

日本産海産珪藻の新種稀種(9)

誌名	東海区水産研究所研究報告
ISSN	00408859
著者	高野, 秀昭
巻/号	109号
掲載ページ	p. 27-39
発行年月	1983年2月

農林水産省 農林水産技術会議事務局筑波産学連携支援センター
Tsukuba Business-Academia Cooperation Support Center, Agriculture, Forestry and Fisheries Research Council
Secretariat



New and Rare Diatoms from Japanese Marine Waters—IX.

A New *Rhaphoneis* Emitting Mucilaginous Threads

Hideaki TAKANO

Abstract: A small pelagic pennate diatom which radiated numerous mucilaginous threads around the frustule was discovered. An electron microscope is essential for detecting this diatom in plankton samples. The mucilaginous threads are clearly seen around the frustule on cells fixed with glutaraldehyde and cleaned with water.

This diatom seems to be a new species in the genus *Rhaphoneis* in Subordo Araphidineae. The valve has a few smaller poroids in terminal areas on the terminal slopes. No labiate process is found in the valve, and there is no apical pore field nor slit field clearly ringed round. The new name *Rhaphoneis crinigera* is given to this diatom.

It is well-known that many centric diatoms in Thalassiosiraceae discharge clear mucilaginous thread from the strutted processes in valves. Many pennate diatoms also excrete organic substance mainly to connect their cells with each other in a chain, or to fix their colonies to a substratum. However, probably no pennate species emitting mucilaginous threads, radially around the frustule for floating the cells, has been reported.

The present author recently obtained a small pennate diatom which radiated many thin mucilaginous threads obviously around the frustule. This diatom was found in seawater collected from the downstream of the Sumida River nearby the Tokai Regional Fisheries Research Laboratory on March 16, 1982, and was grown in glass flasks with enriched seawater. The size of this diatom was so small that details of the frustule were only seen with electron microscopes.

As the result of observing the fine structure of many valves, the author considers that this diatom may be a new species in the genus *Rhaphoneis*. The description and electron micrographs of the frustule with a new specific name are given in this article.

Description

Classis Bacillariophyceae

Ordo Bacillariales

Subordo Araphidineae

Familia Diatomaceae DUMORTIER 1822

Received: October 8, 1982.

Contribution A No. 765 from the Tokai Regional Fisheries Research Laboratory.

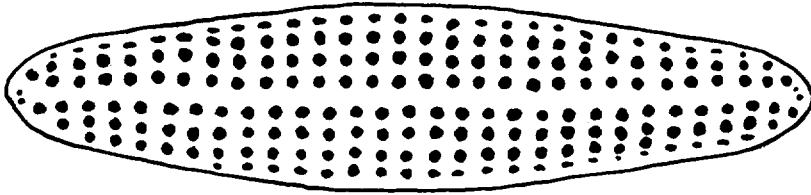


Fig. 1. *Rhapsoneis crinigera* sp. nov., apical length 10.3 μm .

Genus *Rhapsoneis* EHRENBERG

Rhapsoneis crinigera TAKANO sp. nov.

(Figs. 1–20)

Cellulae pelagicae, vel solitariae vel aliquando aggregatae. Cellulae emittentes multa fila gracilia mucosa circum frustulas ex areolis. Aspectu cingulari, frustulae quadrangulatae cum angulis rotundatis. Valvae lineari-ellipticae cum apicibus rotundatis, ca. 5.9–10.3 μm longae, 2.2–3.2 μm latae. Area axialis linearis inter ambos apices. Striae transapicales 3 per 1 μm , plerumque parallelae, in seriebus alternis trans aream axialem mediam. Areolae poroides, 4–5 per 1 μm , formantes 8–12 series longitudinales in medi-valvis. Frons convexa in plano transapicali, et nec areola locata in zona marginalis valvae. Nec rimoportula inventa in valvis. Vel tres vel minores parvulae areolae sitae in areis terminalibus. Valvocopula porosa cum duabus seriebus horizontalibus areolarum poroidum, supra grandium et inferne parvarum, 3 per 1 μm . Copula porosa etiam cum duabus seriebus parvarum areolarum consimilium, 3 per 1 μm .

