

## Diversity of the genus *Placoneis* in Lake Ohrid and other freshwater habitats in Albania

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### Abstract

In a study of the Albanian freshwater diatom flora, twelve species or intra-specific taxa of *Placoneis* were identified. Most of them were of poorly known distribution, i.e. *Placoneis pseudanglica* (Lange-Bertalot) Cox, *Placoneis signata* (Hustedt) Mayama, *Placoneis minor* (Grunow) Lange-Bertalot, *Placoneis significans* Lange-Bertalot, *Placoneis porifera* (Hustedt) Cox var. *porifera*, *Placoneis clementioides* (Hustedt) Cox, *Placoneis clementis* (Grunow) Cox *sensu auct. nonnull*, *Placoneis paraelginensis* Lange-Bertalot, etc. *Placoneis juriljii* Miho & Lange-Bertalot nov. spec. is described as new taxon. Moreover, *Placoneis neoexigua* Lange-Bertalot & Miho nov. spec., similar to *Navicula exigua sensu auct.* is described as new taxon as well. Though rare specimens are only mentioned because of either insufficient evidence or poor documentation, they too can be considered interesting. Most of the species originate from Lake Ohrid, where *Placoneis juriljii* nov. spec. is probably an endemic, like several other established diatom taxa.

Key words: Albanian diatoms, *Placoneis* spp., *Placoneis juriljii*, *Placoneis neoexigua* new species

### Introduction

The genus *Placoneis* was established by Mereschowsky (1903) and resurrected after modifications by Cox (see genus description in Round *et al.* 1990). The particular large plastid divided into two X-shaped plates connected by a column containing a large flat pyrenoid is the main distinguishing character *Navicula sensu stricto*. However, also the frustule morphology differs from *Navicula* by the non-lineolate form of the areola-foramina, terminal raphe fissures, proportions between the striae and interstriae, and (facultative) occurrence of a “cymbelloid” valve symmetry.

In this paper we examine *Placoneis* taxa from Albanian freshwaters – the majority of which were of poorly known distribution, and we formally describe two new species.

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## Material and method

The data was collected from examinations of plankton or benthic samples, collected from the mainly littoral habitats of the transboundary lakes in Ohrid, Prespa, Shkodra (Albanian part), or elsewhere in other freshwater habitats in Albania between 1993-1999. The investigations were based on examinations using the Leitz Diaplan microscope (with 63/1.4 Plan APO oil immersion objective). The cleaning of diatom frustules, preparation of permanent slides and determinations follow up Krammer & Lange-Bertalot (1986-2001) or other recent publications. For SEM studies, the cleaned material was air-dried into stubs and sputtered with gold. The scanning examinations were performed using a Hitachi S4500 electron microscope. The former samples, permanent slides and photos were part of the collection of Prof. Dr. H. Lange-Bertalot, Botanical Institute, J. W. Goethe-University, Frankfurt/M, or are held in Section of Botany, Tirana University.

## Results

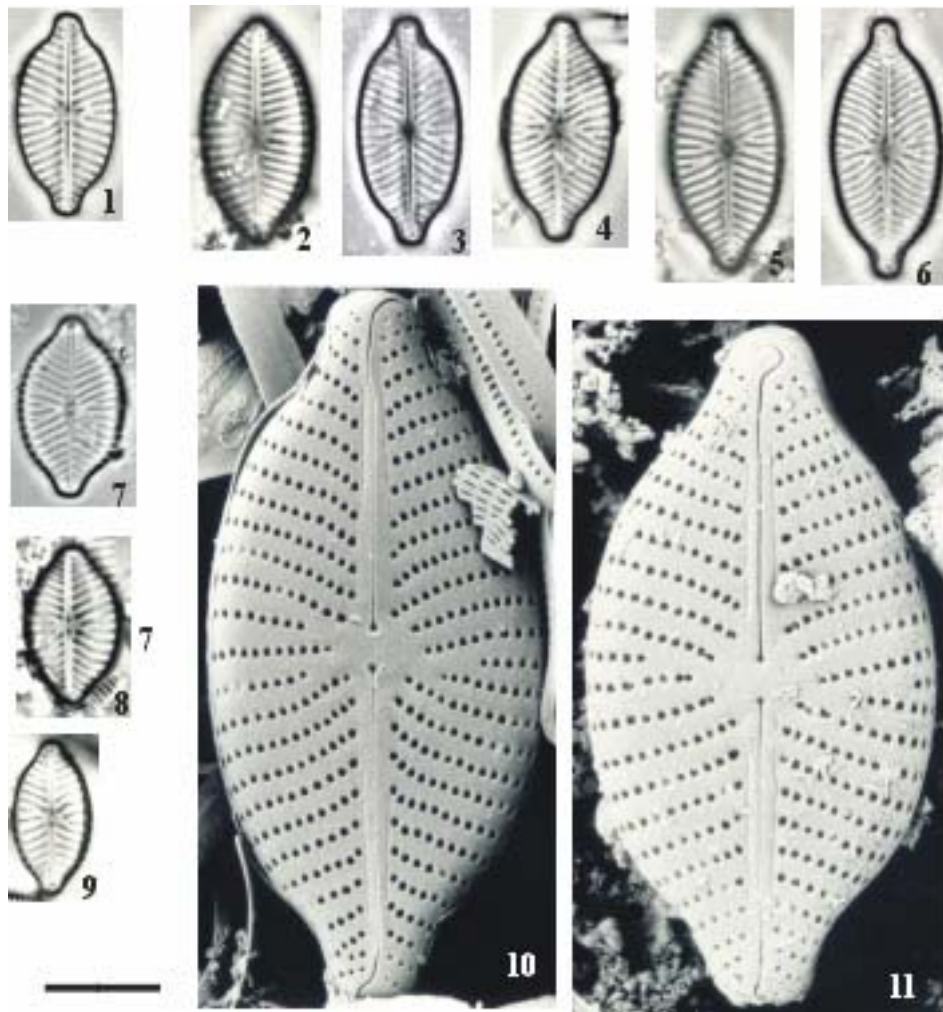
In the study of Albanian freshwater diatom flora, twelve species or other taxonomic forms of *Placoneis* were identified. In the following the descriptions of two new species and the remarks about the other taxa are reported. Photographs from both SEM and LM this will help us to understand more not only about the diversity of this genus, but also about the related ultra-structure of species within *Placoneis*.

