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Neidiomorpha gen. nov. (Bacillariophyta): A new freshwater diatom genus separated from *Neidium* Pfitzer

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ABSTRACT. Comparative morphological (including plastids) and ultrastructural (frustule) analyses of numerous taxa within the established diatom genus *Neidium* Pfitzer led to the conclusion that *N. binodiforme* Krammer and *N. binodis* (Ehrenberg) Hustedt can be identified as striking exceptions. They would be more coherently allocated in a new freshwater benthic diatom genus, *Neidiomorpha* gen. nov. This proposed genus differs from *Neidium* mainly by the longitudinal structures (shallow "caves" in the mantle instead of distinct canals at the junction between valve face and mantle), by areolation pattern (including the absence of renilimbi on the internal valve surface), and raphe endings (no silica flaps causing a bifurcate appearance of the polar endings and no central endings deflected towards opposing directions). Chloroplast number and arrangement (two valve- and girdle-appressed chloroplasts placed fore and aft in the two halves of the cell), overall valve outline, and ecology (preference for medium to high conductivity freshwaters) are likely to be further relevant distinctive elements. Observations on the distribution, and habitat and choriotope preference of the two species combined with the new genus are also provided.

Keywords: Bacillariophyta; Diatoms; Longitudinal structures; *Neidiomorpha* gen. nov.; *Neidiomorpha binodiformis*; *Neidiomorpha binodis*; Ultrastructure.

INTRODUCTION

Neidium is an established diatom genus erected by Pfitzer (1871). Its most important features are the presence of longitudinal canals and the structure of the raphe endings. In particular, central raphe fissures are mostly laterally deflected and opposing, but in a few species they are developed just as central pores. The terminal raphe fissures have a bifurcate appearance because the distal raphe ending is covered by a triangular silica flap (the so-called lacinia, Siver et al., 2003). Siver et al. (2003) observed on the internal valve surface small kidney bean-shaped structures associated with specific rows of areolae and termed them renilimbi.

It has long been known that several established diatom genera were heterogeneous aggregates that had been conserved for practical reasons and for the sake of simplicity, in consideration of the wide range of applications in which diatom taxonomy is a fundamental tool (e.g., Stoermer and Smol, 1999). This situation was especially evident for the four "collective-genera" (in German *Sammelgattungen*) *Navicula* sensu lato, *Fragilaria* s. l., *Achnanthes* s. l., *Cymbella* s. l. In the last two decades, smaller, homogenous groups have been identified and described as new genera within these taxa.

In 1986, Krammer and Lange-Bertalot reported 31 *Neidium* species for the diatom flora of central Europe. Today as many as 500 records, including many varieties and forms, can be found in the names database of the Diatom Collection of California Academy of Sciences (http://research.calacademy.org/research/diatoms/names/). In spite of this, *Neidium* still is a smaller and more homogeneous genus, compared to the above-mentioned "collective-genera." However, detailed analysis of some species included in this genus resulted in a recognition of common morphological and ultrastructural characters that supported the separation of the genus *Neidiopsis* Lange-Bertalot et Metzeltin (in Lange-Bertalot and Genkal, 1999): in particular the absence of longitudinal canals under hyaline areas and the form of the raphe fissures (Lange-Bertalot, 2001).

Krammer and Lange-Bertalot (1986) observed that the genus *Neidium* includes a majority of species showing a high variability and plasticity of valve outline, and of its quantitative characters. However, they also identified as an exception the two species [*Neidium binodiforme* Krammer and *N. binodis* (Ehrenberg) Hustedt] for which the overall valve outline was found to be so characteristic and stable as to be virtually sufficient as a basis for species identification.

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The interphase chloroplast arrangement of *Neidium* taxa is highly characteristic among freshwater diatoms. Round et al. (1990), who also included *N. binodiforme* in the genus *Neidium*, state that this genus is characterized by four, girdle-appressed plastids, disposed symmetrically, one in each quadrant of the cell, or occasionally with two plastids lying against the epivalve. Characteristics of sexual reproduction and auxosporulation (girdle-girdle pairing, plasmogamy via narrow copulation apertures, behavioral anisogamy, and formation of siliceous caps over the ends of the auxospores, Mann and Chepurnov, 2005) suggest a link with *Amphipleura* F.T. Kützing and *Frustulia* L. Rabenhorst (Mann, 1984). Mann (1993) observed that *Neidium* and *Biremis* D.G. Mann et E.J. Cox share a number of auxosporulation character states. Spaulding and Stoermer (1997) discussed links with *Muelleria* (Frenguelli) Frenguelli, and Edlund and Spaulding (2006) systematic relationships with *Scoliopleura* A. Grunow, considered very similar to *Scoliotropis* P.T. Cleve and closely related to *Biremis* by Round et al. (1990).

