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Original Article

Identification of palynomorphs sampled from a sedimentary profile of the last 5000 years in Lagoa dos Patos, Rio Grande do Sul, southern Brazil.

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ABSTRACT

Lagoa dos Patos, the largest lagoon in South America, lies on the coastal plain of Rio Grande do Sul state, southern Brazil. This region forms a transition area between the tropical and subtropical zones of South America. Rio Grande do Sul coastal plain extends over 600 km and is affected by climate changes and sea level oscillations. Lagoa dos Patos is limited to the east by the Atlantic Ocean and to the west by terrain containing granitic and metamorphic rocks. The lagoon is 250 km long, with a maximum width of 60 km and an average depth of 6–7 m. We describe and illustrate 23 palynomorph taxa from six fungi, nine algae, two acritarchs, three bryophytes, as well as three other palynomorphs - platyhelminth eggs, mandible fragments, microforaminifera - preserved in a 2.125-m-long Holocene sediment core (T25) sampled from the lagoon (30°50’51”S–50°59’06”W), which corresponds to the last 5,000 years. After acetolysis, the palynomorphs were analyzed by light microscopy. This study presents the first part of a comprehensive description of palynomorphs from this profile, including their photomicrographs and ecological information. Our objective was to provide comparative materials of palynomorphs for paleoenvironmental reconstructions of Quaternary environments on the southern Brazilian coastal plain.

Keywords: Coastal plain, lagoon sediments, palynomorphs, Quaternary profile, southern Brazil, taxonomic descriptions

Introduction

Lagoa dos Patos, the largest lagoon in South America, is located on the coastal plain of Rio Grande do Sul state, southern tip of Brazil (Fig. 1). This region forms a transitional area between the tropical and subtropical zones of South America (Marchiori, 2004), and its coastal plain is influenced by global climate changes and sea level fluctuations (Seeliger *et al.*, 1998). The extensive coastal plain, over 600 km in length, has a subtropical humid climate, with an average annual temperature around 17 °C and average annual rainfall of 1,300 mm (Waechter, 1985).

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The Lagoa dos Patos is bordered to the east by the Atlantic Ocean and to the west by terrain containing granitic and metamorphic rocks (Alvarez *et al.*, 1981). The lagune is 250 km in length, with a maximum width of 60 km, and an average depth of 6–7 m (Toldo Jr., 1989). It is separated from the Atlantic Ocean by a barrier beach system consisting of four barriers, the last of which (Barrier IV) formed during a marine regression after the maximum Holocene transgression (5500 BP), isolating Lagoa dos Patos (Villwock, 1984; 1988; Villwock *et al.*, 1986; Tomazelli *et al.*, 1987; Villwock & Tomazelli, 1998). The lagoon is presently connected to the sea by a narrow channel at its southern end (Fig. 1).

Palynological catalogs of material preserved in Quaternary sediments offer support for paleoenvironmental reconstructions of the last several millennia. However, despite the extensive coastal plain of Rio Grande do Sul, there have been few palynological descriptions of fungal, algal, acritarch, bryophyte, and other palynomorph taxa from Quaternary sediment profiles (Lorscheitter, 1989; Neves & Lorscheitter, 1992; Masetto & Lorscheitter, 2014; Neves & Bauermann, 2003, 2004; Roth & Lorscheitter, 2013; 2016).

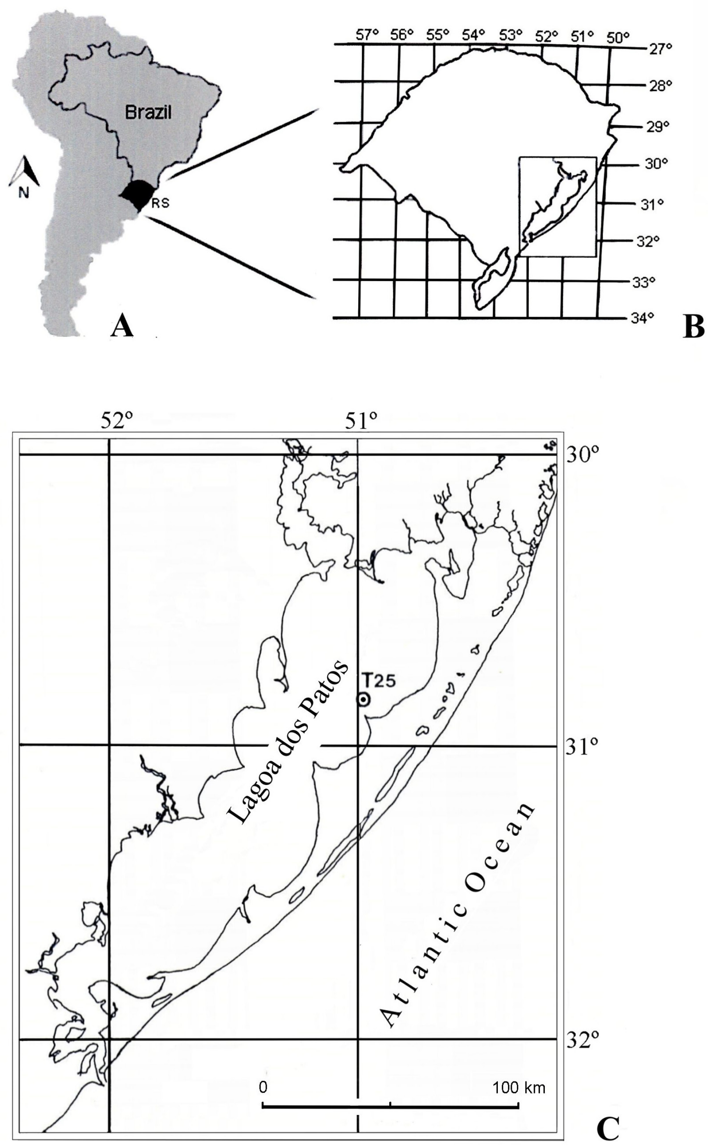

Figure 1. A. South America and Rio Grande do Sul, southern Brazil; B. Location of Lagoa dos Patos on Rio Grande do Sul coastal plain; C. Lagoa dos Patos and the location of the T25 sediment core (30°50’51”S–50°59’06” W).

