

Nanoneis, a Newly Recorded Diatom Genus from China and *Nanoneis longta* sp. nov.

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Abstract: *Nanoneis* was identified as a newly recorded diatom genus for China under transmission electron microscope (TEM) in the water samples from the East China Sea and Huanghai Sea (Yellow Sea). The valves of this diatom are bilaterally symmetrical and have a raphe extending through the middle of the valve from one pole to near the center. The raphe of the opposite valve on the same cell extends from the other pole to near the center. The alveoli or ribs of the valve face continue around the valve mantle. Two species were described in this paper, including *Nanoneis longta* sp. nov. as a new species and *Nanoneis hasleae* as a new recorded species for China. They have some distinctly different characteristics in the shape of valve surface, the ratio of length to width and the density of alveoli or ribs on valve face. Detailed description of the taxonomic characteristics with TEM photographs of these two species and their ecological distributions were given in this paper. *N. longta* sp. nov.: cells are narrowly linear in valve view and bilaterally symmetrical with convexity being present in the apices and in the middle of the valve. Cell length 10-12 μm , width 1.0-1.5 μm . The ratio of length to width is about 10:1. Valve structure consisting of thickened ribs perpendicular to the apical axis alternating with thin areas, alveoli, in the greater length of the valve. Ribs and alveoli radically arranged in apical parts of valves. The density of the transapical ribs is approximately 60 in 10 μm . A simple raphe located in the middle of valve, extending from one pole to a point near to the median part of the valve. The opposite valve on the same cell with the raphe extended from the opposite pole to near the center. The specimens were collected from a 20-m layer at latitude 29° 6' 31'' N, longitude 126° 57' 72'' E, in Nov., 2000.

Key words: East China Sea; Huanghai Sea; nanodiatom; *Nanoneis*; *Nanoneis longta* sp. nov.

Marine nanodiatoms have been either frequently underestimated or overlooked in phytoplankton investigations due to their small size (usually 2-20 μm), which will mostly pass through a regular phytoplankton net of 60-70 μm pore size. But, it has been validated that nanodiatom is an important primary producer in marine waters and makes a great contribution to diatom biomass and species diversity, especially in coastal waters (Hallegraeff, 1981; 1984; Gao *et al.*, 1992; Cheng and Gao, 1993; Cheng *et al.*, 1993). This conclusion has been embodied in several studies concerning nanodiatom taxonomy from coastal waters of China such as Xiamen Harbour (Gao and Cheng, 1992; Cheng and Gao, 1993), coastal waters of Fujian Province (Cheng *et al.*, 1993; Liu *et al.*, 1994), Jiaozhou Bay (Gao and Jiao, 1995; Jiao and Gao, 1995), the north area of South China Sea (Guo *et al.*, 1999a; 1999b) and Hong Kong waters (Gao *et al.*, 2003).

With the meaning of a very small valve surface and boat-like shape, the genus *Nanoneis* was erected by Norris in

1973 which was emended from genus *Anisosiraphe* (Norris, 1972; 1973). The special characteristics of this genus are the extraordinary raphe extending from one pole to near the center and the raphe of the opposite valve on the same cell extending from the opposite pole to near the center. The first species of genus *Nanoneis* was denominated as *N. hasleae* named after Hasle G. R. for her extensive contribution to our understanding of pennate diatoms in oceanic plankton (Norris, 1973). Publications about *Nanoneis*, which has been a monospecific genus, including *N. hasleae* are few.

In a preliminary investigation of nanodiatom species in the East China Sea and Huanghai Sea (Yellow Sea), the diatom genus *Nanoneis* was observed as a newly recorded genus for China and *N. longta* was found as a new species. Detailed description of the taxonomic characteristics with TEM photographs of the genus *Nanoneis* and its two species, i.e. *N. hasleae*, *N. longta* and their ecological characteristics and distribution were made in this paper.

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1 Materials and Methods

One or two litres of water samples were collected from each sampling station in the East China Sea and Huanghai Sea during the cruises carried out from Oct. and Nov., 2000 and Mar. and Apr., 2001. All water samples were fixed with Lugo's solution *in situ* and brought back to the laboratory. Samples were concentrated, acidized and rinsed with distilled water to neutrality before being observed and photographed on carbon-coated copper under the JEM-100CX transmission electron microscope (Cheng *et al.*, 1993).

2 Results and Discussion

Nanoneis has been a monospecific genus previously only including *N. hasleae*. In this paper, two species were described, including *N. longta* sp. nov. as a new species and *N. hasleae* as a new recorded species for China.

Nanoneis R. E. Norris

Nanoneis Norris 1973, Figs. 1-6; Hasle and Syvertsen 1997, p. 271, pl. 60.

Synonymy: *Anisosiraphe* Norris 1972, nom. nud. Figs. 1-4.

