

# Fossil Diatoms in the upper part of the Eoil Formation, Eoil area, Gyeongsangbuk-do, Korea.

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## ABSTRACT

Diatoms collected from the upper part of the Eoil Formation of the study area are identified as comprising 5 species/2 genera, whose known ecologic properties imply that the stratigraphic interval concerned was deposited under freshwater, eutrophic, and stagnant lake environment.

### 1. Introduction

Diatomaceous sediments are interbedded in the upper part of the Eoil Formation distributed in Eoil districts, to the southwest of Yeongil Bay of the Korean Peninsula. Diatom flora of this study area have previously been studied by the writer (1975). In that work, the writer recognized "*Melosira granulata* Assemblage zone" which is characterized by the abundance of *Melosira granulata* in the upper part of Eoil Formation.

The main purpose of the present study is to describe the diatom flora and to interpret the sedimentary condition of the deposits inferred from the diatom assemblage. For this study, the writer collected eight samples from the diatomaceous mudstone of the study area. The locality and stratigraphic position of the samples are shown both on Geologic Map 1 and Fig. 1. Slides of the samples are prepared and treated in accordance with the procedure described by Lee (1975).

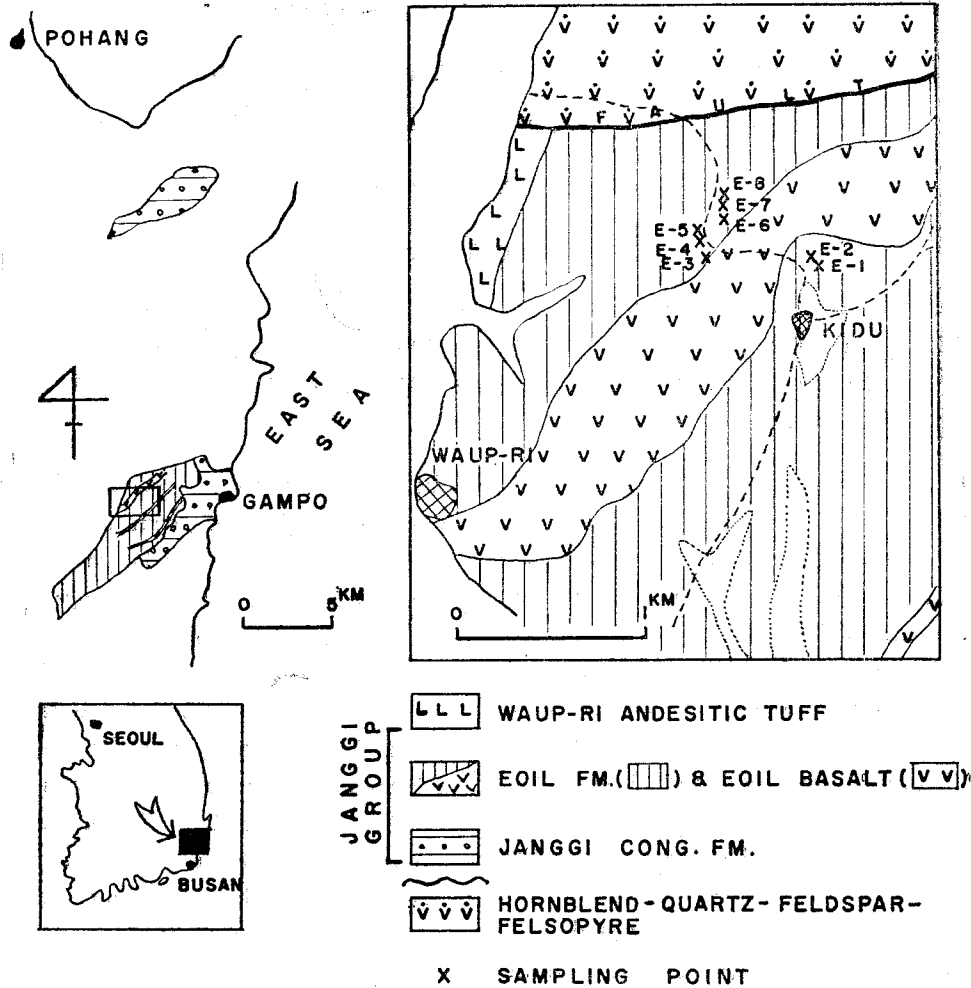
### 2. Summary of Stratigraphy

The Tertiary strata of the study area was first classified by Tateiwa (1924) who mapped the quadrangle sheet (scale 1:50,000) including

the present study area. He classified the rocks into the Janggi, Pouggeogni, and Yeonil Group in ascending order. The Janggi Group is composed mainly of conglomerate, pyroclastic sediments, and volcanic rocks. It was further subdivided into eight Formations in Janggi area, namely Janggi conglomerate, Nultairi volcanic rocks, Kumkwangdong shale, Lower coal-bearing Formation, Lower basaltic tuff Formation, Upper coal-bearing Formation, Kumori andesitic tuff Formation, and Upper basaltic tuff Formation; and was divided into three Formations in Eoil area, namely, Gampo conglomerate, Hyoudongri volcanic rocks, and Eoil Formation (in ascending order).

