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SYSTEMATICS & PHYLOGENY - ORIGINAL ARTICLE

Pseudofilamentous desmids (Zygnematophyceae, Desmidiaceae) from Atlantic Forest ponds from southern Bahia, Brazil

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Abstract
Present work consists of a pioneer taxonomic survey of pseudofilamentous desmids in southern Bahia, Brazil. Based on periphytic and planktonic samples collected from ponds in Serra do Conduru State Park, Uruçuca, Bahia, 24 taxa were identified, including first documented occurrences for South America (*Groenbladia undulata* var. *kriegeri*, *Hyalotheca burmensis,* and *Teilingia excavata*). Moreover, we present a new combination based on previously unknown morphological data: *Hyalotheca confervacea* comb. nov., a species that is being currently reported for the second time in Brazil after a 78-year gap. Furthermore, we present for the first time details of zygospores of two taxa (*Hyalotheca mucosa* var. *laevicincta* and *Hyalotheca tatrica*). This study contributes to our understanding of pseudofilamentous desmid diversity and distribution in Brazil and South America.

Keywords Algae · Periphyton · Phytoplankton · Taxonomy

1 Introduction

Desmids constitute a group of microscopic green algae (Streptophyta, Zygnematophyceae) known for its distinctive bilateral cell symmetry, and their cells often appear as two mirror-image halves joined together by an isthmus (Coesel and Meesters 2014; Bicudo and Samanez 2016). They're also characterized by their intricate cell walls and diverse geometric forms and morphological range, presenting solitary cells or forming colonies that are connected by mucilaginous strands or having a pseudofilamentous aspect. This group represents an important component of freshwater habitats, composing communities such as periphyton, plankton and metaphyton of a range of aquatic ecosystems, and may provide important information concerning the integrity of these systems, due to their specific ecological demands (Coesel 2003; Bellinger and Sigee 2015).

Pseudofilamentous desmids are composed of 11 genera of the Desmidiaceae family (Oliveira et al. 2010), and they can be distinguished from Zygnemataceae filamentous representatives by having each cell their own chloroplasts, whereas the latter has chloroplast continuity along the cells. These desmids form straight or twisted filaments embedded in a mucilage sheath.

A limited number of Brazilian studies have specifically addressed pseudofilamentous desmids. Between the 1980s and the present, 13 floristic studies have been conducted on this group in the states of Amapá (Araújo et al. 2020), Amazonas (Martins 1980; Souza and Melo 2010), Bahia (Oliveira et al. 2010), Distrito Federal (Leite and Senna 1992), Goiás (Nogueira et al. 2016), Mato Grosso (Sophia and Silva 1989; De-Lamonica-Freire 1992), Rio de Janeiro (Sophia 1984; 1987), Rondônia (Sophia and Silva 1989), and São Paulo (Bicudo and Samanez 2016).

Although desmid studies in Bahia have made significant progress over the past 15 years (Ramos 2023), there has been a notable absence of specific focus on this group in the southern region, despite its significance as a prominent center of endemism within the Atlantic Forest (Thomas et al.

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1998; Rojas-Padilla et al. 2020). This domain spans most of the Brazilian coastline, and only 12.4% of its original forest cover remains in relatively well-preserved fragments larger than 3 ha (SOS Mata Atlântica and INPE 2021). Southern Bahia retains the most substantial portion of this biome in northeastern Brazil and supports exceptional levels of biological diversity and endemism (Araujo et al. 1998; Thomas et al. 1998). Southern Bahia retains a substantial portion of the Atlantic Forest in northeastern Brazil, while the state of Bahia retains approximately 49.7% of its native vegetation (MapBiomas 2023). Therefore, present study aimed at performing a pioneer floristic survey of pseudofilamentous desmids in an important conservation area of the Atlantic Forest biome in southern Bahia, northeastern Brazil, providing information on taxonomy and some ecological aspects of these algae.

2 Material and methods

Study area – Serra do Conduru State Park (PESC) (14°29′36.1"S, 39°08′09.5"W) is located in the municipalities of Ilhéus, Itacaré, and Uruçuca, within the Watershed of the Leste River, and has a total area of 9,275 hectares. Its vegetation is characterized as Dense Ombrophilous Forest, and the climate is classified as super-humid tropical, with an average annual temperature of 23ºC. PESC has a high potential for biodiversity conservation and extremely high biological diversity, as well as significant importance in maintaining water bodies in the region, housing the sources of 30 rivers and streams. The park, situated in the Atlantic Forest Biome, a crucial Brazilian hotspot, represents one of the most important remnants on the northeastern coast and has high levels of endemism (SEMARH 2005). The ponds where the present study was conducted (Fig. 1) are located around the park's head office in Serra Grande district, municipality of Uruçuca.

Sampling – Material was collected in ponds from PESC during five sampling campaigns, conducted every three months between June 2023 and June 2024. Periphytic samples were acquired through the manual squeezing of aquatic macrophytes, while planktonic material was obtained using a plankton net with a 20 µm mesh. Some abiotic water parameters were measured, including pH, temperature, conductivity, and total dissolved solids (TDS), with the aid of a portable multiparameter probe BLE-C600. Samples were preserved in Transeau solution (Bicudo and Menezes 2017). For herbarium deposition, a single voucher specimen was chosen to represent each taxon. However, a single taxon may occur in multiple samples, so more than one voucher may be associated with that taxon. Thus, the environmental data presented in Table 1 refer to all sampling events in which each taxon was detected, rather than being tied to just one voucher.

Material analysis – The samples were analyzed at the Laboratory of Plankton Ecology (LEPLAN) at the State University of Santa Cruz (UESC) and subsequently archived in State University of Feira de Santana (UEFS) herbarium (HUEFS). Sample analysis was performed using an optical microscope (Zeiss Axiovert Plus), and taxonomic depletion is based on five consecutive slides without any taxonomic novelty (taxa not previously recorded). In some slides, India ink was used to highlight the taxa's mucilage. The material was photographed with the assistance of a portable camera (ZZCAT SX08.U2.5000 K.0815) attached to the microscope, and cell measurements were carried out using the ToupView software (Toup Tek Photonics). The Scanning Electron Microscopy (SEM) protocol was conducted following the procedures outlined by Moura et al. (2021), and the material was examined at the Electron Microscopy Center of the State University of Santa Cruz (CME-UESC). Taxonomic identification was based on specific literature (e.g. Croasdale et al. 1983; Förster 1964; Oliveira et al. 2010; Nogueira et al. 2016; Araújo et al. 2020). Geographic distribution in Brazil and worldwide was based on Ramos et al. (2024) and Guiry and Guiry (2026), respectively.

