
**BIOLOGY, MORPHOLOGY, AND SYSTEMATICS
OF HYDROBIONTS**

**On the Morphology and Taxonomy
of *Parlibellus crucicula* (Bacillariophyta)**

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Abstract—A study of the phytoplankton of the water bodies and watercourses in the Yarayakha River and Naduyakha River basins (the Yamal Peninsula) has revealed a wide morphological variability of the quantitative diagnostic features in *Parlibellus crucicula*: valve length and width, the number of striae and areolae in 10 μm, and the stria density in the middle part of the valve. A number of the features (raphe structure, presence of pseudosepta, and obliquely oriented oval areolae) typical for the genus *Prestauroneis* have been found in *Parlibellus crucicula*. This makes it possible to define this species as belonging to the genus *Prestauroneis* and to form a new combination, *Prestauroneis crucicula* (W. Smith) Genkal et Yarushina comb. nov.

Keywords: Yamal Peninsula, diatom, morphology, *Parlibellus crucicula*, *Prestauroneis crucicula* comb. nov

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INTRODUCTION

The genus *Parlibellus* is described by E.J. Cox, and mainly marine littoral species of the genus *Navicula* were transferred to this genus [5]. According to the genus diagnosis, its representatives are characterized by the presence of a straight raphe, which does not reach the end of the valve, by a thickened suture rib (costa) at the inner surface of the valve, and by the absence of septae [5]. The species *Parlibellus crucicula* (W. Smith) Witkowski, Lange-Bertalot and Metzeltin (= *Navicula crucicula* (W. Smith) Donkin) refers to a large-size widespread species [3, 8] living in fresh and brackish waters [3, 11]. According to the up-to-date literature [11], the length of the valve varies from 35 to 100 μm, the valve width from 8 to 23 μm, and the number of striae in 10-μm lag from 14 to 18. In the published literature [3, 7–11], only drawings or pictures taken under a light microscope are given for this species. The data on the morphology of this species performed using scanning electron microscopy (SEM) are not available, although they are important for clarifying the systematic position of *P. crucicula* and its possible transfer to the genus *Prestauroneis* [8].

The study aims to describe the morphological features of the *P. crucicula* valve using scanning electron microscopy, to revise the variability of quantitative diagnostic features, and to clarify the systematic position of the species.

MATERIALS AND METHODS

The phytoplankton has been sampled in water bodies and watercourses of the basins of the Yarayakha River (Nizhnii saltmarsh, 69°16'57.00" N, 68°5'28.95" E; the stream flowing into the Nyaavtarka River between the saltmarshes, 69°17'23.9" N, 68°05'19.5" E; and the channel of the Khureikhotarka River, 69°17'0.22" N, 68°9'57.46" E) and the Naduyakha River (the nameless lake at the flood plain of the lower river of the Yunetayakha River, 70°27'21.4" N, 68°18'15.4" E) in the Yamal Peninsula.

Valves of diatoms were cleaned from organic matter by the method of cold combustion [1]. The prepared slides were examined by a JSM-25S scanning electron microscope at the Center of Collective Use of the Papanin Institute of Biology of Inland Waters, Russian Academy of Sciences.

RESULTS

The valves are an elliptical oval—lanceolate shape, the valve length varies from 31 to 100 μm, and the valve width from 10 to 24.4 μm (Figs. 1, 2a–2d). The valve ends are slightly beak-shaped, obtuse (Figs. 1, 2a–2g). The striae are single-row, radial, slightly convergent at the ends, more rarely located in the middle of the valve (10–16 in 10 microns), and sometimes there are shortened striae (Figs. 1f, 2a–2c), or they are absent (Figs. 1b, 2d); at the valve end, there are from 12 to 24 striae in 10 μm. The number of areolae in the stria