The Eoil Formation conformably lies on the Hyoudongri volcanics, and composed mainly of coarse-grained sandstone and conglomerate intercalated with three sheets of basalt lava flow (Lower, Middle, and Upper basalt). Besides the basalt lavas, the Eoil Formation is sometimes intercalated with conglomerates, sandy shales, siltstones, tuff, some thin lignite beds, and diatomaceous beds. Fig. 1 shows stratigraphic sequence of the formations of the Janggi Group in Gampo area. The stratigraphic positions of the samples for this study are above than that the "*Melosira granulata* Assemblage

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Map. I. Geologic map of Gampo and Eoil area and map showing the localities of samples.

zone".

The geological age of the Janggi Group was considered to be Lower Miocene by Tateiwa (1925) and Kanehara (1936) based on the mega-fossil evidences.

### 3. Fossil Diatoms

The total of 5 species and varieties, belonging to 2 genera, have been identified in present study. The names of the species and varieties are shown in Table 1.

The diatomaceous sediments is mainly composed of diatom valves, mostly of *Melosira granulata*, *M. granulata* forma. *curvata*, and

*M. granulata* var. *angustissima*; and very rarely *Melosira distans* and *Diatoma vulgare*. *Melosira granulata*, the most abundant species, is comprised of more than 170 valves in 200 valves counted. It is inferred that the deposit was accumulated under the particula condition favorable for *Molosira granulata* (Ehr.) Ralfs. *Melosira granulata* Ralfs is a freshwater planktonic species, and prefers eutrophic, warm water conditions; often found in cool temperate region during the Summer months (Hutchinson *et al.* 1956).

According to Foged (1954) who studied for this species in lakes of Denmark, *Melosira*



stagnant lake deposits.

As to *Melosira granulata*, Van Landingham (1967) stated that the stratigraphic range is from Oligocene (?) or Miocene to Recent. However, it is difficult to define the geological age based only on the evidence of diatom fossils. Therefore, the writer does not go in detail about the geological age of the Eoil Formation in this study.

#### 4. Description of species

Genus *Melosira* Agardh 1824

*Melosira granulata* (Ehr.) Ralfs 1861

plate 1, figs. 4-10

*Melosira granulata* (Ehr.) Ralfs: Hustedt, 1928, Kieselalg., Teil. 1, p. 248-252, figs. 104a-104f; Hustedt, 1930, Bacill., p. 87-88, figs. 44; Pestalozzi, 1942, Phtol., Süswass., 2 Half., p. 380, figs. 151-152; Kanaya, 1952, p. 62, pl. 1, figs. 1-2; Kokubo, 1955, Planktonic Diatoms, p. 61-62, fig. 32a; Akutsu, 1964, p. 275, pl. 61, figs. -2.

*Size range of measured specimens*; Height of valve  $10\mu$ - $12\mu$ , diameter of valve  $6$ - $10\mu$ . The ratio of height to diameter of diameter of valve varies from 0.6-1.8.

*Remarks*; Valve cylindrical with distinct pseudosulkus and sulkus. Pore on the mantle are arranged in slightly straight or slightly oblique to the apical axis. Hustedt's description and illustration of *M. granulata* (Ehr.) Ralfs indicate that this species has 8-9 pore-lines in  $10\mu$  on the valve mantle which run obliquely or parallel to pervalve axis, and the species has long spine on the valve margin. In the specimens studied, the number of pore-lines and pore in  $10\mu$  are less than the Hustedt's description. The specimens from the present studied area have pore 6-8 in  $10\mu$  and pore-lines 6-8 in  $10\mu$  on valve mentle.

*Ecology*; Hutchinton et al (1956) stated that

this species is a freshwater planktonic species, and prefers eutrophic, warm-water; often found in cool temperate regions during the Summer month. Van Landingham (1967) reported that this species is probably the most abundant of non-marine North American Miocene diatoms. Okuno's studies (1952) of Japanes diatomites, absolute dominance of this species have been recorded only in those fresh-water diatomite of Miocene age.