### *Placoneis neoexigua* Lange-Bertalot & Miho sp. nov. [Figs 1-11; 20-26]

*Navicula exigua sensu* Hustedt 1934 in A. Schmidt, Atlas, figs. 398: 23-26 non *Pinnularia exigua* Gregory 1854 nom.. *invalidum*.

### *Diagnosis differens versus Placoneis pseudanglica (Lange-Bertalot) Cox*

Valvae plerumque ellipticae etiam aliquid lineari-ellipticae apicibus curte rostratis ad parum subcapitatos. Longitudo 14 ad circiter 40  $\mu\text{m}$ , latitudo 6.6 – circiter 11  $\mu\text{m}$ . Raphe filiformis poris centralibus fere dense sitis inter se particulariter quoad specimina minora. Fissurae terminales modice heteromorphae (vide Figs. 10-11) id est inaequaliter inter se quia una simpliciter curvata altera dupliciter curvata sed ambae ad finitum in limbos aequaliter deflexae. Area axialis anguste linearis. Area centralis aliquid irregulariter formata paucis striis transapicalibus alternantibus longioribus curtioribusque (nec fere circularis et parva quia striae non alternantes). Stigma solitaria hic semper abest. Aliae striae transapicales radiantes omnino usque ad apices, circiter 10-12 in 10  $\mu\text{m}$  in media parte sed densius enim circiter 18 in 10  $\mu\text{m}$  prope polos. Puncta striarum bene visibilia etiam microscopio photonico, 26-30 (nec 30-35) in 10  $\mu\text{m}$ . Aspectus ultramicroscopicus externus confer Figs 10, 11 et Figs 18, 19. Species differunt proprie foraminibus areolarum separatis inter se tenuibus costis apicalibus in *P. pseudanglica* sed *vacantibus* in *P. neoexigua*. Altera species similissima, *Placoneis madagascariensis*, differunt proprie striis transapicalibus convergentibus sub apices et areolis densius sitis, 30-34 in 10  $\mu\text{m}$  atque sterno in partibus distalibus non elevato, (cf. Metzeltin & Lange-Bertalot 2002). *Navicula exigua* var. *signata* Hustedt (syn. *Placoneis significans* Lange-Bertalot) differt multis signis typicis itaque speciem independentem repraesentat.



**Figs 1-11.** *Placoneis neoexigua* Lange-Bertalot & Miho sp. nov. (all from Ohrid littoral: Figs 1, 3, 6: plankton sample no. 15, Pogradeci, 04.06.1993; Figs 2, 8, 11: plankton sample no. 16, Guri-Kuq mine, 04.06.1993; Figs 4, 9, 10: no. 208, epiphytes in Tushemishti, 26.09.1997; Figs 5, 7: plankton sample no. 152, Lini, 26.06.1993). Scale bar = 10  $\mu$ m for LM and 3  $\mu$ m for SEM

*Typus:* Praep. no. Eu – A1 – 38 in Coll. Lange-Bertalot, Botan. Inst. Universität Frankfurt a. Main; (FR) (Figs 20-26, holotype Fig. 21).

*Locus typicus:* Lake Macro Prespa, Plankton sample no. 22 with predominantly periphyton near Liqenasi, leg. A. Miho, 05.06.1993.

**Differential diagnosis compared to *Placoneis pseudanglica* (Lange-Bertalot) Cox**

The valve outlines are (broadly) elliptical to linear-elliptical and the ends shortly rostrate to slightly subcapitate. Their length 14 to c. 40  $\mu\text{m}$ , width 6.6 to c. 11  $\mu\text{m}$ . Raphe filiform with rather close-standing central pores. Terminal fissures heteromorphous (see Figs 10, 11); i.e. one is simply deflected or curved, the other one is forming a double-curve, first turning to the opposite side, but finally both terminal fissures curve to the same side of the valve mantle (as is the case in most (or all?) taxa of *Placoneis*). Axial area narrow, linear. Central area somewhat variable in shape by several striae alternating shorter and longer, moderately expanded transapically (not small and almost circular with at most a single shortened stria on either side). Stigmata lacking. Striae radiate throughout up to the ends, c. 10-12/10  $\mu\text{m}$  in proximal parts of the valve becoming c. 18/10  $\mu\text{m}$  close to the apices. Puncta of the striae (areolae) to discern easily also in the LM, 26-30 (not 30-35 difficult to resolve) in 10  $\mu\text{m}$ . SEM, external view, see Figs 10, 11 and Figs 18, 19 for a comparison: The characteristic small apical frets separating the areolae of *P. pseudanglica* are lacking in *P. neoexigua*. These populations from Ohrid (Figs 1-11) and Prespa (Figs 20-26) are described as new taxon coincident or similar to *Navicula exigua sensu auct.*

