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NEW RECORDS OF DESMIDS FROM BLANKET BOGS IN TURKEY

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ABSTRACT

Peatlands are one of the globally important ecosystems. Blanket bogs are a type of peatlands where water is generally supplied by meteorological events (rain, snow). We have been conducting the first detailed algal flora study of blanket bogs of Turkey and found new records of algae genera ever given for Turkey. Here, we report a total of four desmids genera identified as new records for freshwater algal flora of Turkey: *Spirotaenia* (*Spirotaenia condensata*, *Spirotaenia erythrocephala*), *Mesotaenium* (*Mesotaenium macrococcum*), *Hyalotheca* (*Hyalotheca dissiliens*), and *Bambusina* (*Bambusina borreri*). Their ecological habitat is also discussed to highlight the importance of protection and sustainability of these unique areas.

RÉSUMÉ: Des nouvelles mentions des desmidiales des tourbières ombrotrophes en Turquie.

Les tourbières sont des écosystèmes importants au niveau global. Les tourbières ombrotrophes sont un type de tourbière dont l'eau est fournie généralement par les phénomènes météorologiques comme la pluie ou la neige. Nous avons mené la première étude détaillée de la flore algale des tourbières ombrotrophes de Turquie et nous avons trouvé des genres d'algues mentionnées pour la première fois en Turquie. Le présent article fait mention de quatre genres de desmidiales identifiées comme nouvelles mentions pour la flore algale d'eau douce en Turquie: *Spirotaenia* (*Spirotaenia condensata*, *Spirotaenia erythrocephala*), *Mesotaenium* (*Mesotaenium macrococcum*), *Hyalotheca* (*Hyalotheca dissiliens*), and *Bambusina* (*Bambusina borreri*). Leur habitat écologique en est aussi discuté afin de souligner l'importance de la protection et de la soutenabilité de ces uniques zones.

REZUMAT: Noi semnalări de desmide din mlaştinile de tip stratificat din Turcia.

Turbăriile sunt unul dintre ecosistemele importante la nivel global. Mlaştinile de tip stratificat sunt un tip de turbării în care apa este, în general, furnizată de evenimente meteorologice (ploaie, zăpadă). Am efectuat primul studiu detaliat al florei algelor din mlaştinile de tip stratificat din Turcia şi am realizat înregistrări de genuri de alge noi pentru Turcia. Aici, semnalăm un total de patru genuri de desmide identificate ca noi semnalări pentru flora de apă dulce a Turciei: *Spirotaenia* (*Spirotaenia condensata*, *Spirotaenia erythrocephala*), *Mesotaenium* (*Mesotaenium macrococcum*), *Hyalotheca* (*Hyalotheca dissiliens*), and *Bambusina* (*Bambusina borreri*). Habitatul lor ecologic este, de asemenea discutat pentru a evidenţia importanţa protecţiei sustenabilităţii acestor zone unice.

INTRODUCTION

Wetlands are one of the most valuable, diverse and complex realms of our planet (Schneider-Binder, 2008; Kalchev et al., 2010; Straškrábová et al., 2011; Barinova and Nevo, 2012; Klymiuk et al., 2015; Sipaúba-Tavares et al., 2017; Kar, 2019) among them peatlands are one of the globally important ecosystems for the conservation of biological diversity at the genetic, species and ecosystem levels (Beadle, 2015; Harenda et al., 2018).

