日本古生物学會報告・紀事

Transactions and Proceedings of the Palaeontological Society of Japan

New Series No. 57

日本古生物学会

Palaeontological Society of Japan
April 30th, 1965

CONTENTS

TRANSACTIONS

The fossil on the front page is *Pecten takahashii* YOKOYAMA, 1930.

All Communications relating to this Journal should be addressed to the
PALAEONTOLOGICAL SOCIETY OF JAPAN
Geological Institute, Faculty of Science, University of Tokyo, Japan

Trans. Proc. Palaeont. Soc. Japan, N.S., No. 57, pp. 1-7, pl. 1, April 30, 1965

482. REVISION OF THE TAKAGAMI CONGLOMERATE, CHOSHI PENINSULA, AND DESCRIPTIONS OF THE PERMIAN BRYOZOA FROM ITS LIMESTONE PEBBLES*

SUMIO SAKAGAMI

Department of Geology, Hokkaidô Gakugei University

銚子半島高神礫岩の再検討とその石灰岩礫中からの二畳紀蘚虫化石の記載：従来高神礫岩については，その地質時代及び礫の起源について 2, 3 の異った説があるが，ここでは主に礫の起源について，これが同時堆積礫か，あるいは外来礫であるかを検討するため，採集された石灰岩礫のそれぞれについてその中に含まれる紡錘虫化石群及び礫と基質との関係を調べて，すくなくとも石灰岩礫には 3 種類のタイプのあることを明らかにし，石灰岩礫は外来物であることを述べた。また石灰岩礫中の蘚虫化石 3 種 (1 新種, 2 未定種) を記載した。

坂上澄夫

Introduction and acknowledgements

There are many studies on the geology and paleontology of the Chôshi Peninsula, Chiba Prefecture. The Takagami conglomerate which was named originally by KANO (1958) is exposed only in the Takagami Quarry, about 2 km south of Chôshi City. Although it is well known that Permian fossils occur in abundance from the limestone pebbles in the Takagami conglomerate, there are some different opinions on the geological age and the origin of the conglomerate.

N. KANOMATA *et al.* (1958) stated that the deposition of the Takagami conglomerate is post-*Lepidolina* zone in age, and can be correlated with the uppermost Permian Toyoma series of the Kitakami massif notwithstanding the much different lithofacies. H. KANO (1958) made a petrological study of the pebbles of the Takagami conglomerate and stated that it belongs to the Usuginu-type conglomerate from the nature of the pebbles of plutonic origin associated with those of metamorphic derivation and that it is noteworthy that there are many characters common especially with Usuginu conglomerate (upper Permian) at Yukizawa of Rikuzen-Takada City, Iwate Prefecture and the Ozima conglomerate (lower Triassic) of Okachimachi, Miyagi Prefecture. H. OZAKI (1959) stated, in his elaborate report, that the limestone pebbles in the Takagami conglomerate seem to indicate an autochtonous origin and that the geological age may be upper Permian (*Yabeina* zone). S. MAEDA (1959), however, from the mode of appearance of the limestone pebbles in the conglomerate, stated that the limestone pebbles should be thought to be a distinctly exotic deposit and the age of the conglomerate is post-uppermost Permian.

The writer studied the fusulinid assemblages from each limestone pebble

* Received July 24, 1964; read September 20, 1964 at Hiroshima.

Table: Fusulinids and Bryozoa from the pebbles of the Takagami conglomerate.

Species \ Pebbles	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Schubertella sp. A	+															
Schubertella sp. B							+	+			+					
Paraboultonia inuboensis CHISAKA		+									+					+
Reichelina? sp.																+
Schwagerina pseudocrassa KANMERA			+						+				+?			
Schwagerina sp.																+
Pseudofusulina ambigua (DEPRAT)	+															
Pseudofusulina sp. A (*vulgaris* type)	+															
Pseudofusulina sp. B	+															
Pseudofusulina sp. C							+				+					
Chusenella choshiensis CHISAKA		+		+		+							+			+
Chusenella sp. (smaller type)			+		+			+?	+							
Pseudodoliolina sp.		+														
Kahlerina pachytheca KOCHANSKY-DEVIDÉ & RAMOVS		+			+	+	+	+	+			+				+
Yabeina shiraiwensis OZAWA		+		+			+	+			+				+	+
Yabeina gubleri KANMERA			+		+	+			+	+			+	+		
Yabeina sp.			+						+			+	+		+	
Leioclema? choshiensis SAKAGAMI, n. sp.		+														
Fistulipora sp. indet.									+							
Sulcoretepora sp. indet.																+
Types of Fusulinid Assemblage	A	B	C	B	C	C	B	B	C	C	B	B or C	C	C	B	B
Number of Thin Sections	12	16	14	1	1	1	6	13	15	4	7	8	6	5	9	10
Boundary Line of Pebble and Matrix	i	i	s	i	s	si	u	s	s	u	u	si	s	u	si	si

Types
- A: bearing *Pf. ambigua* and etc. and containing no Neoschwagerininae.
- B: bearing *Yabeina shiraiwensis*.
- C: bearing *Yabeina gubleri*.

Boundary Line
- i: irregular
- s: smooth
- si: smooth but partly irregular
- u: unknown

in the Takagami conglomerate to determine whether the limestone pebbles in the conglomerate are autochtonous or exotic.

Here, the writer expresses his sincere thanks to Dr. Hiroshi OZAKI of the National Science Museum in Tokyo for his donation of some limestone pebbles of the Takagami conglomerate for study and to Professor Kotora HATAI of the Tohoku University for his kindness in reading the manuscript.

Discussion of the Takagami Conglomerate

The 16 limestone pebbles examined before and after slicing are all brownish-gray in color. Some of the boundary lines between the pebble and the matrix are distinct and very smooth, whereas others are indistinct and irregular. In some cases, these two types (smooth and irregular) are observed along the same boundary line of pebble and matrix. From the fusulinid assemblage, the limestone pebbles can be classified into three types, namely :—

Type A : Bearing *Pseudofusulina ambigua*, *Pf.* sp. A, *Pf.* sp. B, *Schubertella* sp. A and containing no Neoschwagerininae.

Type B : Bearing *Yabeina shiraiwensis* in abundance and other fusulinids.

Type C : Bearing *Yabeina gubleri* in abundance and other fusulinids.

Occasionally, it is observed in all types of the pebbles, that the fusulinid individuals are cut off at the boundary line.

From the above mentioned facts, the writer considers that :

1) The age of the limestone pebble of Type A corresponds to the lower part of the *Parafusulina* zone from its fusulinid assemblage.

2) The ages of the limestone pebbles of Type B and C are both correlative with that of the *Yabeina* zone.

3) Since the above mentioned three types of limestone pebbles point to at least two different geological ages, it is difficult to consider that all of the pebbles were deposited primarily and contemporaneously. Therefore, the limestone pebbles are certainly of an exotic deposit as mentioned by S. MAEDA.

4) From the boundary lines between the pebble and matrix, it seems to be impossible to consider that the conglomerate is composed of autochtonous pebbles as H. OZAKI pointed out. Even the boundary line of the pebble of Type A (with *Pseudofusulina ambigua*, and etc., and corresponding in age to the lower part of the *Parafusulina* zone) is indistinct and irregular.

5) The writer could not obtain satisfactory data on the geological age of the Takagami conglomerate. However, in the writer's opinion with the consideration of previous views of N. KANOMATA *et al.* (1958), H. KANO (1958), H. OZAKI (1959) and S. MAEDA (1959), the age of the conglomerate should be post-*Yabeina* zone because all of the limestone pebbles of the conglomerate are of exotic origin. Furthermore, the irregular shape of the limestone pebbles, the mode of occurrence and the other evidences suggest that the chronological interval between the age of the pebbles to deposition of the conglomerate may be not so long. Therefore, the writer is led to support KANOMATA *et al.*'s opinion that the Takagami conglomerate may be correlated with the Toyoma series of the Kitakami massif, although the latter consists of very fine sedimentary rocks (slate) and the former of

very coarse grained facies (conglomerate).

In 1958, the writer reported on the upper Permian limestone conglomerates (the Tamanouchi and Nishinoiri conglomerates) containing fusulinids of the *Fusulinella* to *Yabeina* zones from the southeastern part of Kwanto massif. The Takagami conglomerate is considered to be correlated with the conglomerate of the Kwanto massif, although some differences in the lithofacies and fusulinid assemblages in the pebbles between them are recognized.

Some Remarks on the Fusulinids

The fusulinid fauna from the pebbles of the Takagami conglomerate were already described and illustrated by T. CHISAKA (1960). He discriminated the following 14 species: *Reichelina* sp., *Rauserella* sp., *Paraboultonia inuboensis* CHISAKA, *Pseudofusulina ozakii* CHISAKA, *Pf. tamanouchiensis* SAKAGAMI, *Pf.* sp., *Chusenella choshiensis* CHISAKA, *Pseudodoliolina pseudolepida gravitesta* KANMERA, *Neoschwagerina takagamiensis* CHISAKA, *Yabeina shiraiwensis* OZAWA, *Y. columbiana* (DAWSON), *Y. gubleri* KANMERA, *Y. katoi* (OZAWA) and *Y. proboscis* CHEN, and he pointed that the fauna seems to be most closely related to those from the Kuma formation. These species discriminated by CHISAKA well agree with the writer's specimens which were found in the thin slices made from the pebbles of Type B and C.

The writer discriminated 17 species of fusulinids and their distributions are shown in the table. Among the writer's species, *Schubertella* sp. A, *Pseudofusulina ambigua* (DEPRAT), *Pf.* sp. A, and *Pf.* sp. B were found from the pebble of Type A and the age from the specific assemblage can be distinguished from those in the pebbles of Type B and C. *Schubertella* sp. A resembles *Schubertella* cf. *irumensis* FUJIMOTO which SAKAGAMI (1958) reported from the limestone pebble of the Tamanouchi conglomerate in the northern part of Itsukaichi, Kwanto massif. *Schubertella irumensis* was described originally by FUJIMOTO (1936) from the limestone of Asamido and Sôzugawa in Saitama Prefecture in association with *Pseudofusulina ambigua*, *Pf. japonica*, *Pf. vulgaris* var. *globosa*, *Pf. kraffti*, *Pf. granum-avenae*, *Misellina claudiae*, and *Neoschwagerina craticulifera*. *Pseudofusulina ambigua* is known from various localities of the lower part of the *Parafusulina* zone in Japan. *Pseudofusulina* sp. A which was examined by only two not well oriented thin sections resembles *Pf. vulgaris* in the thick spirotheca, coarse alveolar structure and having phrenotheca. *Pseudofusulina* sp. B somewhat resembles *Pf. japonica* but can be distinguished therefrom in detail. From the above, the age of the pebble of Type A may correspond to the lower part of the *Parafusulina* zone.

With regard to the genus *Yabeina*, *Y. shiraiwensis* and *Y. gubleri* are never found in the same pebble, the latter species occurs only in the pebble of Type C and the former in that of Type B, and the two species can be distinguished from one another in the size of the proloculus, thickness of spirotheca, and mode of axial septula and secondary transverse septula. *Yabeina* sp. (Figs. 13, 14 in Plate 1) which occurs from the pebbles of Type B and C has a very small proloculus, and the essential characters are very similar to those of *Y. globosa*. *Yabeina globosa* and *Y. shiraiwensis* or *Y. gubleri* have not been

known to occur from the same geological horizon and their geological ranges were discussed by KANMERA (1953, 1954), HANZAWA and MURATA (1963) and others. It is very interesting to the writer that Y. NOGAMI (1961) described and illustrated *Yabeina* sp. A and B, both of which have very small proloculus and are very similar to *Y. globosa* as mentioned by NOGAMI, from the *Yabeina shiraiwensis* zone of the Atetsu plateau.

Description of Bryozoa

Leioclema? choshiensis SAKAGAMI, n. sp.

Plate 1, Figures 3-10.

Zoarial observations — Five sections were examined: two tangential, two longitudinal and one oblique. Zoarium encrusting and seems to have been attached to foreign substance which was obliterated. Thickest part of zoarium about 2 mm.

Tangential section.—Zooecia pentagonal or quadrate in immature zone and circular in mature zone, usually 7 to 8 zooecia in 2 mm. Diameter of zooecia 0.222 mm in average, ranging from 0.192 mm to 0.256 mm (54 measurements) in mature zone. Mesopores rarely present and circular, its diameter 0.096 mm to 0.128 mm. Zooecial wall thin in immature zone, measuring 0.024 mm to 0.040 mm, but becoming a thick wall in mature zone, measuring 0.04 mm to 0.064 mm. Acanthopores prominent, disposed at each point of intersection of zooecial wall and surrounded by dark colored concentric fibrous tissue, and separated from zooecial wall material; its inner and outer diameters 0.01 mm to 0.02 mm and 0.08 mm to 0.10 mm, respectively.

Longitudinal section.—Zooecial tubes straight and arise at right angle from coenolasma. Immature zooecial tube very short. Wall-sides of mature zone very smooth. Zooecial wall laminae trend approximately parallel to longitudinal directions of zooecia for a short distance before curving into zooecial boundaries. Diaphragms in zooecial tube thin, complete and slightly concave, and 1 or 2 diaphragms in a tube. Diaphragms in mesopores indistinct.

Remarks:—There is some doubt of including the present specimens in the genus *Leioclema* because there are no diaphragms observable in the mesopores and of the rarely developed mesopores. However, the present species may be included in the genus because of the following characters: zooecia without moniliform, diaphragms complete and acanthopore conspicuously developed. The present species resembles *Leioclema globosa* which was described originally from the Nura Nura member of the Poole sandstone of Western Australia by CROCKFORD (1957) and recorded from the lower part of the Kanokura series of Kamiyatsuse, Kitakami massif, Japan by SAKAGAMI (1961), but the present species differs from the latter by the shorter zooecial tube and more coarsely developed diaphragms in the zooecial tube.

Occurrence:—The present form occurred from a limestone pebble of Type B of the Takagami conglomerate. The associated fusulinids are *Paraboultonia inuboensis* CHISAKA, *Chusenella choshiensis* CHISAKA, *Pseudodoliolina* sp., *Kahlerina pachytheca* KOCHANSKY-DEVIDÉ & RAMOVS and *Yabeina shiraiwensis* OZAWA.

Reg. nos. 5824 (holotype), 5816, 5818, 5825, 5828 (paratypes).

Fistulipora sp. indet.

Plate 1, Figures 1, 2.

Zoarium lamellate, about 1.2 mm to 1.8 mm in thickness. Zooecial tubes straight from the proximal to distal ends, rather large and circular or oval in tangential section. Their larger diameter 0.32 mm to 0.43 mm and about the same from inner to outer tube. There are usually three zooecia per 2 mm. Lunarium well developed in zooecial tube of mature zone, about 0.08 mm thick, occupying about one third of zooecial circumference. Interspaces between zooecial tubes filled by well developed vesicular tissue which is regularly arranged in longitudinal rows, subquadrate in longitudinal section and irregularly polygonal in tangential section. One to three rows of vesicles in interspace between zooecial tubes. Stereom covering vesicular tissue almost lacking. Diaphragms absent.

Remarks:—The present form resembles *F. megastoma* SAKAGAMI (1961) which was described from the lower part of the Kanokura series of Kamiyatsuse, Kitakami massif, Japan in many respects. However, the incomplete materials at hand are insufficient for specific decision.

Occurrence:—The present form occurred from a limestone pebble of Type C. The associated fusulinids are *Schwagerina pseudocrassa* KANMERA, *Chusenella* sp., *Kahlerina pachytheca* KOCHANSKY-DEVIDÉ & RAMOVS, *Yabeina gubleri* KANMERA and *Y.* sp.

