

Marine diatoms from Buenos Aires coastal waters (República Argentina). I. Thalassiosiraceae

by

Eugenia A. Sar¹, Inés Sunesen² and Cecilia Castaños²

Departamento Científico Ficología, Facultad de Ciencias Naturales y Museo
Paseo del Bosque s/n, 1900 La Plata, Argentina, E-mail: easar@museo.fcnym.unlp.edu.ar

¹Consejo Nacional de Investigaciones Científicas y Técnicas

²Comisión de Investigaciones Científicas de la Provincia de Buenos Aires

With 76 figures and 2 tables

Sar, E.A., I. Sunesen & C. Castaños (2001): Marine diatoms from Buenos Aires coastal waters (República Argentina). I. Thalassiosiraceae. - Nova Hedwigia 73: 199-228.

Abstract: This study describes the diversity of the species belonging to the diatom family Thalassiosiraceae found in the temperate marine waters along the coast of Buenos Aires Province, Argentina, from October 1994 to January 1999. It comprises morphological, taxonomic and distributional analyses of species found in samples collected at San Clemente del Tuyú, Santa Teresita, La Lucila del Mar, Mar de Ajó, Nueva Atlantis, Pinamar and Villa Gesell. A list of Thalassiosiraceae previously reported from Argentinian coastal waters, but not encountered in the present study, is also provided. Twenty-five taxa of the genus *Thalassiosira* and other related genera, excluding *Cyclotella*, were identified. *Thalassiosira binata* Fryxell, *T. lundiana* Fryxell, *T. oestrupii* var. *venrickae* Fryxell & Hasle, *T. proschkinae* Makarova and *Porosira pentaportula* Syvertsen & Lange are new records for Argentina and for the Southwestern Atlantic Ocean.

Introduction

Diatoms have been reported from temperate marine coastal waters of Buenos Aires Province since the beginning of the twentieth century. Frenguelli (1928, 1930, 1938) made the first comprehensive studies; his work on fossil and extant diatoms in Argentina has been extremely valuable for later research. More recent studies in the area, including ultrastructural analysis of the taxa, have been performed by Ferrario & Sar (1984, 1985), Gayoso (1989), Lange et al. (1983) and Ferrario et al. (1999), however the phytoplankton flora remains little known.

0029-5035/01/0073-0199 \$ 7.50

© 2001 J. Cramer in der Gebrüder Borntraeger
Verlagsbuchhandlung, D-14129 Berlin · D-70176 Stuttgart

In the framework of a monitoring project on potentially toxic species of diatoms, we have started a series of papers devoted to the diatom flora and phytoplankton ecology of marine coastal waters of Buenos Aires Province. One of the most abundant marine planktonic diatom taxa collected in our samplings was the family Thalassiosiraceae Lebour emend. Hasle 1973a. The purpose of the present paper is to provide an account of *Thalassiosira* and related genera, excluding *Cyclotella*, with remarks on morphology and distribution. In addition to the species discussed in this paper, we include a list of taxa that have previously been reported from Argentinian coastal waters but were not found in our samples.

Materials and methods

Phytoplankton was collected, seasonally during October 1994-1996 and bimonthly from October 1996 to January 1999, at several locations along the coast of Buenos Aires Province: San Clemente del Tuyú, Santa Teresita, La Lucila del Mar, Mar de Ajó, Nueva Atlantis, Pinamar and Villa Gesell (Fig. 1, Table 1). Qualitative samples were taken from the surface layer of the water column (between a water depth of 0 and 5 m) with 30 µm net hauls and fixed with 4% formalin.

Cleaning of diatom frustules was performed according to Hasle & Fryxell (1970). The cleaned material was mounted for light and scanning microscopy according to Ferrario et al. (1995). Microscopic observations were made with Wild M20 and Nikon Microphot-FX microscopes using phase contrast. The microphotographs were made with a Nikon Microphot-FX microscope and a

Table 1. Key to sampling stations, dates of collection and sample numbers at the Colección de Diatomeas Argentinas. SC = San Clemente del Tuyú, ST = Santa Teresita, LL = La Lucila del Mar, MA = Mar de Ajó, NA = Nueva Atlantis, PI = Pinamar and VG = Villa Gesell.

Station	SC	ST	LL	MA	NA	PI	VG
Nov 1994		4250		4251	4252		4253
Jan 1995		4254		4255	4256		4257
Mar 1995		4258		4259	4260	4263	4264
Nov 1995		4266	4267	4268	4269	4270	4271
Jan 1996		4272	4273	4274	4275	4276	4277
Mar 1996				4278			
Apr 1996	4279	4280	4281	4282	4283	4284	4285
Jun 1996	4286	4287	4288	4289		4290	4291
Sep 1996	4292	4293		4294		4295	4296
Nov 1996	4297	4298	4299	4300			4301
Jan 1997	4302	4303	4304	4305	4306/7	4308	4309
Mar 1997	4310	4311	4312	4313		4314	4315
May 1997	4316	4317	4318	4319		4320	4321
Jul 1997	4322	4323	4324	4325		4326	
Sep 1997	4327	4328	4329	4330		4331	
Nov 1997	4322	4323	4334	4335		4336	4337
Jan 1998	4338	4339	4340	4341		4342	4343
Mar 1998	4344	4345	4346	4347		4348	4349
May 1998	4250	4351	4352	4353		4354	4355
Jul 1998	4356	4357	4358	4359		4360	4361
Sep 1998	4362	4363	4364	4365		4366	4367
Dec 1998	4368	4369	4370	4371		4372	4373
Jan 1999	4374	4375	4376	4377		4378	4379



Fig. 1. Map of Buenos Aires Province, showing the sampling stations and location of the area in Argentina.

Jeol JSMT 100 scanning electron microscope. The diatom material is deposited in the Colección de Diatomeas Argentinas, Departamento Científico Ficología Facultad de Ciencias Naturales y Museo, Universidad Nacional de la Plata. The terminology follows Ross et al. (1979) and the bibliography about the fine-structure of diatom frustules follows Gaul et al. (1993).

Results and discussion

In this section we first discuss the *Thalassiosira* species in alphabetical order, followed by other related genera. Each description includes the literature references used for identification, light and electron microscopical photographs, notes about diagnostic

features, the distribution in Argentinian coastal waters and the sample numbers of the studied material. In Table 2 we list the *Thalassiosira* species reported from Argentinian marine waters that we have not observed in our material from Buenos Aires Province. For the other genera, this information is included under the heading "Distribution in Argentina".

***Thalassiosira angulata* (Gregory) Hasle** Figs 2-4; Samples 4250, 4279
 Hasle 1978: 93-101, figs 4, 41, 70-99. Muylaert & Sabbe 1996: 104-105, figs 2-6.
 Basionym: *Orthosira angulata* Gregory.

Valves 11-41 µm in diameter, flat or slightly convex, areolae in tangential curved rows on valve face, 9-11 in 10 µm, and radial rows on valve mantle, 14-24 in 10 µm. One ring of marginal strutted processes with long external "cap like" tubes, 2-5 in 10 µm and one central strutted process. Single labiate process with prominent external tube close to a marginal strutted process. Marginal ribs in the same number as mantle areolae.

Table 2. *Thalassiosira* species previously reported from Argentinian marine waters, but not observed in our material from Buenos Aires Province coastal waters.

Species	Reference
<i>T. aestivalis</i> Gran	Lange 1985 *
<i>T. allenii</i> Takano	Lange et al. 1983
<i>T. antarctica</i> Comber	Lange 1985 *
<i>T. conferta</i> Hasle	Frenguelli & Orlando 1959 **
<i>T. delicatula</i> Ostenfeld emend. Hasle	Lange 1985 *
<i>T. exigua</i> Fryxell & Hasle	Lange 1985 *
<i>T. gerloffii</i> Rivera	Lange 1985 *
<i>T. gracilis</i> var. <i>expecta</i> (V.L.) Fryxell & Hasle	Lange 1985 *
<i>T. gravida</i> Cleve	Lange 1985 *
<i>T. hibernalis</i> Gayoso	Gayoso 1989
<i>T. hyalina</i> (Grunow) Gran	Charpy & Charpy 1977 *
<i>T. kryophila</i> (Grunow) Jørgensen	Hendey 1937 **
<i>T. leptopus</i> (Grunow) Hasle & Fryxell	Frenguelli 1928 **
<i>T. mendiolana</i> Hasle & Heimdal	Ferrario & Sar 1988
<i>T. minima</i> Gaarder emend. Hasle	Ferrario & Sar 1988
<i>T. nordenskioldii</i> Cleve	Gayoso 1982 *
<i>T. oestrupii</i> (Ostenfeld) Hasle	Lange 1985 *
<i>T. perpusilla</i> Kozlova	Lange 1985 *
<i>T. poro-irregulata</i> Hasle & Heimdal	Lange 1985 *
<i>T. pseudonana</i> Hasle & Heimdal	Lange et al. 1983
<i>T. subtilis</i> (Ostenfeld) Gran	Balech 1976 *
<i>T. subtilis</i> var. <i>maxima</i> Ferrario	Ferrario 1988
<i>T. symmetrica</i> Fryxell & Hasle	Lange 1985 *
<i>T. trifulta</i> Fryxell	Lange 1985 *
<i>T. tumida</i> (Janisch) Hasle	Lange 1985 *

* Not illustrated

** Line drawings or light microscope photographs, no electron micrographs

REMARKS: This species shares the general process pattern with *T. pacifica* Gran & Angst and *T. decipiens* (Grunow) Jørgensen. Hasle (1978) and Muylaert & Sabbe (1996) clarified distinctions between these and other related species considering the height of valve mantle and the position of the labiate process as the distinctive features of the species. *T. angulata* is very similar to *T. hibernalis* Gayoso (Gayoso 1989) described from Argentina. Hasle & Syvertsen (1996) pointed out that both species are very close. Comparing the protologue of *T. hibernalis* with the description, the quantitative morphological features and the pictures presented by Harris et al. (1995) for *T. angulata* from a Scottish sea-loch, we were not able to distinguish the two taxa.

DISTRIBUTION IN ARGENTINA: *T. angulata* is a temperate species reported from the Northern Hemisphere according to Hasle (1978) and Hasle & Syvertsen (1996). This species was recorded for the first time for Argentinian waters by Lange (1985). We have found it in San Clemente del Tuyú, Santa Teresita, La Lucila del Mar, Mar de Ajó, Nueva Atlantis, Pinamar and Villa Gesell, rare to common but never abundant, all year round.

***Thalassiosira anguste-lineata* (Schmidt) Fryxell & Hasle**

Figs 5-7; Samples 4279, 4284, 4285, 4288

Fryxell & Hasle 1977: 73-75, figs 22-34. Rivera 1981: 45, figs 29-47.

Basionym: *Coscinodiscus anguste-lineatus* A. Schmidt.

Valves flat, 25-68 μm in diameter, areolae linear to fasciculate, 8-16 in 10 μm on valve face, 20-24 in 10 μm on valve mantle. One ring of strutted processes with external sculptured tube, 3-5 in 10 μm . One ring of arcs of 2-6 strutted processes without external tube, at some distance from valve centre. Single labiate process with prominent external tube between two marginal strutted processes.

REMARKS: The distinctive features of the species are the arrangement of the strutted processes in the subcentral ring and the morphology of the marginal strutted processes. Some of the specimens found in our material had one central strutted process.

DISTRIBUTION IN ARGENTINA: This is a cosmopolitan species (Harris et al. 1995), it was reported by the authors listed in Ferrario & Galván (1989), by Gayoso (1988) and by Sar (1996) in Bahía San Antonio. We have found it in San Clemente del Tuyú, Santa Teresita, La Lucila del Mar, Mar de Ajó, Pinamar, and Villa Gesell, rare to common in summer, fall and winter.

***Thalassiosira binata* Fryxell**

Figs 8-10; Samples 4282, 4297, 4303

Hasle & Fryxell 1977a: 244-247, figs 24-39. Takano 1978: 45-47, figs 1-9.

Valves slightly concave in the centre, 6-12 μm in diameter, areolae in radial rows, 30-36 in 10 μm on valve face, 30-45 in 10 μm in valve mantle. One central strutted process with external tube adjacent to a depressed central areola, strutted processes with simple tube in one ring, 4 in 10 μm . Single labiate process with long external tube one areola away from a strutted process.

