



## *Cocconeis tortilis*: a new marine diatom (Bacillariophyta, Cocconeidaceae) from Japan

HIDEKAZU SUZUKI<sup>1\*</sup>, TAMOTSU NAGUMO<sup>2</sup> & JIRO TANAKA<sup>1</sup>

<sup>1</sup>Graduate School of Marine Science and Technology, Tokyo University of Marine Science and Technology, 4-5-7 Konan, Minato-ku, Tokyo, 108-8477, Japan

<sup>2</sup>Department of Biology, The Nippon Dental University School of Life Dentistry at Tokyo, 1-9-20 Fujimi, Chiyoda-ku, Tokyo, 102-8159, Japan

\*Corresponding author: [hsuzuki@kaiyodai.ac.jp](mailto:hsuzuki@kaiyodai.ac.jp)

### Abstract

A new species of *Cocconeis*, *C. tortilis*, was found on some seaweed collected from the Izu and Okinawa Islands of Japan. Its morphology was examined using both light and electron microscopy; details are described herein. This small diatom is characterized by: 1) a concave raphid valve with a straight raphe inclined from the apical axis, central area forming stauros, and uniseriate striae consisting of circular areolae occluded by hymens: 2) a twisted convex araphid valve with a narrow lanceolate sternum inclined from the apical axis, and uniseriate striae consisting of several loculate areolae occluded by hymens: and 3) a cingulum consisting of three non fimbriated girdle bands including a valvocopula.

**Key words:** Bacillariophyta, *Cocconeis tortilis*, Japan, marine diatom, new species

### Introduction

This report is a continuation of our previous papers dealing with morphological and taxonomic investigations of species in the genus *Cocconeis* (Ehrenberg 1837: 173; Nagumo & Kobayasi 1985, Suzuki *et al.* 2001). In the present study, an unrecognized species of *Cocconeis* was found growing on seaweed (e.g. *Codium intricatum* Okamura 1913: 74) and the seagrass *Zostera japonica* Ascheron & Graebner (1907: 32) from the coasts of Izu Islands, Minami-Daito Island and Okinawa Islands, both affected by the Kuroshio Current. It has been named *C. tortilis* Hide. Suzuki *sp. nov.* and is described using light (LM), scanning and transmission electron microscopy (SEM and TEM); it is compared to similar taxa.

### Material and methods

Samples were obtained from seaweeds and seagrass collected from the intertidal zone of the North Pacific coast of Japan at the following localities (Fig. 1):

I. Tsuchikata beach (34°04'20"N, 139°28'41"E), Miyake Island, the Izu Islands, Tokyo, epiphytic on *Codium intricatum* (Codiaceae, Ulvophyceae) collected by A. Takahashi on 3 July 2012, material and slide BM 101683 and MTUF-AL-43010;

II. Shioma beach (33°04'06"N, 139°50'07"E), Hachijo Island, the Izu Islands, Tokyo, epiphytic on *Asparagopsis taxiformis* (Delie) Trevisan (Bonnemaisoniaceae, Rhodophyceae) collected by A. Kobayashi on 28 June 2003, material MTUF-AL-43011;

III. Honba beach (25°52'19"N, 131°14'58"E), Minami-Daito Island, the Daito Islands, Okinawa Pref., epiphytic on *Jania* sp. (Corallinaceae, Rhodophyceae) collected by T. Nagumo on 17 Feb. 2004, material MTUF-AL-43012;

IV. Eef beach (26°19'54"N, 126°48'39"E), Kume Island, the Okinawa Islands, Okinawa Pref., epiphytic on the

providing us with the samples treated herein. We thank anonymous reviewers for valuable suggestions and comments. This work has been partially supported by a Grant in Aid for Scientific Research (C: 24580261 & 25450272) from the Japan Society of the Promotion of Science.