This study presents the first part of a comprehensive taxonomic description of palynological material collected from the T25 Holocene sediment core sampled from Lagoa dos Patos (Fig. 1) and used in paleoenvironmental reconstruction of the last 5,000 years on the Rio Grande do Sul coastal plain (Cordeiro & Lorscheitter, 1994). This first part includes fungal, algal, acritarch, and bryophyte palynomorphs, as well as those from other taxa, such as platyhelminth eggs, mandible fragments, and microforaminifera. Morphological descriptions, measurements, and photomicrographs were used for the taxonomic distinction of palynomorphs. Ecological information about the source organism accompanies each description. The objective of this study was to provide more comparative material for the identification of palynomorphs in Quaternary paleoenvironmental reconstructions of the coastal plain of southern Brazil.

Materials and methods

The collection of the T25 sediment core was carried out during the cruise of the ship Benjamim Constant, from the Departamento de Portos, Rios e Canais, Rio Grande do Sul– DEPRC/RS. Coring was carried out with a vibracore collector.

The T25 sedimentary core is preserved in the Centro de Estudos de Geologia Costeira e Oceânica (CECO) at the Instituto de Geociências, Universidade Federal do Rio Grande do Sul. This profile, which is 2.125 m in length, was collected from the northern part of the lagoon (30°50’51” S–50°59’06” W; Fig. 1), at a water depth of 7.70 m. From positions uniformly distributed over the length of the sedimentary profile, the 24 subsamples were collected and prepared for palynological analysis. The radiocarbon age at T25 core base by Beta Analytic Inc. Laboratory (Miami, FL, USA) allowed to determine of the time interval of 5,000 years (Cordeiro & Lorscheitter, 1994).

The subsamples collected along the T25 sedimentary core were processed, and their permanent slides included in the palynotheca of the Departamento de Botânica, Universidade Federal do Rio Grande do Sul. In this collection, each slide was recorded according to the core number and subsample depth (cm).

Sedimentary subsamples were subjected to standard chemical processing using hydrochloric acid, hydrofluoric acid, potassium hydroxide, and acetolysis, followed by filtration through a 250 μm mesh, as previously described (Faegri & Iversen, 1975; 1989). The processed subsamples were mounted on slides in glycerol jelly (Salgado-Labouriau, 1973; Faegri & Iversen, 1989) and examined under a light microscope (Carl Zeiss Jena, Germany).

Taxonomic identification was performed based on several publications (Boulouard & Delauze, 1966; Cross *et al.*, 1966; Traverse & Ginsburg, 1966; Sarjeant, 1974; Van Geel, 1978; Van Geel &Van Der Hammen, 1978; Pals *et al.*, 1980; Hooghiemstra, 1984; Traverse, 1988; Lorscheitter, 1989; Uutela & Tynni, 1991; Neves & Lorscheitter, 1992; Haas, 1996; Nakrem *et al.*, 2001; García *et al.*, 2004; Masetto & Lorscheitter, 2014; Guiry, 2013; Roth & Lorscheitter, 2013; 2016).

To assist in paleoenvironmental reconstructions, ecological information about the source organism accompanies the descriptions (Alexopoulos . *et al.*, 1996; AlgaeBase 2024; Barrón *et al.,* 2013; Bicudo & Menezes, 2006; Boulouard & Delauze, 1966; Bold *et al.,* 1987; Dias, 1983; Domsch *et al.,* 1980; Erdtman, 1969; Franceschini *et al.,* 2010; Haas, 1996; 1989; Menéndez, 1962; Nakrem *et al.,* 2001; Pals *et al.,* 1980; Parihar, 1962; Rosa & Miranda-Kiesslich, 1988; Torgan & Hentschke, 2011; Traverse, 1988; Traverse & Ginsburg, 1966; Van Geel, 1978; Van Geel & Van der Hammen, 1978; Von Arx, 1974; Wall *et al.,* 1977; Watson, 1968).

Palynomorphs were identified using names of species or genera, according to the difficulties that came up. Numbers were assigned to distinguish indeterminate specimens, and the word “type” was used when precise identification was not possible (Berglund, 1986).

Taxonomic ordination of fungal, algal, and bryophyte palynomorphs to the species or genus level was conducted based on the Index Fungorum (2024), AlgaeBase (2024), and Cole & Hilger (2013).

To calculate the medium size, 25 palynomorphs were counted for each taxon. This number could not be reached in only two indeterminate ascospores, indicated as rare in the respective descriptions. The morphological nomenclature used in palynomorph taxonomic descriptions was based on the work of Punt *et al.* (2007). Photomicrographs were captured using a FOTO 1 camera (Zeiss Oberkochen, Germany) connected to the microscope.

Results

Our T25 core analyses revealed palynomorphs of six fungi, nine algae, two acritarchs, three bryophytes, and three other palynomorphs, for a total of 23 taxa.

Fungi

Phylum Ascomycota
Class Sordariomycetes
Order (incertae sedis)

1. *Nigrospora* Zimm. type
   (Fig. 2A, B)

Conidia elliptical, dark, opaque. Thick wall, laevigate, with a characteristic fissure. Long axis *ca.* 17–22 µm ($\bar{x}$ 20 µm), short axis *ca.* 13–16 µm ($\bar{x}$ 14 µm). Ecological data: *Nigrospora* species are cellulose-decomposing fungi that mainly inhabit warm regions, including forest soils, grasslands, mangroves, sandy soils, and bat caves (Domsch *et al.*, 1980).

Order Sordariales
Family Sordariaceae

2. *Neurospora* Shear & B.O. Dodge type
   (Fig. 2C–E)

Ascospore elliptical, dark, surface with numerous tiny pores. Long axis *ca.* 39–45 µm, ($\bar{x}$ 43 µm), short axis *ca.* 30–34 µm ($\bar{x}$ 32 µm). Synonym: *Gelasinospora* Dowding. Ecological data: *Neurospora* species are mainly fimicolous, but may also be carbonicolous or lignicolous (Van Geel, 1978).