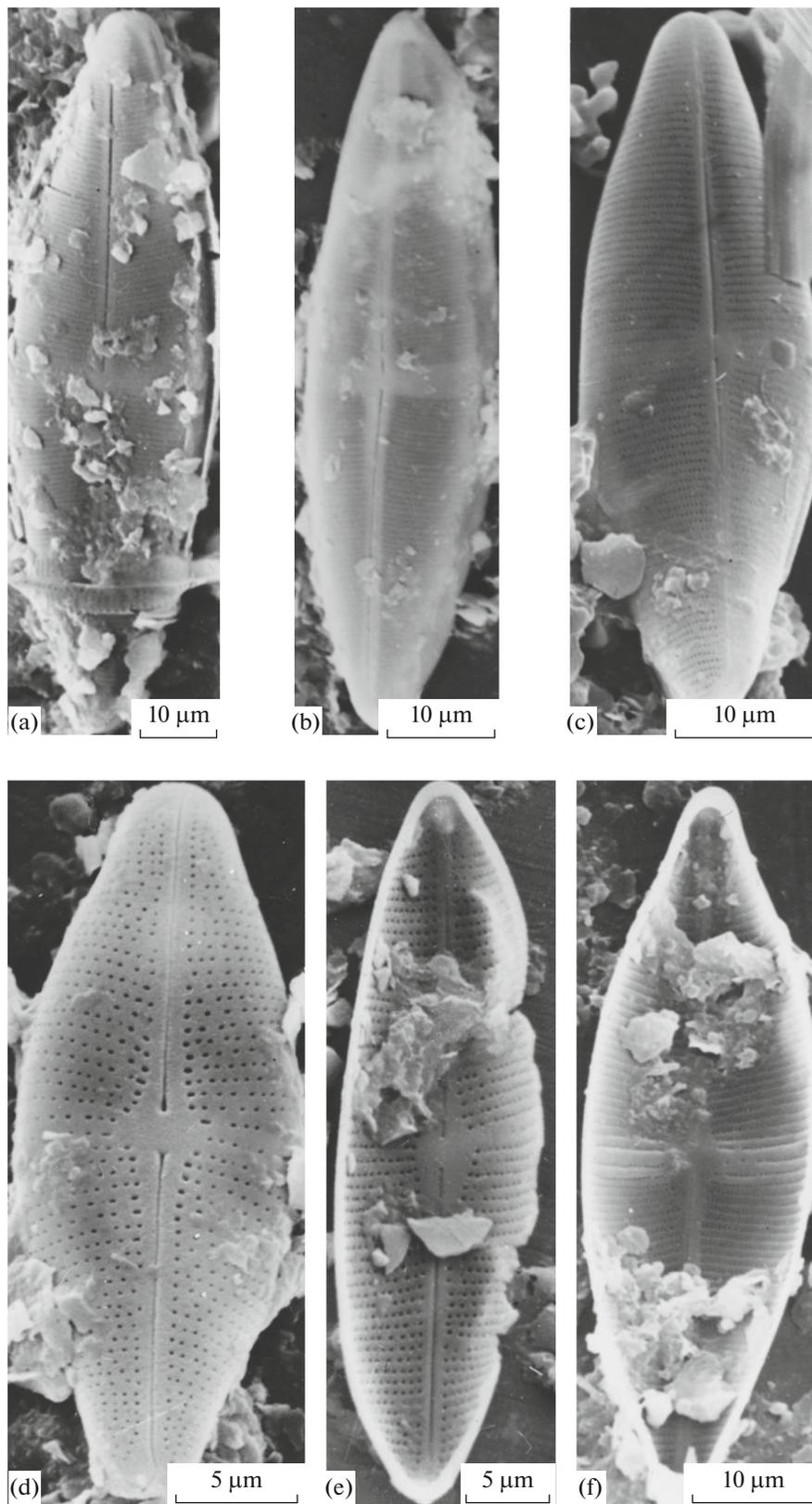


Fig. 1. Electron microphotographs of the valves of *Prestauroneis crucicula* (SEM): (a–d) outer surface of the valves; (e, f) the inner surface.