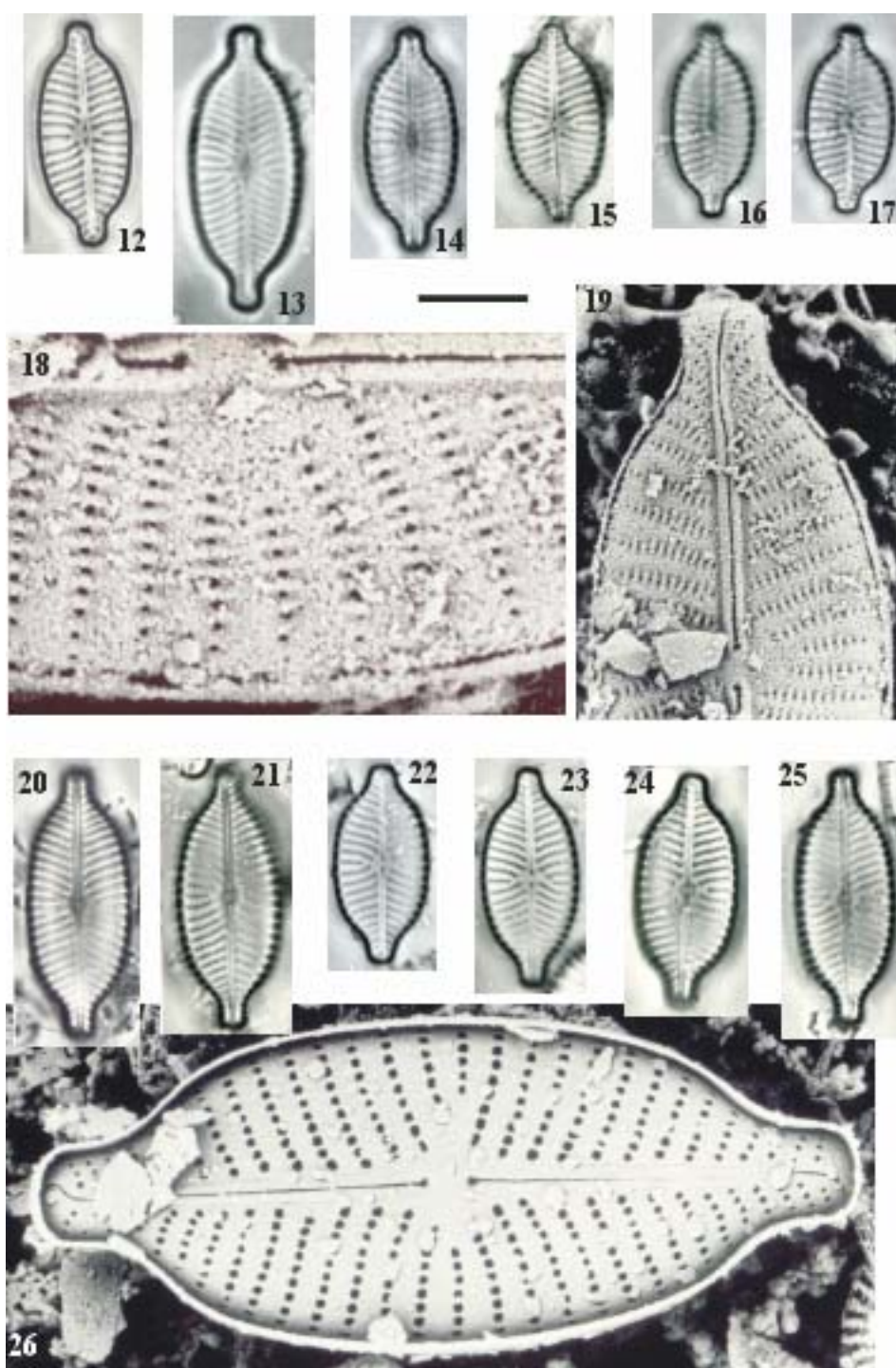
Another stigma-less taxon similar to *P. neoexigua* is *P. madagascariensis* Metzeltin & Lange-Bertalot 2002. It differs mainly by striae becoming convergent in the ends, and denser spaced areolae (30-34/10  $\mu\text{m}$ ). Moreover the raphe sternum is not elevated on the valve surface. *P. significans* (Hustedt) Lange-Bertalot (syn. *Navicula exigua* var. *signata* Hustedt) is easy to distinguish (in the LM) not only by the stigma, but also by longer cell sizes on average with more broadly protracted rostrate to subcapitate ends. This can be confirmed comparing *P. significans*, *P. pseudanglica* and *P. neoexigua* in samples from Lake Neuenburg, Switzerland, where the three taxa occur associated.

*Distribution:*

In Albania it is found also in Prespa and Shkodra/Scutari lakes. In central Europe observed in several lakes with less individual numbers, commonly recorded as *Navicula exigua*.

*Remarks:*

In their recent publication Metzeltin *et al.* (2004) confirm once more that *Navicula (Placoneis) exigua* Gregory ex Grunow in Van Heurck 1880 is a provisional name and therefore was not validly established. As stated also by Patrick & Reimer (1966, p. 522), since the identity of nominate variety cannot be elucidated by studies on the type material from Mull/Scotland - no confirming specimens could be found - other taxa should not be combined with this ambiguous taxon intraspecifically. See also explanations in Krammer & Lange-Bertalot (1986, p. 138). *Navicula exigua sensu* Hustedt *partim* as shown in Krammer & Lange-Bertalot 1986, fig. 46: 17 does not belong to *P. neoexigua*. Together with *Navicula exigua sensu* Brockmann, it may represent another species in its own rights or may belong to *Placoneis elginensis* (Gregory) Ralfs. Hustedt's specimens originate from the "Maschinenfleet" in Bremen; Brockmann's from interglacial deposits "Eiderstedt", Schleswig-Holstein, North-Germany.