*Occurrence in the present materials*; Abundant to very abundant in all samples examined.

*Geologic range*; Oligocene (?) or Miocene to Recent.

*Melosira granulata* (Ehr.) Ralfs var. *angustissima* Müller 1899

plate 1, figs. 1-3.

*Melosira granulata* (Ehr.) Ralfs var. *angustissima* Müll.: Hustedt, 1928, Kieselalg., Teil. 1, p. 250-251, fig. 104d; Hustedt, 1930, Bacill., p. 88, fig. 45; Pestalozzi, 1942, Phytopl., Süswass., 2 Half., p. 381, figs. 452, 453; Okuno, 1952, Atlas, pl. 21, figs. 3, 5; Kokubo, 1955, Plankton Diatoms, p. 61-62, fig. 32b.

*Size range of measured specimens*;  $2$ - $3\mu$  in diameter. Height of valve  $15$ - $20\mu$ .

*Remarks*; This variety is distinguished from the species by its fine long valve. The specimens found in the material range from  $2\mu$  to  $3\mu$  in diameter, and from  $15\mu$  to  $20\mu$  in height. In some species, its valves are more or less bended.

*Ecology*; This variety is a planktonic diatom common in freshwater. Skovortzov (1936) reported the variety from Biwa lake; Kokubo (1955) found the variety living in Juni, Ashino and in other eutrophic lakes of Japan. According to Kokubo (1955) who studied the seasonal variation of the diatom flora of the Juni lake in Japan, this variety flourished in September when the surface water temperature of the late

falls down to 17°C, and begins to decrease in number from November to the next Spring.

*Occurrences in the present materials*; Common in all the specimens examined.

*Melosira granulata* forma. *curvata*  
(Grunow) Hustedt

plate 1, figs. 11-12.

*Melosira granulata* forma. *curvata* (Grun.,)  
Hustedt: Kanaya, 1959, pl. 1, fig. 2.

*Size range of measured specimens*; 4-6 $\mu$  in diameter.

*Remarks*; This variety is distinguished from the species by its long, narrow and distinctly bended valve. This variety is a fresh-water species, common in lake and river.

*Occurrences in the present materias*; Common in all samples examined.

*Melosira distans* (Ehr.) Kütz., 1844  
plate 1, figs. 13-14.

*Melosira distans* (Ehr.) Kütz 1844: Hustedt, 1927, Kieselalg., Teil. 1, p. 262, figs. 110a-110c, 110i; Hustedt, 1930, Bacill., p. 92-93, fig. 53; Miller, 1964, pl. 1, fig. 6.

*Remarks*; Short cylindrical cell, constricted

at each end, firmly united by valve surface into long straight chains, Valvecell-wall with fine, oblique line of small puncta. Striae somewhat spiral and punctate. Reported as recent from bogs, swamp and moor of mountain.

*Occurrences in the present materials*; very rare in all the sample.

Genus *Diatoma* De Candolle

*Diatoma vulgare* Bory

plate 1, fig. 15

Genus *Diatoma* De Candolle

*Diatoma vulgare* Bory

*Diatoma vulgare* Bory: W. Smith, 1856, Brit. Diat., v. II, p. 39, pl. XI, Fig. 309; Hustedt, 1930, Bacil., p. 127, figs. 103-110; A. Cleve-Euler, 1953, Diat. Schw. Finn., Teil. II, p. 21, Fig. 329; Akutsu, 1971, Diat. Niiza., pl. 31, fig. 3.

*Remarks*; Valve elliptical with five or seven intermedium belts (costae), gradually attenuate toward the obtuse end. Pseudoraphe is very narrow and straight. Length of apical axis; about 30 $\mu$  Length of transapical axis, 15 $\mu$

*Occurrence in the present materials*; very rare in three samples.