Reg. nos. 5875, 5876.

Sulcoretepora sp. indet.

Plate 1, Figures 11, 12.

Only two oblique sections were examined. Zoarium bifoliate. Mesotheca apparently a closely joined bouble layer, reaching surface at edge of zoarium. Thickness of zoarium about 1.2 mm and width uncertain on account of bad oriented section. Zooecial tube arise from mesotheca, straight or gradually curved. Zooecium circular to oval in tangential section, its diameter 0.16 mm to 0.176 mm. Vesicular tissue poorly developed in inner part of zoarium, and its size and arrangement indistinct.

Explanation of Plate 1

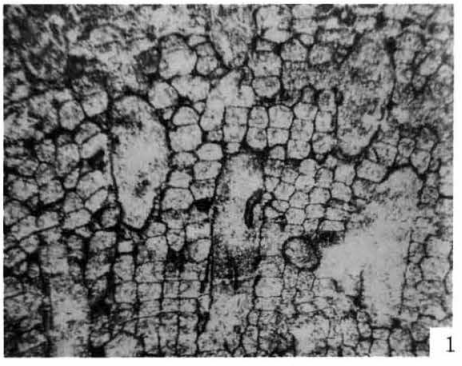
Figs. 1, 2. *Fistulipora* sp. indet.
1, Longitudinal section, 2, tangential section, ×20, Reg. no. 5876.

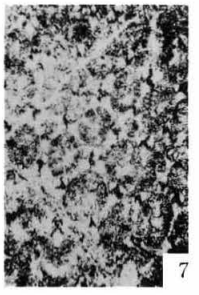
Figs. 3-10. *Leioclema? choshiensis* SAKAGAMI, n. sp.
3, 4, Longitudinal sections (holotype), ×20, Reg. no. 5824, 5, 6, enlarged parts of Figs. 3 and 4, respectively, ×60, 7, 8, tangential section, ×20, Reg. no. 5825, 9, 10, enlarged parts of Figs. 7 and 8, respectively, ×60.

Figs. 11, 12. *Sulcoretepora* sp. indet.
Oblique sections, ×20, Reg. nos. 5919 and 5924, respectively.

Figs. 13, 14. *Yabeina* sp.
13, Outer part of axial section, 14, inner part of the same section, ×60, Reg. no. 5910.

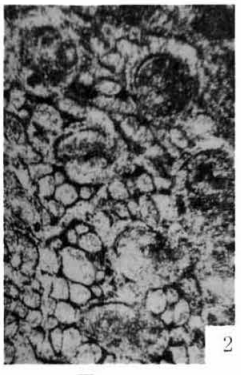
All of the specimens treated in this paper are preserved in the collection of the Department of Geology, Hokkaidô Gakugei University, Hakodate.

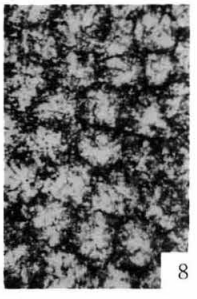

1


7


3

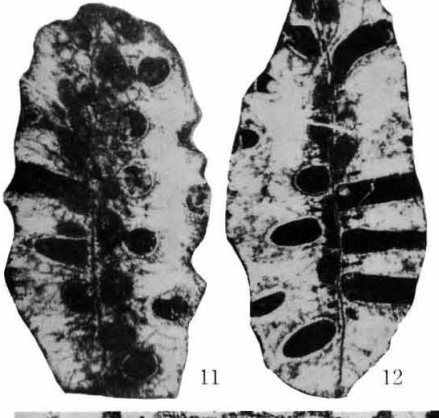

4

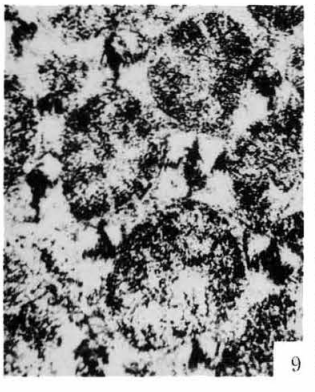

2

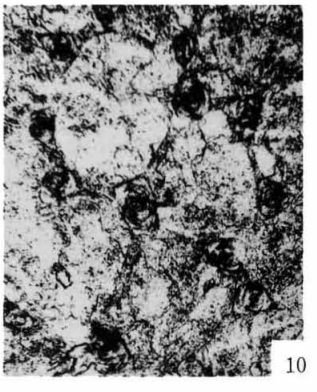

8

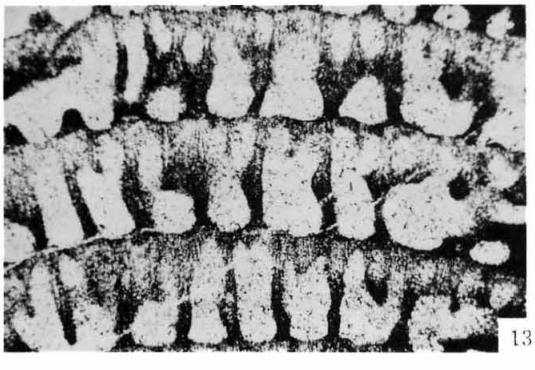

5

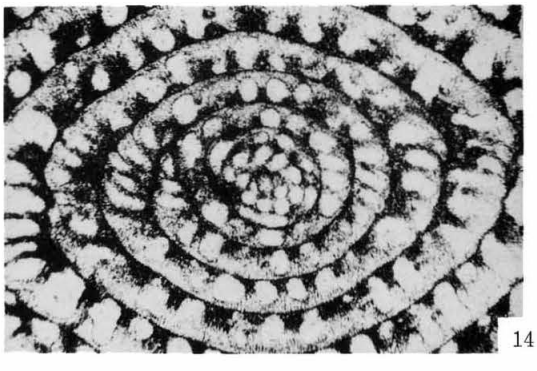

6


11 12


9


10


13


14

SAKAGAMI photo

Remarks:—The present form may belong to the genus *Sulcoretepora*, but the specific comparison is not possible because there are only two incomplete thin sections at hand.

Occurrence:—The present form occurred from a limestone pebble of Type B. The associated fusulinids are *Paraboultonia inuboensis* CHISAKA, *Reichelina?* sp., *Schwagerina* sp., *Chusenella choshiensis* CHISAKA, *Kahlerina pachytheca* KOCHANSKY-DEVIDÉ & RAMOVS, and *Yabeina shiraiwensis* OZAWA.

Reg. nos. 5919, 5924.

References

BASSLER, R. S. (1953): Treatise on Invertebrate Paleontology. G. Bryozoa. *Kansas Univ. Kansas Press.* p. G1-G253.

CHISAKA, T. (1960): On Some Permian Fusulinids from the Takagami Conglomerate, Choshi Peninsula, Chiba Prefecture, Japan. *Jour. Coll. Arts & Sci., Chiba Univ., Vol. 3, No. 2*, p. 235-254, pl. 1-9.

CROCKFORD, J. (1957): Permian Bryozoa from the Fitzroy Basin, Western Australia. *Commonwealth of Aust., Dept. Nat. Development, Bureau of Min. Res., Geol. Geophysics, Bull. No. 34*, p. 1-134, pl. 1-21.

FUJIMOTO (HUZIMOTO), H. (1936): Stratigraphical and Palaeontological Studies of the Titibu System of the Kwanto-Mountainland. Pt. 2. Palaeontology: *Sci. Rep. Tokyo Bunrika Daigaku. Sec. C. 1*, p. 29-125, pl. 1-26.

HANZAWA, S. and MURATA, M. (1963): The Paleontologic and Stratigraphic Considerations on the Neoschwagerininae and Verbeekininae, with the Descriptions of Some Fusulinid Foraminifera from the Kitakami Massif, Japan. *Sci. Rep. Tohoku Univ., 2nd Ser., Vol. 35, No. 1*, p. 1-31, pl. 1-20.

KANO, H. (1958): On a Granite-bearing Conglomerate from the Choshi Peninsula, Chiba Prefecture, Japan. *Jour. Geol. Soc. Japan, Vol. 64, no. 757*, p. 551-556. (*in Japanese with English abstract*)

KANOMATA, N. *et al.* (1958): Geological Study of the Choshi Peninsula. *Study of Synthesis (Late Mesozoic of Japan). Connection Paper of Study, Kyushu Univ., No. 7*, p. 96-104. (*in Japanese*)

KANMERA, K. (1953): The Kuma Formation with Special Reference to the Upper Permian in Japan. *Jour. Geol. Soc. Japan, Vol. 59, No. 697*, p. 449-468. (*in Japanese with English abstract*)

—— (1954): A Fusulinids from the Upper Permian Kuma Formation, Southern Kyushu, Japan, with Special Reference to Fusulinid zone in the Upper Permian of Japan. *Mem. Fac. Kyushu Univ., Ser. D, Geol., 1*, p. 1-38, pl. 1-6.

MAEDA, S. (1959): Geological Age of the Takagami Conglomerate. *Jour. Coll. Arts & Sci., Chiba Univ., Vol. 3, No. 1*, p. 75-80. (*in Japanese with English abstract*)

NOGAMI, Y. (1961): Permische Fusuliniden aus dem Atetsu-Plateau Südwestjapans. Teil 2. Verbeekininae, Neoschwagerininae u. a. *Mem. Coll. Sci., Univ. Kyoto, Ser. B, Vol. 28, No. 2*, p. 159-228, pl. 1-7.

SAKAGAMI, S. (1958): Conglomerates in the Upper Permian System of the Northern Part of Itsukaichi, Tokyo-to, Japan. *Jub. Publ. Commem. Prof. H. FUJIMOTO sixtieth birthday*, p. 91-95. (*in Japanese with English abstract*)

—— (1958): Fusulinids from the Permian Conglomerates of the Northern Part of Itsukaichi, Tokyo-to, Japan. *Jour. Hokkaidô Gakugei Univ., Vol. 9, No. 2*, p. 72-97, pl. 1-4.

—— (1961): Japanese Permian Bryozoa. *Palaeont. Soc. Japan, Spec. Papers No. 7*, p. 1-58, pl. 1-30.

Asamido	浅海戸	Atetsu plateau	阿哲台
Itsukaichi	五日市	Kamiyatsuse	上八瀬
Okachi-machi	雄勝町	Sôzugawa	三津川
Usuginu	薄衣	Yukizawa	雪沢

Trans. Proc. Palaeont. Soc. Japan, N.S., No. 57, pp. 8-27, pls. 2, 3, April 30, 1965

483. SOME CEPHALOPODS IN THE PERMIAN FAUNULE OF TAKAKURA-YAMA, FUKUSHIMA PREFECTURE, JAPAN (WITH A NOTE ON THE GEOLOGY OF THE DISTRICT, BY ICHIRO YANAGISAWA AND MAMORU NEMOTO)

ICHIRO HAYASAKA

福島県高倉山ペルム紀化石群中の頭足類について：既に記載した 2 種のオウムガイ類の外に，新たに 1 種を記載し，アムモノイド類 8 種の記載と共に発表する。産地付近の地質状況についての，柳沢一郎・根本守両氏の記事は，ここの化石の産出の状況を知るために極めて有益である。岩質に依って 3 分された高倉山層群は，古生物学的には，はっきり区分され得ぬもののようで，全体として Sosio stage を示すものであろう。　早坂一郎

I. Introduction

Our knowledge on the Permian fossils of Takakura-yama has a brief history: it goes back to 1950, when Hajime KOBIYAMA happened to discover some fragmentary specimens of brachiopods in a float of slate in a valley on the northern slope of Takakura-yama. Early in summer he was on an excursion with some pupils he was teaching in the prefectural technical school in Taira city. In autumn the members of Taira Chigaku Dôkôkai, that is, the Association of lovers of earth science in Taira, made an excursion to the same district, and could collect some more specimens of fossils in the valleys around Takakura-yama. Those fossils were sent to some paleontologists for examination. A list of rather preliminarily ascribed generic names of the fossils was introduced by KOBIYAMA in a number (no. 3) of the bulletin of their Association in the year 1952. The writer had been entrusted by him some imperfect specimens of brachiopods and molluscs for study: a few ammonoids especially attracted the writer's attention. Some of these and *Lophophyllum*, *Wentzelella*, *Parafusulina* and some others were mentioned in the list. The geological age of the faunule seems to have been approximately made out.

Since then the members of Dôkôkai have been earnestly engaged, in their leisure times, in the geological and paleontological researches. The results of their observations have been reported from time to time in the succeeding issues of their bulletins. Besides, several geologists and paleontologists have visited the district, and have added new data more or less. The present writer had an opportunity of meeting the geologists of Taira in the summer of 1956, and was guided through the field by KOBIYAMA: the mode of occurrence of the fossils was observed, and some fossils were collected.

In the meantime, the writer published a paper in 1957, in which two species of nautiloids were described. These specimens were put in the writer's disposal by KOBIYAMA in the previous year. The specimens were in an un-

* Received Sept. 21, 1964; read Sept. 20, 1964, at Hiroshima.

usually good state of preservation for the fossils of Takakura-yama, so that the writer was tempted to venture description in no time: they were named *Tylonautilus permicus* and *Tainoceras abukumaense*, respectively. In this paper the geological features of the district informed so far were briefly referred to: a little more detailed account was given in the author's paper of 1962, in which the occurrence of *Tainoceras abukumaense* in the southern Kitakami Permian was placed on record.

In the former of these two papers the writer enumerated several ammonoid genera that occurred in association with the nautiloids described in order to assure the geological age of the latter. It is these ammonoids that are dealt with in the present parer. The study of these ammonoids, of which the generic affinities had been almost ascertained, has been delayed for rather a long time, because of the writer's vain hope of obtaining more, and better materials, not to say of his official situation inconvenient for palcontological study during the last several years.

The geological and stratigraphical relations of the Paleozoic formation of Takakura-yama district have been cleared by degrees during these years. Based on these data, Ichiro YANAGISAWA and Mamoru NEMOTO, both members of the said Association, prepared a summary report which was contributed to the Journal of the Geological Society of Japan in 1961. This was naturally consulted by the writer in preparing his last-mentioned paper. These two authors, however, have taken trouble to write for the present paper a concise account of the geology supplemented with some recent data as well as a more or less simplified geological map adopted from what was published in their work just referred to.

For bringing up this note for publication the writer owes a great deal to YANAGISAWA and NEMOTO for their favor of preparing their note which is to follow. The writer is greatly indebted to KOBIYAMA for the specimens that make the major part of the material of this paper: besides, he has kindly supplied the writer with various informations concerning the results of the incessant efforts of the geologists in and around Taira toward geological exploration of the Takakura-yama district.

II. An outline of the geology around Takakura-yama: with a geological map (By Ichiro YANAGISAWA and Mamoru NEMOTO)

Takakura-yama is a hill, 293 m. high, situated in the town of Yotsukura, and is about 8 km. north of the city of Taira, Fukushima Prefecture. In the area around this hill are exposed the Tertiary Jôban and the Cretaceous Futaba formations that unconformably overlie the "basement formation" which, in part, has been generally regarded as of unknown age. In 1953 the members of Taira Chigaku Dôkôkai started a systematic field research in the region, and various informations have been acquired since. They have found some fossils in the valleys in the north of Takakura-yama: among them are Trilobites, Corals, Ammonoids, Fusulinids and some others. It is in the "basement formation" of the unknown age that these fossils have been collected. According to the paleontologists who examined these fossils, the faunule represents the Permian age.