Order Magnaporthales
Family Magnaporthaceae

3. *Gaeumannomyces cf. caricis* J. Walker type
   (Fig. 2F, G)

Hyphopodia laevigate, dark brown, approximately circular in frontal view, with irregular lobate margins. Clear spot in the central area of only one face, showing the point of host penetration. Diameter *ca.* 15–28 µm ($\bar{x}$ 18 µm). Ecological data: *Gaeumannomyces* species are parasitic or saprophytic on the stems and roots of various cereals, including wheat, rice, and oats (Von Arx, 1974; Alexopoulos *et al.*, 1996).

Indeterminate fungal material

4. Ascospore 1
   (Fig. 2H, I)

Elliptical dispersion unit, 2-septate, with three dark laevigate ascospores. Dispersion unit with a long axis of *ca.* 27 µm and short axis *ca.* 12 µm. Rare.

5. Ascospore 2
   (Fig. 2J-K)

Fusiform dispersion unit, 1-septate, with two small, clear, hyaline and laevigate ascospores. Dispersion unit with a long axis *ca.* 10 µm, short axis *ca.* 6 µm. Rare.

6. Hyphae
   (Fig. 2L, M)

Fragments of multicellular or coenocytic filaments, dark brown, usually branched, of varying sizes. Width *ca.* 5 µm.

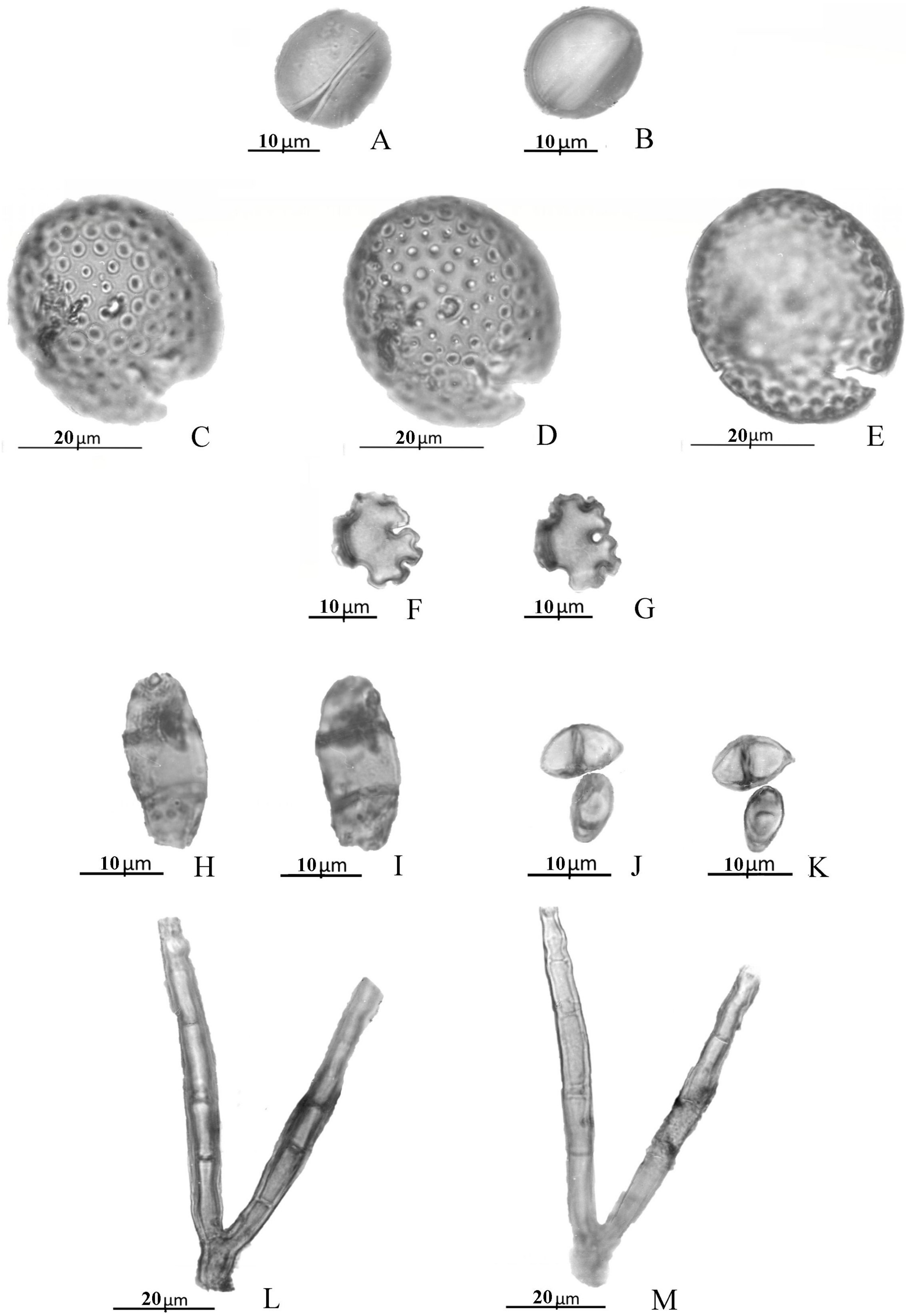

Figure 2. Fungi. A, B. *Nigrospora* Zimm. type: 1º–2º pl; C–E *Neurospora* Shear & B.O. Dodge type: 1º–3º pl; F, G. *Gaeumannomyces cf. caricis* J. Walker type: 1º–2º pl; H, I. Ascospore 1: 1º–2º pl; J, K. Ascospore 2: 1º–2º pl; L, M. Hypha, multicellular filament: 1º–2º pl (pl planes).

Algae

Division Dinophyta
Class Dinophyceae
Order (incertae sedis)

7. *Operculodinium centrocarpum* (Deflandre & Cookson) Wall (Fig. 3A–C)

Spheroidal cyst, with laevigate or finely granulated surface. Fine, elongate capitate processes, densely distributed over the entire surface. Archeopyle formed by loss of the third precingular plate (Sarjeant, 1974). Diameter (including projections) *ca*. 54–70 µm ($\bar{x}$ 60 µm). Ecological data: marine, cosmopolitan dinocyst found from estuaries to areas beyond the continental slope (Wall *et al.*, 1977). Used as an index to ancient shoreline positions on the southern Brazilian coastal plain (Lorscheittter, 1983; Lorscheitter & Romero, 1985; Cordeiro & Lorscheitter, 1994; Lorscheitter & Dillenburg, 1998; Lorscheitter, 2003; Masetto & Lorscheitter, 2019; Roth *et al.*, 2021).