## References

- Anonymous (1975) Proposals for a standardization of diatom terminology and diagnoses. *Nova Hedwigia, Beiheft* 53: 323–354.
- Ascherson, P. & Graebner, P. (1907) Potamogetonaceae. In: Engler, A. (ed.) *Das Pflanzenreich heft 31*. Wilhelm Englemann, Leipzig. 184 pp.
- Cox, E.J. (2012) Ontogeny, homology and terminology – wall morphogenesis as an aid to character recognition and character state definition for pennate diatom systematics. *Journal of Phycology* 48: 1–31.  
<http://dx.doi.org/10.1111/j.1529-8817.2011.01081.x>
- De Stefano, M. & Romero, O. (2005) Survey of alveolate species of the diatom genus *Cocconeis* (Ehr.) with remarks on the new section *Alveolatae*. *Bibliotheca Diatomologica* 52: 1–132.
- De Stefano, M., Marino, D. & Mazzella, L. (2000) Marine taxa of *Cocconeis* on leaves of *Posidonia oceanica*, including a new species and two new varieties. *European Journal of Phycology* 35: 225–242.  
<http://dx.doi.org/10.1080/09670260010001735831>
- Ehrenberg, C.G. (1837) Zusätze zur Erkenntniss grosser organischer Ausbildung in den kleinsten thierischen Organismen. *Abhandlungen der Königlichen Akademie der Wissenschaften zu Berlin* 1835: 151–180.
- Giffen, M.H. (1967) Contributions to the diatom flora of South Africa III. Diatoms of the marine littoral regions at Kidd's Beach near east London, Cape Province, South Africa. *Nova Hedwigia* 13: 245–292
- Gregory, W. (1857) On new forms of Marine Diatomaceae, found in the Firth of Clyde and in Loch Fine. *Transactions of the Royal Society of Edinburgh* 21: 473–542.  
<http://dx.doi.org/10.1017/s0080456800032269>
- Kobayasi, H. & Nagumo, T. (1985) Observations on the valve structure of marine species of the diatom genus *Cocconeis* Ehr. *Hydrobiologia* 127: 97–103.  
<http://dx.doi.org/10.1007/bf00004189>
- Kobayasi, H., Idei, M., Mayama, S., Nagumo, T. & Osada, K. (2006) *H. Kobayasi's Atlas of Japanese Diatoms Based on Electron Microscopy I*. Uchida Rokakuho, Tokyo. 533 pp.
- Kützing, F.T. (1844) *Die Kieselalgen Bacillarien oder Diatomeen*. Nordhausen. 152 pp., 30 pls.  
<http://dx.doi.org/10.1080/037454809495289>
- Nagumo, T. (1995) Simple and safe cleaning methods for diatom samples [in Japanese]. *Diatom* 10: 88.
- Nagumo, T. & Kobayasi, H. (1990) The bleaching method for gently loosening and cleaning a single diatom frustule. *Diatom* 5: 45–50.
- Okamura, K. (1913) *Icones of Japanese algae*. Vol. III, pp. 1–77, pls CI–CXX. Tokyo: published by the author.
- Osada, K. & Nagumo, T. (2001) An introduction to diatom research. *Bulletin of Nippon Dental University, General Education* 30: 131–142
- Ross, R., Cox, E.J. Karayeva, N.I., Mann, D.G., Paddock, T.B.B., Simonsen, R. & Sims, P.A. (1979) An amended terminology for the siliceous components of the diatom cell. *Nova Hedwigia, Beiheft* 64: 513–533.
- Round, F.E., Crawford, R.M. & Mann, D.G. (1990) *The diatoms: biology and morphology of the genera*. Cambridge University Press, Cambridge. 747 pp.  
<http://dx.doi.org/10.1017/s0025315400059245>
- Silva, P.C. (1962) Classification of algae. In: Lewin, R.A. (ed.), *Physiology and biochemistry of algae*. Academic Press, New York and London, pp. 827–837.
- Suzuki, H., Nagumo, T. & Tanaka, J. (2001) Morphology of the marine epiphytic diatom *Cocconeis convexa* Giffen (Bacillariophyceae). *Diatom* 17: 59–68.
- Van Heurck, H. (1880–1885) *Synopsis des diatomées de Belgique*. Texte & Atlas. Ducaju & Cie., Anvers. 235+120 pp. 135 pls.  
<http://dx.doi.org/10.5962/bhl.title.1990>
- Voigt, M. (1956). Sur certaines irrégularités dans la structure des Diatomées. *Revue Algologique, nouvelle série*, 2: 85–97.