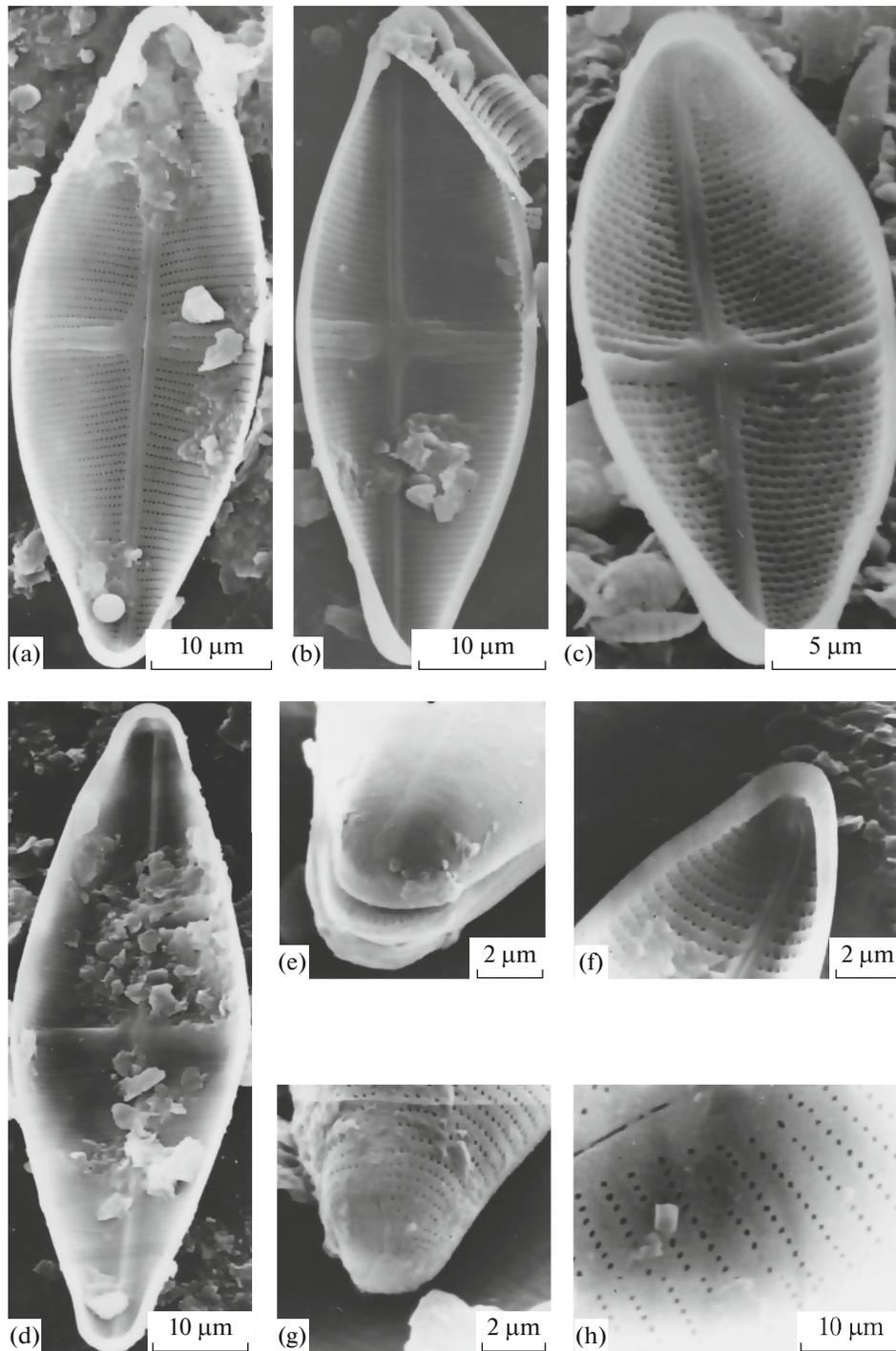


Fig. 2. Electron microphotographs of the valves of *Prestauroneis crucicula* (SEM): (a–d) the inner surface of the valves, (f) the inner surface of the valve end, (h) the middle of the valve, the outer surface, and (e, g) the outer surface of the valve end.