REMARKS: *T. binata* can be differentiated from related species with a processes pattern similar to *T. allenii* Takano, *T. angulata* (Gregory) Hasle and *T. nordenskiöldii* Cleve by the location of the labiate process, the higher number of areolae and the absence of marginal ribs.

DISTRIBUTION IN ARGENTINA: This species from warm to temperate waters (Hasle & Syvertsen 1996) is recorded for the first time in Argentina. It has been found in San Clemente del Tuyú, Santa Teresita, Mar de Ajó, Nueva Atlantis and Pinamar, rare all year round, but more common in spring and fall.

Thalassiosira curviseriata Takano

Figs 11-13; Samples 4284, 4289, 4291, 4293, 4294

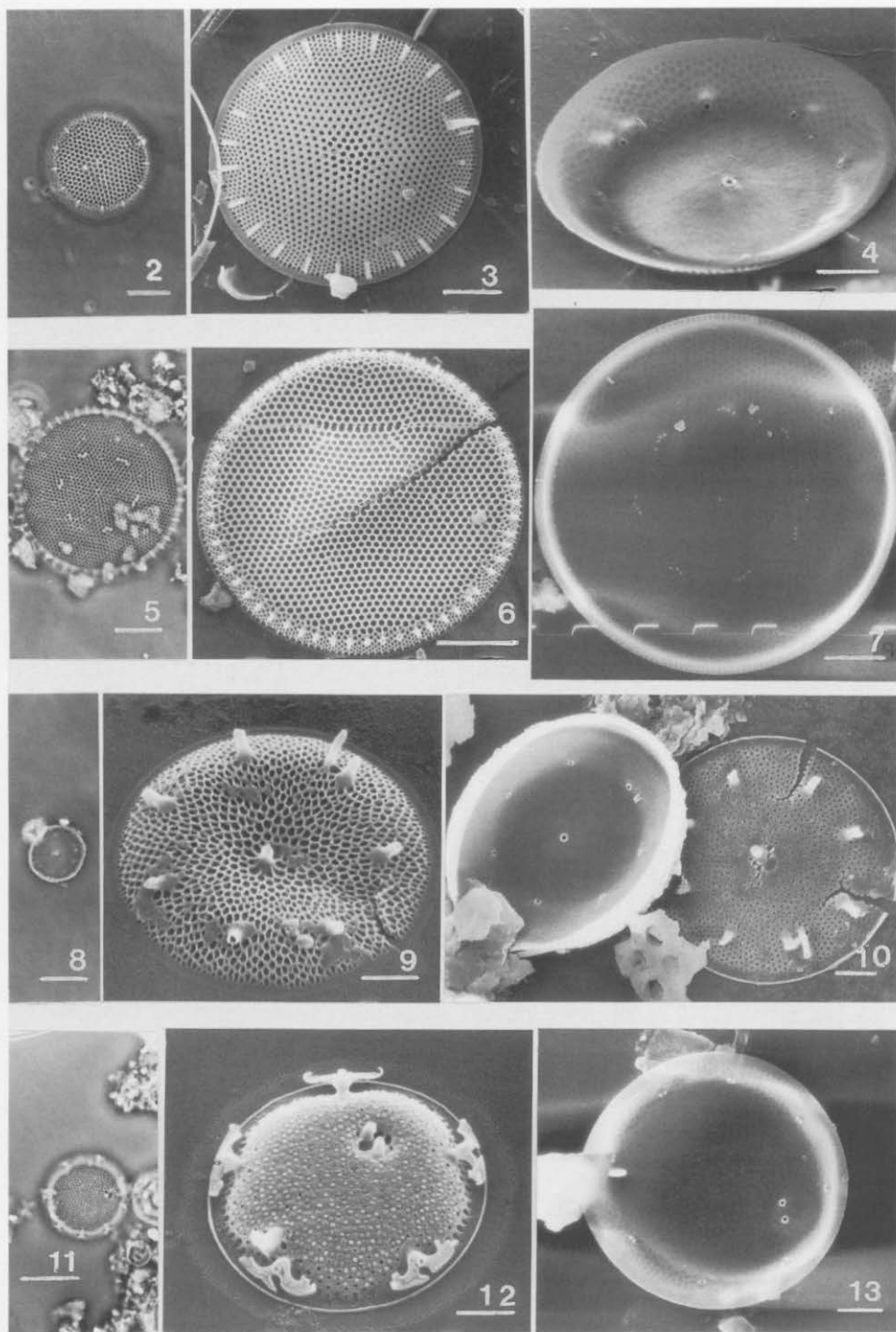
Takano 1981: 34-35, figs 26-28. Hallegraeff 1984: 498, fig. 8 a-c. Sar & Ferrario, 1987: 89-90, figs 1-4.

Valves circular or slightly elliptical, 9-20 μm in diameter. Areolae in radial rows from an eccentric larger one, 20-25 in 10 μm . One, or more often two, strutted processes with external tube adjacent to the subcentral largest areola. One marginal ring of strutted, 2-3 in 10 μm , processes with distal wings from the tip of the external tube. Single labiate process near a marginal strutted process. Siliceous granules covering the valve face.

REMARKS: *T. curviseriata* resembles *T. tealata* Takano but differs in the more eccentric position of the structural centre and in the shorter and more complex wings of the strutted processes. However we agree with Lange et al. (1992) that the two taxa are synonyms because we found some specimens with only one sub-central strutted process in the same population of specimens with two subcentral processes.

DISTRIBUTION IN ARGENTINA: *T. curviseriata*, a cosmopolitan species (exclusive of polar regions; Hasle & Syvertsen 1996), was recorded in Bahía Blanca by Gayoso (1988, 1989), in Bahía San Antonio by Sar (1996) and in Chubut by Sar & Ferrario (1987). We found this species in San Clemente del Tuyú, Santa Teresita, Mar de Ajó, Pinamar and Villa Gesell, present throughout the year, abundant in winter.

Figs 2-4. *Thalassiosira angulata*. Fig. 2. LM: Valve view, labiate process at 2 o'clock, close to a strutted process. Fig. 3-4. SEM: Fig. 3. External valve view; note the central strutted process. Fig. 4. Internal valve view. Figs 5-7. *Thalassiosira anguste-lineata*. Fig. 5. LM: Valve view; note the arcs of strutted processes on the valve face. Fig. 6-7. SEM: Fig. 6. External valve view; labiate process at 9 o'clock. Fig. 7. Internal valve view; labiate process, marginal ring and arcs of strutted processes. Note the central strutted process. Figs 8-10. *Thalassiosira binata*. Fig. 8. LM: General aspect of the valve. Figs 9-10. SEM: Fig. 9. External valve view. Fig. 10. External and internal valve view of the same specimen. Note the differences in general aspect between both external valve views. Figs 11-13. *Thalassiosira curviseriata*. Fig. 11. LM: Valve view; labiate process at 9 o'clock. Fig. 12-13. SEM: Fig. 12. External valve view; note the two subcentral strutted processes adjacent to a large areola, the labiate process and the wings of the marginal processes. Fig. 13. Internal valve view. Figs 2, 3, 5-8, 11: scale bar = 10 μm . Figs 4, 9, 10, 12, 13: scale bar = 2 μm .



Thalassiosira decipiens (Grunow) Jørgensen

Figs 14-16; Samples 4250, 4253, 4291 and 4295

Hasle 1979: 85-108, figs 1-42. Hernández Becerril & Tapia Peña 1995: 545, figs 10-15.

Basionym: *Coscinodiscus eccentricus* var. ? *decipiens* Grunow in Schneider.

Valves convex, nearly flat to concave, with eccentric to radial areolation pattern, 20-32 μm in diameter. Areolae 8-11 in 10 μm on valve centre and 10-15 on valve mantle. One central strutted process with no external tube, one marginal ring of strutted processes with external tubes in the valve mantle, 4-5 in 10 μm . One labiate process between two strutted processes closer to one of them.

REMARKS: *T. decipiens* is closely related to *T. angulata* as it has a similar pattern of valve processes. The distance between the strutted processes is shorter in *T. decipiens* than in *T. angulata* and the number of areolae and the depth of the valve mantle are smaller.

DISTRIBUTION IN ARGENTINA: This cosmopolitan species has frequently been reported from our coastal waters (see Ferrario & Galván 1989). In our study it was found in Santa Teresita, Nueva Atlantis, Villa Gesell and Pinamar, rare in winter and spring.

Thalassiosira eccentrica (Ehrenberg) Cleve

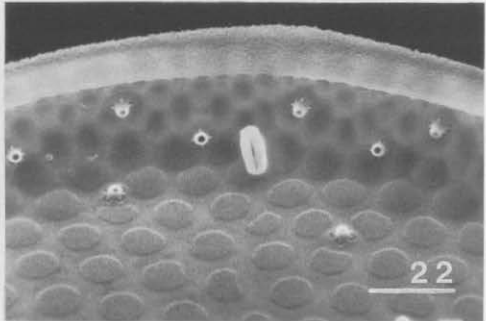
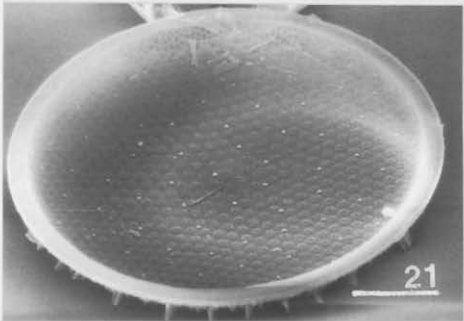
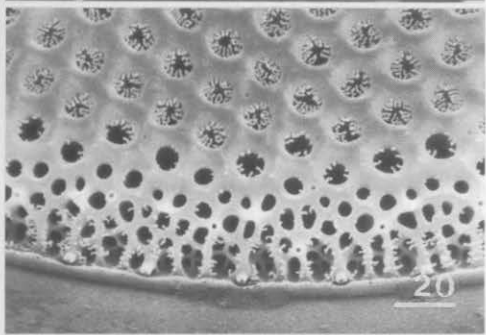
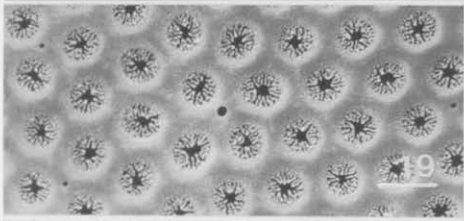
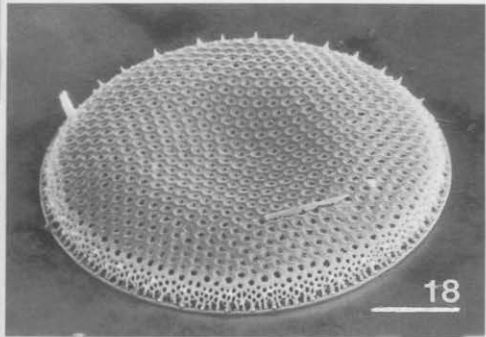
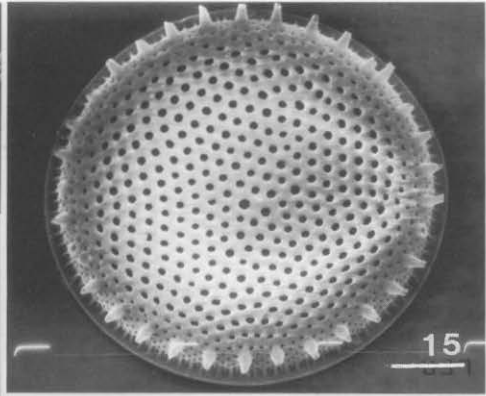
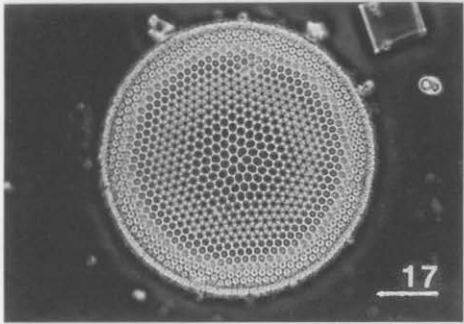
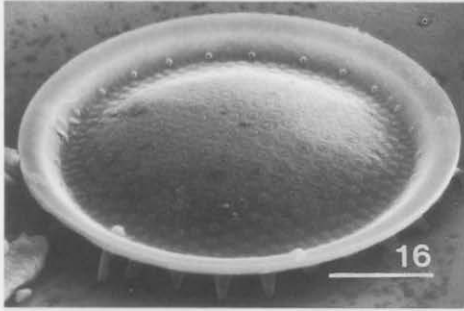
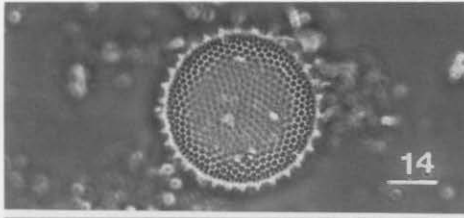
Figs 17-22; Samples 4263, 4279, 4311, 4313, 4314, 4317

Fryxell & Hasle 1972: 300-312, figs 1-21. Muylaert & Sabbe 1996: 106, figs 11-12.

