses was extracted from exsiccate held at the ICN (Instituto de Ciências Naturais) Herbarium, Department of Botany, Institute of Biosciences, UFRGS, which contains species from the flora of Rio Grande do Sul. Some taxa that are unrecorded in Rio Grande do Sul, but that occur in Brazil's southern region may be exceptionally included in the reference collection, to highlight a certain pollen characteristic, as in the case of the dicot *Xylopia grandiflora* A. St.-Hil. (Vol. 1, Lorscheitter & Santos 2023).

Despite being the main field indicator, the pollen of only one species of Poaceae was included in the reference collection owing to its considerable morphological uniformity, which generally permits identification of the family only.

All reference pollen material was collected directly from the herbarium exsiccate using a magnifying glass, and the sample (anthers) was placed in a 10 ml glass centrifuge tube. Information about the exsiccate was recorded in a book, including the respective species numbers of the reference pollen samples collected and the ICN herbarium. The samples were chemically processed by acetolysis (Faegri & Iversen 1975), and the material was subsequently filtered through 250 µm mesh. Five permanent slides were mounted in glycerol-jelly for each species (Salgado-Labouriau 1973; Faegri & Iversen 1975).

Light microscopy (DIAPLAN; Leitz, Wetzlar, Germany) was used for microscopic analyses and photomicrographs. The photomicrographs were taken with a digital camera (DFC295; Leica Microsystems, Wetzlar, Germany) connected to the microscope.

The polar axes and equatorial diameters of 25 grains were measured for each pollen species, and the average was used to obtain an approximate size. In grains that had two equatorial diameters, only the largest equatorial diameter was measured, and only the diameters of the spheroidal grains were measured. Measurements were always taken within 1 week after acetolysis owing to the tendency for the exine to increase over

time until the volume stabilized (Salgado-Labouriau 1973). This may explain why certain photomicrographs had larger pollen grain sizes than indicated in the averages, as they were taken after the respective measurements but preserved the original morphology.

The species were named following the Missouri Botanical Garden (MOBOT) nomenclature (2023), and pollen terminology was based on Punt *et al.* (2007). The general taxonomic ordering of the pollen material followed that of the Angiosperm Phylogeny Group version IV (APG IV; Byng *et al.* 2016) and took the form of a catalog of photomicrographs. The taxa sequence was the same as that in Angiosperm Phylogeny Poster (APP; Cole *et al.* 2017), according to APG IV. A band of the same color as the respective APP clade was placed along the margin of each page of the catalog.

Each pollen grain photomicrograph is accompanied by a legend detailing the name of the species, the registration numbers of the reference collection (left) and the ICN Herbarium, an equatorial or polar view of the grain and respective plane of focus, and the grain's shape to facilitate comparison. For aperturate pollen grains, the number, position, and characteristics of the apertures are indicated. The legends also include the type of ornamentation and the average pollen grain measurements in micrometers (P = polar axis, EQ = greatest equatorial diameter). In general, only the grain diameter measurement is indicated for spheroidal grains.

Characteristics of pollen grains

A substantial number of the 59 monocot species in the reference material have a polar axis smaller than the greatest equatorial diameter, oblate (in general) or peroblate grains, with an elongate latitudinal aperture at the distal pole in the form of a sulcus, monosulcate grain of anasulcate type (25 species). Monosulcate is the most primitive aperture found in angiosperm pollen (Walker 1974).

The abundant monosulcate pollen in the analyzed monocots is also common in primitive dicot species from the reference collection (Lorscheitter & Santos 2023), according to Takhtajan (1969) and Cronquist (1981), authors who suggest that the monocots may have originated from primitive monosulcate dicots. In APG IV (Byng *et al.* 2016) and APP (Cole *et al.* 2017) monosulcate pollen is also among the main characteristics of monocots and the primitive group of dicots.

The anasulcate pollen of the monocots examined were generally eurenticulate (24 species), with a thick-to-fine reticulum. The elongate latitudinal aperture not situated at a pole, the sulculus in sulculate grains, occurred sporadically (four eurenticulate species).

The circular aperture at the distal pole (primitive position), the ulcus, ana-ulcerate grains, also occurs in numerous analyzed monocot (22 species), generally scabrate (17 species) or rugulate (five species).

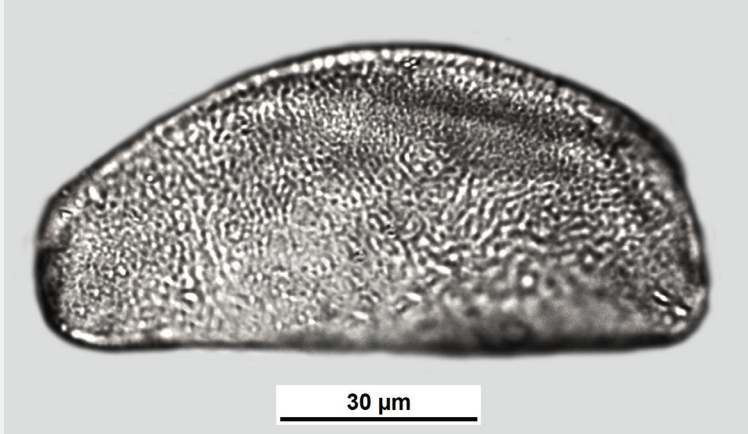
Spiraperturate microechinate pollen grains occurred sporadically (four species).

Rare grains granulate (two species) and psilate (three species) were found in the analysed material.

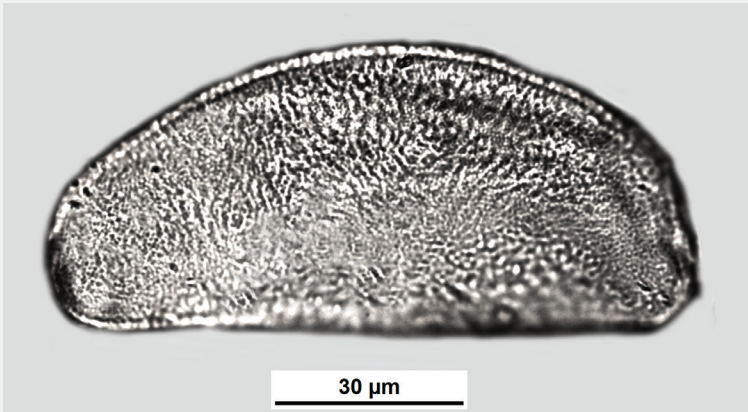
As in primitive dicots, the results confirm that pollen morphology can contribute to our understanding of monocot evolution.

The pages that follow present the catalog, which contains photomicrographs of the 59 species studied, according to the MONOCOTS in the APP sequence (Cole *et al.* 2017).

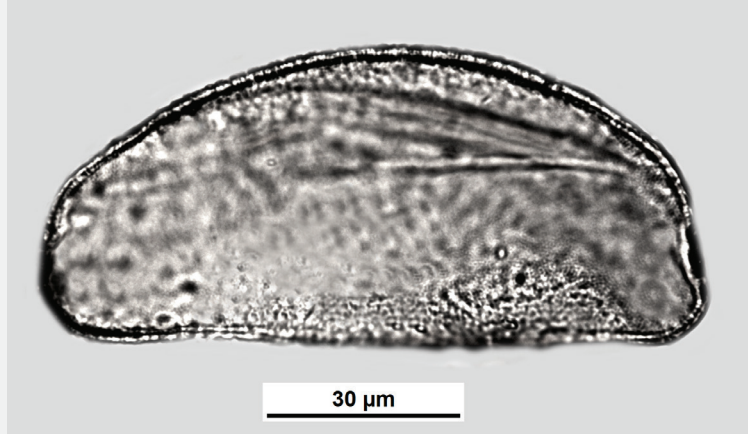
Alstroemeriaceae



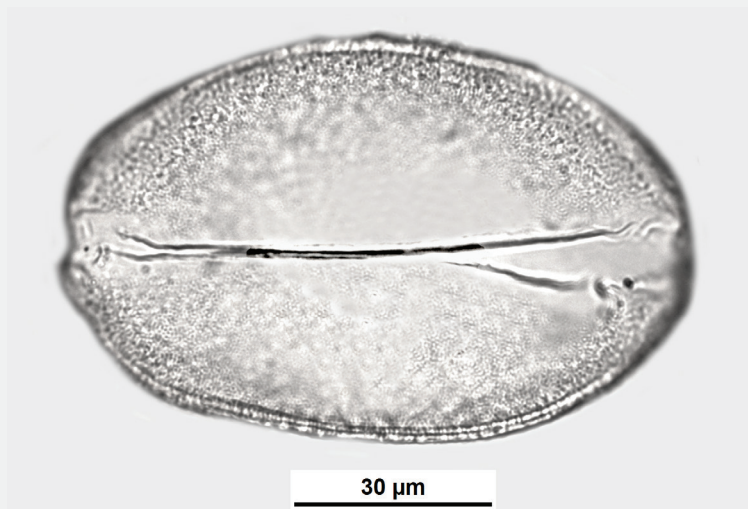
Alstroemeria isabellana Herb.
856 – ICN 68266
Equatorial view: first plane
Oblate - Anasulcate - Reticulate
P \bar{x} = 57 μ m EQ \bar{x} = 98 μ m



Alstroemeria isabellana Herb.
856 – ICN 68266
Equatorial view: second plane
Oblate - Anasulcate - Reticulate
P \bar{x} = 57 μ m EQ \bar{x} = 98 μ m

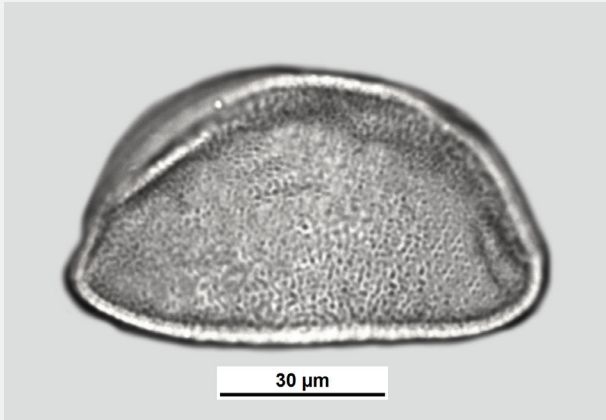


Alstroemeria isabellana Herb.
856 – ICN 68266
Equatorial view: third plane
Oblate - Anasulcate - Reticulate
P \bar{x} = 57 μ m EQ \bar{x} = 98 μ m

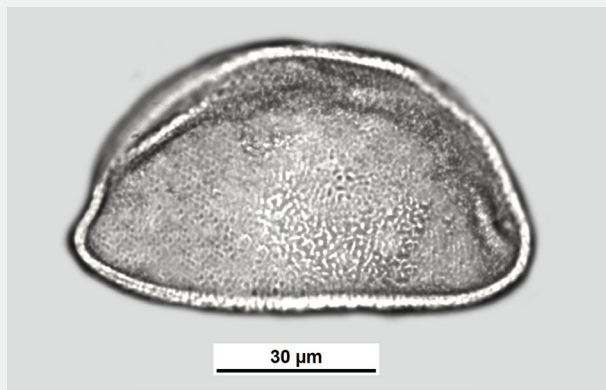


Alstroemeria isabellana Herb.
856 – ICN 68266
Polar view Distal

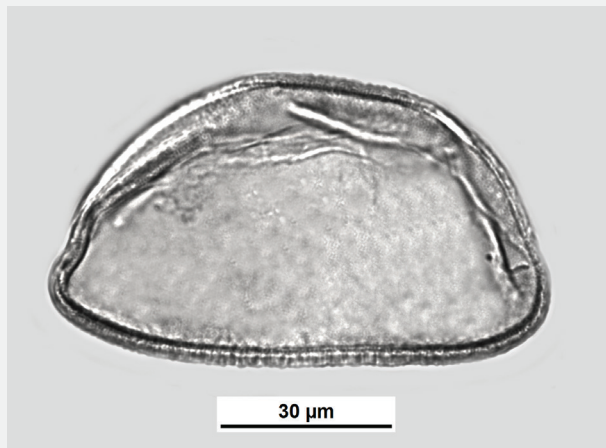
Alstroemeriaceae



Bomarea edulis (Tussac) Herb.
714 – ICN 40467
Equatorial view: first plane
Oblate - Anasulcate - Reticulate
P \bar{x} = 49 μ m EQ \bar{x} = 91 μ m



Bomarea edulis (Tussac) Herb.
714 – ICN 40467
Equatorial view: second plane
Oblate - Anasulcate - Reticulate
P \bar{x} = 49 μ m EQ \bar{x} = 91 μ m

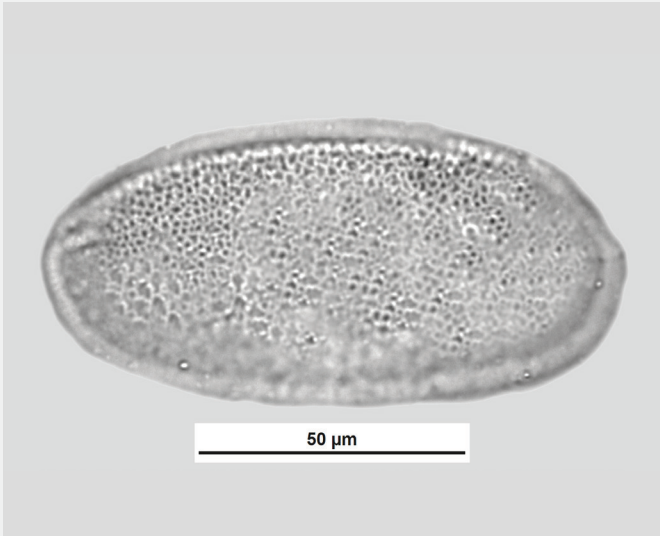


Bomarea edulis (Tussac) Herb.
714 – ICN 40467
Equatorial view: third plane
Oblate - Anasulcate - Reticulate
P \bar{x} = 49 μ m EQ \bar{x} = 91 μ m



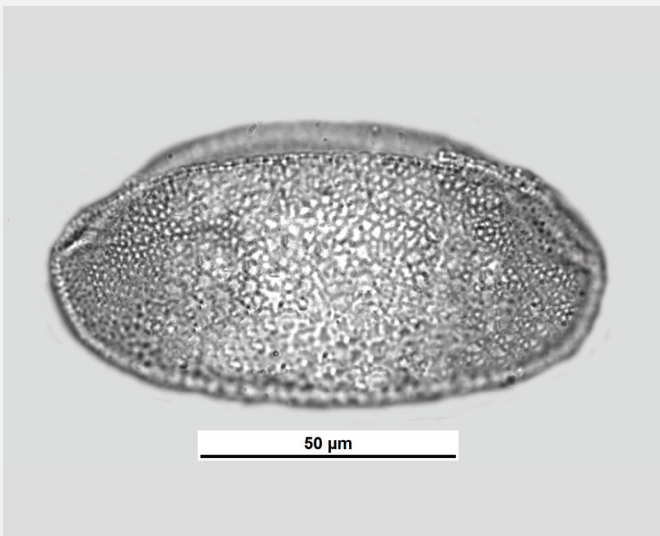
Bomarea edulis (Tussac) Herb.
714 – ICN 40467
Polar view Distal face
Oblate - Anasulcate - Reticulate
P \bar{x} = 49 μ m EQ \bar{x} = 91 μ m

Amaryllidaceae



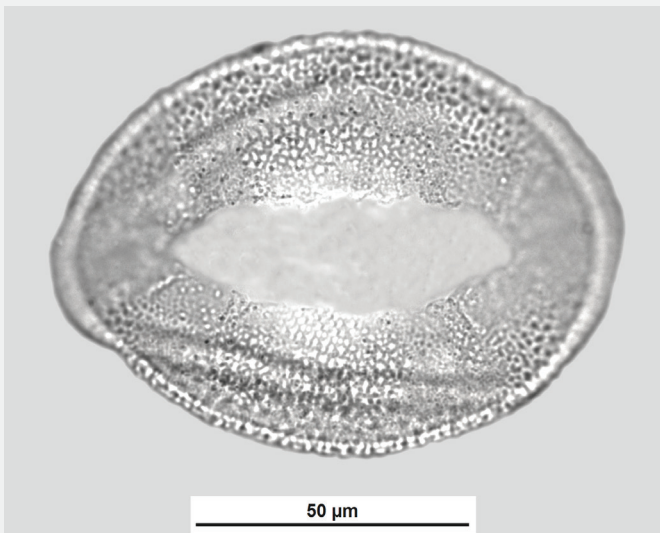
Amaryllis breviflora (Herb.) Traub & Uphof.
855 – ICN 68265

Equatorial view: first plane
Oblate - Anasulcate - Reticulate
P \bar{x} = 58 μ m EQ \bar{x} = 86 μ m



Amaryllis breviflora (Herb.) Traub & Uphof.
855 – ICN 68265

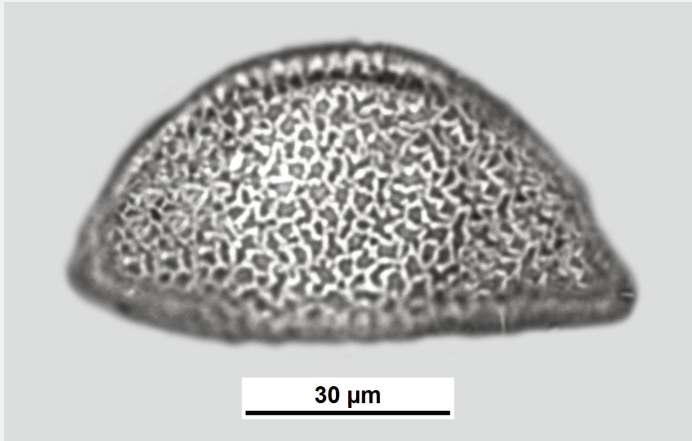
Equatorial view: second plane
Oblate - Anasulcate - Reticulate
P \bar{x} = 58 μ m EQ \bar{x} = 86 μ m



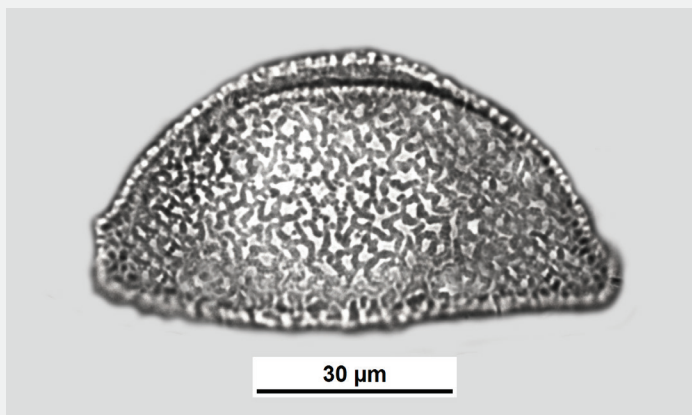
Amaryllis breviflora (Herb.) Traub & Uphof.
855 – ICN 68265

Polar view Distal face
Oblate - Anasulcate - Reticulate
P \bar{x} = 58 μ m EQ \bar{x} = 86 μ m

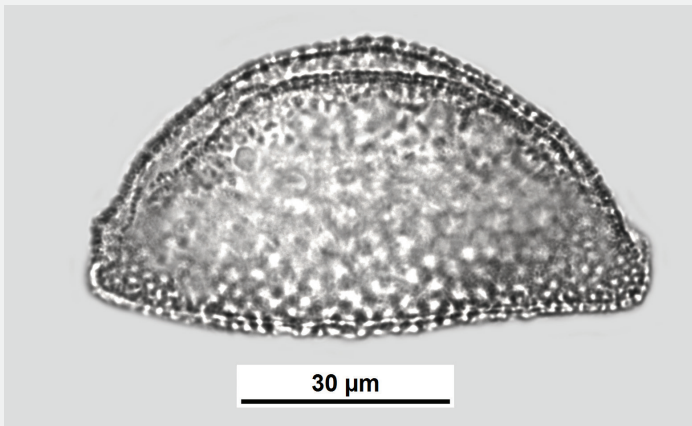
Amaryllidaceae



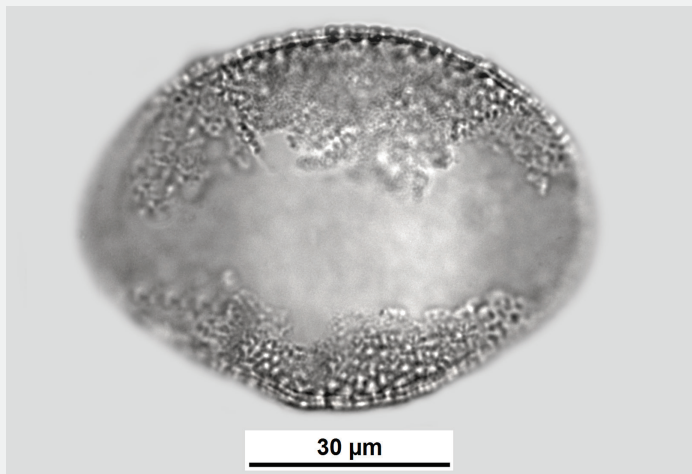
Amaryllis robusta (Herb.) Sweet ex Steud.
1023 – ICN 85618
Equatorial view: first plane
Oblate - Anasulcate - Reticulate
P \bar{x} = 43 μ m EQ \bar{x} = 68 μ m



Amaryllis robusta (Herb.) Sweet ex Steud.
1023 – ICN 85618
Equatorial view: second plane
Oblate - Anasulcate - Reticulate
P \bar{x} = 43 μ m EQ \bar{x} = 68 μ m

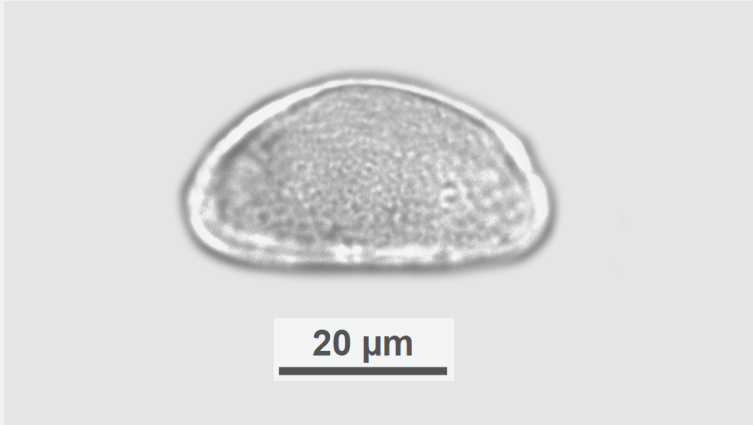


Amaryllis robusta (Herb.) Sweet ex Steud.
1023 – ICN 85618
Equatorial view: third plane
Oblate - Anasulcate - Reticulate
P \bar{x} = 43 μ m EQ \bar{x} = 68 μ m

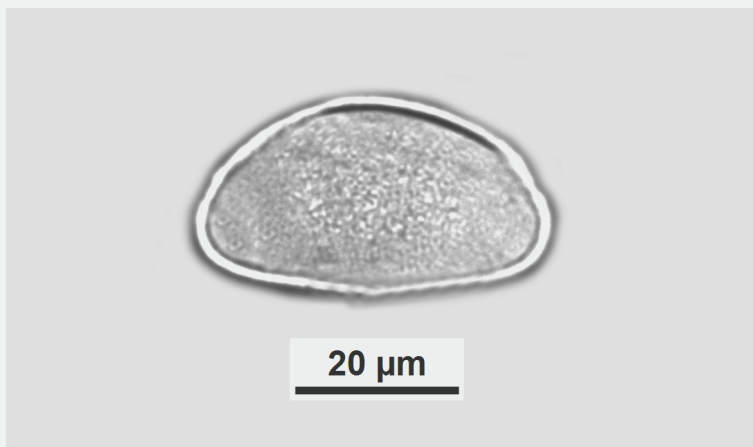


Amaryllis robusta (Herb.) Sweet ex Steud.
1023 – ICN 85618
Polar view Distal face
Oblate - Anasulcate - Reticulate
P \bar{x} = 43 μ m EQ \bar{x} = 68 μ m

