53. *Pleistocene Foraminifera from the
Hiradoko Shell Beds, Noto
Peninsula, Japan*

By

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The material of the present article was collected by the late Tadao MATUSIMA of our Institute from Hiradoko, Syôin-mura, Syuzu-gun, Isikawa prefecture (Noto peninsula), where a marine fossiliferous deposit of sandy mud forms a terrace some 25-40 meters high. The deposit is rich in fossil shells in its upper half, and is known under the name of the "Hiradoko shell bed". It has a more extended distribution in the environs of the village Syôin. The fossil content seems to vary greatly according to the kind of sediment, fossils being fragmental in the marginal part of deposition and abundant and well preserved at Hiradoko.

The deposit contains a rich foraminifera fauna, beside mollusca, bryozoa, sponge-spicules and diatoms. Its molluscan fauna has already been treated by Dr. M. YOKOYAMA, Messrs. K. MOTIZUKI and Y. ÔTUKA independently; the latter author enumerated as many as 99 species of mollusca from Hiradoko.

The foraminifera fauna to which I am solely in concern is interesting in several respects. Firstly it comprises many warm-water forms; especially *Amphistegina radiata* (FICHTEL & MOLL) and *Sorites marginalis* (LAMARCK). These two are now common in tropical and subtropical seas, but seldom living in the seas bordering Honsyû; it is as exceptional cases that I lately obtained the former species from a shore sand of Miyazu, Wakasa bay, and the latter in an off-shore material from Kannoura, the southeast coast of Sikoku.

Secondly, this foraminifera fauna is quite different in its composition from those prevailing in the younger Neogene marine

formations of this district. Thirdly, it is significant in lacking *Cassidulina*, a genus with a very characteristic distribution of its species in the Japanese Neogene formations, and the absence of its species in this deposit suggests 1) the warm 2) shallow-water condition and 3) a complicated migration of the foraminifera in this district during the latest geological ages. The abundance in individual and specific numbers of the three genera, *Quinqueloculina*, *Spiroloculina*, and *Elphidium* in the deposit is also another indication of its shoal water origin.

The specifically determined forms are given in the following list.

Family Textulariidae :—

<i>Textularia gramen</i> d'ORBIGNY	common
<i>T. conica</i> d'ORBIGNY	few
<i>T. hauerii</i> d'ORBIGNY	few
<i>T. candeiana</i> d'ORBIGNY	rare
<i>T. uedai</i> ASANO	rare

Family Verneuilinae :—

<i>Gaudryina</i> (<i>Siphogaudryina</i>) <i>matusimai</i> n. sp.	rare
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Family Miliolidae :—

<i>Quinqueloculina subarenaria</i> CUSHMAN	common
<i>Q. seminulum</i> (LINNÉ)	few
<i>Q. vulgaris</i> d'ORBIGNY	few
<i>Q. dutemplei</i> d'ORBIGNY	rare
<i>Q. linnaeana</i> d'ORBIGNY	rare
<i>Spiroloculina antillarum</i> d'ORBIGNY	common
<i>S. canaliculata</i> d'ORBIGNY	common
<i>Hauerina fragilissima</i> (BRADY)	few
<i>Triloculina trigonula</i> (LAMARCK)	abundant
<i>T. tricarinata</i> d'ORBIGNY	few
<i>T. terquemiana</i> (BRADY)	rare

Family Lagenidae :—

<i>Lagena striata</i> d'ORBIGNY	very rare
<i>L. squamosa</i> MONTAGU	very rare
<i>L. hexagona</i> WILLIAMSON	very rare

Family Polymorphinidae :—

<i>Guttulina orientalis</i> CUSHMAN & OZAWA	few
<i>Pseudopolymorphina ishikawaensis</i> CUSHMAN & OZAWA	few
<i>P. okuwaensis</i> CUSHMAN & OZAWA	few
<i>P. indica japonica</i> CUSHMAN & OZAWA	rare
<i>Sigmoidella kagaensis</i> CUSHMAN & OZAWA	few

Family Nonionidae :—

<i>Nonion boueanum</i> (d'ORBIGNY)	rare
<i>Pseudononion japonica</i> ASANO	few
<i>Elphidium advenum</i> (CUSHMAN)	common
<i>E. crispum</i> (LINNÉ)	few
<i>E. jenseni</i> (CUSHMAN)	rare
<i>E. subgranulosa</i> ASANO	rare

Family Peneroplidae :

<i>Sorites marginalis</i> (LAMARCK)	few
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Family Buliminidae :—