The Paleozoic formation which we call the Takakura-yama Group, as a whole, has the strike of about NE~NNE

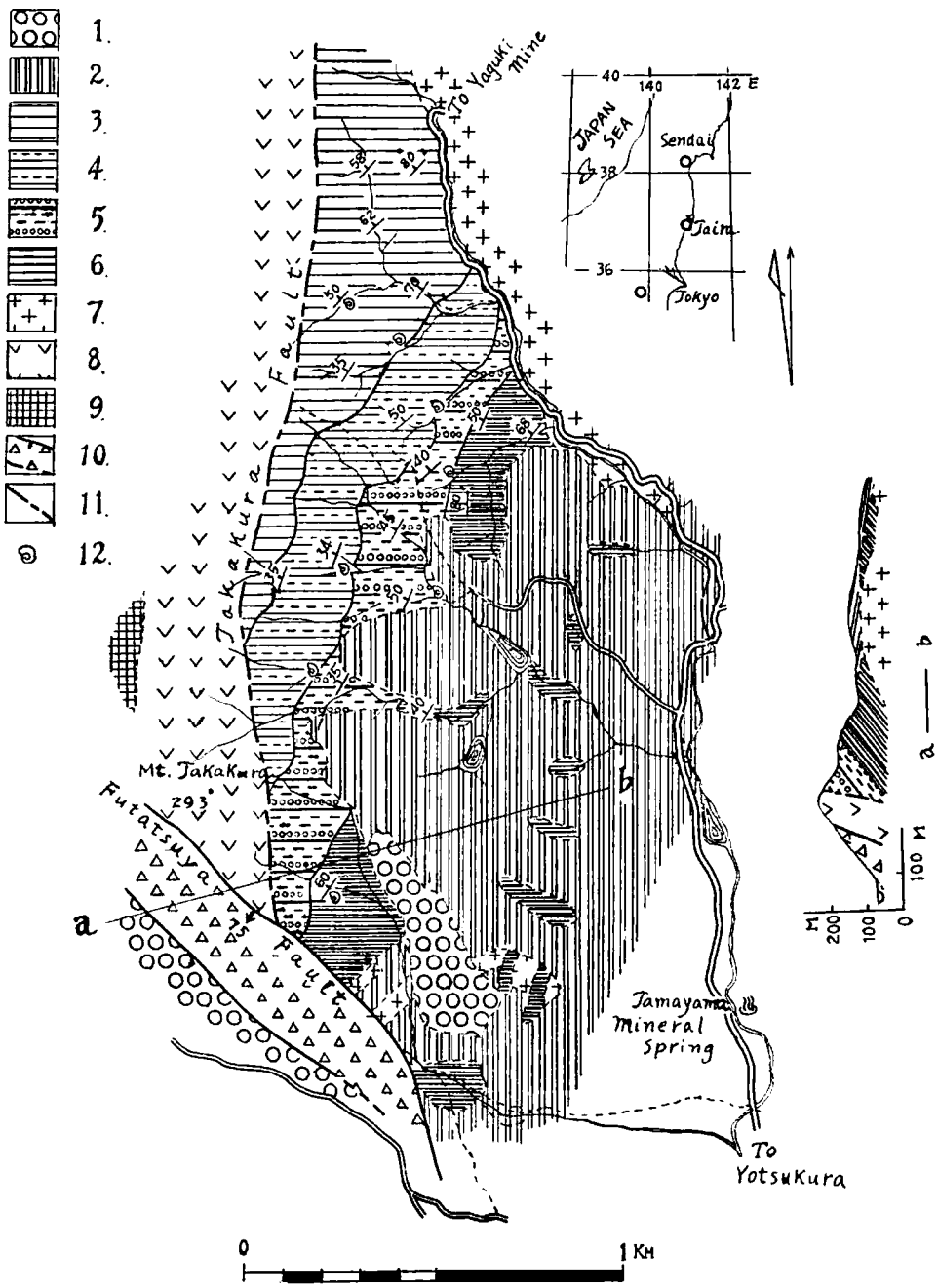


Fig. 1. Geological map of the district around Takakura-yama, and a schematic profile 1. Quaternary deposits; 2. Cretaceous Futaba formation; 3. Upper and 4. Lower Kashiwadaira formations; 5. Motomura formation; 6. Iriishikura formation; 7. granites; 8. porphyrite; 9. green metamorphic rocks; 10. faults; 11. presumed dislocation; 12. localities of fossils.

and the dips toward NW～WNW. It is limited in the south by a transverse dislocation called the Futatsuya fault trending N45°～50°W : toward north the exposure is traced, though intermittently, close to the Yaguki mines of the Nittetsu Mining Company. On the east of the area the Paleozoic formation comes in contact with the Cretaceous Futaba formation and granite, the boundary between the Paleozoic and the Cretaceous being unconformable. On the west a porphyrite and some green metamorphic rocks with quartz schist are exposed side by side with the Paleozoic : the boundary is presumed to be a dislocation. The Paleozoic as a whole exposes in a roughly wedge-shaped outline, extending almost N-S. Text-figure 1 is to summarize the geological and stratigraphical relations of the area under consideration.

The Takakura-yama Group consists chiefly of black slates, graywackes, conglomerates and limestone breccia, forming a continuous sequence of about 900m. in thickness. Throughout the whole thickness there are 5 fossil horizons recognized. The structure is considered to be monoclinal, dipping 40°～70° toward NW, with a general strike of N25°～50°E. These sedimentaries are penetrated by granite and porphyrite at places. Covering all these are the Quaternary deposits : these latter seem to have yielded to dislocation movement.

The Takakura-yama Group is divided into three formations chiefly according to the variation of facies features. They are as follows, being numbered from below upwards :

3. Kashiwadaira formation .... Upper Slate formation
2. Motomura formation .... Conglomerate formation
1. Iriishikura formation .... Lower Slate formation

The formation 1 is about 100 m. thick, and intercalates, in its middle part, beds of graywacke and siliceous slate, or graywacke and limestone. The fossils found in this formation are *Gerthia kobiyamai* EGUCHI (MS), *Spirifer* sp., *Bellerophon* sp. and *Paraceltites* ? sp. The formation 2 is an alternating series of somewhat fossiliferous conglomerate, graywacke, and slate, the thickness varying from about 70 to 170 m. Some important fossils recognized are : *Parafusulina* sp., *Wentzelella minor* EGUCHI (MS), *Lophophyllum* aff. *pendulum* GRABAU, *Liebea* sp., *Waagenophyllum* ? sp., *etc.* The upper formation, 3, begins with black slate, followed by conglomerate containing subangular or rounded pebbles of limestone, black slate, and graywacke, attaining to the thickness of about 420～530 m. as a whole. This formation is quite richly fossiliferous, containing the following forms : *Tachylasma* cf. *magnum* GRABAU, *Fenestella* sp., *Productus* sp., *Tylothyris* sp., *Aviculopecten* sp., *Tylonautilus permicus* HAYASAKA, *Tainoceras abukumaense* HAYASAKA, beside several ammonoids that are being described by HAYASAKA in the present paper. These fossils seem to assure the Takakura-yama Group to be middle Permian in age.

As to the geological age of the granitic intrusion, it is only so far certain that it took place after the deposition of the Takakura-yama Group, and before that of the Futaba formation. The period of intrusion of the porphyrite is presumed to be earlier than that of the granitic series.

III. The cephalopods and some associate fossils

The cephalopods hitherto known to the writer are 3 nautiloids and 8 ammonoids. Of the former, 2 were described some years ago, as referred to elsewhere. In this paper another species is added which is represented by a single, fragmentary specimen having a rather valid physiognomic characteristic: it resembles *Tainoceras unklesbayi* MILLER and YOUNGQUIST to a considerable degree. Of the ammonoids there are

Propinacoceras spp. indet.
Medlicottidae? gen. & sp. indet.
Paraceltites aff. *elegans* GIRTY
?*Pseudogastrioceras* spp. indet.
Agathiceras cf. *suessi* GEMMELLARO
Stacheoceras aff. *grünwaldti* GEMMELLARO
Popanoceras sp. indet.
Waagenoceras cf. *dieneri richardsoni* MILLER and FURNISH.

There may probably be more than one species in *Propinacoceras*: so also may possibly be with *Agathiceras*. Therefore the number of species may be more than einght.

All these cephalopods have been collected in the Upper Slate formation, that is the Kashiwadaira formation. Several indeterminable species of pelecypods and brachiopods are known to have occurred in this formation. Perhaps the occurrence of *Paladin yanagisawai* described by Riuji ENDO and Eiji MATSUMOTO in this formation may be worthy of mention. *Paladin* is a genus known to range from the Upper Mississippian to the Lower Pennsylvanian in North America, and from Moscovian to the Sakmarian in U.S.S.R., as referred to by ENDÔ and MATSUMOTO. In the Takakura-yama Group it was found with a few other trilobites in association with these ammonoids. Most of the corals identified by EGUCHI seem to have occurred in the Motomura or the conglomerate formation, together with *Parafusulina* sp.

In the slate of the Kashiwadaira formation imperfect and often obscure remains of terrestrial plants are rather frequently found. According to a recent correspondence from KOBIYAMA, Prof. Enzô KONNO who examined the specimens identified *Calamites* sp., *Pecopteris* sp. and *Taeniopteris* sp. among them.

The fossils of the Takakura-yama Group are almost without exception incomplete, being crushed and deformed. In this point they do not differ from those of the Kitakami Paleozoic fossils, although the modes of fossilization are not invariably the same. It is very difficult to find specimens that allow unanimous identification at ease in both cases. This seems especially true with ammonoids. Here the writer likes to repeat what he remarked in one of his 1963 papers dealing with the Kitakami Permian fossils. "The writer believes, however, that even almost unmanageably deformed fossils should not be neglected: ....Even if specific identification is not possible, some general view of the fauna may, though dimly, be suggested through them. At the same time, records of even such fragmentary specimens might" suggest or foreshadow future possibilities of discovery.

As far as the ammonoids of the age are concerned, even unfavorably preserved, incomplete specimens may be expected useful for deciding the horizons of the Permian formation, provided that their generic identification is tenable. Zoning of the Permian by ammonoid genera has been in practice since long ago. In recent years this has become more and more generally accepted by paleontologists. MILLER and FURNISH, for instance, schemed a table of ammo-

noid zones in their work on the Guadalupe Mountain materials. In this case the "Correlation chart" covers all the important ammonoid-bearing beds of the United States. Somewhat later, GERTH provided a similar but more exhaustive correlation table, with the scope of establishing a stratigraphical zoning of the world-wide application. More recently, the above mentioned American paleontologists, joined by CLARK, remarked, in the summary of their paper entitled "Permian Ammonoids from Western United States" as follows:—"The stratigraphic range of the great majority of the Permian ammonoid genera has been established; many are practically good index fossils. They appear to be reasonably independent of facies and provincialism; none of the forms encountered in this large territory are bizarre. There is little or no reason to differentiate a Tethyan faunal assemblage, and the ammonoids known from America are in general like those of the Mediterranean and Asiatic regions."

These remarks of the American and German paleontologists combined show that the value of the ammonoid genera as stratigraphical indices of the Permian formations has to be given a universal credit. Notwithstanding, the writer needs some courage to speak decisively of the stratigraphical stage of the Permian of the Takakura-yama Group by means of such meager materials. Combining the vertical ranges of the genera of these ammonoids, however, the writer is led to conclude that the faunule, and in all probability, the Takakura-yama Group as a whole, corresponds to the Sosio stage, as remarked elsewhere.

The invertebrate fossils in the Takakura-yama Group are all severely damaged: the remains of animals of different habitats are found mixed up in the rocks that are near-shore sediments. Moreover, fragmented remains of some terrestrial plants also occur in association. All these facts seem to suggest that the Takakura-yama Group was deposited rater rapidly in an area not far from shore, possibly in a lagoon.

Description of species

NAUTILOIDEA

Family Tainoceratidae HYATT 1883

Genus *Tylonautilus* PRINGLE and JACKSON 1928

Tylonautilus permicus HAYASAKA

1957. *T. permicus*, HAYASAKA:—Two Perm. Nautiloids from Takakurayama, etc., pp. 26-30, pl. 9, fig. 12.

This was considered perhaps worth of note as the first Permian occurrence of the genus. No additional material has been found since, however.

Genus *Tainoceras* HYATT 1883

Tainoceras abukumaense HAYASAKA

1957. *T. abukumaense*, HAYASAKA:—*Op. cit.*, pp. 24-26, pl. 8, figs. 1-3.

1962. *T. abukumaense*, HAYASAKA:—Two Species of *Tainoceras* from the Permian of the Kitakami Mountains, pp. 137-140, pl. 11, figs. 1-3; text-fig-1.

That the same species was discovered at two rather remote localities, one in the Abukuma plateau (Takakura-yama) and the other in the southern Kitakami mountains, appears to be quite a rare case, especially in regard to the cephalopods of the Japanese Permian. By careful observations it may be found

that such coincidences of species are not so uncommon as it appears to be at present, however.

Tainoceras aff. *unklesbayi* MILLER and YOUNGQUIST

Plate 3, Figs. 7a, b.

1949. *T. unklesbayi*, MILLER and YOUNGQUIST:—American Permian Nautiloids, p. 91, pl. 33, figs. 1, 2.

Beside the two species of Nautiloids referred to above, here is another species of the latter genus, the third of the Takakura-yama nautiloids. The material is only a piece of black slate with an impression of a part of what appears to be the ventral sculpture of a nautiloid. After much hesitation the writer has become disposed for regarding the specimen almost congruous with the Permian species of MILLER and YOUNGQUIST from Arizona, quoted above. In the specific diagnosis of this North American species the authors remark that "on each side of rather deep ventral groove there is a row of large narrowly rounded nodes that are obliquely elongate—the axis of elongation slopes orad from the venter." This holds true in principle with the present Japanese specimen. In details, however, there is some difference. In the latter, each of the obliquely elongate nodes bears a more or less rounded, almost hemispherical protuberance at about its middle. This may perhaps be regarded as a feature characterizing this species: this feature is somewhat better shown in the plaster cast of the specimen (Fig. 7b).

It is worthy of note in this place that in the famous Lo-ping fauna of southern China studied long ago by E. KAYSER, there is a nautiloid species which presents an aspect similar to the present specimen. It is "*Nautilus*" *mingshanensis* KAYSER: it was re-described later by F. FRECH as *Tainoceras mingshanense*. As the latter author remarked, the Lo-ping specimen is a "flachgedrücktes Wohnkammerbruchstück" seen from above. There is a similarity between it and the Japanese one in the mode of preservation. In the details of sculpture, however, they differ from each other. The Chinese species is characterized by KAYSER something as follows. On the surface of the specimen there are two outer and two inner series of nodes, the latter series being separated by a deep, narrow and fluted furrow. Both outer and inner nodes are elongate tubercles that are so arranged that they make obtuse angles pointed orad. The tubercles of the inner row or series are not exactly symmetrically arranged. The outer nodes are considered as swollen and rounded external, that is, ventral ends of lateral ribs that are not fully preserved in the very specimen.

The oblique ribs in the Japanese specimen are seen to be somewhat dumb-bell-like in shape, but are not divided into nodes as in the Lo-ping specimen. In this point the former is very closely allied to the American species, though the form and the relative size of the ribs are not like those of the latter. What would become of the ventral sculpture of *T. unklesbayi* if it were to be flatly crushed as *T. mingshanense* was?

AMMONOIDEA

It is quite long since the generic disposition of the ammonoids of the Takakura-yama Group was roughly grasped by the writer. The generic names were

referred to couple of times on the occasions of describing some of the associate fossils or some of the comparable group of fossils as complementary in assigning their geological age, and so on. Unfortunately, however, little has been added to the material, and the writer's knowledge about the faunule has not been increased to any degree. The material, especially of ammonoids consists of very meager specimens, so that the following pages should be entitled something like the explanation of the specific affinities rather than the description of species. The records of the occurrence of such a faunule and the paleontological observations on the constituent fossils though poorly preserved may not be totally meaningless, however.

