



***Tetracyclus radius* (Bacillariophyta) a new fossil species from Miocene freshwater sediments in the Japan Sea**

MEGUMI SAITO-KATO^{1*}, TATSUYA HAYASHI¹ & YOSHIHIRO TANIMURA¹

¹Department of Geology and Paleontology, National Museum of Nature and Science, 3-23-1 Hyakunin-cho, Shinjuku-ku, Tokyo, 169-0073, Japan.

*Corresponding author: memekato@kahaku.go.jp

Abstract

A new fossil diatom species, *Tetracyclus radius* sp. nov, is described from freshwater sediments under the Yamato Bank in the Japan Sea. Its valve outline is circular with radiating costae and has a single rimoportula. There is no distinct sternum but a hyaline central area is present. The freshwater sediments are deposited before the Early Pliocene by diatom biostratigraphy of the overlying marine sediments.

Key words: Diatoms, Miocene fossil, Yamato Bank

Introduction

The diatom genus *Tetracyclus* Ralfs is mainly composed of extinct, freshwater species, most having characteristic valve shapes. The valve outline can be circular (Williams & Li 1990), elliptical/rhomboidal (Williams 1996), elongate (Williams 1996) or with certain parts constricted (Williams 1989, 2007, 2009). All known species, however, have uniseriate striae that may be somewhat disorganized but are transversely arranged on a flat valve face; they are not interrupted by the internal costae. The more or less elongate valves are symmetrical about the apical axis and the sternum is of an irregular structure, defined by terminating striae.

At present *Tetracyclus* has over 30 species (Williams 1996). A number of fossil species have been described from East Asia: *T. japonicus* (Petit 1890: 2) Tempère & Peragallo (1909: 185) and *T. polygibbum* (Pantocsek 1892: pl. 2, fig 19) Jousé (1952: 242) from Japanese sediments (Williams 1996); *T. ovaliformis* Li (1984: 234), *T. shanduensis* Li (1984: 235), *T. subclypeus* Li & Williams (in Williams & Li 1990: 336); and *T. subdivisium* Williams & Li (1990: 337) from Late Miocene deposits in Inner Mongolia (Williams & Li 1990). This paper documents a new fossil species of *Tetracyclus* from freshwater sediments at the earliest Middle Miocene. The specimens were found in the central part of the Japan Sea (Burckle & Akiba 1978). In this area, freshwater lakes were known to be formed during the Early to earliest Middle Miocene (about 20 to 15 Ma), accompanied by the birth and expansion of the Proto-Japan Sea (Otofuji *et al.* 1985; Torii *et al.* 1985; Jolivet & Tamaki 1992; Tamaki *et al.* 1992).

Material and methods

A deep-sea core, RC12-394, was recovered from the northeast flank of the Yamato Bank at lat. 40° 19' N, long. 136° 13.5' E in 2338 m of water depth (Burckle & Akiba 1978). The core was composed of 376 cm-thick freshwater sediments under 225 cm-thick marine sediments. Raw material taken from 490 cm core depth was