

Foraminifera From the Nakado Formation, Sakito-Matsushima Coal-Field, Nagasaki Pref., Kyushu.

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Abstract:— Sixty species and varieties of fossil foraminifera, representing thirty-seven genera and seventeen families, have been identified in Nakado microfaunas from fourteen localities in the Sakito-Matsushima coal-field, Nagasaki Pref. Foraminiferal evidence appears to indicate a little older age than that of the Aquitanian Kishima formation.

Introduction

In the previous paper, the foraminiferal fauna in the Nishisonogi group, the upper Paleogene sediments of the Sakito-Matsushima coal-field were discussed by the author. The Matsushima group, including the Nakado formation in the lower part, is overlaid conformably by the Nishisonogi group.

Fourteen microfossil samples in the Nakado formation were collected and stratigraphically allocated; they were prepared at the Kyushu Institute of Technology, and the fossils included in them were classified and ecologically evaluated.

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General Geology

The geology of the Paleogene sediments in the Sakito-Matsushima coal-field has been studied in detail by Dr. T. Nagao, and Dr. H. Matsushita.

By the above-mentioned studies, the Nakado formation distributes mainly

at the following districts; namely the underground of the Kakinoura Island, the western margin of the Terashima Island, and the northeastern part of the Matsushima Island.

In the Kakinoura Island, the Nakado formation were discovered by some boring wells and galleries of the Mitsubishi Coal Mining Company. In the Terashima No. 2 boring well of the Sakito mine, the formation indicates about 130 m. in thickness, and consists of mainly shale, but includes sandstone in the upper part and conglomerate bearing some megafossils in the lower. (see the left column in Fig.1) The above-mentioned rock facies of the formation may