Family Medlicottidae KARPINSKY*

Genus *Propinacoceras*
GEMMELLARO 1887

Propinacoceras spp. indet.

Plate 2, Figs. 1a, b; 2.

In the Takakura-yama faunule fragmented specimens of *Propinacoceras* are found occasionally. They are mostly detached pieces of the natural casts of ventral or ventro-lateral parts of conchs. At the writer's disposal are three such specimens belonging to the different individuals: they are all flattened. The specimens are characterized by two rows of transversely elongate, and more or less rounded nodes, or ribs as may better be called. None of the specimens shows the suture-lines.

In the diagnosis of the genus *Propinacoceras*, GEMMELLARO seems to have rather lightly referred to the characteristic feature of the ventral zone of conch. In the descriptions of his species, namely, *P. beyrichi*, *P. galilaei*, and *P. affine*, however, this very feature is taken up as one of the important external characteristics. This ventral sculpture, though different in details from species to species, are all of the similar pattern, irrespective of localities of occurrences in different countries. This peculiar pattern of the ventral zone seems to have proved useful as a distinctive mark of the genus.

TOUMANSKY, for instance, seems to have attached importance to the ventral sculpture in the treatment of his specimens. In one of his papers, on the Permo-Carboniferous ammonoids of Crimea, several species including some new ones of the genus are described, most of which exhibit suture-lines if not in complete forms. Take *P. soramense*, a new species, for instance. It is obvious that the species belongs to the Family Medlicottidae because of the partly observed suture-lines. It is the general form of conch, and the pattern of the ventral sculpture that urged the author to decide the fossil to be a *Propinacoceras*. *P. almense*, also a new species, which resembles both *Propinacoceras* and *Medlicottia* in point of the sutural pattern, was finally decided to be the former on account of the broad siphonal zone of the conch with the characteristic feature. TOUMANSKY's *P.* sp. indet. No. 2 does not exhibit suture-line, but because of the wide ventral zone with large transverse tubercles or ribs it was ascribed to *Propinacoceras*.

In another paper TOUMANSKY gives further examples showing his attitude toward recognizing the genus *Propinacoceras*. Of the six species of the genus

* "Family" according to MILLER and FURNISH.

found in ihe Permian of the Translai range, only one, *P. butense*, is specifically identified: it shows suture-lines. Of all the others, suture-lines are unknown. But they are placed in *Propinacoceras* because they have wide, flat ventral zones with two rows of transverse tubercles intervened by a distinct median furrow.

DIENER seems to have regarded the sculptural pattern of the ventral zone important for the recognition of the genus *Propinacoceras*. In his "Leitfossilien des marinen Perm", the genus is defined in a deliberate style. "Der breite, ein wenig gewölbte Externteil setzt gegen den flachen Seitenteile mit gerundeten Kanten ab und wird durch scharf eingeschnittene Kerben in eine große Anzahl von quer über denselben verlaufenden Wellen zerlegt. Diese Querskulptur des Externteils wird durch eine tiefe und schmale Medianfurche unterbrochen."

The three specimens from Takakurayama are designated, expediently, A, B and C. The specimen A (Fig. 1) shows the lateral side though not very distinctly (Fig. 1a) and the ventral sculpture (Fig. 1b). This specimen appears to closely resemble a similarly fragmented specimen from the neighborhood of Kesennuma city. They may probably be more like *P. galilaei* GEMMELLARO, than any others. The specimen B is not given in picture, as it is so very badly worn out that a photographic representation is hardly available. However, it is characterized by its wide and robust transverse nodes and very narrow interspaces: three of the nodes occupy a space of 10 mm. The transverse nodes are wide and robust also in the specimen C (Fig. 2): this may perhaps be specifically the same as B. These latter specimens are likely to be compared with *P. beyrichi* GEMMELLARO as well as *P. knighti* MILLER and FURNISH, in having wide and robust transverse nodes and very narrow interspaces: three nodes occupy a space of 10 mm.

Medlicottidae? genus and species indet.

Plate 3, Fig. 1.

The specimen is an artificial mud cast made from a natural external cast of a small fragment of an ammonoid in the collection of KOBIYAMA. It is obliquely crushed and deformed. It has, however, a physiognomic feature resembling more or less that of *Propinacoceras*; namely, there is a distinct, rather deep and narrow median groove on the ventral zone. But the transverse ventral nodes on either side of the median groove are of a pattern different from those of the latter genus: they are virtually not nodes but are sharply defined radial ribs extending over the ventrolateral borders of the conch. These ribs are slightly convex forward. The interspaces, somewhat narrower than the ribs, are sharp with almost flat bottoms. The lateral sides of conch appear to be flat in general, but they approach to each other gradually toward venter so as to form slightly convex ventral zone which is not distinctive from the lateral zones, unlike the flattish ventral zone of *Propinacoceras* or *Artinskia*.

It is not possible to measure the thickness of the conch, as the specimen is very incomplete, and the other side of the specimen is not exposed. The size and form are only to be judged from the picture given in natural size on the plate (Fig. 1). Of the transverse ribs 5 are counted in a distance of 10 mm, with

4 interspaces: the median furrow is a little wider, being about 1.4 mm.

From the above remarks it is suggested that the specimen may belong to the Family Medlicottidae if not to the Genus *Medlicottia*.

In the Kitakami Permian fauna a species of a somewhat doubtful *Medlicottia* has been recognized. Although it is also only a fragmentary specimen, it shows parts of suture-lines naturally weathered out which suggest that the specimen belongs, or closely allied at least to *Medlicottia*. However, it and the Takakura-yama specimen are so distinctly different from each other in the mode of fossilization that there are no means of correlating them.

Family Paraceltitidae SPATH, 1930

Genus *Paraceltites* GEMMELLARO, 1888

Paraceltites aff. *elegans*
GIRTY (HAYASAKA)

Plate 3, Fig. 2.

1940. *Paraceltites*. aff. *elegans* GIRTY, HAYASAKA :—*Jour. Geol. Soc. Japan, no. 565 (vol. XLII)*, pp. 423-424, text-figs. 2, 3.

The occurrence of this species in Japan was recorded in 1940 as shown above. There were several specimens, mostly external and internal molds preserved in a small boulder of a dark gray sandy shale found in one of the fossil localities in the southern Kitakami mountains. Although the material consisted of specimens that are in an unsatisfactory state of preservation, the writer endeavored to demonstrate that they very closely resemble *P. elegans* GIRTY, if not identifiable with it. With respect to the external physiognomic features the specimen shown by Fig. 3, twice natural size, fairly coincides with the description and illustration by GIRTY, except that the Kitakami specimens are considerably smaller in size.

Now, in the fossils from Takakura-yama, there are two specimens that are likely to be identified with the Kitakami species just referred to: they are in a similarly incomplete state of fossilization. Of the Takakura-yama specimens the one (Fig. 2) is of a singular way of preservation. It is as a whole an external mold, but in the ultimate portion of the whorl it seems to show the inside of the whorl, suggesting that a part of the adoral portion of conch had been damaged, and exposed the inside before the specimen was buried. The venter is seen as a narrow but perceptively impressed, and the lateral side is flat, though the specimen as a whole seems to have yielded to a flattening pressure.

The surface sculpture exhibited by the external mold is just the same as is observed in the Kitakami specimen. The other specimen is only a part of an external mold of what is considered a living chamber: it exposes a venter with characteristic features similar to those observed in the other specimen mentioned above. The fine, wavy transverse plications, or rather striae, are all alike in both the Kitakami and the Abukuma (Takakura-yama) specimens.

To sum up the physiognomic characters observed in the Takakura-yama specimens:—Conch is flatly discoidal and quite evolute, with about 6 volutions: it is deformed to an oblique shape, the longer diameter being estimated to be about 30 mm. Whorls compressed, with narrow convex venter which is smooth, and has shallow but distinct impressions. Transverse ribs or plications on the lateral surface of whorl, except for the ultimate are rather straight and round-

topped, and wider than interspaces that are apparently grooves having obtusely angular profile: there are about 12 of plicae in 10 mm. on the last portion of the whorl: plicae are stouter on the umbilical side, and faint away before reaching the ventro-lateral border. Toward the ultimate part of the whorl the transverse plicae rather abruptly turn into fine, sinuate striae that are densely crowded: they appear to extend close to the ventro-lateral border. Suture-lines are not known of the present specimens. Neither the thickness of the conch is easy to make out, as the specimens are compressed more or less, and are without shell substance attached.

The specimens here under consideration, though not well preserved, have much in common with those from the southern Kitakami mountains, as stated above. The writer considers that the specimens from both regions are specifically identical. They are very closely allied to, if not identical with *Paraceltites elegans* GIRTY as repeatedly remarked.

Although there are several other species of the genus hitherto known, some having characters more or less common with the present Japanese species, the writer takes it an inevitable course to refrain himself from discussing the systematic or taxonomic relations among them. However, GIRTY's remarks in his description of *P. elegans*, appear worthy of note in this place. After having identified his fossil with the genus *Paraceltites*, and discussed the affinities between his *P. elegans* and the Sicilian species, he concluded that the former is not specifically identical with the latter. "One difference which can be named is the more nearly transverse direction of the plications in *P. elegans*, while in the Sicilian species they slope forward." This character seems to separate the Japanese species from many known species from various parts of the world. Moreover, many species are characterized by broad plications that are consequently small in number.

Regarding the distribution and geological horizons of the species of *Paraceltites*, MILLER and FURNISH afford us comprehensive summary. The Japanese occurrence of these fossils, though their species is not decided, presents an additional item to the list of distribution of the genus. The same authors call attention to a few important points concerning the physiognomic variation of the paraceltitids. "Primitive forms, which occur in early Middle Permian are characterized by prominent sculpture, evolute whorls, and relatively simple sutures. In advanced forms, the sculpture is less pronounced, whorls are somewhat more deeply impressed dorsally, and the sutures trend to form an additional lobe..." In the Takakurayama specimens, suture-lines are not accessible, but the sculpture is rather conspicuous, and the dorsal impression is clearly observed.

Family Gastrioceratidae WEDEKIND, 1914

Genus *Pseudogastrioceras* SPATH, 1930

For the distinction of *Pseudogastrioceras* from the other, kindred genera, the writer follows the scheme elaborated by MILLER and FURNISH in 1940.

? *Pseudogastrioceras* sp. indet.

Plate 3, Figs. 3, 4.

A small fragment of venter and ventro-lateral border of a relatively large conch (Fig. 3), and an incomplete external mold

of a small indivudual (Fig. 4) are the material of this fossil. The former yielded to oblique compression, and bilateral symmetry is disturbed. Ventral surface is broadly rounded, but nothing is known of lateral sides and apical part. Ventral surface is ornamented with fine spiral lirae that are quite dense, counting about 15 within the venter which is about 20 mm. wide: interspaces much wider.

Among the upper Paleozoic ammonoid genera, to which this species most likely belong, *Pseudogastrioceras* is the one which provides a few comparable species as regards the features remaining in the present incomplete specimen. Probably *P. zitteli* (GEMMELLARO) may be mentioned as one of those most strongly suggest affinity to the former, provided that it is a *Pseudogastrioceras*.

The other, smaller specimen (Fig. 4) is a broken piece of an external mold as stated above. Conch is of a rather thickly discoidal outline, with thin and quite distant revolving lirae that are preserved as thin spiral grooves in the specimen, interspaces being several times wider. Conch is transformed into ovoidal shape: no transverse constriction is recognized. This also may possibly be a *Pseudogastrioceras*, perhaps specifically different from the other.

Family Agathiceratidae ARTHABER, 1912

Genus *Agathiceras* GEMMELLARO, 1887

Agathiceras cf. *suessi* GEMMELLARO

Plate 2, Figs. 3, 4a, b; Text-fig. 2.

1887. *Agathiceras Suessi*, GEMMELLARO:—La fauna dei Calc. con *Fusulina* della valle del fiume Sosio, *etc.*, pp. 79-80, pl. VI, figs. 1-4 (Pl. VII, fig. 36).

1888. *Agathiceras Suessi*, GEMMELLARO:—*Ibid.*, Appendiche, pp. 22-24, pl. C, fig. 20; pl. D, fig. 13.

1927 *Agathiceras suessi*, DIENER:—Leitfossilien des marinen Perm, p. 68, pl. XIII, fig. 2; text-fig. 6e (reproduced from GEMMELLARO).

1931. *Agathiceras suessi*, TOUMANSKY:—The Permo-Carb. beds of the Crimea, pp. 55-56, 103, pl. IV, figs. 21-29; pl. VI, fig 25; text-figs. 39a-b (all the figures on the plates unfortunately lack clearness).

1936. *Agath.* cf. *suessi*, MILLER and CROCKFORD:—Permian Cephelopods from British Columbia, p. 25, pl. 1, figs. 7-9.

1939. *Agath. suessi*, MARTYNOV:—The Atlas of the Leading forms of the Fossil Fauna, USSR, VI, Permian, p. 178, pl. XLIV, fig. 1; text-fig. 73 (suture-line from GEMMELLARO).

1940. *Agath. suessi*, MILLER and FURNISH:—Permian Ammonoids of the Guadalupe Mountain Region, *etc.*, p. 118, pl. 31, figs. 8-12 (Specimens from Sosio beds, Palermo, illustrated for comparison with allied American species described).

1963. *Agath.* aff. *suessi*, HAYASAKA:—Some Perm. Foss. from southern Kitakami, III. Ammonoidea, pp. 596-597, text-fig. 5.

The *Agathiceras* is quite widely distributed all the world over, almost exclusively in the Permian formations, being found only rarely in the upper Carboniferous. The genus is rather easily recognized because of the physiognomic features clearly observed in well-preserved specimens. The surface of the thickly discoidal conch which is deeply involute is ornamented with fine spiral lirae. The suture-line is straight, consisting of four lateral saddles and four lateral lobes, and a wide ventral lobe divided by a long ventral saddle. First three lateral saddles are rounded at top, and the first three lateral lobes are spatulate or acuminate in outline: the fourth saddle is low and wide, and the fourth

lobe also is shallow and wide, and extends over the umbonal border to form a wide second lateral saddle of the internal suture followed by a narrow first lateral lobe, first lateral saddle and a narrow and deep dorsal lobe.

The specific distinction is based on the differences recognized in the characters shown in the shape of conch, the form of lobes and saddles of suture-lines, frequency of spiral lirae, as well as the presence or absence of varices.

Now, in the Takakura-yama faunule, there are several specimens of *Agathiceras* at the writer's disposal. Among them is only one specimen in which suture-lines are exposed beneath the thin shell, although they are not complete: a portion of the shell was chipped off to exhibit them. In another specimen the shell substance is preserved attached. Others are external and internal molds preserved in the shale. All the specimens are crushed and deformed to elliptical shape, and compressed flat.