Peatlands in the world cover an area of approximately 3.985.000 km^2 and have about 5.000 to 6.000 gross tonnage (Lappalainen, 1996). Peatlands, which have the highest carbon storage capacity per unit area (Frolking et al., 2011), are the most important carbon storage of terrestrial ecosystems. Therefore, they play an important role in terms of climate change and biodiversity richness (Harenda et al., 2018). Algae are one of the organism groups that contribute to this high biodiversity of peatlands. Acidophilic and sphagnophilous alga taxa are more common in these areas (Cambra, 2015). Particularly, desmids prefer a widely low nutrient environment and are distributed in acidic areas such as blanket bogs (Brook, 1981). Therefore, protection and conservation of these areas are essential. However, approximately 85% of the total area of peatlands in Turkey has been degraded because of human intervention (Hoş-Çebi and Korkmaz, 2015). Blanket bogs are a type of peatlands where water is generally supplied by meteorological events (rain, snow), making them mostly ombrotrophic. *Sphagnum* moss forms the bog peat and accumulates about one mm per year and some of these areas are thousands of years old. In Turkey, blanket bogs are rare habitats and are all located in the Eastern Black Sea region except the one located in Çanakkale province (Kırmacı et al., 2019). These unique areas are generally located in high altitudes. EU Habitats Directive listed blanket bogs as prioritized protection areas and the Eleventh Development Plan of Republic of Turkey emphasizes the recognition, protection, and sustainability of Turkish biodiversity. Consequently, proper identification of flora in blanket bogs is very important before their possible degradation and even disappearance in the future.

Although floristic research on freshwater algae in Turkey was firstly carried out by Geldiay (1949) numerous studies have been conducted as both floristically and ecologically perspectives on fresh water algae since the late 1970s (Taşkın, 2019). Most of these studies have been carried out to determine the diversity and ecology of all taxonomic groups of benthic and planktonic algae of aquatic ecosystems such as lakes, wetlands, streams, ponds, and dam lakes. To our knowledge, there has been no study and report of algae from blanket bogs of Turkey; thus, this is the first report of new algae genera from these special areas. Although diatoms and green algae are more common in algal flora of peatlands (Štěpánková et al., 2008) desmids are typical and dominant organisms of high acidity areas such as *Sphagnum* peat (Coesel and Meesters, 2007; Štástný, 2010). In addition, desmids which found only in freshwater environments prefer in ecologically oligo-mesotrophic, slightly acidic (pH 5) (Coesel and Meesters, 2007; Kouwets, 2008) and slightly alkaline (pH 8) environments (Coesel and Meesters, 2007).

There has been a significant interest in the ecology of desmids since they are present in almost all freshwater environments and certain characteristics drive accumulation of certain species in distinctive habitats (Brook, 1981). Studies have been conducted to find and determine the algal flora of alpine and subalpine lakes having oligo-mesotrophic slightly acidic and slightly alkaline in the Eastern Black Sea Region of Turkey and new record of desmid species has been identified for the algal flora of the Turkey (Şahin 1998, 2005, 2021; Şahin and Akar 2007, 2019; Akar and Şahin 2014; Şahin et al., 2020). The main objective of this study was to determine new records of desmids in blanket bogs for the first time studied in Turkey.

MATERIAL AND METHODS

Study area

The algal samples were collected from blanket bogs of Ağaçbaşı (40°41ʾ44.79ʾʾN, 40°04ʾ59.31ʾʾE), Barma (40°42ʾ09.46ʾʾN, 40°08ʾ53.03ʾʾE), Yılanlıtaş (40°41ʾ44.25ʾʾN, 39°59ʾ32.69ʾʾE), Sazak (41°13ʾ50.05ʾʾN, 41°19ʾ37.04ʾʾE), Kabaca-Petek (41°09ʾ50.03ʾʾN, 41°30ʾ58.12ʾʾE) located in Eastern Black Sea of Turkey (Fig. 1). Among them, Ağaçbaşı is the Turkey's largest blanket bog (Payne et al., 2008; Hoş-Çebi and Korkmaz, 2015).

