**MOUGEOTIA AG. AND SPIROGYRA LINK
(ZYGNEACEAE) – NEW SPECIES FOR THE EUROPEAN FLORA**

JOANNA ZOFIA KADŁUBOWSKA¹, ANDERS LANGANGEN²

¹Department of Algology and Mycology,
Institute of Ecology and Conservation, University of Łódź,
12/16 Banacha Str., 90-237 Łódź, Poland

²Botanical Museum,
Trondheimsveien 23 B, N-0562 Oslo-5, Norway

(Received: May 27, 1996. Accepted: December 11, 1996)

ABSTRACT

In samples collected in Norway the following species new for Europe, *Mougeotia olivacea* Y.J. Ling, *Mougeotia mysorensis* Iyengar, *Spirogyra reflexa* Transeau and *Spirogyra schmidtii* W. et G.S. West, are identified. The diagnosis of *M. olivacea* has been supplemented with data on the dimensions of vegetative cells and zygotes and the number of pyrenoids. The diagnosis of *M. mysorensis* has been supplemented with data on the number and distribution of pyrenoids and, often curved, vegetative filaments. The sites of *M. olivacea*s and *M. mysorensis*'s occurrence are the second one in the world. Morphological features and dimensions of *S. reflexa* and *S. schmidtii* are congruent with those given from other non-European sites.

KEY WORDS: *Mougeotia* and *Spirogyra* species; new for Europe

INTRODUCTION

Samples were collected in various regions of Norway by the Norwegian author (AL), who also gave the descriptions of respective occurrence sites. Owing to the intermediacy of the Botanical Museum in Oslo the already preserved material was sent to the Polish author (JZK) for identification. Initial, general information on *Zygnemaceae* in Norway were presented at the International Symposium "Biology and Taxonomy of Green Algae" in Slovakia (Kadłubowska & Langanen 1993).

RESULTS

As a result of taxonomic analysis and reviewing world literature on *Zygnemaceae* the present author (JZK) described the following species new for Europe: *Mougeotia olivacea* Y.J. Ling and *Mougeotia mysorensis* Iyengar, *Spirogyra reflexa* Transeau, *Spirogyra schmidtii* W. & G.S. West. Descriptions and microphotographs (orig. JZK) supplement data on their vegetative and generative stages. The Norwegian sites of these species are the most northern localities of their occurrence.

Description of investigated species

Mougeotia olivacea Y.J. Ling 1979 (Figs 1, 2)

M. olivacea has been described for the first time in China (Ling 1979). This species was identified in a sample collected

on June 11, 1991 from a puddle in Lauar prope Kongsberg (Norway). Its vegetative and generative stages were the basis for this identification. The site in Norway is the second site of this species occurrence in the world.

The material from Norway used in our investigation was compared with Lings diagnosis (Table 1) and his two figures published in "*Flora algarum sinicarum aquae dulcis*" (Jao et al. 1988).

The description of *M. olivacea* from Norway: vegetative cells 15-20 µm wide; 6-10 pyrenoids in a single row. Conjugation scalariform. Zygotes in the conjugating tube, compressed globose, 37-50 x 37-50 x 32-37 µm, mesospore smooth, thick, olive.

As can be seen from the comparison of characteristics of *M. olivacea* from China and from Norway Lings diagnosis should be supplemented with data on the width of vegetative cells, number of pyrenoids and zygotes dimensions (Table 1). The microphotographs (Figs 1, 2), constituting a documentation of generative studies of *M. olivacea* from Norway.

Ling (1979) distinguished also *M. olivacea* forma *shanxiensis*, which "differt a typo cellulis vegetativis majoribus, 18-22 µm latis; 90-175 µm longis; mesosporio maturitate atrocaeruleo". In our view, this form, due to its differently coloured mesosporium, cannot be included in the species *M. olivacea*. Ling (1979) pointed up the morphological similarity of *M. olivacea* and *M. maltae* Skuja but stressed that these species differ by the colour of their mesosporium and a gelatinous layer surrounding the zygotes of *M. maltae*.

TABLE 1. A comparison of characteristics of *Mougeotia olivacea* from China and from Norway.