3 Results

In this study, 24 pseudofilamentous desmid (Figs. 2, 3, 4, 5, 6, 7, 8) taxa were identified, including some rare species and a new combination. The taxa's names, dimensions, their habitat characteristics (water conductivity, pH, total dissolved solids and temperature), distribution in Brazil, and the communities in which they occurred are in Table 1. Taxonomic notes were provided only for rare taxa and/or new occurrences for Brazil or South America.

4 Discussion

This study provides a comprehensive taxonomic and biogeographic update of pseudofilamentous desmids in Brazil, proposing a new combination (*Hyalotheca confervacea* comb. nov.) for a species not recorded in the country for 78 years, documenting three new records for South America (*Groenbladia undulata* var. *kriegeri*, *Hyalotheca burmensis*, and *Teilingia excavata*), and fourteen new records for Bahia state. In addition, we present the first detailed descriptions of zygospores for two taxa (*Hyalotheca mucosa* var. *laevicincta* and *H. tatrica*), offering critical morphological evidence that supports recent taxonomic reclassifications and fills historical gaps in the knowledge of Brazilian desmid diversity.

Fig. 1 **a**–**c** Pond located in Serra do Conduru State Park (PESC), Uruçuca, Bahia, Brazil. **d**–**e** Sampling of periphytic and planktonic material, respectively, in PESC's pond

Desmidium bicristatosporum Grönblad 1945 (Fig. 2h–k)

Grönblad (1945) introduced this species based on Brazilian samples from Pará State, Amazonian region. The author noted that the vegetative cells closely resembled those of *Desmidium graciliceps* (Nordstedt) Lagerheim 1886, making it challenging to differentiate between the two without the presence of zygospores. This species is probably endemic to Brazil and relatively rare, with only three records: Pará (Grönblad 1945), Tocantins (Förster 1964), and Goiás (Nogueira et al. 2016). This is the first record of this species for Bahia state.

Desmidium elegans (Raciborski) Grönblad 1945 (Fig. 3a–i)

Basionym: *Hyalotheca elegans* Raciborski 1895

This taxon was the most abundant in our study area, forming large populations. This taxon was originally proposed by Raciborski (1895), based on material from Guyana, as *Hyalotheca elegans*. Fifty years later, Grönblad (1945) proposed a new combination, grouping *Desmidium quadratum* var. *doliiforme* Taylor 1935, based on material from Canada, with his own material from the Amazon, and collectively designating them as *D. elegans*.

The material from Bahia presented two morphological forms, one longer than broad and with a subtle median constriction, and the other almost as long as broad with a very marked constriction, similar to the Amazonian material from Pará State (Förster 1969). During cell division, we observed a few specimens forming the characteristic *Desmidium*-type septum, the defining feature that prompted Grönblad's transfer of this taxon from *Hyalotheca* to *Desmidium*.

Groenbladia undulata var. ***kriegeri*** Kurt Förster 1973 (Fig. 6c)

Table 1 Pseudofilamentous desmids of Serra do Conduru State Park (PESC), Bahia State, Brazil

Taxon	Cell dimensions	Habitat characteristics				Community	Fig	Distribution in Brazil	Material examined
		WC (µS/cm)	pH	TDS (ppm)	Temp (°C)				
Bambusina borreri (Ralfs) Cleve	length 30–35 µm, apex breadth 9.5–11 µm, isthmus 15–16 µm	17.0	6.2	8.0	27.5	plankton	2a-c	PR, BA, SP, PA, MT, RJ, AM, GO, MG, RS, RO, TO, AP	HUEFS 26,306
Desmidium baileyi (Ralfs) Nordstedt	length 18–20 µm, breadth 21–23 µm	63.5 ± 48.8	6.46 ± 0.1	31.5 ± 24.8	27.8 ± 0.3	plankton	2d-g	RS, BA*	HUEFS 263061, HUEFS 263063
Desmidium bicristato-sporum Grönblad	length 45–48 µm, breadth 40–41 µm, isthmus 35–36 µm	17.5 ± 4.9	6.5 ± 0.2	8.5 ± 2.1	27.9 ± 0.8	plankton, periphyton	2 h-k	GO, PA, TO, BA*	HUEFS 263065
Desmidium elegans (Raciborski) Grönblad	length 28–37 µm, breadth 26–30 µm	43.6 ± 44.4	6.5 ± 0.3	21.5 ± 22.2	28.7 ± 1.7	plankton, periphyton	3a-i	AM, SP, PA, DF, AP, GO, BA*	HUEFS 263061, HUEFS 263063
Desmidium grevillei (Kützing ex Ralfs) De Bary	length 27–29 µm, breadth 52–58 µm, isthmus 49–53 µm	14.0	6.3	7.0	27.3	plankton	4a-c	PR, SP, BA, MG, GO, MT, PA, RS, AM, RJ, RO	HUEFS 26,306
Desmidium quadrangulatum Ralfs ex Ralfs	length 27–29 µm, breadth 41–52 µm, isthmus 33–39 µm	63.5 ± 48.8	6.5 ± 0.1	31.5 ± 24.8	27.8 ± 0.3	plankton	5a-d	SP, BA*	HUEFS 263061
Desmidium quadratum Nordstedt	length 21–23 µm, breadth 33–34 µm	44.3 ± 46.6	6.5 ± 0.1	22.0 ± 23.4	27.8 ± 0.6	plankton, periphyton	4d-f	SP, PA, BA, MT, RJ, AM, AP, TO, GO	HUEFS 263063
Desmidium swartzii C.Agardh ex Ralfs	length 10–11 µm, breadth 26–29 µm, isthmus 23–25 µm	14.0	6.3	7.0	27.3	plankton, periphyton	4 g-j	SP, RS, PR, RJ, MT, AM, GO, BA*	HUEFS 263066
Groenbladia neglecta (Raciborski) Teiling	length 23–33 µm, breadth 14–16 µm	31.5 ± 27.4	6.4 ± 0.2	15.5 ± 13.8	28.0 ± 0.7	plankton, periphyton	5e-i	AM, PA, AP, BA*	HUEFS 263060, HUEFS 263064
Groenbladia undulata var. *undulata* (Nordstedt) Kurt Förster	length 13–15 µm, breadth 6–7 µm, isthmus 4–5 µm	34.0 ± 27.4	6.4 ± 0.2	15.5 ± 13.8	28.0 ± 0.7	plankton	6a-b	SP, PR, BA, AM, MT, PA, GO, DF	HUEFS 263065
***Groenbladia undulata* var. *kriegeri* Kurt Förster**	length 9–11 µm, breadth 6–8 µm, isthmus 4–5 µm	18.5 ± 2.1	6.1 ± 0.1	9.0 ± 1.4	27.9 ± 0.6	plankton, periphyton	6c	BA*	HUEFS 263059
Groenbladia undulata var. *perundulata* (Grönblad) Kurt Förster	length 17–20 µm, breadth 4–6 µm, isthmus 3–4 µm	33.1 ± 29.2	6.3 ± 0.2	16.3 ± 14.7	28.0 ± 0.7	plankton, periphyton	6d-e	AM, BA*	HUEFS 263058, HUEFS 263060
***Hyalotheca burmensis* West & G.S.West**	length 17–18 µm, breadth 17–18 µm	70.5 ± 50.2	6.5 ± 0.1	35.0 ± 25.5	28.1 ± 1.3	plankton, periphyton	6f-g	BA*	HUEFS 263065
Hyalotheca confervacea (West & G.S.West) B.Fadul-Souza & G.J.P.Ramos *comb.nov*	length 19–23 µm, breadth 15–16 µm, isthmus 14–15 µm	38.2 ± 34.1	6.3 ± 0.2	18.8 ± 17.2	27.9 ± 0.9	plankton, periphyton	6 h-i	PA, BA*	HUEFS 263058, HUEFS 263062
Hyalotheca javanica (Gutwinski) Coesel	length 15–21 µm, breadth 17–18 µm	47.0 ± 38.0	6.5 ± 0.2	23.3 ± 19.2	27.8 ± 0.8	plankton, periphyton	7a-c	PA, AP, BA*	HUEFS 263064, HUEFS 263059