As reported by Sims et al. (2006), only a few genera, including *Neidium*, are known to have evolved solely in freshwaters. *Neidium* is considered to be primarily a genus of epipelic diatoms, which is very widely distributed, but rarely abundant (Round et al., 1990). The genus is typically found in acidic, poorly buffered waters with low conductivity (e.g. Siver et al., 2003).

During the taxonomic screening of the materials sampled from Trentino springs (CRENODAT Project: Biodiversity assessment, integrity evaluation, and long-term ecological research on the springs of Trentino, Italian Alps), small populations of *Neidium binodiforme* were found, and carefully observed and documented. LM and SEM work on these and further materials, discussion of the morphological features (including plastid arrangement), comparative analysis of the two species (*N. binodiforme* and *N. binodis*) that turned out to share a set of relevant features (between them and with respect to established genera) allowed us to conclude that a new diatom genus based on taxa previously included in *Neidium* should be defined. This new genus is described and characterized in the present paper, deserving attention also to its distribution and habitat and microhabitat preferences.

MATERIALS AND METHODS

During the CRENODAT Project, *N. binodiforme* was found in springs of the Autonomous Province of Trento (south-eastern Alps). For these springs, relevant morphological features (GPS location, altitude, aspect, shading) were assessed, and physical factors (current velocity, discharge, temperature) were measured in the field. Detailed hydrochemical analyses, including not only major ions, but also trace metals, were carried out following standard methodology (APHA 2000).

The main microhabitats were sampled separately. Surface sediment was collected with a large-bore syringe or a spoon, and bryophytes were squeezed, including some entire plants. The field samples were treated with hydrogen peroxide and hydrochloric acid to remove organic material and carbonates, respectively, and cleaned valves were mounted in Naphrax® (Phyco Tech, St. Joseph, MI, USA).

Slides, prepared material, and aliquots of the original samples were deposited in the diatom collection of the Museo Tridentino di Scienze Naturali of Trento (Italy).

Light microscope observations and micrographs were conducted using a Zeiss Axioskop 2 microscope (Zeiss, Jena, Germany) equipped with phase-contrast and with an Axiocam digital camera. SEM observations were made primarily at the University of Frankfurt using a Hitachi S-4500 (Hitachi Ltd., Tokyo, Japan). Further SEM observations were done at the Museo Tridentino di Scienze Naturali using a LEO XVP (Carl Zeiss SMT Ltd., Cambridge, UK) at high vacuum on gold coated prepared material (Agar Sputter Coater B7340, Agar Scientific Ltd., Stansted, Essex, UK).

Further materials studied to describe and compare the morphological features were samples containing *Neidiomorpha binodis*: Hustedt-material that was collected in a lake in Mecklenburg-Vorpommern (Germany): L. Breiter Luzin.

Fresh material from surface sediment and bryophytes sampled on at least two occasions (November 2007, January 2008) was used for observations on plastids.

RESULTS

Neidiomorpha Lange-Bertalot H. & Cantonati M., gen. nov. familiae Neidiacearum—Typus generis: *Neidiomorpha binodiformis* (Krammer) nov. comb. (vide infra). Figures 1-18

Diagnosis generis. Cellulae neidioideae cum duobus chromatophoris (adhuc solum in specie generotypica observatis) in parte anteriore et posteriore cellulae, prope cingulum et unam valvam posita. Duae species adhuc certe cognitae autem probabiliter alterae duae non satis cognitae.