**Figs 12-19:** *Placoneis pseudanglica* (Lange-Bertalot) Cox (Shkodra Lake: Figs 12-17: plankton sample nr. 8SH, near Kamica, Kopluku, 24.03.1999, collected Dr. M. Rakaj, Shkodra University; Figs 18, 19: the same specimen, plankton sample no. 214, near Zogaj, 23.10.1997). **Figs 20-26:** *Placoneis neoexigua* (Hustedt) Lange-Bertalot (plankton sample no. 22 near Liqenasi, Macro Prespa, 05.06.1993). (holotype: Fig. 21). Scale bar = 10µm for LM; 1.25 µm for SEM Fig 18; 3 µm for Figs 19, 26

***Placoneis juriljii* Miho & Lange-Bertalot sp. nov. [Figs 27-25]*****Diagnosis differens versus Placoneis clementis* (Grunow) Cox**

Valvae late ellipticae ad aliquid elliptico-lanceolatas apicibus curte latissimeque protractis et latissime rotundatis (nec simpliciter lanceolatae apicibus angustius protractis rostratiformibus). Longitudo 40-73  $\mu\text{m}$ , latitudo 16-20  $\mu\text{m}$  (nec 40-45  $\mu\text{m}$  et 12-15  $\mu\text{m}$ ). Raphe filiformis extremis centralibus incrassatis et poris centralibus comparate distanter (nec fere dense) sitis inter se. Fissurae terminales primo opposite deflexae inter se ut communiter in genere (vide sub *Placoneis neoexigua*). Area axialis anguste lanceolata. Area centralis modice ampla cum regulariter duabus stigmatibus unilateraliter (ut *P. clementis*) sed saepe cum una vel paucis areolis separatis a striis mediis, ita ut stigmata addita apparentibus. Striae transapicales radiantes omnino, 9-11 in 10  $\mu\text{m}$  proximaliter, sub apices parum densius sitae enim circiter 12 (nec 16) in 10  $\mu\text{m}$ . Circum aream centralem alternantes irregulariter curvae longaeque. Puncta striarum circiter 25 in 10  $\mu\text{m}$ . Aspectus ultramicroscopicus externus vide Figs 31-35. Alterae species similissimae adhuc incognitae sunt.

*Typus*: Praep. no. Eu – Al – 37 in coll. Lange-Bertalot, Botan. Inst. Universität Frankfurt a. M. (FR) (Figs 27-35, holotype Fig. 29).

*Locus typicus*: Lake Ohrid, littoral sample near Tushemishti, Albania, epiphytic on higher aquatic plants, leg. A. Miho, prep. no. 208, dt. 26.09.1997

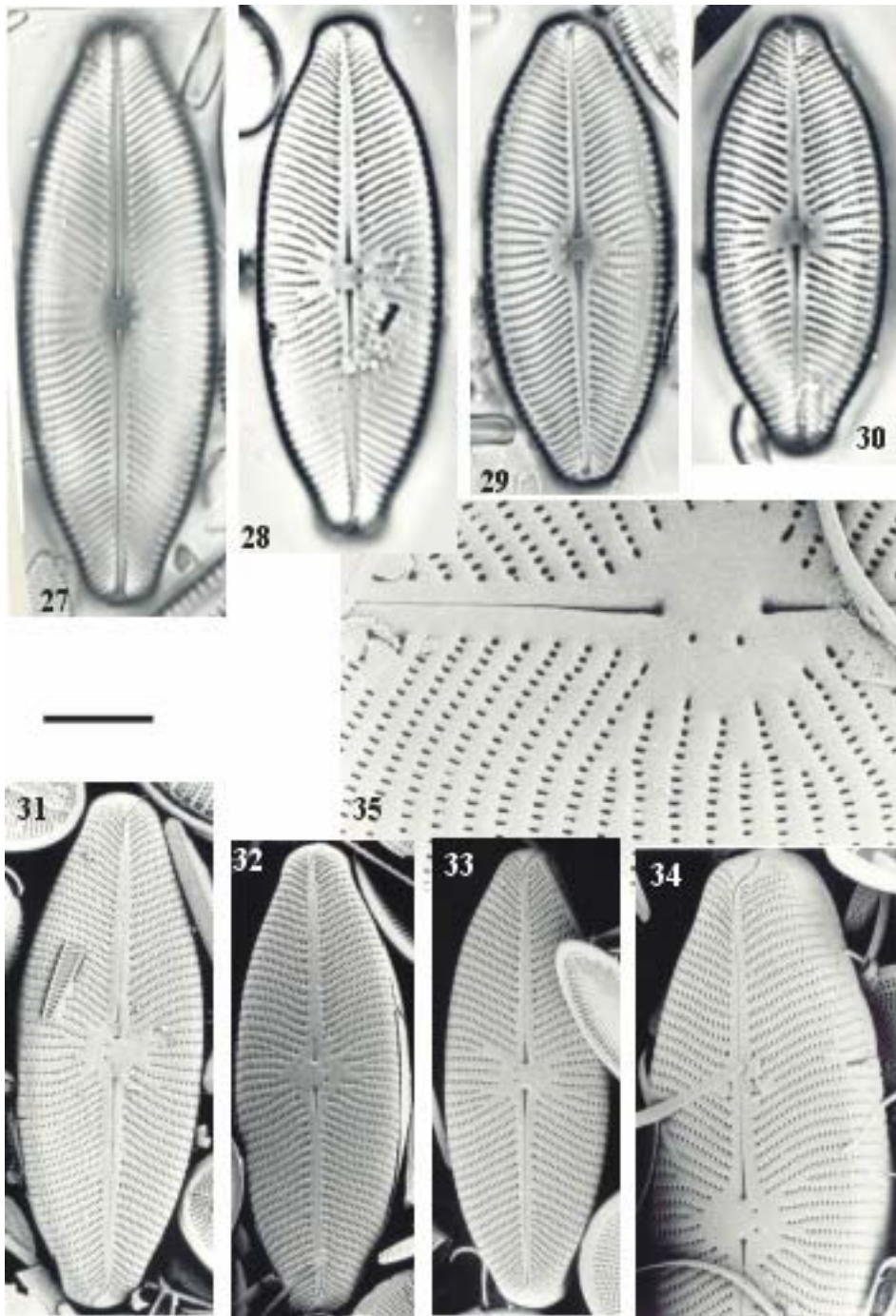
**Differential diagnosis compared to *Placoneis clementis* (Grunow) Cox**