Table 1 (continued)

Taxon	Cell dimensions	Habitat characteristics				Community	Fig	Distribution in Brazil	Material examined
		WC (µS/cm)	pH	TDS (ppm)	Temp (°C)				
Hyalotheca mucosa Ralfs var. *mucosa*	length 17–20 µm, breadth 16–17 µm	38.8 ± 33.7	6.4 ± 0.3	19.2 ± 16.9	27.8 ± 0.8	plankton, periphyton	7d,g	BA, SP, AM, GO, PA, TO	HUEFS 263064, HUEFS 263059
Hyalotheca mucosa var. *laevicincta* (W.R.Taylor) Grönblad	length 17–19 µm, breadth 13–14 µm	35.2 ± 31.4	6.4 ± 0.3	17.3 ± 15.8	28.0 ± 0.6	plankton, periphyton	7e,f,h	PA, BA*	HUEFS 263064, HUEFS 263062
Hyalotheca siolii (Kurt Förster) Kurt Förster	length 17–20 µm, breadth 16–20 µm	46.0 ± 45.0	6.2 ± 0.2	23 ± 22.5	28.1 ± 0.4	plankton, periphyton	8a-b	AM, PA, GO, BA*	HUEFS 263059, HUEFS 263062
Hyalotheca tatrica (Raciborski) Coesel & Meesters	length 17–22 µm, breadth 19–20 µm	38.0 ± 34.2	6.4 ± 0.3	18.8 ± 17.2	28.0 ± 0.6	plankton, periphyton	8c-e	BA, GO, SP	HUEFS 263064, HUEFS 263062
Mateola curvata (Nordstedt) Coesel	length 29–33 µm, breadth 30–38 µm, isthmus 18–21 µm	17.0 ± 4.2	6.2 ± 0.2	8.5 ± 2.1	27.8 ± 0.7	plankton, periphyton	8f	SP, AP, PA, DF, BA*	HUEFS 263059
Spondylosium moniliforme P.Lundell	length 20–21 µm, breadth 15–18 µm, isthmus 7.5–8 µm	66.5 ± 44.5	6.5 ± 0.1	33.0 ± 22.6	28.3 ± 1.0	plankton	8 g	PR, SP, RS, PA, BA*	HUEFS 263059
Spondylosium panduriforme (Heimerl) Teiling	length 33–34 µm, breadth 16–21 µm, isthmus 9–10 µm	31.2 ± 25.6	6.4 ± 0.2	15.3 ± 12.9	27.9 ± 0.7	plankton, periphyton	8 h	GO, AM, SP, BA*	HUEFS 263062
***Teilingia excavata* (Ralfs ex Ralfs) Bourrelly**	length 10–12 µm, breadth 8–9 µm, isthmus 4–5 µm	20.4 ± 0.5	6.4 ± 0.3	10.0 ± 0.0	27.9 ± 0.7	plankton, periphyton	8i-j	BA*	HUEFS 263060, HUEFS 263064
Teilingia granulata (H. Roy & Bisset) Bourrelly	length 8–9 µm, breadth 8–9 µm, isthmus 3–6 µm	38.7 ± 33.8	6.4 ± 0.2	19.1 ± 17.0	27.9 ± 0.7	plankton, periphyton	8 k-l	SP, PR, BA, MT, ES, AM, RS, PA, RJ, DF, GO	HUEFS 263065