8. *Spiniferites mirabilis* (M.R. Rossignol) Sarjeant (Fig. 3D, E)

Spheroidal cyst, with laevigate or finely granulated surface. Large number of thick conical processes, with small branches at the top, covering the entire surface. Archeopyle formed by loss of the third precingular plate (Sarjeant, 1974). Diameter (including projections) *ca*. 58–115 µm ($\bar{x}$ 95 µm). The cyst generally has irregular folds and/or is fractured due to preservation conditions. Ecological data: marine, cosmopolitan, dinocyst from low to high salinity levels, in estuarine, coastal, and coastal to open oceanic sites, widely occurring in diverse ocean environments, and always in low numbers (Wall *et al.*, 1977). As *O. centrocarpum*, it is used as an index of ancient shoreline positions on the southern Brazilian coastal plain (Lorscheitter, 1983, Lorscheitter & Romero, 1985; Cordeiro & Lorscheitter, 1994; Neves & Lorscheitter, 1995; Lorscheitter & Dillenburg, 1998; Lorscheitter, 2003; Roth *et al.*, 2021).

Division Chlorophyta
Class Trebouxiophyceae
Order Trebouxiales
Family Botryococcaceae

9. *Botryococcus* Kützing (Fig. 3F, G)

Colony irregularly lobate, of varied size, composed of many concentrically arranged laevigate ovoid or spheric cells, with the base immersed in a dense, dark mucilage of the colony. Colony diameter *ca*. 40–130 µm ($\bar{x}$ 100 µm). Ecological data: found in shallow freshwater environments (Erdtman, 1969; Franceschini *et al.*, 2010).

Class Chlorophyceae
Order Sphaeropleales
Family Hydrodictyaceae

10. *Pediastrum boryanum* (Turpim) Meneghini (Fig. 3H)

Discoid colony, hyaline, not clathrate, with a flattened star-like shape. Size variable, with 8–16 smooth-walled to microverrucate cells. Bifurcated cells at the periphery of the colony, with characteristic elongated processes. Internal cells with distinct morphology. Colony diameter *ca*. 50–68 µm ($\bar{x}$ 55 µm). Colony usually found with irregular folds in sediment due to its fragile structure. Ecological data: found in shallow freshwater environments such as lakes, marshes, and near deltas (Erdtman, 1969; Rosa & Miranda-Kiesslich, 1988; Lorscheitter ,1989; Torgan & Hentschke, 2011).

11. *Pediastrum duplex* Meyen (Fig. 3I, J)

Discoid colony, hyaline, clathrate, with a flattened star-like shape. Size variable, with *ca*. 16 smooth-walled to microverrucate cells. Bifurcated cells at the periphery of the colony, with characteristic elongated processes. Internal cells with distinct morphology. Colony diameter *ca*. 40–123 µm ($\bar{x}$ 68 µm). As in *P. boryanum*, colony usually found with irregular folds in sediment due to its fragile structure. Ecological data: as described for *P. boryanum*.

Division Charophyta
Class Zygnematophyceae
Order Zygnematales
Family Zygnemataceae

12. *Mougeotia* C.A. Agardh
(Fig. 4A–D)

Cylindrical zygospore with two wide apertures, often deformed by variable folds. Hyaline and laevigate thin wall. Diameter of apertures *ca.* 50–55 µm ($\bar{x}$ 52 µm). Ecological data: *Mougeotia* is found in water reservoirs and moist soils (Dias, 1983; Hooghiemstra, 1984; Joly, 2002) and common in acidic, stagnant freshwater environments (Franceschini *et al.*, 2010). Ideal growth temperature appears to be 10 °C–15 °C (Van Geel & Van der Hammen, 1978).

13. *Transeauina* Guiry
(Fig. 4E–G)

Zygospore circular to elliptical in polar view, hyaline, composed of two symmetrical halves. Each half divided into polar and equatorial zones by a low circumpolar (orbicular to oblong) ridge encircling the pole; irregular sculpturing in the center of the polar zone; equatorial zone of each half radially striate. Polar diameter *ca.* 23–32 µm ($\bar{x}$ 26 µm), equatorial diameter *ca.* 27–45 µm ($\bar{x}$ 39 µm). Only one-half typically found in sediment. In algae, the name *Debarya* Wittrock is illegitimate for this genus and is currently regarded as a synonym of *Transeauina* Guiry in the phycological literature (Guiry, 2013; Roth & Lorscheitter, 2016). Ecological data: *Transeauina* is found in clean, shallow, stagnant, more or less mesotrophic freshwater lakes (Van Geel & Van der Hammen, 1978; AlgaeBase, 2024).

14. *Zygnema* C.A. Agardh
(Fig. 4H)

Zygospore approximately elliptical, hyaline, cell wall showing circular recesses across the surface. Long axis *ca.*43–50 µm ($\bar{x}$ 48 µm), short axis *ca.* 30–35 µm ($\bar{x}$ 33 µm). Ecological data: *Zygnema* is found in small, shallow freshwater mesotrophic lakes that warm rapidly in spring (Van Geel, 1978; Bold *et al.*, 1987). Better development observed at temperatures between 15 ºC–20 ºC (Van Geel & Van der Hammen, 1978). Cosmopolitan distribution (Bicudo & Menezes, 2006).

Order Spirogyrales
Family Spirogyraceae

15. *Spirogyra* Link
(Fig. 5A–G)

Zygospore ellipsoid to oblong, hyaline, cell wall with a coarse and irregular reticulum. Some with a well-developed fine membrane covering the entire zygospore. Long axis *ca.* 83–161 µm ($\bar{x}$ 156 µm), short axis *ca.* 35–90 µm ($\bar{x}$ 85 µm). Ecological data: *Spirogyra* has a cosmopolitan distribution in freshwater (Bicudo & Menezes, 2006), growing at temperatures above 20 ºC (Van Geel & Van der Hammen, 1978; Dias, 1983).