Average valves in the population are bigger and coarser than *P. clementis*, more or less elliptical, rhomboid, broadly lanceolate. Valves broadly elliptical to slightly elliptical-lanceolate. The ends are more or less shortly protracted and bluntly rounded (not distinctly lanceolate with narrowly rostrate or subrostrate ends). Dimensions: length 40-73  $\mu\text{m}$ , width 16-20  $\mu\text{m}$  (not 40-45  $\mu\text{m}$  and 12-15  $\mu\text{m}$  respectively). Raphe filiform to slightly lateral, central ends appearing expanded with comparatively far-standing central pores (not rather narrowly spaced). Terminal fissures first deflected to opposite sides, but finally also the more curved of both heteromorphous fissures turns to the same side, as commonly in *Placoneis* (see diagnosis of *P. neoexigua*). Axial area narrowly lanceolate towards the centre. Central area moderately large, confined by irregularly alternating shorter and longer striae. Two stigmata near the central nodule and distinctly separated from the striae unilaterally (like in *P. clementis*), one or some additionally stigma-like areolae occur facultatively closer to but somewhat isolated from the striae. Striae radiate throughout, 9-11/10  $\mu\text{m}$  in proximal parts becoming only slightly denser near the apices, c. 12 (not 16) in 10  $\mu\text{m}$ . Areolae about 25/10  $\mu\text{m}$ . SEM external view (see Figs 31-35): the foramina conform to other taxa of the genus as well as the proportion of the striae/interstriae. Differentiation character from *P. clementis s. stricto* and *sensu auct.* are the larger dimensions, the broadly rounded ends, and more alternating striae.

Other species that could be actually confused are not known neither in the diatom flora of Eurasia nor in the Neotropics.

***Distribution*:**

Common in the oligo- to moderately mesotrophic Lake Ohrid, littoral epiphytic on higher aquatic plants. To date, they have not been found in other lakes.



**Figs 27-35:** *Placoneis juriljii* Miho & Lange-Bertalot sp. nov., samle no. 208, type population from Lake Ohrid (holotype: Fig. 29). Scale bar = 10 $\mu$ m for LM and SEM Figs 31-34; 3  $\mu$ m for Fig. 35.

*Remarks:*

The species was found common in Lake Ohrid as epiphytic on *Chladophora* or *Myriophyllon*. Apparently also Jurilj has found this taxon but mistaken for *Navicula clementis* (see Jurilj 1954, fig. 40 d) because of the two stigmata.

We dedicate the new taxon to our late Croatian colleague, Ante Jurilj. His investigations on the Ohrid diatom flora have resulted in publications that must be considered as fundamental.

**Other Placoneis taxa*****Placoneis signata* (Hustedt) Mayama [Figs 36-40]**

*Basionym:* *Navicula gastrum* var. *signata* Hustedt

Figures 37, 39, 40 conform well to be the type specimens from Lake Ladoga/Finland, Ancyclus Clay, than Figs 36, 38. The latter have narrow outlines. Characteristics of Albanian specimens: length 26-50  $\mu\text{m}$ , width 11-16  $\mu\text{m}$ , striae 9-12/10  $\mu\text{m}$  and areolae ~30/10  $\mu\text{m}$ . Valves elliptic-lanceolate with slightly cymbelloid symmetry; ends broadly rounded and shortly protracted. The striae in the middle are not equally shortened but alternately long and short. Central area with a single stigma. However, the combination of the characteristics is similar to *N. gastrum* var. *signata* Hustedt, except for a constant finer structure and denser spaced foramina, up to 30/10  $\mu\text{m}$ . May be it is more closely related to *N. gastriformis* Hustedt from Sumatra.

**Specimens of *Placoneis minor* (Grunow) Lange-Bertalot [Figs 41-45]**

*Basionym:* *Navicula placentula* fo. *minor* Grunow in V. H. Atlas, fig. 8:26; this is a synonym of *Navicula placentula* auct. non Ehrenberg (see Metzeltin *et al.* 2005)

It seems that our specimens are closer related to *Navicula subplacentula* Hustedt. On the other hand, Hustedt (1945) recorded *N. placentula* var. *maculata* Hustedt from Lake Ohrid.