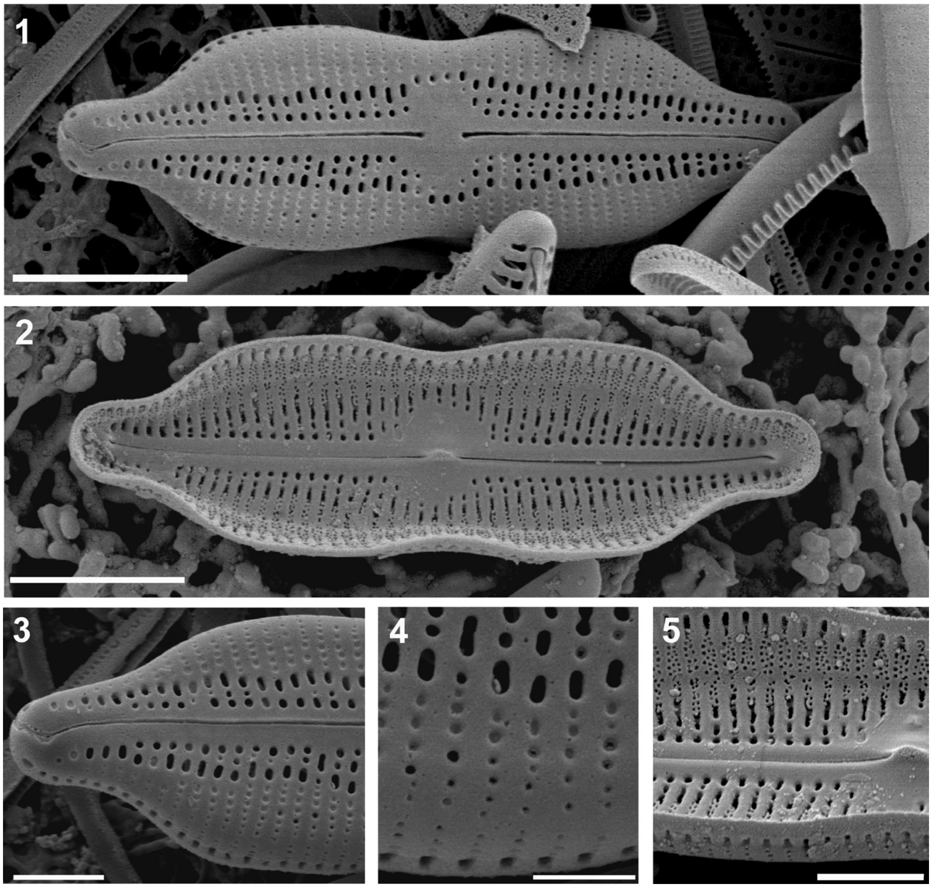
Valvae lineares marginibus plus minusve fortiter constrictis in medio apicibus semper distincte rostratis. Frontes valvarum externe leviter convexae leniter transientes in limbos. Raphe filiformis extremis centralibus paulo curvatis in poros simplices deflexis ad latus primum valvae. Fissurae centrales variabiles—ut paene semper in genere *Neidium*—numquam adsunt. Fissurae terminales raphis simpliciter ad latus secundum in limbum curvatae—ita distincte differentes a genere *Neidium* ubi furcatae apparentes. Id est lacinia triangulata ad apices semper abest. Interne systema raphis cum helictoglossis et nodulo centrali specioso non differt. Foramina areolarum externe omnia aperta et uniseriata. Particulariter 3-4 series apicales prope raphosternum irregulariter sinuolatae sitae. Hic foramina ampliora et plerumque transapicaliter elongata.

Striae transapicales abrupte transientes in seriebus foraminum minorum circularium densius sitorum inter se interruptae ad limbum foraminibus singulis amplis pervalvariter elongatis. Lineae apicales hyalinae super canales longitudinales absunt.

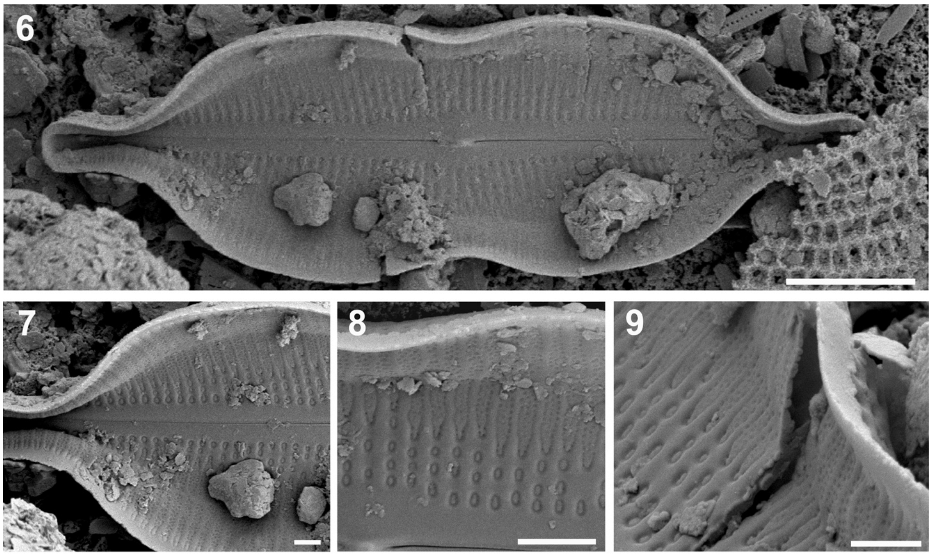
Interne striae transapicales (sub-)marginales usque trans limbos pluriseriatae, hic membrana duplex cum caverna inclusa efficiens.

