563. 12(521. 11)

Foraminifera in the Vicinity of Odose, Nishitsugaru-gun, Aomori Prefecture

by
Keizo Fujii*

Abstract

The Tertiary formations in the vicinity of Odose, Nishitsugaru-gun, Aomori prefecture are divided into four formations in descending order; Odose, Shiomizaki, Odoji formations and Toriizaki andesite.

It is well known long ago that Shiomizaki formation has much *Operculina* and many smaller foraminifera, and that the lower part of Odoji formation has many smaller foraminifera.

As the result of the study of the microfauna, two zoning is possible. The lower part (Shiomizaki formation) was shallow water deposit.

The upper part (Odoji formation) was neritic to bathyal and oceanic, and its microfauna is Lageniidae and abundant planktonic foraminifera.

Considering the benthonic foraminiferal contents, this fauna resembles of the Higashi-innai formation in the Noto peninsula, Ishikawa prefecture, the Mizunami group in the vicinity of Mizunami city, Gifu prefecture, and the Miyoshian stage in San'in province and Setouchi province of West Honshu.

The planktonic foraminiferal zone of the Shiomizaki and Odoji formations is *Globorotalia fohsi barisanensis* zone.

Introduction and Acknowledgment

The paleontology of the Shiomizaki and the Odoji formation which overlie so called "Green-tuff" Odose formation, is not well known but it is well known that the *Operculina* zone occupies the upper part of Shiomizaki formation.

For such reason, I have undertaken a detailed study of the smaller foraminifera with the view to determine the sequence of fauna and to find whether zoning is possible.

Before preceding, I wish to thank for Dr. K. Asano, Dr. Y. Takayanagi, T. Saito of the Institute of Geology and Paleontology, Tohoku University for their suggestions and encouragement.

Stratigraphy

According stratigraphical research of N. Kitamura and H. Nakajima (1959), Tertiary formations at the vicinity of Odose are divided into four formations in descending order:

Toriizaki	andesite
Odoji	formation
Shiomizaki	formation
Odose	formation

* Sendai Residence

the composite column of the vicinity of Odose is shown in fig. 1.

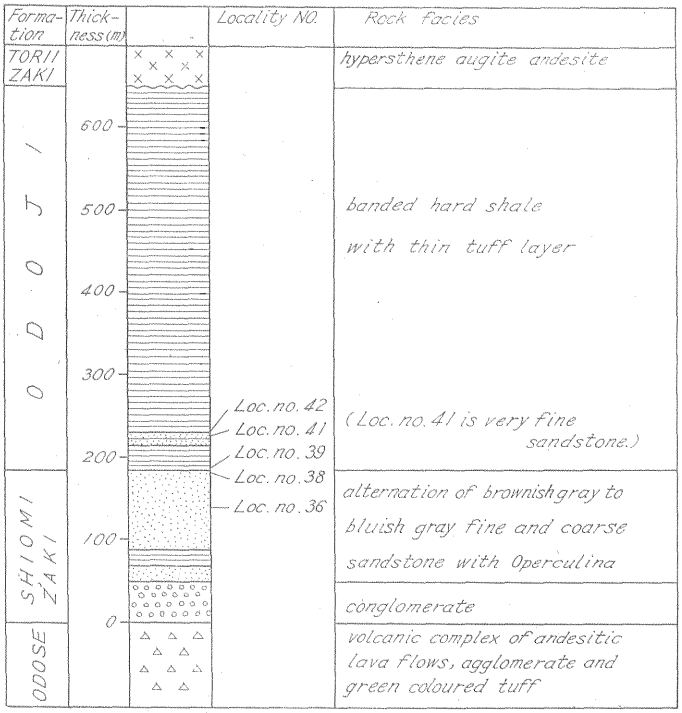


Fig. 1 Composite column in the vicinity of Odose

Faunal Consideration

Herein consideration is given to the smaller foraminifera in the section from Odose to Kairagi as shown fig. 2.