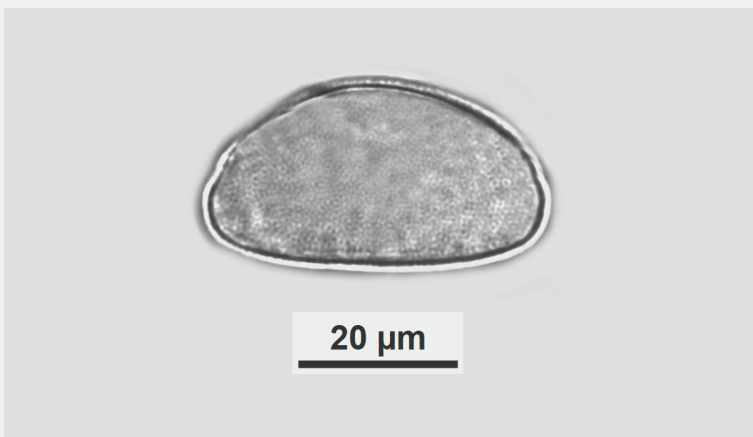
Amaryllidaceae



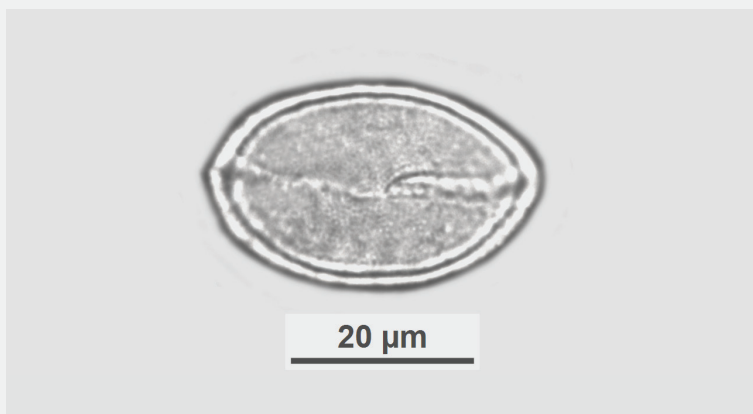
Nothoscordum bivalve (L.) Britton
373 – ICN 16542
Equatorial view: first plane
Oblate - Anasulcate - Reticulate
P \bar{x} = 21 μ m EQ \bar{x} = 32 μ m



Nothoscordum bivalve (L.) Britton
373 – ICN 16542
Equatorial view: second plane
Oblate - Anasulcate - Reticulate
P \bar{x} = 21 μ m EQ \bar{x} = 32 μ m

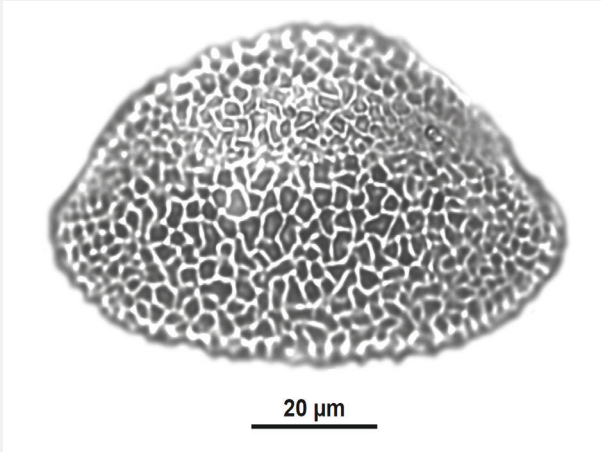


Nothoscordum bivalve (L.) Britton
373 – ICN 16542
Equatorial view: third plane
Oblate - Anasulcate - Reticulate
P \bar{x} = 21 μ m EQ \bar{x} = 32 μ m

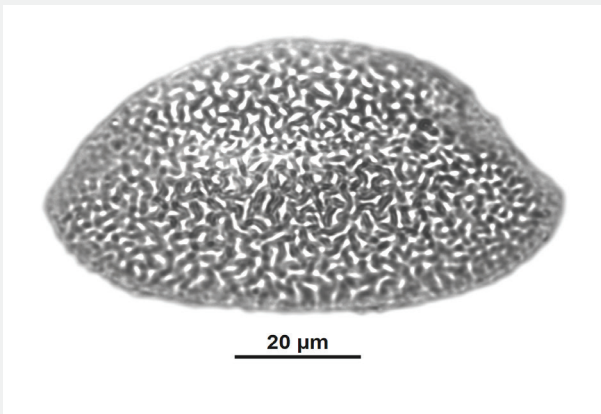


Nothoscordum bivalve (L.) Britton
373 – ICN 16542
Polar view Distal face
Oblate - Anasulcate - Reticulate
P \bar{x} = 21 μ m EQ \bar{x} = 32 μ m

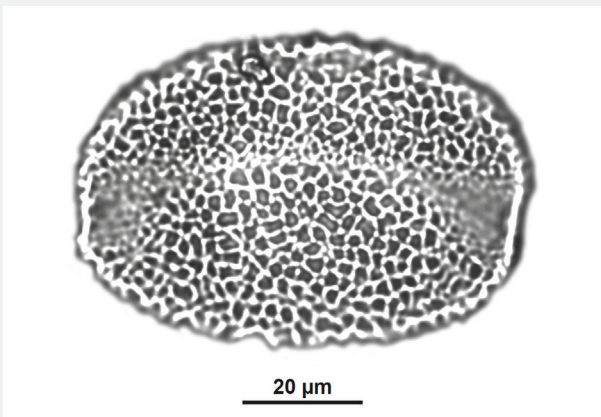
Amaryllidaceae



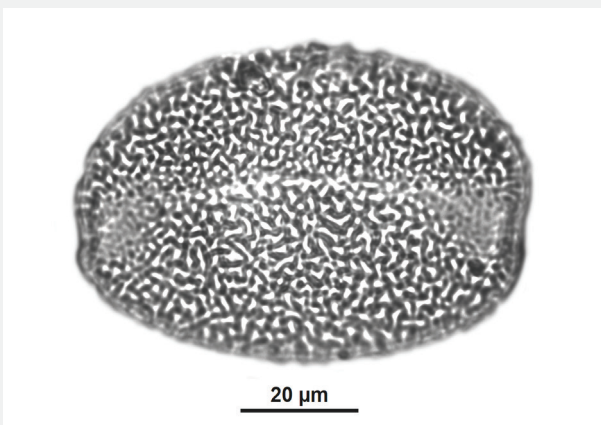
Zephyranthes andersonii (Herb. ex Lindl.) Baker
91 – ICN 509
Equatorial view: first plane
Oblate - Anasulcate - Reticulate
P \bar{x} = 36 μ m EQ \bar{x} = 69 μ m



Zephyranthes andersonii (Herb. ex Lindl.) Baker
91 – ICN 509
Equatorial view: second plane
Oblate - Anasulcate - Reticulate
P \bar{x} = 36 μ m EQ \bar{x} = 69

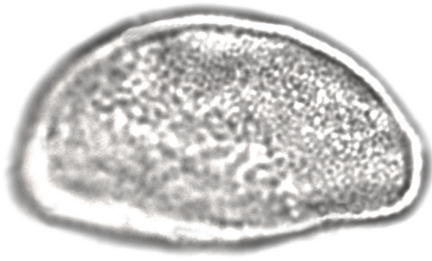


Zephyranthes andersonii (Herb. ex Lindl.) Baker
91 – ICN 509
Polar view Distal face: first plane
Oblate - Anasulcate - Reticulate
P \bar{x} = 36 μ m EQ \bar{x} = 69 μ m



Zephyranthes andersonii (Herb. ex Lindl.) Baker
91 – ICN 509
Polar view Distal face: second plane
Oblate - Anasulcate - Reticulate
P \bar{x} = 36 μ m EQ \bar{x} = 69 μ m

Asparagaceae



20 µm

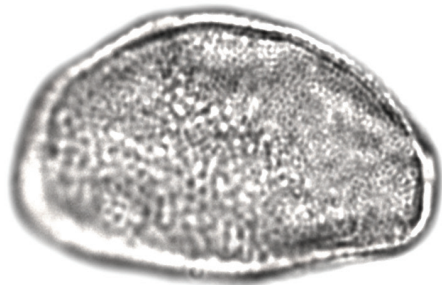
Herreria montevidensis Klotzsch ex Griseb.

372 – ICN 321

Equatorial view: first plane

Oblate - Anasulcate – Reticulate

P \bar{x} = 24 µm EQ \bar{x} = 41 µm



20 µm

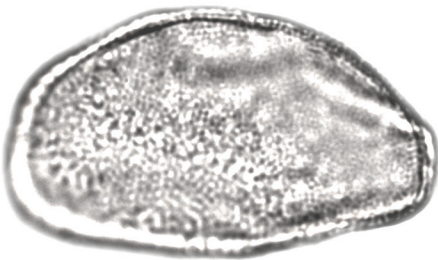
Herreria montevidensis Klotzsch ex Griseb.

372 – ICN 321

Equatorial view: second plane

Oblate - Anasulcate - Reticulate

P \bar{x} = 24 µm EQ \bar{x} = 41 µm



20 µm

Herreria montevidensis Klotzsch ex Griseb.

372 – ICN 321

Equatorial view: third plane

Oblate - Anasulcate - Reticulate

P \bar{x} = 24 µm EQ \bar{x} = 41 µm



20 µm

Herreria montevidensis Klotzsch ex Griseb.

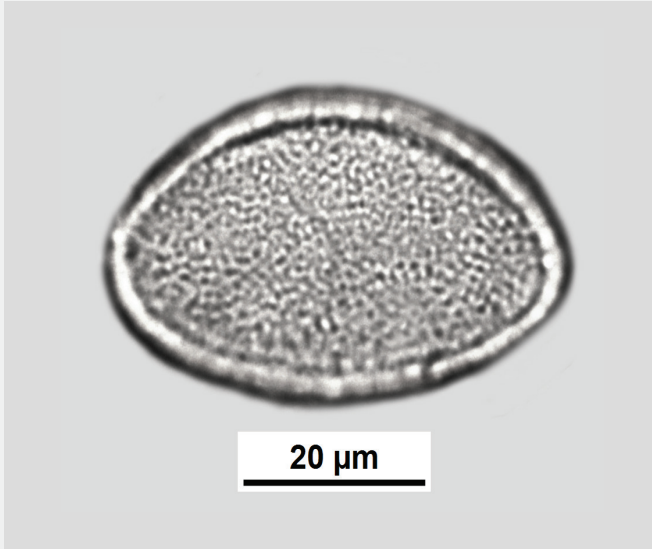
372 – ICN 321

Polar view Distal face

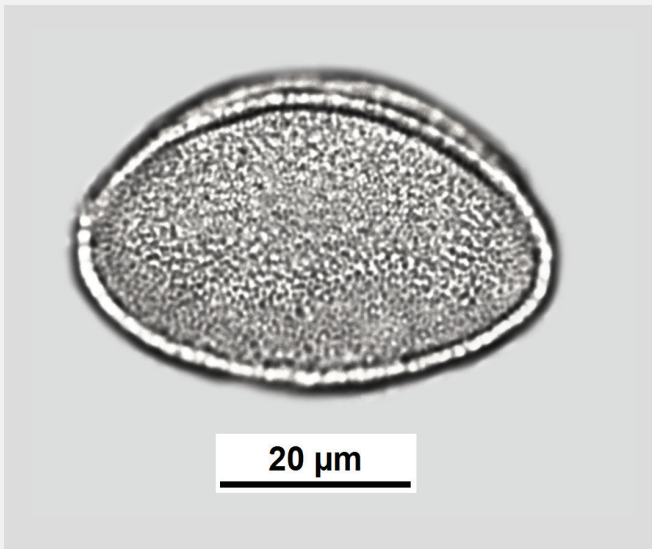
Oblate - Anasulcate - Reticulate

P \bar{x} = 24 µm EQ \bar{x} = 41 µm

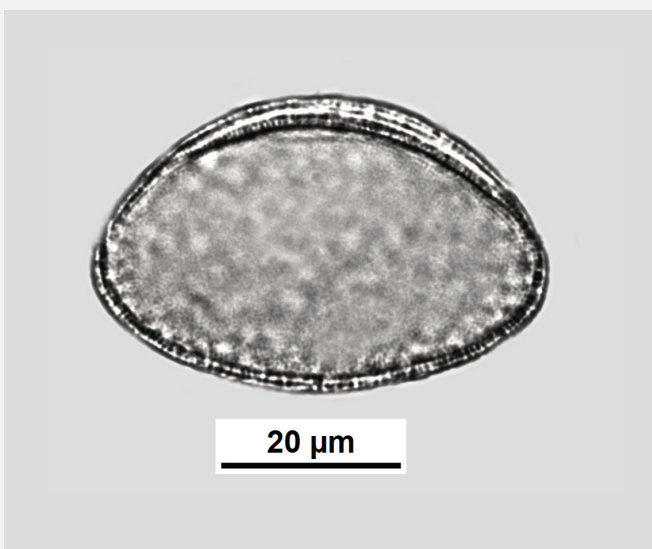
Hypoxidaceae



Hypoxis decumbens L.
712 – ICN 5256
Equatorial view: first plane
Oblate - Anasulcate - Reticulate
P \bar{x} = 32 μ m EQ \bar{x} = 51 μ m

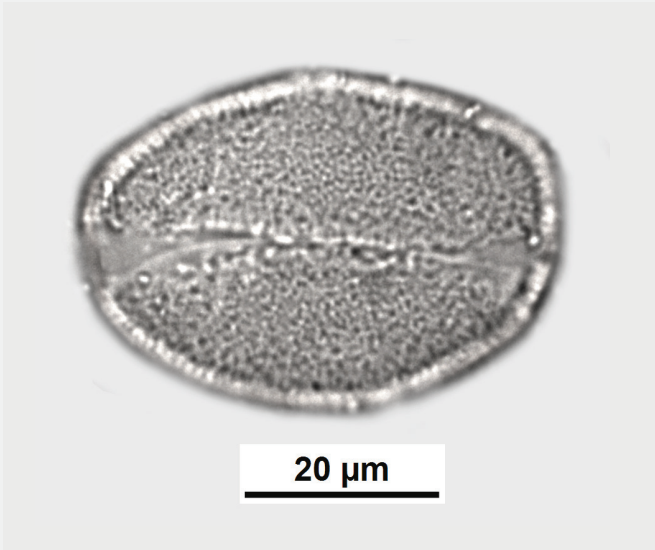


Hypoxis decumbens L.
712 – ICN 5256
Equatorial view: second plane
Oblate - Anasulcate - Reticulate
P \bar{x} = 32 μ m EQ \bar{x} = 51 μ m



Hypoxis decumbens L.
712 – ICN 5256
Equatorial view: third plane
Oblate - Anasulcate - Reticulate
P \bar{x} = 32 μ m EQ \bar{x} = 51 μ m

Hypoxidaceae



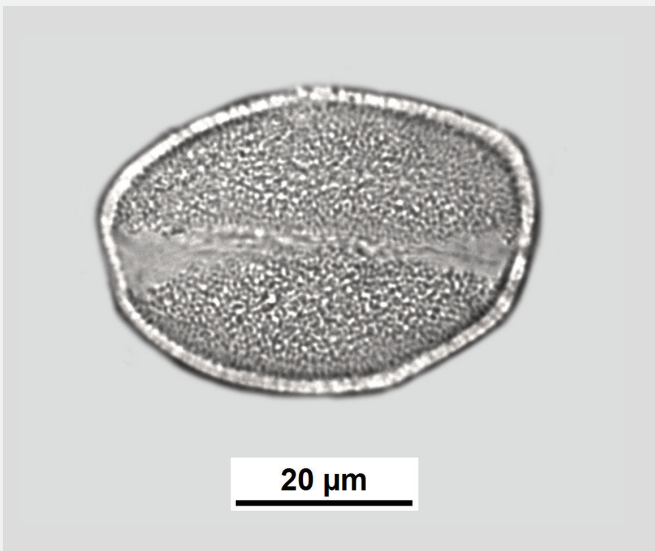
Hypoxis decumbens L.

712 – ICN 5256

Polar view Distal face: first plane

Oblate - Anasulcate - Reticulate

P \bar{x} = 32 μ m EQ \bar{x} = 51 μ m



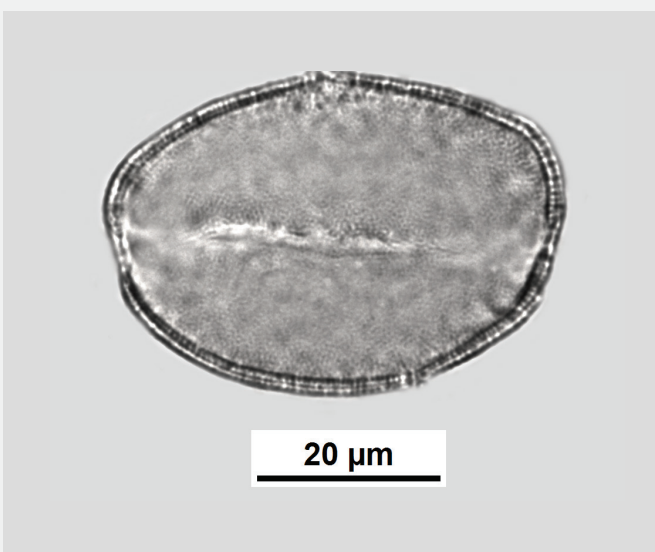
Hypoxis decumbens L.

712 – ICN 5256

Polar view Distal face: second plane

Oblate - Anasulcate - Reticulate

P \bar{x} = 32 μ m EQ \bar{x} = 51 μ m



Hypoxis decumbens L.

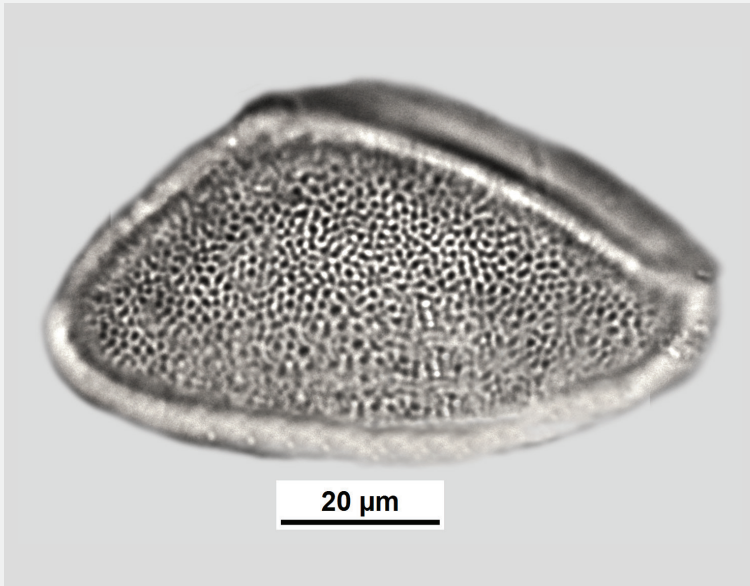
712 – ICN 5256

Polar view Distal face: third plane

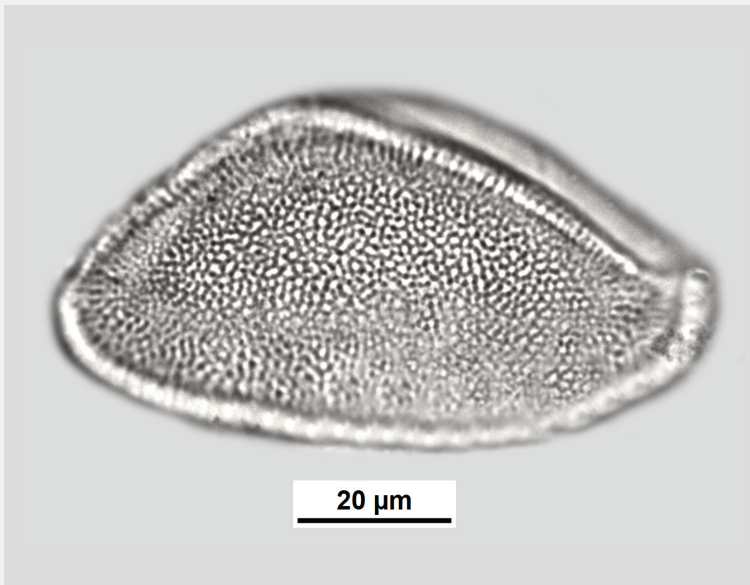
Oblate - Anasulcate - Reticulate

P \bar{x} = 32 μ m EQ \bar{x} = 51 μ m

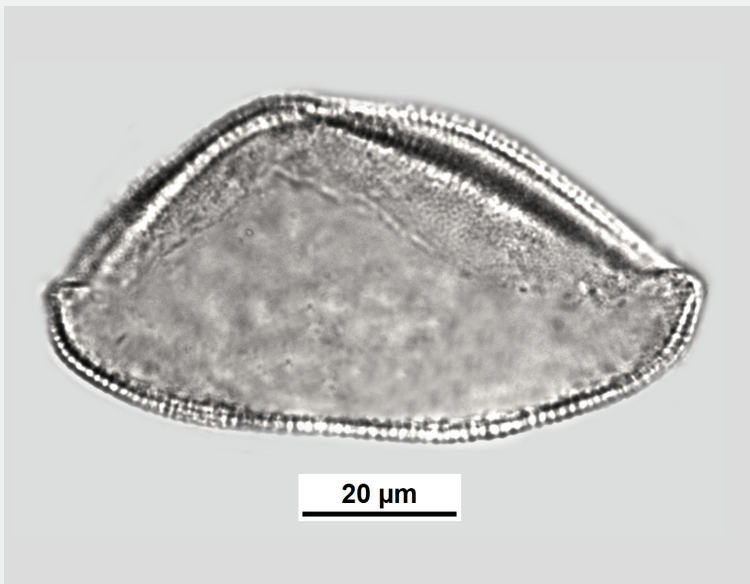
Iridaceae



Alophia pulchella (Sweet) Kuntze
73 – ICN 185860
Equatorial view: first plane
Oblate - Anasulcate - Reticulate
P \bar{x} = 38 μ m EQ \bar{x} = 65 μ m

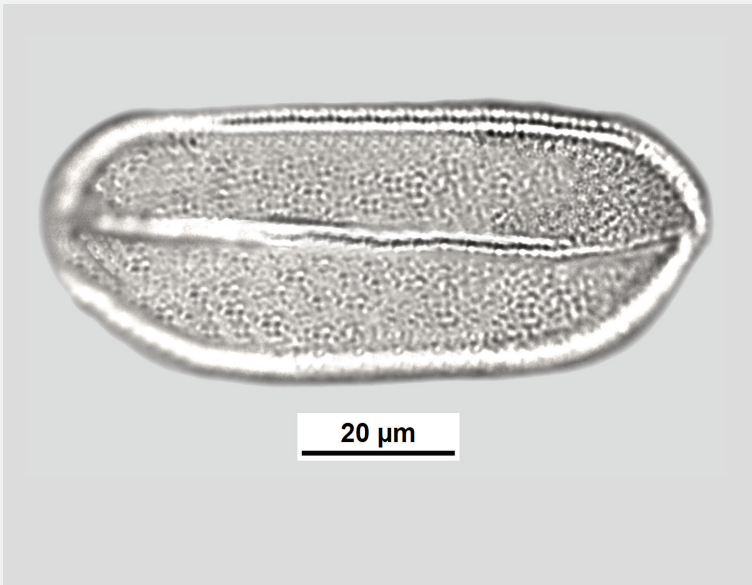


Alophia pulchella (Sweet) Kuntze
73 – ICN 185860
Equatorial view: second plane
Oblate - Anasulcate - Reticulate
P \bar{x} = 38 μ m EQ \bar{x} = 65 μ m