Basionym: *Coscinodiscus eccentricus* Ehrenberg.

Valves flat, 20-77 μm in diameter, with eccentric areolation pattern, areolae 4-7 in 10 μm in the centre, 7-8 in 10 μm at the margin, 12-17 in 10 μm on valve mantle. Central areola surrounded by seven areolae. One strutted process adjacent to the central areola, 2-3 marginal rings of strutted processes with short external tube, 2-4 in 10 μm in each ring, numerous strutted processes scattered over the valve face. One marginal labiate process with pronounced external tube. Irregular ring of spines between the valve surface and the valve mantle, 1-4 in 10 μm .

Figs 14-16. *Thalassiosira decipiens*. Fig. 14. LM: Valve with focus on the margin. Fig. 15-16. SEM: Fig. 15. External valve view; note the central strutted process and the labiate process at 1.30. Fig. 16. Internal valve view. Figs 17-22. *Thalassiosira eccentrica*. Fig. 17. LM: Valve view focused in the centre; note the strutted process adjacent to the central areolae. Fig. 18-22. SEM: Fig. 18. External valve view; note the large tube of the labiate process. Fig. 19. Detail of the central area with seven areolae surrounding the central areola and the strutted process. Note the scattered processes and the foramina with siliceous threads. Fig. 20. Detail of the external valve mantle; note the marginal and scattered processes. Fig. 21. Internal valve view; note the external ring of spines. Fig. 22. Detail of the internal view, labia, strutted processes and cribae. Figs 14, 17, 18, 21: scale bar = 10 μm . Figs 15, 16: scale bar = 5 μm . Figs 19, 20, 22: scale bar = 2 μm .



REMARKS: *T. eccentrica* is closely related to *T. mendiolana* as it has a similar pattern of valve processes, but *T. eccentrica* is more silicified, has more scattered processes over the valve face and a more uniform areolation pattern.

DISTRIBUTION IN ARGENTINA: This cosmopolitan species (exclusive of polar regions; Hasle & Syvertsen 1996) has frequently been reported from our coastal waters (see Ferrario & Galván 1989, Gayoso 1988, Sar 1996). In our study it was recorded in San Clemente del Tuyú, Santa Teresita, La Lucila del Mar, Mar de Ajó, Nueva Atlantis, Pinamar and Villa Gesell, common all year round, more abundant in late summer and fall.

***Thalassiosira endoseriata* Hasle & Fryxell**

Figs 23-25; Samples 4266, 4282, 4283, 4315

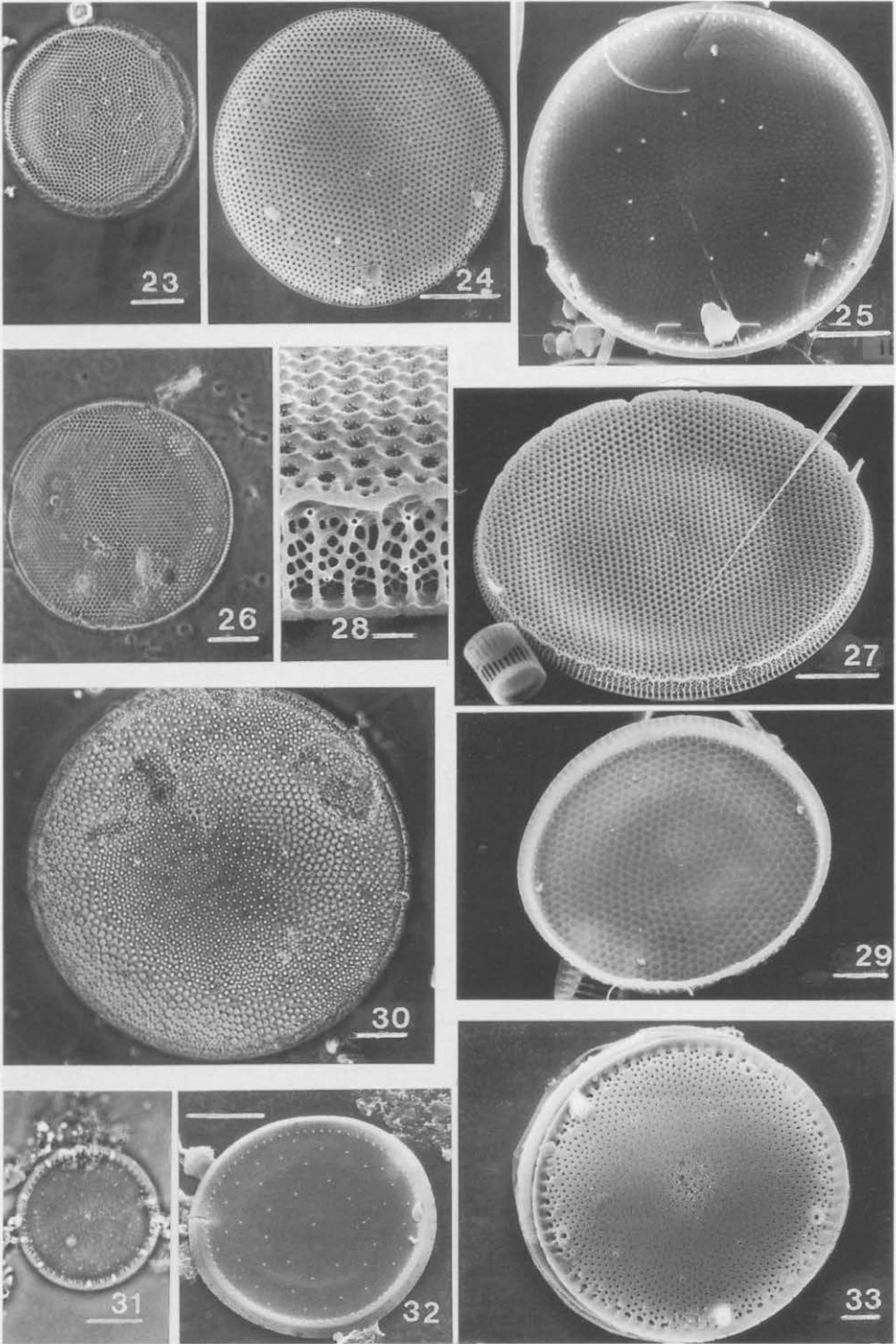
Fryxell & Hasle 1977: 78-79, figs 45-49. Rivera 1981: 68-71, figs 145-147.

Valves flat, 37-48 μm in diameter. Areolae pattern fasciculated with rows parallel to the central radial row, areolae 10-13 in 10 μm . Ring of strutted processes (7-9) closer to the centre than to the margin. One marginal ring of strutted processes with no external tube, 6-7 in 10 μm . One labiate process on the valve face between the margin and the ring of central strutted processes.

REMARKS: This species is very similar to *T. poro-irregularata* Hasle & Heimdal but differs in the distribution of the strutted processes in the internal ring and in the length of the internal tube of the subcentral strutted processes. *T. endoseriata* presents the strutted processes of the internal ring taking the place of an areola within complete radial rows and the tube of all strutted processes are shorter than *T. poro-irregularata*.

DISTRIBUTION IN ARGENTINA: This warm-water species (Hasle & Syvertsen 1996) has been reported from the Argentinian continental shelf in front of Mar del Plata by Lange et al. (1983) and Lange (1985). In our study it was found in San Clemente del Tuyú, Santa Teresita, La Lucila del Mar, Mar de Ajó, Nueva Atlantis, Pinamar and Villa Gesell, all year round, more common in winter.

Figs 23-25. *Thalassiosira endoseriata*. Fig. 23. LM: Valve view; note the fasciculated areola array and the subcentral ring of strutted processes. Fig. 24-25. SEM: Fig. 24. External valve view; processes on the valve face taking the place of an areola. Fig. 25. Internal valve view; labiate process in from the marginal ring of strutted processes. Figs 26-29. *Thalassiosira hendeyi*. Fig. 26. LM: Valve view. Fig. 27-29. SEM: Fig. 27. External valve view; note the opposite labiate processes and the wavy margin. Fig. 28. Detail of the mantle showing two rings of processes and marginal ribs. Fig. 29. Internal valve view. Fig. 30. *Thalassiosira lentiginosa*. LM: Valve view; note labiate process at 3 o'clock and the scattered strutted processes. Figs 31-33. *Thalassiosira lundiana*. Fig. 31. LM: Valve view; note the strutted and occluded processes. Fig. 32-33. SEM: Fig. 32. Internal valve view; note the labiate process included in the marginal ring of strutted processes. Fig. 33. External valve view; note the marginal stripes and the scattered processes. Figs 26, 27: scale bar = 20 μm . Figs 23-25, 29-32: scale bar = 10 μm . Figs 28, 33: scale bar = 2 μm .



Thalassiosira hendeyi Hasle & Fryxell

Figs 26-29; Samples 4279, 4285, 4308, 4314, 4317, 4318

Hasle & Fryxell 1977b: 25-26, figs 35-45. Mahood et al. 1986: 130, figs 6-11, 86.

Synonym: *Coscinodiscus hustedtii* Müller-Melchers.

Valves flat, 44-100 µm in diameter. Areolae in linear rows, sometimes with slight irregularities, 5-6 in 10 µm, and foramina with radial siliceous threads. Single central strutted process to one side of the central areola, two adjacent rings of marginal strutted processes with short external tube, alternating in orientation, 3-5 in 10 µm in each ring. Two labiate processes with prominent external tube, in opposite sides of the valve. Wavy marginal ridge. Shallow mantle with a ribbed rim, areolae 12-13 in 10 µm.

REMARKS: The most important characters for differentiating this taxon are the conspicuous wavy marginal ridge and the prominent external tube of the two labiate processes.

DISTRIBUTION IN ARGENTINA: This species typical of warm to temperate coastal waters (Hasle & Syvertsen 1996) has been recorded in Buenos Aires waters by Müller-Melchers (1959) as *Coscinodiscus hustedtii*; in Bahía Blanca by Gayoso (1981, 1982, 1988, 1989) and in Mar del Plata by Lange (1985). We found *T. hendeyi* in San Clemente del Tuyú, Santa Teresita, La Lucila del Mar, Mar de Ajó, Nueva Atlantis, Pinamar and Villa Gesell, common all year round, fairly abundant in summer and fall.

Thalassiosira lentiginosa (Janisch) Fryxell Fig. 30; Samples 4252, 4288, 4295, 4296

Fryxell 1977: 100-103, figs 13-14. Johansen & Fryxell 1985: 170, figs 7, 49-50.

Basionym: *Coscinodiscus lentiginosus* Janisch.

Valves flat and disc-shaped, 30-82 µm in diameter. Areolae in fasciculated rows, 6-9 in 10 µm. Scattered strutted processes across valve face, one ring of strutted processes near the margin, 2-4 in 10 µm. One prominent labiate process on the mantle.

REMARKS: The scattered and marginal strutted processes are readily seen in light microscope. This species shares with *T. lineata* Jousé and *T. lineoides* Herzig & Fryxell the position of strutted processes with no external tube on the valve face. *T. lentiginosa* differs from those species by the pattern of the areolae distribution, fasciculated in the former and linear in the others. Herzig & Fryxell (1986) clarified the distinctions between these and related species.