Iconotypus: Fig. 2, 3 and 20. (Membranae negativae per microscopia electronica figurarum 2, 3 et 20 conservatae in Collectione Novarum Bacillariophycearum Takanoi No. 18.)

Locus typicus: Sinus Tokyoensis, Japonia.

Cells pelagic, solitary or sometimes gathered in masses. Many thin mucilaginous threads radiated around the frustule from areolae. In girdle view, frustules quadrangular with round corners. Valves linear-elliptical with round ends, ca. 5.9–10.3 μm long, and 2.2–3.2 μm wide. Axial area linear between both ends. Transapical striae 3 per 1 μm , usually parallel, in alternate rows across the central axial area. Poroid areolae 4–5 in 1 μm , forming 8–12 longitudinal rows in the middle part of the valve. Valve face convex transapically, and no areola located in the marginal zone of valves. No labiate process found in the valve. Three or less numbers of smaller areolae located in terminal areas. The valvocopula pierced with two horizontal rows of poroids, 3 per 1 μm , upper large and lower small. The copula also pierced with two rows of small poroids of similar sizes, 3 per 1 μm .

Iconotype: Figs. 2, 3 and 20. (The TEM and SEM negative films are kept in the

Takano's New Diatom Collection No. 18.)

Type locality: Tokyo Bay, Japan.

Discussion

This small pennate diatom is characterized by its pelagic life and the very thin mucilaginous threads extended out of frustules. The threads are easily seen by electron microscopes on cells cleaned with water after fixing with glutaraldehyde (Figs. 2 and 20). It is evident that the threads are coming out through many poroids located in the valve and copulae (Fig. 19).

Though there are valves of somewhat slender (Figs. 3, 7 and 11), broad (Figs. 4 and 5), and moderate (Figs. 6 and 8–10), all are linear-elliptical. Poroid areolae are regularly arranged in transapical and longitudinal rows on both sides of the axial area in most valves, however, abnormal arrangement of them (Figs. 12 and 13) was often found in a concentrated population by cultivation.

The transapical rows of areolae are usually discontinuous across the axial area. The vela in areolae were hardly seen on most acid-cleaned valves. But the poroids of a valve shown in Fig. 15 look like bearing simple vela, and some holes are made in the vela. If those holes are not artifacts, very thin siliceous membranes may be present in areolae, and mucilaginous threads are coming out through the vela.

Three or less numbers of apical pore-like areolae are located in the sloping terminal areas. Those smaller poroids are sometimes recognized with the transmission electron microscope (TEM), and much clearly with the scanning electron microscope (SEM) (Figs. 16 and 17). Copulae have two horizontal rows of poroids each, and the first row in the valvocopula is composed of larger poroids (Figs. 14 and 20).

As there is no raphe on both valves, this diatom is evidently a member of Araphidineae. Although it has no labiate process in valves, it is preferable to put this diatom in the genus *Rhaphoneis*, because of its solitary living cells, and of having no pore field nor slit field clearly ringed round in both apices but with a few smaller poroids in terminal areas. Some species of *Rhaphoneis* have transverse striae which are partially or wholly discontinuous across the axial area. And it is known that labiate processes are not found in valves of some *Rhaphoneis* (ANDREWS, 1975). Therefore, this diatom newly found is included in *Rhaphoneis* with no confliction.

R. crinigera was first found in the downstream of the Sumida River in Tokyo on March 16, 1982, and later it was detected in samples collected off Yokohama City on July 17, 1982. Individuals found in Atsumi Bay in July, 1982, were smaller in sizes, ca. 6 μm long and 2.3 μm wide. This diatom may be commonly distributed in coastal eutrophic waters in Tokyo Bay and adjacent waters. Because of the smallness of its size, electron microscopes are necessary for the precise identification.

