Seminavis atlantica Garcia, a new psammic diatom (Bacillariophyceae) from southern Brazilian sandy beaches

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(With 18 figures)

Abstract

The paper presents the description of Seminavis atlantica Garcia, a psammic marine diatom from dissipative sandy beaches from southern Brazil. It is characterized by its convex linear dorsal margin (37 to 50% of its length is in a straight line), linear ventral margin and raphe located very close to the ventral margin. Its morphology is compared to similar species such as Amphora clevei Grunow, Amphora angusta (Greg.) Cleve var. orientalis Allem, Amphora ventricosa Gregory and Amphora eulesteinii Grunow.

Keywords: benthic diatoms, Brazil, marine sandy beaches, new taxa, taxonomy.

1. Introduction

The genus Seminavis D.G. Mann was described in Round et al. (1990) and included in Naviculaceae because of the internal raphe fissure that opens laterally, its two plate-like plastids lying along each side of the girdle, and the presence of developed transapical ribs located internally on the valve face.

In LM microscopy, the features used to identify species of Seminavis are: the outline of the ventral margins, the shape of the apices, the length of striae on the dorsal valve face, the presence or absence of striation interruption on the ventral valve face, the shape and position of the raphe in relation to the ventral margin.

Seminavis has been revised and several new species have been described recently by Danielidis and Mann (2002 and 2003): S. basilica Danielidis, S. heidenii D.G. Mann, S. strigosa (Hustedt) Danielidis and Economou-Amilli, S.obustiascula (Grunow) Danielidis and D.G. Mann, S. latior (A. Schmidt) Danielidis and D.G. Mann, S. cymbelloides (Grunow) D.G. Mann, S. ventricosa (Gregory) Garcia-Baptista, S. arranensis Danielidis and D.G. Mann, S. robusta Danielidis and D.G. Mann, S. macilenta (Gregory) Danielidis and D.G. Mann, and S. gracilentex (Grunow ex Schmidt) D.G. Mann. Two species, S. basilica and S. strigosa are commonly found on macroalgae and S. ventricosa, S. macilenta and S. obtiusiuscula were described for sublittoral sediments.

Garcia-Baptista (1993) studied sand samples from a dissipative marine sandy beach in southern Brazil and found a species that was identified following Hustedt (1955), and Foged (1975) Amphora ventricosa Gregory. After examining some specimens in SEM A. ventricosa was combined into Seminavis and named Seminavis ventricosa (Gregory) Garcia-Baptista mainly because of the presence of internal prominent transapical ribs between the striae and the internally twisted raphe system. Danielidis and Mann (2002) have redefined and...
emended the description of *S. ventricosa* (Gregory) Garcia-Baptista. Studying the type material, they proved *Amphora ventricosa* belongs to *Seminavis* but the type of *Amphora ventricosa* has a morphology distinct from the Brazilian specimens. In conclusion, the Brazilian species studied by Garcia-Baptista (1993) was not correctly identified. Therefore, the description of a new species is proposed.

### 2. Materials and Methods

Praia Azul (municipality of Arroio do Sal) is located on the coast in the northern part of Rio Grande do Sul State (29° 29' S and 49° 49' W). The sediment is very well sorted, sub-round to round, very fine quartz (2.52 to 2.62 φ). The shore is subject to microtides which have an amplitude of up to 2 m. Samples were collected monthly from April 1990 to April 1991. Sand from the first centimetre was collected with a 3.7 cm diameter PVC tube and fixed with a 0.3% Lugol solution. Fixed material was stored in the Herbarium (ICN) of the Department of Botany, Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil, under the numbers 91001 to 91189. Sand samples were cleaned following the Simonsen (1974) technique. Aliquots were dried on cover slips and mounted in Hyrax for permanent slides. Slides were examined with a Zeiss Axioplan light microscope with phase contrast and the specimens were photographed on Ilford Pan F 50. The diatoms drawings were made with the aid of a camera lucida attached to a Zeiss Standard 044 Br microscope. For scanning electron microscopy (SEM), cleaned frustules were dried on a stub coated with gold at 1 kV for 4 minutes, and examined with Jeol JSM6060 at an accelerating voltage of 20 kV. Terminology follows Round et al. (1990) and Barber and Haworth (1981).

### 3. Results

#### 3.1. *Seminavis atlantica* Garcia sp. nov. (Figures 1-18)

*Holotypus*: ICN 91079 Praia Azul, Rio Grande do Sul, Brazil  
*Isotypus*: ICN 91014 Praia Azul, Rio Grande do Sul, Brazil  
*Locus typicus*: Praia Azul, Rio Grande do Sul, Brazil

#### 3.2. Studied material

**BRAZIL, Rio Grande do Sul, Praia Azul**: April 1990 (ICN 91013, 91014, 9106, 91019)  
October 1990 (ICN 91079)  
February 1991 (ICN 91144)

#### 3.3. Diagnosis

Frustulum apicibus rotundatis. Valva margine dorsali lineari-convexa et margine ventrali recta, 64.5-100 µm, 7-12 µm longa, 7-12 µm lata. Area axialis multo angusta in facie dorsali valvae. Raphe multo proxima marginis ventralis. Striae dorsales et ventrales parallelae, 11-14 per 10 µm. Striae centrales e facie dorsali valvae leviter reductae in longitudine. Taeniae apertae.