5 samples (two from Shiomizaki formation, and others from Odoji formation), each weighing

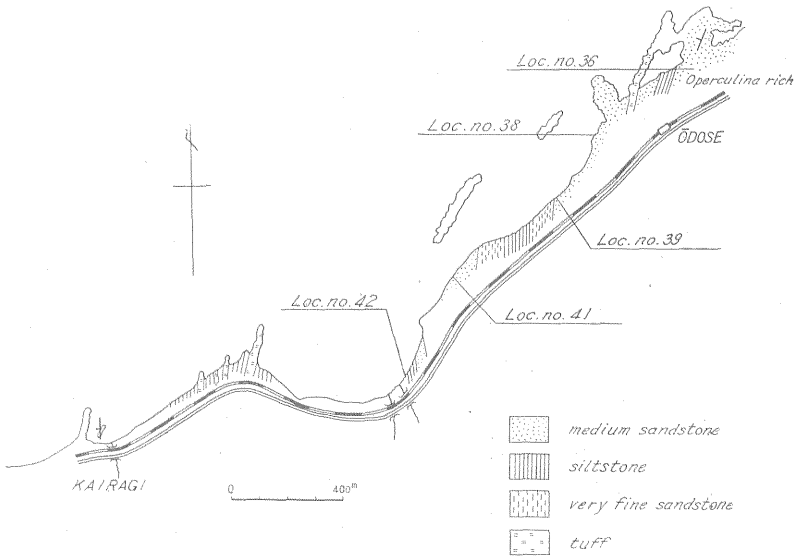


Fig. 2 Section from Odose to Kairagi

Table 1 Frequency of Benthonic Foraminifera from the Shiomizaki and Odoji Formations
(Locality. Nos. 36 & 38 are the former; Nos. 39, 41 & 42 are the latter)

Species \ Locality No	36	38	39	41	42
Amphistegina sp.	—	3	—	—	—
Angulogerina hughesi (GALLOWAY & WISSLER)	—	1	1	—	—
A. kokozuraensis ASANO	—	1	1	1	—
A. occidentalis (CUSHMAN)	—	—	1	—	—
Anomalia globulosa CHAPMAN & PARR	—	—	—	1	—
Baggina notoensis ASANO	—	—	1	—	—
B. sp.	—	1	—	1	—
Bolivina asanoi UCHIO	—	—	3	—	1
B. marginata masudai ASANO	—	—	54	6	42
B. robusta BRADY	1	6	17	31	11
B. sp.	—	2	2	1	2
Bulimina cf. *inflata* SEGUENZA	—	—	—	—	4
B. sp.	—	—	1	—	—
Cancris auriculus (FICHTEL & MOLL)	—	1	6	—	—
Cassidulina laeirgata carinata CUSHMAN	—	16	—	—	—
C. margareta KARRER	—	59	10	32	2
C. subglobosa BRADY	—	—	—	3	3
C. subglobosa depressa ASANO & NAKAMURA	—	1	—	—	—
C. cf. *subylobosa depressa* ASANO & NAKAMURA	—	1	—	—	—
C. yabei ASANO & NAKAMURA	—	—	—	14	—
C. sp.	—	2	1	—	4
Cibicides akerianus (d'ORBIGNY)	—	—	1	—	5
C. lobatulus (WALKER & JACOB)	17	9	5	15	6
C. pseudoungerianus (CUSHMAN)	62	25	13	27	10
C. cf. *refulgens*	13	—	—	2	—
C. sp.	—	2	1	—	—
Discopulirnulina bradyi (CUSHMAN)	16	—	—	—	—
D. cf. *hofkeri* ASANO	3	—	—	—	—
D. cf. *isabelleana* (d'ORBIGNY)	1	1	2		
D. cf. *nitida* (WILLIAMSON)	11			1	
D. stachi ASANO					1
D. sp. *a*	24	1			
D. sp. *b*	2		2		
D. sp. *c*		1			
Discorbis n. sp.?	38				
D. opercularis (d'ORBIGNY)	1	1			
D. cf. *opercularis* (d'ORBIGNY)	1	1			
Dyocibicides sp.			3		
Ehrenbergia cf. *notoensis* ASANO		1			
Ellipsonodosaria hayasakai ISHIZAKI		2	13	30	39
E. japonica ISHIZAKI				1	
E. cf. *japonica* ISHIZAKI					1
E. ketienziensis ISHIZAKI					7
E. lepidula (SCHWAGER)			2	6	
E. cf. *lepidula* (SCHWAGER)					2