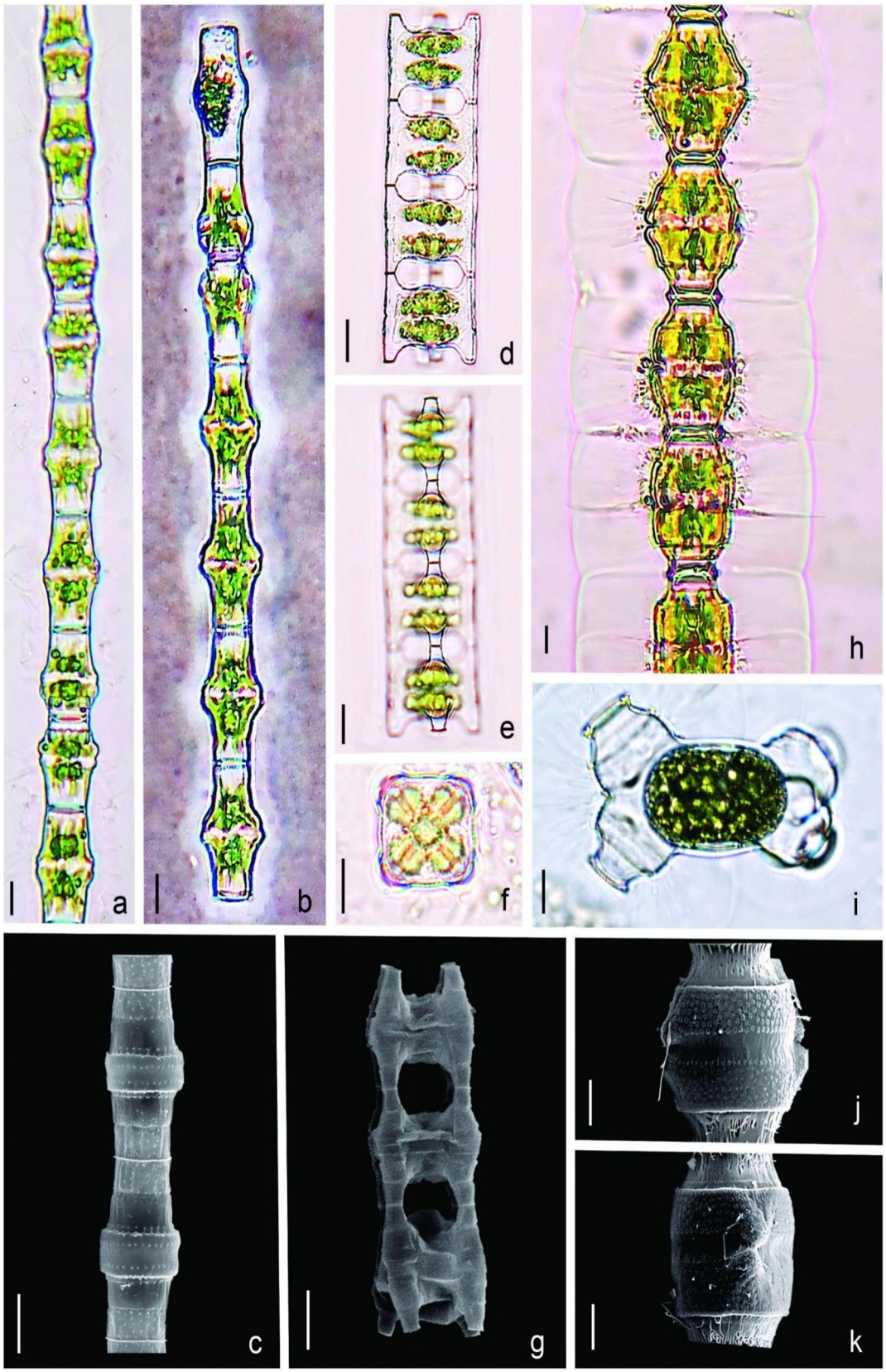

Fig. 2 **a**–**c** *Bambusina borreri*. Frontal view (**a**, **b**). SEM picture (**c**). **d**–**g** *Desmidium baileyi*. Frontal view (**d**, **e**). Apical view (**f**). SEM picture (**g**). h–k *Desmidium bicristatosporum*. Frontal view (**h**). Zygospore (**i**). SEM picture of frontal view (**j**). SEM of side view (**k**). Scale bar = 10 µm

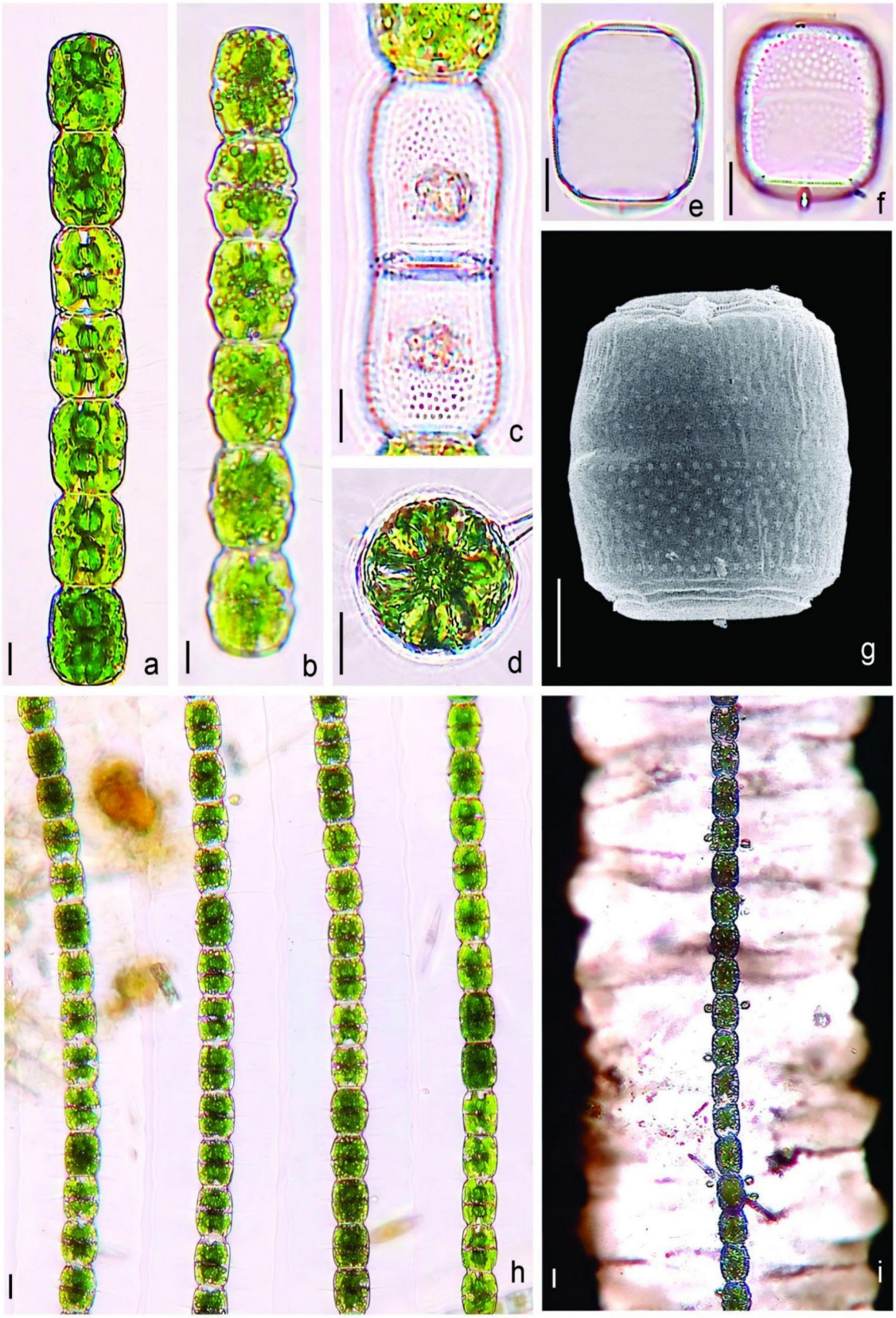

Fig. 3 **a**–**i** *Desmidium elegans*. Frontal view (**a**, **b**). Cell division (**c**). Apical view (**d**). Cell wall details (**e**, **f**). SEM picture of a single cell (**g**). Overview of the population (**h**). Details of mucilage sheath highlighted by India ink (**i**). Scale bar = 10 µm