Cingulum paucis copulis apertis cum poris uniseriatis vel biseriatis constans.

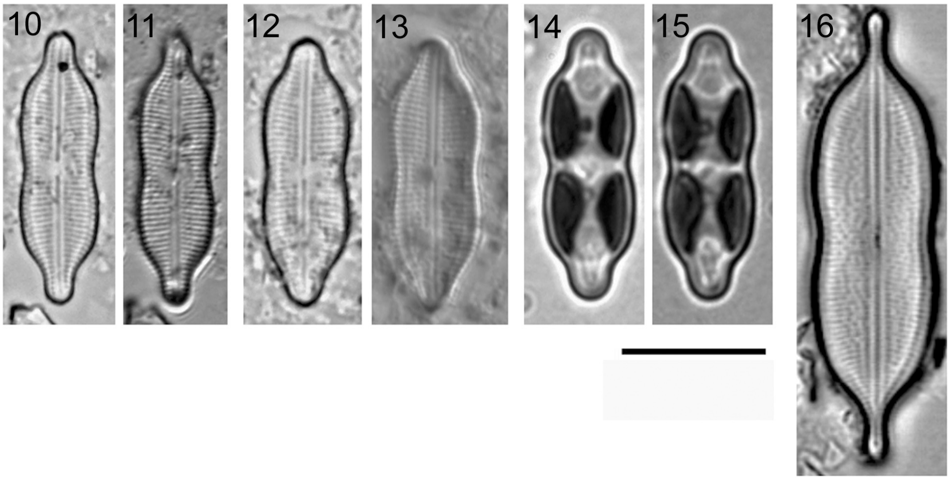
Diagnosis. Naviculoid cells resembling *Neidium* with two plastids (until now observed only in the generitype species), appressed to one valve and to the girdle, arranged fore and aft, one in each half of the cell (Figures 14-15). The two so far precisely known species live in freshwater. Valves are linear with margins strongly con-



Figures 1-5. SEM micrographs of the new diatom genus (*Neidiomorpha binodiformis* nov. comb.). 1, Valve outside view (note external raphe structure and areolation pattern); 2, Inside view of the valve (note internal raphe structure and areolation pattern); 3, Polar part of the valve. Note the terminal raphe fissure, and the uniseriate areolae foramina forming 1-3 larger unoccluded apertures near the sternum becoming abruptly and distinctly smaller towards and onto the valve mantle; 4, Detailed outside view of the junction between valve face (upper part) and mantle (lower part). Note the outmost distal apertures of each stria forming a circumferential series of large areolae on the mantle; 5, Detailed inside view showing the proximal raphe end, the helictoglossa-like silica accumulation in correspondence of the central nodule, and inside pluriseriate areolation pattern over the shallow cave in the mantle that is consistently lacking in *Neidium* sensu stricto. Scale bars: Figures 1-2 = 5 µm, Figures 3, 5 = 2 µm, Figure 4 = 1 µm.



Figures 6-9. SEM micrographs, all inside view, of the new diatom genus (*Neidiomorpha binodis* nov. comb.; Hustedt material). 6, Entire valve (note internal raphe structure and central nodule); 7, Detail of the distal part (note inside areolation pattern); 8, Detail view on valve face and mantle, which appears inflated (note hymenes closing the areolae); 9, Detailed view showing a break in the marginal part of the valve that makes the structure of the shallow cave in the mantle visible. Scale bars: Figures 6 = 5 µm, Figures 7-9 = 1 µm.



Figures 10-16. LM micrographs of *Neidiomorpha binodiformis* (Figures 10-15), and of *N. binodis* (Figure 16). 10, 12, LM bright field; 11, 13, LM oblique lighting; 14-15, LM fresh material (note the two chloroplasts and round structures formed by reserve material). Scale bar, 10 μm.

Table 1 Comparison of key features between *Neidiomorpha* gen. nov. and the most related diatom genera (compare with Figures 17-22).