Elphidiella momiyamaensis UCHIO	11			1	
Elphidium advenum (CUSHMAN)		2			
E. *craticulatum* (FICHTEL & MOLL)	5				
E. *etigoense* HUSEZIMA & MARUHASHI	6	6	5	7	1
E. *hughesi foraminosum* CUSHMAN		4			
E. *subgranulosum* ASANO	1	4	2	1	
E. *tsudai* CHIJI & NAKASEKO	3	1			
E. sp.		3	1		
Epistominella japonica (ASANO)			2	1	10
E. *pulchella* HUSEZIMA & MARUHASHI		1	3	2	
Eponides frigidus (CUSHMAN)	9	2	1	9	5
E. cf. *frigidus* (CUSHMAN)		2			
E. *haidingeri* (d'ORBIGNY)				4	
E. cf. *praecinctus* (KARRER)				1	
E. *tanai* UCHIO	42				
E. sp.	4	8			
Fissurina orbiguyana (SEGUENZA)				1	2
F. cf. *orbiguyana* (SEGUENZA)					1
F. sp.			1		
Gavelinopsis sp.	1			2	
Guttulina irregularis nipponensis CUSHMAN & OZAWA					4
G. *orientnlis* CUSHMAN & OZAWA	1				
G. *yabei ovale* CUSHMAN & OZAWA	1				
G. sp.					3
Gyroidina nipponica ISHIZAKI			14		1
G. *soldanii* d'ORBIGNY					7
Hanzawaia nipponica ASANO	5	89	24	11	10
H. *tagaensis* ASANO	2	4			
H. sp.				3	
Lagena acuticosta REUSS					1
L. cf. *semistriata* WILLIAMSON			1		
L. *striata* (d'ORBIGNY)			2		
L. sp.			3	1	1
Lagenodosaria scalaris (BATSCH)					8
L. *scalaris sagamiensis* ASANO			3		17
Marginulina glabra d'ORBIGNY					1
M. cf. *glabra* d'ORBIGNY					3
Miliolinella circularis (BORNEMANN)		1			
M. *oblonga* (MONTAGU)	2				
Nodosaria vertebralis (BATSCH)		1			3
Nonion japonicum ASANO		5	4	6	13
N. *manpukujiensis* OTSUKA			1	8	7
N. *nakosoensis* ASANO				2	
N. *nicobarense* CUSHMAN	1		16	8	11
N. *pompilioides* (FICHTEL & MOLL)				1	
N. *scaphum* (FICHTEL & MOLL)			6	3	
N. sp.		3			
Nonionella miocenica stella CUSHMAN & MOYER		1			
Planodiscorbis cf. *rarescens* (BRADY)	6	1			

Planulina convexa TAKAYANAGI				1	
P. *nipponica* ASANO			5	10	3
P. *subdepressa* ASANO				3	
Pseudononion japonicum ASANO		3	4	2	2
P. sp.		1			
Pullenia bulloides (d'ORBIGNY)			1		
Quinqueloculina akeriana d'ORBIGNY	1	3			
Q. *elongata* NATLAND		1			1
Q. *sawanensis* ASANO	2				
Q. *seminula* (LINNAEUS)		5			
Q. sp.	2	4	1		
Reussella spinulosa (REUSS)		2	2		2
Robulus lucidus (CUSHMAN)				6	5
R. *nikobarensis* (SCHWAGER)			2	2	9
R. *pseudorotulatus* ASANO					2
R. *sagamiensis* ASANO					2
R. sp.			1		
Rotalia cf. *beccarii* LINNAEUS	3	1			
R. *beccarii hatatatensis* TAKAYANAGI			13		
R. *japonica* HADA			15	8	3
R. *takanabenensis* ISHIZAKI			11	13	17
R. cf. *takanabenensis* ISHIZAKI			4		
R. sp.	1		1		
Sigmorphina sp.			1		
Saracenaria angularis NATLAND			1		2
Triloculina rotunda d'ORBIGNY		1			
T. *trigonula* (LAMARCK)		2			
Valvulineria sadonica ASANO			1	1	
Vaginulina mimataensis ASANO			1	1	1
Virgulina complanata EGGER	1				
V. *ishikiensis* ASANO			3		
V. cf. *nodosa* R. E. & K. C. STEWART				7	2
V. *schreibersiana* CZIZCK		1	2	2	
Total number of benthonic foraminifera	300	300	300	300	300

about 100 grams, were first treated with Glauber's salt, and the samples were washed through a 200 mesh screen and then dried. Three hundred specimens of benthonic foraminifera were taken from each dried sample at random, all planktonic foraminifera were taken. Then they were identified (Table 1, 2 and 3).

From the result of analysis, it is noticed that there is a marked paleontological change between the Shiomizaki formation below and the Odoji formation above.
that is:

1. Miliolidae is present in the lower zone, but is rare in the upper zone.
2. Lageniidae is abundant in the upper zone, but is rare in the lower zone.
3. *Elphidium* is common in the lower zone, but is not common in the upper zone. *Nonion* is contrary to *Elphidium* in occurrence.
4. Planktonic foraminifera increases in the upper zone.