Characteristic	Site: China: Linhe Xian in Nei Monggol Zizshiqu Habitat: puteo	Site: Norway: Buskerud:Kongsberg: Laur Habitat: puddle close to the Sandåa brook/river On marble
Width of vegetative cells	13-15 μm	15-20 μm
Number and distribution of pyrenoids	4-6 in a single row	6-10 in a single row
Conjugation type	scalariform	scalariform
Zygotes		
Placement	in the conjugating tube	in the conjugating tube
Shape	compressed-globose	compressed-globose
Dimensions	30-40x30-40x24-28 μm	37-50x37-50x32-37 μm
Mesospore's sculpturing and colour	smooth, thick, olive	smooth, thick, olive

Figs 1-2. *Mougeotia olivacea*.

Fig. 1. Vegetative cells and zygotes. 500 X.

Fig. 2. Scalariform conjugation. 750 X.

Mougeotia mysorensis Iyengar 1963 (Figs 3-6)
(*M. mysorens* Iyengar in Randhawa, *Zygnemaceae* p. 172
Fig. 107 B).

M. mysorensis was described for the first time in India. The diagnosis of this species was given in the article "Latin Diagnoses of New Taxa of Zygnematales" (Iyengar 1963, posthumous publication). Earlier, because in 1959, Randhawa, while citing Iyengar, gave its description and drawings.

This species was also identified in a sample on July 16, 1993 in a small river by the mainroad in Nordland: Hamarøy: Sommerset (Norway). It is the second site of the occurrence of this species in the world.

Morphological observations of the very numerous generative stage and shape of the zygotes and their placement in the conjugating tubes decided in favour of considering *M. mysorensis*, which was formerly included in *M. varians* (Witt.) Czurda (Kadłubowska 1984), a separate taxon by the present author (JZK). Iyengar (1963) pointed up the similarity of both these species: "This alga also shows a certain amount of resemblance to *M. varians* (Witt.) Czurda in the shape of zygospores but it differs from the latter in the zygospores not extending completely across the gametangia".

Description of *M. mysorensis* from Norway: vegetative cells 27 μm wide, often curved semicircularly; 6-10 pyrenoids in a single row. Conjugation scalariform; gametangia strongly geniculate (Figs 3, 4). Zygotes in wide conjugating tubes and slightly extending into gametangia, but not reaching the opposite sides of the gametangia. Zygotes 47-50x40-47 μm , cask-shaped with the lateral walls strongly convex and concave upper and lower wall; mesospore smooth, thick, golden-brown.

Conjugation in *M. mysorensis* from Norway not always occurs in a way typical for this species. In about 30% of its specimens the present author observed that conjugating tubes adhere to the transversal cell-wall of the single cell. The shape of zygotes in conjugation taking place in this manner is also untypical (Figs 5, 6).

The width of vegetative cells, zygotes' shape, dimensions and placement in the conjugating tubes are congruent with Iyengar's diagnosis. Observations of numerous vegetative stages from Norway should be supplemented with Iyengar's diagnosis data on the number and distribution of pyrenoids and often on the vegetative filament cells, which are semicircularly curved.

Figs 3-6. *Mougeotia mysorensis*.

Fig. 3. Initial conjugation stage. 400 X.

Fig. 4. Scalariform conjugation. 600 X.

Fig. 5. Abnormal conjugation; zygote ovoid. 300 X.

Fig. 6. Abnormal conjugation; zygote quadrangular. 600 X.

Spirogyra reflexa Transeau 1915

S. reflexa was described for the first time from the United States, initially from Illinois, and later from Michigan, Indiana and Mississippi (Transeau 1915). This species has been reported also from the region of Lake Chad (Compère 1976). This species was identified in a sample taken on May 29, 1992, from a small eutrophic lake in Buskerund: Drammen: Åsendammen (Norway).

Description of *S. reflexa* from Norway: vegetative cells 28-30x130-170 µm, with plane end walls; 1 chloroplast, making 5-8 turns; conjugation scalariform; conjugating tubes formed by the male gametangia; female gametangia inflated to 62 µm; the conjugating pairs separated by vegetative cells. Zygotes ellipsoid 43-47x77-96 µm; mesospore smooth, yellow-brown.

Morphological features and dimensions of *S. reflexa* from Norway are congruent with the description and drawings of Transeau (1915), only the width of vegetative cells and zygotes' sizes are slightly smaller.