## References

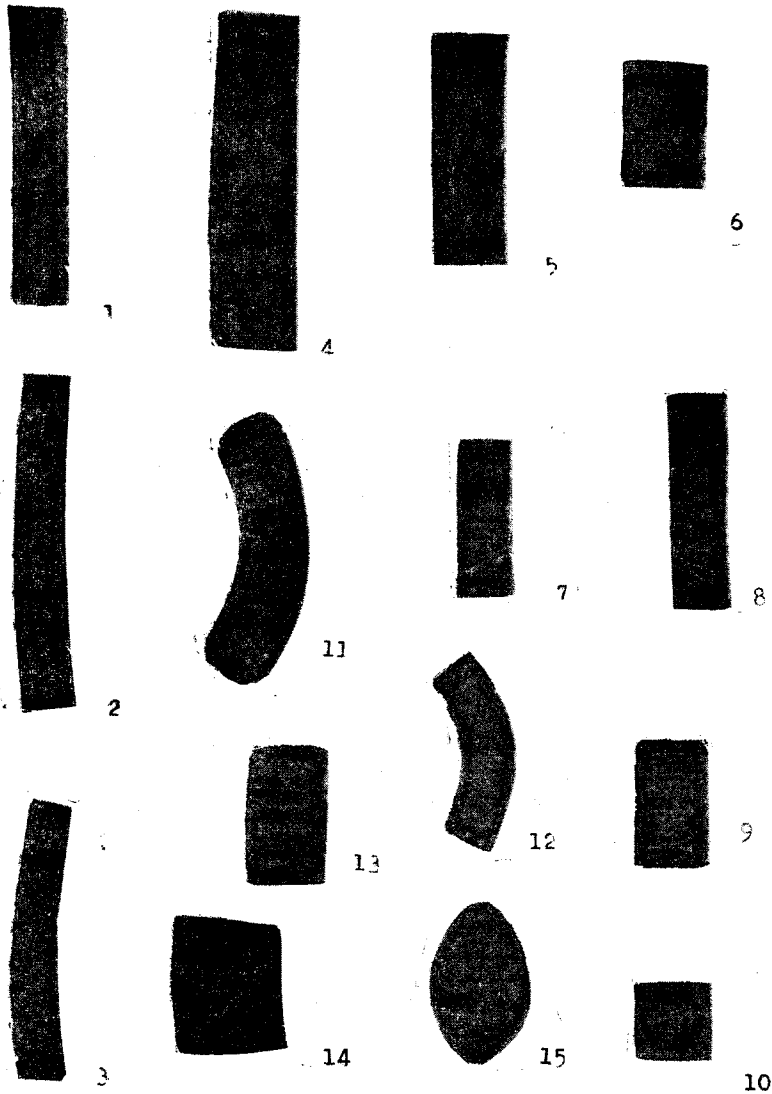
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### PLATE I

Fig. 1-3.: *Melosira granulata* var. *angustissima* Müller, KUDG-3014-a, dia.  $3\mu$ , height.  $15-20\mu$ , x500.

Fig. 4.: *Melosira granulata* (Ehr.) Ralfs, KUDG-3015-b, dia.  $10\mu$ , height,  $12\mu$ , x 500.

Fig. 5.: *Melosira granulata* (Ehr.) Ralfs, KUDG-3016-b, dia.  $8\mu$ , height,  $12\mu$ , x 500.

- Fig. 6. : *Melosira granulata* (Ehr.) Ralfs, K UDG-3012-a, x 500.  
 Fig. 7. : *Melosira granulata* (Ehr.) Ralfs, KUDG-3018-c, x 500.  
 Fig. 8-9. : *Melosira granulata* (Ehr.) Ralfs, KUDG-3017-a, x 500.  
 Fig. 10. : *Melosira granulata* (Ehr.) Ralfs, KUDG-3016-a, valve view, dia.  $10\mu$ , x 500.  
 Fig. 11-12. : *Melosira granulata* forma. *curvata* (Grun.) Hustedt, KUDG-3014-b, x 500.  
 Fig. 13. : *Melosira distans* (Ehr.) Kütz., KUDG-3013-a, x 500.  
 Fig. 14. : *Melosira distans* (Ehr.) Kütz., KUDG-3011-a, x 500.  
 Fig. 15. : *Diatoma vulgare* Bory, KUDG-3012-a, length of apical axis,  $25\mu$ , length of transapical axis,  $15\mu$ , x 500.

## 魚日層上部的 化石 珪藻群

李 永 吉

본 연구는 경상북도 양북면 魚日일대에 分布하는 新第三紀 魚日層上部에서 産出되는 化石珪藻에 대한 연구결과이다.

산출되는 化石珪藻종들의 체계적인 기재와 生態조사를 통해 魚日層上部의 珪藻퇴적층의 퇴적환경은 淡水·湖沼環境下이었던 것으로 推定된다. 그러나 본층에서 地層對比와 地質時代규명을 위한 유용한 化石珪藻종은 산출되지 않으므로 본 연구에서는 본층의 地質時代를 확실히 추정할 수가 없었다.