The frustule is linear with round apices (Figures 1-6). The valve is 64.5-100 µm long and 7-12 µm wide with a convex-linear dorsal margin (37 to 50% of its length is in straight line). The ventral margin is straight, and the apices are cuneate produced (Figures 1, 2, 4, and 5). The axial area is almost invisible at LM on the ventral side and is present on the dorsal side (Figures 1, 2, 4, and 5). The raphe is located very close to the ventral margin (Figures 7-11). Externally, the raphe is straight. The central endings are slightly expanded and deflected towards the ventral side (Figures 8, 9). The distal ends are hooked towards the dorsal side (Figures 12, 13). Internally, the

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**Figures 1-6.** 1-2) General valve views; LM drawings; 3) Girdle view; LM drawings; 4-5) General valve views; phase contrast photographs; and 6) Girdle view; phase contrast photograph. Scale: 10 µm.
Seminavis atlantica

raphe runs on a rib, which is turned over towards the dorsal side and twists into the vertical position at the center and poles (Figures 11, 14, 15). At the center, the proximal raphe endings are on a small nodule (Figures 16, 17) and the distal ones end in helictoglossa (Figures 14, 15). A single row of simple pores is present at both valve apices (Figures 14, 17). The dorsal and ventral striae are parallels 11-14 in 10 µm. They are slightly reduced in length at the center on the dorsal side, and composed of elongated areolae (Figures 12, 18). At the central nodule on the ventral side the striae are absent (Figures 9, 10, 17). The ventral mantle is essentially absent; the dorsal mantle is deep and has no clear boundary with the valve face. The girdle is composed of plain open bands. The valvocopula is wider then other bands (Figures 8, 13).

Seminavis atlantica occurs sporadically in the samples. It occurs in the middle of the beach more often than in the swash zone. The maximum number of frustules counted in October 1990 was of 1,400 frustules/cm³ in a sample collected 30 m from the dune line and 30 m from the swash zone. In this sample the environmental parameters were: pH: 6.5; electric conductivity: 878; Na: 617 ppm; NH₄⁺: 2 ppm, and P: 5 ppm. The range in environmental parameters of 6 samples where: pH: 6.5-7.0; electric conductivity: 27.1-2660; Na: 617 ppm; NH₄⁺: 2 ppm, and P: 5 ppm.

4. Discussion

Remarks on similar species to Seminavis atlantica (A. clevei, A. eulensteinii, A. angusta var. orientalis and S. ventricosa) are as follows.


A detailed examination of Schmidt’s (1885) drawings of Amphora clevei reveals some similarities with S. atlantica as the somewhat linear in outline frustule, the semi-lanceolate hyaline area, and the shorter striae at the centre on the dorsal valve face. However, they differ by the slightly biarcuated ventral margin and the capitate apices, characteristics which are totally absent in S. atlantica. Foged (1984) published a micrograph of A. clevei measuring 87 µm in length, 12 µm in width, and with 11 striae in 10 µm that differs from the drawings of Schmidt (1885) with regard to the central striae interruption on the ventral side, the dorsal striae of equal length on the valve face and the presence of rostrated apices.

4.2. Amphora angusta (Greg.) Cleve var. orientalis Allem, Meddelanden från Göteborgs Botaniska Trädgård, 18: 322, Figure 2E, 1950.

The main distinguishing features between this species and S. atlantica are the more centrally located raphe on the valve face, the continuity of the ventral striae at the centre, and the slightly curved dorsal striae. The dimensions are 35 to 65 µm long, 2 to 9 µm wide, and 22 striae in 10 µm in both valve faces. These features are very distinct from S. atlantica. Amphora angusta var. orientalis is an epiphytic species on macroalgae according to Allem (1950).


The most similar figures illustrated in the literature with our specimens are the ones presented by Foged (1975) from Tanzania. Especially Figures 7, 8, and 9 in the Plate 26 resemble S. atlantica. They differ in the wider axial dorsal area and the rhombic dorsal margin (Figures 8 and 9).

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Figures 7-18. SEM. 7) External general view showing the valve face and valvocopula; 8) Another external view of a valve with valvocopula; 9) Detail of external central raphe end reflected towards the ventral side (arrowed); 10) Internal general view; 11) Detail of figure 10 showing the raphe running on a rib; 12) Detail of figure 7, showing a distal raphe end and showing in detail the elongated areolae. Note the raphe distal ends turned to dorsal side (arrowed); 13) Apex of a valve showing the external distal raphe end; 14) Another view of an apex, internally; 15) Detail of a distal raphe end and helcitoglossa. Note the presence of a row of simple pores at apex (arrowed); 16) Internal view of a valve centrally showing a small nodule where the proximal raphe terminates and the twisted raphe rib; 17) Internal valve view showing the raphe rib; and 18) Detail of areolae externally.

References