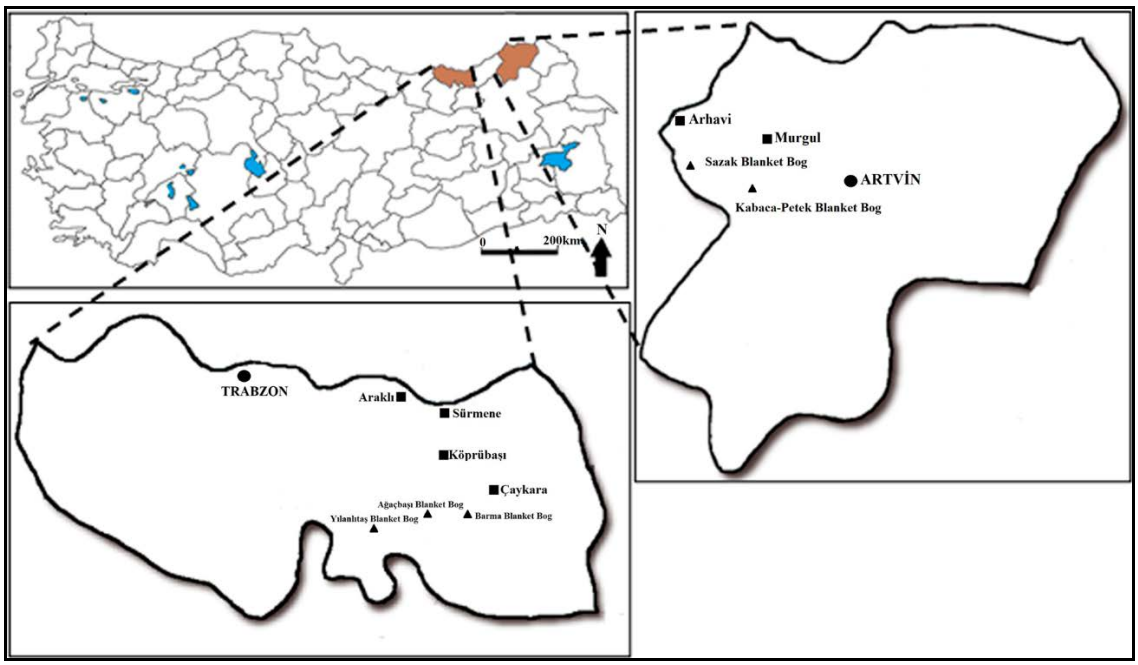


Figure 1: Map of the study areas.

Sampling

Samplings were conducted in May, July, and September of 2021. In each sampling month, 44 sampling stations for Ağaçbaşı, 10 sampling stations for Barma, five sampling stations for Yılanlıtaş, five sampling stations for Sazak, and nine sampling stations for Kabaca-Petek were selected. Epipelic algal samples were collected from the surface of the sediments of the blanket bog pool with a plastic pipe in one cm diameter, while epiphytic samples were collected by squeezing the submerged plants and mosses (*Sphagnum* out of the water) in 370 ml glass bottles. Conductivity, pH, dissolved oxygen and temperature of water were measured with Hach Lange HQ40D Portable Multi Meter. All of the algal samples were stored at +4°C. The samples were examined in fresh condition in microscopic studies. In addition, a certain amount of each sample was fixed with formaldehyde for long-term storage. A light microscope (ZEISS Axioimager) was used for taxonomic identification of desmids.

Desmids were ascertained from West and West (1904), West et al. (1923), Förster (1982), John et al. (2002), Coesel and Meesters (2007), Brook and Williamson (2010) and Kim (2012). The taxa were controlled by checking algal flora of Turkey (Taşkın, 2019; Guiry and Guiry, 2022). The taxonomy of the species was determined by the rules of the International Code of Nomenclature (Turland et al., 2018).

RESULTS AND DISCUSSION

Division Charophyta; Class Zygnematophyceae; Order Desmidiales; Family Mesotaeniaceae; Genus *Spirotaenia* Brébisson ex Ralfs 1848. (Guiry and Guiry, 2022)

Lectotype species: *Spirotaenia condensata* Brébisson

Saccoderm genus *Spirotaenia* contains taxonomically accepted 22 species, two varieties and fur forms (Guiry and Guiry, 2022). Cells in different shapes cylindrical, ellipsoid or narrowly fusiform. Apices of the cell acute or broadly rounded. Chloroplast single or two (only in *Spirotaenia diplohelica* Coesel) ribbon like twisted (spiraling) parietal and lengthens continuously from end to other end of the cell without interruption. Chloroplasts have reddish cap in some species. Cells in two, four or more are usually surrounded with mucilaginous sheath. The wall is smooth and colourless without pores.