Acritarchs

16. *Cymathiosphaera* O. Wetzel
emend. Deflandre type
(Fig. 5H–J)

Vesicle spherical and hyaline, small, largely reticulate. High, very fine, delicate muri, forming polygons on the surface. Diameter *ca.* 15–30 µm ($\bar{x}$ 28 µm). Ecological data: probably of marine origin (Pals *et al.*, 1980).

17. *Michrystridium* Deflandre
emend. Sarjeant type
(Fig. 5K–M)

Vesicle spherical, small, densely covered by very short, acuminate processes. Diameter *ca.* 15–35 µm ($\bar{x}$ 34 µm). Ecological data: found in marine environments (Barrón *et al.*, 2013).

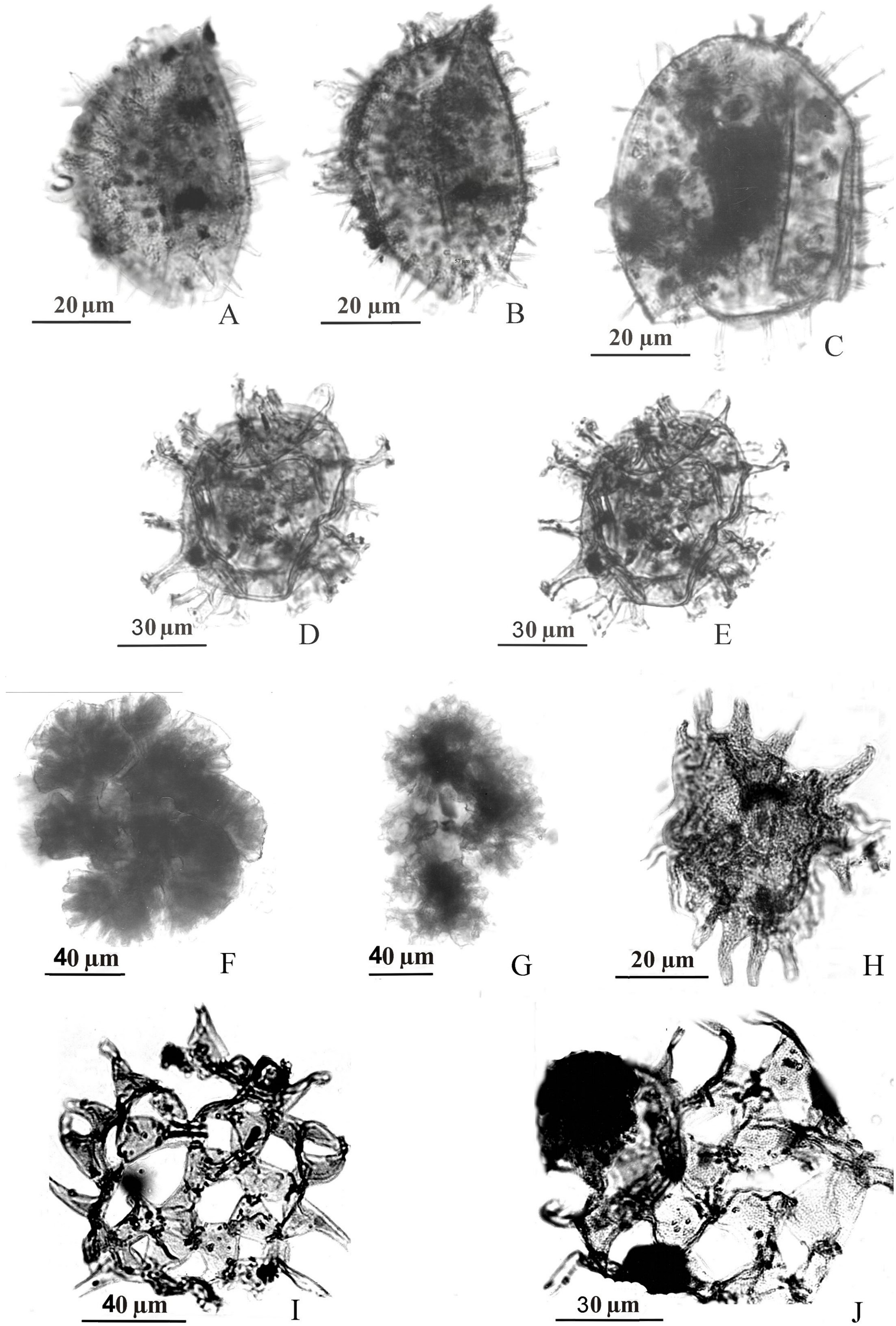

Figure 3. Algae. A–C. *Operculodinium centrocarpum* (Deflandre & Cookson) Wall, A, B: 1º–2º pl; D, E. *Spiniferites mirabilis* (M.R. Rossignol) Sarjeant: 1º–2º pl; F, G. *Botryococcus* Kützing: 1º–2º pl; H. *Pediastrum boryanum* (Turpim) Meneghini; I, J. *Pediastrum duplex* Meyen (pl planes).