Preservation of Negatives of Typical Micrographs

The International Code of Botanical Nomenclature at present requires to indicate a nomenclatural type for each of new taxa. The present author has been puzzled for many years what is the best element for the type of diatom taxa. Many workers are making their diatom type specimens mounted on slide glasses. However, recent studies on diatom morphology with the aid of electron microscopes show more importance of fine structures as the specific characteristics of diatoms. Specimens mounted on slide glasses cannot be seen with the electron microscopes. Therefore, specimens put in liquid preservatives or dried on SEM stubs may be better than mounted slides for later re-examination, however, most museums do not accept to keep those. Accordingly, the present author prefers to indicate iconotypes for his new taxa, and to keep the micrographic negatives which contain better information on the shape and fine structures on each taxon as far as possible.

The type materials of diatom taxa so far given the names by the present author are indicated in the following.

Takano's New Diatom Collection

- No. 1. *Chaetoceros lorenzianum* GRUNOW forma *singulare* TAKANO, 1960:
J. Oceanogr. Soc. Jap., 16(4); 182, fig. 2a.
Iconotypus: fig. 2a.
(Two 35 mm LM negative films of specimens made in 1959 are kept.)
- No. 2. *Chaetoceros didymum* EHRENBERG forma *singulare* TAKANO, 1960:
J. Oceanogr. Soc. Jap., 16(4); 182, fig. 2b.
Iconotypus: fig. 2b.
(One 35 mm LM negative film of a specimen made in 1959 is kept.)
- No. 3. *Chaetoceros affine* LAUDER forma *singulare* KOKUBO, 1955:
Fuyu Keisorui (1st ed.): 181.
Iconotypus: TAKANO, 1960, J. Oceanogr. Soc. Jap., 16(4): 184, fig. 4a.
Ditto, subforma *extreme* TAKANO, 1960:
J. Oceanogr. Soc. Jap., 16(4): 184.
Typus: the description by KOKUBO (1955, Fuyu Keisorui, p.182) on solitary cells bearing thick terminal setae on one valve.
- No. 4. Ditto, subforma *ferox* TAKANO, 1960:
J. Oceanogr. Soc. Jap., 16(4): 184, fig. 4b.
Iconotypus: fig. 4b.
(Two 35 mm LM negative films of specimens made in 1959 are kept.)

Note: In violation of the rules in ICBN, the above mentioned formae of three *Chaetoceros* bear the same epithet '*singulare*.' This was done only to distinguish the solitary cells of them for the use in field observations. Therefore, those should be changed in future if it is needed in taxonomy.

No. 5. *Thalassiosira pulchella* TAKANO, 1963:

Bull. Tokai Reg. Fish. Res. Lab., No. 36: 5, fig. 1a, b, and pl. I, fig. 11a, b.

Iconotypus: fig. 1a, b, and pl. I, fig. 11a, b.

(A TEM glass negative plate made in 1961 is kept.)

Note: *Thalassiosira pulchella* TAKANO is already known as conspecific with *Thalassiosira pacifica* GRAN & ANGST, 1931 (MAKAROVA, 1976).

No. 6. *Thalassiosira mala* TAKANO, 1965:

Bull. Tokai Reg. Fish. Res. Lab., No. 42: 1, fig. 1a-m and pl. I, figs. 1-8.

Iconotypus: pl. I, fig. 3.

(The TEM glass negative plate of fig. 3, which includes the fig. 4 together, made in 1964 is kept.)

No. 7. *Thalassiosira allenii* TAKANO, 1965:

Bull. Tokai Reg. Fish. Res. Lab., No. 42: 4, fig. 2a-f and pl. I, figs. 9-11.

Iconotypus: pl. I, fig. 10.

(The TEM glass negative plate made in 1964 is kept.)