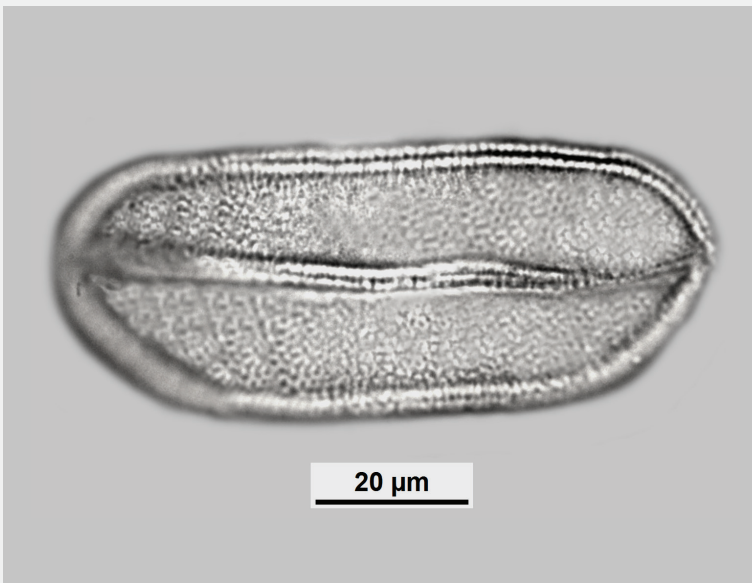
Alophia pulchella (Sweet) Kuntze
73 – ICN 185860
Equatorial view: third plane
Oblate - Anasulcate - Reticulate
P \bar{x} = 38 μ m EQ \bar{x} = 65 μ m

Iridaceae



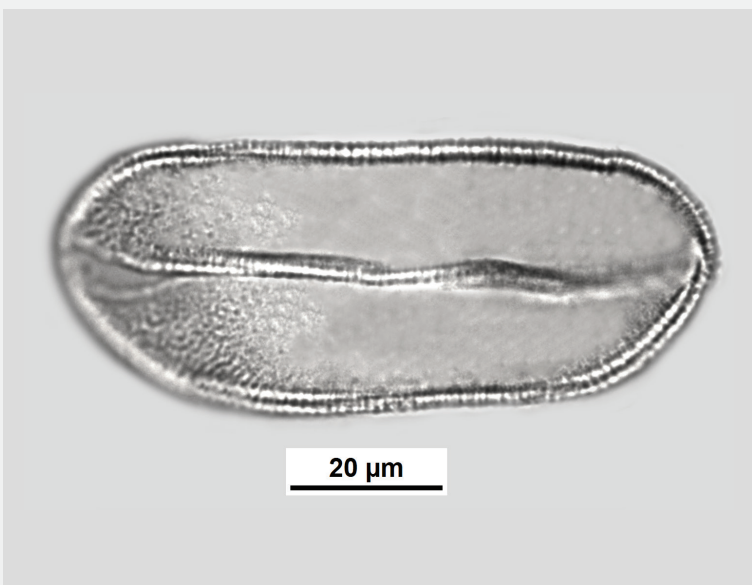
Alophia pulchella (Sweet) Kuntze
73 – ICN 185860

Polar view Distal face: first plane
Oblate - Anasulcate - Reticulate
 $P \bar{x} = 38 \mu\text{m}$ $EQ \bar{x} = 65 \mu\text{m}$



Alophia pulchella (Sweet) Kuntze
73 – ICN 185860

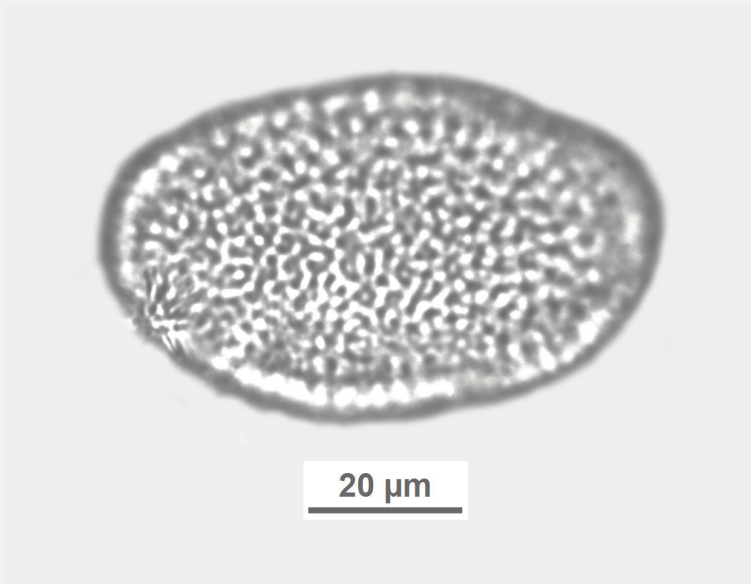
Polar view Distal face: second plane
Oblate - Anasulcate - Reticulate
 $P \bar{x} = 38 \mu\text{m}$ $EQ \bar{x} = 65 \mu\text{m}$



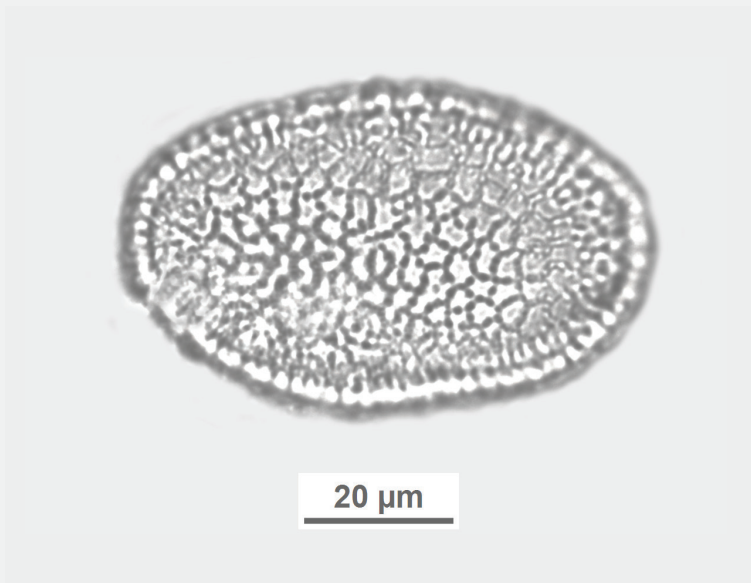
Alophia pulchella (Sweet) Kuntze
73 – ICN 185860

Polar view Distal face: third plane
Oblate - Anasulcate - Reticulate
 $P \bar{x} = 38 \mu\text{m}$ $EQ \bar{x} = 65 \mu\text{m}$

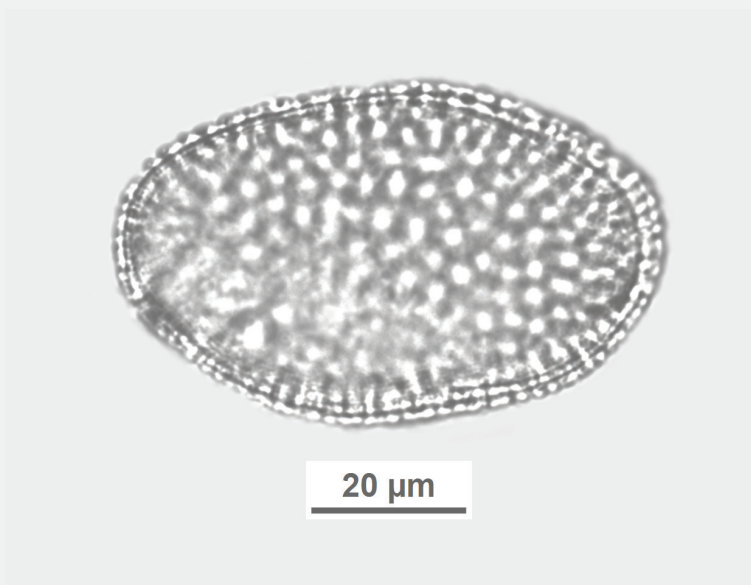
Iridaceae



Calydorea crocoides Ravenna
860 – ICN 68271
Equatorial view: first plane
Oblate - Anasulcate - Reticulate
 $P \bar{x} = 34 \mu\text{m}$ $EQ \bar{x} = 54 \mu\text{m}$

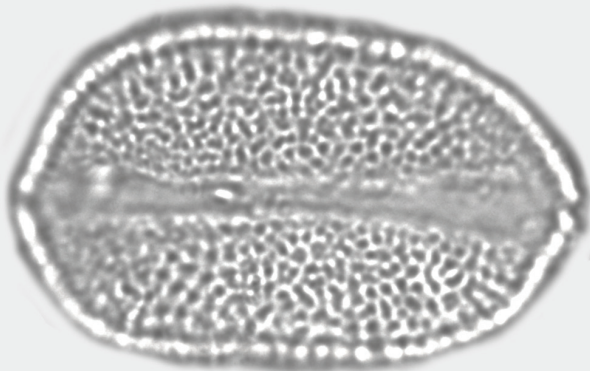


Calydorea crocoides Ravenna
860 – ICN 68271
Equatorial view: second plane
Oblate - Anasulcate - Reticulate
 $P \bar{x} = 34 \mu\text{m}$ $EQ \bar{x} = 54 \mu\text{m}$



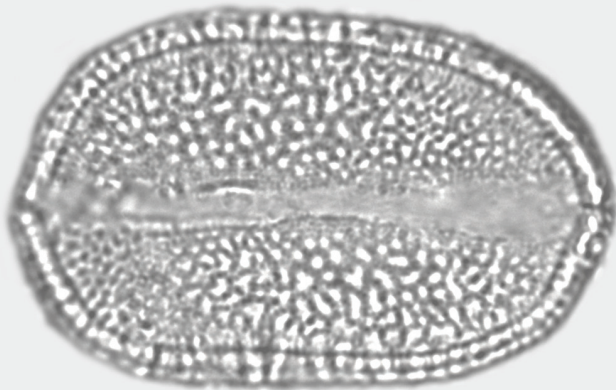
Calydorea crocoides Ravenna
860 – ICN 68271
Equatorial view: third plane
Oblate - Anasulcate - Reticulate
 $P \bar{x} = 34 \mu\text{m}$ $EQ \bar{x} = 54 \mu\text{m}$

Iridaceae



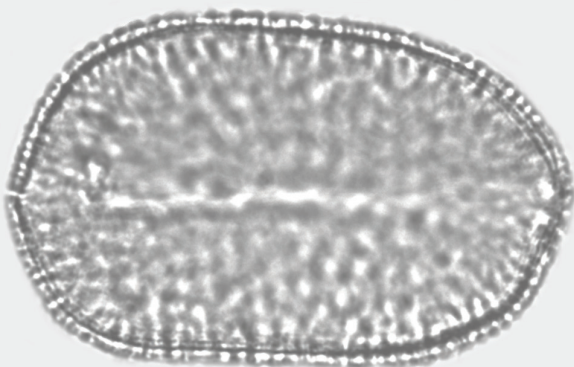
20 µm

Calydorea crocoides Ravenna
860 – ICN 68271
Polar view Distal face: first plane
Oblate - Anasulcate - Reticulate
 $P \bar{x} = 34 \mu\text{m}$ $EQ \bar{x} = 54 \mu\text{m}$



20 µm

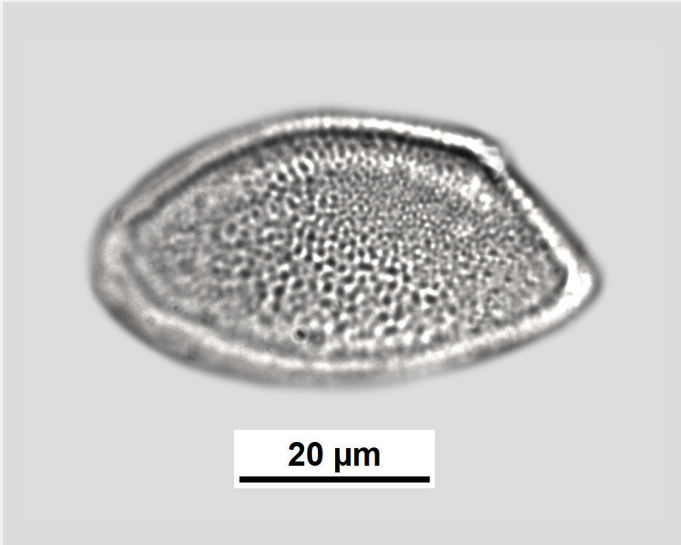
Calydorea crocoides Ravenna
860 – ICN 68271
Polar view Distal face: second plane
Oblate - Anasulcate - Reticulate
 $P \bar{x} = 34 \mu\text{m}$ $EQ \bar{x} = 54 \mu\text{m}$



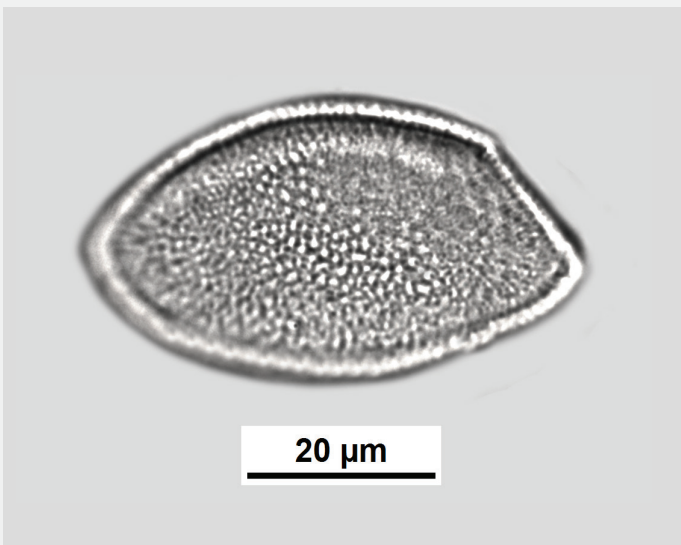
20 µm

Calydorea crocoides Ravenna
860 – ICN 68271
Polar view Distal face: third plane
Oblate - Anasulcate - Reticulate
 $P \bar{x} = 34 \mu\text{m}$ $EQ \bar{x} = 54 \mu\text{m}$

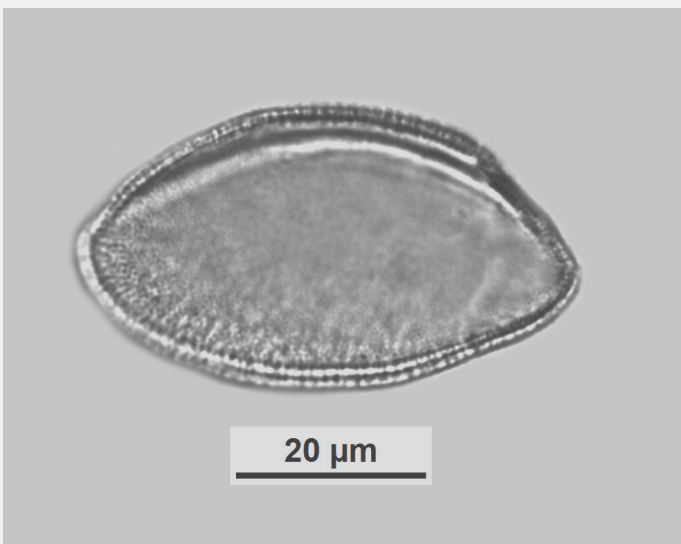
Iridaceae



Cypella herbertii (Herb.) Herb.
49 – ICN 318
Equatorial view: first plane
Oblate - Anasulcate - Reticulate
 $P \bar{x} = 29 \mu\text{m}$ $EQ \bar{x} = 44 \mu\text{m}$

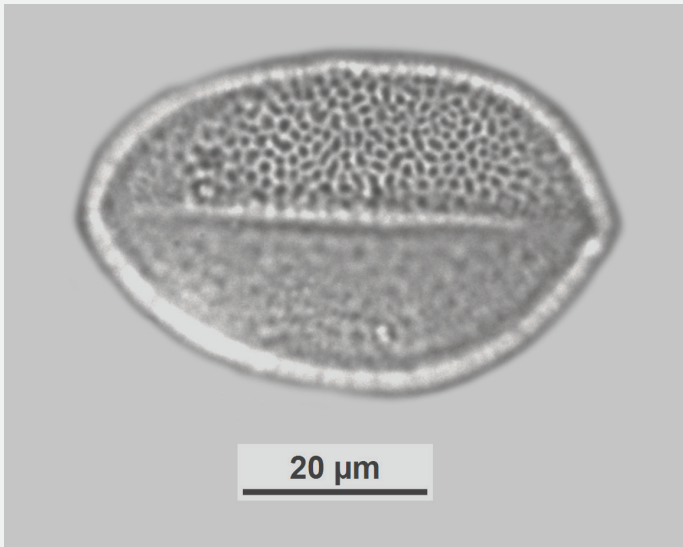


Cypella herbertii (Herb.) Herb.
49 – ICN 318
Equatorial view: second plane
Oblate - Anasulcate - Reticulate
 $P \bar{x} = 29 \mu\text{m}$ $EQ \bar{x} = 44 \mu\text{m}$

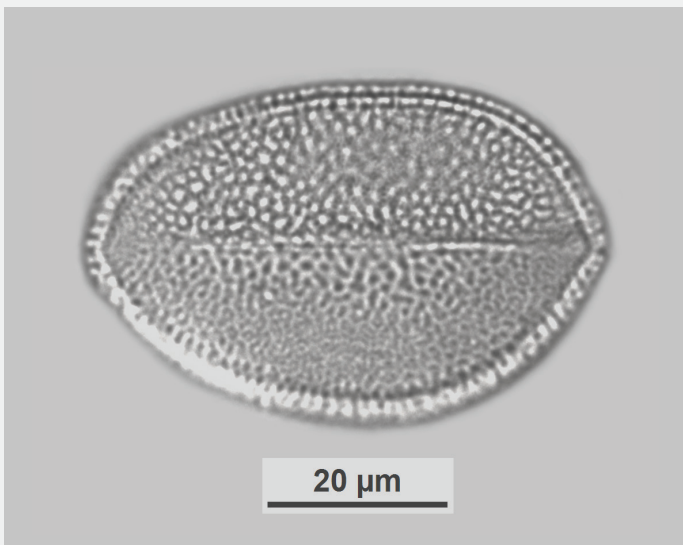


Cypella herbertii (Herb.) Herb.
49 – ICN 318
Equatorial view: third plane
Oblate - Anasulcate - Reticulate
 $P \bar{x} = 29 \mu\text{m}$ $EQ \bar{x} = 44 \mu\text{m}$

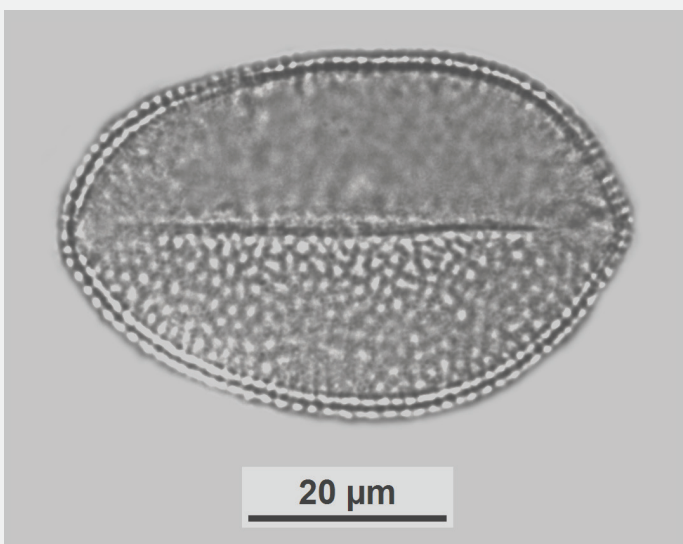
Iridaceae



Cypella herbertii (Herb.) Herb.
49 – ICN 318
Polar view Distal face: first plane
Oblate - Anasulcate - Reticulate
 $P \bar{x} = 29 \mu\text{m}$ $EQ \bar{x} = 44 \mu\text{m}$

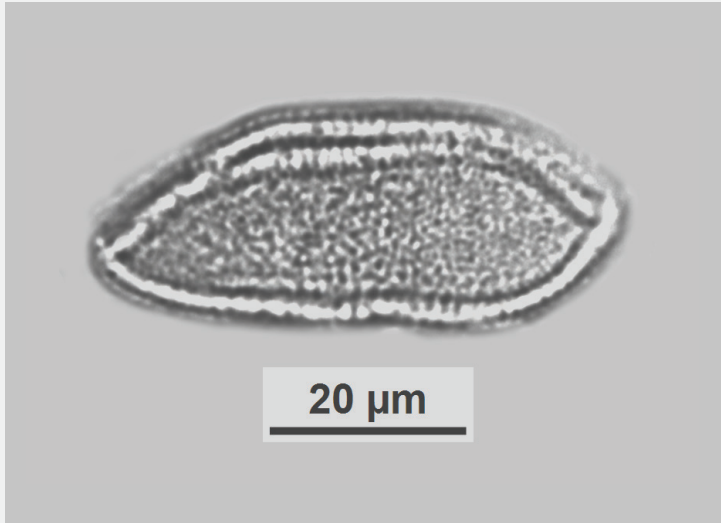


Cypella herbertii (Herb.) Herb.
49 – ICN 318
Polar view Distal face: second plane
Oblate - Anasulcate - Reticulate
 $P \bar{x} = 29 \mu\text{m}$ $EQ \bar{x} = 44 \mu\text{m}$

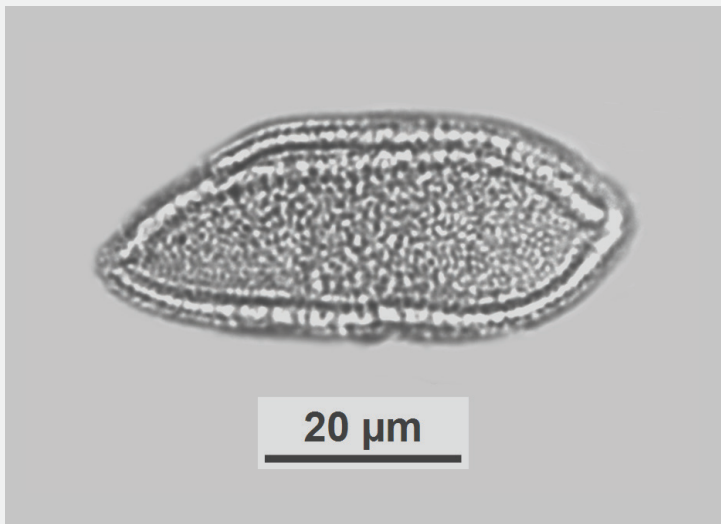


Cypella herbertii (Herb.) Herb.
49 – ICN 318
Polar view Distal face: third plane
Oblate - Anasulcate - Reticulate
 $P \bar{x} = 29 \mu\text{m}$ $EQ \bar{x} = 44 \mu\text{m}$