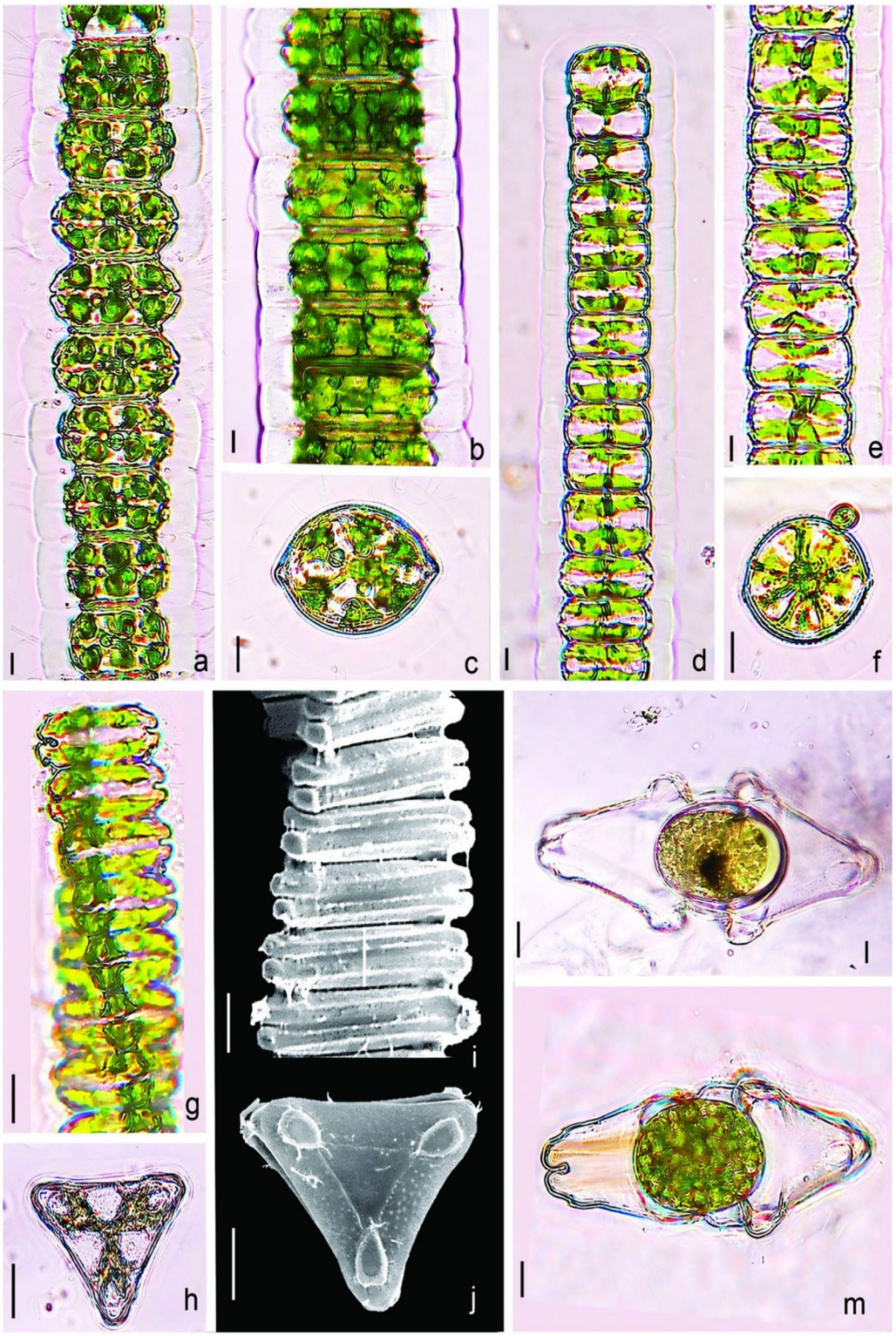

Fig. 4 **a**–**c** *Desmidium grevillei*. Frontal view (**a**, **b**). Apical view (**c**). **d**–**f** *Desmidium quadratum*. Frontal view (**d**, **e**). Apical view (**f**). **g**–**j** *Desmidium swartzii*. Frontal view (**g**). Apical view (**h**). SEM picture of frontal view (**i**). SEM picture of apical view (**j**). Scale bar = 10 µm