No. 8. *Chaetoceros calcitrans* (PAULSEN) TAKANO, 1968:

Bull. Tokai Reg. Fish. Res. Lab., No. 55: 1.

Ditto, forma *pumilum* TAKANO, 1968:

Bull. Tokai Reg. Fish. Res. Lab., No. 55: 3, fig. 2 and pl. I, figs. 1-7.

Iconotypus: pl. I, fig. 1.

(The TEM glass negative plate made by Mr. O. UMEBAYASHI in 1960 is kept.)

No. 9. *Rhizosolenia hebetata* BAILEY forma *decorata* TAKANO, 1972:

Biol. Oceanogr. North. N. Pacific Ocean: 171, fig. 1a-c, fig. 2a, b.

Iconotypus: fig. 1a-c.

(Two 35 mm LM negative films of specimens made in 1970 are kept.)

Note: As there was no literature referring to the existence of otaria on this species at the time of publication, this forma was made. However, it should be seen nowadays that this form is the typical vegetative cells of *R. hebetata* in cold waters.

No. 10. *Lithodesmium variabile* TAKANO, 1979:

Bull. Tokai Reg. Fish. Res. Lab., No. 100: 36, figs. 1-20.

Iconotypus: fig. 1A-M, fig. 14 and fig. 18.

(The SEM negative films of figs. 14 and 18 are kept.)

No. 11. *Thalassiosira bingensis* TAKANO, 1980a:

Bull. Tokai Reg. Fish. Res. Lab., No. 103: 42, figs. 1-34.

Iconotypus: figs. 1-3, 12, 16 and 21.

(The SEM negative films of figs. 12, 16 and 21 are kept.)

No. 12. *Thalassiosira tealata* TAKANO, 1980b:

Bull. Tokai Reg. Fish. Res. Lab., No. 103: 55, figs. 1-17.

Iconotypus: figs. 1, 3, 7, 11 and 17.

(The SEM and TEM negative films of figs. 3, 7, 11 and 17 are kept.)

No. 13. *Minidiscus comicus* TAKANO, 1981a:

Bull. Tokai Reg. Fish. Res. Lab., No. 105: 32, figs. 1A and 2-13.

Iconotypus: figs. 6 and 10.

(The SEM and TEM negative films of figs. 6 and 10 are kept.)

No. 14. *Thalassiosira spinulata* TAKANO, 1981a:

Bull. Tokai Reg. Fish. Res. Lab., No. 105: 33, fig. 1B and 14-25.

Iconotypus: figs. 17 and 23.

(The TEM negative films of figs. 17 and 23 are kept.)

No. 15. *Thalassiosira curviseriata* TAKANO, 1981a:

Bull. Tokai Reg. Fish. Res. Lab., No. 105: 34, figs. 1C and 26-38.

Iconotypus: figs. 27, 34 and 36.

(The SEM and TEM negative films of figs. 27, 34 and 36 are kept.)

No. 16. *Anorthoneis excentrica* (DONK.) GRUN. var. *ornata* TAKANO, 1981b:

Bull. Tokai Reg. Fish. Res. Lab., No. 105: 49, text-fig. 1, figs. 22 and 23.

Iconotypus: figs. 22 and 23.

(The TEM negative films of figs. 22 and 23 are kept.)

No. 17. Genus *Neodelphineis* TAKANO, 1982:

Bull. Tokai Reg. Fish. Res. Lab., No. 106: 45.

Generitypus: *Neodelphineis pelagica* TAKANO, 1982:

Bull. Tokai Reg. Fish. Res. Lab., No. 106: 46, figs. 1-34.

Iconotypus: figs. 5, 9, 11 and 17.

(The SEM and TEM negative films of figs 5, 9, 11 and 17 are kept.)

This collection of photographic negatives is at present preserved in the Marine Resources Section, Tokai Regional Fisheries Research Laboratory, Kachidoki 5-5-1, Chuo-ku, Tokyo.