Thus, the specific identification of these specimens is not easy, if not impossible, as the specific characteristics are not recognized sufficiently in detail. The specimen which shows parts of the suture-lines, referred to above, is the best of the material (Fig. 3). In it a few points are noticed that are considered useful for considering its specific affinity. The size of the specimen is only to be estimated from the following measurements: the longer axis of the elliptical outline is about 30 mm, the shorter about 17 mm: conch is not complete, however. Conch is tightly involute and the umbilicus is very small. Spiral lirae count about 25 on the flanc which is not considered fully exposed. Though the venter and the dorsum are not observed, the total of the lirae, if the flancs are restored, may not be much less than 60 on the whole surface: interspaces are somewhat narrower than the lirae toward ventral zone, while the reverse appears to be toward umbonal border. The last small portion of the preserved whorl was chipped off on collecting, so as to show the suture-lines partly. They are straight, and exposed almost along the longer axis of the ellipse, and the saddles and lobes are shortened crosswise in consequence. The ventral portion of the suture-lines are not observed: neither are the umbilical and inner portions, the umbilicus being obscured. In tracing one of the suture-lines between about the ventro-lateral border and the umbilical shoulder, three lateral lobes and three lateral saddles are recognized: they are from the second to the fourth (Text-Fig. 2). All of them appear low, and wider than long: saddles are somewhat flattened at the top, and similarly widened and shortened lobes are very slightly pointed or acuminated at the bottom. Between saddle and lobe the suture-line draws constrictions. Cursorily observed, lobes appear to be rounded at the bottom to remind the top of saddle, and the pattern may look more like that of *A. uralicus* KARPINSKY or *A. applini* PLUMMER and SCOTT than *A. suessi*. But if the original contour of conch could be restored saddles and lobes would resume the pattern characteristic of *A. suessi* rather

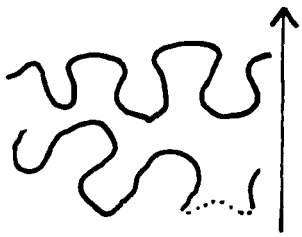


Fig. 2. Deformed suture-lines.

than of the others. If the assumption is allowed that the conch is thickly discoidal, which is most likely the case, the specimen should be regarded most closely allied to *A. suessi* than to any other species.

The other specimens are smaller and less well preserved. They are thickly discoidal in form, deeply involute, and ornamented with fine spiral lirae over the whorl surface. On the assumption that these specimens belong to the same species as the one just taken into account, they would provisionally have to be placed on record as *A.* cf. *suessi* (Figs. 4a, b: another specimen is not given in figure). The ratios of dimensions often used for distinguishing species can not be applied to such deformed specimens as those from Takakura-yama.

Family Popanoceratidae HYATT, 1900

Genus *Stacheoceras* GEMMELLARO, 1887

Stacheoceras aff. *grünwaldti* GEMMELLARO

Plate 3, Figs. 5a, b; Text-figs. 3, 4.

This genus was recorded from the Japanese Permian for the first time by S. MABUTI in 1935 from a small promontory called Iwaizaki, south of Kesennuma city in the southern Kitakami mountains. It was named *Stacheoceras iwaizakiense*. Although it was only a single specimen, an internal mold of a conch, it is quite well preserved for a Permian fossil of this region. Some years later, the present writer happened to find a broken piece of an ammonoid, which he described as an indeterminable species of *Stacheoceras*. The locality is about 10 km. to the south of Iwaizaki, on the shore of Kobama, Monô-gun. The specimen in this case was only a cut-edge of a steinkern buried in a piece of black limestone, showing the profiles of succeeding whorls and oblique or random cut-ends of septa. Regarding the relation between this and MABUTI's species the writer remarked that "..it is very likely that the two are different from each other, because the measurements made of the whorls respectively give considerably different values and proportions." MABUTI's specimen was found in the "subformation" of the succession he named the Iwaizaki Limestone, containing *Parafusulina wanneri* (SCHUBERT), *Yabeina* sp., *Richthofenia*, *Amblysiphonella*, and so on. The specimen from Kobama occurred together with several brachiopods such as *Camarophoria humbletonensis* HOWSE, *Productus* (*Marginifera*) *flemingi* (SOWERBY), *Rhynchonella* (*Uncinulus*) *jabiensis* WAAGEN, and the like.

The material from Takakura-yama is again a single specimen, also incomplete in preservation, being one half of an internal mold, rather small in size. Fortunately, however, the specimen does not seem to have suffered strong deformation, and shows a number of suture-lines, although it is difficult to make out clearly by photography. All the physiognomic features observed under magnifying glass prove the specimen to be a *Stacheoceras*, however. What are observed of the specimen are briefly summed up in the following lines.

The specimen, one half of a steinkern, measures 23 mm. in diameter, and 12 mm. in thickness, thus the conch being rather thickly subdiscoidal: umbilicus appears to be closed. On the fractured surface, whorls are seen to be crescent with extended wings, whorls being completely involute: in the center of the conch a small inner whorl is kept intact. Lateral

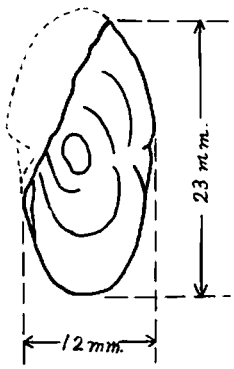


Fig. 3. Conch viewed from broken edge to show its shape and volution.

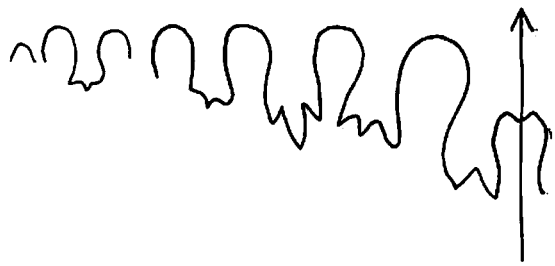


Fig. 4. A suture-line traced.

surfaces are convex, venter rounded in outline (Text-Fig. 3). Varices are recognized on outer and inner volutions. Suture-lines are straight as a whole, and are composed of 6 or 7 elongately rounded lateral saddles and a lower and shallowely divided siphonal saddle, and the lateral lobes in alternation are digitate, the first one being bifid and the following 3-5 trifid though gradually wither away toward umbilical depression (Text-Fig. 4). Dorsal sutures are not accessible.

The genus *Stacheoceras* is known to be widely distributed geographically in the Permian formations of the different parts of the world. Aside from its occurrence in the southern Kitakami mountains as referred to above, the writer described *Stacheoceras quadridens*, a new species, in a Permian faunule of the Province Chechiang, China, in 1947. It occurred in association with *Waagenoceras* cf. *dieneri* BÖSE, *Paragastrioceras roadense* (BÖSE), *P. beedi* PLUMMER and SCOTT beside a few other ammonoids and nautiloids the writer considered new. This record may be regarded as an additional datum for the distribution of *Stacheoceras*, as well as of the accompanying forms.

Of the numerous works dealing with *Stacheoceras*, and also with others, not many have been accessible to the writer. However, more than dozen of forms from different localities have been found to be allied to the present fossil more or less. Although it is very difficult to identify the Japanese species with any one of them, the following species may be recommended as being especially closely allied to the former with regard to some physiognomic feature or other: *St. iwaizakiense* MABUTI, *St. mediterraneum* GEMMELLARO, *St. gordoni* MILLER, FURNISH and CLARK, *St. tridens* ROTHPLETZ, *St. grünwaldti* GEMMELLARO and *St. quadridens* HAYASAKA. More closely examining the available details of these species and of the Takakura-yama specimen the writer is strongly inclined to believe that the latter is much more approximate to *St. grünwaldti* than to any others: the size, form and the pattern of suture-lines are almost the same in these two. Thus the present Japanese species is designated *Stacheoceras* aff. *grünwaldti* GEMMELLARO, at least for the time being.

Genus *Popanoceras* HYATT, 1883

Popanoceras sp. indet.

Plate 3, Fig. 6; Text-fig. 5.

This is the second genus of the Popanoceratidae found in the Japanese Permian. The material from Takakura-yama is but a fragmentary specimen which shows, though very vaguely, the suture-lines of the pattern of *Popanoceras*. The specimen is naturally worn, but a little too strongly. Moreover, it is only a half of a conch, and the umbilical part is only obscurely shown on the opposite flanc, which, as a whole, is buried in the rock. The form of conch is flatly discoidal, but is deformed to an elliptical outline: flatness must in part at least be due to compression. The specimen, an incomplete steinkern, gives the following measurements:

Longer diameter of ellipse ....ca. 32 mm.
Shorter radius (venter to umbilicus) ....
.....ca. 14 mm.
Thickness (estimated).....ca. 5 mm.

Venter is narrowly rounded, flancs slightly convex, umbilicus small and deep. Suture-lines are dense, but are obscured by compression of the conch: ventral lobes are turned intelligible in form: 4 lateral saddles are recognized to be rounded at the top; lobes are rather wide and digitate; prongs do not appear long and pointed, evidently due to strong weathering of the specimen as pointed above. As the distance between the innermost saddle preserved and the umbilicus is very short, there can not be many more saddles and lobes there (Text-fig. 5).

On the basis of these observations, the writer considers that the specimen under discussion is a *Popanoceras*. With such an imperfect specimen specific comparison may not be of any sense. However, it may possibly be not very remote from the group of the species including, for instance, *P. indoaustralicum* HANIEL, *P. bowmani* (BÖSE), *P. hanieli* SMITH and *P. goochi* TEICHERT.

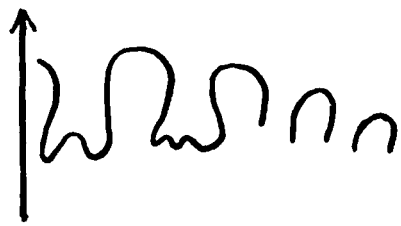


Fig. 5. A suture-line partly exposed.

Family Cyclolobidae ZITTEL, 1903

Genus *Waagenoceras* GEMMELLARO, 1887

Waagenoceras cf. *dieneri richardsoni* MILLER and FURNISH

Plate 2, Figs. 5a, b.

1937. *Waagenoceras richardsoni*, PLUMMER and SCOTT:—*Univ. of Texas, Bull., no. 3701*, pp. 158-160 pl. 39, figs. 9-11.
1940. *Waagenoceras dieneri richardsoni*, MILLER and FURNISH:—*Geol. Soc. America, Special Papers, no. 26*, pp. 170-173, pl. 43, figs. 4-7; especially pl. 44, fig. 3; text-fig 54.

A fragmentary inner mold preserving a larger part of the living chamber and a part of the septate whorl, is the only material at disposal. Living chamber seems to be at least about one volution long. Whorls are few in number, and closely embrace the foregoing: umbilicus is rounded and deep, measuring about 10 mm. across. Ventral portion of the penultimate whorl exposes parts of a few suture-lines including the last one. Apical portion is corroded and the umbilical portion is broken through.

The specimen is quite severely deformed by compression in an oblique direction. This is evidently shown by the fact that the umbilical shoulders of the opposite flancs are displaced against each other. Thus the specimen, lost part restored, is roughly elliptical in outline, diameter in average being assumed to be about 90 mm : it measures about 27 mm. thick : the ratio thickness/diameter is only 0.3—a very small value for a species of *Waagenoceras* or allied genera. In other words, it is rather exceptionally large and unusually flatly discoidal, with a helmet-shaped venter and only slightly convex flancs; the conch in mechanically compressed.

As to the suture-lines, the last and a few preceding ones are only partly exposed on both flancs. Of the last suture-line 3 saddles on one flanc may probably be middle ones; on the opposite flanc 2 of them are recognized. Suture-lines as a whole are apparently not curved, but rather straight, though there is no complete one to be traced. Were the detached portion of the conch restored, there may probably be about 6 or 7 saddles and lobes recognized on the flanc. They are long and narrow. Saddles are rounded at top and extend into narrow, notched lobes ending in trifid points.

These are all what the writer has been able to know about the specimen. It is, therefore, not an easy matter to decide to which of the genera of the Cyclolobidae it does belong. According to the authority of MILLER and FURNISH three genera are recognized in the Family Cyclolobidae, namely, *Cyclolobus*, *Waagenoceras*, and *Timorites*. It is presumed by these authors that these genera "represent a continuous phylogenetic sequence....".

The incompletely recognized suture-lines of the Japanese specimen show some affinities to those of the species of both *Waagenoceras* and *Timorites*, in having somewhat wide saddle bases and rather simple lobes. Especially the specimen appears to be more closely related to *W. guadalupense* than to the typical forms of *W. dieneri*. But if the narrow and long lobes that are pointed are taken into account, it may be considered to resemble *W. richardsoni*. This latter species was created on an incomplete specimen, but characterized by its

Explanation of Plate 2

Fig. 1. *Propinacoceras* sp. indet. Specimen A, natural size. a, lateral view of an obliquely compressed specimen showing the transverse ventral ribs. b, the lower part of the right side of fig. a to show the two rows of transverse ribs on the venter. The specimen is slightly contorted.

Fig. 2. *Propinacoceras* sp. indet. Specimen C, natural size.

Fig. 3. *Agathiceras* cf. *suessi* GEMMELLARO. Specimen A. ×2.
The best specimen at disposal: entrusted for study by Shôzô HAYASAKA of Tôhoku University, Sendai, whom the writer owes deeply.

Fig. 4. *Agathiceras* cf. *suessi* GEMMELLARO. Specimen B, ×1.5.
More strongly deformed and damaged than A. a, lateral view; b, oral view.

Fig. 5. *Waagenoceras* cf. *dieneri richardsoni* MILLER and FURNISH.
Nat. size. a and b, opposite sides, show a long living chamber and the last suture-line, beyond which are a few more imperfect ones observed.


5b
3
4
b
a
b
1
a
5a
2

large size and more or less discoidal form (93 mm. in diameter and 50 mm. in thickness, the ratio thickness/diameter thus being 0.53). MILLER and FURNISH regard this species as a variety of *W. dieneri*, and reserve the possibility of its being "a distinct species which is about as closely related to *Timorites* as to *Waagenoceras*". The specimens which these authors pictured as conspecific with PLUMMER and SCOTT's species are globular in shape, and the ratios thickness/diameter of three specimens are 0.80, 0.83 and 0.85, respectively (p. 169). If the form of conch is not of much taxonomic meaning, the discoidal form of the Japanese species, though it most likely has been thicker before deformation, may not necessarily be regarded extraordinarily as a *Waagenoceras*. With respect to the discoidal form of conch *Timorites uddeni* MILLER and FURNISH (p. 178) looks to more or less closely approach to the Japanes species. The conch is about 80 mm. across and about 33 mm. thick, the ratio being 0.4, that is, the conch is more strongly compressed than *W. dieneri richardsoni* which it resembles. The suture-lines of the latter are slightly more advanced than those of the former. According to MILLER and FURNISH these two species "are more or less intermediate between typical *Waagenoceras* and typical *Timorites* and both are closely related".

Taking into consideration all these remarks the writer feels it plausible to put his specimen in *Waagenoceras* rather than in the other genera. For specific determination the physiognomic data are by no means sufficient, but the specimen appears to quite closely resemble *W. richardsoni* PLUMMER and SCOTT among the species known to the writer.

List of references quoted in the text

BOSE, Emil, (1917): The Permo-Carboniferous Ammonoids of the Glass Mountains, West Texas, and their Stratigraphical Significance. *Univ. Texas, Bull., no. 1762.*

DIENER, C., (1927): Leitfossilien des marinen Perm. GÜRICH's Leitfossilien, 5te Lieferung.

END�ô, Riuji and MATSUMOTO, Eiji (1962): Permo-Carbonifrous Trilobites from Japan. *Sci. Rep. Saitama Univ., ser. B, IV, 2.*

FRECH, Fritz, (1911): RICHTHOFEN's China, V.

GEMMELLARO, G.G., 1887. La fauna de calcari con *Fusulina* della valle del fiume Sosio nella provincia di Palermo: Cephalopoda.

—— (1888): *Ditto*, Appendice.