DISTRIBUTION IN ARGENTINA: *T. lentiginosa* was reported as a widespread Antarctic species. Johansen & Fryxell (1985) reported it from the Antarctic Convergence Zone in the Pacific, Indian and Atlantic Ocean. However Hendey (1937), Frenguelli (1930), Balech & El Sayed (1965), Martinez Macchiavello (1976) and Lange (1985) reported the species in Argentinian waters. We found *T. lentiginosa* in Santa Teresita, La Lucila del Mar, Mar de Ajó, Nueva Atlantis, Pinamar and Villa Gesell, rare all year round.

Thalassiosira lundiana Fryxell

Figs 31-33; Samples 4297, 4303, 4310

Fryxell 1975: 64, figs 14-24. Mahood et al. 1986: 137, figs 36-37.

Valves circular, flat, 14-35 μm in diameter. Fasciculated areola array, areolae 23-30 in 10 μm . One central strutted process, apparently one marginal ring of strutted processes in internal view and two alternating rows, one areola apart in external view, 6-10 in 10 μm , many scattered strutted processes on valve surface. All strutted processes with short internal and very short or absent external tubes. One large labiate process and 4-5 occluded processes in a row inside the marginal ring of strutted processes. Marginal stripes (or ribs), 16-17 in 10 μm .

REMARKS: This species is closely related to *T. punctigera* because of the fasciculated areolae pattern and the presence of large occluded processes. However *T. lundiana* has scattered processes on the valve face, more areolae and marginal processes in 10 μm , and is smaller and less silicified than *T. punctigera*.

DISTRIBUTION IN ARGENTINA: This cosmopolitan euryhaline species (Fryxell 1975) is recorded for the first time in Argentinian waters. It was found in San Clemente del Tuyú, Santa Teresita, Mar de Ajó, Pinamar and Villa Gesell, fairly common all year round, more frequent in summer.

Thalassiosira minuscula Krasske

Figs 34-36; Samples 4279, 4291, 4294, 4309

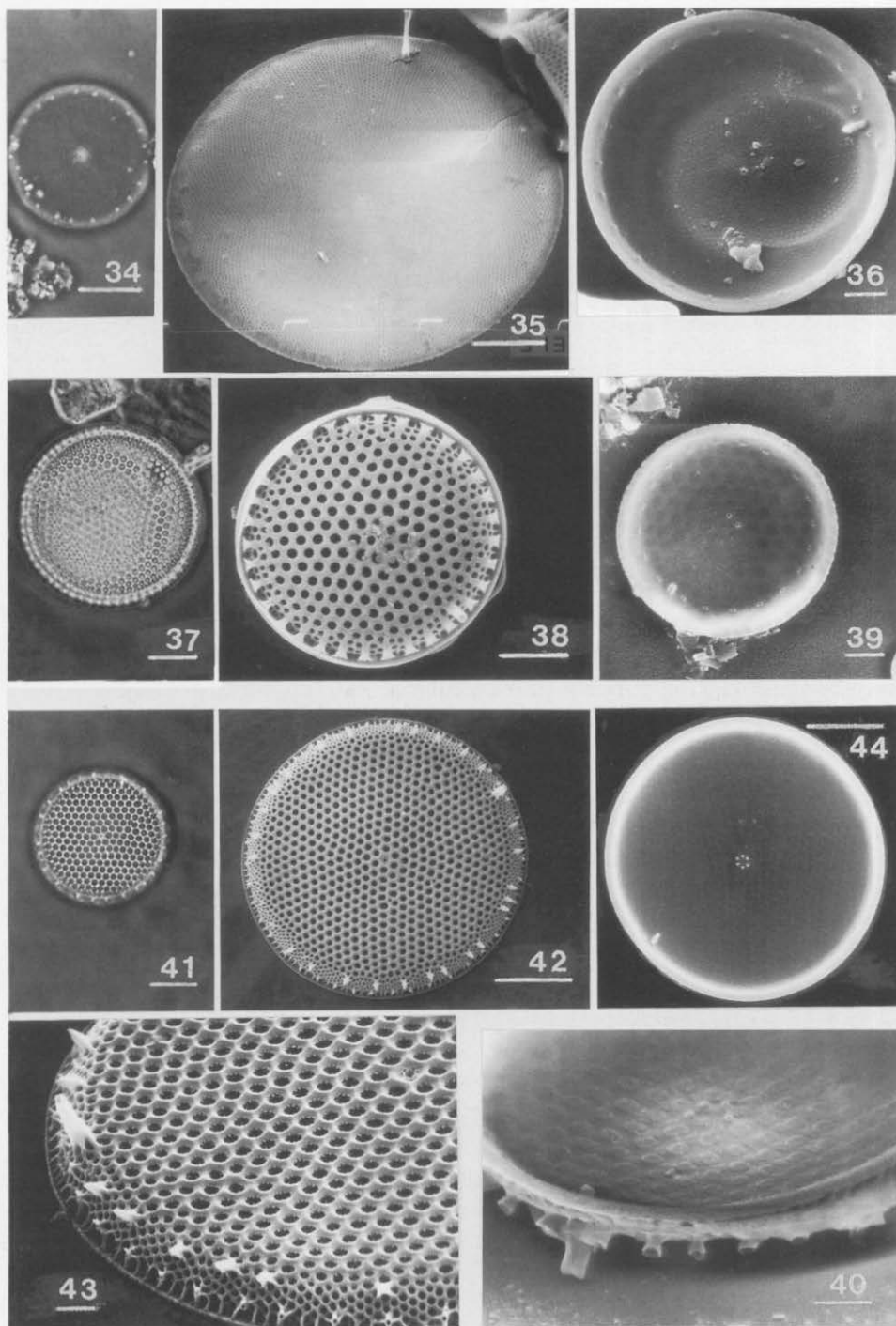
Krasske 1941: 262, pl. 5, figs 4-6. Hasle 1976a: 104-105, figs 6-10. Mahood et al. 1986: 137, figs 36-37. Ferrario & Sar 1988: 425, figs 2 E, 22-23.

Synonym: *Thalassiosira monoporocyclus* Hasle.

Valves convex, slightly depressed in the centre, 15-28 μm in diameter. Fasciculated areolation pattern, areolae 29-36 in 10 μm on valve surface. One central strutted process, marginal ring of strutted processes with short tubes prolonged towards both sides of the valve surface, 3-4 in 10 μm . Single prominent labiate process radially oriented in from the margin, close to one (or two) strutted processes internal to those of the ring.

REMARKS: Hasle & Syvertsen (1996) pointed out that this species is characterized by the lack of external tubes of the labiate processes. However some specimens in our material had a prominent external tube similar to Rivera's material (Rivera 1981) and Hernández Becerril's material (Hernández Becerril & Tapia Peña 1996).

DISTRIBUTION IN ARGENTINA: This warm-water (Hasle 1972) and temperate-water (Hasle & Syvertsen 1996) species has been reported from Chubut by Ferrario & Sar (1988) and at Bahía San Antonio by Sar (1996). In our samplings it was found in Santa Teresita, Mar de Ajó, Nueva Atlantis, Pinamar and Villa Gesell, rare in summer, fall and winter, more frequent in the stations located further away from the Río de la Plata.



Thalassiosira nanolineata (Mann) Fryxell & Hasle

Figs 37-40; Samples 4291, 4294, 4295

Hasle & Fryxell 1977b: 32-33, figs 74-80. Hallegraeff 1984: 504, figs 19 a-e. Licea 1990: 322-324, figs 53-56.

Basionym: *Coscinodiscus nanolineatus* Mann.

Valve surface slightly convex, 12-38 μm in diameter, areolae in linear to curved rows, 5-10 in 10 μm . One or more strutted processes around the central areola, one ring of strutted processes with external tube, 6-8 in 10 μm . Single labiate process between two marginal strutted processes. Twelve ribs in 10 μm in valve margin.

REMARKS: The distinctive features of this species are the arrangement, the shape and the position of the strutted processes.

DISTRIBUTION IN ARGENTINA: *T. nanolineata*, reported as a warm-water species by Hasle & Fryxell (1977b) and Hallegraeff (1984), was recorded by Lange (1985) near Mar del Plata. We have found it in Santa Teresita, La Lucila del Mar, Mar de Ajó, Pinamar and Villa Gesell, rare in spring, summer and fall, more frequent in winter.

Thalassiosira nodulolineata (Hendey) Hasle & Fryxell

Figs 41-44; Samples 4250, 4279, 4297

Hasle & Fryxell 1977b: 35-36, figs 86-93. Mahood et al. 1986: 130, figs 12-17, 87, 90.

Basionym: *Coscinodiscus nodulolineatus* Hendey.

Valves 27-60 μm in diameter, areolae in linear or slightly eccentric rows, 5.5-8 in 10 μm in the centre, 15-22 in 10 μm near the mantle. Six strutted processes inside the central areola, 4-6 in 10 μm marginal strutted processes with short external tubes in a ring, 3-4 spines in 10 μm forming a second ring. Single labiate process with external tube near the valve mantle.

REMARKS: This species appears at first sight similar to *T. densannula* Hasle & Fryxell (1977b) because both species have six strutted processes surrounding the central areola. The main distinctions between the two species are found in the density of the marginal processes, fewer in *T. nodulolineata*, and in the absence of spines in *T. densannula*.

Figs 34-36. *Thalassiosira minuscula*. Fig. 34. LM: Valve view; note the labiate process close to a strutted one in from the marginal ring. Fig. 35-36. SEM: Fig. 35. External valve view; note the prominent tube of the labiate process. Fig. 36. Internal valve view. Figs 37-40. *Thalassiosira nanolineata*. Fig. 37. LM: Valve view. Fig. 38-40. SEM: Fig. 38. External valve view; note the strutted processes surrounding the central areola. Labiate process at 4.30. Fig. 39. Internal valve view. Fig. 40. Detail of the external tubes of the processes. Figs 41-44. *Thalassiosira nodulolineata*. Fig. 41. LM: Valve view; labiate process at 1 o'clock. Fig. 42-44. SEM: Fig. 42. External valve view; note the processes in the central areola. Fig. 43. Detail of spines and marginal processes. Note the strutted processes inside the central areola. Fig. 44. Internal valve view. Figs 34, 37, 41, 42, 44: scale bar = 10 μm . Figs 35, 38: scale bar = 5 μm . Figs 36, 39, 40, 43: scale bar = 2 μm .

DISTRIBUTION IN ARGENTINA: This warm-water species (Hallegraeff 1984) has been reported from the Argentinian continental shelf in front of Mar del Plata by Lange (1985). In our samples it was found in San Clemente del Tuyú, Santa Teresita, La Lucila del Mar, Mar de Ajó, Nueva Atlantis, Pinamar and Villa Gesell, rare to common in fall and winter, common to abundant in spring and summer.

Thalassiosira oestrupii* var. *venrickae Fryxell & Hasle

Figs 45-47; Samples 4256, 4269, 4285, 4314

Fryxell & Hasle 1980: 810, 813, figs 11-19. Mahood et al. 1986: 137.

Valves slightly convex to flat, with eccentric areolation pattern, 14-28 μm in diameter. Areolae 6-9 in 10 μm in the centre, 9-12 in 10 μm near the margin. One strutted process almost centrally located. One marginal ring of strutted processes with no external tube, 1-4 in 10 μm . All strutted processes with internal projection and reduced tricolumnar supports. One labiate process 2-3 areolae away from the central process.

REMARKS: *T. oestrupii* var. *venrickae* differs from *T. oestrupii* var. *oestrupii* in the number of marginal strutted processes (3.5-5 μm apart in var. *venrickae* and 0.8-1.9 μm apart in var. *oestrupii*), in the length of the strutted processes (longer in var. *venrickae*) and in the areolation pattern on valve surface (eccentric in var. *venrickae* and sublinear in var. *oestrupii*). In our material we found some specimens with a supplementary strutted process near the labiate process that we attribute to this taxon.

DISTRIBUTION IN ARGENTINA: *Thalassiosira oestrupii* var. *venrickae* was reported from continental shelves in tropical and subtropical waters by Fryxell & Hasle (1980) and from coastal temperate waters by Mahood et al. (1986). It was found in San Clemente del Tuyú, Santa Teresita, La Lucila del Mar, Mar de Ajó, Nueva Atlantis, Pinamar and Villa Gesell and reported for the first time to Argentina, fairly common all year round, more frequent in summer.