Cells broadly elliptical to linear, valve surfaces slightly convex to flat or concave, with the concavity present between the apices and the middle part of the valve (Hasle and Syvertsen, 1997). Valves symmetrical about apical axis. Special raphe in the middle of the valve extending from one pole to near the center and raphe of opposite valve on the same cell extending from the opposite pole to near the center. Alveoli or ribs present on the valve surfaces except the axial area (Norris, 1973).

Cells occurring in irregular chains with a short overlap of cell ends, connected to another so that the raphe on one valve touches the pseudo-raphe on the valve of the adjacent cell (Norris, 1973; Hasle and Syvertsen, 1997).

The species of *Nanoneis* are warm in behaviour and are mostly distributed in subtropical and tropical open oceanic waters.

Nanoneis hasleae R. E. Norris (Pl. 1, Fig. 1)

R. E. Norris 1973, p. 321-325, Figs. 1-6; Hasle and Syvertsen 1997, p. 270-271, pl. 60.

Synonymy: *Anisosiraphe hasleae* Norris 1972, nom. nud. Figs. 1-4.

Cells broadly elliptical to fat-shortly linear in valve view. Cell length 5-7 μm , width 1.0-1.5 μm . The ratio of length to width is about 4:1. The concavity presents between the broadly rounded apices and the middle part of the valve. Alveoli or ribs rank on the valve surface except the axial area, arranged in apical parts radially and perpendicularly

to apical axis in the greater length of valves. There are 40-50 transapical ribs in 10 μm .

A simple raphe extending from one pole to a point near to the median part of the valve. Opposite valve with the raphe extending from the opposite pole (Norris, 1973).

Cells were connected with each other in irregular chains by a short overlap of valve ends (Norris, 1973). But, we have not seen the colony.

N. hasleae is a warm species. The first specimen observed by Norris was collected from the Indian Ocean in 1967. Dr. Hasle found several frustules similar to *N. hasleae* at latitude 30° 55' 7" S, Longitude 30° 20' 5" E (near Durban, South Africa), on Aug. 26, 1958 and in a collection of plankton made near La Jolla, California, on Aug. 22, 1967 (Norris, 1973). Our specimens were collected from a 20-m layer at latitude 29° 6' 31" N, longitude 126° 57' 72" E, in Nov., 2000.

Nanoneis longta Li et Gao sp. nov.

(Pl. 1, Figs. 2-6)

Cellulae valvae visae longae lineares. Facies exterioris paullulum convexae in apices et medias valvae praesens. Raphe in parte valvae media ex polo uno ad centrum extendens, raphe valvae opposita a polo opposito fere ad centrum extendens. Alveolae praesentes in valvas, parallelae dispositae pro partibus majoribus valvarum et radiatae dispositae in polas.

Longitudo cellulae 10-12 μm . Latitudo 1.0-1.5 μm , admodum 60 costae transapicales in 10 μm .

Habitat in mare East China Sea

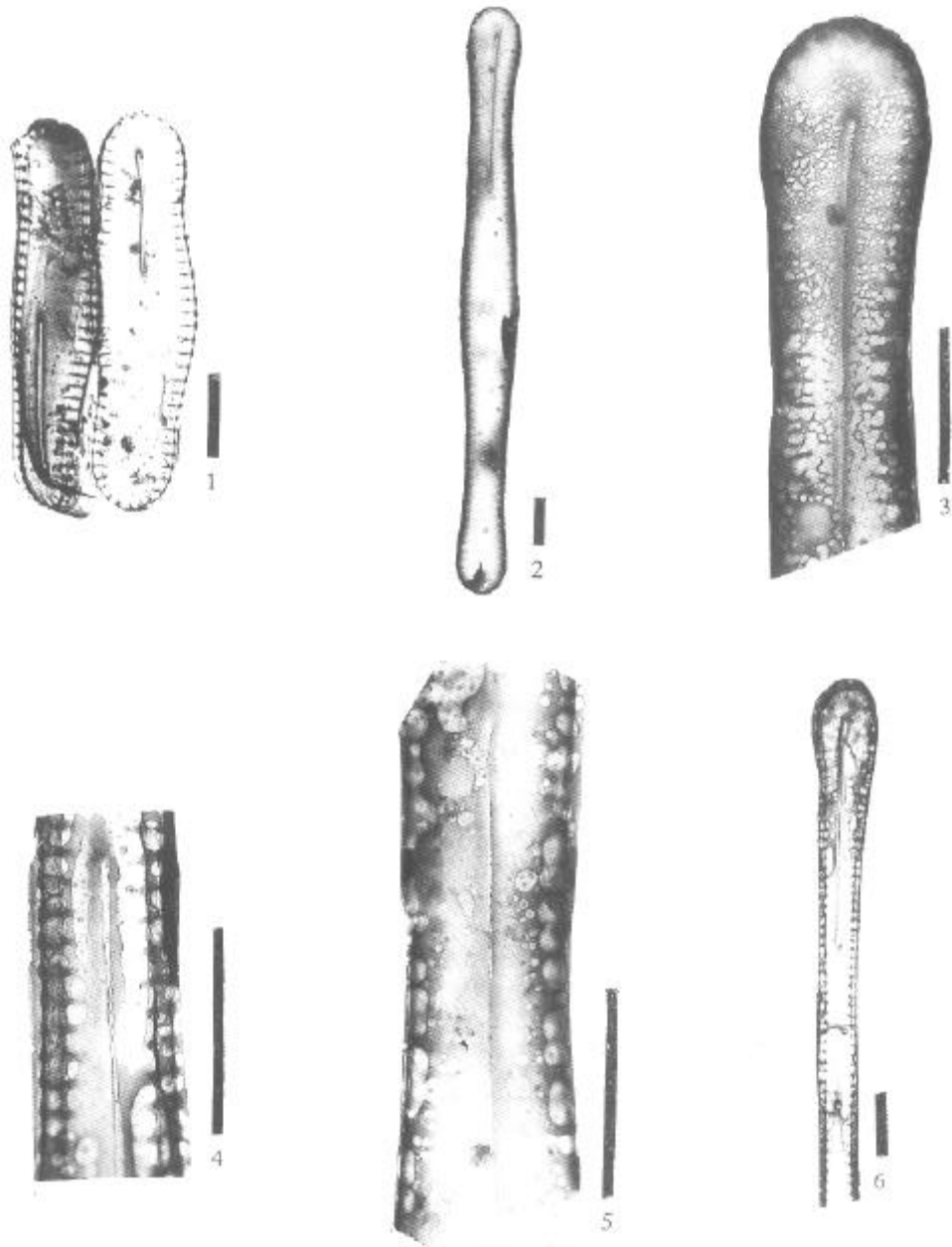
Typus: 0011G10L20, Facultas Biologica Universitatis Xiamensis