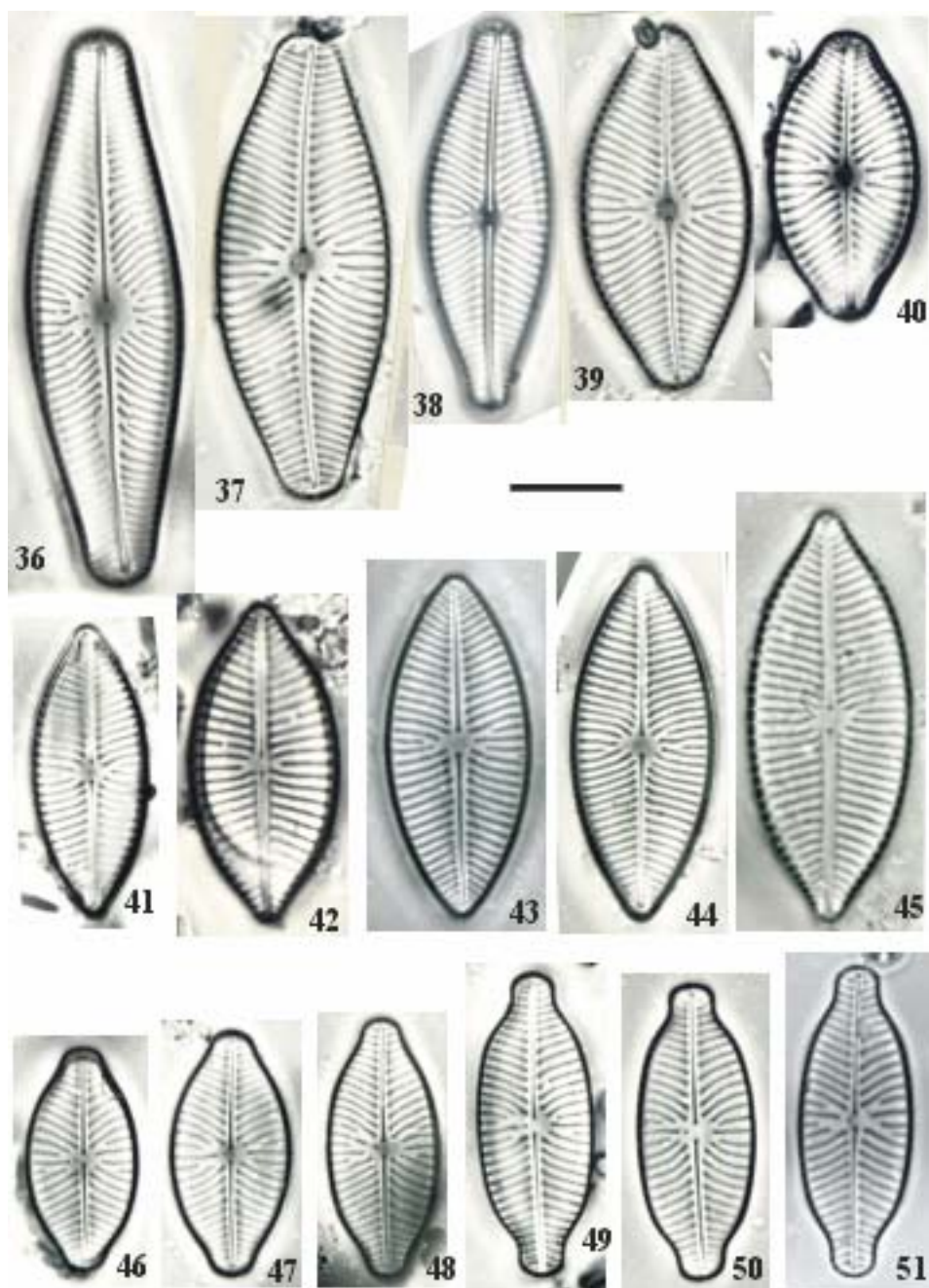
***Placoneis significans* Lange-Bertalot [Figs 46-51]**

This is the new name replacing the epithet stigmata of the synonym *Navicula exigua* var. *signata* Hustedt (see Metzeltin *et al.* 2005). It was found in Ohrid and Prespa lakes. The valves are linear-elliptic to elliptic-lanceolate, with more or less protracted, obtusely rounded ends; terminal fissures of the raphe bent to the same side; central area small, with one stigma; striae more finely punctate, areolae indiscernible in LM (about 10/10 $\mu\text{m}$ ), radial at the ends. Dimensions: length 20-30  $\mu\text{m}$ , width about 10  $\mu\text{m}$ .