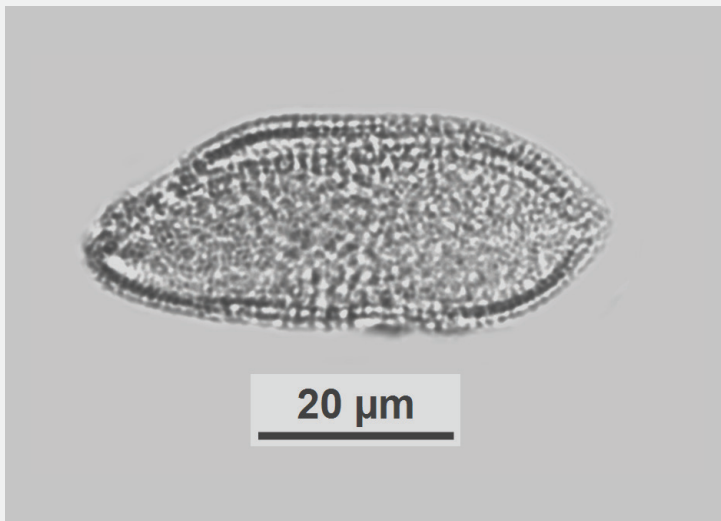
Iridaceae



Sisyrrinchium iridifolium Kunth
894 – ICN 34071
Equatorial view: first plane
Oblate - Anasulcate - Reticulate
P \bar{x} = 23 μ m EQ \bar{x} = 39 μ m

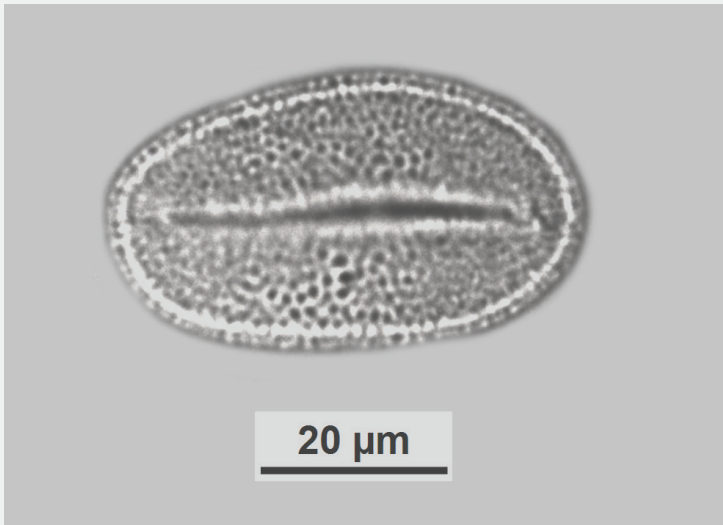


Sisyrrinchium iridifolium Kunth
894 – ICN 34071
Equatorial view: second plane
Oblate - Anasulcate - Reticulate
P \bar{x} = 23 μ m EQ \bar{x} = 39 μ m

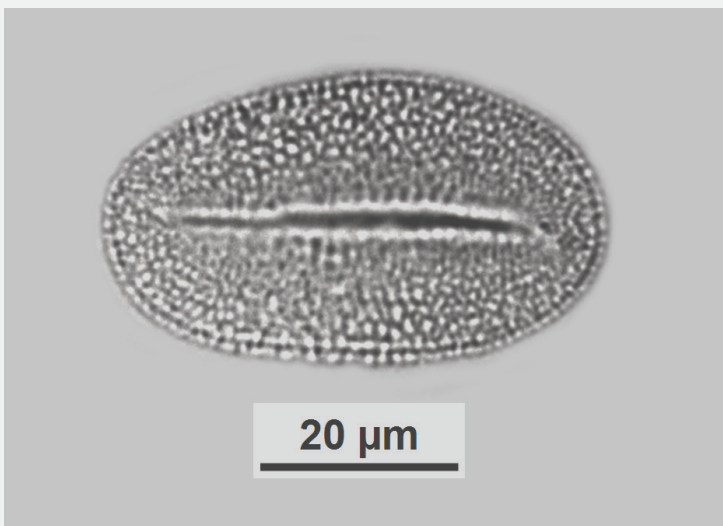


Sisyrrinchium iridifolium Kunth
894 – ICN 34071
Equatorial view: third plane
Oblate - Anasulcate - Reticulate
P \bar{x} = 23 μ m EQ \bar{x} = 39 μ m

Iridaceae

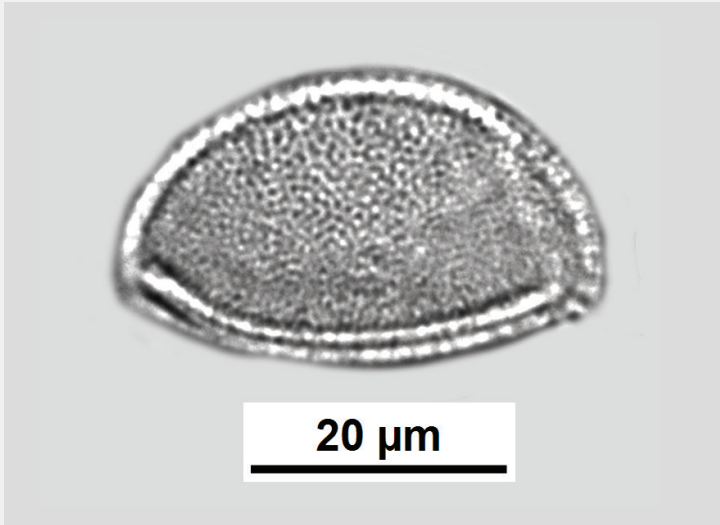


Sisyrrinchium iridifolium Kunth
894 – ICN 34071
Polar view Distal face: first plane
Oblate - Anasulcate - Reticulate
P \bar{x} = 23 μ m EQ \bar{x} = 39 μ m

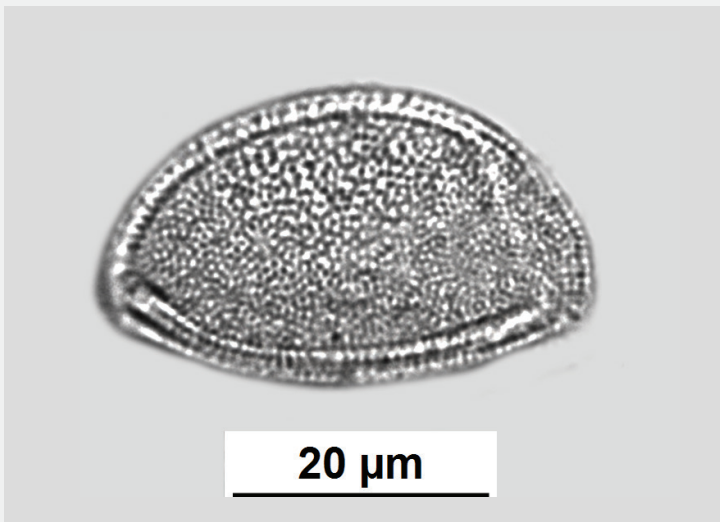


Sisyrrinchium iridifolium Kunth
894 – ICN 34071
Polar view Distal face: second plane
Oblate - Anasulcate - Reticulate
P \bar{x} = 23 μ m EQ \bar{x} = 39 μ m

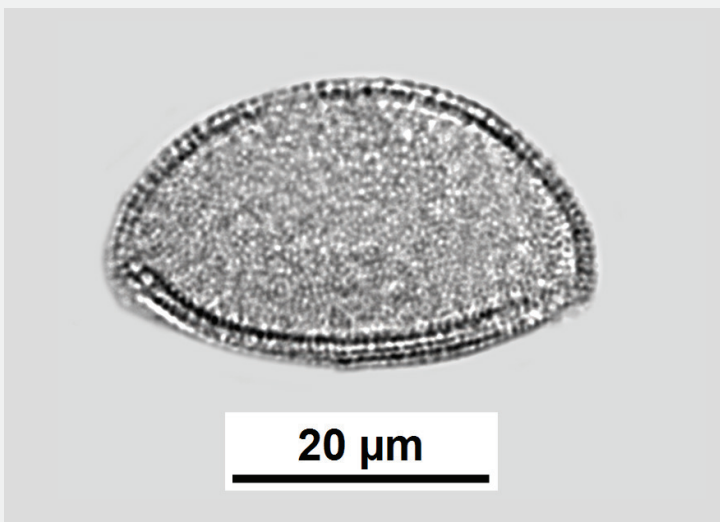
Iridaceae



Sisyrrinchium pendulum Ravenna
1357 – ICN 119045
Equatorial view: first plane
Oblate - Anasulcate - Reticulate
 $P \bar{x} = 21 \mu\text{m}$ $EQ \bar{x} = 33 \mu\text{m}$

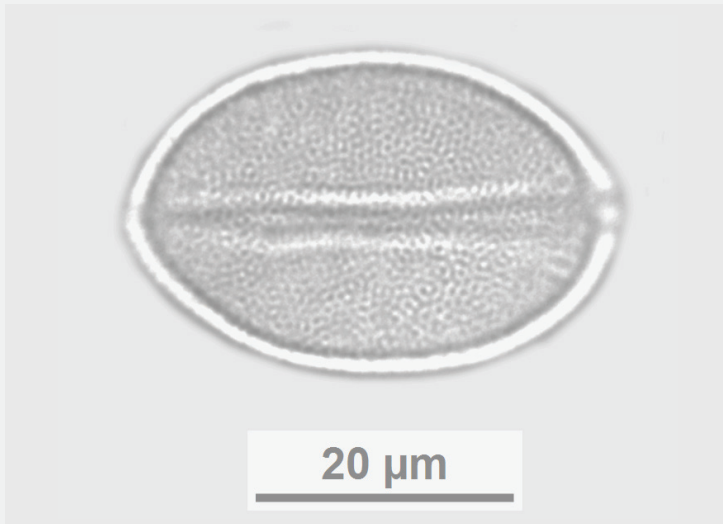


Sisyrrinchium pendulum Ravenna
1357 – ICN 119045
Equatorial view: second plane
Oblate - Anasulcate - Reticulate
 $P \bar{x} = 21 \mu\text{m}$ $EQ \bar{x} = 33 \mu\text{m}$



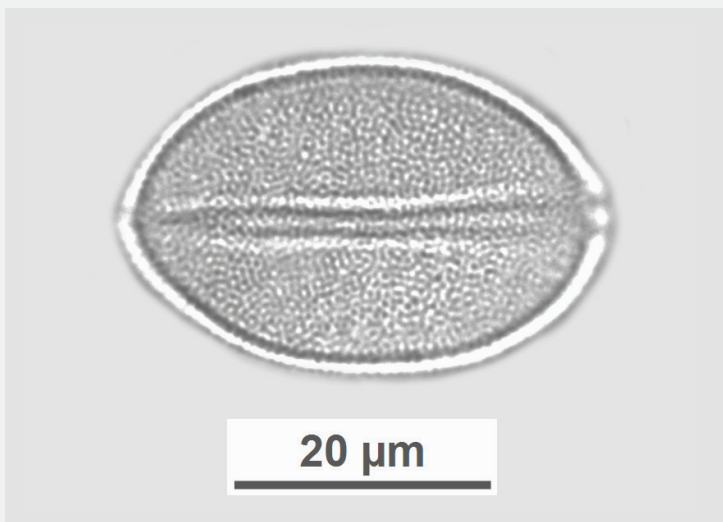
Sisyrrinchium pendulum Ravenna
1357 – ICN 119045
Equatorial view third plane
Oblate - Anasulcate - Reticulate
 $P \bar{x} = 21 \mu\text{m}$ $EQ \bar{x} = 33 \mu\text{m}$

Iridaceae



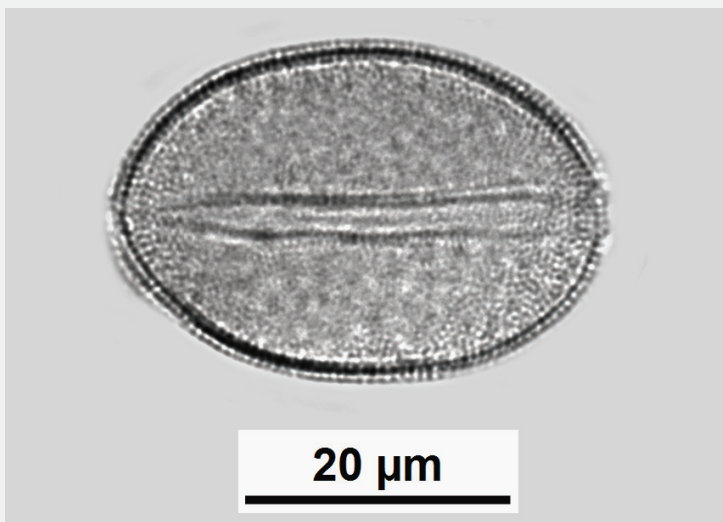
Sisyrrinchium pendulum Ravenna
1357 – ICN 119045

Polar view Distal face: first plane
Oblate - Anasulcate - Reticulate
 $P \bar{x} = 21 \mu\text{m}$ $EQ \bar{x} = 33 \mu\text{m}$



Sisyrrinchium pendulum Ravenna
1357 – ICN 119045

Polar view Distal face: second plane
Oblate - Anasulcate - Reticulate
 $P \bar{x} = 21 \mu\text{m}$ $EQ \bar{x} = 33 \mu\text{m}$



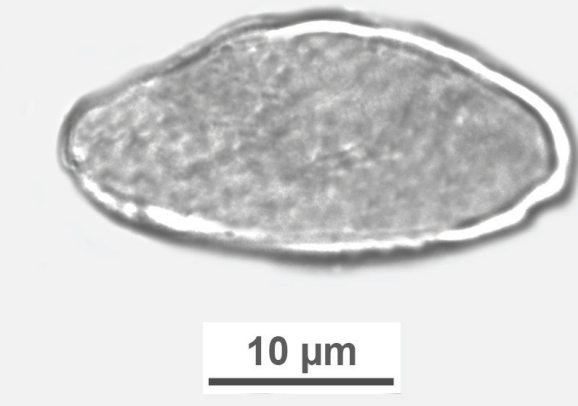
Sisyrrinchium pendulum Ravenna
1357 – ICN 119045

Polar view Distal face: third plane
Oblate - Anasulcate - Reticulate
 $P \bar{x} = 21 \mu\text{m}$ $EQ \bar{x} = 33 \mu\text{m}$

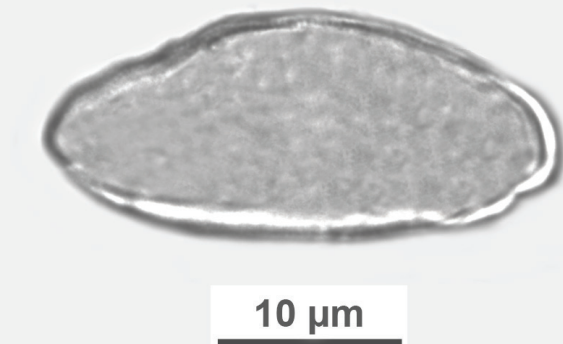
Areceaceae



Butia capitata (Mart.) Becc.
05 – ICN 34144
Polar view Distal face
Oblate - Anasulcate - Reticulate
 $P \bar{x} = 36 \mu\text{m}$ $EQ \bar{x} = 56 \mu\text{m}$

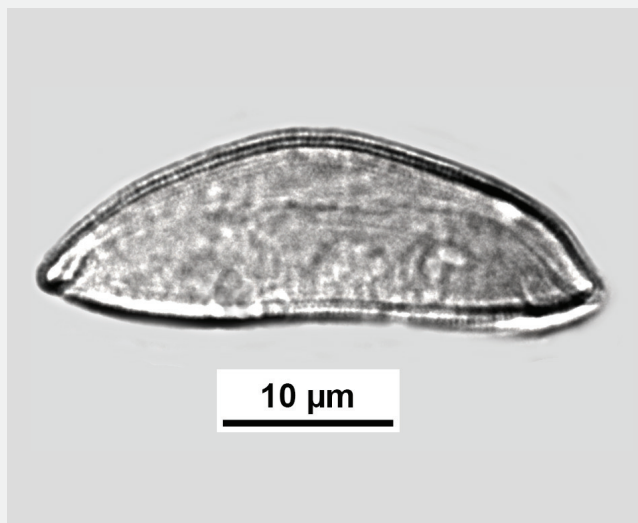


Euterpe edulis Mart.
86 – ICN 5477
Equatorial view: first plane
Oblate - Anasulcate - Reticulate
 $P \bar{x} = 22 \mu\text{m}$ $EQ \bar{x} = 40 \mu\text{m}$

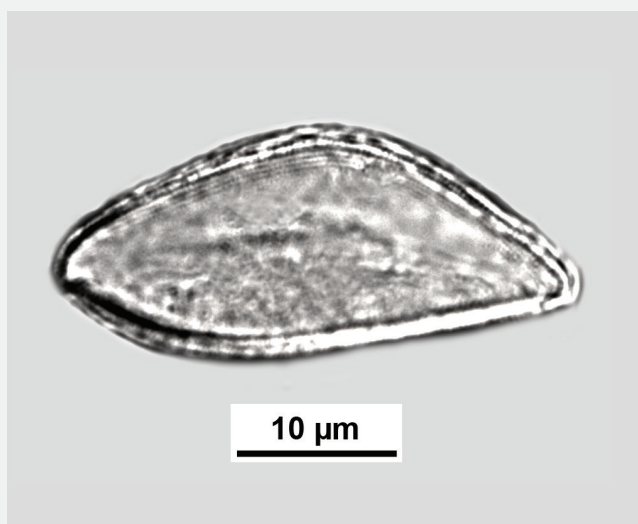


Euterpe edulis Mart.
86 – ICN 5477
Equatorial view: second plane
Oblate - Sulcate - Reticulate
 $P \bar{x} = 22 \mu\text{m}$ $EQ \bar{x} = 40 \mu\text{m}$

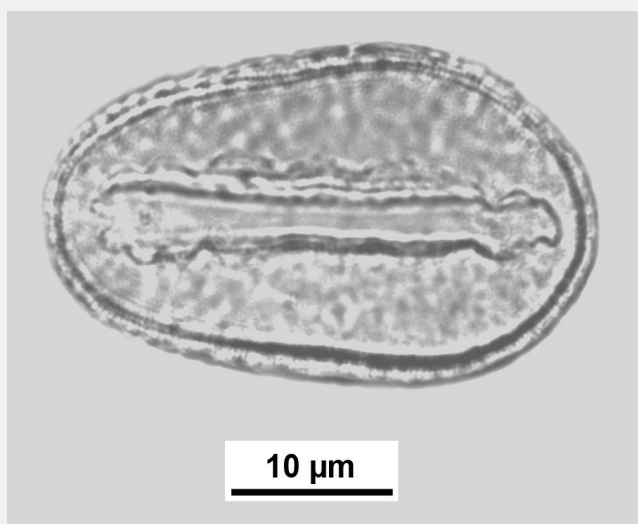
Areceaceae



Geonoma schottiana Mart.
794 – ICN 33860
Equatorial view
Peroblate - Anasulcate - Reticulate
P \bar{x} = 20 μ m EQ \bar{x} = 44 μ m



Syagrus romanzoffiana (Cham.) Glassman
1134 – ICN 63926
Equatorial view
Oblate - Anasulcate - Reticulate
P \bar{x} = 26 μ m EQ \bar{x} = 43 μ m

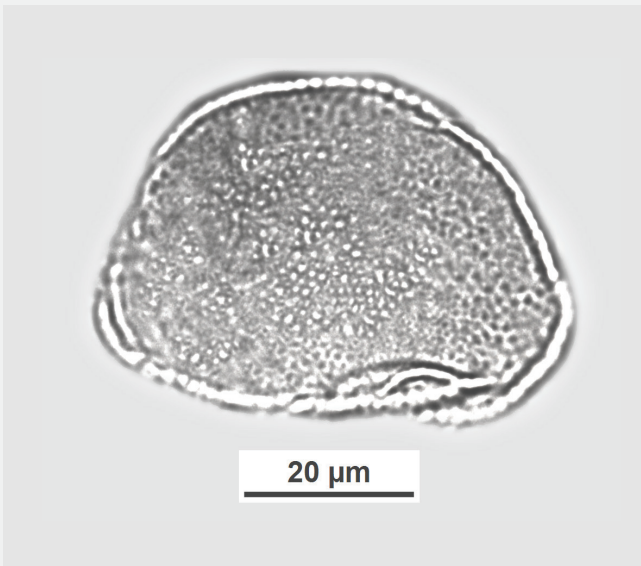


Syagrus romanzoffiana (Cham.) Glassman
1134 – ICN 63926
Polar view Distal face
Oblate - Anasulcate - Reticulate
P \bar{x} = 26 μ m EQ \bar{x} = 43 μ m

Bromeliaceae



Agallostachys antiacantha (Bertol.) Beer
562 – ICN 19342
Equatorial view: first plane
Oblate - Anasulcate - Reticulate
P \bar{x} = 53 μ m EQ \bar{x} = 77 μ m

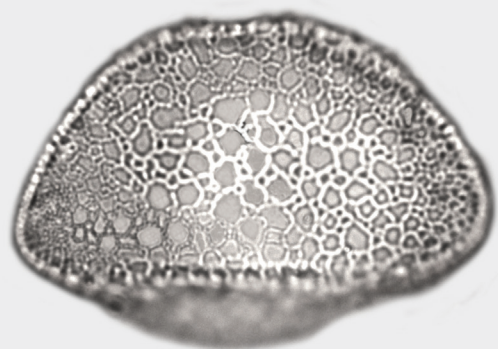


Agallostachys antiacantha (Bertol.) Beer
562 – ICN 19342
Equatorial view: second plane
Oblate - Anasulcate - Reticulate
P \bar{x} = 53 μ m EQ \bar{x} = 77 μ m



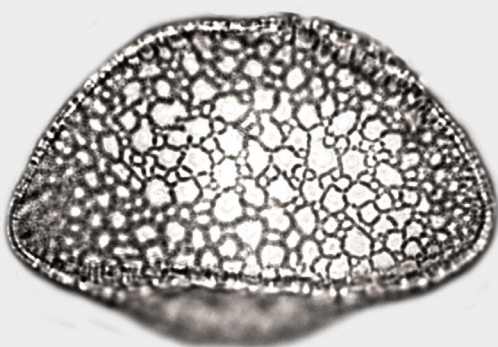
Agallostachys antiacantha (Bertol.) Beer
562 – ICN 19342
Polar view Distal face
Oblate - Anasulcate - Reticulate
P \bar{x} = 53 μ m EQ \bar{x} = 77 μ m

Bromeliaceae



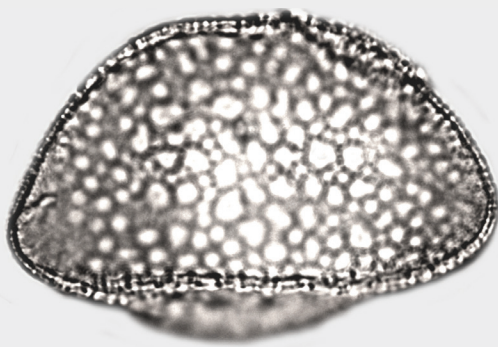
20 µm

Billbergia nutans H. Wendl. ex Regel
555 – ICN 45209
Equatorial view: first plane
Oblate - Anasulcate - Reticulate
P \bar{x} = 36 µm EQ \bar{x} = 69 µm