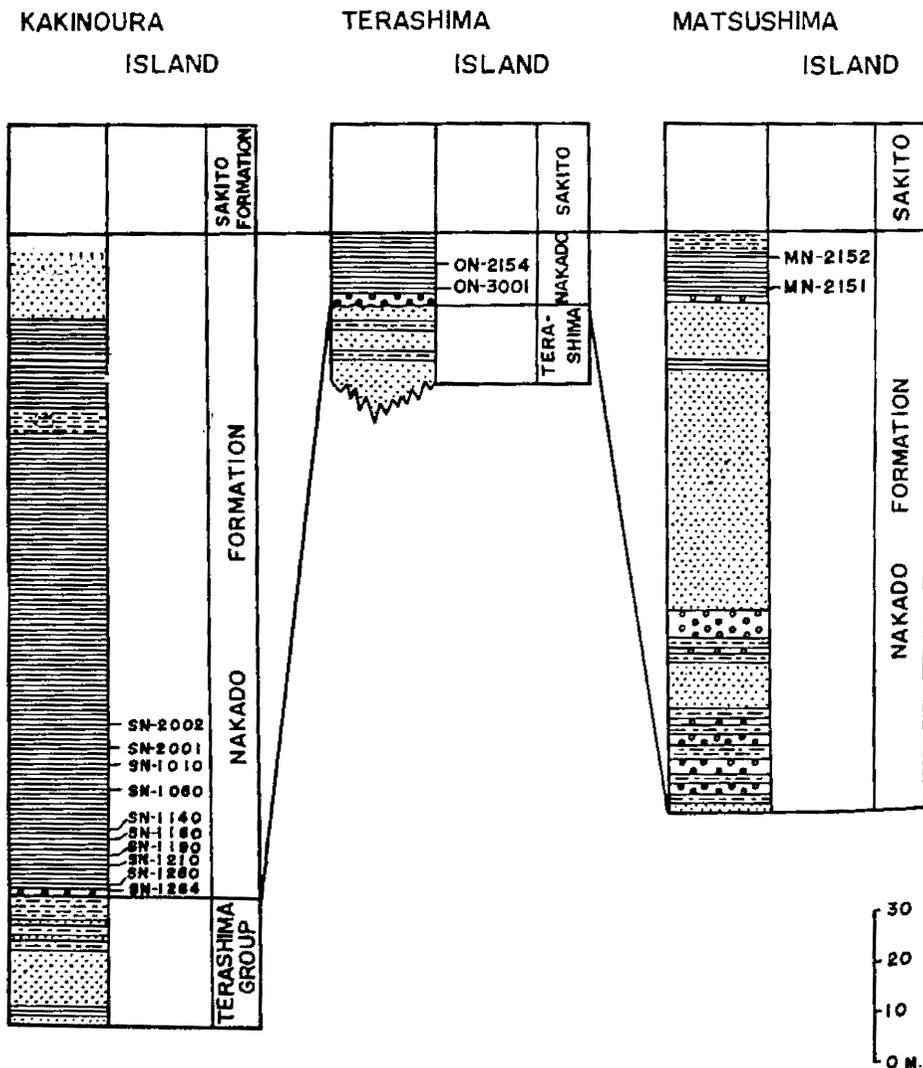


Fig. 1. Stratigraphic Columns

be observed also in galleries of the Mitsubishi Sakito mine. The thickness of the Nakado formation decreases in the direction of the east; it shows about 100m. in a boring well of the Fukuura mine, but decreases to about 70m. in the Nakado boring well at the northeast margin of the Kakinoura Island, and becomes into about 10m. in the western margin of the Terashima Island. (see the middle column in Fig.1) In the western margin of the Terashima Island, the Nakado formation consists mainly shale, but includes the basal conglomerate, 2m. in thickness, bearing some megafossils in the lower part.

The Nakado formation increases southwards in thickness, and indicates about 110m. or more in thick, in the northeastern part of the Matsushima Island. In the area cited, the formation consists an alternation of shale and sandstone in the upper part, and medium-coarse sandstone and conglomerate in the lower part.

The following megafossils has been reported by Dr. T. Nagao in the lower part of the Nakado formation in the above-mentioned districts.

Chlamys sakitoensis Nagao

Glycimeris cisshuensis Makiyama

Venericardia subnipponica Nagao

Ostrea sakitoensis Nagao

The Foraminifera

Foraminiferal specimens are found abundantly in the shaly facies of the Nakado formation. The foraminiferal fauna includes a large number of species and varieties, 60 in all, each characteristically represented by but a few individuals.

Throughout the foraminiferal assemblages in the sequence, calcareous perforate forms are decidedly dominant. Eight genera of arenaceous foraminifera are represented, but only three calcareous imperforate genera has been discovered so far. Of the twenty-six calcareous genera represented, ten are included in the Lagenidae; four in the Rotalidae; three each in the Nonionidae and Buliminidae; two in the Polymorphinidae; and one each in the Cassidulinidae, Anomalindae, Chilostomellidae, and Globigerinidae.

The Nakado foraminiferal fauna indicates essentially a single assemblage—the *Elphidium-Plectina-Gaudryina-Robulus-Planularia* faunle. Although in general the composition of the assemblages is much the same, these are apparently independent variations in the presence of several of the common species.

The Nakado fauna is characterized by the common *Elphidium sumitomo*, *Gaudryina kishimaensis*, and *Plectina poronaiensis*, and by the presence also of *Bathysiphon eocenicus*, *Haplophragmoides amakusaensis*, *Quinqueloculina karatsuensis*, *Robulus cf holcombensis*, *Planularia iojimaensis*, *Pseudononion kishimaense*, *Eponides iojimaensis*, and *Cibicides yabei*. Although rare,

Haplophragmoides shikiyamaensis, *Trochammina enouraensis*, *Gaudryina hayasakai*, *Sigmoilina sakasegawaensis*, *Hemicristellaria saundersi*, *Elphidium saitoi*, *Nodosaria okinoshimaensis*, and *Baggina saitoi* are also conspicuous.

Age and Correlation

The Nakado fauna includes the most important and characteristic species in the Aquitanian kishima fauna and its equivalent, although *Hanzawaia sumitomoii* has never been discovered in the former. They are;

Gaudryina kishimaensis Asano & Murata
Quinqueloculina karatsuensis Asano & Murata
Pseudononion kishimaense Asano & Murata
Elphidium saitoi Asano & Murata
Elphidium sumitomoii Asano & Murata
Baggina saitoi Asano & Murata

The following forms existing in the Kishima fauna also occur in the present fauna.

Textularia imariensis Asano & Murata
Robulus sagaensis Asano & Murata
Lenticularia cf. convergens (Bornemann)
Bulimina yabei Asano & Murata
Globobulimina pacifica Cushman
Nonion aritaense Asano & Murata
Guttulina irregularis d'Orbigny

As above mentioned, the Nakado fauna shows marked relationships to the Kishima fauna and its equivalent, but also contains many older elements of the foraminifera in northwest Kyushu. In them, the following species has been found commonly in the Eo-Oligocene sediments of Amakusa, Kumamoto Pref. and etc.

Bathysiphon eocenicus Cushman & G.D. Hanna
Haplophragmoides amakusaensis Asano & Murata
Haplophragmoides shikiyamaensis Asano & Murata
Plectina poronaiensis Asano
Cyclammina pacifica Beck
Cyclammina tani Ishizaki
Sigmoilina sakasegawaensis Asano & Murata
Trochammina enouraensis Asano
Hemicristellaria saundersi Hanna & Hanna
Nodosaria okinoshimaensis Asano & Murata
Epistominella amakusaensis Asano & Murata
Cibicides cf. nagaii Asano & Murata
Cibicides yabei Asano

Gaudryina hayasakai, appearing in the Nakado fauna, has been described by Li-Sho Chang from the Yuhangian foraminiferal faunule of Taiwan, which seems to indicate the lower Oligocene age. These foraminifera just cited has never been discovered in the Kishima formation and its equivalent, and the younger sediments in Northwest Kyushu.