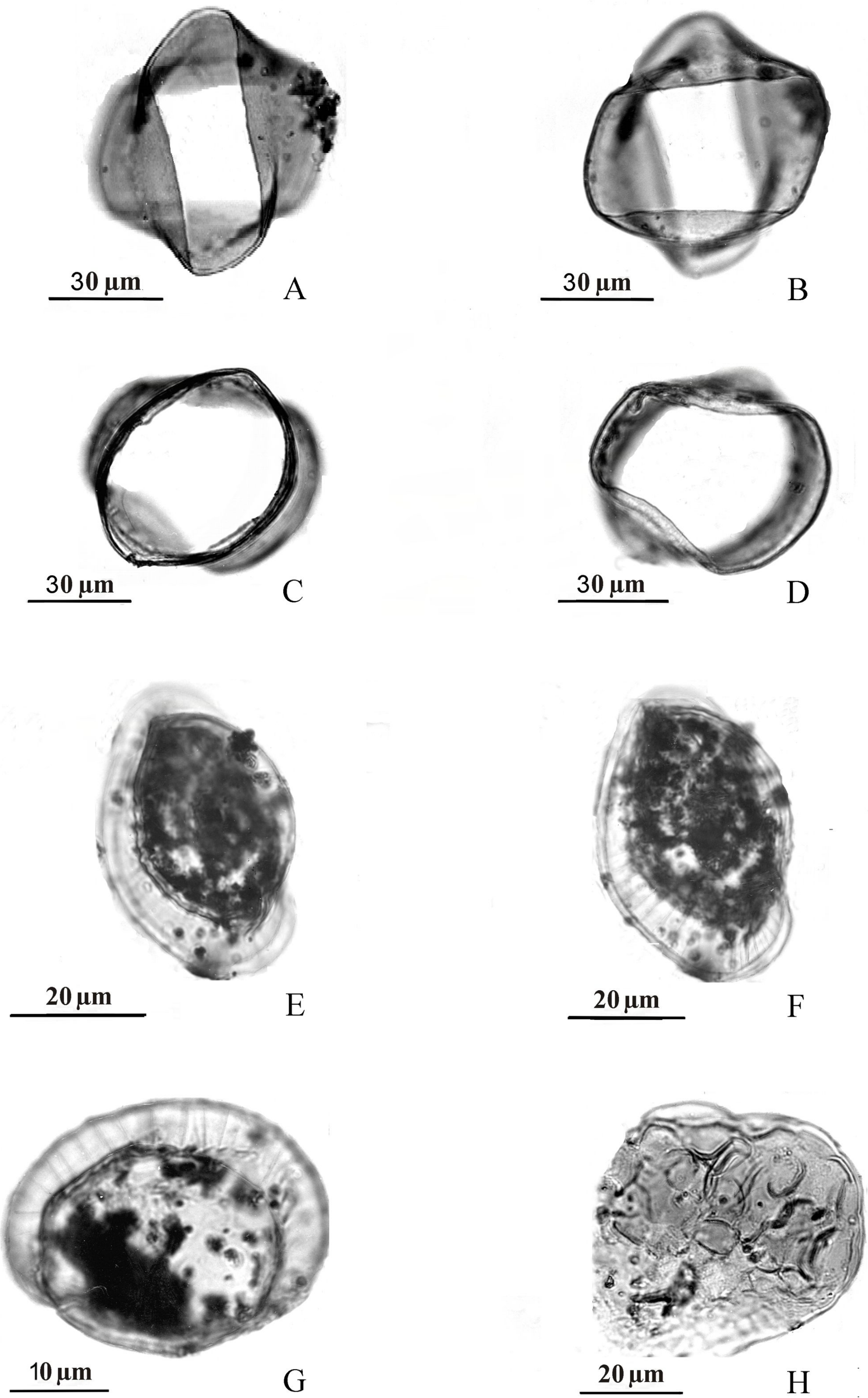

Figure 4. Algae. A–D. *Mougeotia* C.A. Agardh, A, B: 1º–2º pl, C, D: 1º–2º pl; E–G. *Transeauina* Guiry, E, F: 1º–2º pl; H. *Zygnema* C.A. Agardh (pl planes).