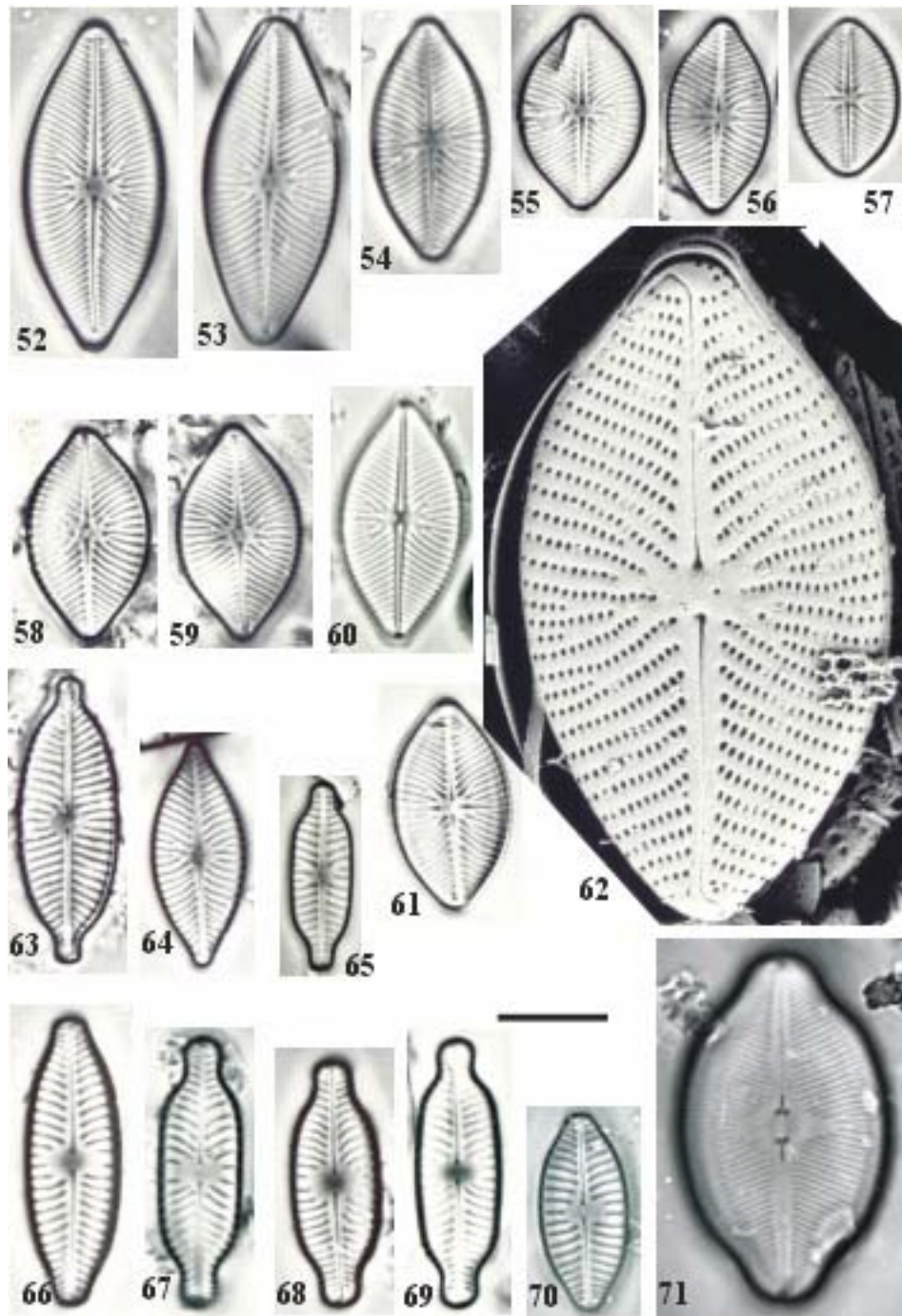
***Placoneis porifera* (Hustedt) Cox [Figs 52-62]**

*Basionym:* *Navicula porifera* Hustedt

It was found common in plankton of littoral zone of Lake Ohrid, and rarely in Macro Prespa. Fig. 61 has an outline similar to *P. porifera*, but appearing without a stigma in the central area and is found in the same sample. Concerning taxonomical and nomenclatorial problems about *Navicula porifera* Hustedt and *N. balcanica* Hustedt see Metzeltin *et al.* (2005, p. 170).



**Figs 36-40.** *Placoneis signata* (Hustedt) Mayama 1998 (all from Lake Ohrid littoral: Figs 36, 40: no. 15, Pogradeci, 04.06.1993; Figs 37, 39, plankton sample no. 186, Pogradeci, 06.09.1996; Fig. 38: no. 208). **Figs 41-45.** *Placoneis minor* (Grunow) Lange-Bertalot. Figs 41, 43, 44: no. 15, Pogradeci; fig. 42: plankton sample no. 201, Kallamasi, Macro Prespa, 23.09.1997; Fig. 45: plankton sample nr. 8SH, Kamica, Lake Shkodra, 24.03.1999). **Figs 46-51.** *Placoneis significans* (Hustedt) Lange-Bertalot. Figs 46-49: no. 15, Pogradeci; Figs 50, 51: plankton sample no. 202, Zaveri gorge, Macro Prespa, 23.09.1997. Scale bar = 10µm



**Figs 52-62.** *Placoneis porifera* (Hustedt) Cox var. *porifera*; Figs 52, 54-57, 61: sample no. 15, Pogradeci; Figs. 53, 62: sample no. 208, Ohrid; Figs 58, 59: sample no. 22, Macro Prespa. **Fig. 63:** *Placoneis clementioides* (Hustedt) Cox. Sample no. 161, Dumre, 28.06.1993. **Fig. 64:** *Placoneis clementis* (Grunow) Cox *sensu auct. nonnull.* Sample no. 208, Ohrid. **Fig. 65:** *Placoneis* sp. Sample no. 172, Dajti mountain, Tirana, 15.06.1995. **Fig. 67-69:** *Placoneis paraelginensis* Lange-Bertalot; Figs. 67, 68: sample no. 159, karsic pond in Cepi, Dumre, 28.06.1993; Fig. 69: sample no. 208, Ohrid. **Figs 66, 70.** *Placoneis* cf. *ignorata* (Schimanski) Lange-Bertalot, Fig. 66, sample no. 159, Dumre; Fig. 70: sample no. 158, Buzeliqenasi, Micro Prespa, 27.06.1993). **Fig. 71.** *Navicula* (*Placoneis?*) *platystoma* Ehrenberg. Sample no. 15, Ohrid. **Scale bar** = 10µm for LM and 3 µm for SEM Fig. 62.

***Placoneis clementis* (Grunow) Cox sensu auct. nonnull. [Fig. 64]**

Only a single specimen of was found in Ohrid. The fossil type has dimensions of 45 µm length, 15 µm width, 11 striae and 28 areolae/10 µm, and is probably not specific with *Navicula (Placoneis) clementis* auct., a recent and cosmopolitan taxon that is much more common. The identity of the fossil *Navicula clementis* s. str. is discussed in Metzeltin *et al.* (2005) under *Placoneis clementis* and *P. abundans*.