***Spirotaenia* genus** of desmids, are mostly rare except for common and cosmopolitan species *Spirotaenia condensata* and generally distributed in North America and Europe (Guiry and Guiry, 2022). Generally rare, these interesting saccoderms mostly found in acidic waters and are most commonly found in peat ponds and *Sphagnum* bogs (Förster, 1982; Brook and Williamson, 2010), but also live in oligotrophic and mesotrophic water accumulations up to an altitude of 2.500 m, more rarely also atmophytic between mosses and moist rocks. Only two species occur in plankton (Förster, 1982). In addition, some members of *Spirotaenia* inhabit small rocky shallow pools and it is even resistant (Brook and Williamson, 2010). For example, *Spirotaenia* species (*Spirotaenia clostridia* (Kützing) Rabenhorst, *Spirotaenia condensate* Brébisson, *Spirotaenia endospira* W. Archer, *Spirotaenia filiformis* G. J. P. Ramos, C. E. M., Bicudo and C. W. N. Moura) collected from bromeliad tanks of *Alcantarea nahoumii* (Leme) J. R. Grant grown in the rocky outcrops in northeastern Brazil which is located in the southern hemisphere (Ramos et al., 2017). Cells of *Spirotaenia* and mucilaginous colonies were also identified on the trees' bark (*Arbutus unedo* L. (Ericaceae), *Tilia cordata* Mill. (Tiliaceae)) as corticolous microalgae in Europe (Neustupa and Štifterová, 2013).

Spirotaenia condensata Brébisson 1848: 179, pl. XXXIV (34).

West and West, 1904, p. 38, Pl. 2: Figs 7-10; Förster, 1982, p. 39, Pl. 1: Figs 15-17; Coesel and Meesters, 2007, p. 25, Pl. 1: Figs 1-2; Brook and Williamson, 2010, p. 70, Pl. 24: Figs 1-5; Kim, 2011, p. 16, Pl. 12: Figs A-K. Homotypic synonym: *Entospira condensata* (Brébisson) Kuntze.

Cells cylindrical with parallel or slightly convex sides, about 6.4 times longer than broad, could even be up to 13 times longer. Cell straight, sometimes slightly curved, rounded apices in a thick, stratified mucilage envelope covering. Cell wall smooth, without pores and without segmentation. Chloroplasts parietal from a wide, spirally coiled band. Cells with 122-149 µm lengths and 19-23 µm breadths (Fig. 2A).

Habitat – Epiphytic (on submerged plants) and epipelic in Ağaçbaşı, Barma. Measured maximum and minimum values of physicochemical parameters at the stations where the species was detected: temperature: 7.3-18.6°C, pH 5.76-7.25, conductivity: 19.4-103.3 µS/cm, dissolved oxygen 4.5-6.31 mg/L. Ecology – It is cosmopolitan and has a worldwide distribution extending to the arctic and tropical regions (Förster, 1982) and inhabits *Sphagnum* bog and bog pools particularly at high altitudes (Brook and Williamson, 2010), which is at 2,150 m above sea level on Alps, in British Columbia about 2.500 m above sea level, in swampy areas all over the world, specially predominant in the littorals of boggy ponds (Förster, 1982). In addition to benthic, they also exist as atmophytic (inhabit a thin film of water, periodically on drying substrates) (Štástný, 2010). However, it is not common in oligo-mesotrophic European lowlands (Coesel and Meesters, 2007), acidophilous (Štástný, 2010),

and circumneutral and alkaliphilous. Common ininhabited the plankton of oligo- and mesotrophic lakes and larger bog waters (Förster, 1982). The species is present in bromeliad tanks (*Alcantarea nahoumii)* in the southern hemisphere (Ramos et al., 2017). Geographical distribution – Europe, North America, Caribbean Islands, South America, Africa, South-West Asia, South-East Asia, Asia, Australia, and New Zealand (Guiry and Guiry, 2022).

Spirotaenia erythrocephala Itzigsohn in Braun 1856: 46, no figure.

Coesel and Meesters, 2007, p. 25, Pl. 1: Figs 3-4; Brook and Williamson, 2010, p. 70, Pl. 26: Figs 1-7. Synonym: No synonym.