	Neidiomorpha gen. nov.	*Neidium* sensu stricto	*Neidiopsis*
Cell outline	Naviculoid, valve linear with margins strongly constricted centrally and rostrate ends; valve face slightly domed, curving gently into the mantles (Figure 17)	Naviculoid, valves linear to lanceolate, with blunt or rostrate poles; valve face flat, fairly well differentiated from the deep mantle (Figure 19)	Naviculoid, valves linear, linear-lanceolate, or linear-elliptic with variously protracted, obtusely rounded ends (Figure 21)
Longitudinal structures	The mantle consists of two differentiated layers of silica containing a shallow cave; no longitudinal hyaline areas (Figure 9 and 18; Figure 17)	Distinct canals, with a special apically orientated series of apertures, usually located at the margin of the valve face (rarely close to the median rib); longitudinal hyaline areas over the canals (Figure 20; Figure 19)	Longitudinal hyaline areas (absence of longitudinal canals below the hyaline areas) Figure 21 (Figure 22)
Areolation pattern	Areolae foramina uniseriate forming 1-3 larger unoccluded apertures near the sternum becoming abruptly and distinctly smaller towards and onto the valve mantle (Figures 3, 17). Outmost distal apertures of each stria form a circumferential series of large areolae on the mantle (Figures 3-4). Inside: renilimbi absent (Figure 18)	Striae uniseriate, interrupted by apically running hyaline area over the canal. Series of large areolae on the mantle lacking (Figure 19). Inside: reniform outgrowths on the frets delimiting the areolae (renilimbi, Figure 20) present in many species	Areolae arranged basically in single rows (but double close to the axial area). Rows interrupted by apically running hyaline area at the junction between valve face and mantle (Figure 21). Inside: renilimbi absent (Figure 22)
Raphe-outer polar endings	Deflected as simple terminal fissures onto the mantle; not appearing forked (Figure 17)	The polar raphe endings appear characteristically forked, because of a triangular silica flap (Figure 19 top)	Polar raphe endings form long terminal fissures that run in a simple curve on the valve mantle, and do not appear bifurcate (Figure 21)
Raphe-outer central endings	Small simple central pores, slightly deflected to the primary side (Figure 17)	Almost always curved or deflected in opposite directions (Figure 19)	Straight or both deflected to the same side (Figure 21)
Plastid	2, appressed to one valve and to the girdle, arranged fore and aft, one in each half of the cell (Figures 14-15)	Usually 4, girdle-appressed, disposed symmetrically, one in each quadrant	Not known
Habitat	Circumneutral to alkaline waters, with medium to high TDS content	Primarily distributed in acidic waters, with low TDS content	Water with both low and medium TDS content; habitats affected by desiccation

stricted centrally and distinctly rostrate ends (Figures 10-16). Valve face slightly domed, curving gently into the mantles (Figures 1-4).