Cells are narrowly linear in valve view and bilaterally symmetrical with convexity presenting the apices and the middle of the valve. Cell length 10-12 μm , width 1.0-1.5 μm . The ratio of length to width is about 10:1. Valve structure consisting of thickened ribs perpendicular to apical axis alternating with thin areas, alveoli, in the greater length of the valve. Ribs and alveoli radically arranged in apical parts of valves. The density of transapical ribs is approximately 60 in 10 μm . A simple raphe located in the middle of valve, extending from one pole to a point near to the median part of the valve. The opposite valve on the same cell with the raphe extending from the opposite pole.

The specimens were collected at the same location and time as *N. hasleae*, 20 m layer at Latitude 29° 6' 31" N, longitude 126° 57' 72" E, in Nov., 2000.

Type specimens: 0011G10L20, School of Life Sciences, Xiamen University.

Norris (1973) regarded that the longer specimens, with one valve elliptical and the other linear and longer, be the



Figs.1-6. 1. *Nanoneis hasleae*. 2-6. *Nanoneis longta*. 2. Whole valve. 3, 5. Detail of raphe. 4. Detail of raphe and alveoli or ribs. 6. Fragmentary valve (Scale bar = 1 μm).

same species with *N. hasleae*. But, we do not think so, as our specimens identified as *N. longta* have distinctive characteristics from *N. hasleae* (Table 1).

Table 1 The difference between *Nanoneis hasleae* and *N. longta*

	Length (μm)	Width (μm)	Density of ribs (in 10 μm)	Length/ Width
<i>N. hasleae</i>	5-7	1-1.5	40-50	4:1
<i>N. longta</i>	10-12	1-1.5	60	10:1

Firstly, the valve view of the two species are distinctly different. *N. hasleae* has elliptical valve surface with the ratio of length to width about 4:1 and the ratio of length of raphe to length of valve about 3:10. They were 10:1 and 1:4 in the narrowly linear valve surface of *N. longta* respectively. Therefore, the valve surface of *N. longta* is longer in apical axis than that of *N. hasleae*. Secondly, the density of ribs on the valve surface of *N. longta* is about 60 in 10 μm , which is higher than 40-50 of *N. hasleae*. Due to those two reasons, we suggest that the longer specimens should be ranked as a new species *N. longta*, which was

named according to its typical feature of longer valve length than *N. hasleae*.

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我国硅藻类的新记录属——微舟藻属及其一新种

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摘要: 利用透射电镜对采自东黄海海域典型站位的微型硅藻(nanodiatom, <20 μm)进行了研究。观察到我国微型硅藻类的一个新记录属: 微舟藻属Nanoneis R.E.Norris以及该属的一个新种: 长微舟藻Nanoneis longta sp. nov.。该属的主要特征是: 壳面两侧对称, 具有不完全壳缝, 壳面除中轴区外都有横肋纹或长室孔分布。本文描述该属的两个种, 其中海斯微舟藻(Nanoneis hasleae R. E. Norris)为我国的新记录种, 长微舟藻为新种, 两种之间主要的区别特征是壳面外形、长宽比例以及壳面横肋纹的密度。并较详细地描述了该属种类的分类特征、生态习性和分布。

关键词: 东海; 黄海; 微型硅藻; 微舟藻属; 长微舟藻

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