***Placoneis clementioides* (Hustedt) Cox [Fig 63]**

*Basionym* : *Navicula clementioides* Hustedt

Hustedt's two i-types (in the sense of Simonsen 1987), the lectotype from western Germany, the other one from northern Germany, are very poor basis for comparison with isolated specimens from elsewhere. The single specimen found in Albania so far originates from a plankton sample of the karstic lake Merhoja (Dumre). It resembles by and large the lectotype conforming in the valve outline with distinct rostrate-subcapitate ends and position of the striae, whereas the specimen from Northern Germany barely possesses protracted ends.

***Placoneis paraelginensis* Lange-Bertalot in Rumrich *et al.* (2000) [Figs 67-69]**

This taxon occurs in the northern and less frequently also in the southern hemisphere, e.g. in the Andes. It was formerly not distinguished from *P. elginensis* which possesses distinctly elliptical instead of linear or at most moderately convex valve outlines consistently. *P. paraelginensis* was mistaken sometimes in the past for *Pinnularia dicephala* Ehrenberg syn. *Navicula dicephala* (Ehrenberg) W. Smith.

***Placoneis cf. ignorata* (Schimanski) Lange-Bertalot [Figs 66, 70]**

*Basionym*: *Navicula ignorata* Schimanski

*Synonyms*: *Navicula dicephala* f. *cuneata* M. Moeller ex Foged; *Navicula elginensis* var. *cuneata* (M. Moeller) Lange-Bertalot

More specimens than the few ones found are needed for a clear identification. Compared to the type specimens of *Placoneis ignorata* and many other populations from northern and central Europe the Albanian specimens have (significantly?) denser spaced areolae not to discern in LM easily.

***Placoneis pseudanglica* (Lange-Bertalot) Cox [Figs 12-19]**

*Basionym*: *Navicula pseudanglica* Lange-Bertalot

Figures 18 and 19 present the main features of the areola fine structure differentiating that differentiate this taxon from *P. neoexigua* nov. spec. (cf. Figs 10, 11, 26).

***Placoneis* sp. [Figs 65]**

Only a single specimen roughly resembling *Placoneis pseudanglica* var. *signata* (Hustedt) Lange-Bertalot was found in spring mosses of Dajti Mountain (Tirana), and for a description more specimens would be needed.

***Navicula (dicta) platystoma* Ehreneberg [Fig. 71]**

Few specimens were found in Lake Ohrid plankton samples from near Pogradeci. These specimens clearly show the bifurcation or T-form of the central raphe ends. This character is unknown in *Placoneis*; it was not depicted or noted by Hustedt (1945) or Hustedt (1930, fig. 539), and appears much less developed in the photographs of Krammer & Lange-Bertalot (1989, figs. 51: 3-5). The specimens here are 32 µm long, 19 µm wide, striae 18 in 10 µm.

**Discussion**

Studying the Albanian freshwater diatom flora, up to 900 taxa were identified, including some of poorly known distribution (Miho & Lange-Bertalot, 2001; 2003).

The *Placoneis* taxa for which the identification is certain are: *Placoneis pseudanglica* (Lange-Bertalot) Cox, *P. signata* (Hustedt) Mayama, *P. minor* (Grunow) Lange-Bertalot, *P. significans* (Hustedt) Lange-Bertalot, *P. porifera* (Hustedt) Cox (possibly syn. *P. balcanica* (Hustedt) Lange-Bertalot *et al.*), *P. clementioides* (Hustedt) Cox, *P. clementis* (Grunow) Cox *sensu auct. nonnull*, *P. paraelginensis* Lange-Bertalot. *P. juriljii* nov. spec. and *P. neoexigua* nov. spec. are described as new taxons. *P. juriljii* nov. spec. is presumably an endemic of Lake Ohrid. Rare specimens of other *Placoneis* taxa are only mentioned because of insufficient evidence, or poor documentation, but they can be considered also interesting.

Most of the species reported here originate from the Ohrid littoral near Tushemishti village, close to the Macedonian border. There were several aquatic grasses collected, probably *Chaldophora* and *Myrophyllum*. The sample was dominated by Achnathidium *pyerenaicum* (Hustedt) Kobyasi syn. *Achnanthes biasoletiana* Grunow *ex parte* (29.6%), *Cocconeis pediculus* Ehrenberg (19.7%), *Encyonopsis minuta* Krammer & Reichardt (7.9%), *Amphora pediculus* (Kützing) Grunow (5.9%), *A. inariensis* Krammer (2.6%), *Gomphonema minutiforme* Lange-Bertalot & Reichardt (3.6%), *G. minutum* (Agardh) Agardh (2.0%), *G. pumilum* var. *elegans* Reichardt & Lange-Bertalot (2.4%), *Meridion circulaire* (Grewille) Agardh (3.9%), *Navicula cryptotenelloides* Lange-Bertalot (2.2%), etc. This sample was the richest in taxa among all our samples from Albania. About 155 species were found there, with many rare interesting species - most of them relicts of Tertiary (Neogene), such as *Cocconeis robusta* Jurilj, *Gomphoneis transsylvanicum* (Pantocsek) Hustedt, *Navicula perturbata* Jurilj, and *N. jakovlevicii* Hustedt. Six new taxa were described from this sample including *Aneumastus albanicus*, *A. rosettae*, *A. humboltianus*, *Navicula pseudoppugnata*, *N. parahasta* and *N. hastatula* (Lange-Bertalot, 2001). Moreover, several other, probably new taxa, belong to the genera *Sellaphora*, *Diploneis* or *Geissleria*, and await further study.

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