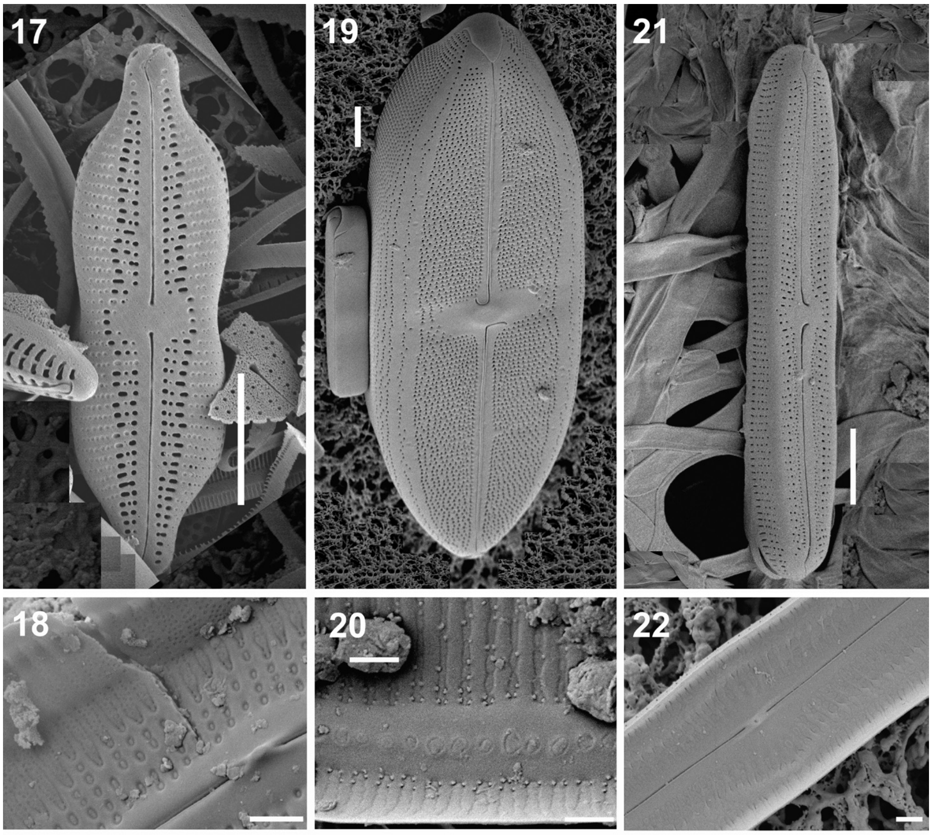
Differentiating features

Valve outside: Distal raphe ends deflected as simple terminal fissures onto the mantle, not forked, or —more precisely— the triangular silica flap (covering and masking the polar area in *Neidium*, Figure 19) is lacking (Figure 1). Also central fissures turning to opposite sides (characteristic of by far most *Neidium* species, Figure 19) are replaced by small simple central pores, slightly deflected to the primary side (Figure 1). Areola foramina uniseriate forming unoccluded 1-3 larger apertures near the sternum becoming abruptly and distinctly smaller towards and onto the valve mantle (Figures 1, 3-4, 17). Of particular note are the outmost distal apertures of each stria on the mantle, together forming a circumferential series of pervalvar-elongated large areolae (Figures 1-5; lacking commonly in *Neidium*, Figures 19-20). A particular pattern of hyaline longitudinal lines above the canals is missing (Figure 1).

Valve inside. Raphe system with a straight raphe slit lying in the sternum with polar helictoglossae and a central compound of helictoglossa-like silica accumulation (Figures 2, 5) as in *Neidium*. Few areolae, commonly 1-4, close to the sternum, uniseriate, but with hymenes in the apertures moderately deeper impressed, not lying flush with the internal valve surface (Figures 6-9 for *N. binodis*; see Krammer & Lange-Bertalot, 1985, Plate 43, especially Figure 4, for *N. binodiformis*). Areolae becoming consistently bi- and finally multiseriate at the junction of valve face and over the mantle (Figures 2, 5, 6-9, 18). No hymenes are discernible there. Longitudinal canals with a special apically-orientated series of apertures is lacking in the valve face, but the mantle consists of two differentiated layers of silica, containing a shallow cave (Figures 9, 18) with presumably the same function as the distinct canal of *Neidium*.

Girdle. The girdle consists of few copulae, and at least the valvocopula is differentiated by a single or double row of pores.

Taxa comparison (see Table 1 and Figures 17-22). Under the light microscope the new genus closely resembles *Neidium* species. However, it differs from it mainly by the absence of distinct canals at the valve margin that are replaced by "shallow caves" between the two silica layers of the mantle (Figure 9), by the simple polar fissures that do not appear bifurcate, and by the simple central pores (instead of central fissures deflected in opposite directions). *Neidiopsis* Lange-Bertalot & Metzeltin differs mainly by the lack of longitudinal



Figures 17-22. SEM micrographs of typical representatives of the three genera recognized within *Neidium* sensu lato, and of their characteristic features (compare with Table 1): 17-18, *Neidiomorpha* gen. nov.; 19-20, *Neidium* sensu stricto; 21-22, *Neidiopsis*. Scale bars: Figures 17, 19, 21 = 5 µm, Figures 18, 20, 22 = 1 µm.

canals and another pattern of areolation including smaller, double areolae lying close to the axial area and the edge between valve face and mantle being non-porous (Figure 21-22). Moreover, both the new genus and *Neidiopsis* lack the renilimbi that appear to be characteristic of typical *Neidium* species (e.g. Siver et al., 2003; Thomas and Kociolek, 2008) (Figure 20). *Neidium* also lacks the circumferential series of pervalvar-elongated large areolae found on the mantle of the proposed genus while it has a single row of fine pores on the advalvar-most margin of the pars exterior.

Etymology. The name of the new genus refers to the fact that—especially under the light microscope—it closely resembles *Neidium*.

Distribution. The two so-far exactly known species of the new genus (*Neidiomorpha binodiformis* and *N. binodis*) are infrequent but widely distributed in the temperate zone from the lowlands to the mountains, with *N. binodiformis* being more common in mountain areas. Moreover, according to Krammer and Lange-Bertalot (1986) there would be an important difference in the preference for the level of total dissolved solids: *N. binodiformis* would be characteristicly found in medium conductivity waters while *N. binodis* would be limited to carbonate, high conductivity, and even salty waters.