GERTH, H., 1950. Die Ammonoiden des Perms von Timor und ihre Bedeutung für die stratigraphische Gliederung der Permformation. *Neues Jahrb. Miner., usw. Abh., 91, Abt. B.*

GIRTY, George H., (1908): The Guadalupian Fauna. *U.S. Geol. Surv., Prof. Paper 58.*

HANIEL, C.A., (1915): Die Cephalopoden der Dyas von Timor. Palaeontologie von Timor, VI (iii Lieferung)

HAYASAKA, Ichirô, (1940): On two Permian Ammonoids from the Kitakami Mountains. *Jour. Geol. Soc. Japan, no. 565. (vol. 47).*

—— (1947): A Permian Cephalopod Faunule from Chêchiang Province, China. *Acta Geol. Taiwanica, 1.*

—— (1954): Younger Paleozoic Cephalopods from the Kitakami Mountains. *Jour. Fac. Sci., Hokkaidô Univ., ser. IV, Geol. Miner., VIII, 4.*

—— (1955): On the Permian Cephalopods from Japan (in Japanese). *Chigaku Kenkyû (Earth Sci. Res.), VIII, 3.*

—— (1957): Two Permian Nautiloids from Takakura-yama, near Yotsukura-machi, Fukushima Prefecture (Abukuma Plateau Region), Japan. *Sci. Rep. Yokohama*

Nat. Univ., sec. II, no. 6.

—— (1962): Two species of *Tainoceras* from the Permian of the Kitakami Mountains. *Nat. Sci. Mus. (Tôkyô) Bull., VI, 2 (through number 51).*

—— (1963): Some Permian Fossils of Southern Kitakami, I. *Proc. Japan Acad. XXXIX, 7.*

—— (1963): *Ditto*, III, Ammonoids. *Ibid. XXXIX*, 8.

KAYSER, Emmanuel, (1883): RICHTHOFEN'S China, IV.

KOBIYAMA, Hajimé, (1956): On the Geological Age of the Takakura-yama Formation (Japanese). *Taira Chigaku Dôkô-kai Bull. no. 3.*

MABUTI, Seiichi, (1935): On the Occurrence of *Stacheoceras* in the Kitakami Mountainland, Northeast Honsyû, Japan. *Saitô Hô-on Kai Mus., Res. Bull., no 6.*

MARTYNOV, A., (1939): The Atlas of the Leading Forms of the Fossil Fauna USSR. (Russian).

MILLER, A. K. and CROCKFORD, M. B., (1936): Permian Cephalopods from British Columbia. *Trans. Royal Soc. Canada, 3rd ser., sec. IV, XXX.*

MILLER, A. K. and FURNISH, W. M., (1940): Permian Ammonoids of the Guadalupe Mountain Region and Adjacent Areas. *Geol. Soc. Amer., Spec. Papers, no. 26.*

MILLER, A. K. and YOUNGQUIST Walter, (1949): American Permian Nautiloids. *Geol. Soc. Amer., Mem., 41.*

MILLER, A. K. and FURNISH, W. M., (1957): Permian Ammonoids from Tunisia. *Jour. Paleont., XXXI, 4.*

MILLER, A. K., FURNISH, W. M. and CLARK, David L., (1957): Permian Ammonoids from Western United State. *Ibid. XXXI, 6.*

PLUMMER, F. B. and SCOTT, Gayle, (1937): Upper Paleozoic Ammonites in Texas. *Univ. Texas Bull., no. 3701 (The Geology of Texas, vol. III).*

SMITH, J. Perrin, (1927): Permian Ammonoids of Timor. *Jaarboek van het Mijnwezen in Nederlandsch-Indie, 55 Jaargang, 1.*

TEICHERT, Court, (1942): Permian Ammonoids from Western Australia. *Jour. Paleont., XVI, 2.*

TOUMANSKY, O. G., (1931): The Permo-Carboniferous Beds of the Crimea, Pt. I, Cephalopoda, Ammonoidea (Russian, with an English summary). This seems to have been published by the Bureau of Geological Prospecting of the Supreme Council of National Economy of USSR.

—— (1939): Permian Ammonoids of the Transalai Range and their Significance of the Stratigraphy of the Pamirs. (Russian, with an English summary of the stratigraphical part). *Problems of*

Explanation of Plate 3

Fig. 1. Medlicottidae? genus *et* species indet. Nat. size.
Only specimen, a mud cast, showing the sculpture of venter and ventro-lateral border in part.

Fig. 2. *Paraceltites* aff. *elegans* GIRTY. Nat. size. Note the peculiar state of preservation. Hardly distinguishable from the specimen reported from the Kitakami Permian in 1940.

Fig. 3. ? *Pseudogastrioceras* sp. indet. Specimen A, nat. size.

Fig. 4. ? *Pseudogastrioceras* sp. indet. Specimen B, nat. size.

Fig. 5. *Stacheoceras* aff. *grünwaldti* GEMMELLARO. ×1.5. a, lateral view; b, ventral view showing rather dense suture-lines; their pattern is sketched to show the detail (Text-figs. 3 and 4.

Fig. 6. *Popanoceras* sp. indet. × 1.5. A suture-line traced is given in the text (Text-fig. 5).

Fig. 7. *Tainoceras* aff. *unklesbayi* MILLER and FURNISH. Nat. size. a, the specimen, an outer mold on a slab of black slate b, a mud cast to show the real relief of the wide vente.

5

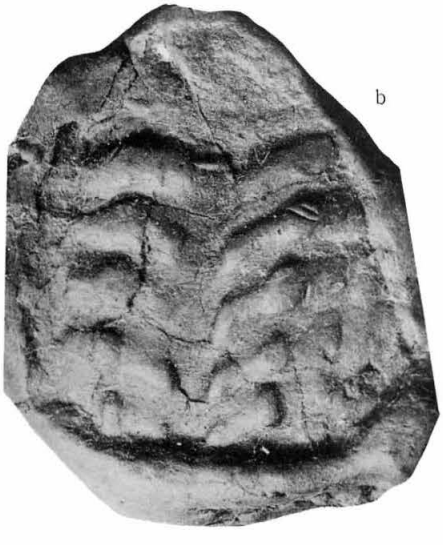
4

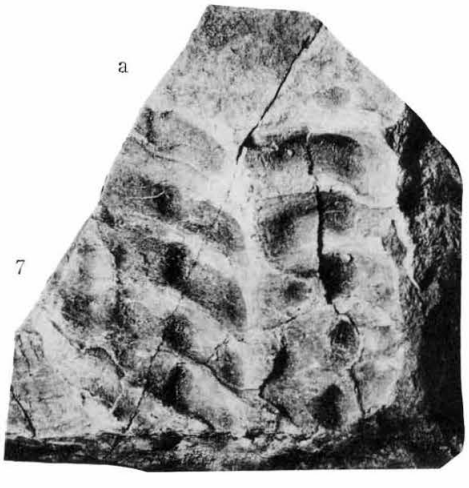
1

2

6

3





7

Paleontology, V.

YANAGISAWA, Ichirô and NEMOTO, Mamoru, (1961): On the Paleozoic Formation of the Takakura-yama District, Abukuma Mountains (Japanese, with an English abstract). *Jour. Geol. Soc. Japan, no. 788 (vol. LXVII).*

Futatsuya (fault)	二ッ箭(断層)	Iriishikura	入石倉
Iwaizaki	岩井崎	Kashiwadaira	柏平
Kesennuma	気仙沼	Kobama	小浜
Monô-gun	桃生郡	Motomura	元村
Takakura-yama	高倉山	Yaguki	八茎
Yotsukura	四倉		

Trans. Proc. Palaeont. Soc. Japan, N.S., No. 57, pp. 28-33, April 15, 1965

484. DISCOVERY OF MARINE SHELLS FROM THE KUNOHE TERRACE DEPOSITS, KUJI CITY, IWATE PREFECTURE

KOTORA HATAI and RIKIZO IMAIZUMI

Tohoku University, Sendai, Japan

九戸段丘産海棲貝化石：1957 年，岩手県久慈付近を調査の際，久慈高校，吉田耕一郎先生より，久慈北西方高地の砂鉄層より産した貝化石 3 ケを与えられた。正確な産地をたしかめるに至らなかったが，九戸段丘より産したものと思われる。貝化石は，貝殻がとけ，充塡された雄型の破片であるが，*Pecten* cf. *albicans* (SCHRÖTER), 1802, *Mizuhopecten* cf. *yessoensis* (JAY), 1857, *Spisula sachalinensis* (SCHRENCK), 1867 に同定される。これらの 3 種は，本州北部・北海道・樺太海岸に普通のもので，*Pecten albicans* は本州北部～中西部まで分布する。

Mizuhopecten cf. *yessoensis* をくだき構成砂粒を調べた結果，磁鉄鉱及び褐鉄鉱に富み，石英及び緑色角閃石を少量，また僅かの長石類，輝石類を含む。　畑井小虎・今泉力蔵

Introduction and Acknowledgments

Some marine shells from the deposits of the Kunohe Terrace were given to the junior writer in 1957 by Mr. Koichiro Yoshida, teacher of the Kuji High School, Kuji City in Iwate Prefecture, for determination of the generic and specific names as well as of the geological age of the terrace deposits. To date there had been no record of any kind of fossils from the said terrace deposits, and although it had been thought to be of marine origin, there was no direct evidence. For this reason, the discovery of marine shells from the terrace deposits is of considerable interest.

The Kunohe terrace is Plain V of NAKAGAWA (1961), who states that "The distribution of Plain V is within the area of resistant rocks. The gradient of the plain with its deposits of sands and gravels is gentle or sub-horizontal. In the northeastern parts of the Kitakami Massif, the Plain V ranges between 160 and 200 meters in altitude. The features of the plain resemble to those of Plain III, though no fossil is found to date. Probably, the Plain V indicates the high sea-level during the penultimate interglacial stage". He also shows that Plain V or the Kunohe Terrace is the oldest among the ones distributed in the Kitakami Massif in northeastern Japan, but he gave no direct evidence for the geological age of it.

The fossils comprise three casts of marine shells, one of an isolated right valve, and the two others of broken parts of two different genera of bivalves. The latter two are so ill-preserved that it was very difficult to determine their generic positions and approximate specific relations with known species. However, fortunately the three specimens could be determined as belonging to, *Pecten* cf. *albicans* (SCHRÖTER), *Mizuhopecten* cf. *yessoensis* (JAY), and *Spisula sachalinensis* (SCHRENCK).

All of the three mentioned genera and

* Received September 28, 1964; read September 20, 1964 at Hiroshima.

species are found commonly along the coasts of northern Honshu, Hokkaido and Sakhalin, whereas only *Pecten albicans* is distributed as far south as Central and Western Honshu, Japan. From such considerations it can be stated that the evidence of the three genera and species is insufficient for discussing the geological age of the Kunohe terrace deposits. However, it seems that the fossils were drifted by longshore currents or thrown up on the sandy beach by waves. The wave action does not seem to have been in the plunge zone or breaker zone because the terrace deposits of the area do not show evidence of agitation, the sediments are too well sorted and no erratics were found.

From the assemblage containing no warm water species and only those found commonly in the seas of northern Honshu, it is evident or at least suggested that the climatic conditions may not have been much different from that of the present at the same latitude.

An analysis was made of the mineral components contained in 9.96 gr of the sediments which yielded *Mizuhopecten* cf. *yessoensis*, with the following results: magnetite 50 percent, limonite 30 percent, green hornblende 7 percent, quartz 13 percent, besides some pyroxene and feldspar. The abundant amount of magnetite also suggests that deposition may have been in such an area as already mentioned.

Because the fossils are from a single locality of the Kunohe terrace near Kuji City, Iwate Prefecture, repetition of the locality and horizon will be avoided under the remarks of each species. The specimens are preserved in the collection of the Institute of Geology and Paleontology, Tohoku University, Sendai (abbreviation, IGPS coll. cat. no.).

Acknowledgements are expressed to Mr. Shun-ichi KATO of the Morioka High School in Morioka City and Mr. Koichiro YOSHIDA of the Kuji High School in Kuji City, both in Iwate Prefecture, for kindly donating the speciments to the writers for study and to Mr. Moriaki KO-ONOYAMA of the Geological Survey of Hokkaido for his guidance in the field.

Remarks on the Fossil Mollusca

Family Pectinidae

Genus *Pecten* MÜLLER, 1776

Pecten cf. *albicans* (SCHRÖTER), 1802

Fig. 3.

Pecten albicans (SCHRÖTER) in REHDER, *Nautilus, vol. 58, no. 2*, p. 54, 1944 (SOWERBY's *Pecten laqueatus* from Japan is a synonym of SCHRÖTER's species, fide REHDER, op. cit.).

Pecten laqueatus SOWERBY, *Thes. Conch., vol. 1*, p. 46, pl. 15, fig. 101, 1847. SCHRENCK, *Moll. Amurland*, p. 482. YOKOYAMA, *Jour. Coll. Sci., Imp. Univ. Tokyo, vol. 39, art. 6*, p. 160, pl. 14, figs. 9, 10, 1920 and of authors.

Pecten excavatus ANTON of YOKOYAMA, 1922, *Jour. Coll. Sci., Imp. Univ. Tokyo, vol. 44, art. 1*, p. 183, pl. 15, figs. 5, 6 (not of ANTON, 1839).

In the present collection there is a small broken part of a rather large shell (IGPS coll. cat. no. 85724) which has on its surface several rounded radial ribs, each of which is much narrower than the rather flat-bottomed interspaces. The flat-bottomed interspaces are sculptured with faint concentric lines which seem to be obliterated on the tops of the ribs by subsequent wear. The flat-bottomed interspaces as well as the ribs themselves suggest that the curvature or

Figs. 1, 2. *Spisula sachalinensis* (SCHRENCK). 1-view from umbonal side. 2-lateral view. Both in natural size.

Fig. 3. Plaster model of external surface of *Pecten* cf. *albicans* (SCHRÖTER), showing development of characteristic radial ribs. Natural size.

convexity of this preserved part of the original shell was rather slight, in fact, probably almost flat in part. And, from the very slight angle of divergence of the radial ribs within the area of the preserved broken part of the original shell, it is suggested that the original specimen may have been a rather large one.

From the features just described it is judged that the preserved broken part of the original specimen was the left

valve of the genus *Pecten*, and most probably of the species *albicans*. The present specimen is identified with *albicans* for several reasons as, the degree of divergence of the radial ribs as well as their shape coincide well with the left valve of the Recent specimens of that species and the spacing and strength of the faint concentric growth lines (somewhat worn) on the flat-bottomed interspaces of the radial ribs also seem to be identical with or at least very similar to those of the left valve of the Recent. And, the nearly flat specimen at hand is very similar to that of the left valve of the Recent *albicans*.

Genus *Mizuhopecten* MASUDA, 1963

Mizuhopecten cf. *yessoensis* (JAY), 1857

Pecten yessoensis JAY, *Rep. Shells Coll. Jap. Exped.*, p. 393, pl. 3, figs. 3, 4, pl. figs. 1, 2, 1857. SCHRENCK, *Moll. Amurland.* p. 484, pl. 20, figs. 1-4, 1867. YOKOYAMA, *Jour. Coll. Sci., Imp. Univ. Tokyo, vol. 39, art. 6*, p. 159, pl. 13, figs. 14, 15, 1920. NOMURA and HATAI, *Saito Ho-on Kai Mus. Notes, Spec. No.*, p. 2, 1932.

Pecten (Patinopecten) yessoensis JAY. NOMURA and HATAI, *Saito Ho-on Kai Mus., Res. Bull., no. 5*, p. 6, 1935. NOMURA, *Ibid., no. 5*, p. 105, pl. 5, fig. 5, 1935.

Patinopecten yessoensis yessoensis (JAY), MASUDA, *Sci. Rep., Tohoku Univ., Ser. 2, Geol., vol. 33, no. 2*, p. 213, pl. 26, figs. 5, 6, 1962.