Thalassiosira pacifica Gran & Angst

Fig. 48; Samples 4289, 4291

Gran & Angst 1931: 437, fig. 12. Mahood et al. 1986: 138, figs 49-55, 105.

Valves flattened or slightly concave, 30-43 μm in diameter. Linear, eccentric to fasciculated areola array, areolae 9-18 in 10 μm in the central area and 23-28 in 10 μm in the mantle. One central strutted process adjacent to a larger areola, one ring of strutted processes near the margin, 4-5 in 10 μm . Single marginal labiate process as for a strutted process.

REMARKS: *T. pacifica* is very similar to *T. aestivalis* Gran. According to Hasle (1978) *T. pacifica* is distinguished from *T. aestivalis* by the areola array, linear to eccentric to fasciculated in the former and fasciculated in the latter. In our material the specimens usually had a mixture of curved, tangential rows and sectors, thus they can be attributed to *T. pacifica*.

DISTRIBUTION IN ARGENTINA: This species was classified by Hasle & Syvertsen (1996) as cosmopolitan exclusive of polar regions. Gayoso (1989) reported it from Bahía Blanca estuary and we have found it in San Clemente del Tuyú, Santa Teresita, Mar de Ajó, Pinamar and Villa Gesell, rare to common in summer and winter.

Thalassiosira proschkinae Makarova Figs 49-50; Samples 4284, 4291

Makarova in Makarova et al. 1979: 922, figs 1-7. Muylaert & Sabbe, 1996: 110, figs 24-26.

Valve flat, 5.5-8 μm in diameter, areolae in curved tangential rows, 24-29 in 10 μm . One central strutted process with seven areolae around, one ring of marginal strutted processes with no external tube, 1.8-2.1 μm apart. Labiate process in radial position one areola away from the central strutted process. Numerous spines on valve mantle sometimes absent.

REMARKS: *T. proschkinae* is similar to *T. perpusilla* regarding morphometric data and processes distribution. The labiate process in *T. proschkinae* is closer to the central strutted process than in *T. perpusilla* and differs in the orientation. Furthermore, *T. perpusilla* has strutted processes without external tube and no spines.

DISTRIBUTION IN ARGENTINA: This cosmopolitan species is recorded for the first time in Argentina. We have found it in Pinamar and Villa Gesell, rare in fall and winter.

Thalassiosira punctigera (Castracane) Hasle

Figs 51-53; Sample 4250, 4284, 4285, 4293

Hasle 1983: 593-608, figs 1-45. Fryxell 1978: 133-137, figs 9-21 (as *T. angstii*). Muylaert & Sabbe 1996: 110, figs 29-30.

Basionym: *Ethmodiscus punctiger* Castracane.

Synonym: *Thalassiosira angstii* (Gran) Makarova.

Valves convex with ribbed flattened margin, 43-92 μm in diameter. Fasciculated areolation pattern, areolae 10-14 in 10 μm on valve centre, 15-20 in 10 μm near valve margin. Single central strutted process with short internal tube, marginal ring of strutted processes with internal and external tubes, 4-8 in 10 μm . One labiate process with prominent external tube and a variable number (0-5) of large occluded processes in a row, some areolae in from the marginal ring of strutted processes.

REMARKS: This species is closely related to *T. lundiana* because of the fasciculated areolae pattern and the presence of large occluded processes. However, *T. lundiana* has scattered processes on the valve face, more areolae and marginal processes in 10 μm , and is smaller and less silicified than *T. punctigera*.

DISTRIBUTION IN ARGENTINA: This cosmopolitan species has been reported from Necochea by Müller-Melchers (1953), as *Coscinodiscus punctiger*; in Quequén by Hasle (1983); in Mar del Plata by Lange et al. (1983) as *T. angstii*; in ocean waters in front of Buenos Aires Province by Müller-Melchers (1959) as *C. punctiger*, Lan-

ge (1985), Lange et al. (1983); in Bahía San Antonio by Sar (1996) and in Chubut by Ferrario & Sar (1988) and Gayoso (1989). We have found this species in Santa Teresita, La Lucila del Mar, Mar de Ajó, Nueva Atlantis, Pinamar and Villa Gesell, rare to common all year round, fairly abundant during fall.

Thalassiosira rotula Meunier

Fig. 57; Samples 4279, 4291

Meunier 1910: 264, pl. 29, figs 67-70. Lange et al. 1983: 16, figs 25-28. Mahood et al. 1986: 151, figs 80-85, 94.

Valves circular, weakly silicified, 33-40 μm in diameter. Areolae pattern in radial ribs, 18-20 in 10 μm . Cluster of strutted processes in the centre, scattered strutted processes over the valve face. Strutted processes with external tubes. Single prominent labiate process between valve face and mantle.

REMARKS: *T. rotula* is similar to *T. gravida*, but it is less silicified with poorly defined areolae.

DISTRIBUTION IN ARGENTINA: This species, cosmopolitan in cold temperate to warm waters (Hasle 1976b), has been recorded in southern Buenos Aires by Balech (1962) and Gayoso (1988), in ocean waters in front of Buenos Aires Province by Lange et al. (1983) and Balech (1976, 1979), in Las Grutas, Golfo San Matías by Sar (1996) and in Chubut by Ferrario & Sar (1988). We found it in San Clemente del Tuyú, Santa Teresita, Mar de Ajó, Nueva Atlantis, Pinamar and Villa Gesell, rare in spring and summer, more common in fall and winter.

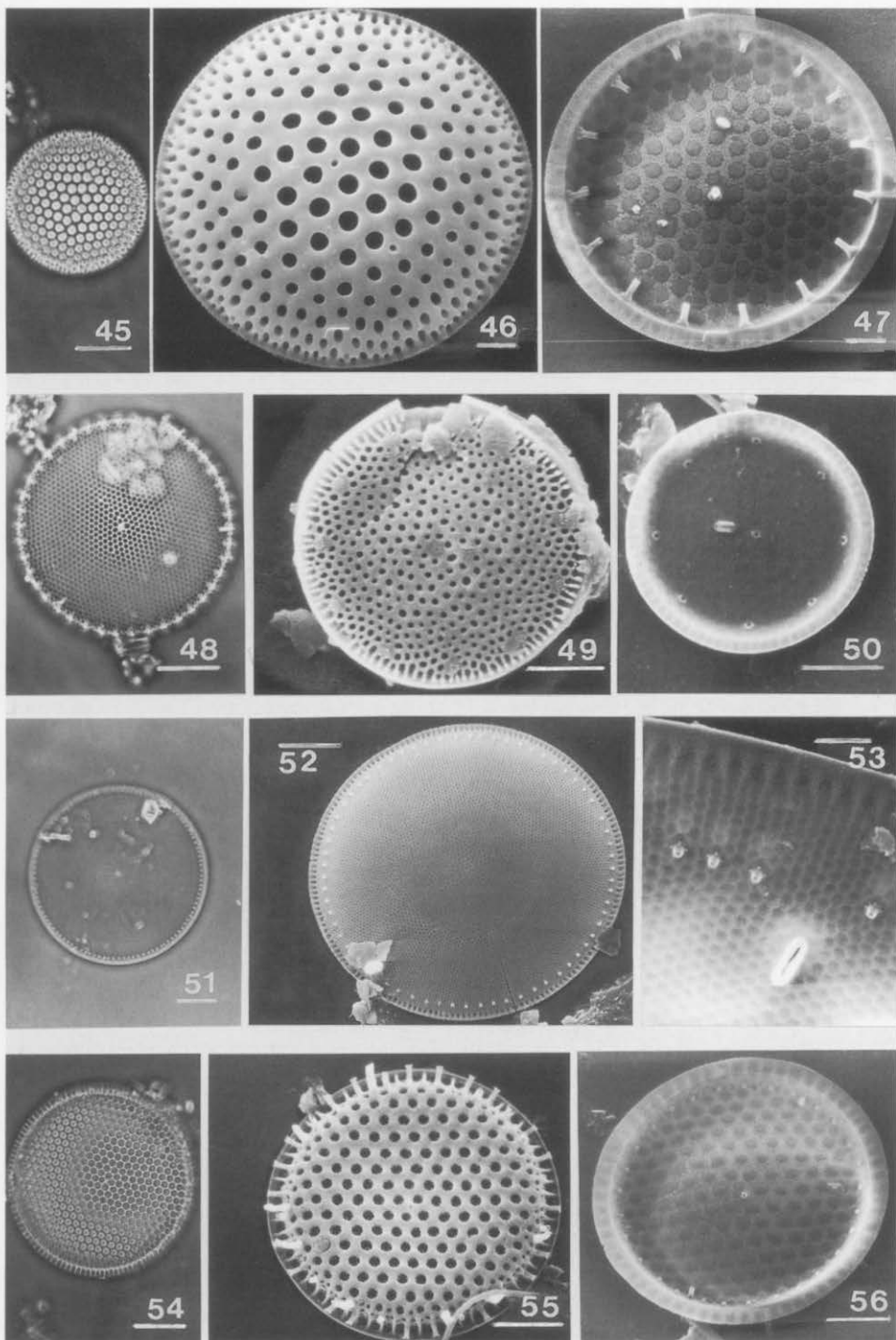
Thalassiosira simonsenii Hasle & Fryxell

Figs 54-56; Samples 4284, 4286, 4290, 4291

Hasle & Fryxell 1977b: 23-24, figs 26-34, 97. Ferrario & Sar 1988: 428, figs 2g, 17-19.

Valves circular and flat, 20-38 μm in diameter. Linear areola array, areolae 6-7 in 10 μm on valve centre, 7-9 in 10 μm near the margin. Shallow valve mantle with

Figs 45-47. *Thalassiosira oestrupii* var. *venrickae*. Fig. 45. LM: Valve view; note the subcentral strutted process and the labiate process 3 areolae away towards 1.00. Fig. 46-47. SEM: Fig. 46. External valve view. Fig. 47. Internal valve view. Fig. 48. *Thalassiosira pacifica*. LM: Valve view; note the central process adjacent to a larger areola. Figs 49-50. *Thalassiosira proschkinae*. SEM: Fig. 49. External valve view; note the labiate process one areola away from the central strutted process. Fig. 50. Internal valve view. Figs 51-53. *Thalassiosira punctigera*. Fig. 51. LM: Valve view. Fig. 52-53. SEM: Fig. 52. Valve in external view with no occluded processes. Fig. 53. Internal view of labiate and marginal strutted processes. Figs 54-56. *Thalassiosira simonsenii*. Fig. 54. LM: Valve view focused in the centre; note central strutted process. Fig. 55-56. SEM: Fig. 55. External valve view; note the opposite labiate processes at 11.00 and 5.00. Fig. 56. Internal valve view. Fig. 51: scale bar = 20 μm . Figs 45, 48, 52, 54: scale bar = 10 μm . Figs 55, 56: scale bar = 5 μm . Figs 46, 47, 49, 50, 53: scale bar = 2 μm .



marginal ribs, 9-11 in 10 μm . One strutted process adjacent to the central areola, one internal and two external rings of strutted processes on valve mantle, 5-6 in 10 μm . Two labiate processes, 180° apart, with long external tubes. Variable number of long occluded processes in a marginal ring.

REMARKS: This species has two labiate processes which are situated 180° apart, similar to *T. hendeyi*, but *T. simonsenii* has occluded processes and no marginal ridge.

DISTRIBUTION IN ARGENTINA: This warm- to temperate-water species (Hasle & Syvertsen 1996) has been reported to Argentinian waters by Lange et al. (1983), Lange (1985) and Ferrario & Sar (1988). In our samples it was found in San Clemente, La Lucila del Mar, Mar de Ajó, Pinamar and Villa Gesell, rare in summer, fall and winter.