Microhabitat. According to Krammer and Lange-Bertalot (1986) *N. binodiformis* is epipelic and epiphytic, and this matches very well the observations done in the CRENODAT springs where this species has been found on bryophytes and on surface sediment.

Associated diatoms. *Achnanthidium minutissimum* (Kützing) Czarnecki, *Amphora pediculus* (Kützing) Grunow, *Cocconeis placentula* var. *euglypta* Ehrenberg, *Amphora inariensis* Krammer, *Caloneis fontinalis* Lange-Bertalot & Reichardt, *Denticula tenuis* Kützing, *Gomphonema angustum* Agardh, *Meridion circulare* (Greville) Agardh, and *Nitzschia hantzschiana* Rabenhorst are common and/or abundant diatoms at the sites where *Neidiomorpha binodiformis* was found (considering all microhabitats investigated). Representatives of the new genus usually occur with comparatively low percentages (with very few specimens found during counts).

Ecology. The CRENODAT springs in which *Neidiomorpha binodiformis* was found are pool springs or small flowing-springs located at low to medium elevations (503-1,440 m a.s.l.). Discharge is low (< 2 L s^{-1}). Current velocity is very reduced (with water in the pool springs almost still), and consequently sediment, debris, and bryophytes are prominent substrates. Water temperatures are low to medium (6-9°C). The lithology is almost always carbonate, and therefore pH values are slightly alkaline (8.1), and conductivity values are medium (230-260 µS cm^{-1}). Silica availability is good (3-7 mg L^{-1}), and also the other algal nutrients are available in sufficient amounts. Several sites are oligotrophic according to total phosphorus values, but a few are not (TP 5-19 µg L^{-1}). The springs where *N. binodiformis* was found frequently show above-average sulphate values (8-30 mg L^{-1}). In one case (VZ1178) this was due to the influence of several geological formations including *Bellerophon* and evaporites. This is probably the reason for the above-average values of several trace elements (Zn = 3220 µg L^{-1}, As = 1.3 µg L^{-1}, V = 1.8 µg L^{-1}, Ni = 0.25 µg L^{-1}) found in this spring. According to Krammer and Lange-Bertalot (1986) *N. binodis* thrives in carbonate aquatic habitats with high conductivity, and even salty waters.

Neidiomorpha binodiformis (Krammer) nov. comb.

Basionym: *Neidium binodiforme* Krammer in Krammer et Lange-Bertalot 1985, Bibliotheca Diatomologica 9, p. 102, Figures 5: 14-15; Figures 43: 1-5.

Neidiomorpha binodis (Ehrenberg) nov. comb.

Basionym: *Navicula binodis* Ehrenberg 1840, Ber. Akad. Wiss. Berlin 1840, p. 212.

Synonym: *Neidium binodis* (Ehrenberg) Hustedt 1945, Arch. Hydrobiol. 40, p. 933, 934.

Another population belonging to *Neidiomorpha* is documented by Levkov et al. (2007; Figures 117: 1-9), based on the SEM pattern of structures. Due to the narrower valves of the larger cell cycle stages it is distinguished from *N. binodis* s. str.

Neidium elongatum (Hustedt) Lange-Bertalot, Metzeltin et Krammer in Lange-Bertalot and Metzeltin 1996, p. 91, Figures 29: 12-15 belongs very likely as well to *Neidiomorpha*, but has not yet been observed in SEM.

DISCUSSION

Neidiomorpha gen. nov. was carefully compared with the more closely-related diatom genera, and could be confirmed to be different (Table 1 and Figures 17-22). It differs from *Neidium* mainly by the characteristics of the raphe endings, areolation pattern (including the absence of renilimbi on the valve inside), and by the structure of the longitudinal canals. *Neidiomorpha* differs from *Neidiopsis* mainly by the presence of the longitudinal caves in the mantle, and absence of longitudinal hyaline areas. It is also likely that plastid number and location and valve outline are good diagnostic characters, but this must be confirmed by means of further observations on a higher number of species, that are or will have to be combined with the new genus, and on species of *Neidiopsis*. Information on plastid number and arrangement in *Neidiomorpha binodis* would be very useful in this respect. According to Mann (1996) the two valve-appressed chloroplasts of *N. binodiformis*, contrasting the four girdle-appressed chloroplasts generally found in *Neidium*, might have evolved by rephasing of chloroplast division relative to cell division. Also further information on the ecology of *Neidiomorpha* taxa could confirm an important difference between the new genus and *Neidium* relative to ecological preferences: *Neidium* is known to be primarily distributed in acidic and poorly buffered waters (e.g. Siver et al., 2003) while the two species so far combined with the new genus thrive in waters with medium to high conductivity. *Neidiopsis* appears to colonize waters with both low and medium total dissolved solid concentrations. According to Antoniades et al. (2008) *Neidiopsis* is currently recognized as limited to harsher environments, being adapted to ephemeral-like living conditions characterized by environmental stressors like desiccation and marked changes in water quality due to evapotranspiration.