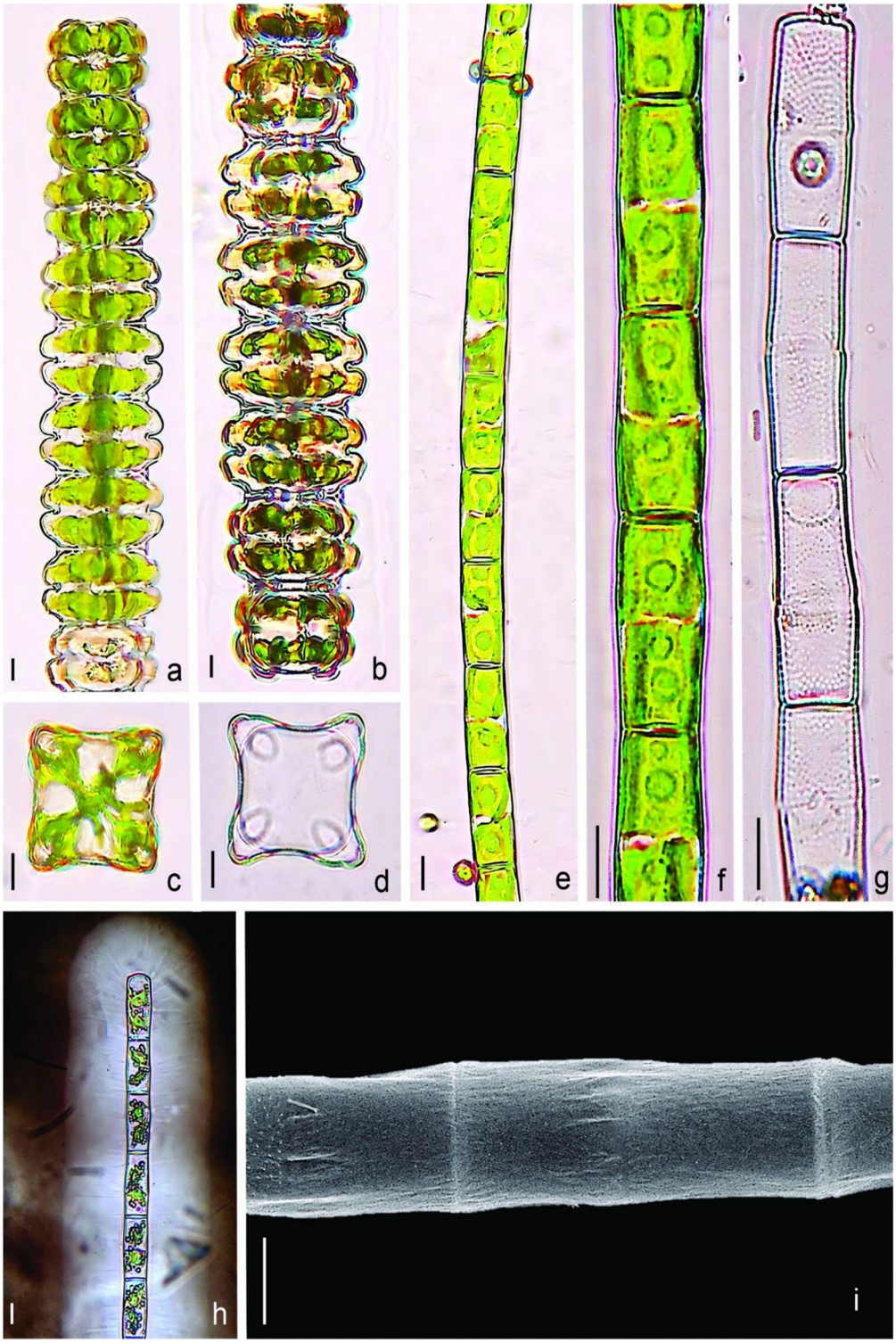

Fig. 5 **a**–**d**. *Desmidium quadrangulatum*. Frontal view (**a**, **b**). Apical view (**c**, **d**). **e**–**i**. *Groenbladia neglecta*. Frontal view (**e**, **f**). Cell wall details (**g**). Mucilage sheath highlighted by India ink (**h**). SEM picture (**i**). Scale bar = 10 µm

Groenbladia undulata (Nordstedt) Kurt Förster 1973 is known for having small cells with undulate margins, and a shallow and broad sinus. So far, three varieties of this species have been proposed: *G. undulata* var. *ornata* (O.Borge) G.J.P.Ramos and C.W.N.Moura 2019, *G. undulata* var. *perundulata* (Grönblad) Kurt Förster 1974 and the

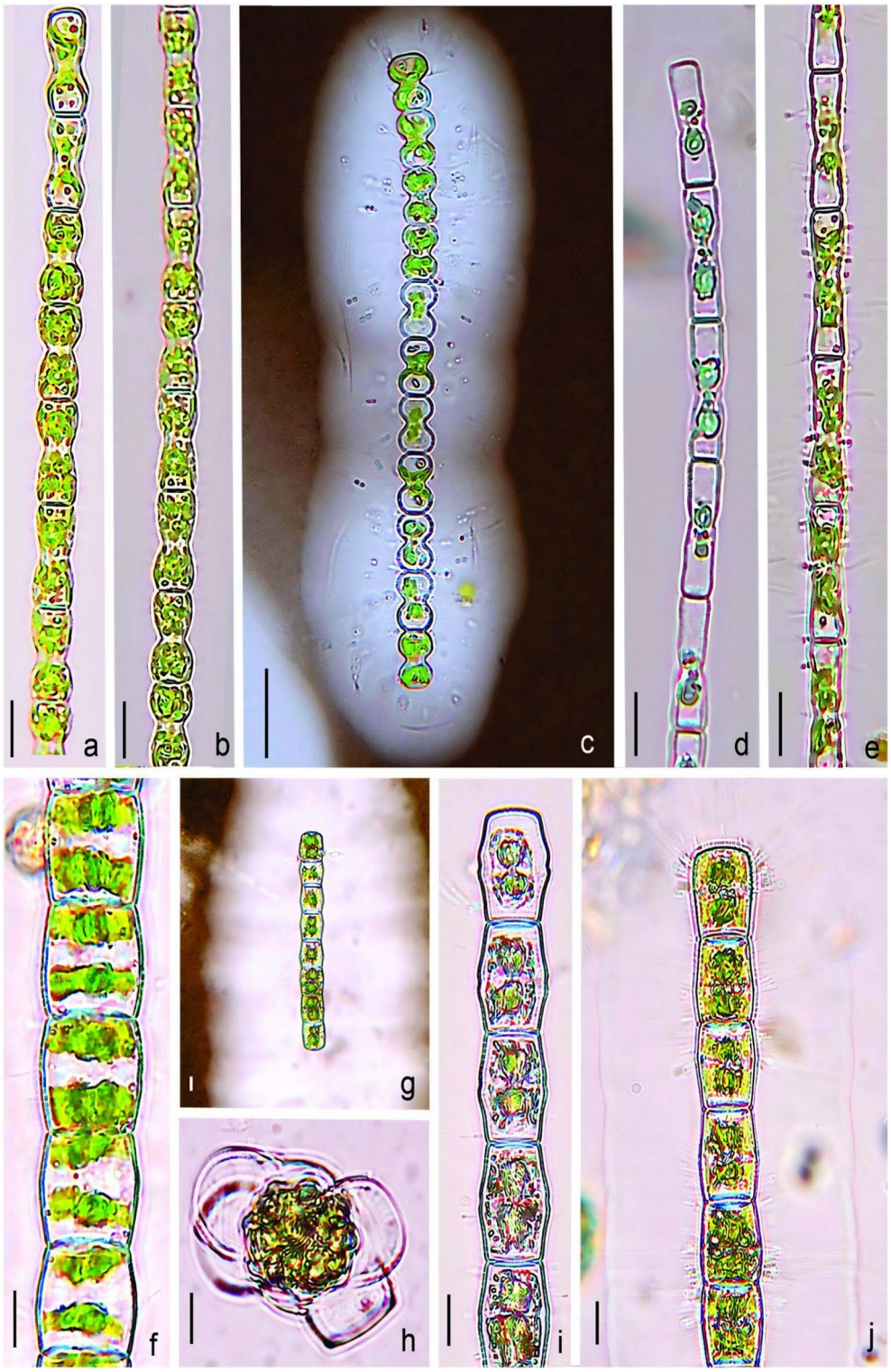

Fig. 6 **a**–**b**. *Groenbladia undulata* var. *undulata*. c. *Groenbladia undulata* var. *kriegeri*. Mucilage sheath highlighted by India ink (**c**). **d**–**e**. *Groenbladia undulata* var. *perundulata*. **f**–**h**. *Hyalotheca burmensis*. Mucilage sheath (**g**). Zygospore (**h**). **i**–**j**. *Hyalotheca confervacea*. Mucilage sheath (**h**). Scale bar = 10 µm