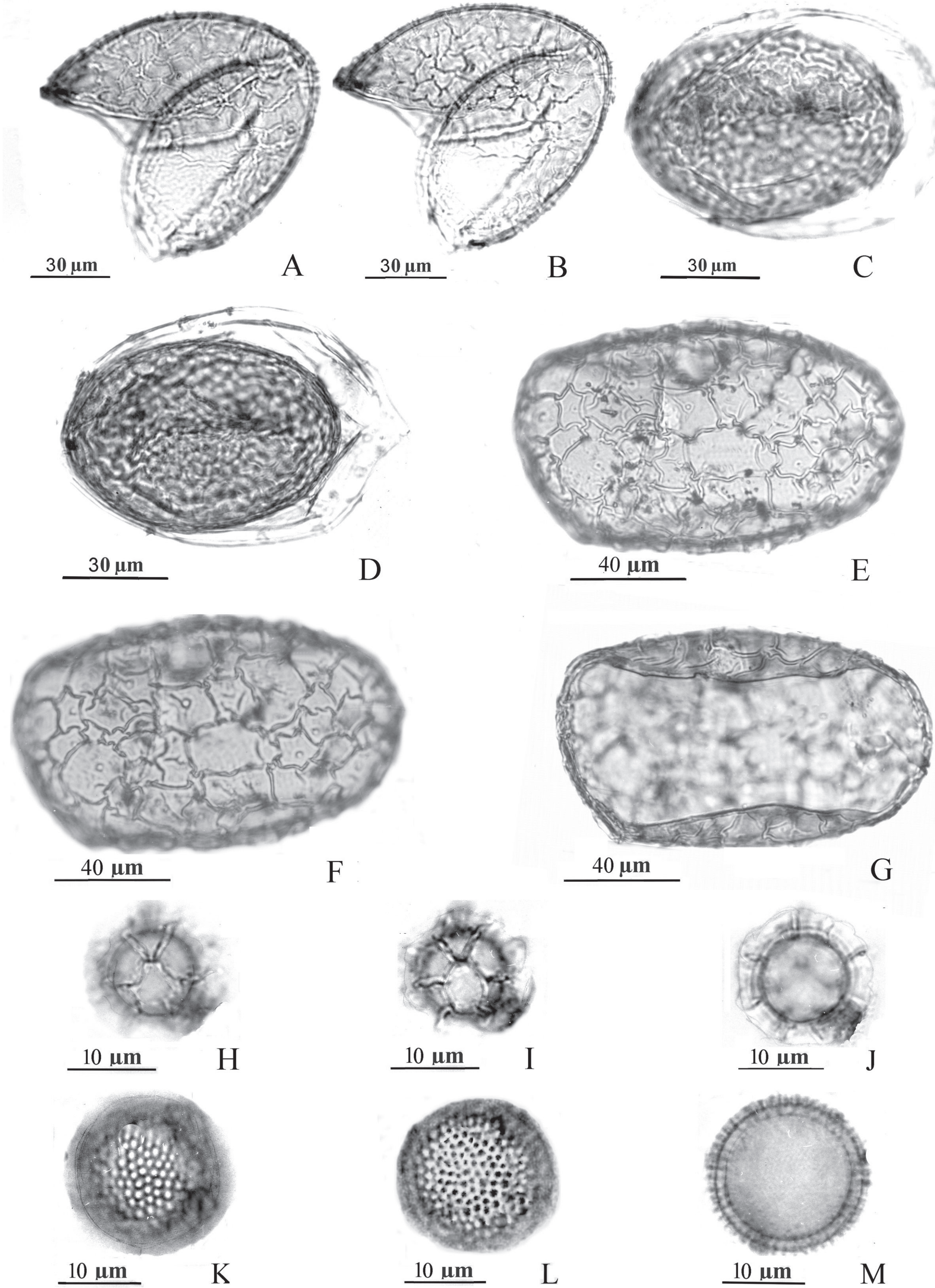

Figure 5. Algae. A–G. *Spirogyra* Link, A, B: 1º–2º pl, C, D: 1º–2º pl (with membrane covering the zygospore), E, G: 1º–3º pl. **Acritarchs**. H–J. *Cymathiosphaera* O. Wetzel emend. Deflandre type: 1º–3º pl; K–M. *Michrystridium* Deflandre emend. Sarjeant type: 1º–3º pl (pl planes).

Bryophytes

Division Bryophyta
Order Sphagnales
Family Sphagnaceae

18. *Sphagnum* (Dill). Hedwis
(Fig. 6A, B)

Radial spore, subtriangular polar view, with rounded angles and slightly convex sides. Thick exospore. Heteropolar, trilete with fine long arms bifurcate at extremities on laevigate proximal face. Coarse, irregular trilobate thickening on the distal pole. Equatorial diameter *ca.* 50–65 μm (x̄ 62 μm). Ecological data: plants more characteristic of bogs, forming extensive spongy masses; also occurs in other humid places. Color ranges from green to red in response to pH (Watson, 1968).

Division Anthocerotophyta
Order Anthocerotales
Family Anthocerotaceae

19. *Anthoceros* L. emend. Prosk.
(Fig. 6C, D)

Radial spore, circular to subtriangular in polar view, with rounded angles and slightly convex sides. Heteropolar, trilete with long arms, bifurcate at the extremities on the proximal face. Coarse reticulate distal face, with irregular echinate muri. Conspicuous echinae bifurcated or trifurcated. Reticulum gradually decreases towards the proximal face, disappearing in the central portion. Equatorial diameter *ca.* 50–60 μm (x̄ 57 μm). Ecological data: plant found mainly in temperate regions, in shady and humid places, and on margins of small water reservoirs or narrow spaces between rocks (Parihar, 1962).

Order Notothyladales
Family Notothyladaceae

20. *Phaeoceros laevis* (L.) Prosk.
(Fig. 6E–G)

Radial spore, circular to subtriangular polar view, with rounded angles and slightly convex sides. Thick exospore. Heteropolar, trilete with long arms, bifurcate at extremities on the proximal face. Laevigate to abundant small ornamentation on the distal face, according to the spore grain: granulate, echinate, or irregularly verrucate. Proximal face laevigate or minimally ornamented. Equatorial diameter *ca.* 45–60 μm (x̄ 58 μm). Ecological data: plant typically found in wet soils; can cover large areas on bare soils or the banks of rivers and streams (Menéndez, 1962).

Other palynomorphs

21. Platyhelminth eggs
(Fig. 6H, I)

Dome-shaped flatworm egg capsule, wide aperture, tapering at opposite end. Hyaline. Length: *ca.* 145–200 μm (x̄ 150 μm). Likely remnants of oocytes produced by members of the order Neorhabdocoela (Haas, 1996). Ecological data: organism lives in freshwater ecosystems from littoral to inland areas, including diverse semiaquatic and aquatic habitats such as ponds, marshy pools, ditches, peat trenches, bogs, springs, running water, or lakes (Haas, 1996).

22. Mandible fragments
(Fig. 6J, K)

Denticulate remains, probably of scolecodonts from polychaetous annelid worms (Boulouard & Delauze, 1966; Van Geel, 1978; Traverse, 1988; Nakrem *et al.,* 2001). Length *ca.* 60–150 μm (x̄ 90 μm), width *ca.* 30–50 μm (x̄ 45 μm). Ecological data: remains of a marine organism (Nakrem *et al.,* 2001).

23. Microforaminifera
(Fig. 6L)

Planispiral chitinous inner test, with progressively larger chambers, sometimes fragmented. Larger test diameter *ca.* 50–205 μm (x̄ 150 μm); smaller test diameter *ca.* 45–155 μm (x̄ 120 μm). The chitinous inner membrane, which delineates the inner surface of the calcareous test, remains after processing techniques have removed the outer shell (Cross *et al.,* 1966; Traverse & Ginsburg, 1966). Ecological data: organism of marine origin (Boulouard & Delauze, 1966; Traverse & Ginsburg, 1966).