There are several longitudinal canal-bearing diatoms (*Biremis*, *Diploneis* Ehrenberg ex Cleve, *Muelleria*, *Neidium*, *Scoliopleura* etc.). Species of *Muelleria* and *Scoliopleura* are known to have four chloroplasts while *Biremis* and *Diploneis* are reported to have two chloroplasts per cell (Edlund and Spaulding, 2006). The external, distal, raphe ends are divergent in the majority of *Muelleria* species (Spaulding et al., 1999), and can closely resemble those of typical *Neidium* species. Canal-like structures that develop at the junction between valve face and mantle are present also in the genus *Luticola* D.G. Mann. According to Round et al. (1990) they are slightly reminiscent of the distinct canals in *Neidium*. For all other morphological characteristics (with the exception of the outermost row of particularly large areolae on the mantle, present in *Neidiomorpha*, but not in *Neidium*), and features, including the presence of one plastid, *Luticola* is very different from the neidioid genera. Bruder and Medlin (2008) in an extensive work on the phylogeny of naviculoid diatoms (91 species analyzed with three molecular markers: SSU rDNA, LSU rDNA, and *rbc*L gene), found that *Luticola goeppertiana* (Bleisch) D.G. Mann and *Neidium affine* (Ehrenberg) Pfizer formed a clade in the tree based on the combination of the three alignments. In spite of the fact that this clade was supported by bootstrap values of 99 and 97, the cited authors concluded that this sister relationship was most likely to be an artifact of the tree, since both species were on long branches.

Neidium is a moderately large and only slightly heterogeneous freshwater diatom genus. Relatively small groups of species, in part already identified in the past as exceptions within the genus due to some important features (e.g. valve outline, longitudinal structures, but also plastid number and arrangement) are turning out to have more properly to be considered separate new genera following careful comparative morphological analyses (*Neidiopsis* Lange-Bertalot et Metzeltin in Lange-Bertalot and Genkal 1999; *Neidiomorpha*, the present paper).

Even if they are almost never abundant in terms of numbers of individuals the two species of *Neidiomorpha* known to date appear to be widely distributed in the temperate zones. *N. binodis*, however, seems to be much less frequent than *N. binodiformis*. In the freshwaters of Siberia, for instance, the latter is a common species while *N. binodis* has not been found (Metzeltin personal com.). This might be explained by the preference of *N. binodiformis* for medium-conductivity waters, and of *N. binodis* for carbonate, high-conductivity and even salty waters (Krammer and Lange-Bertalot, 1996). Indeed, these latter aquatic habitats are by far less widespread than the former ones.

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Neidiomorpha gen. nov.：一種從矽藻門長篦藻屬分出之淡水矽藻新屬

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Neidium Pfitzer 為已被確定的矽藻屬，由該屬諸多物種的形態 (含質體) 及微細構造（含硅藻殼）之比較分析發現 *N. binodiforme* Krammer 及 *N. binodis* (Ehrenberg) Hustedt 是個例外。此兩種應該移至另一個淡水底棲矽藻新屬 *Neidiomorpha* gen. nov.。這一新建議屬和已被確定之 *Neidium* 屬之主要差別，在於其縱向構造（外殼為淺洞而非在殼面和外殼交界處為溝狀構造）、殼上空洞的形狀、溝端部份（因缺矽質而下垂蓋呈分叉狀，且缺折向對面方向之中心端）、葉綠體數目及排列（具有兩個貼近殼及溝環之葉綠體，係位於細胞兩半部之前和後部）、殼形外觀、及生態（偏好中到高導電度之淡水）等，它們很可能屬於親緣度較遠的二種。本文提供此二物種之分佈，棲地及物種分佈學的偏好等之觀察結果及描述所歸併之新屬。

關鍵詞：矽藻門；矽藻；縱向構造；*Neidiomorpha* gen. nov.；*Neidiomorpha binodiforme*；*Neidiomorpha binodis*；微細構造。