The cell is six times as long as broad, cell fusiform apices rounded. The cells are enclosed in a couple in a mucilage envelope. They have a chloroplast consisting of a single tape and a broad, closely spiralled, making 2.5 turns of the cell. As it is understood from its specific epithet, chloroplasts have reddish caps on each pole, which is its characteristic feature. However, Brook and Williamson (2010) stated that these reddish caps of chloroplast are seen in mature cells, and may not be seen in quickly dividing populations. Cells are 40 µm lengths and seven µm breadths (Fig. 2B).

Habitat – Epiphytic (on submerged plants) in Ağaçbaşı. The species was present at one station in May 2021. Temperature: 18.4°C, pH 6.17, conductivity: 23.9 µS/cm, dissolved oxygen 4.55 mg/L. Ecology – Preferr oligo-mesotrophic habitats and rare occurrence (Coesel and Meesters, 2007; Štástný, 2010). It is benthic and atmophytic (Štástný, 2010). Brook and Williamson (2010) reported that the species is distributed in acidic environments especially in shallow ponds. In addition, it has been observed in temporary pools and sediments of marshes and acidic peaty pools. Geographical distribution – Europe (Britain, Bulgaria, Czech Republic, Germany, Netherlands, Romania, Slovakia), Asia (Guiry and Guiry, 2022).

***Mesotaenium* genus Nägeli, 1849**

Holotype species: *Mesotaenium endlicherianum* Nägeli

The taxonomic history of the genus *Mesotaenium* Nägeli in Zygnematophyceae begins with Nägeli (1849) paper. Taxonomically, the genus has all accepted 18 species, 14 varieties, three forms in the algal database at present (Guiry and Guiry, 2022). Cell cylindrical or ellipsoidal with mostly rounded apices or subtruncate. Usually straight or slightly curved, not constricted. The cell has one or two chloroplast (rarely two chloroplast) ribbons or plate-like. Cells are often singular or in small groups. Members of *Mesotaenium* found usually in subaerial habitats mostly as mucilaginous stacks particularly through mosses such as *Sphagnum*, on wet rock and soil. However, rarely, oligotrophic aquatic environments or in acid bog pools (Guiry and Guiry, 2022). Ling and Seppelt (1990) reported that *Mesotaenium berggrenii* (Wittrock) Lagerheim is a common member of the algal flora of snow in Windmill Islands of Continental Antarctica. In addition, the species were reported on snow in Himalayas (Yoshimura et al., 1997), in Alaska (Takeuchi, 2001), in the South America (Takeuchi and Kohshima, 2004), in the Russian Altai Mountains (Takeuchi et al., 2006), and in European Alps (Remias et al. 2009). Likewise *Spirotaenia*, an individual of *Mesotaenium* genus, were also present on the bark of trees (*Juniperus oxycedrus* L.) in Europe (Neustupa and Štifterová, 2013).

Mesotaenium macrococcum (Kützing) J. Roy and Bisset 1894: 61.

West and West, 1904, p. 38, Pl. 3: Figs 34-36; John et al., 2002, p. 513, Pl. 128: Fig C; Coesel and Meesters 2007, p. 21, Pl. 2: Figs 24-26; Brook and Williamson 2010, p. 86, Pl. 37: Figs 1-7: Pl. 38: Figs 1-8. Homotypic synonym: *Palmogloea macrococca* Kützing.

Cells cylindrical, mostly two times longer than broad, rarely 2.5 times. The apices varied form broadly rounded to truncate rounded sometime slightly attenuated. Chloroplast in the shape of a strong axile plate is single in each cell and can have distinctly toothed and almost lengthens to the inner side of the cell wall in some populations. It contains one central pyrenoid. Especially in sub-aerial habitats, cells enclosed by a wide, firm, often layered mucilaginous masses. Cells are 23 µm lengths and 12 µm breadths (Fig. 2C).