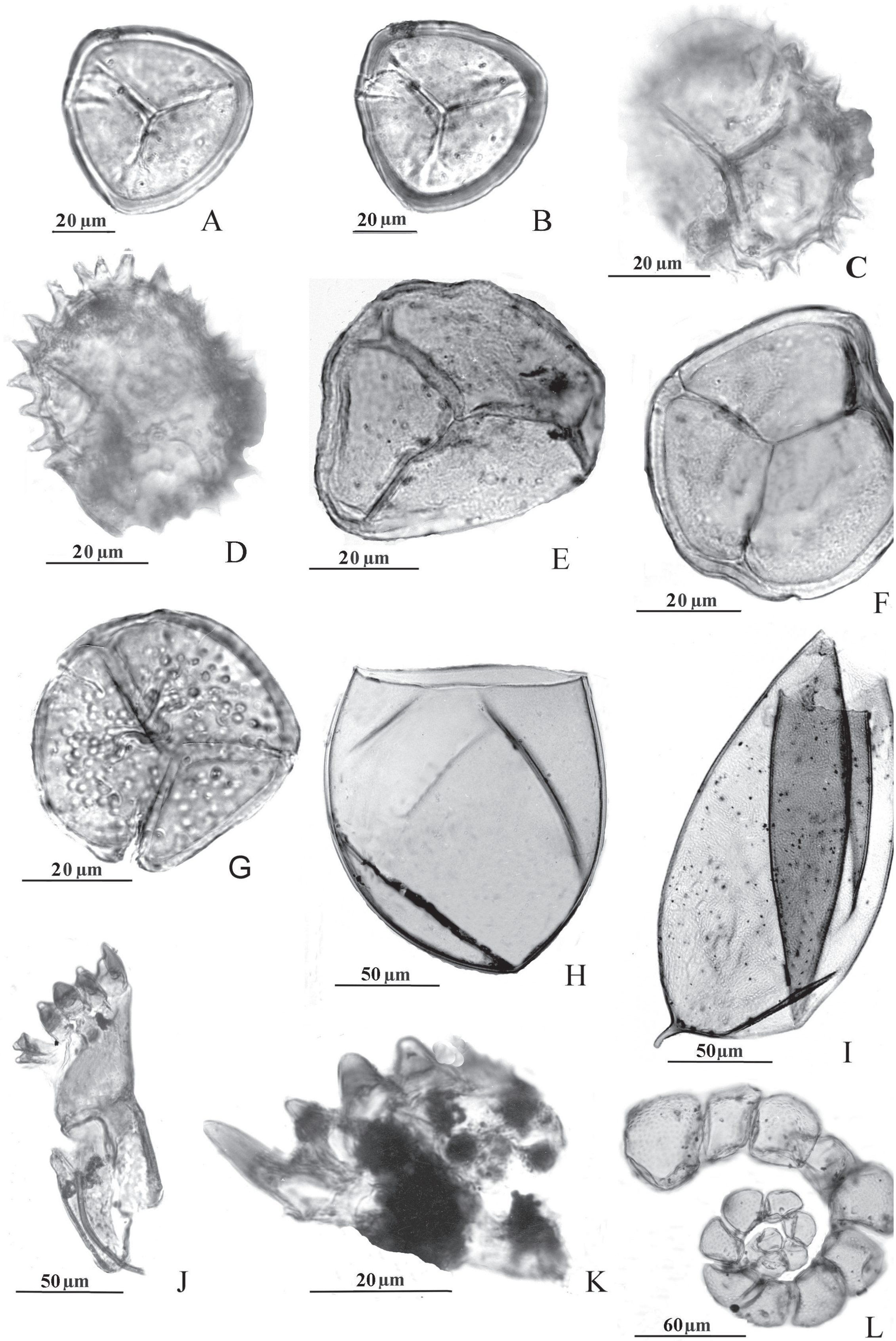

Figure 6. Bryophytes. A, B. *Sphagnum* (Dill). Hedwis, proximal face: 1º 2º pl; C, D. *Anthoceros* L. emend. Prosk., proximal face: 1º–2º pl; E–G. *Phaeoceros laevis* (L.) Prosk., proximal face. **Other palynomorphs**. H, I. Platyhelminth eggs; J, K. Mandible fragments; L. Microforaminifera (pl planes).

Discussion

The palynological analysis of the T25 Holocene sediment core indicated palynomorphs from varied environments and contributed to paleoenvironmental reconstructions of the coastal plain of Rio Grande do Sul over the last 5000 years. Among the 23 palynomorphs described and illustrated in this study, fungi in general were related to phases of temperature elevation (Lorscheitter & Romero, 1985; Masetto & Lorscheitter, 2019; Roth *et al.,* 2021). Algal palynomorphs of freshwater origin indicated lacustrine environments (*Botryococcus*, *Pediastrum boryanum*, *P. duplex*, *Mougeotia*, *Spirogyra*, *Transeauina*, *Zygnema*). Platyhelminth eggs are from freshwater ecosystems, too. Bryophyte palynomorphs indicated organisms of marshland soils (*Anthoceros*, *Phaeoceros laevis, Sphagnum*). Palynomorphs of marine origin indicated sea level oscillations on the coastal plain (dinoflagellate cysts such as *Operculodinium centrocarpum* and *Spiniferites mirabilis*; acritarchs such as *Cymathiosphaera* and *Michrystridium*; mandible fragments and microforaminifera).

Quantitative analysis of this palynological material from the 24 samples collected from T25 core, together with pteridophyte, gymnosperm, and angiosperm palynomorphs, enabled paleoenvironment reconstructions of the Rio Grande do Sul coastal plain over the last 5000 years (Cordeiro & Lorscheitter, 1994).

Palynomorphs from distinct taxonomic groups have been described and illustrated for Quaternary sediments in other profiles from different locations on the coastal plain of Rio Grande do Sul, as cited in Roth & Lorscheitter (2022). These materials were used in paleoenvironmental reconstructions.

The groups of palynomorphs analyzed in the T25 core were also found in Quaternary sediment profiles, collected in other environments of the coastal plain: Interior of Atlantic Rainforests (Neves & Lorscheitter, 1992; Neves & Bauermann, 2003; 2004; Roth & Lorscheitter, 2013; 2016), marine sediments from the South Atlantic Ocean (Lorscheitter, 1989), and Holocene herbaceous marshes (Masetto & Lorscheitter, 2014). The study of T25 core presents the first palynological descriptions of a Quaternary lagoon sedimentary profile of this coastal plain. However, a broad drainage network comprising many rivers converges towards Lagoa dos Patos (Toldo Jr., 1989). Therefore, palynological indicators, such as those sampled from the T25 sedimentary core, can be useful for detecting events in broader neighboring areas, beyond the limits of the coastal plain.

The palynomorphs analysed and described in this study provide comparative material that will contribute to new paleoenvironmental reconstructions of the coastal plain and adjacent areas, which are important for detecting climate and vegetation dynamics in southern Brazil during the last several millennia.

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Authors' contributions

The two authors contributed jointly to all phases of this project.

Conflict of interest

The authors declare no conflict of interest.

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