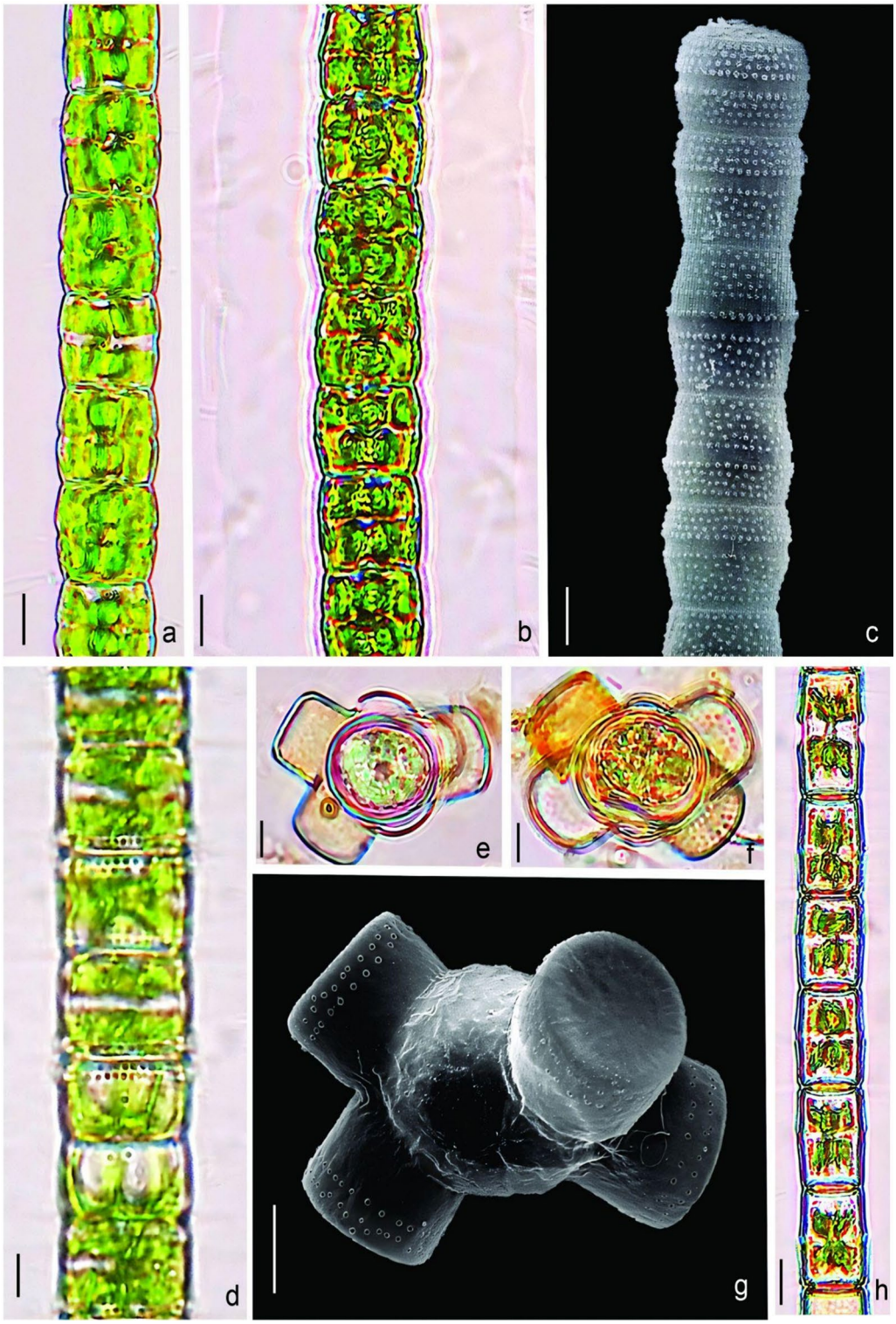

Fig. 7 **a**–**c**. *Hyalotheca javanica*. Frontal view (**a**). Mucilage sheath (**b**). SEM picture (**c**). d, g. *Hyalotheca mucosa* var. *mucosa*. Frontal view (**d**). SEM picture of the zygospore (**g**). e,f,h. *Hyalotheca mucosa* var. *laevicincta*. Zygospore (**e**, **f**). Frontal view (**h**). Scale bar = 10 µm

present variety. This variety is particularly distinguished for having triangular semicells, a deeper sinus, and elliptical apical view (Croasdale et al. 1983). This species was proposed based on material from Mississippi, USA, by Förster (1972). The author described it as being like *Spondylosium tetragonum* West & G.S.West 1892, but with a

Fig. 8 **a**–**b**. *Hyalotheca siolii.* c-e. *Hyalotheca tatrica.* Frontal view (**c**). Cell wall details (**d**). Zygospore (**e**). **f**. *Mateola curvata.* **g**. *Spondylosium moniliforme*. **h**. *Spondylosium panduriforme.* Frontal view (**h**). **i**–**j**. *Teilingia excavata.* **k**–**l**. *Teilingia granulata.* Frontal view (**k**). SEM picture (**l**). Scale bar = 10 µm

notably narrow isthmus, triangular semicells, and widely rounded angles. The dimensions of specimens from Bahia are slightly smaller compared to the type material (length 12.5–13.0 µm, breadth 9.0–11.0 µm, isthmus 4.5), but the cell morphology is remarkably similar.

This is the first record of this variety in South America.

Groenbladia undulata var. ***perundulata*** (Grönblad) Kurt Förster 1974 (Fig. 6d–e)

Basionym: *Hyalotheca undulata* var. *perundulata* Grönblad 1938

This taxon was described based on Russian material (Grönblad 1938), but it has been registered in many tropical countries, such as Nigeria, Indonesia, Thailand, and Brazil (Guiry and Guiry 2026). This variety is known for having semicells with biundulate margins, and two series of punctations along the undulations. It was recorded for Brazil only once from material collected in the Amazon by Förster (1974), but the author highlighted that in his material almost all filaments contain cells in which one or both semicells lacked biundulate margins, and the variety is known for having homogeneous filaments, which made it difficult for him to confirm the identification.

At first our material seemed very distinguished from the type illustrated by Grönblad (1938), mainly due to the elongated appearance of the cells. However, the dimensions of our material have already been reported for this taxon (Croasdale et al. 1983), which made us identify it accordingly. Given that this taxon has only a single recorded occurrence in Brazil, it may be regarded as rare within the country. However, populations of the present variety are easily found in the plankton and periphyton of our study area. This variety is being recorded again in Brazil after a fifty-year gap.