Thalassiosira tenera Proschkina-Lavrenko Figs 58-59; Samples 4283, 4288

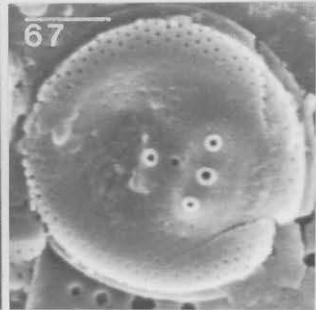
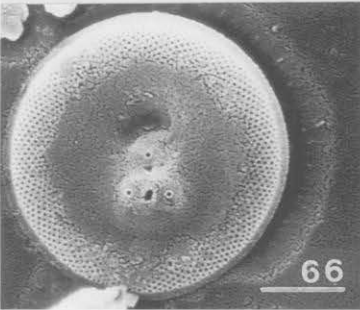
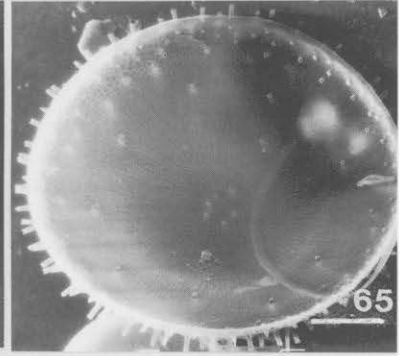
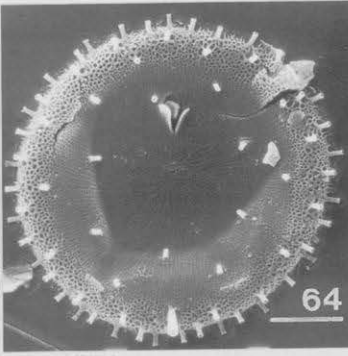
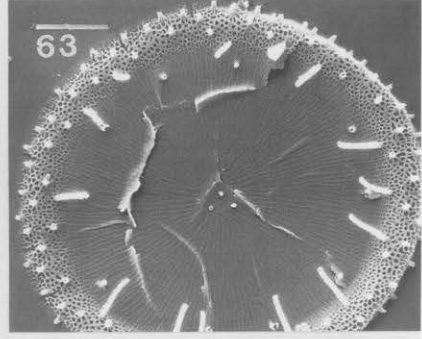
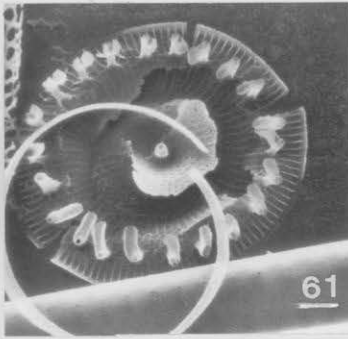
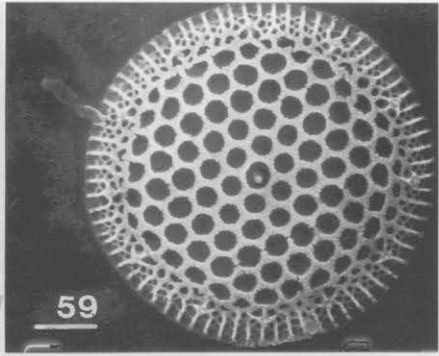
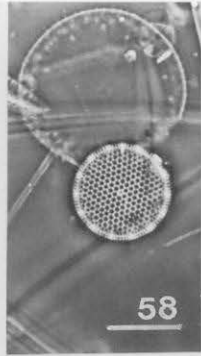
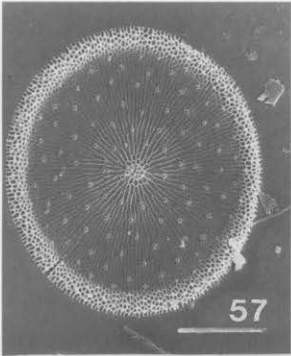
Proschkina-Lavrenko 1961: 33, figs 1-7. Hasle & Fryxell 1977b: 28-30, figs 54-65. Harris et al. 1995: 121, figs 6, 24.

Valves flat, 9-12 μm in diameter. Areolae in linear rows, 11-12 in 10 μm . One central strutted process inside the central areolae. One ring of marginal strutted processes with a silica layer, 4-5 in 10 μm . One labiate process between two marginal strutted processes.

REMARKS: In our material we have found some specimens without a layer of silica over the strutted processes.

DISTRIBUTION IN ARGENTINA: This cosmopolitan species (exclusive of polar regions; Hasle & Syvertsen 1996) has previously been reported from continental shelves of Argentina (Lange et al. 1983, Lange 1985). In this study we have found it in La Lucila del Mar, Pinamar and Villa Gesell, rare all year round.

Fig. 57. *Thalassiosira rotula*. SEM: External valve view; note the cluster of central strutted processes and the scattered processes. Figs 58-59. *Thalassiosira tenera*. Fig. 58. LM: Valve view; note the central areola and the marginal strutted processes covered by a layer of silica. Fig. 59. SEM: External valve view; note the strutted process inside the central areola and the marginal strutted processes with no layer of silica. Figs 60-61. *Detonula pumila*. Fig. 60. LM: Valve view. Fig. 61. SEM: External valve view; note the shape of the tubes of the strutted processes. Figs 62-65. *Lauderia annulata*. Fig. 62. LM: Valve view. Figs 63-65. SEM: Figs 63, 64. External valve views; note the central annulus and the radial costae. Fig. 65. Internal valve view; note the large labia near the margin. Figs 66-68. *Minidiscus chilensis*. Fig. 66-68. SEM: Figs 66, 67. External valve views. Note the central non-areolated undulated area, the disposition of the processes and "perforation" on the valve face and the differences in general aspect of both valves. Fig. 68. Internal valve view; note the labiate process between two strutted processes. Figs 57, 58, 60, 62: scale bar = 10 μm . Figs 63-65: scale bar = 5 μm . Figs 59, 61, 66: scale bar = 2 μm . Figs 67, 68: scale bar = 1 μm .



Detonula pumila (Castracane) Schütt

Figs 60-61; Samples 4266, 4283

Hasle 1973b: 18-20, figs 74-76. Sancetta 1990: 202, fig. 4.

Basionym: *Lauderia pumila* Castracane.

Synonym: *Schroederella delicatula* (Peragallo) Pavillard.

Valves circular, 11-20 μm in diameter. Complete areolae in the central area and radial ribs outward. Single strutted process with simple external tube in the depressed centre. One marginal ring of strutted processes with double external tubes with upright flanged extensions, 6-8 in 10 μm . Single labiate process with simple external tube in the circumferential ring of strutted processes. Copulae numerous and split.

REMARKS: *D. pumila* is never a common member of the assemblage. This species can be distinguished from the others of the genus by morphometric data and the shape of the external tubes of the marginal strutted processes.

DISTRIBUTION IN ARGENTINA: This cosmopolitan species has been reported by Müller-Melchers (1959) and Balech (1962, 1964) as *S. delicatula*, by Balech (1976) as *Detonula delicatula* and by Lange (1985) and Sar (1996) as *D. pumila*. In our study we found it in San Clemente del Tuyú, Santa Teresita, Nueva Atlantis and Villa Gesell, rare in spring, summer and fall. No other species of the genus have been reported from Argentinian coastal waters.

Lauderia annulata Cleve

Figs 62-65; Samples 4279, 4283

Cleve 1873: 8, pl.1, fig. 7. Hasle 1973b: 3-6, figs 1-3, 6-12. Round et al. 1990: 150, figs a-i.

Synonym: *Lauderia borealis* Gran.

Valves circular, slightly convex, 26-36.8 μm in diameter. Valve face with central annulus, radial costae, 30-32 in 10 μm , and marginal areolae, 30-32 in 10 μm . Few sub-central strutted processes, numerous strutted processes in several ranks at the margin of the valve. Strutted processes with long external tube and short internal tube. Single large labiate process near the valve edge. One ring of long occluded processes between the loculate and the costate regions.

REMARKS: *Lauderia* is a monospecific genus, *L. annulata* can be distinguished from the species of other related genera, such as *Bacterosira* Gran and *Detonula*, by the type of chain-formation, the number of copulae and the structure of the cingulum (Round et al. 1990, Takano 1990, Hasle & Syvertsen 1996).

DISTRIBUTION IN ARGENTINA: This common and widespread species (Round et al. 1990) has been reported from Mar del Plata by Balech (1964), in Bahía San Antonio by Sar (1996), in Golfo San Matías by Carreto et al. (1974) and Verona et al. (1974) and in Golfo San José by Charpy & Charpy (1977) as *L. borealis*. It was reported from oceanic waters in front of Buenos Aires Province by Frenguelli & Orlando (1959) and Müller-Melchers (1959). In our samplings we found it in San Clemente del Tuyú, Santa Teresita, La Lucila del Mar, Mar de Ajó, Nueva Atlantis, Pinamar and Villa Gesell, rare in fall and winter.

Minidiscus chilensis Rivera

Figs 66-68; Samples 4251, 4253, 4289

Rivera & Koch 1984: 281-282, figs 5-14. Ferrario 1988: 313-314, pl. 1, fig. 3; pl. 2, figs 1-2.

Valves circular in outline, diameter 3.5-8.4 μm . Central area undulated, non-areolated with three strutted processes close to the centre. Labiate process between two strutted processes in the elevated area. "Perforation" between the labiate process and the subcentral strutted process. Areolae in radial rows near the valve margin, 46-69 in 10 μm .

REMARKS: This species differs from the others of the genus by the central part of the valve undulated and non-areolated and by the "perforation" internally occluded. Some of our specimens are bigger than those reported in the literature and have less number of areolae.

DISTRIBUTION IN ARGENTINA: *M. chilensis* has been reported from Puerto Deseado by Ferrario (1988). In this study we have found it in Santa Teresita, Mar de Ajó, Pinamar and Villa Gesell, rare all year round. *M. comicus* is other species of the genus reported by Lange (1985) from Argentinian marine waters, but we did not observe it in our material.

Porosira pentaportula Syvertsen & Lange Figs 69-71; Samples 4279, 4283, 4289

Syvertsen & Lange 1990: 143-151, figs 1-21.

Valves convex, 28-45 μm in diameter, with radially branching striae, 36-38 in 10 μm , and tangential areolae 84-90 in 10 μm near the margin. Valve face with scattered strutted processes except in the central area. Valve mantle with one irregular ring of strutted processes. Single marginal labiate process radially oriented with two close pairs of strutted processes (insert Fig. 71).

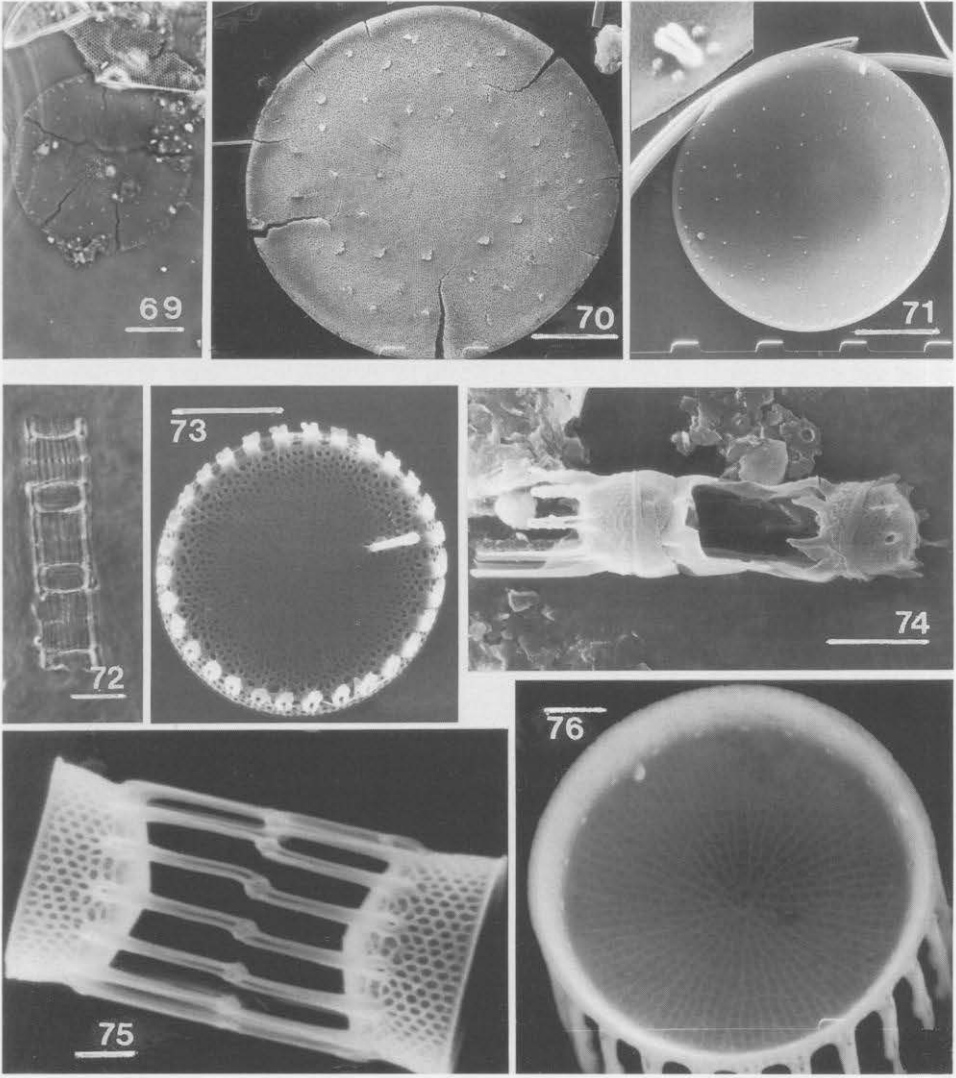
REMARKS: This species was compared with other species of the genus and with the related genera *Lauderia* and *Thalassiosira* by Syvertsen & Lange (1990). The distinctive feature of the species is the labiate process with four strutted processes around.