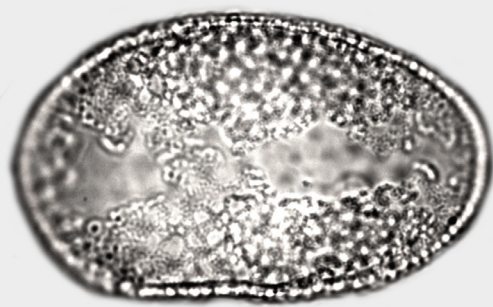
20 µm

Billbergia nutans H. Wendl. ex Regel
555 – ICN 45209
Equatorial view: second plane
Oblate - Anasulcate - Reticulate
P \bar{x} = 36 µm EQ \bar{x} = 69 µm



20 µm

Billbergia nutans H. Wendl. ex Regel
555 – ICN 45209
Equatorial view: third plane
Oblate - Anasulcate - Reticulate
P \bar{x} = 36 µm EQ \bar{x} = 69 µm



20 µm

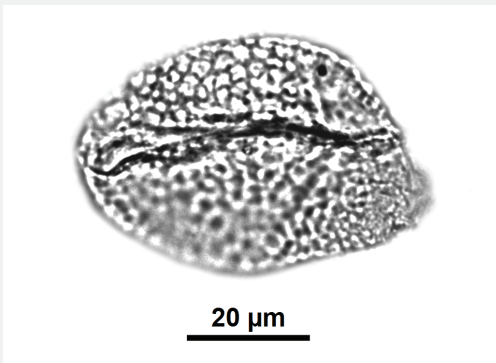
Billbergia nutans H. Wendl. ex Regel
555 – ICN 45209
Polar view Distal face
Oblate - Anasulcate - Reticulate
P \bar{x} = 36 µm EQ \bar{x} = 69 µm

Bromeliaceae



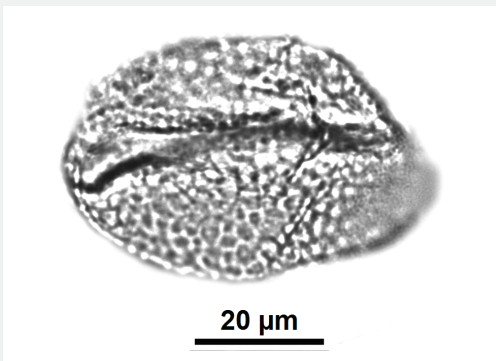
Ortgiesia gamosepala (Wittm.) L.B. Sm. & W.J. Kress
554 – ICN 27812

Polar view Distal face: first plane
Oblate - Anasulcate - Reticulate
 $P \bar{x} = 61 \mu\text{m}$ $EQ \bar{x} = 83 \mu\text{m}$



Ortgiesia gamosepala (Wittm.) L.B. Sm. & W.J. Kress
554 – ICN 27812

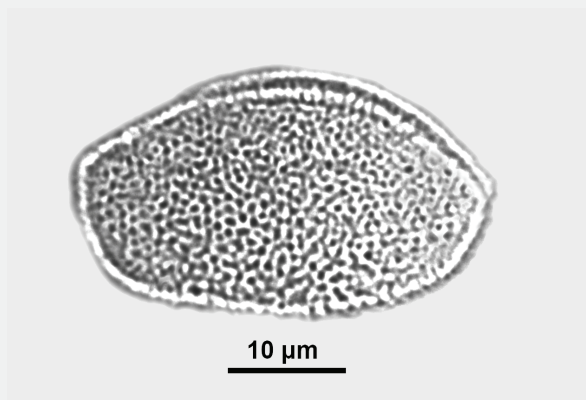
Polar view Distal face: second plane
Oblate - Anasulcate - Reticulate
 $P \bar{x} = 61 \mu\text{m}$ $EQ \bar{x} = 83 \mu\text{m}$



Ortgiesia gamosepala (Wittm.) L.B. Sm. & W.J. Kress
554 – ICN 27812

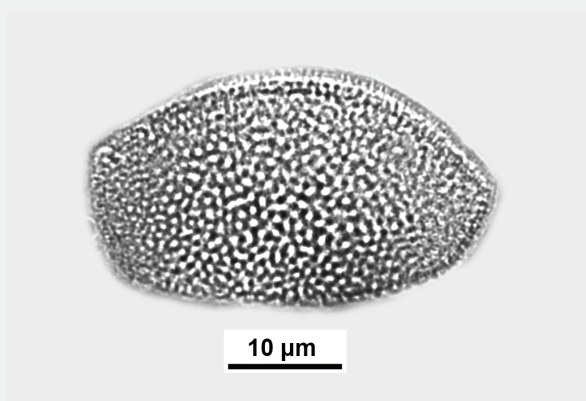
Polar view Distal face: third plane
Oblate - Anasulcate - Reticulate
 $P \bar{x} = 61 \mu\text{m}$ $EQ \bar{x} = 83 \mu\text{m}$

Bromeliaceae



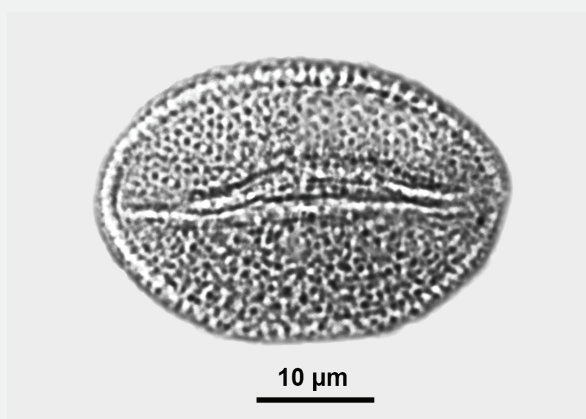
Prionophyllum maritimum (Baker) Mez
563 – ICN 5697

Equatorial view: first plane
Oblate - Anasulcate - Reticulate
P \bar{x} = 25 μ m EQ \bar{x} = 41 μ m



Prionophyllum maritimum (Baker) Mez
563 – ICN 5697

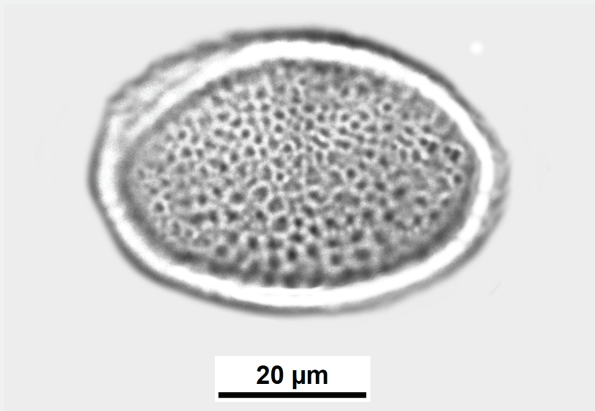
Equatorial view: second plane
Oblate - Anasulcate - Reticulate
P \bar{x} = 25 μ m EQ \bar{x} = 41 μ m



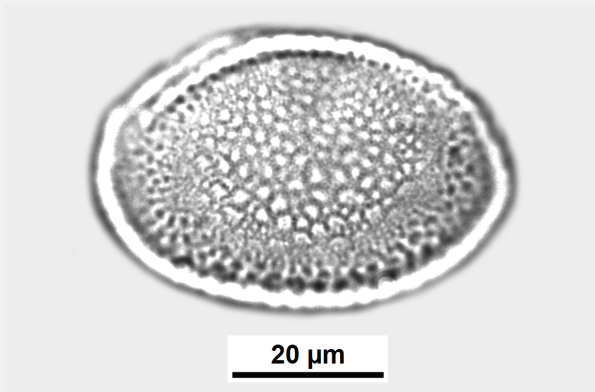
Prionophyllum maritimum (Baker) Mez
563 – ICN 5697

Polar view Distal face
Oblate - Anasulcate - Reticulate
P \bar{x} = 25 μ m EQ \bar{x} = 41 μ m

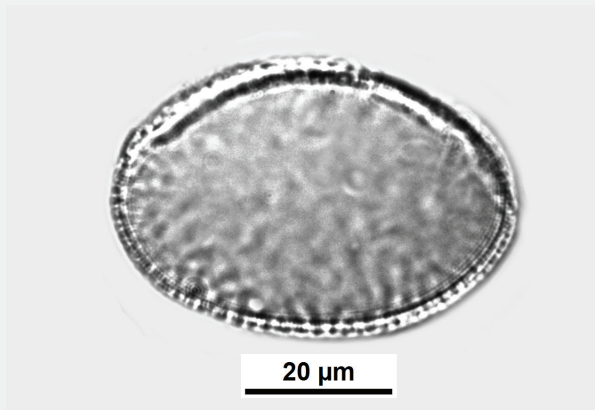
Bromeliaceae



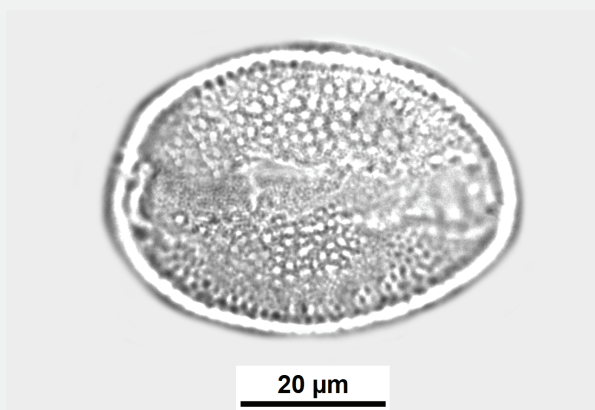
Tillandsia aeranthos (Loisel.) L.B. Sm.
89 – ICN 30798
Equatorial view: first plane
Oblate - Anasulcate - Reticulate
P \bar{x} = 28 μ m EQ \bar{x} = 45 μ m



Tillandsia aeranthos (Loisel.) L.B. Sm.
89 – ICN 30798
Equatorial view: second plane
Oblate - Anasulcate - Reticulate
P \bar{x} = 28 μ m EQ \bar{x} = 45 μ m

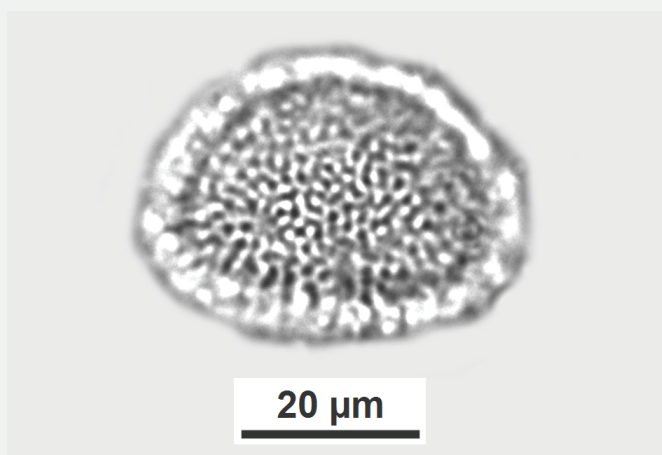


Tillandsia aeranthos (Loisel.) L.B. Sm.
89 – ICN 30798
Equatorial view: third plane
Oblate - Anasulcate - Reticulate
P \bar{x} = 28 μ m EQ \bar{x} = 45 μ m

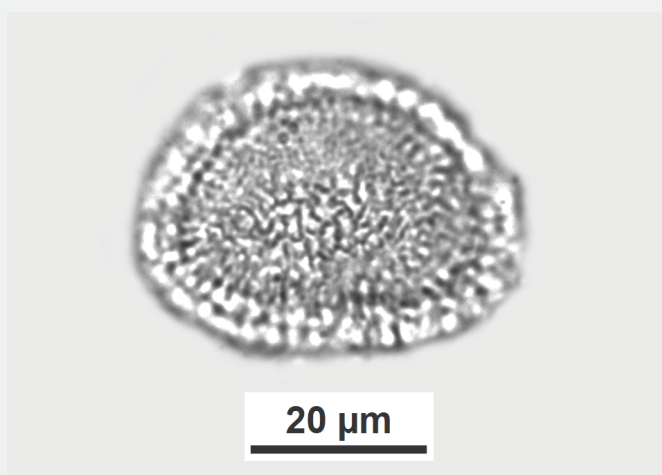


Tillandsia aeranthos (Loisel.) L.B. Sm.
89 – ICN 30798
Polar view Distal face
Oblate - Anasulcate - Reticulate
P \bar{x} = 28 μ m EQ \bar{x} = 45 μ m

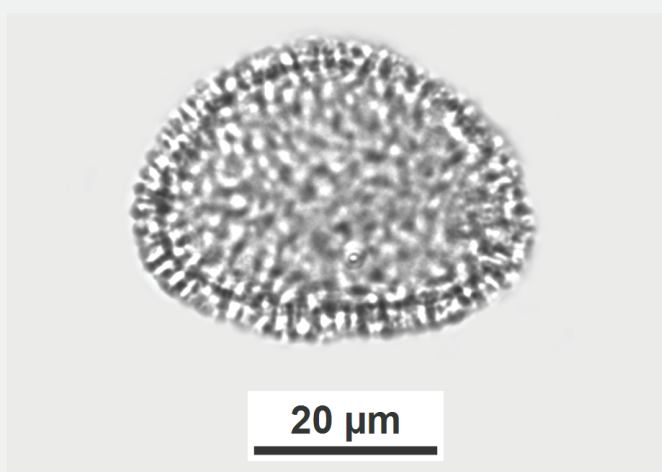
Bromeliaceae



Tillandsia usneoides (L.) L.
923 – ICN 32785
Equatorial view: first plane
Suboblate - Anasulcate - Reticulate
P \bar{x} = 24 μ m EQ \bar{x} = 31 μ m

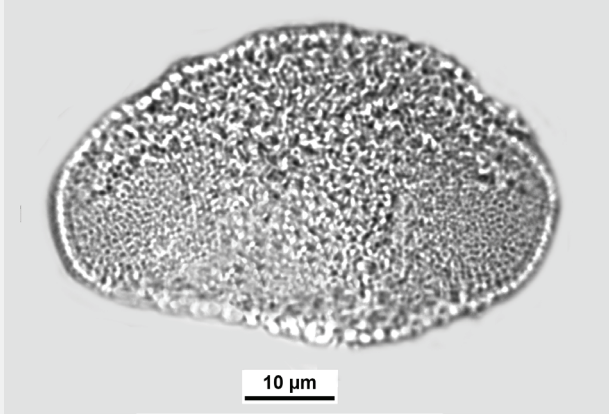


Tillandsia usneoides (L.) L.
923 – ICN 32785
Equatorial view: second plane
Suboblate - Anasulcate - Reticulate
P \bar{x} = 24 μ m EQ \bar{x} = 31 μ m



Tillandsia usneoides (L.) L.
923 – ICN 32785
Equatorial view: third plane
Suboblate - Anasulcate - Reticulate
P \bar{x} = 24 μ m EQ \bar{x} = 31 μ m

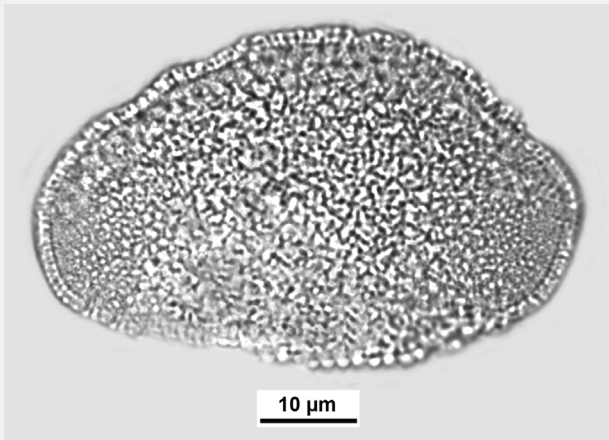
Bromeliaceae



Vriesea flammea L.B. Sm.
666 – ICN 43279

Equatorial view: first plane
Oblate - Anasulcate - Reticulate
 $P \bar{x} = 24 \mu\text{m}$ $EQ \bar{x} = 45 \mu\text{m}$

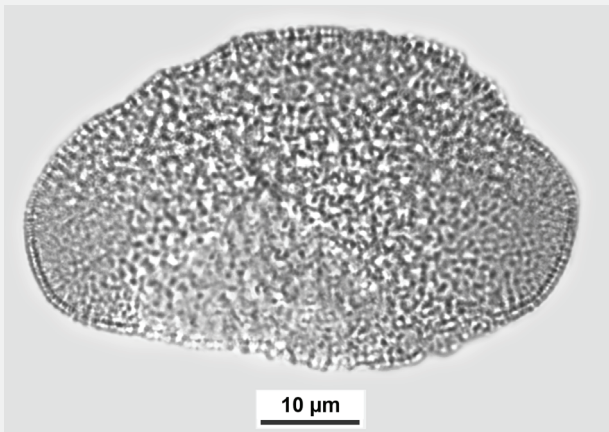
Note: The ends of the grain with a reticulum much finer than that of the rest of the surface.



Vriesea flammea L.B. Sm.
666 – ICN 43279

Equatorial view: second plane
Oblate - Anasulcate - Reticulate
 $P \bar{x} = 24 \mu\text{m}$ $EQ \bar{x} = 45 \mu\text{m}$

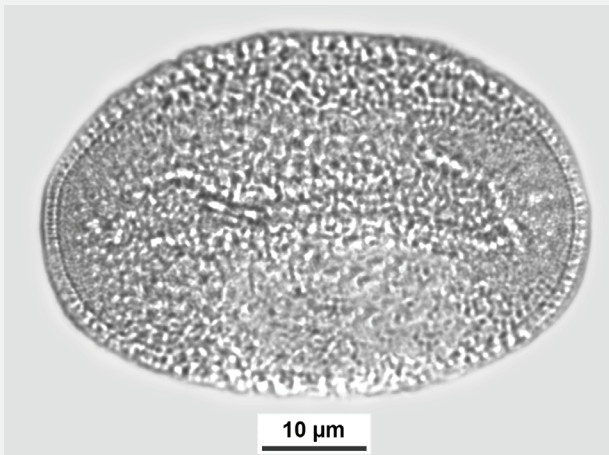
Note: The ends of the grain with a reticulum much finer than that of the rest of the surface.



Vriesea flammea L.B. Sm.
666 – ICN 43279

Equatorial view: third plane
Oblate - Anasulcate - Reticulate
 $P \bar{x} = 24 \mu\text{m}$ $EQ \bar{x} = 45 \mu\text{m}$

Note: The ends of the grain with a reticulum much finer than that of the rest of the surface.



Vriesea flammea L.B. Sm.
666 – ICN 43279

Polar view Distal face
Oblate - Anasulcate - Reticulate
 $P \bar{x} = 24 \mu\text{m}$ $EQ \bar{x} = 45 \mu\text{m}$

Note: The ends of the grain with a reticulum much finer than that of the rest of the surface.

Cyperaceae

Note: The elongate apertures observed in this family were generally faintly marked and microgranulated.



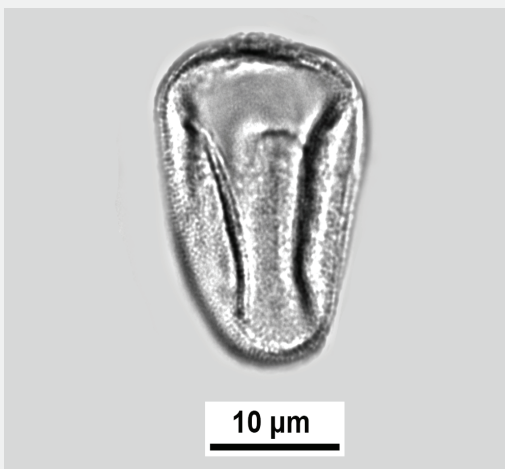
Androtrichum trigynum (Spreng.) H. Pfeiff.
68 – ICN 46679

Equatorial view: first plane
Prolate - Ana-ulcerate and three elongate longitudinal
apertures - Scabrate
P \bar{x} = 33 μ m EQ \bar{x} = 21 μ m



Androtrichum trigynum (Spreng.) H. Pfeiff.
68 – ICN 46679

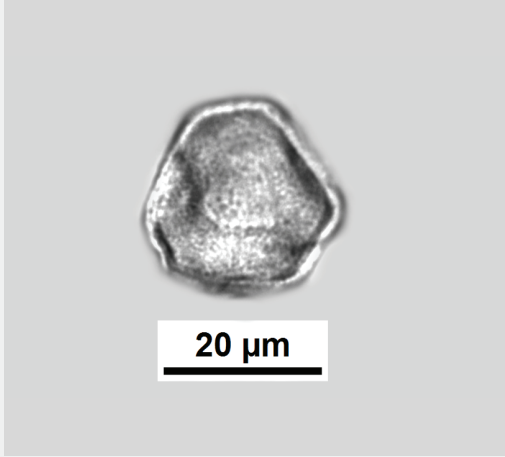
Equatorial view: second plane
Prolate - Ana-ulcerate and three elongate longitudinal
apertures - Scabrate
P \bar{x} = 33 μ m EQ \bar{x} = 21 μ m



Androtrichum trigynum (Spreng.) H. Pfeiff.
68 – ICN 46679

Equatorial view: third plane
Prolate - Ana-ulcerate and three elongate longitudinal
apertures - Scabrate
P \bar{x} = 33 μ m EQ \bar{x} = 21 μ m

Cyperaceae



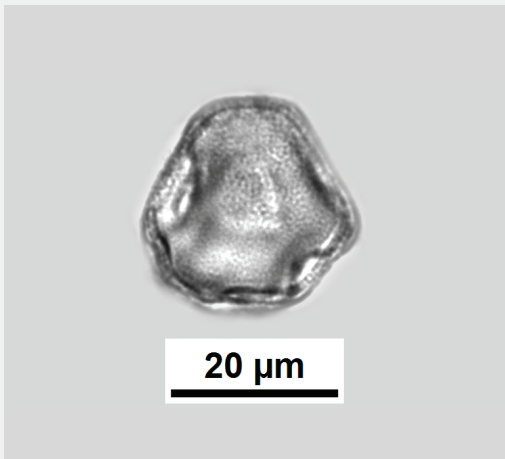
Androtrichum trigynum (Spreng.) H. Pfeiff.

68 – ICN 46679

Polar view Distal face: first plane

Prolate - Ana-ulcerate and three elongate longitudinal apertures - Scabrate

$P \bar{x} = 33 \mu\text{m}$ $EQ \bar{x} = 21 \mu\text{m}$



Androtrichum trigynum (Spreng.) H. Pfeiff.