Habitat – Sub-aerial (on *Sphagnum*), epipelic, epiphytic in Ağaçbaşı. Measured maximum and minimum values of physicochemical parameters at stations where the species was detected. Temperature: 10.8-20.2°C, pH: 5.59-6.87, conductivity: 27.7-47.8 µS/cm, dissolved oxygen: 4.28-6.31mg/L. Ecology – *Mesotaenium macrococcum* are commonly found in gelatinous masses on sub-aerial materials. However, it is present in bog pools and on *Sphagnum* (Brook and Williamson, 2010). It is oligotrophic and common on wet acidic substrates (Coesel and Meesters, 2007). Geographical distribution – As *Palmogloea macrococca* Kützing: Europe, Australia and New Zealand; as *Mesotaenium braunii*: Europe, North America, South America, Australia and New Zealand; as *Mesotaenium macrococcum*: Europe, North America, South America, Africa, South West Asia, South-East Asia, Asia, Australia and New Zealand (Guiry and Guiry, 2022).

Family: Desmidiaceae

Genus: *Hyalotheca* Ehrenberg ex Ralfs, 1848

Lectotype species: *Hyalotheca mucosa* Ralfs

Currently, the genus contains taxonomically accepted 12 species names, eight varieties, and two forms in the database (Guiry and Guiry, 2022). Cells are very shallow constricted, shaped sub-cylindrical. Apices of the cell truncate united into long filaments, which are sometimes bent and almost always surrounded by a mucilage sheath of a certain thickness. Chloroplast one in each semicell and axile with radiating ridges from central core and each chloroplast have one central pyrenoid. Members of the genera (especially, *Hyalotheca dissiliens* Brébisson ex Ralfs and *Hyalotheca mucosa*) are cosmopolitan usually in habitats non-flowing waters such as acidic, oligotrophic lakes, ponds, and swamps (John et al., 2002; Guiry and Guiry, 2022).

Hyalotheca dissiliens Brébisson ex Ralfs 1848: 51, pl. 1: figure 1 a-I.

West et al., 1923, p. 229, Pl. 161: Figs 16, 18-27; John et al., 2002, p. 589, Pl. 143: Fig I; Coesel and Meesters, 2007, p. 208, Pl. 121: Figs 1-4. Heterotypic synonyms: *Desmidium mucosum* (Dillwyn) Brébisson, *Hyalotheca dissili*ens f. *tridentula* Nordstedt, *Hyalotheca dissiliens* var. *quadridentula* Nordstedt, *Hyalotheca dissiliens* var. *bidentula* (Nordstedt) Boldt, *Hyalotheca dissiliens* f. *bidentula* Nordstedt.

Cells broader than length almost 1¼ to two times, median constriction rather shallow, rectangular semicells with rounded angles in the outline. Apices of semicells broadly truncate. United apices of each cell form long filaments. It could not be observed in apical view. Each semicell has one axile chloroplasts containing a central pyrenoid with several radiating ridges. Thick (10.5 µm), colourless mucilaginous envelope surrounded with filaments. The length of the cell 12-14 µm, breadth 19-21 µm (Fig. 2D).

Habitat – Epiphytic, epipelic, and subaerial in Ağaçbaşı, Barma, Yılanlıtaş Sazak, Kabaca-Petek. Measured maximum and minimum values of physicochemical parameters at the stations where the species was detected. Temperature: 6.3-36.8°C, pH: 4.88-7.65, conductivity: 14.50-341.80 µS/cm, dissolved oxygen: 4.00-7.45 mg/L. Ecology – It is a cosmopolitan species and one of the most common of all desmids. It is often found in large quantities in acid bogs and ditches (West and West, 1923; John et al., 2002) and common in nutrient poor to

moderately nutrient rich lakes as plankton (John et al., 2002), It occurs in mesotrophic waters such as peat pits, quivering fen hollows, moorland pools and dune pools (Coesel and Meesters, 2007). Geographical distribution – As *Desmidium mucosum*: Europe; as *Hyalotheca dissiliens*: Arctic, Europe, North America, Caribbean Islands, Africa, Middle East, South-West Asia, South-East Asia, Asia, Australia, New Zealand, Pacific Islands/Pacific Ocean; as *Hyalotheca dissiliens* f. *tridentula*: Europe, North America, Asia, Australia and New Zealand; as *Hyalotheca dissiliens* var. *bidentula*: Europe, North America, Asia; *Hyalotheca dissiliens* f. *bidentula*: Europe, Caribbean Islands, South America: Brazil, Asia, Australia, and New Zealand (Guiry and Guiry 2022).