<i>Loxostoma karreriana</i> (BRADY)	rare
<i>Reussella spinulosa</i> (REUSS)	rare
<i>Chrysalidinella dimorpha</i> (BRADY)	rare
<i>Siphogenerina raphana</i> (PARKER & JONES)	few

Family Rotaliidae :—

<i>Discorbis orbicularis</i> (TERQUEM)	rare
<i>Eponides repandus</i> (FICHTEL & MOLL)	rare
<i>Rotalia japonica</i> HADA	rare

Family Amphisteginidae :—

<i>Amphistegina radiata</i> (FICHTE & MOLL)	few
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Family Cymbaloporidae :—

<i>Cymbalopora bradyi</i> (CUSHMAN)	rare
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Family Globigerinidae :—

<i>Globigerina bulloides</i> d'ORBIGNY	rare
<i>G. triloba</i> REUSS	very rare
<i>G. inflata</i> d'ORBIGNY	very rare
<i>Orbulina universa</i> d'ORBIGNY	very rare

Family Anomalinidae :—

<i>Planulina wuellerstorfi</i> (SCHWAGER)	very rare
<i>Cibicides lobatulus</i> (WALKER & JACOB)	few
<i>C. refulgens</i> (MONTFORT)	rare
<i>C. pseudoungerianus</i> (CUSHMAN)	very rare

Family Planorbulinidae :—

<i>Acerbulina inhaerens</i> SCHULTZE	rare
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Besides 51 species enumerated in the above list, there are several indeterminable ones belonging to the genera, *Quinqueloculina*, *Textularia*, *Triloculina*, *Guttulina* and *Discorbis*.

Remarks to the Foregoing List

Family *Textulariidae*

5 species were discriminated of genus *Textularia*, and the

commonest one is *T. gramen* d'ORBIGNY. It is a species common in the shallow waters of the adjacent seas of Japan. *T. uedai* ASANO was originally described from the Pliocene of Muraokamura, Kanagawa prefecture.

Family *Verneuilinidae*

Genus *Gaudryina* d'ORBIGNY, 1839

Subgenus *Siphogaudryina* CUSHMAN, 1935

Gaudryina (*Siphogaudryina*) *matusimai* n. sp.

Text-figs. 1-3.

Test wedge-shaped, early portion triserial and triangular, later portion biserial and somewhat compressed; one edge divided, resulting to a generally quadrangular aspect of test; chambers indistinct, not inflated; sutures oblique, very slightly depressed in later ones; wall very finely arenaceous; aperture a small, low opening of inner margin of last-formed chamber. Length up to 0.5 mm.

Gaudryina (*Siphogaudryina*)
matusimai n. sp.

Holotype (Reg. No. 21443, Institute of Geology and Palaeontology, Tôhoku Imperial University, Sendai, Japan) from the Hiradoko shell beds, Hiradoko Syôin-mura, Noto Peninsula, Japan. Coll. by the late T. MUTUSIMA.

This species somewhat resembles *G. (S.) wrightiana* MILLETT from the Malay Archipelago, but has less numerous chambers with less prominent edges.

Family *Miliolidae*

4 genera and 11 species of this family were distinguished in the present material. These species live mostly in warm, shallow, clear water, and are present in abundance in some deposits laid down under those conditions.

Quinqueloculina: Of the 5 identified species, *Q. suberenaria* CUSHMAN is most common. It is a subtropical species originally described from off Singapore in 13 fathoms, and sometimes found in the Neogene deposits of Japan. The two striated forms *Q.*

dutemplei d'ORBIGNY and *Q. linnaeana* d'ORBIGNY are rather rare in the present material, although they are now common in warm shallow waters.

Spiroloculina: 2 species, namely *S. canaliculata* d'ORBIGNY and *S. antillarum* d'ORBIGNY were distinguished. These two forms are very common in the Plio-Pleistocene and recent faunas of Japan, as well as in the present collection.

Hauerina: *H. fragilissima* (BRADY) only was found.

Triloculina: 3 species were found. *T. trigonula* (LAMARCK) is most abundant in the present material. The others *T. tricarinata* d'ORBIGNY and *T. terquemiana* (BRADY) are rather rare, although they are common in the seas adjacent to Japan.

Family *Ophthalmidiidae*

Vertebralina: *V. striata* d'ORBIGNY only was found. This is one of the common species of foraminifera from the Byôritu beds of Taiwan.

Family *Lagenidae*

The material from Hiradoko beds has only *Lagena* of this family.

Lagena: 3 species of this genus were rarely found. These species are more common in moderately deep oceanic waters than in shallow waters. In the adjacent seas of Japan, there is a notable increase in both individuals and species in depths exceeding 100-200 meters.

Family *Polymorphinidae*

3 genera and 5 different forms were distinguished.