DISTRIBUTION IN ARGENTINA: This is the first report of *P. pentaportula* in Argentina. The species was found in San Clemente del Tuyú, Santa Teresita, La Lucila del Mar, Mar de Ajó, Nueva Atlantis, Pinamar and Villa Gesell, present all year round, common in fall and winter. *Porosira glacialis* (Grunow) Jørgensen is the other species of the genus reported from Argentinian coastal waters by Marques Da Cunha & Da Fonseca (1917), but we did not observe it in our material.

Skeletonema costatum (Greville) Cleve

Figs 72-76; Samples 4263, 4268, 4280, 4281, 4282, 4285, 4297

Hasle 1973c: 109-137, figs 1-26, 30-55, 57-61, 63-82, 87. Fryxell 1976: 94, 98, figs 10 a-c, 11. Medlin et al. 1991: 514-521, figs 1-2, 5-8. Aké Castillo et al. 1995: 109, figs 2 f-i, 17-22.



Figs 69-71. *Porosira pentaportula*. Fig. 69. LM: Valve view. Figs 70, 71. SEM: Fig. 70. External valve view; note the scattered processes. Fig. 71. Internal valve view. Note in the left superior angle a detail of the labiate process with two strutted processes on each side. Figs 72-76. *Skeletonema costatum*. Fig. 72. LM: Chain in girdle view. Figs 73-76. SEM: Fig. 73. External valve view of the terminal valve with the labiate process on the valve face. Fig. 74. Chain in girdle view; note the low number of marginal tubuli of the valves. Fig. 75. Girdle view of two adjacent valves connected by marginal tubuli. Fig. 76. Internal valve view; note the labiate process near the margin. Figs 69-72: scale bar = 10 μ m. Figs 73, 74: scale bar = 5 μ m. Figs 75, 76: scale bar = 2 μ m.

Basionym: *Melosira costata* Greville.

Valves circular, flat to convex, 9-19 μm in diameter. Areolae in radial rows from a central silicified ring, 30-40 in 10 μm . One ring of strutted processes between valve face and mantle, 8-9 in 10 μm , 3-4 areolae apart. Strutted processes with short internal tube and long split external tube fused with those of the sibling valves. Single tubular labiate process within the marginal ring of strutted processes on intercalary valves, eccentric and larger labiate process on terminal valves.

REMARKS: *S. costatum* can be distinguished from related species by the silicification of the frustule, the type of strutted processes (split or tubular), and the length of the chains.

DISTRIBUTION IN ARGENTINA: This cosmopolitan coastal species (Medlin et al. 1991) has frequently been reported from Argentinian coastal and oceanic waters (see Ferrario & Galván 1989 and Gayoso 1988). We have found it in Santa Teresita, La Lucila and Mar, Mar de Ajó, Nueva Atlantis, Pinamar and Villa Gesell, common to fairly abundant all year round, with occasional blooms in spring and fall. No other species of the genus have been reported from Argentinian coastal waters.

Conclusions

The family Thalassiosiraceae has a high diversity in Buenos Aires coastal waters. In this study we report twenty-five taxa, five of which are here reported for first time for Western South-Atlantic waters, these are: *Thalassiosira binata*, *T. lundiana*, *T. oestrupii* var. *venrickae*, *T. proschkinae* and *Porosira pentaportula*.

T. angulata, *T. nanolineata* and *T. nodulolineata* were reported by Lange (1985) without electron-microscopic analysis. We confirm the presence of these species in the area using scanning electron microscopy for a reliable identification.

The comprehensive works on the genus *Thalassiosira* from different regions (Rivera 1981, Hallegraeff 1984, Johansen & Fryxell 1985, Mahood et al. 1986, Sancetta 1990, Licea 1990, Harris et al. 1995, Muylaert & Sabbe 1996) and the information published by Hasle & Syvertsen (1996) about species distributions allowed us to delineate more clearly the distributional pattern of some species; *T. anguste-lineata*, *T. decipiens*, *T. lundiana*, *T. proschkinae*, *T. punctigera* and *T. rotula* have a cosmopolitan distribution and *T. curviseriata*, *T. eccentrica*, *T. pacifica* and *T. tenera* cosmopolitan except for polar regions.

T. endoseriata, *T. nanolineata* and *T. nodulolineata* were defined as warm-water species by Hasle & Syvertsen (1996), Hasle & Fryxell (1977b) and Hallegraeff (1984), respectively and *T. lentiginosa* as an Antarctic species by Johansen & Fryxell (1985). In all these cases the distribution of the mentioned species must be extended to temperate waters. *T. angulata* was by Hasle & Syvertsen (1996) considered as a species restricted to the Northern Hemisphere. In our study we have found it in Buenos Aires coastal waters, and therefore the distribution of this species must be extended to the Southern Hemisphere.

The analysis of the valve morphology of our material showed some differences with previously published information. Despite comments on the absence of an external process tube in *T. minuscula* we have found some specimens with a long external tube of the labiate process, similar to those illustrated by Rivera (1981) and Hernández Becerril & Tapia Peña (1996). Some specimens assigned to *T. oestrupii* var. *venrickae* showed one supplementary strutted process near the labiate process, a feature that has not been reported before. Additionally, many specimens of *T. anguste-lineata* present a central strutted process.

Differences in morphometric data between our observations and those reported in the literature were observed in the cases of *T. curviseriata*, *T. nanolineata* and *Minidiscus chilensis* Rivera, and therefore the morphometric range of these species should be enlarged.

Acknowledgements

We would like to thank Dr. Silvia Sala for critically reading of this paper and to Ms. Nilda Malacalza for the technical assistance. The study was supported by Grants of CIC de la Provincia de Buenos Aires and CONICET.

References

- AKÉ CASTILLO, J., M.E. MEAVE DEL CASTILLO & D.U. HERNÁNDEZ BECERRIL (1995): Morphology and distribution of species of the diatom genus *Skeletonema* in a tropical coastal lagoon. - Eur. J. Phycol. **30**: 107-115.
- BALECH, E. (1962): Plancton de las campañas oceanográficas Drake I y II. - Servicio de Hidrografía Naval, H **627**: 1-57.
- BALECH, E. (1964): El plancton de Mar del Plata durante el período 1961-62. - Bol. Inst. Biol. Mar. **4**: 1-49.
- BALECH, E. (1976): Fitoplancton de la campaña Convergencia 1973. - Physis, Sección A **35**(90): 47-58.
- BALECH, E. (1979): Dinoflagelados. Campaña Oceanográfica Argentina, Islas Orcadas, 06/75. - Servicio de Hidrografía Naval, H **655**: 1-76.
- BALECH, E. & S.Z. EL SAYED (1965): Microplankton of the Weddell Sea. - Amer. Geogr. Union, Antarctic Res. Series **5**: 107-124.
- CARRETO, J.I., C.A. VERONA, A.B. CASAL & M.A. LABORDE (1974): Fitoplancton, pigmentos y condiciones ecológicas del Golfo San Matías III. - Inst. Biol. Mar. Mar del Plata, Contribución 237. Informe 10 de la Comisión de Investigaciones Científicas de la Provincia de Buenos Aires: 49-76.
- CHARPY, C. & L. CHARPY (1977): Biomasse phytoplanctonique, production primaire et facteurs limitant la fertilité des eaux du Golfe "San José" (Péninsule Valdés, Argentine). - Thèse, Centre Universitaire de Marseille-Luminy, Université d'Aix-Marseille II, 186 pp.
- CLEVE, P.T. (1873): Examination of diatoms found on the surface of the Sea of Java. - Kongl. Svenska Vetenskapskad. Handl., Bihang **1**(11): 1-13.
- FERRARIO, M.E. (1988): Ultrastructure de deux taxa de la famille Thalassiosiraceae: *Thalassiosira subtilis* var. *minima* var. nov. et *Minidiscus chilensis* présents sur les côtes de l'Atlantique Sud (Argentine). - Cryptog. Algol. **9**: 311-318.

- FERRARIO, M.E. & N.M.GALVÁN (1989): Catálogo de las diatomeas marinas citadas entre los 36° y los 60° S con especial referencia al Mar Argentino. - Instituto Antártico Argentino, Publicación 20: 1-327.
- FERRARIO, M.E. & E.A SAR (1984): Consideraciones taxonómicas sobre diatomeas epífitas del intermareal rocoso marplatense I. - Revista Mus. La Plata N.s. 13, Secc. Bot. **79**: 197-211.
- FERRARIO, M.E. & E.A. SAR (1985): Consideraciones taxonómicas sobre diatomeas epífitas del intermareal rocoso marplatense II. - Rev. Mus. La Plata N.s. 14, Secc. Bot. **88**: 11-27.
- FERRARIO, M.E. & E.A. SAR (1988): Marine diatoms from Chubut (Argentina Republic) Centrales II - *Thalassiosira*. - Revista Brasil. Biol. **48**: 421-429.
- FERRARIO, M.E., E.A. SAR, C. CASTAÑOS & F. HINZ (1999): Potentially toxic species of the diatom genus *Pseudo-nitzschia* in Argentinian coastal waters. - Nova Hedwigia **68**: 131-147.
- FERRARIO, M.E., E.A. SAR & S.E. SALA (1995): Metodología básica para el estudio del fitoplancton con especial referencia a las diatomeas. In: ALVEAL, K., M.E. FERRARIO, E.C. DE OLIVEIRA & E.A. SAR (eds): Manual de Métodos Ficológicos: 1-23. Universidad de Concepción, Editora A. Pinto, Chile.
- FRENGUELLI, J. (1928): Diatomeas del Océano Atlántico frente a Mar del Plata. - Anales Mus. Nac. Hist. Nat. Bernardino Rivadavia **34**: 497-572.
- FRENGUELLI, J. (1930): Diatomeas marinas de la costa atlántica de Miramar (Provincia de Buenos Aires). - Anales Mus. Nac. Hist. Nat. Bernardino Rivadavia **36**(2): 243-311.
- FRENGUELLI, J. (1938): Diatomeas de la Bahía San Blás (Provincia de Buenos Aires). - Revista Mus. La Plata N.s. 1, Secc. Bot. **5**: 251-337.
- FRENGUELLI, J. & H.A. ORLANDO (1959): Operación Merluza. Diatomeas y silicoflagelados del plancton del "VI Crucero". - Servicio de Hidrografía Naval, H **619**: 5-62.
- FRYXELL, G.A. (1975): Three new species of *Thalassiosira*, with observations on the occluded process, a newly observed structure of diatom valves. - Nova Hedwigia, Beih. **53**: 57-75.
- FRYXELL, G.A. (1976): The position of the labiate process in the diatom genus *Skeletonema*. - Br. Phycol. J. **11**: 93-99.
- FRYXELL, G.A. (1977): *Thalassiosira australis* Peragallo and *T. lentiginosa* (Janisch) G. Fryxell, comb. nov.: two Antarctic diatoms (Bacillariophyceae). - Phycologia **16**: 95-104.
- FRYXELL, G.A. (1978): The diatom genus *Thalassiosira*: *T. licea* sp. nov. and *T. angstii* (Gran) Makarova, species with occluded processes. - Bot. Marina **21**: 131-141.
- FRYXELL, G.A. & G.R. HASLE (1972): *Thalassiosira eccentrica* (Ehrenb.) Cleve *T. symmetrica* sp. nov., and some related centric diatoms. - J. Phycol. **8**: 297-317.
- FRYXELL, G.A. & G.R. HASLE (1977): The genus *Thalassiosira*: some species with a modified ring of central strutted processes. - Nova Hedwigia, Beih. **54**: 67-98
- FRYXELL, G.A. & G.R. HASLE (1980): The marine diatom *Thalassiosira oestrupii*: structure, taxonomy and distribution. - Amer. J. Bot. **67**: 804-814.
- GAYOSO, A.M. (1981): Estudio del fitoplancton del Estuario de Bahía Blanca (Provincia de Buenos Aires, Argentina. Zona Interna, Pto. Cuatrerros). - Instituto Argentino de Oceanografía, Contribución **60**: 1-29.
- GAYOSO, A.M. (1982): Estudio de las diatomeas del Estuario de Bahía Blanca. - Tesis 403, Universidad Nacional de La Plata, 75 pp.
- GAYOSO, A.M. (1988): Variación estacional del fitoplancton de la zona más interna del estuario de Bahía Blanca (Prov. Buenos Aires, Argentina). - Gayana, Botánica **45**(1-4): 241-247.