68 – ICN 46679

Polar view Distal face: second plane

Prolate - Ana-ulcerate and three elongate longitudinal apertures - Scabrate

$P \bar{x} = 33 \mu\text{m}$ $EQ \bar{x} = 21 \mu\text{m}$

Cyperaceae



Becquerelia muricata (Boeckeler) Nees
968 – ICN 83274

Oblique view: first plane
Spheroidal – two elongate longitudinal
apertures - Scabrate
P \bar{x} = 35 μ m EQ \bar{x} = 31 μ m



Becquerelia muricata (Boeckeler) Nees
968 – ICN 83274

Oblique view: second plane
Spheroidal – two elongate longitudinal
apertures - Scabrate
P \bar{x} = 35 μ m EQ \bar{x} = 31 μ m

Cyperaceae



Carex brasiliensis A. St.-Hil.
883 – ICN 68298
Equatorial view: first plane
Subprolate - Ana-ulcerate - Scabrate
P \bar{x} = 50 μ m EQ \bar{x} = 41 μ m



Carex brasiliensis A. St.-Hil.
883 – ICN 68298
Equatorial view: second plane
Subprolate - Ana-ulcerate - Scabrate
P \bar{x} = 50 μ m EQ \bar{x} = 41 μ m

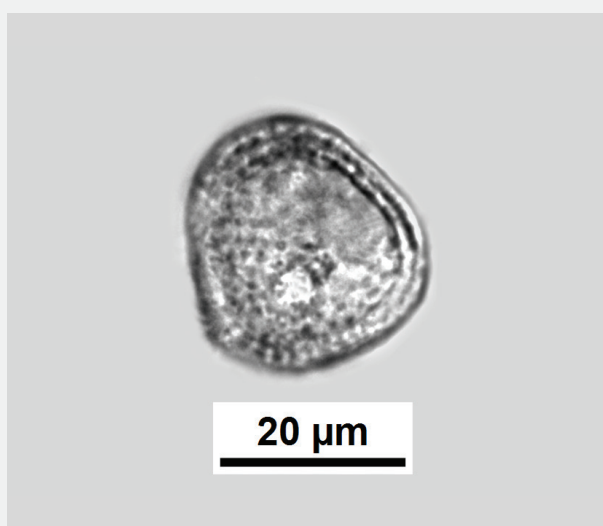


Carex brasiliensis A. St.-Hil.
883 – ICN 68298
Equatorial view: third plane
Subprolate - Ana-ulcerate - Scabrate
P \bar{x} = 50 μ m EQ \bar{x} = 41 μ m

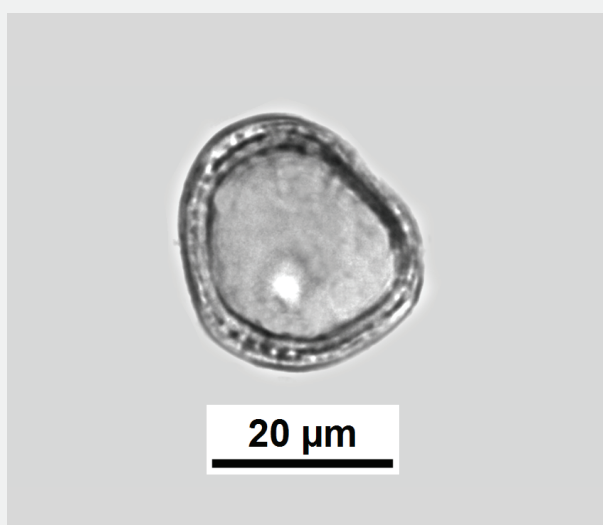
Cyperaceae



Cyperus brasiliensis (Kunth) Batters
112 – ICN 42695
Oblique polar view: first plane
Subprolate - Ana-ulcerate - Rugulate
 $P \bar{x} = 21 \mu\text{m}$ $EQ \bar{x} = 18 \mu\text{m}$



Cyperus brasiliensis (Kunth) Batters
112 – ICN 42695
Oblique polar view: second plane
Subprolate - Ana-ulcerate - Rugulate
 $P \bar{x} = 21 \mu\text{m}$ $EQ \bar{x} = 18 \mu\text{m}$

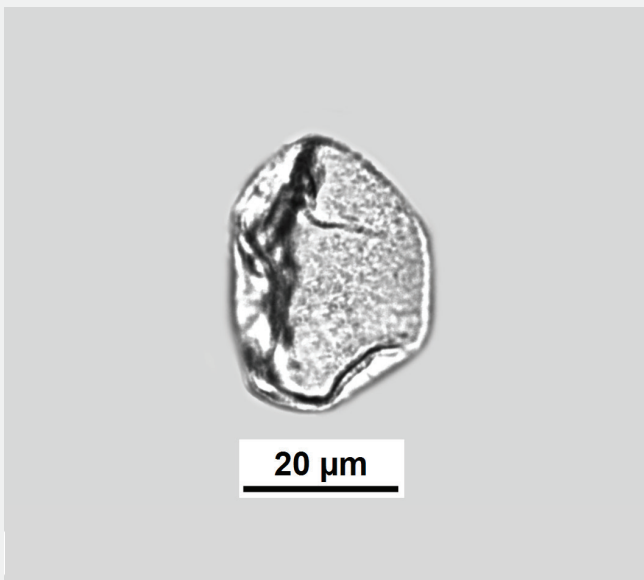


Cyperus brasiliensis (Kunth) Batters
112 – ICN 42695
Oblique polar view: third plane
Subprolate - Ana-ulcerate - Rugulate
 $P \bar{x} = 21 \mu\text{m}$ $EQ \bar{x} = 18 \mu\text{m}$

Cyperaceae

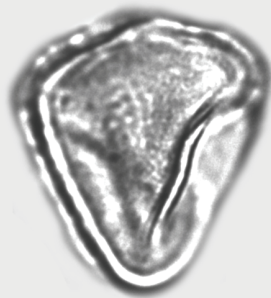


Eleocharis bonariensis Nees
778 – ICN 67441
Equatorial view
Subprolate - Ana-ulcerate - Scabrate
P \bar{x} = 39 μ m EQ \bar{x} = 31 μ m



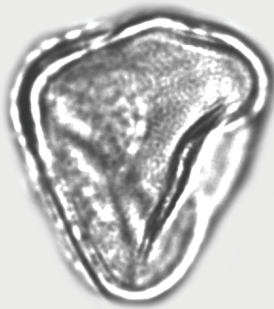
Eleocharis geniculata (L.) Roem. & Schult.
100 – ICN 43806
Equatorial view
Prolate - indeterminate apertures - Scabrate
P \bar{x} = 31 μ m EQ \bar{x} = 22 μ m

Cyperaceae



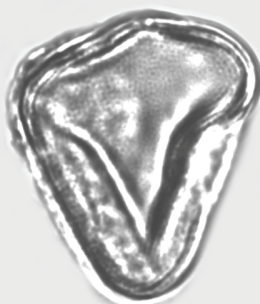
20 µm

Eleocharis maculosa (Vahl) Roem. & Schult.
1037 – ICN 81755
Equatorial view: first plane
Subprolate - Ana-ulcerate and indeterminate
number of elongate longitudinal
apertures - Scabrate
P \bar{x} = 48 µm EQ \bar{x} = 38 µm



20 µm

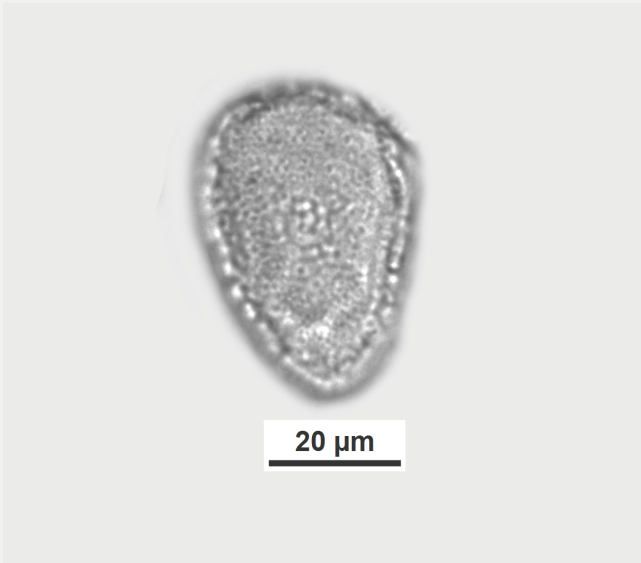
Eleocharis maculosa (Vahl) Roem. & Schult.
1037 – ICN 81755
Equatorial view: second plane
Subprolate - Ana-ulcerate and indeterminate
number of elongate longitudinal
apertures - Scabrate
P \bar{x} = 48 µm EQ \bar{x} = 38 µm



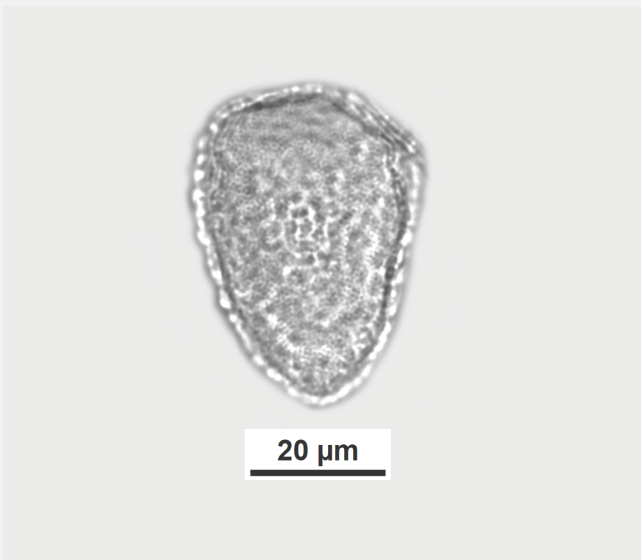
20 µm

Eleocharis maculosa (Vahl) Roem. & Schult.
1037 – ICN 81755
Equatorial view: third plane
Subprolate - Ana-ulcerate and indeterminate
number of elongate longitudinal
apertures - Scabrate
P \bar{x} = 48 µm EQ \bar{x} = 38 µm

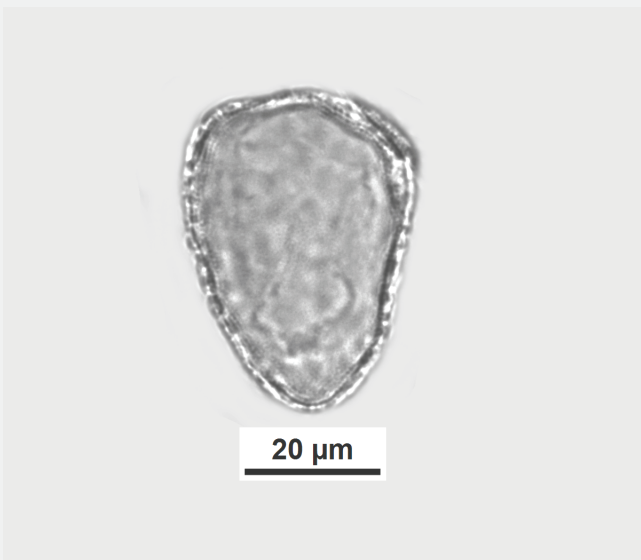
Cyperaceae



Eleocharis nudipes (Kunth) Palla
1363 – ICN 119048
Equatorial view: first plane
Prolate - Ana-ulcerate
and three elongate longitudinal
apertures - Rugulate
 $P \bar{x} = 38 \mu\text{m}$ $EQ \bar{x} = 25 \mu\text{m}$



Eleocharis nudipes (Kunth) Palla
1363 – ICN 119048
Equatorial view: second plane
Prolate - Ana-ulcerate
and three elongate longitudinal
apertures - Rugulate
 $P \bar{x} = 38 \mu\text{m}$ $EQ \bar{x} = 25 \mu\text{m}$



Eleocharis nudipes (Kunth) Palla
1363 – ICN 119048
Equatorial view: third plane
Prolate - Ana-ulcerate
and three elongate longitudinal
apertures - Rugulate
 $P \bar{x} = 38 \mu\text{m}$ $EQ \bar{x} = 25 \mu\text{m}$

Cyperaceae



20 µm

Eleocharis obtusa (Willd.) Schult.
1036 – ICN 9731

Equatorial view: first plane
Subprolate - Ana-ulcerate and four elongate
longitudinal apertures - Scabrate
P \bar{x} = 42 µm EQ \bar{x} = 32 µm



20 µm

Eleocharis obtusa (Willd.) Schult.
1036 – ICN 9731

Equatorial view: second plane
Subprolate - Ana-ulcerate and four elongate
longitudinal apertures - Scabrate
P \bar{x} = 42 µm EQ \bar{x} = 32 µm



20 µm

Eleocharis obtusa (Willd.) Schult.
1036 – ICN 9731

Equatorial view: third plane
Subprolate - Ana-ulcerate and four elongate
longitudinal apertures - Scabrate
P \bar{x} = 42 µm EQ \bar{x} = 32 µm

Cyperaceae

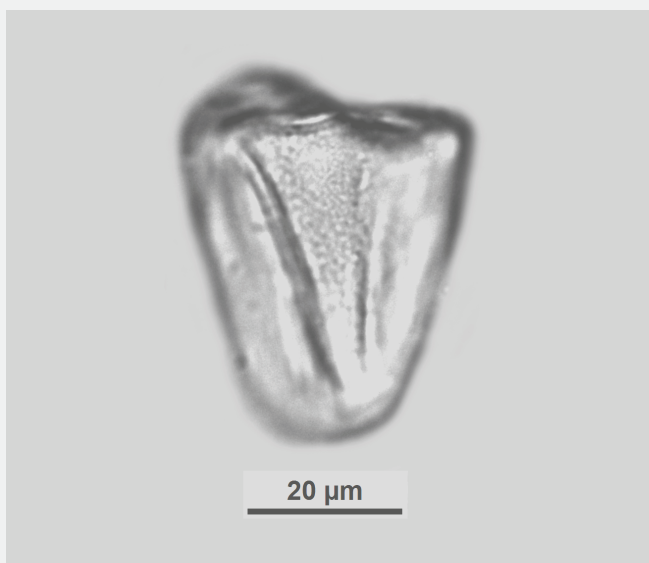


Fimbristylis complanata (Retz.) Link
102 – ICN 45852
Equatorial view: first plane
Subprolate – Ana-ulcerate and
indeterminate longitudinal
apertures - Rugulate
 $P \bar{x} = 24 \mu\text{m}$ $EQ \bar{x} = 19 \mu\text{m}$

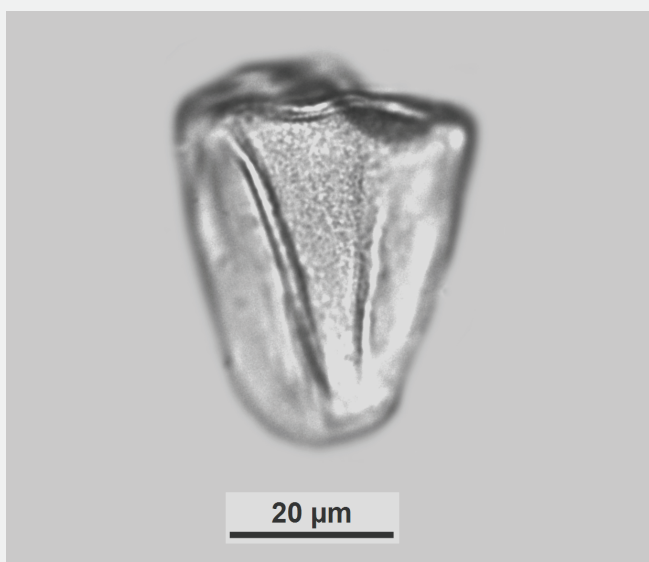


Fimbristylis complanata (Retz.) Link
102 – ICN 45852
Equatorial view: second plane
Subprolate – Ana-ulcerate and
indeterminate longitudinal
apertures - Rugulate
 $P \bar{x} = 24 \mu\text{m}$ $EQ \bar{x} = 19 \mu\text{m}$

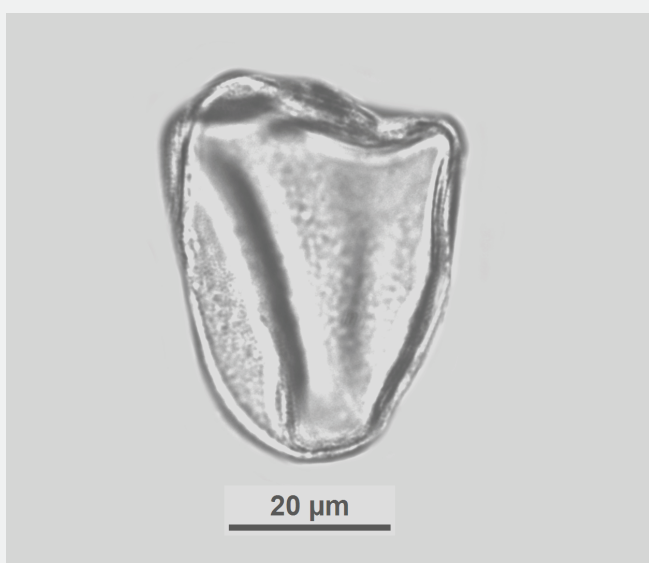
Cyperaceae



Fuirena robusta Kunth
1021 – ICN 85622
Equatorial view: first plane
Subprolate - Ana-ulcerate and
four elongate longitudinal
apertures - Scabrate
P \bar{x} = 47 μ m EQ \bar{x} = 37 μ m



Fuirena robusta Kunth
1021 – ICN 85622
Equatorial view: second plane
Subprolate - Ana-ulcerate and
four elongate longitudinal
apertures - Scabrate
P \bar{x} = 47 μ m EQ \bar{x} = 37 μ m

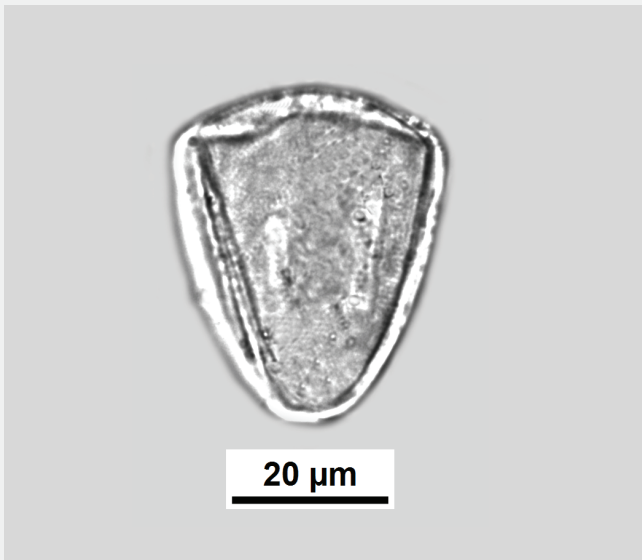


Fuirena robusta Kunth
1021 – ICN 85622
Equatorial view: third plane
Subprolate - Ana-ulcerate and
four elongate longitudinal
apertures - Scabrate
P \bar{x} = 47 μ m EQ \bar{x} = 37 μ m

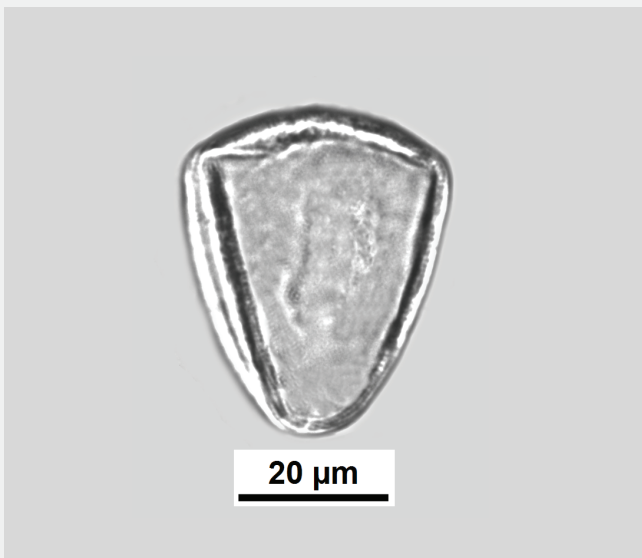
Cyperaceae



Papyrus giganteus (Vahl) Schrad. ex Nees
09 – ICN 5566
Equatorial view: first plane
Subprolate - Ana-ulcerate and four
elongate longitudinal apertures - Scabrate
 $P \bar{x} = 42 \mu\text{m}$ $EQ \bar{x} = 32 \mu\text{m}$

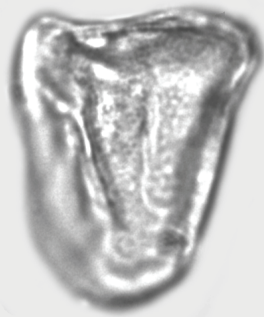


Papyrus giganteus (Vahl) Schrad. ex Nees
09 – ICN 5566
Equatorial view: second plane
Subprolate - Ana-ulcerate and four
elongate longitudinal apertures - Scabrate
 $P \bar{x} = 42 \mu\text{m}$ $EQ \bar{x} = 32 \mu\text{m}$



Papyrus giganteus (Vahl) Schrad. ex Nees
09 – ICN 5566
Equatorial view: third plane
Subprolate - Ana-ulcerate and four
elongate longitudinal apertures - Scabrate
 $P \bar{x} = 42 \mu\text{m}$ $EQ \bar{x} = 32 \mu\text{m}$

Cyperaceae



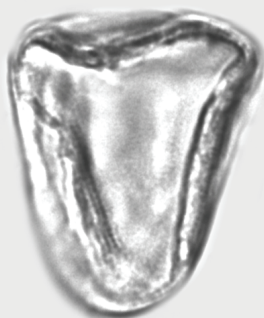
20 µm

Pycreus polystachyos (Rottb.) P. Beauv.
724 – ICN 49906
Equatorial view: first plane
Spheroidal - Ana-ulcerate and four elongate
longitudinal apertures - Scabrate
P \bar{x} = 30 µm EQ \bar{x} = 29 µm



20 µm

Pycreus polystachyos (Rottb.) P. Beauv.
724 – ICN 49906
Equatorial view: second plane
Spheroidal - Ana-ulcerate and four elongate
longitudinal apertures - Scabrate
P \bar{x} = 30 µm EQ \bar{x} = 29 µm



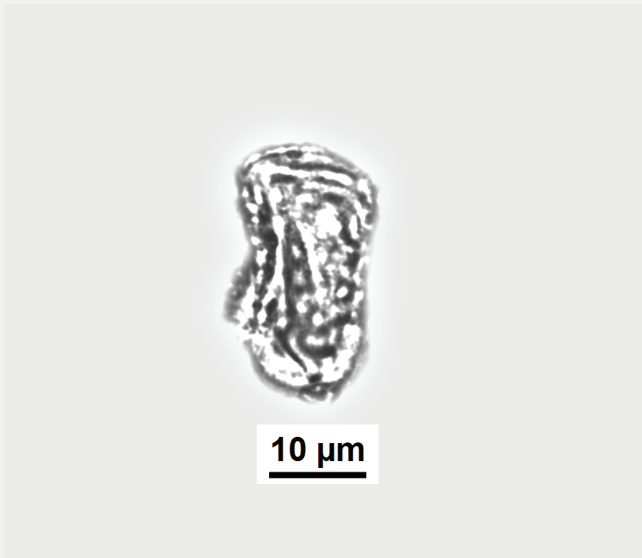
20 µm

Pycreus polystachyos (Rottb.) P. Beauv.
724 – ICN 49906
Equatorial view: third plane
Spheroidal - Ana-ulcerate and four elongate
longitudinal apertures - Scabrate
P \bar{x} = 30 µm EQ \bar{x} = 29 µm

Cyperaceae



Rhynchospora corymbosa (L.) Britton
103 – ICN 8790
Equatorial view
Prolate - Ana-ulcerate and
indeterminate longitudinal
apertures - Scabrate
P \bar{x} = 28 μ m EQ \bar{x} = 18 μ m