An anterior portion of a large bivalve shell is in the collection. The specimen is considered to be a part of *Mizuhopecten yessoensis* (JAY) judged from the faint indications of broad, rounded radial ribs which are about as broad as the flatly rounded interspaces and from the profile of the anterior portion showing the approximate angle at which the valves are joined. Since both sides show the same angle, the specimen can not belong to *Pecten albicans*, which has the valves strongly inequivalve, or to some member of the Veneridae because of the angle formed by the junction of the ventral part of the valves and by the development of low radial ribs which are about as broad as the interspaces. For the mentioned reasons the broken part of a large shell is considered to be either very close to or identical with the named species. However, naming must be reserved until better specimens are obtained.

Family Mactridae

Genus *Spisula* GRAY, 1838

Spisula sachalinensis (SCHRENCK), 1838

Figs. 1, 2.

Mactra sachalinensis SCHRENCK, *Moll. Amurland*, p. 575, pl. 23, figs. 3-7, 1867.

Mactra sachalinensis SCHRENCK var. *imperialis* YOKOYAMA, *Jour. Coll. Sci., Imp. Univ. Tokyo, vol. 44, art. 1*, p. 129, pl. 7, figs. 9, 10, 1922 (from Otake, Shisui and Shito in Shimosa, and Oji and Tabata in Musashi).

Spisula sachalinensis (SCHRENCK). TAKI and OYAMA, *Paleont. Soc. Japan, Special Paper No. 2*, p. 45, pl. 27, figs. 7-10 (figs. 7, 8=*Mactra dunkeri* YOKOYAMA, 7=paratype, 8=holotype, designated by TAKI and OYAMA, loc. cit.), (figs. 9, 10 =*Mactra sachalinensis* var. *imperialis* YOKOYAMA, 9=paratype, 10=holotype, designated by TAKI and OYAMA, loc. cit.). Figures all reproduced from original paper (YOKOYAMA, 1922), 1954.

Spisula sachalinensis (SCHRENCK). NOMURA and HATAI, *Saito Ho-on Kai Mus. Notes, Spec. No.*, p. 7 (from coast of Nonai and Kugurizaka in Mutsu Bay), 1932.

Mactra (Spisula) sachalinensis SCHRENCK. NOMURA and HATAI, *Saito Ho-on Kai*

Mus., Res. Bull., no. 5, p. 18 (landed by Tsunami of 1933; Sanriku coast). 1935. (*Mactra ludorfii* DUNKER, *Mactra sachalinensis* var. *imperialis* YOKOYAMA, and *Mactra straminea* DUNKER, as well as *Mactra dunkeri* YOKOYAMA are synonyms; the last mentioned is an immature form).

Remarks:—YOKOYAMA (1922, p. 129) distinguished his var. *imperialis* from SCHRENCK's *Mactra sachalinensis*, which was reported and figured by TOKUNAGA (1906, p. 39, pl. 2, fig. 25) from Oji in Tokyo, by the variety having more triangular shell outline, a shorter anterior muscular impression and with a larger ligamental pit which protrudes more downward. This distinction was made with the *sachalinensis* figured by TOKUNAGA (1906, pl. 2, fig. 25) and not with the original illustrations of SCHRENCK. TOKUNAGA's figured *sachalinensis* is a rotund shell.

Comparing the illustrations of YOKOYAMA (1922, pl. 7, figs. 9, 10) with the ones of TOKUNAGA (1906, pl. 2, fig. 25) it is evident that the features upon which YOKOYAMA proposed his variety *imperialis* can be recognized as valid. However, YOKOYAMA (1922, p. 129) even stated that "there is considerable variation in the shape of the shell, some being more ovate than others". The original figures of SCHRENCK (1867, pl. 23, figs. 3-7) show rounded forms as illustrated by TOKUNAGA (1906, op. cit.), thus verifying the statements by NOMURA and HATAI (1935) and of TAKI and OYAMA (1954) that *imperialis* is a synonym of *sachalinensis*. However, there still seem to be room for finding whether biometrical analysis of the shells of *Spisula sachalinensis* (SCHRENCK) will result in discovering geographical forms as described by NOMURA and HATAI (1937, p. 1-5, pl. 1, 2) in *Neptunea arthritica* BERNARDI from Northern and Central Honshu, Japan. They could distinguish geographic forms of latitudinal value and of importance in the study of its fossil forms from the Pleistocene and younger deposits of Japan. A similar phenomenon was recorded by HATAI (1939, p. 99-118, pl. 8) in *Coptothyris grayi* (DAVIDSON), a brachiopod which is distributed widely around the Japanese Islands.

The specimen in the present collection (IGPS coll. cat. no. 85726) which is identified with *Spisula sachalinensis* (SCHRENCK) is also identical with the variety *imperialis* YOKOYAMA, a form which also occurs as Recent in the seas bordering Sakhalin. The present specimen, however, is not well preserved, the shell covering was dissolved, and the internal cast is broken in part at its umbonal region and slightly along the ventral margin. However, the general outline of the shell, convexity, strength of the hinge-line area and the cast of the teeth, very faint indications of the external growth lines (sometimes appearing as corrugations), are all preserved to a grade permitting identification with the named species.

The ill-preserved specimen measures about 7.5 cm in height, a little more than 10 cm in length and approximately 5.5 cm in thickness of an isolated right valve, in the preserved condition.

References

HATAI, K., (1939): A Note on a Cenozoic Brachiopoda, *Coptothyris grayi* (DAVIDSON). *Jubilee Publ. Commem. Prof. H. YABE's 60th Birthday*, 99-118, pl. 8.

JAY, J.C., (1857): Report of the shells Collected by the Japan Expedition, under the Command of Commodore, M.C. PERRY, U.S.N., together with a List of Japanese

Shells. 291-297, pl. 1-5.

MASUDA, K., (1962) : Tertiary Pectinidae of Japan. *Sci. Rep. Tohoku Univ., Ser. 2, Geol.*, 33 (2), 117-193, 11 figs., pls. 18-27.

NAKAGAWA, H., (1961) : Pleistocene Eustasy and Glacial Chronology along the Pacific Coastal Region of Japan. *Contr. Inst. Geol. Pal., Tohoku Univ.*, 54, 1-61, 16 figs., 3 tables. (Japanese with Abstract in English).

—— (1963) : Quaternary Tephlochronology in Northeast Honshu, Japan. *Quat. Res.*, 3 (1-2), 88-93. (English and Japanese).

NOMURA S., (1935) : Fossil Mollusca from the Vicinity of Ogino, Yama-gun, Hukusima-Ken. *Saito Ho-on Kai Mus., Res. Bull.*, 5, 101-125, pl. 5-7.

—— and K. HATAI, (1932) : Marine Mollusca from Mutsu Bay. *Saito Ho-on Kai Mus. Notes, Special Number*, p. 1-13.

—— and ——, (1935) : Catalogue of the Shell-bearing Mollusca Collected from the Kesen and Motoyosi Districts, Northeast Honsyu, Japan, immediately after the Sanriku Tunami, March 3, 1933, with the Descriptions of Five New Species. *Saito Ho-on Kai Mus., Res. Bull.*, 5, 1-15, pl. 1, 2.

—— and ——, (1937) : On the Variation of *Neptunea arthritica* BERNARDI from Northern and Central Honsyu, Japan. *Saito Ho-on Kai Mus., Res. Bull.*, 13, 1-5, pl. 1-2.

REHDER, H. A., (1944) : A New Pectinid Shell from the Pacific Ocean, with a Note on the Genus *Palliolum* SCHROETER. *Nautilus*, 58 (2), 52-54, pl. 2.

SCHRENCK, L., (1867) : Mollusken Amurlandes und Nordjapanischen Meeres. *Reisen und Forschung im Amur-Lande in den Jahren* 1854-1856, 2 (3), 259-976, pl. 12-28, 1 map.

SOWERBY, G. B., (1847) : Monograph of the Genus *Pecten*. *Thesaurus Conchelium*, 1, 45-82, pl. 12-20.

TAKI, I. and K. OYAMA, (1954) : Matajiro YOKOYAMA's The Pliocene and Later Faunas from the Kwanto Region in Japan. *Palaeont. Soc. Japan, Special Papers*, 2, 1-68, pl. 1-49.

TOKUNAGA, S., (1906) : Fossils from the Environs of Tokyo. *Jour. Coll. Sci., Imp. Univ. Tokyo*, 21 (2), p. 1-96, pl. 1-6.

YOKOYAMA, M., (1920) : Fossils from the Miura Peninsula and Its Immediate North. *Jour. Coll. Sci., Imp. Univ. Tokyo*, 39 (6), 1-186, pl. 1-20.

——, (1922) : Fossils from the Upper Musashino of Kazusa and Shimosa. *Jour. Coll. Sci., Imp. Univ. Tokyo*, 44 (1), 1-200, pl. 1-17.

Kitakami	北上	Kuji	久慈
Kunohe	九戸		

Trans. Proc. Palaeont. Soc. Japan, N.S., No. 57, pp. 34-37, April 30, 1965

485. A STING RAY AND EAGLE RAY FROM THE TATSUNOKUCHI FORMATION (PLIOCENE) IN SENDAI CITY, MIYAGI PREFECTURE, JAPAN

KOTORA HATAI, MASAFUMI MURATA

and

KOICHIRO MASUDA

Institute of Geology and Paleontology Faculty of Science,
Tohoku University Sendai, Japan

竜ノ口層産 "えい" 化石：竜ノ口層から発見した "あかえい" の尾骨及び "とびえい" の歯を記載した。 畑井小虎・村田正文・増田孝一郎

Introduction

The Tatsunokuchi Formation (Sendai Group) of marine origin is well known to the paleontologists and geologists of Japan because of the interesting marine fauna reported from its lower to middle parts. This fauna consists of abundant shell-bearing marine pelecypods, scaphopods and gastropods (S. NOMURA, 1938, S. NOMURA and K. HATAI, 1936, H. YABE and K. HATAI, 1940), decapod crustaceans (T. NAGAO, 1940), foraminifers (Y. TAKAYANAGI, 1950), shark teeth (Y. ISHIWARA, 1921, K. HATAI, 1938), whale bones and ear bones (K. HATAI, S. HAYASAKA and K. MASUDA, 1963), an elephant (H. MATSUMOTO, 1927), a cetacean called *Delphinus* sp. (S. HANZAWA, *et al.*, 1953), plant leaves (H. OKUTSU, 1955) besides others which have not yet been described. However, there has been no record of sting ray or eagle ray from the formation.

* Received October 20, 1964; read November 24, 1964 at Sapporo.

Descriptions of the Ray Specimens

Suborder Masticura

Family Dasyatidae

Genus *Dasybatus* (KLEIN) GARMAN, 1885

Dasybatus cf. *akajei* (MÜLLER and HENLE)

Figs. 5, 6.

1962. *Dasybatus akajei* (MÜLLER and HENLE). HATAI and KOTAKA, *Trans. Proc. Paleont. Soc. Japan, N.S., no. 45*, p. 202, pl. 30, figs. 3, 4, 6, 7, 9. (tail spine only).

Remarks:—The single spine studied is now in the collection of the Sendai First High School. It is well preserved except for its tip and basal parts which are lost. The small denticles along its lateral sides differ from the Recent *Dasybatus akajei* tail spines in the angular backward curvature, especially near the tip and in the more defined narrow

flattened area adjacent to the spines in the fossil specimen. Further, the surface of the fossil spine has finer longitudinal wrinkles than the Recent *Dasybatus*, and the cross-section of the shaft in the present fossil is more flattened than in the Recent one. The fossil under consideration measures about 67 mm in preserved length of the shaft, about 15 mm in width inclusive of the spines, and there are about 12 spines in a distance of about 40 mm.

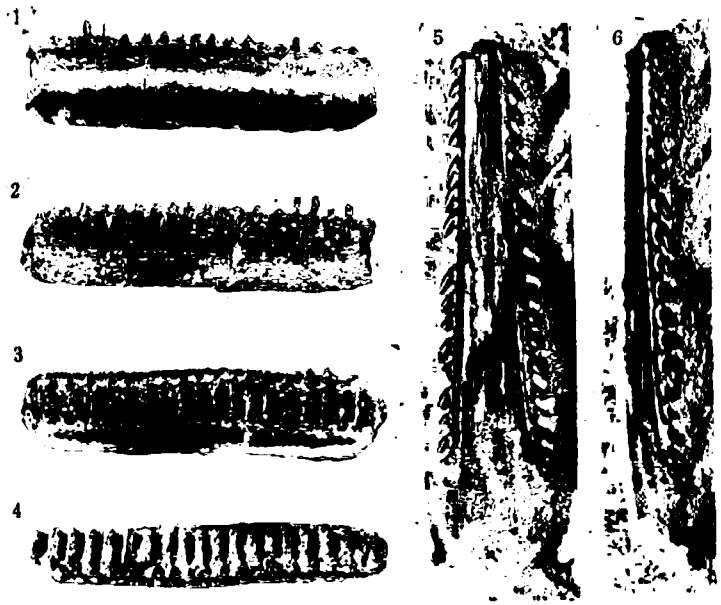
From the details of the present fossil specimen, it is difficult to identify it with the Recent *Dasybatus akajei* (MÜLLER and HENLE) to which it is very similar, and is also different from *Dasybatus nipponensis* HATAI and KOTAKA (Op. cit., p. 201, pl. 30, figs. 5, 8, 10), a Miocene species from Mizunami City, Gifu Prefecture, and *D. masudae* HATAI and KOTAKA (Op. cit., p. 204, pl. 30, figs. 1, 2) from the Miocene of Nisatai in Fukuoka-machi, Ninohe-gun, Iwate Prefecture in the nature of the denticles on the lateral parts and of the spines, shape of the shaft and in detail of the sculpture. The differences just cited seem to be sufficient to propose a new subspecific name, and for the specimen the name of *rikuzenensis* is proposed as a subspecies of *akajei*.

Family Myliobatidae

Genus *Myliobatis* CUVIER, 1817

Myliobatis sendaicus HATAI, MURATA and MASUDA, n. sp.

Figs. 1-4.



Figs. 1-4. *Myliobatis sendaicus* HATAI, MURATA and MASUDA, n. sp. ×3 1-view of upper surface. 2-lateral view. 3-lateral view from opposite side. 4-view of under surface showing ridges and furrows.

Figs. 5-6. *Dasybatus* cf. *akajei* (MÜLLER and HENLE). ×1 5-view of shaft showing recurved teeth and wrinkles on surface. 6-lateral view of recurved teeth.

The nearly straight, rather narrow, parallel sided, not thick, isolated plate of a tooth measures 16 mm in length, 0.5 mm in width, and 0.4 mm in thickness. Its upper surface is smooth, whereas the comb-like lower surface has 20 ridges, each of which is almost equal to or a little narrower than the furrows in width. Ridges appear to be more or less weak in structure.

Locality and horizon:—Lower part of the Tatsunokuchi Formation (Sendai Group) in the Tatsunokuchi gorge below the bridge in the southern part of Sendai City, Miyagi Prefecture. IGPS coll. cat. no. 85998. Coll. K. MASUDA, 1963.

Remarks: — Comparing the present plate with specimens of *Myliobatis* previously recorded from Japan, many outstanding differences between them are noticed.

Myliobatis sp. reported and figured by TOKUNAGA (1906, p. 72, pl. 6, fig. 1) from the Pleistocene Tokyo Formation at Tabata in Tokyo City, is stated to be 30 mm in length, 5.5 mm in thickness, and to have 28 ridges. The ridges and furrows, judged from the original figures, seem to be about the same in width.

TOKUNAGA stated that his single specimen was similar to *Myliobatis cornuta* GÜNTHER from the seas of Rikuzen and Hizen, but the later plate measures 14 mm in length, 3.5 mm in width and 2 mm in thickness. Thus, TOKUNAGA's specimen is larger than the Recent one just mentioned. Both the fossil and Recent specimens reported by TOKUNAGA can be distinguished from the present one from the Tatsunokuchi Formation by the greater width and length, and by the ridges, which in the latter are equal to or little narrower than the furrows. The teeth of a Recent *Myliobatis tobijei* BLEEKER was illustrated by OZAKI (1958, p. 178, pl. 13, figs. 1-3). This specimen shows 23 ridges, and the ridges appear to be broader than their furrows.