Table 2 Frequency of Planktonic Foraminifera of the Shiomizaki and Odoji Formations
(Locality. Nos. 36 & 38 are the former; Nos. 39, 41 & 42 are the latter)

Species \ Locality No	36	38	39	41	42
Globigerina angustumbilicata (BOLLI)	1	2	7	53	6
G. concinna REUSS	—	—	1	—	—
G. druryi AKERS	—	—	1	—	2
G. juveniles BOLLI	—	—	4	1	—
G. praebulloides BLOW	—	1	7	3	22
G. woodi JENKINS	—	1	21		22
G. sp.	—	—	15	9	5
Globorotalia fohsi barisanensis (LEROY)	—	2	6	10	9
G. scitula praescitula BLOW	—	—	1	1	—
Globorotaliloides variabilis BOLLI	—	—	—	3	—
Total number of planktonic foraminifera	1	6	63	80	66

Other characteristics of benthonic foraminiferal assemblage is as follows:

1. Buliminidae, Cassidulinidae, Anomalinidae and Rotaliidae have a mutual relation as shown table 3.

2. The scarcity of Miliolidae and arenaceous foraminifera

According to the knowledge of the living foraminifera, *Rotalia* is a familiar among shallow water genus and is often associated with *Elphidium*, which is also common in the littoral zone. *Nonion*, commonly with *Elphidium* in the Shiomizaki and Odoji formation, is commonest in shallow water, but is apparently prefers somewhat deeper water than the closely related, more often littoral living *Elphidium* the Discorbinae is constituent of various littoral assemblage.

Cassidulinidae and Lageniidae appears to be bathymetrically restricted. Planktonic form shows oceanic condition. In short, the foraminiferal assemblages of the Shiomizaki and the Odoji formation indicate that the environment of the Shiomizaki formation was shallow water and that the Odoji formation was neritic to bathyal and oceanic.

Age Consideration

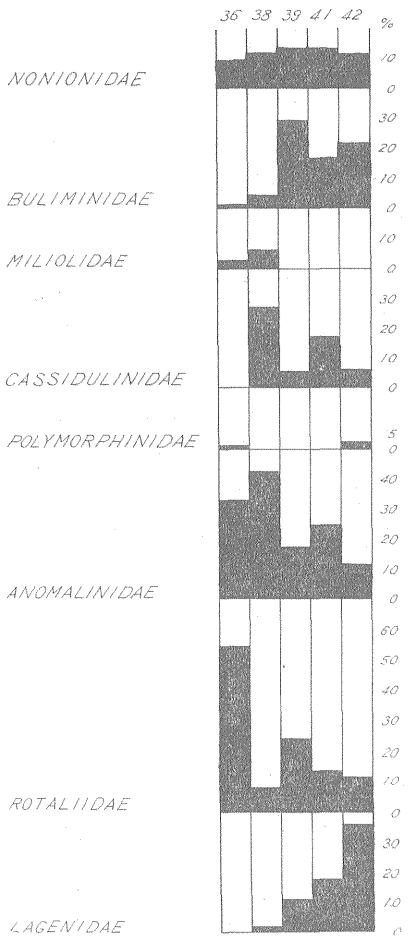
The smaller foraminifera's fauna of the Shiomizaki and the Odoji formation most resembles the fauna of other strata with *Operculina-Miogypsina* in the other localities of Japan.

Recently, the planktonic foraminifera enabled to be made to the exact biostratigraphic correlation of the Japanese Miocene.

The planktonic foraminiferal zone of the Shiomizaki and the Odoji formations is *Globorotalia fohsi barisanensis* zone (Table 2).

Then, among the benthonic foraminiferal assemblage, the Shiomizaki and the Odoji fauna resembles the upper part of the Higashiinnai formation in the Noto peninsula, Ishikawa prefecture (K. Asano, 1953), Mizunami group in the vicinity of Mizunami city, Gifu prefecture (Y. Tai, 1959 and Y. Tamura, 1961) Sugota formation in the Dewa hills, Akita prefecture (S. Iwasa and Y. Kikuchi, 1957) and the fauna of Miyoshian stage in San'in province,

Table 3 Frequency of the Main Families of the Shiomizaki and Odoji Formations



Setouchi province of West Honshu (Y. Tai, 1959).

The similarity of benthonic foraminiferal assemblage suggests that sedimentary environment were very similar.