Genus *Bambusina* Kützing ex Kützing, 1849

Holotype species: *Bambusina brebissonii* Kützing ex Kützing

Currently accepted name for the type species: *Bambusina borreri* (Ralfs) Cleve

Genus *Bambusina* first described Kützing F. T. in 1849. There are six species, six varieties and one form of the genus taxonomically accepted in the database (Guiry and Guiry, 2022). Members of genus have the cylindrical or barrel-shaped cells (like two flower pots with the upper edges placed side by side) having a very shallow median constriction, V-shaped sinus. Cell wall smooth. Chloroplast one in each semicell axial with radiating widges. In addition, *Bambusina* has a distinctive type of cell division and differed form "*Cosmarium*-type" cell division in many constricted species in Desmidiaceae and it was called *Bambusina* type (Hall et al., 2008). *Bambusina* is found in acidic, oligotrophic, aquatic habitats with other filamentous algae. Species of *Bambusina* are rare in Africa, Asia, Europe, Indonesia, North America, and South America except *Bambusina borreri* (Guiry and Guiry, 2022).

Bambusina borreri (Ralfs) Cleve 1864: 496.

West et al., 1923, p. 255, Pl. 165: Figs 8, 9; John et al., 2002, p. 587, Pl. 143: Fig. M; Coesel and Meesters, 2007, p. 210, Pl. 123: Figs 7-9.

Basionym: *Desmidium borreri* Ralfs

Homotypic synonym: *Desmidium borreri* Ralfs

Heterotypic synonyms: *Bambusina moniliformis* Teiling, *Gymnozyga brebissonii* (Kützing) Wille, *Bambusina brebissonii* Kützing, and *Gymnozyga moniliformis* Ehrenberg.

Barrel shaped cell, forms filaments by attaching end to end like a flower pot. Very slight median constriction, V-shaped. Lateral margins straight, apices broad and truncate. Cell walls are smooth but some have delicate vertical striations. Each semicell has one axile chloroplast including a central pyrenoid. Cell length 28-32 µm, breadth 17-20 µm (Fig. 2E).

Habitat – Epiphytic, epipelic and subaerial in Sazak and Kabaca-Petek. Measured maximum and minimum values of physicochemical parameters at stations where the species was detected. Temperature: 8.24-28.9°C, pH: 5.17-6.79, conductivity: 8.70-55.80 µS/cm, dissolved oxygen: 5.81-6.85 mg/L. Ecology – It is cosmopolite and very common in acid habitats. The species is widespread in the littoral zone of lakes and ponds (nutrient-poor) (John et al., 2002). It occurs in oligotrophic and more or less acid environments (Kouwets, 1987). Geographical distribution – As *Gymnozyga brebissonii*: Europe; as *Desmidium borreri*: Europe; as *Bambusina brebissonii*: Europe, North America, South America, Africa, South-West Asia, South-East Asia, Asia, Australia, and New Zealand; as *Gymnozyga moniliformis*: Europe, North America, South America, Africa, South-West Asia, South-East Asia, Asia, Australia, and New Zealand; as *Bambusina borreri*: Europe, North America, South America, Pacific Islands/Pacific Ocean, Africa, South-West Asia, South-East Asia, Asia, Australia, and New Zealand (Guiry and Guiry, 2022).