- GAYOSO, A.M. (1989): Species of the diatom genus *Thalassiosira* from a coastal zone of the South Atlantic (Argentina). - Bot. Marina **32**: 331-337.
- GRAN, H.H. & E.E. ANGST (1931): Plankton diatoms of Puget Sound. - Puget Sound Mar. Sta. Publ. **7**: 417-519.
- GAUL, U., U. GEISSLER, M. HENDERSON, R. MAHONEY & C. REIMER (1993): Bibliography on the fine-structure of diatom frustules (Bacillariophyceae). - Proc. Acad. Nat. Sci. Philadelphia **144**: 69-238.
- HALLEGRAEFF, G.M. (1984): Species of the diatom genus *Thalassiosira* in Australian waters. - Bot. Marina **27**: 495-513.
- HARRIS, A.S.D., L.K. MEDLIN, J. LEWIS & J. JONES (1995): *Thalassiosira* species (Bacillariophyceae) from a Scottish sea-loch. - Eur. J. Phycol. **30**: 117-131.
- HASLE, G.R. (1972): *Thalassiosira subtilis* (Bacillariophyceae) and two allied species. - Norw. J. Bot. **19**: 111-137.
- HASLE, G.R. (1973a): Thalassiosiraceae, a new Diatom Family. - Norweg. J. Bot. **20**: 67-69.
- HASLE, G.R. (1973b): Some marine plankton genera of the diatom Family Thalassiosiraceae. - Nova Hedwigia, Beih. **45**: 1-49.
- HASLE, G.R. (1973c): Morphology and taxonomy of *Skeletonema costatum* (Bacillariophyceae). - Norweg. J. Bot. **20**: 109-137.
- HASLE, G.R. (1976a): Examination of diatom type material: *Nitzschia delicatissima* Cleve, *Thalassiosira minuscula* Krasske, and *Cyclotella nana* Hustedt. - Br. Phycol. J. **11**: 101-110.
- HASLE, G.R. (1976b): The biogeography of some marine planktonic diatoms. - Deep-Sea Res. **23**: 319-338.
- HASLE, G. R. (1978): Some *Thalassiosira* species with one central process (Bacillariophyceae). - Norweg. J. Bot. **25**: 77-110.
- HASLE, G.R. (1979): *Thalassiosira decipiens* (Grun.) Jørg. (Bacillariophyceae). - Bacillaria **2**: 85-108.
- HASLE, G.R. (1983): *Thalassiosira puntigera* (Castracane) comb. nov., a widely distributed marine planktonic diatom. - Nordic J. Bot. **3**: 593-608.
- HASLE, G.R. & G.A. FRYXELL (1970): Diatoms: cleaning and mounting for light and electron microscopy. - Trans. Amer. Microscop. Soc. **89**: 469-474.
- HASLE, G.R. & G.A. FRYXELL (1977a): *Thalassiosira conferta* and *T. binata*, two new diatom species. - Norweg. J. Bot. **24**: 239-248.
- HASLE, G.R. & G.A. FRYXELL (1977b): The genus *Thalassiosira*: some species with a linear areola array. - Nova Hedwigia, Beih. **54**: 15-66.
- HASLE, G.R. & E.E. SYVERTSEN (1996): Marine diatoms. In: TOMAS, C.R. (ed.): Identifying Marine Phytoplankton: 5-385. Academic Press, San Diego, California.
- HENDEY, N.I. (1937): The plankton diatom of the Southern Seas. - Discovery Reports **16**: 151-365.
- HERNÁNDEZ BECERRIL, D.U. & M.I. TAPIA PEÑA (1995): Planktonic diatoms from the Gulf of California and coasts off Baja California: species of the genus *Thalassiosira*. - Bot. Marina **38**: 543-555.
- HERZIG, W.N. & G.A. FRYXELL (1986): The diatom genus *Thalassiosira* Cleve in gulf stream warm core rings: Taxonomy, with *T. intrannula* and *T. lineoides*, spp. nov. - Bot. Marina **29**(1): 11-25.
- JOHANSEN, J.R. & G.A. FRYXELL (1985): The genus *Thalassiosira* (Bacillariophyceae): studies on species occurring south of the Antarctic Convergence Zone. - Phycologia **24**: 155-179.

- KRASSKE, G. (1941): Die Kieselalgen des chilenischen Küstenplanktons. - Arch. Hydrobiol. **38**: 260-287.
- LANGE, C. (1985): Spatial and seasonal variations of diatom assemblages off the Argentinian coast (South Western Atlantic). - Oceanol. Acta **8**: 361-370.
- LANGE, C.B., G.A. HASLE & E.E. SYVERTSEN (1992): Seasonal cycle of diatoms in the Skagerrak, North Atlantic, with emphasis on the period 1980-1990. - Sarsia **77**: 173-187.
- LANGE, C., R.M. NEGRI & H.R. BENAVIDES (1983): Algunas especies del género *Thalassiosira* (Bacillariophyceae) del Mar Argentino. (Parte 1). - Iheringia, Série Botânica **31**: 9-30.
- LICEA, S. (1990): *Thalassiosira* species from the Southern gulf of Mexico. In: KOCIOLEK, J.P.(ed.): Proceedings of the 11th International Diatom Symposium: 311-335. - Mem. Calif. Acad. Sci. 17.
- MAHOOD, A.D., G.A. FRYXELL & M. MCMILLAN (1986): The diatom genus *Thalassiosira*: species from the San Francisco Bay System. - Proc. Calif. Acad. Sci. **44**: 127-156.
- MAKAROVA, I.V., S.I. GENKAL & G.V. KUZMIN (1979): Species of the genus *Thalassiosira* Cl. (Bacillariophyta), found in continental water bodies of the U.S.S.R. - Bot Zhurn. **64**: 921-927.
- MARQUES DA CUNHA, A. & O. DA FONSECA (1917): O microplankton do Atlantico nas imediações de Mar del Plata. - Mem. Inst. Oswaldo Cruz **9**: 3-5.
- MARTINEZ MACCHIAVELLO, J.C. (1976): Condiciones climáticas antárticas en parte del pleistoceno. Interpretación paleoclimática basada en el resultado del análisis diatomológico en la Perforación V: 15-142. - Instituto Antártico Argentino, Contribución **194**: 1-35.
- MEDLIN, L.K., H. ELWOOD, S. STICKEL & M.L. SOGIN (1991): Morphological and genetic variation within the diatom *Skeletonema costatum* (Bacillariophyta): evidence for a new species, *Skeletonema pseudocostatum*. - J. Phycol. **27**: 514-524.
- MEUNIER, A. (1910): Microplankton des Mers de Barents et de Kara. Duc d'Orleans Campagne Arctique de 1907, 355 pp. Bulens, Brussels.
- MÜLLER-MELCHERS, P. (1953): New and little known diatoms from Uruguay and the South Atlantic coast. - Com. Bot. Mus. Hist. Nat. Montevideo **3**(30): 1-11.
- MÜLLER-MELCHERS, P. (1959): Plankton diatoms of the Southern Atlantic Argentine and Uruguay coast. - Comun. Bot. Mus. Hist. Nat. Montevideo **3**(38): 1-45.
- MUYLAERT, K. & K. SABBE (1996): The diatom genus *Thalassiosira* (Bacillariophyta) in the Estuaries of the Schelde (Belgium/ The Netherlands) and the Elbe (Germany). - Bot. Marina **39**: 103-115.
- PROSCHKINA-LAVRENKO, A.I. (1961): Diatomeae novae e Mari Nigro (Ponto Wuxino) et Azoviano (Maeotico). Notul. Syst. Inst. Cryptog. URSS **14**: 33-39.
- RIVERA, P. (1981): Beiträge zur Taxonomie und Verbreitung de Gattung *Thalassiosira* Cleve (Bacillariophyceae) in den Küstengewässern Chiles. - Biblioth. Phycol. **56**: 1-220. J. Cramer, Vaduz.
- RIVERA, P. & P. KOCH (1984): Contributions to the Diatom Flora of Chile II. In: MANN D.G. (ed.). 7th International Diatom Symposium: 279-298. Koeltz, Koenigstein.
- ROSS, R., E.J.COX, N.I. KARAYEVA, D.G. MANN, T.B. PADDOCK, R. SIMONSEN & P.A. SIMS (1979): An amended terminology for the siliceous components of the diatom cell. - Nova Hedwigia, Beih. **64**: 513-533.
- ROUND, F.E., R.M. CRAWFORD & D.G. MANN (1990): The Diatoms. Biology and morphology of the genera, 747 pp. - Cambridge University Press, Cambridge.
- SANCETTA, C. (1990): Occurrence of Thalassiosiraceae (Bacillariophyceae) in two fjords of British Columbia. - Nova Hedwigia, Beih. **100**: 199-215.
- SAR, E.A. (1996): Flora diatomológica de Bahía San Antonio (Prov. de Río Negro, Argentina). O. Centrales I. - Revista Mus. La Plata N.s. 14, Secc. Bot. **106**: 386-400.

- SAR, E.A. & M.E. FERRARIO (1987): New records of *Thalassiosira curviseriata* Takano and *T. pacifica* Gran & Angst (Bacillariophyceae) from Argentina. - *Gayana, Bot.* **44**: 89-91.
- SYVERTSEN, E.E. & C.B. LANGE (1990): *Porosira pentaportula* Syvertsen & Lange, sp. nov. (Bacillariophyceae), a marine planktonic diatom. - *Nova Hedwigia, Beih.* **100**: 143-151.
- TAKANO, H. (1978): Scanning electron microscopy of diatoms - IV. *Thalassiosira binata* Fryxell. - *Bull. Tokai Reg. Fish. Res. Lab.* **94**: 45-49.
- TAKANO, H. (1981): New and rare diatoms from Japanese marine waters. VI. - *Bull. Tokai Reg. Fish. Res. Lab.* **105**: 31-43.
- TAKANO, H. (1990): Diatoms. In: FUKUYO, Y., H. TAKANO, M. CHIHARA & K. MATSOUKA (eds): *Red tide organisms in Japan - An illustrated taxonomic guide*: 162-331. Uchida Rokakuho, Tokyo.
- VERONA, C.A., J.I. CARRETO & A. HINOJAL (1974): Fitoplancton, pigmentos y condiciones ecológicas del Golfo San Matías II. Campaña SAO II (mayo de 1971). - *Inst. Biol. Mar. Mar del Plata, Contr.* **236**. Informe 10 de la Comisión de Investigaciones Científicas de la Provincia de Buenos Aires: 23-48.

Received 20 September 1999, accepted in revised form 20 January 2001.