In the fauna of the Higashi-innai formation, the *Miogypsina-Operculina* zone occupies the middle part, in the upper part, family Lageniidae is represented by the largest number of genera, species and individuals in the other families, the genera *Bulimina Uvigerina, Cassidulina, Guttulina, Nonion, Cibicides, Gaudryina* and *Valvulineria* contain the majority of the species and individuals, family Miliolidae occurs rare, pelagic foraminifera of the family Globigerinidae also occurs in the abundance in association. The species in common with the species of the Shiomizaki and Odoji formations are about forty species.

Miyoshian stage is divided into two zones, the lower zone occurs in a sandstone facies and its microfauna is *Miogypsina kotoi-Operculina complanata japonica* zone, the upper zone occurs in a siltstone facies and its microfauna is *Lagenodosaria scalaris-Uvigerina crassicostata* zone, in this upper zone, the family Lageniidae are represented by the number of genera, species and individuals.

Of the other families, the genera *Uvigerina, Ellipsonodosaria, Nonion, Angulogerina, Eponides, Gaudryina, Bolivina, Bulimina, Hanzawaia, Cibicides, Cassidulina* and *Epistominella* contains the majority of species and individuals.

The pelagic, open sea genera *Globigerina* and *Globorotalia* occur in considerable number. Consequently, the lower zone and upper zone of Miyoshian stage correspond to each zone of the Shiomizaki and Odoji formations.

Recently, Y. Tamura (1961) reported that the Oidawara formation and the Shukunohora formation of Mizunami city, Gifu prefecture which Y. Tai included in Miyoshian stage, correspond to *Globorotalia fohsi barisanensis* zone. Consequently, the Shiomizaki and Odoji formations correspond to Miyoshian stage in view of the similarity of both benthonic foraminiferal and planktonic foraminiferal assemblage.

Conclusion

Faunal assemblages of Shiomizaki and Odoji formations are divided into two zones. The lower zone (Shiomizaki formation) contains *Operculina complanata japonica* and the benthonic foraminiferal fauna which is composed of shallow water species.

The upper zone is composed of neritic or bathymetrical species.

Age of their formation is regarded as *Globorotalia fohsi barisanensis* zone and is correlated to the Nishikurosawa formation of Oga peninsula, Akita prefecture.

Bibliography

Asano, K.: Illustrated Catalogue of Japanese Tertiary Smaller Foraminifera, Pts. 1～15 and Supplement 1, 1950～1952

Asano, K.: Miocene Foraminifera from the Noto Peninsula, Ishikawa Prefecture, Short Papers, IGPS, No. 5, p. 1～12, pls. 1～3, 1953

Iwasa, S. & Kikuchi, Y.: Foraminifera from the Sugota Formation, Akita Prefecture, Japan, Trans. Proc. Paleont. Soc. Japan, n.s., No. 16, p. 183～194, 8 text-figs., 1954

Nakajima, H.: Geology of the Northwestern Part in Nishitsugaru-gun, Aomori Prefecture, Grad. Thes., IGPS (MS) (in Japanese), 1959

Tai, Y.: On "the Togarian Stage"-Miocene Microbiostratigraphy of the Setouchi Geologic Province, Jour. Geol. Soc. Japan, Vol. 64, p. 516～525 (in Japanese), 1958

Tai, Y.: Miocene Microbiostratigraphy of West Honshū, Japan, Jour. Sci. Hiroshima Univ., Ser. C, Vol. 2, No. 4, p. 265～395, 2 text-figs., 7 pls., 1959

Tamura, Y.: Geological Structure covering from the Tajimi and Mizunami City, Gifu Prefecture to the Eastern Part of Kani-gun, Gifu Prefecture, Grad. Thes IGPS (MS) (in Japanese), 1961

青森県西津軽郡大戸瀬付近における有孔虫について

藤 井 敬 三

要 旨

青森県西津軽郡大戸瀬付近に発達する第三系は下位から，大戸瀬層・塩見崎層・大童子層・鳥居崎安山岩の各層に区分される。塩見崎層には *Operculina* が豊富に存在することで昔から知られているが，それに伴ない小型有孔虫も多産する。また大童子層の下位にも小型有孔虫が多産するので，その有孔虫群集を検討した結果，2つの群集に分けられる。下位は浅い型の群集で，上位は Lageniidae と Planktonic foraminifera の多い，より深い外海性の群集を示す。その群集内容は，能登半島の東院内層，岐阜県瑞浪の生俵層と宿洞層，多井による三好階の有孔虫群集に非常に類似している。

時代対比からいうと，汎世界的に認められる *Globorotalia fohsi barisanensis* zone に相当する。