Spirogyra schmidtii W. & G.S. West 1902

S. schmidtii is cited from Siam (Czurda 1932) from China (Jao et al. 1988) from Texas and Florida (Transeau 1915) from Guinea (Gauthier-Lièvre 1965) and from the region of Lake Chad (Compère 1976). *Spirogyra schmidtii* was identified in a sample taken on 6 June 1992, from eutrophic Lake Akershus: Asker: Padderudtjen (Norway).

Description of *S. schmidtii* from Norway: vegetative cells 27-39 µm, with plane end walls; 2-3 chloroplasts making 3-4 turns; conjugation scalariform; conjugating tubes formed by both gametangia; female gametangia inflated to 54 µm; zygotes ellipsoid 50-54x72-87 µm; mesospore scrobiculate, yellow-brown.

Morphological features and dimensions of *S. schmidtii* from Norway are congruent with those given from other sites, also our observations concerning conjugation, zygotes' shape and sculpturing of mesospores are congruent with drawings of W. & G.S. West (citation after Czurda 1932), Gauthier-Lièvre (1965) and Jao et al. (1988).

LITERATURE CITED

- COMPÈRE P., 1976. Algues de la région du Lac Tchad. VI – Chlorophycophytes (2^e partie: Ulotrichopycées, Zygnematacées). Cah. O. R. S. T. O. M., sér. Hydrobiol. 3: 135-164.
- CZURDA V., 1932. *Zygnemales*. In: A. Pascher (ed.), Die Süßwasser – Flora Mitteleuropa. 9. G. Fischer, Jena.
- GAUTHIER-LIÈVRE L., 1965. Zygnemacées Africaines. Beih. Nova Hedwigia 20: 1-210.
- IYENGAR M.O.P., 1963. Latin Diagnoses of New Taxa of *Zygnematales*. Phycos 2: 54-62.
- JAO C.C., BI L., WEI Y.X. & LING Y.J., 1988. *Zygnemataceae*. Vol. I. In: *Flora algarum sinicarum aquae dulcis* (in Chinese).
- LING Y.J., 1979. Materials for the *Zygnemataceae* of Shanxi, Hebei and Nei Monggol (II). Acta Phytotax. Sinica 17: 124-127.
- KADŁUBOWSKA J.Z., 1984. *Conjugatophyceae* I. *Chlorophyta* VIII. *Zygnemales*. In: H. Ettl, J. Gerloff, H. Heynig & D. Mollenhauer (eds.), Süßwasserflora von Mitteleuropa. G. Fischer, Jena, Stuttgart.
- KADŁUBOWSKA J.Z. & LANGANGEN A., 1993. The Taxonomical and Morphological Investigations on the *Zygnemataceae* of Norway. In: Hindak F. (ed.) Abstracts of Inter. Symp. "Biology and Taxonomy of Green Algae II": 37, Bratislava.
- RANDHAWA M.S., 1959. *Zygnemataceae*. I.C.A.R. New Delhi.
- TRANSEAU E.N., 1915. The *Zygnemataceae*. State Ohio University Press, Columbus.

GATUNKI MOUGEOTIA AG. I SPIROGYRA LINK NOWE DLA EUROPY

STRESZCZENIE

W próbach zebranych w Norwegii oznaczono następujące gatunki glonów nowe dla Europy: *Mougeotia olivacea* Y.J. Ling, *M. mysorensis* Iyengar, *Spirogyra reflexa* Transeau i *S. schmidtii* W. et G.S. West. Uzupełniono dotychczasowe diagnozy: dla *M. olivacea* danymi odnośnie wymiarów komórek wegetatywnych i zygot oraz liczby pirenoidów, natomiast dla *M. mysorensis* określono liczbę i układ pirenoidów a także stwierdzono często występujące skręcone nitki wegetatywne. Opisywane stanowiska *M. olivacea* i *M. mysorensis* są dotychczas dla tych gatunków drugie w świecie. Cechy morfologiczne i wymiary *S. reflexa* i *S. schmidtii* są zgodne z diagnozą i opisami podawanymi z innych pozaeuropejskich stanowisk.

SŁOWA KLUCZOWE: Gatunki *Mougeotia* i *Spirogyra* nowe dla Europy.