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- TAKANO, H., 1980a: New and rare diatoms from Japanese marine waters-IV. *Thalassiosira bingensis* sp. nov. *Bull. Tokai Reg. Fish. Res. Lab.*, No. **103**: 41—53.
- TAKANO, H., 1980b: New and rare diatoms from Japanese marine waters-V. *Thalassiosira tealata* sp. nov. *Bull. Tokai Reg. Fish. Res. Lab.*, No. **103**: 55—63.
- TAKANO, H., 1981a: New and rare diatoms from Japanese marine waters-VI. Three new species in Thalassiosiraceae. *Bull. Tokai Reg. Fish. Res. Lab.*, No. **105**: 31—43.
- TAKANO, H., 1981b: New and rare diatoms from Japanese marine waters-VII. Ten species from neritic waters. *Bull. Tokai Reg. Fish. Res. Lab.*, No. **105**: 45—57.
- TAKANO, H., 1982: New and rare diatoms from Japanese marine waters-VIII. *Neodelphineis pelagica* gen. et sp. nov. *Bull. Tokai Reg. Fish. Res. Lab.*, No. **106**: 45—53.

Explanation of Figures 2-20

Rhaphoneis crinigera sp. nov.

(Figs. 2-16 are TEM-graphs, and Figs. 17-20 are SEM-graphs.)

Fig. 2. Cells and the mucilaginous threads. Length of cells, 8.3-8.7 μm .

Figs. 3, 7, and 11. Slender valves.

Fig. 3. length 10.3 μm , width 2.4 μm .

Fig. 7. " 9.4 μm , " 2.4 μm .

Fig. 11. " 8.5 μm , " 2.2 μm .

Figs. 4 and 5. Broad valves.

Fig. 4. Length 9.5 μm , width 3.2 μm .

Fig. 5. " 9.3 μm , " 3.1 μm .

Figs. 6, and 8-10. Moderate valves.

Fig. 6. Length 9.4 μm , width 2.6 μm .

Fig. 8. " 9.4 μm , " 2.6 μm .

Fig. 9. " 9.0 μm , " 2.7 μm .

Fig. 10. " 9.0 μm , " 2.4 μm .

Figs. 12 and 13. Irregular arrangement of areolae found in cultured specimens.

Fig. 12. Length 8.8 μm , width 2.9 μm .

Fig. 13. " 9.5 μm , " 3.0 μm .

Fig. 14. Valvocopula and copula.