Hyalotheca burmensis West & G.S.West 1907 (Fig. 6f–g)

This species is characterized by having subquadrate cells with broadly truncated and straight apices, and a broadly oblong-elliptic and nodulated zygospore (West and West 1907). We identified this species through the observation of its zygospore and cell shape, although our material presented a more spherical shaped zygospore in comparison to the typical oblong-elliptic shape.

This is the first record of this species for Brazil, thus for Bahia state.

Hyalotheca confervacea (West & G.S.West) B.Fadul-Souza & G.J.P.Ramos *comb.nov.* (Fig. 6h–i)

Basionym: *Gymnozyga confervacea* West & G.S.West, Transactions of the Linnean Society of London, series 2, Botany 5: 232, pl. XII [12]: figs. 20, 21, 1896.

Synonym: *Bambusina confervacea* (West & G.S.West) C.E.M.Bicudo 1983

Description: Cells 1.3–2 times longer than broad, no median constriction, inflated in the median region; semicells trapezoid, lateral margins straight and convergent towards the apex, apices truncate; cell wall punctate, one or two horizontal lines of punctuations above the median region; filament embedded in a thick and conspicuous mucilage sheath; length 19–23 µm, breadth 15–16 µm, isthmus 14–15 µm.

Comments: This taxon was proposed in the late nineteenth century by West and West (1896), based on material from the United States of America, and it was initially placed in the genus *Gymnozyga*. The type's description, originally proposed, provides only a few details on its morphology, including the subrectangular cell shape and the inflation in the middle region. Croasdale et al. (1983) also commented on the lack of information about this taxon, how the species was still poorly known and, until more details about the cell division, chloroplast and zygospore are discovered, the placement of this taxon in the genus *Bambusina* would remain questionable.

During the present investigation, we were able to spot key features of this taxon that led us to transfer it to the *Hyalotheca* genus, such as the chloroplast type (axial, stelloid with one pyrenoid per semicell), and a thick, wide and very visible mucilage sheath, that had not been documented for this taxon until now. Both features are typical of *Hyalotheca* taxa, and the last is not very common in other *Bambusina* taxa, that usually have thin and barely visible sheath. Furthermore, we observed that the pattern of cell division of this species, as described in Hall et al. (2008), is not the same pattern observed in *Bambusina borreri* (Ralfs) Cleve 1864, but it is very similar to the early cell division stages of *Hyalotheca dissiliens* Brébisson ex Ralfs 1848 and *Hyalotheca mucosa* Ralfs 1848. Such characteristics led us to believe that the former taxon *B. confervacea* must in fact belong to the *Hyalotheca* genus.

Unfortunately, although a large population of this taxon was found in our study area, we did not observe its zygospore, that still has not been documented. Our material also had slightly bigger dimensions than the type's (length 12–18.5 µm, breadth 9–10.5 µm, isthmus 10.5–12 µm), but the general morphology seems identical.

The only record of the species in Brazil was reported by Grönblad (1945), from Amazonian material collected in Santarém, Pará State. Therefore, now the species is being reported for the second time in Brazil, after a gap of 78 years. This is the first record of this taxon for Bahia state.

Hyalotheca mucosa var. ***laevicincta*** (W.R.Taylor) Grönblad 1945 (Fig. 7e, f, h).

Basionym: *Hyalotheca laevicincta* W.R.Taylor 1935

This variety differs from the typical for having longer subcylindrical cells and subtle punctation in the poles (Taylor 1935), while the typical variety presents more flattened cells and granules disposed in two or more horizontal series at the poles. We were able to record for the first time the zygospore of this taxon, that had remained unknown since its proposition. The zygospore's smooth-wall and oblong-elliptic

shape reinforce the placement of this taxon as a variety of *H. mucosa.* This taxon is commonly found in the ponds of Serra do Conduru State Park, forming large populations.

Hyalotheca tatrica (Raciborski) Coesel & Meesters 2023 (Fig. 8c–e)

Basionym: *Hyalotheca dissiliens* var. *tatrica* Raciborski 1885

Raciborski (1885) described this taxon based on material from Poland, characterizing it by elliptical-quadrangular cells, nearly equal in length and width, and a distinct constriction in the middle. The current variety is differentiated from the type by having semicells that are as long as wide or up to 1.3 times longer than wide. We were also able to record for the first time the zygospore of this species, that had remained unknown until now. The zygospore has a globose shape and its cell wall is irregularly wavy and nodulous, somewhat similar to *H. burmensis* zygospore. This taxon is mostly known as *Hyalotheca dissiliens* var. *tatrica* Raciborski 1885, because it was very recently elevated to species status by Coesel and Meesters (2023). We believe that the peculiar zygospore shape of *H. tatrica* reinforces its taxonomic elevation at species level.

Teilingia excavata (Ralfs ex Ralfs) Bourrelly 1964 (Fig. 8i–j)

Basionym: *Sphaerozosma excavatum* Ralfs ex Ralfs 1848

This species is known for having moderately deep and very wide sinus with an obtuse interior, and flattened apices containing four connecting processes that resemble small granules (Croasdale et al. 1983). *Teilingia excavata* var. *westii* (Smith) Croasdale 1983 has already been recorded for Brazil, specifically for Goiás State (Nogueira et al. 2016). However, this variety has been recently changed to species category, being renamed as *Teilingia westii* (G.M.Smith) Coesel & Meesters 2023.

The present work presents the first record of this taxon for South America.

Finally, the present study expands the taxonomic and biogeographical knowledge of pseudofilamentous desmids in Brazil, particularly in southern Bahia.

The high taxonomic richness recorded at Parque Estadual da Serra do Conduru (PESC), particularly within *Desmidium* and *Hyalotheca*, highlights the importance of this protected area for pseudofilamentous desmid diversity. Notably, the richness documented here exceeds that reported in most previous Brazilian studies of this group, despite their substantially greater sampling efforts. These findings indicate that the diversity and geographical distribution of pseudofilamentous desmids in southern Bahia remain considerably underestimated.

Our results therefore reinforce the importance of floristic and taxonomic surveys in poorly explored aquatic environments of the Atlantic Forest in southern Bahia. Continued investigations in the region are essential not only to refine current knowledge of species diversity and distribution but also to reveal potentially overlooked taxa and provide a stronger basis for understanding the biogeography of desmids in Brazil and South America.

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Data Availability The data that support the findings of this study are available from the corresponding author upon request.

Declarations

Conflict of interest The authors have no conflicts of interest to declare.

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