Guttulina: *G. orientalis* CUSHMAN and OZAWA was only found; this is a species originally described from the Upper Pliocene of Sawane, Island of Sado.

Pseudopolymorphina: 3 species, namely *P. ishikawaensis* CUSHMAN and OZAWA, *P. okuwaensis* CUSHMAN and OZAWA, and *P. indica japonica* CUSHMAN and OZAWA were present. All are characteristic of the Japanese Plio-Pleistocene.

Sigmoidella: *S. kagaensis* CUSHMAN and OZAWA is the only species found. It is very common in the Pliocene and recent

faunas of Japan.

Family *Nonionidae*

Of this family, 3 genera and 6 species were found.

Nonion: *E. boueanum* (d'ORBIGNY) which is common in the Japanese Neogene is also present.

Pseudononion: This genus was based upon a material from the Pliocene of Sagami, Japan. Its genotype, *P. japonicum* ASANO, is often found in the Hiradoko beds.

Elphidium: Among the 4 species of this genus, *E. advenum* (CUSHMAN) and *E. crispum* (LINNÉ) were most common; both are abundant in the Japanese Neogene. On the other hand, *E. jenseni* (CUSHMAN) and *E. subgranulosa* ASANO are not common in the collection.

Family *Peneroplidae*

According to NORTON, "members of the Peneroplidae are almost never found below 60 fathoms and are restricted to warm, shallow water zone". In the present material, *Sorites marginalis* (LAMARCK) belonging to this family, was found. This species has not yet been known from the Japan Sea, both fossil and recent.

Family *Buliminidae*

Loxostoma: *L. karreriana* (BRADY) is the single representative of this genus.

Reussella: *R. spinulosa* (REUSS).

Chrysalidinella: One species, *C. dimorpha* (BRADY).

Siphogenerina: *S. raphana* (PARKER and JONES) was found. Its distribution ranges from the Kerimba Archipelago across the Indian Ocean to the Pacific where it extends northward to Japan, Guam and the Hawaiian Islands, and southward to New Zealand.

Family *Rotaliidae*

Discorbis: Only one species, *D. orbicularis* (TERQUEM).

Eponides: Only one species, *E. repandus* (FICHTEL & MOLL). This is very abundant in Siogama Bay, Japan.

Rotalia: *R. japonica* HADA, first described from Mutu Bay, Japan was found.

Family *Amphisteginidae*

Amphistegina: Foraminifera of this genus are often abundant on coral reefs and in warm shallow waters of the Indo-Pacific, but less abundant elsewhere. In Japan, *A. radiata* (FICHTEL & MOLL) is known from Miyazu, Wakasa Bay, Kannoura on the south-east coast of Tosa and Sagami Bay. The presence of this species, together with *Sorites marginalis* (LAMARCK) above noted, is a good indication of warm, shallow water deposits.

Family *Cymbaloporidae*

Only *Cymbalopora bradyi* (CUSHMAN) was found.

Family *Globigerinidae*

The genera of this family comprise pelagic species. Though carried by oceanic currents every directions, there is a marked decrease in number of the foraminifera of the Globigerinidae in the cold regions or embayments. The rare occurrence of these forms in the present material is by no means an indication of its deposition under open-sea conditions.

Family *Anomalinidae*

Planulina: *P. wuellerstorfi* (SCHWAGER).

Cibicides: 3 species were distinguished in the collection. *C. lobatulus* (WALKER & JACOB) is rather common, but *C. refulgens* (MONTFORT) and *C. pseudoungerianus* (CUSHMAN) are rare, these species are abundant in the adjacent seas of Japan.

Finally I wish to offer my warmest thanks to Prof. H. YABE of the Institute of Geology and Palaeontology, Tôhoku Imperial University, Sendai, Japan, for the permission to publish this short note on the one hand and for the various suggestions given me during the preparation of this article on the other.

能登半島平床層の化石有孔蟲類 (摘要)

浅 野 清

卒業論文作成中、不幸にしてフキールドに急焉玉碎されし故松島君が、筆者に、平床貝層の有孔蟲類研究を依頼されたのは、5月初旬であつた。而して今や君への報告が、靈前に捧げなければならなくなつた。

平床貝層の有孔蟲類は可成り暖海性の要素を含み、且つ同地方の第三紀層のものとは、明に區別され得る。本有孔蟲群の中に新種 (*Gaudryina matusimai* n. sp.) を發見せる外、日本海沿岸にて始めて、*Amphistegina radiata* (F. & M.) 及び *Sorites marginalis* (LAM.) の如き熱帶性有孔蟲化石産地を知ることが出来た。