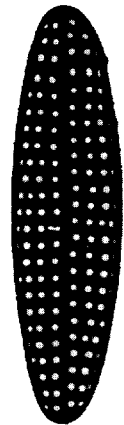
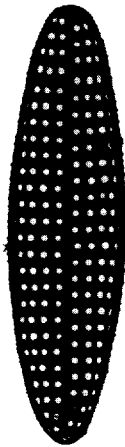
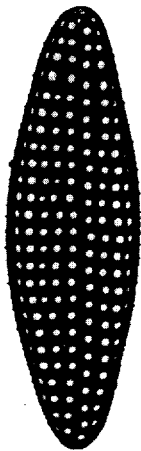
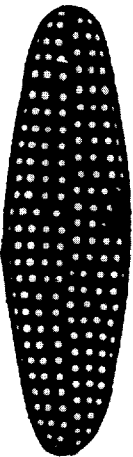
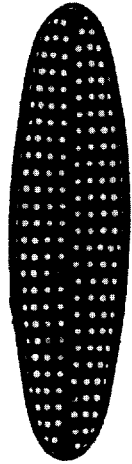
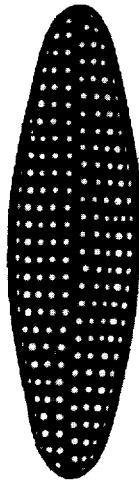
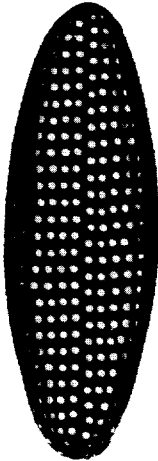
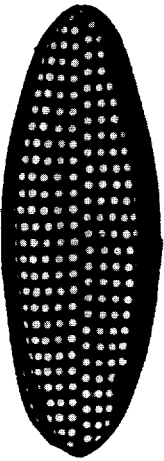
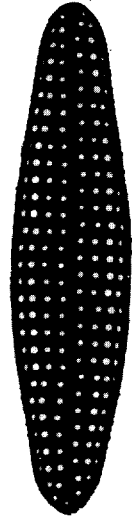
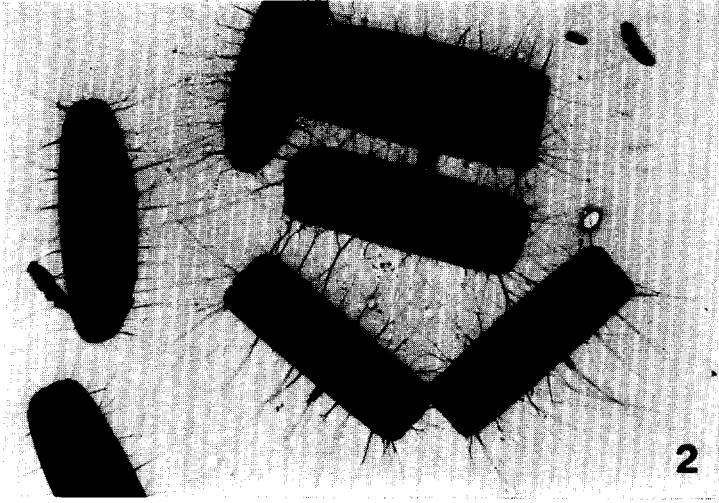
Fig. 15. Vela(?) in poroids.

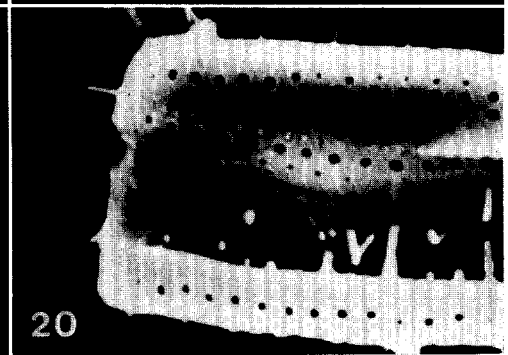
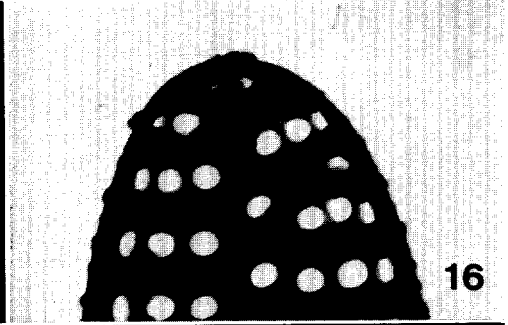
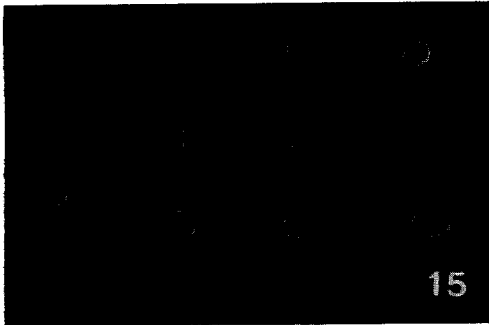
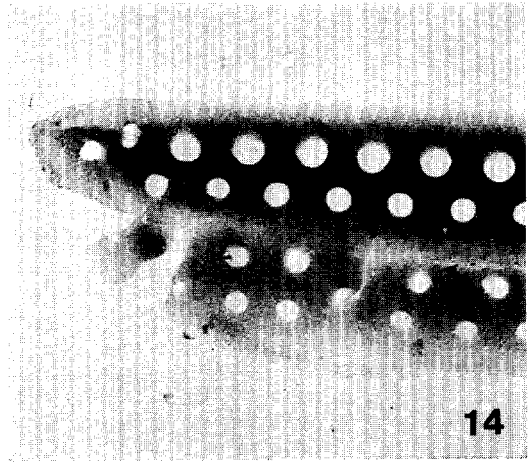
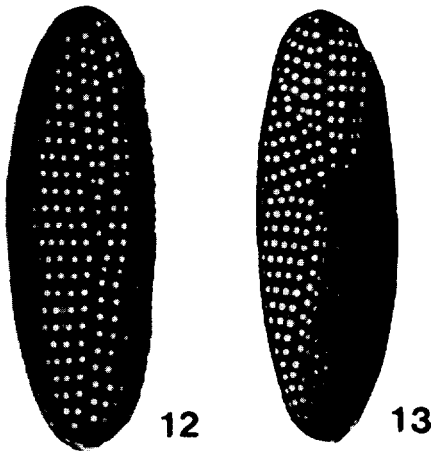
Figs. 16 and 17. Small poroids in apical areas.