The megafossils from the Nakado formation indicates a very similarity to that of the Kishima fauna, while the older elements of Northwest Kyushu co-exists with the latter.

By the facts above mentioned, it seems that the Nakado fauna shows a transitional forms between the Kishima fauna and the older elements in Northwest Kyushu. It is therefore probable that the strata under consideration is considered representative of a little older age than that of the Aquianian Kishima formation. (December, 1959)

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Table 1. Foraminifera From the Nakado Formation

SPECIES	GEOGRAPHIC LOCATION			KAKINOURA-JIMA						OSHIMA		MATSUSHIMA				
	SAMPLE	LOCALITY	NUMBERS	SN-2002	SN-2001	SN-1010	SN-1060	SN-1140	SN-1180	SN-1210	SN-1260	SN-1289	ON-2154	ON-3001	MNS-2152	MNS-2151
<i>Ammodiscus cf. incertus</i> (d'Orbigny)																
<i>Buccina</i> Saito Asano & Murata																
<i>Bathysiphon costatus</i> Cushman & G.U. Hanna																
<i>Bolivina</i> sp.																
<i>Bolivina cf. pupoides</i> d'Orbigny																
<i>Bolivina</i> Saito Asano & Murata																
<i>Cibicides cf. naganoi</i> Asano & Murata																
<i>Cibicides</i> Saito Asano																
<i>Cyclammina cf. incisa</i> Stache																
<i>Cyclammina pacifica</i> Beck																
<i>Cyclammina</i> Imai Ishizaki																
<i>Cyclammina</i> sp.																
<i>Dentalina</i> sp.																
<i>Desorbis</i> sp.																
<i>Ephidium</i> Saito Asano & Murata																
<i>Ephidium sumitani</i> Asano & Murata																
<i>Entolonia</i> sp.																
<i>Epistominella amakusensis</i> Asano & Murata																
<i>Eponides tojimaensis</i> Asano & Murata																
<i>Gaudryina hayashiki</i> Chang																
<i>Gaudryina kishimacensis</i> Asano & Murata																
<i>Gilvulina</i> cf. <i>irregularis</i> d'Orbigny																
<i>Globigerina</i> cf. <i>bulloides</i> d'Orbigny																
<i>Globigerina</i> sp.																
<i>Globobulimina</i> cf. <i>pacifica</i> Cushman																
<i>Gutulina</i> cf. <i>irregularis</i> (d'Orbigny)																
<i>Gyrodina tojimaensis</i> Asano & Murata																
<i>Gyrodina</i> sp.																
<i>Hoplitragoides amakusensis</i> Asano & Murata																
<i>Hoplitragoides</i> cf. <i>shikigawensis</i> Asano & Murata																
<i>Hoplitragoides</i> sp.																
<i>Hemecostellaria sonderi</i> (Hanna & Hanna)																
<i>Lenticulina</i> cf. <i>congerata</i> (Bornemann)																
<i>Margulina okinawensis nakadomii</i> Murata (MS)																
<i>Margulina</i> sp.																
<i>Nodosaria okinawensis</i> Asano & Murata																
<i>Nodosaria</i> sp.																
<i>Nonion okinawense</i> Asano & Murata																
<i>Nonion</i> cf. <i>plandium</i> Cushman & Thomas																
<i>Nonion</i> sp.																
<i>Pinnularia tojimaensis</i> Murata (MS)																
<i>Plectina poronensis</i> Asano																
<i>Pseudonandalina</i> sp.																
<i>Pseudononion</i> kishimacense Asano & Murata																
<i>Pullenia</i> sp.																
<i>Quinqueloculina karatsunensis</i> Asano & Murata																
<i>Quinqueloculina</i> cf. <i>maia</i> Heck																
<i>Quinqueloculina</i> sp. A																
<i>Quinqueloculina</i> sp.																
<i>Robulus</i> cf. <i>chehalensis</i> Rau																
<i>Robulus</i> cf. <i>kolcambensis</i> Rau																
<i>Robulus</i> <i>ogawensis</i> Asano & Murata																
<i>Robulus</i> sp.																
<i>Saracenaria</i> cf. <i>schrocks</i> Cushman & Hobson																
<i>Sigmulina sakasegawensis</i> Asano & Murata																
<i>Textularia imatensis</i> Asano & Murata																
<i>Textularia</i> sp.																
<i>Trifarina</i> cf. <i>globosa</i> (Hanna & Hanna)																
<i>Trochammina tojimaensis</i> Asano																
<i>Trochammina</i> sp.																

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