varies from 20 to 35 in 10 μm ; from the outer surface of the areola, they are obliquely oriented, oval, and sometimes round (Figs. 1d, 2g, 2h); the inner areolae are round (Figs. 2c, 2f). On the outer surface of the valve, the axial field is narrow and the middle area is slightly widened; the raphe is filiform, its distal ends

are bent in one direction and reach almost to the edge of the valve; the proximal ends are simple, sometimes slightly enlarged (Figs. 1a–1d, 2e, 2g). The raphe is straight on the inner surface of the valve, it is located in the sternum, the distal ends are with small helictoglossae, and the proximal ends are simple (Figs. 1e, 1f,

Table 1. Variability of the quantitative features of *Parlibellus crucicula*

Valve length, μm	Valve width, μm	Number of striae in 10 μm	Reference
38–70	12–19	16–19 (13–14 in the middle)	[3]**
45–70(92)	(10)14–19(23)	9–10 in the middle 16–19 at the ends	[8]
(20?)35–100	8–23	14–18	[7]**
35–100	8–23	14–18	[11]
36–70*	12.6–17.3*	13–16 in the middle of the valve* 20–22 at the ends of the valve*	[6]

* According to the measurements performed at microphotographs.

** Referred as *Navicula crucicula*.

2a–2d, 2f). The pseudoseptae are at the ends of the valve (Figs. 1e, 1f, 2a–2d, 2f).

DISCUSSION

According to our material, the minimal valve length differs from that provided in literature to the lower side, and the maximal valve width changes to the higher side (Table 1). The number of striae in 10 μm in the middle of the valve is similar to that provided in literature, but at the ends of the valve it varies over a wider range (Table 1). For the first time an area free from the striae was observed in the middle of the valve; this area was widened across the longitudinal valve axis (Figs. 1b, 2d). In the literature, there were also no data on the number of areolae in 10 μm of the stria, and the values obtained by the authors are close to those for large species of the genus *Navicula* [2]. A number of researchers [8] believed that *Parlibellus crucicula* should be transferred to the genus *Prestauroneis* Bruder et Medlin, but to do this it was necessary to study the elements of the valve ultrastructure; however, these data were absent. In the genus *Parlibellus*, the areolae seen from the outer surface are usually of a circular shape, sometimes transversely elongated [5]. In our material, the areolae in the striae are usually oval and obliquely oriented (Fig. 2h), which is characteristic of representatives of the genus *Prestauroneis* [4].

In the examined material, small pseudoseptae are present at the ends at the inner surface of the valve; at the outer surface, the distal ends of the raphe extend almost to the edge of the valve (Figs. 2e, 2g), which is also characteristic of the genus *Prestauroneis* [4, 8]. The authors confirmed the hypothesis of a number of researchers on the need to transfer *Parlibellus crucicula* to another genus. Here is a new combination.

Prestauroneis crucicula (W. Smith) Genkal et Yarushina comb. nov.

Basionym: *Stauroneis crucicula* W. Smith 1853, Syn. Brit. Diat. vol. 1, p. 60, Fig. 19: 192.

Synonym: *Navicula crucicula* (W. Smith) Donkin, *Parlibellus crucicula* (W. Smith) Witkowski, Lange-Bertalot et Metzeltin.

CONCLUSIONS

P. crucicula has a wide variability of quantitative morphological features (the length and the width of the valve, the number of striae and areolae in 10 μm , and the frequency of the arrangement of striae in the middle part of the valve), which must be taken into account when carrying out algological and hydrobiological studies. The presence of a number of the features (raphe structure, the presence of pseudoseptae, and obliquely oriented oval areolae) in *P. crucicula* made it possible to transfer this species to the genus *Prestauroneis*.

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