Fig. 18. Internal (left) and external (right) valves seen with SEM.

Fig. 19. Mucilaginous threads coming out from poroids.

Fig. 20. Girdle view of a frustule.





日本産海産珪藻の新種稀種—IX.

粘質糸を放射するラフォネースの1新種 (英文)

高野 秀 昭

要 約

円心目の珪藻には、粘質糸を放射する種がかなりある。羽状目の珪藻は、接着のために有機物を分泌するものは多いが、浮游するために粘質糸を放出するものは、これまで報告された例はない。著者は、1982年3月に隅田川河口域でとった海水中にみられた羽状目の1種が、明らかに粘質糸を射出しているのを、透過型電子顕微鏡で発見した。この粘質糸は、生細胞を2%グルタルアルデヒドで固定して水洗した標本を、TEMで見ると容易に認めることができる。この珪藻は小型なので、光学顕微鏡では外形しかみえない。透過型と走査型の電子顕微鏡で被殻の構造を観察した結果、新種とみられるので、ラフォネース・クリニゲラと命名した。

本種の細胞は浮游性で、単体かまたは数個が塊状になるが、一定形の群体はつくらない。蓋殻は長楕円形で、長さ5.9~10.3 μm 、幅2.2~3.2 μm 。縦溝はないが中軸域が両極間に伸びて、その両側に切頂条線が1 μm に3本ある。中軸域の両側の条線は不連続で、交互に平行している。条線は孔状小室列であるが、頂軸方向にも並んでおり、中央部では8~12列が認められる。蓋殻の縁部は、無紋帯でとりまかれている。蓋殻は中軸域が凸出しているが、両極の極域は斜向き、そこに3個以下のより小さい小室がみられる。唇状突起は全くない。細胞の側面観は角の円い4角形で、接蓋帯片とその次の帯片には、水平に2列ずつの小室列があるが、蓋殻に最も近い1列は、蓋殻の小室と同じくらい大きい孔列である。粘質糸は、蓋殻と接蓋帯片の小室から放射されている。この珪藻は、7月に横浜沖の標本中にもみられ、東京湾や隣接水域の富栄養域にはごく普通に出現する種と思われる。

なお、現在の国際植物命名法は、新しいタクソンの設定には、タイプ標本またはタイプ資料の指定を規定し、その保存を勧告している。珪藻では光学顕微鏡用包埋スライドが多く用いられているが、近年は微細構造が分類学的要素としてより重要となってきているので、著者がこれまで創設したタクサについて、すべて図や顕微鏡写真をタイプに指定し、写真はその陰画原板をまとめて保存することにした。