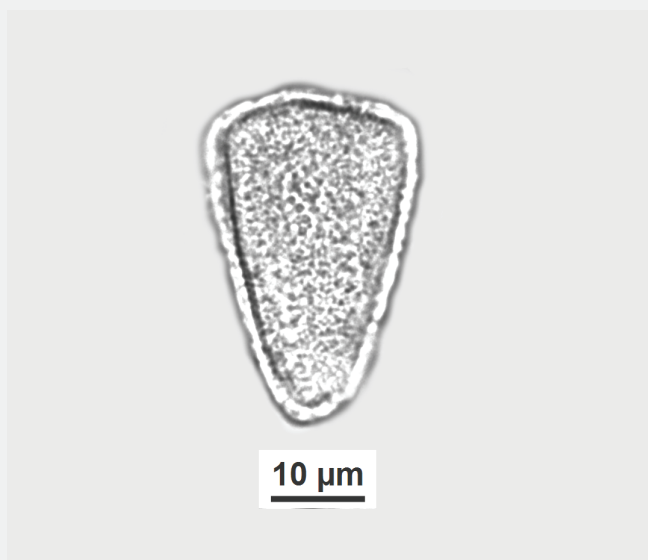


Rhynchospora holoschoenoides (Rich.) Herter
104 – ICN 9068
Equatorial view
Prolate - indeterminate apertures - Granulate
P \bar{x} = 26 μ m EQ \bar{x} = 18 μ m

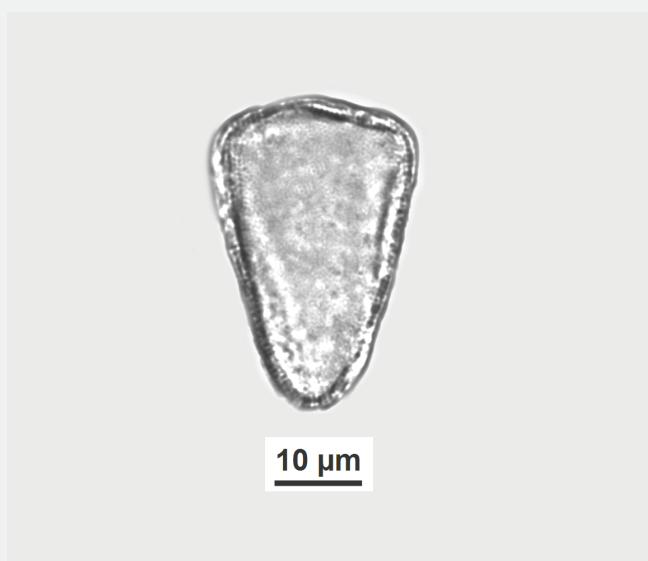
Cyperaceae



Rhynchospora marisculus Lindl. ex Nees
760 – ICN 9136
Equatorial view: first plane
Prolate - Ana-ulcerate and indeterminate
longitudinal apertures - Rugulate
P \bar{x} = 22 μ m EQ \bar{x} = 15 μ m



Rhynchospora marisculus Lindl. ex Nees
760 – ICN 9136
Equatorial view: second plane
Prolate - Ana-ulcerate and indeterminate
longitudinal apertures - Rugulate
P \bar{x} = 22 μ m EQ \bar{x} = 15 μ m



Rhynchospora marisculus Lindl. ex Nees
760 – ICN 9136
Equatorial view: third plane
Prolate - Ana-ulcerate and indeterminate
longitudinal apertures - Rugulate
P \bar{x} = 22 μ m EQ \bar{x} = 15 μ m

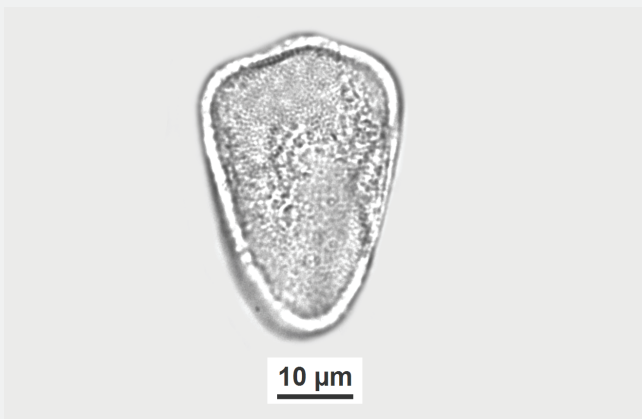
Cyperaceae



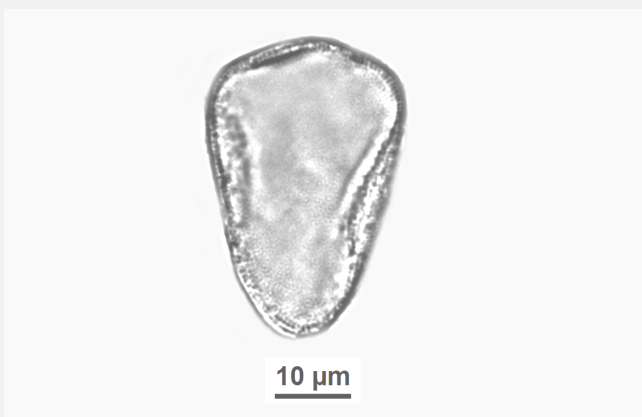
Rhynchospora panicoides Nees ex L.B. Sm.
105 – ICN 21787
Equatorial view
Spheroidal – Ana-ulcerate and
indeterminate longitudinal
apertures - Psilate
P \bar{x} = 16 μ m EQ \bar{x} = 14 μ m



Rhynchospora setigera Griseb.
107 – ICN 8550
Equatorial view: first plane
Subprolate – Ana-ulcerate and four elongate
longitudinal apertures - Scabrate
P \bar{x} = 30 μ m EQ \bar{x} = 24 μ m

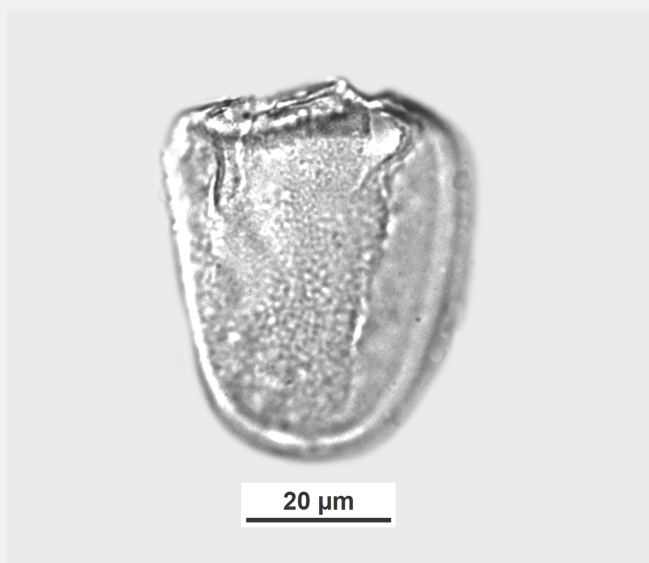


Rhynchospora setigera Griseb.
107 – ICN 8550
Equatorial view: second plane
Subprolate – Ana-ulcerate and four elongate
longitudinal apertures - Scabrate
P \bar{x} = 30 μ m EQ \bar{x} = 24 μ m

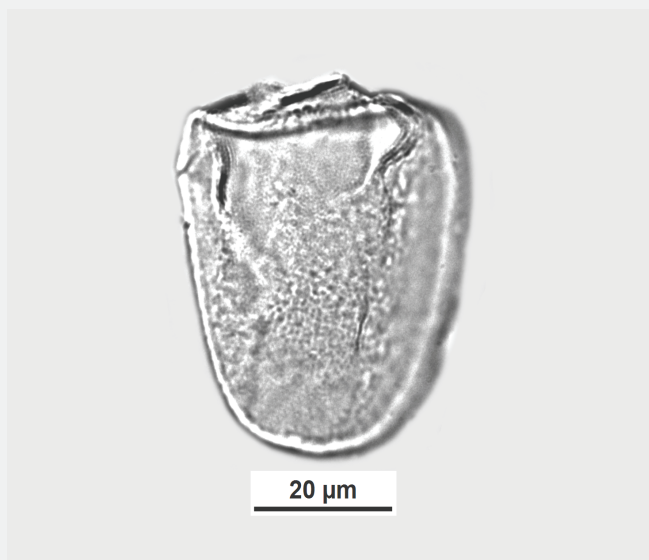


Rhynchospora setigera Griseb.
107 – ICN 8550
Equatorial view: third plane
Subprolate – Ana-ulcerate and four elongate
longitudinal apertures - Scabrate
P \bar{x} = 30 μ m EQ \bar{x} = 24 μ m

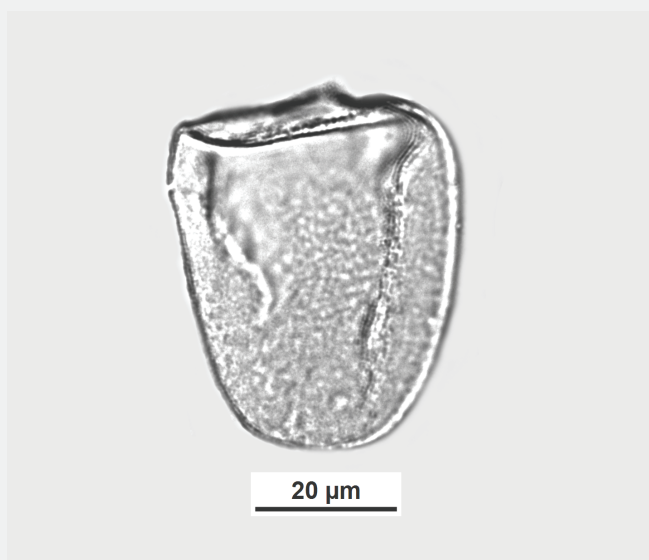
Cyperaceae



Schoenoplectus americanus (Pers.)
 Volkart ex Schinz & R. Keller
 1034 – ICN 60101
 Equatorial view: first plane
 Prolate - Ana-ulcerate and four elongate
 longitudinal apertures - Scabrate
 $P \bar{x} = 52 \mu\text{m}$ $EQ \bar{x} = 32 \mu\text{m}$

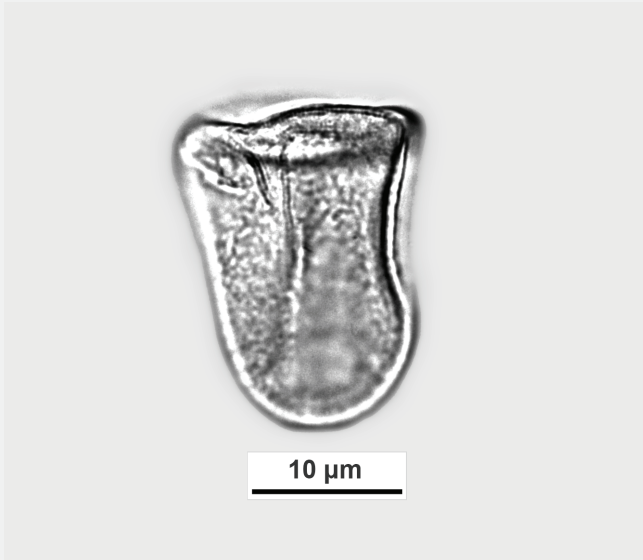


Schoenoplectus americanus (Pers.)
 Volkart ex Schinz & R. Keller
 1034 – ICN 60101
 Equatorial view: second plane
 Prolate - Ana-ulcerate and four elongate
 longitudinal apertures - Scabrate
 $P \bar{x} = 52 \mu\text{m}$ $EQ \bar{x} = 32 \mu\text{m}$



Schoenoplectus americanus (Pers.)
 Volkart ex Schinz & R. Keller
 1034 – ICN 60101
 Equatorial view: third plane
 Prolate - Ana-ulcerate and four elongate
 longitudinal apertures - Scabrate
 $P \bar{x} = 52 \mu\text{m}$ $EQ \bar{x} = 32 \mu\text{m}$

Cyperaceae



Scirpus californicus (C.A. Mey.) Steud.

736 – ICN 9145

Equatorial view: first plane

Subprolate - Ana-ulcerate and four elongate longitudinal apertures - Scabrate

$P \bar{x} = 24 \mu\text{m}$ $EQ \bar{x} = 18 \mu\text{m}$



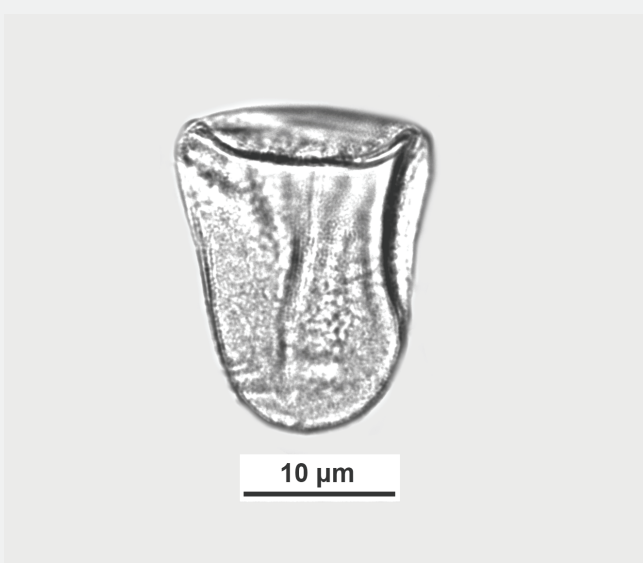
Scirpus californicus (C.A. Mey.) Steud.

736 – ICN 9145

Equatorial view: second plane

Subprolate - Ana-ulcerate and four elongate longitudinal apertures - Scabrate

$P \bar{x} = 24 \mu\text{m}$ $EQ \bar{x} = 18 \mu\text{m}$



Scirpus californicus (C.A. Mey.) Steud.

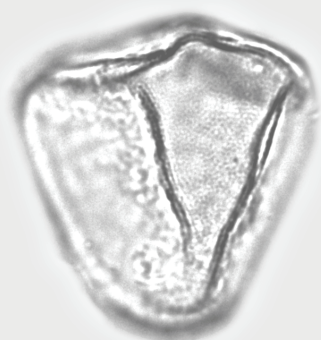
736 – ICN 9145

Equatorial view: third plane

Subprolate - Ana-ulcerate and four elongate longitudinal apertures - Scabrate

$P \bar{x} = 24 \mu\text{m}$ $EQ \bar{x} = 18 \mu\text{m}$

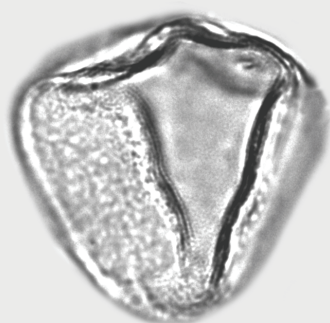
Cyperaceae



20 µm

Scleria hirtella (Sw.) J.F. Gmel.
951 – ICN 61584

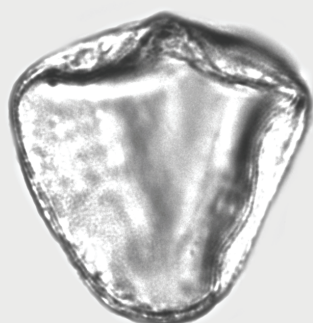
Equatorial view: first plane
Spheroidal - Ana-ulcerate and indeterminate
longitudinal apertures - Scabrate
P \bar{x} = 38 µm EQ \bar{x} = 35 µm



20 µm

Scleria hirtella (Sw.) J.F. Gmel.
951 – ICN 61584

Equatorial view: second plane
Spheroidal - Ana-ulcerate and indeterminate
longitudinal apertures - Scabrate
P \bar{x} = 38 µm EQ \bar{x} = 35 µm

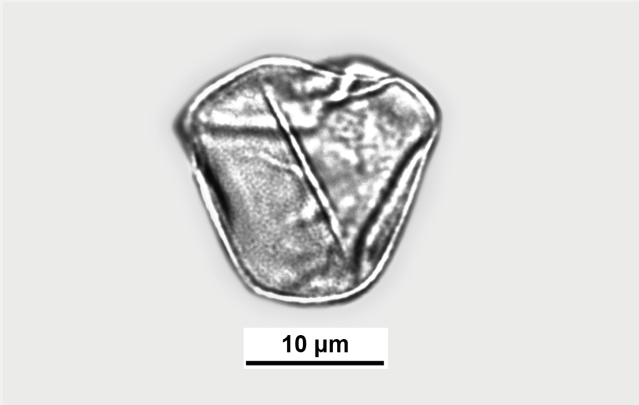


20 µm

Scleria hirtella (Sw.) J.F. Gmel.
951 – ICN 61584

Equatorial view: third plane
Spheroidal - Ana-ulcerate and indeterminate
longitudinal apertures - Scabrate
P \bar{x} = 38 µm EQ \bar{x} = 35 µm

Cyperaceae



Scleria uleana Boeckeler
756 – ICN 28219
Equatorial view
Spheroidal - Ana-ulcerate and
indeterminate longitudinal
apertures - Scabrate
P \bar{x} = 21 μ m EQ \bar{x} = 19 μ m



Uncinia sellowiana (Schltdl.) Nees
109 – ICN 46218
Equatorial view: first plane
Prolate – Ana-ulcerate and three
elongate longitudinal
apertures - Scabrate
P \bar{x} = 39 μ m EQ \bar{x} = 29 μ m

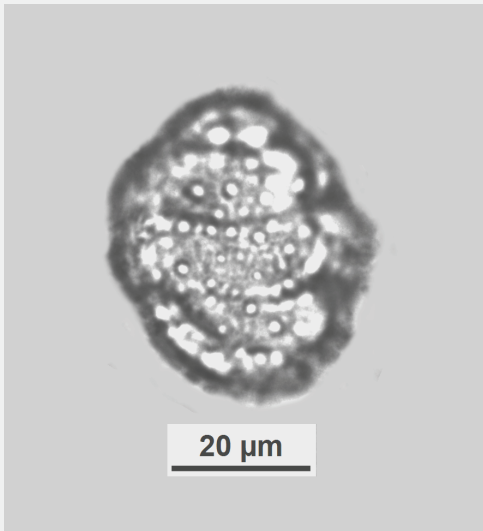


Uncinia sellowiana (Schltdl.) Nees
109 – ICN 46218
Equatorial view: second plane
Prolate – Ana-ulcerate and three
elongate longitudinal
apertures - Scabrate
P \bar{x} = 39 μ m EQ \bar{x} = 29 μ m



Uncinia sellowiana (Schltdl.) Nees
109 – ICN 46218
Equatorial view: third plane
Prolate – Ana-ulcerate and three
elongate longitudinal
apertures - Scabrate
P \bar{x} = 39 μ m EQ \bar{x} = 29 μ m

Eriocaulaceae



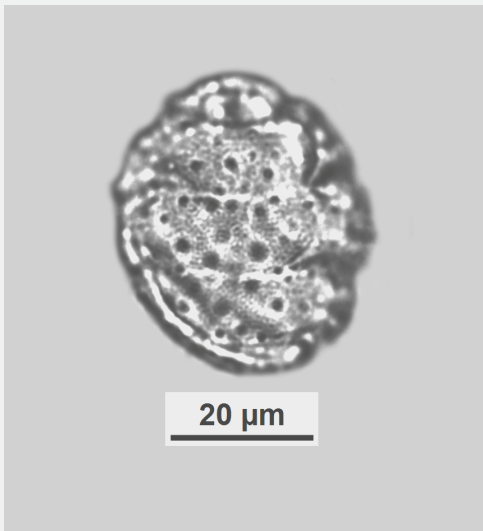
Eriocaulon gomphrenoides Knuth

1331 – ICN 119039

Equatorial view: first plane

Prolate spheroidal - Spiraperturate - Microechinate

P \bar{x} = 34 μ m EQ \bar{x} = 30 μ m



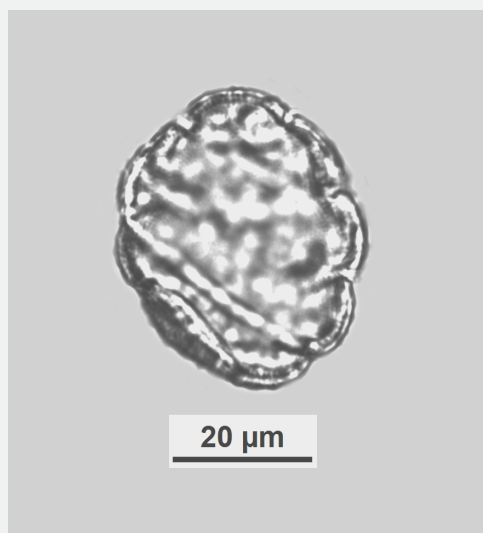
Eriocaulon gomphrenoides Knuth

1331 – ICN 119039

Equatorial view: second plane

Prolate spheroidal - Spiraperturate - Microechinate

P \bar{x} = 34 μ m EQ \bar{x} = 30 μ m



Eriocaulon gomphrenoides Knuth

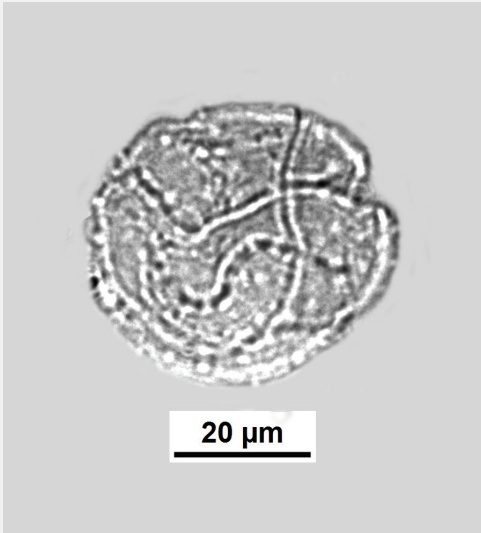
1331 – ICN 119039

Equatorial view: third plane

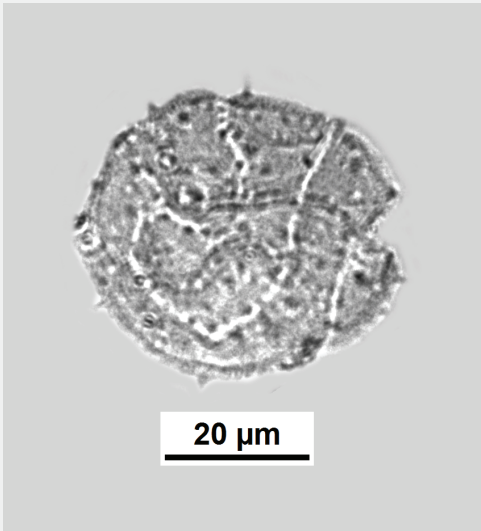
Prolate spheroidal - Spiraperturate - Microechinate

P \bar{x} = 34 μ m EQ \bar{x} = 30 μ m

Eriocaulaceae

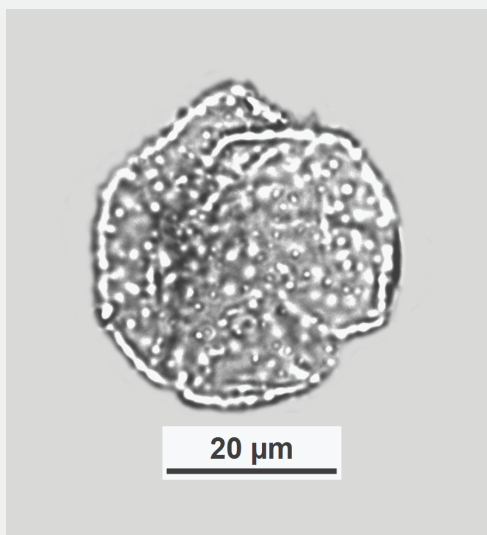


Eriocaulon ligulatum (Vell.) L.B. Sm.
788 – ICN 53492
Polar view: first plane
Subprolate - Spiraperturate - Microechinate
 $P \bar{x} = 33 \mu\text{m}$ $EQ \bar{x} = 26 \mu\text{m}$