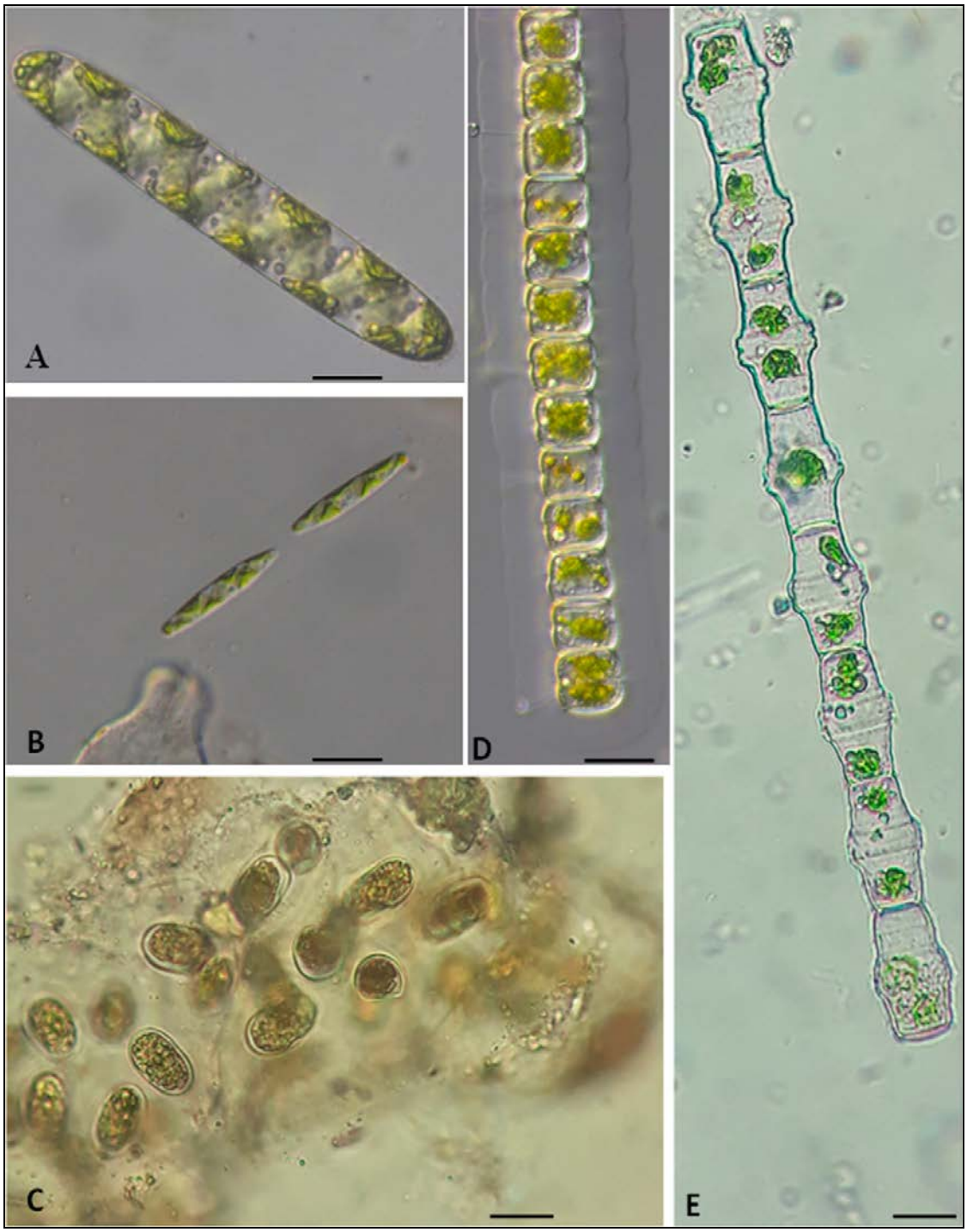


Figure 2: A. *Spirotaenia condensata*, B. *Spirotaenia erythrocephal*a, C. *Mesotaenium macrococcum*, D. *Hyalotheca dissiliens*, E. *Bambusina borreri*; scale bars are equal to 20 µm.

CONCLUSIONS

The new record of desmids for Turkey identified in the blanket bogs are *Spirotaenia condensata, Spirotaenia erythrocephala, Mesotaenium macrococcum, Hyalotheca dissiliens,* and *Bambusina borreri*. This determination of algal flora of blanket bogs in Turkey make significant contributions to the algal biodiversity knowledge.

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