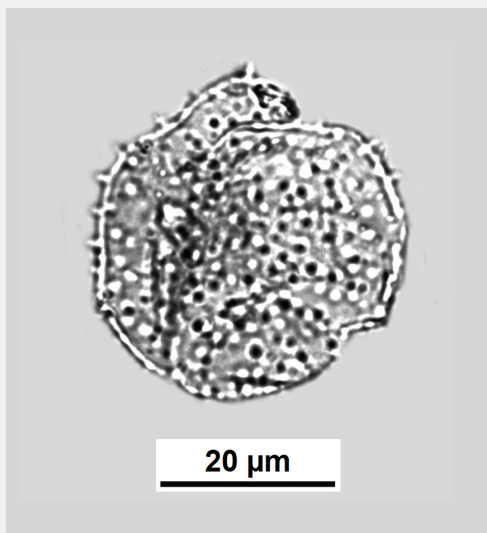


Eriocaulon ligulatum (Vell.) L.B. Sm.
788 – ICN 53492
Polar view: second plane
Subprolate - Spiraperturate - Microechinate
 $P \bar{x} = 33 \mu\text{m}$ $EQ \bar{x} = 26 \mu\text{m}$

Eriocaulaceae

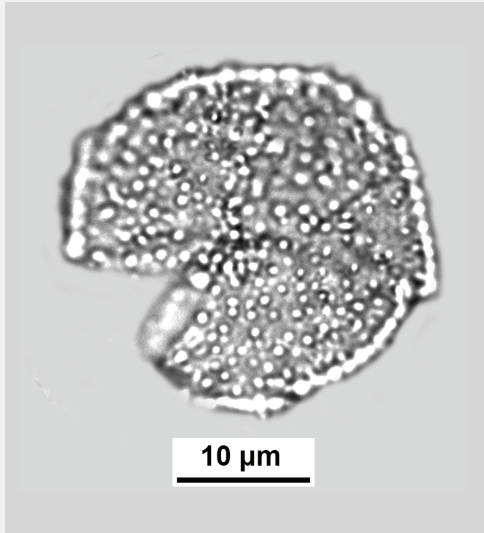


Leiothrix flavescens (Bong.) Ruhland
787 – ICN 51495
Equatorial view: first plane
Subprolate - Spiraperturate - Microechinate
P \bar{x} = 31 μ m EQ \bar{x} = 26 μ m

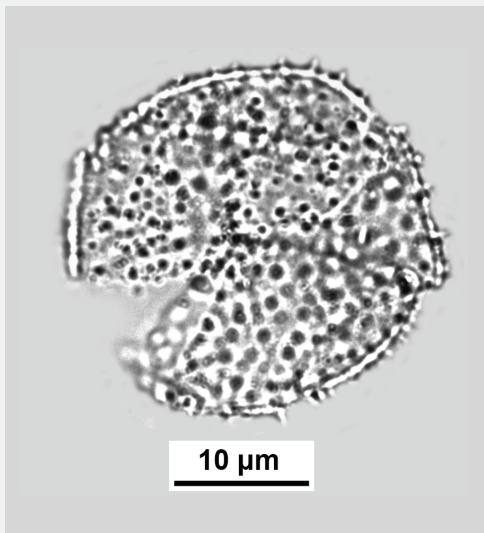


Leiothrix flavescens (Bong.) Ruhland
787 – ICN 51495
Equatorial view: second plane
Subprolate - Spiraperturate - Microechinate
P \bar{x} = 31 μ m EQ \bar{x} = 26 μ m

Eriocaulaceae



Paepalanthus catharinae Ruhland
122 – ICN 7398
Oblique view: first plane
Subprolate - Spiraperturate - Microechinate
 $P \bar{x} = 30 \mu\text{m}$ $EQ \bar{x} = 26 \mu\text{m}$



Paepalanthus catharinae Ruhland
122 – ICN 7398
Oblique view: first plane
Subprolate - Spiraperturate - Microechinate
 $P \bar{x} = 30 \mu\text{m}$ $EQ \bar{x} = 26 \mu\text{m}$

Poaceae



Bromus unioloides Kunth

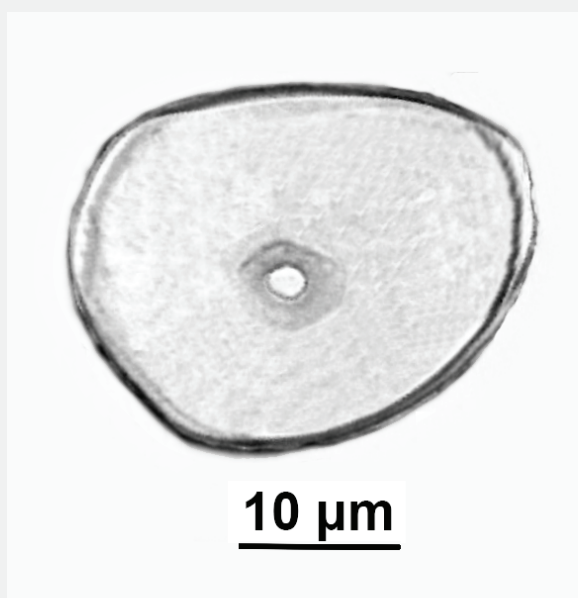
84 – ICN 32527

Equatorial view

Spheroidal – Ana-ulcerate - Psilate

P \bar{x} = 38 μ m EQ \bar{x} = 34 μ m

Note: Ulcus slightly protruding and crassimarginate.
This morphology is characteristic of the family.



Bromus unioloides Kunth

84 – ICN 32527

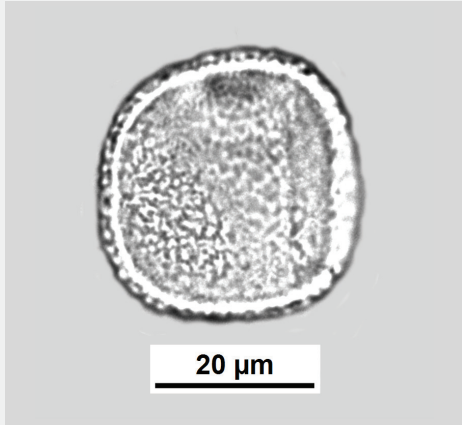
Polar view Distal face

Spheroidal – Ana-ulcerate - Psilate

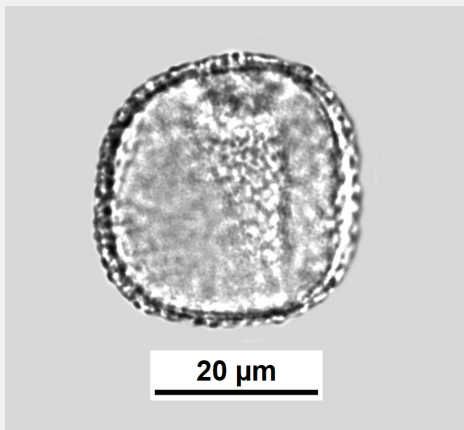
P \bar{x} = 38 μ m EQ \bar{x} = 34 μ m

Note: Ulcus slightly protruding and crassimarginate.
This morphology is characteristic of the family.

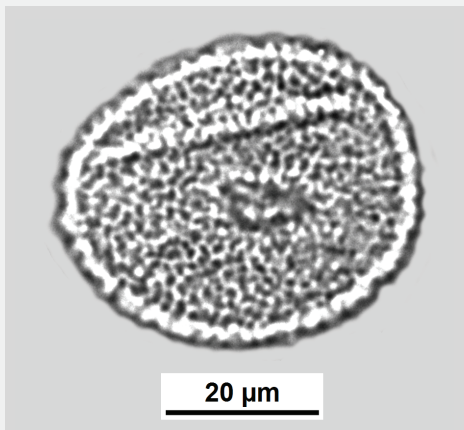
Thyphaceae



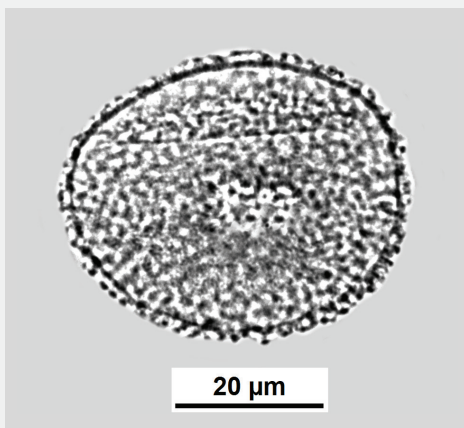
Typha angustifolia L.
809 – ICN 53651
Equatorial view: first plane
Spheroidal - Ana-ulcerate - Rugulate
P \bar{x} = 28 μ m EQ \bar{x} = 27 μ m



Typha angustifolia L.
809 – ICN 53651
Equatorial view: second plane
Spheroidal - Ana-ulcerate - Rugulate
P \bar{x} = 28 μ m EQ \bar{x} = 27 μ m

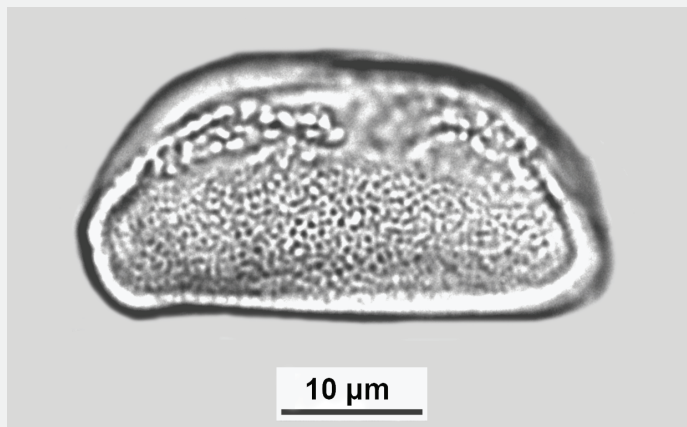


Typha angustifolia L.
809 – ICN 53651
Polar view Distal face: first plane
Spheroidal - Ana-ulcerate - Rugulate
P \bar{x} = 28 μ m EQ \bar{x} = 27 μ m

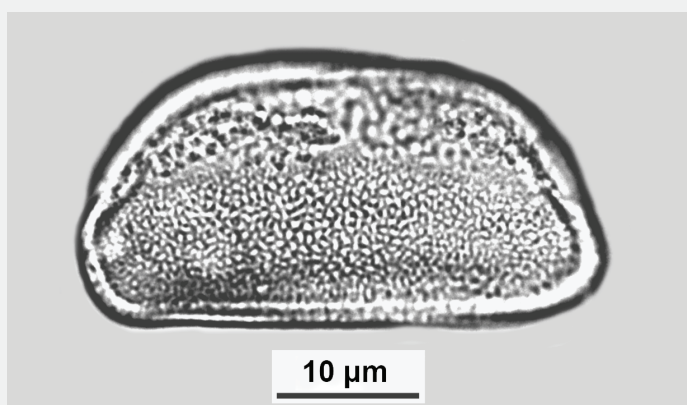


Typha angustifolia L.
809 – ICN 53651
Polar view Distal face: second plane
Spheroidal - Ana-ulcerate - Rugulate
P \bar{x} = 28 μ m EQ \bar{x} = 27 μ m

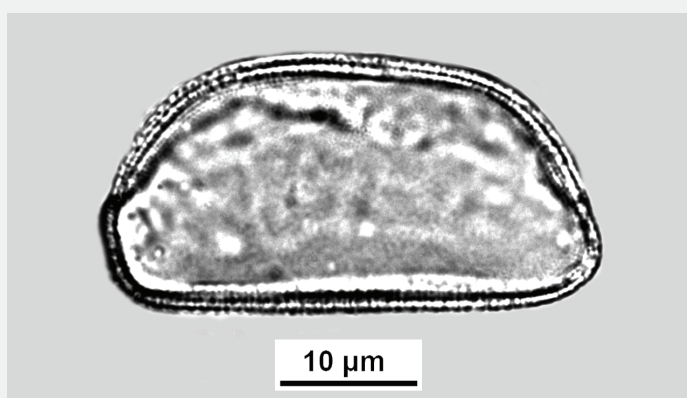
Xyridaceae



Xyris guaranítica Malme
447 – ICN 458
Equatorial view: first plane
Oblate - Sulcate - Reticulate
P \bar{x} = 27 μ m EQ \bar{x} = 48 μ m

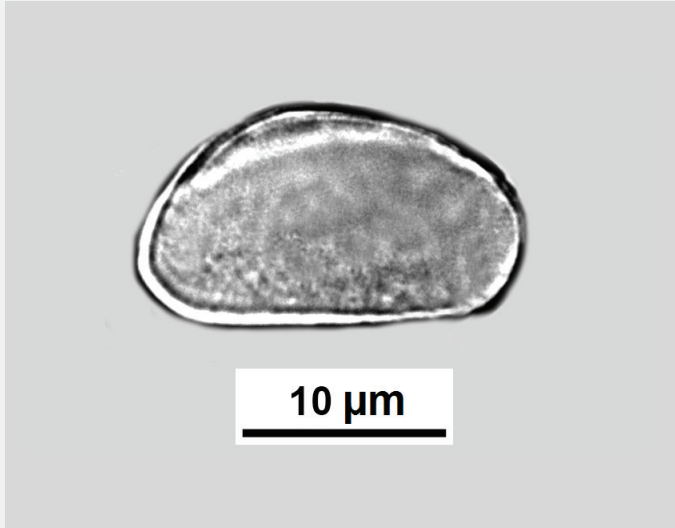


Xyris guaranítica Malme
447 – ICN 458
Equatorial view: second plane
Oblate - Sulcate - Reticulate
P \bar{x} = 27 μ m EQ \bar{x} = 48 μ m

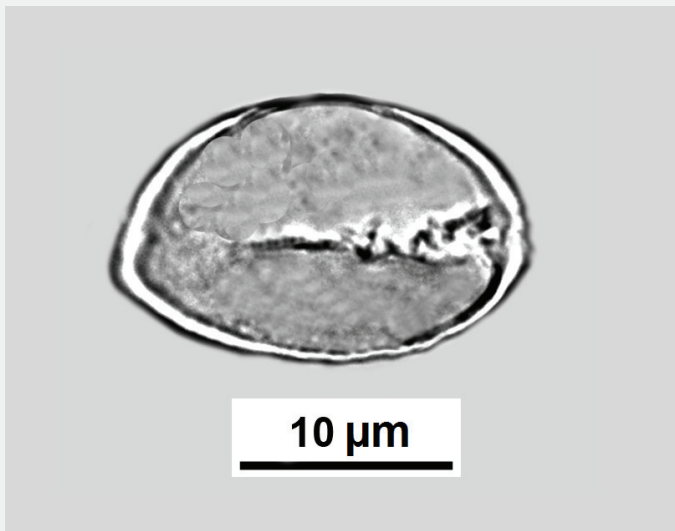


Xyris guaranítica Malme
447 – ICN 458
Equatorial view: third plane
Oblate - Sulcate - Reticulate
P \bar{x} = 27 μ m EQ \bar{x} = 48 μ m

Commelinaceae



Tradescantia crassula Link & Otto
303 – ICN 2025
Equatorial view
Oblate - Anasulcate - Psilate
P \bar{x} = 19 μ m EQ \bar{x} = 27 μ m



Tradescantia crassula Link & Otto
303 – ICN 2025
Polar view Distal face
Oblate - Anasulcate - Psilate
P \bar{x} = 19 μ m EQ \bar{x} = 27 μ m

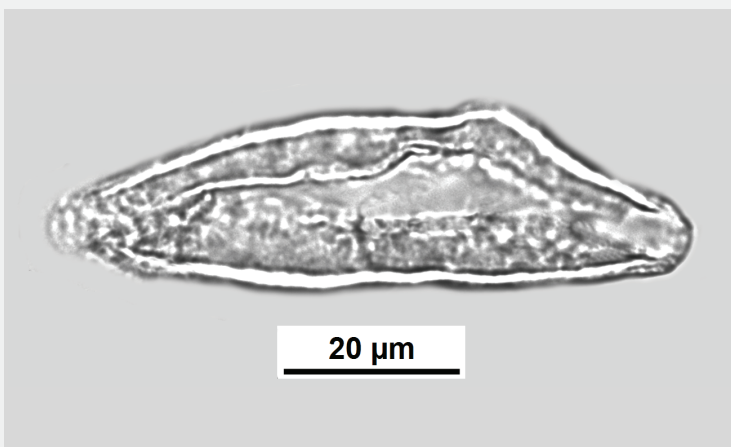
Pontederiaceae



Eichhornia azurea (Sw.) Kunth
13 – ICN 30740
Equatorial view: first plane
Peroblate - 2-Sulcate - Reticulate
 $P \bar{x} = 25 \mu\text{m}$ $EQ \bar{x} = 60 \mu\text{m}$

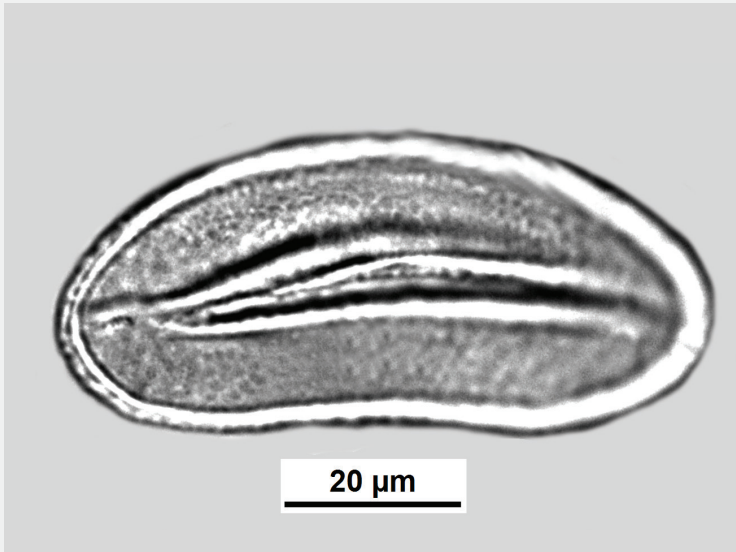


Eichhornia azurea (Sw.) Kunth
13 – ICN 30740
Equatorial view: second plane
Peroblate - 2-Sulcate - Reticulate
 $P \bar{x} = 25 \mu\text{m}$ $EQ \bar{x} = 60 \mu\text{m}$

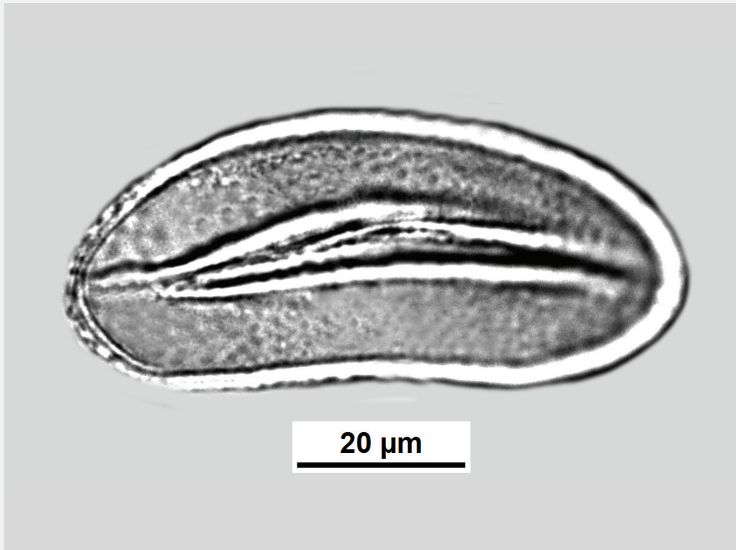


Eichhornia crassipes (Mart.) Solms
1038 – ICN 53743
Equatorial view
Peroblate - 2-Sulcate – Reticulate
 $P \bar{x} = 20 \mu\text{m}$ $EQ \bar{x} = 70 \mu\text{m}$

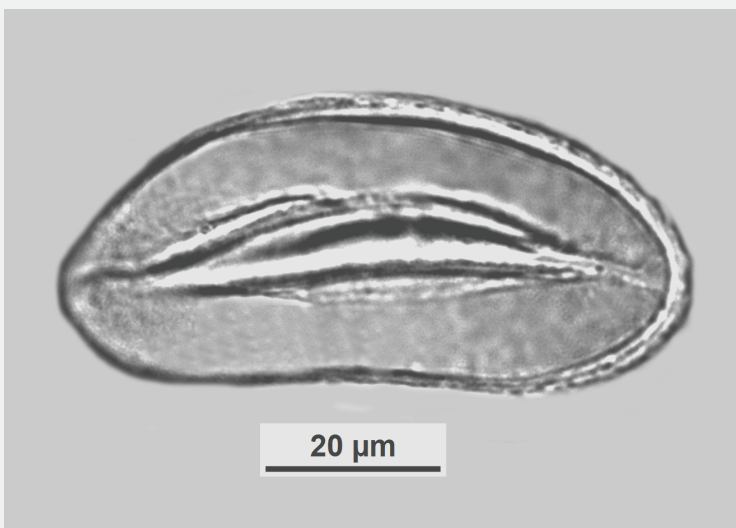
Pontederiaceae



Pontederia cordata L.
70 – ICN 46681
Equatorial view: first plane
Peroblate - 2-Sulcate - Reticulate
P \bar{x} = 24 μ m EQ \bar{x} = 51 μ m

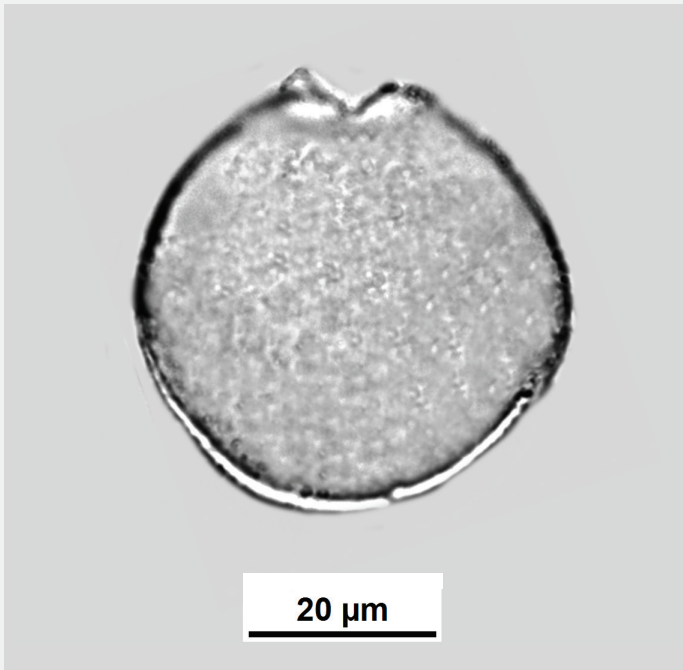


Pontederia cordata L.
70 – ICN 46681
Equatorial view: second plane
Peroblate - 2-Sulcate - Reticulate
P \bar{x} = 24 μ m EQ \bar{x} = 51 μ m



Pontederia cordata L.
70 – ICN 46681
Equatorial view: third plane
Peroblate - 2-Sulcate - Reticulate
P \bar{x} = 24 μ m EQ \bar{x} = 51 μ m

Heliconiaceae



Heliconia velloziana Emygdio
27 – ICN 16366
Equatorial view
Spheroidal - Ana-ulceroidate
Microgranulate
diameter \bar{x} = 49 μm
Note: Surface with sparse granules.

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