A Pliocene *Myliobatis* sp. was illustrated by OZAKI (1958, p. 178, pl. 13, figs. 4-6), who pointed out that it is similar with *Myliobatis tenuicaudatus*, which was figured by E. R. WAITE (1923, The Fishes of South Australia, p. 59). This fossil specimen of OZAKI is stated to measure 26.5 mm in length, 7.0 mm in width and 9.0 mm in thickness. It has 25 ridges on the slightly arcuate plate, and the ridges appear to be broader than the furrows. The ridges are not very strong in aspect. OZAKI's specimen is stated to be from the Na-Arai Formation of Cape Inuwaka, Choshi City, Chiba Prefecture.

The Pliocene and Recent specimens reported and figured by OZAKI can both be distinguished from the present one by the larger number of ridges which are broader than the furrows, whereas they are almost equal to or a little narrower than the furrows in width in the present tooth.

As mentioned above, the present tooth may represent an undescribed species of the genus *Myliobatis* for which the name of *sendaicus* is proposed. The name is taken from Sendai where the specimen was found.

References

HANZAWA, S., HATAI, K., IWAI, J., KITAMURA, N. and SHIBATA, T. (1953) : The Geology of Sendai and its Environs. *Tohoku Univ., Sci. Rep., Ser. 2, Geol., vol. 25*, p. 1-50, 4 charts, geol. map.

HATAI, K. (1938) : A Review of the Fossil Cirripedia and Shark-Teeth from the Region of Northeast Honsyû, Japan. *Biogeogr. Soc. Japan, Bull., vol. 8 no. 5,*

p. 103-110.

—— (1939) : Plio-Pleistocene versus Lower Pliocene Age for the Tatsunokuchi Beds Developed in Sendai and Its Environs, Rikuzen Province, Northeast Honsyû, Japan. *Jap. Jour. Geol. Geogr., vol. 16, nos. 3-4*, p. 239-243.

—— (1940) : A Review of the Stratigraphy and Paleontology of the Tertiary Deposits of the Environs of Sendai, Miyagi-ken, Northeast Honsyû, Japan. *Jap. Jour. Geol. Geogr., vol. 17, nos. 1-2*, p. 125-157.

—— and KOTAKA, T. (1962) : *Dasybatus* from the Japanese Miocene. *Trans. Proc. Paleont. Soc. Japan, N. S., no. 45*, p. 201-205, pl. 30.

——, HAYASAKA, S. and MASUDA, K. (1963) : Some Fossil Tympanics from the Mizuho Period of Northern Japan. *Saito Ho-on Kai Mus., Res. Bull., no. 32*, p. 5-14, pl. 1-2.

ISHIWARA, Y. (1921) : On Some Fossil Shark-Teeth from the Neogene of Japan. *Tohoku Univ., Sci. Rep., Ser. 2, Geol., vol. 5*, p. 61-71, pl. 10-12.

MATSUMOTO, H. (1927) : On Two New Mastodonts and an Archetypal Stegodont of Japan. *Tohoku Univ., Sci. Rep., Ser. 2, Geol., vol. 10, no. 1*, p. 1-12, pl. 1-5.

NAGAO, T. (1940) : On a New Brachyura Crab from the Tatunokuti Bed of Sendai, Miyagi Prefecture. *Hokkaido Univ., Jour. Fac. Sci., Ser. 2, vol. 6, no. 1*, p. 69-73, pl. 23.

NOMURA, S. (1938) : Molluscan Fossils from the Tatunokuti Shell Bed Exposed at Goroku Cliff in the Western Border of Sendai. *Tohoku Univ., Sci. Rep., Ser. 2, Geol., vol. 18, no. 2*, p. 235-275, pl. 33-36.

—— and HATAI, K. (1936) : On Some Species of the Genus *Arca* from the Neogene of Northeast Honsyû, Japan. *Jap. Jour. Geol. Geogr., vol. 13, nos. 1-2*, p. 63-70, pl. 12-13.

OKUTSU, H. (1955) : On the Stratigraphy and Paleobotany of the Cenozoic Plant Beds of the Sendai Area. *Tohoku Univ., Sci. Rep., Ser. 2 Geol., vol. 26*, p. 1-114, 33 figs., 8 pls.

OZAKI, H. (1958) : Stratigraphical and Paleontological Studies on the Neogene and Pleistocene Formations of the Tyosi District. *Nat. Sci. Mus., Bull., vol. 4, no. 1*, p. 1-182, 15 figs., tables and maps, 24 pls.

TAKAYANAGI, Y. (1950) : Pliocene Smaller Foraminifera from Western Sendai. *Short Papers, Inst. Geol. Pal., Tohoku Univ., no. 2*, p. 23-28, 6 figs.

YABE, H. and HATAI, K. (1940) : A Note on *Pecten* (*Fortipecten*, subgen. nov.) *takahashii* YOKOYAMA and its Bearing on the Neogene Deposits of Japan. *Tohoku Univ., Sci. Rep., Ser. 2, Geol., vol. 21, no. 2*, p. 147-160, pl. 35, 36.

Inuwaka	犬若	Tatsunokuchi	竜ノ口
Nisatai	仁佐平		

PROCEEDINGS OF THE PALAEONTOLOGICAL SOCIETY OF JAPAN

日本古生物学会第89回例会および「Ultramicropaleontology の進歩と未来」および「石狩・幌内問題」についてのシンポジウムが 1964 年 11 月 24 日（火）北海道大学理学部地質学鉱物学教室（本館）およびクラーク会館において開催された。

（参加者 25 名）

個人講演

北海道中川町産 木性シダ化石……橋本 亘

Some Marine Shell-bearing Mollusca from the Alluvial Deposits of Yamashita-cho, Watari-gun, Miyagi Prefecture (代読)....

.....Kotaro HASE
Steinmannella (*Yeharella*) *kimurai* from the Futaba Group in Northeast Japan (代読) .....Shiro MAEDA
Lower Cretaceous Trigonids from the Todai Formation, Central Japan (代読).... ..... Shiro MAEDA
The Collignoniceratidae from Hokkaido. Part 1. Collignoniceratidae (代読)..... ..... Tatsuro MATSUMOTO
Oxytropidoceras の発見 ....橋本 亘・猪間明俊
長野県下伊那郡千代村産 中新世 *Macrocheira* タカアシガニ (代読).....今泉力蔵
A Sting Ray and Eagle Ray from the Tatsunokuchi Formation (Pliocene) in Sendai City, Miyagi Prefecture, Japan (代読) .....Kotora HATAI, Masafumi MURATA and Koichiro MASUDA
Waagenophyllum Sea..... ..... 湊 正雄・加藤 誠・藤原嘉樹
フレミング氏記載の石炭紀サンゴ化石について の覚え書き .....加藤 誠
Desmostylus minor の共存化石.....魚住 悟

シ ン ポ ジ ウ ム

Ultramicropaleontology の進歩と未来 ....(話題提供者)....本庄 丕
石狩・幌内問題..... (話題提供者)....手島 淳

討 論 会

古生物学長期計画案について:

日本古生物学会1965年度総会および年会は1965年1月23(土), 24日(日)東京国立科学博物館において開催された。 (参加者44名)

会 長 講 演

Cambrian Biosphere .....小林貞一

特 別 講 演

鯨類の分類について .....西脇昌治

脊椎動物に関する講演会

新生代後半における淡水魚相の変遷 ....上野輝弥
別所層の魚鱗の化石 .....中沢克三
ブラジル産 *Mesosaurus* について .....
..... 尾崎 博・鹿間時夫
日本の小型哺乳動物化石相にいて ....長谷川善和
On the postcranial skelten of Japanese Desmostylid .....鹿間時夫
A new species of *Rusa* from western Kyushu .....大塚裕之
日本哺乳動物群の起原 .....今泉吉典
霊長類の形態学的研究—サルの歯を中心にして ..... 佐伯政友

個 人 講 演

On the genus *Tilia* from the *Woodwardia*-zone of Hokkaido and with descriptions of the two new species.....Seido ENDO
高島炭田端島坑内に産出した上部白亜紀の *Salvinia* について .....松尾秀邦
房総および三浦半島からの鮮新世—更新世の *Uvigerina* 類について .....青木直昭
Shell structures of Japanese Foraminifera. Pt. 1. *Rotalia tochigiensis* UCHIO, 1951. ..... Hiroshi UJIIE
Ditto. Pt. 2. *Rotalia nipponica* Asano, 1936. ..... Hiroshi UJIIE
長崎県男女群島沖の海底から採集した新しい大型のホタテ貝 .....永沢譲次
Some fossil *Anadara* from Southwest Japan ..... Hiroshi NODA
Classification of the Astartacea from the Lower Cretaceous of Japan .... Itaru HAYAMI
New species, *Myophorella* (*Haidaia*) *kappazakensis* from the Kappazaka Formation in the Kwanto Mountainland, Central Japan.....Shiro MAEDA
インド産白亜紀アンモナイトの2・3について.. ..... 松本達郎
A new occurrence of *Scutellum* in the Silurian of Shikoku Island..... Teiichi KOBAYASHI and Takashi HAMADA
A Proetoid Trilobite from Perlis, Malaya (Malaysia)..... Teiichi KOBAYASHI and Takashi HAMADA

報 告

国際古生物学連合について .....松本達郎
古生物学長期研究計画案について

例会通知

	開催地	開催日	講演申込締切日
第90回例会	金沢大学	1965年6月20日	1965年5月20日
第91回例会	長崎大学教養部	1965年9月25日	1965年8月25日

第90回例会（金沢大学）：シンポジウム・北陸地方を中心とした新生代後半の古地理と古生物の変遷（主として古植物群を中心に）（世話人　市川　渡）。

第91回例会（長崎大学）：シンポジウム・化石群集と堆積相　（世話人　勘米良亀齢・九大　および鎌田泰彦・長崎大学教学部　なお，宿泊その他一般の連絡先は高橋　清・長崎大教養部　である）。

会　告

当学会では，会則第2条に示された目的の一端として，古生物学関係各分野における研究委員会の活動を援助している。委員会に対しては，通信費程度の運営金の補助を行なうことがあるので，希望するむきは，次の各項を記載し，学会庶務係まで申し込むこと。申し込みは随時受付けている。補助については常務委員会で審議のうえ通知する。なお，補助をうけた委員会に対しては，必要に応じて簡単な成果報告書の提出を求めることがある。1）委員会名　2）責任者氏名および所属　3）メンバー表　4）仕事の内容と規模　5）委員会の継続予定期間　6）年間必要金額。

学会記事

1963年1月1日より1965年1月22日までの会員移動は次の通りである。

入会者：藤山家徳・後藤博弥・波田重熙・浜田潤一・原田幹彦・長谷弘太郎・服部陸彦・平野弘道・F. Kahler・鹿島愛彦・加藤倭司・木田貴郷・金　鳳均・木村秀雄・小泉　斉・小泉　格・熊野純男・A.R. Loeblich・A. McIntyre・中居　功・中沢克三・木村一夫・大塚裕之・斎藤靖二・佐藤二郎・沢村孝之助・柴田　博・高橋　和・竹内貞子・山田静雄・吉野道彦。

退会者：林　治一・A. M. Keen・松岡　寛・光木将喜・望月勝海（死亡）・照沼義夫。

1965年1月24日国立科学博物館で開催された本会総会において学会報告記事投稿規定12条が次の様に改正された。

12. 別刷の必要部数を原稿に付記する。但し無表紙120部までは無償で，それ以上は著者がその費用を負担する。

News

◎ 古生代の微植物群に関する国際委員会（Commission Internationale de Microflore du Paleozoique 略称 C. I. M. P.）の第6回総会と古生代の層序に関する第1回セミナー及び石炭紀の層序に関する国際委員会（Commission Internationale de Stratigraphie du Carbonifere）と C. I. M. P. との共催の石炭紀の層序に関する会合が Sheffield（英国）で本年9月5日より11日まで7日間にわたり開催される。くわしくは下記に問合せられたい。
Dr. B. Alpern-Cerchar, Boite Postale 27, Creil (Oise), France.

◎ 本会の特別出版「第10号」がこの程出版された。棚井敏雅・鈴木順雄著「Late Tertiary Floras from Northeastern Hokkaido, Japan」で，本文117頁，コロタイプ図版21枚。一部定価2,100円。

1965年4月25日　印　刷
1965年4月30日　発　行

日本古生物学会報告・紀事
新　篇　第57号
400円

東京大学理学部地質学教室内
日本古生物学会
編集者　花井哲郎
発行者　市川健雄
（振替口座東京84780番）
印刷者　東京都港区芝片門前2ノ13
学術図書印刷株式会社　富田　元

日本古生物学会会則　(1964, 1, 18)

第 1 条　本会は日本古生物学会という。

第 2 条　本会は古生物学およびこれに関係ある諸学科の進歩および普及を計るのを目的とする。

第 3 条　本会は第 2 条の目的を達するため次の事業を行う。

1. 会誌そのほかの出版物の発行。 2. 学術講演会の開催。
3. 普及のための採集会・講演会そのほかの開催。
4. 研究の援助・奨励および研究業績ならびに会務に対する功労の表彰その他第 2 条の目的達成に資すること。

第 4 条　本会の目的を達するため総会の議を経て本会に各種の研究委員会を置くことができる。

第 5 条　本会は古生物学およびこれに関係ある諸学科に興味を持つ会員で組織する。

第 6 条　会員を分けて普通会員・特別会員・賛助会員および名誉会員とする。

第 7 条　普通会員は所定の入会申込書を提出した者につき評議員会の議によって定める。

第 8 条　特別会員は本会に 10 年以上会員であり古生物学について業績のあるもので，特別会員 5 名の推薦のあったものにつき評議員会の議によって定める。

第 9 条　賛助会員は第 2 条の目的を賛助する法人で評議員会の推薦による。

第 10 条　名誉会員は古生物学について顕著な功績のある者につき評議員会が推薦し，総会の決議によって定める。

第 11 条　会員は第 12 条に定められた会費を納めなければならない。会員は会誌の配布を受け第 3 条に規定した事業に参加することができる。

第 12 条　会費の金額は総会に計って定める。会費は普通会員年 1,000 円，特別会員年 1,500 円，賛助会員年 10,000 円以上とする。名誉会員は会費納入の義務がない。在外の会員は年 1 弗とする。

第 13 条　本会の経費は会費・寄付金・補助金などによる。

第 14 条　会費を 1 ケ年以上滞納した者および本会の名誉を汚す行為のあった者は，評議員会の議を経て除名することができる。

第 15 条　本会の役員は会長 1 名，評議員 15 名とし，うち若干名を常務委員とする。任期は総て 2 年とし再選を妨げない。
会長の委嘱により本会に幹事および書記若干名を置くことができる。
常務委員は評議員会において互選される。評議員は特別会員の中から会員の通信選挙によって選出される。

第 16 条　会長は特別会員の中から評議員会において選出され，本会を代表し会務を管理する。
会長に事故ある場合は会長が臨時に代理を委嘱する。

第 17 条　本会には名誉会長を置くことができる。名誉会長は評議員会が推薦し総会の決議によつて定める。名誉会長は評議員会に参加することができる。

第 18 条　本会は毎年一回定例総会を開く。その議長には会長が当り本会運営の基本方針を決定する。
総会の議案は評議員会が決定する。
会長は必要があると認める時は臨時総会を召集する。総会は会員の十分の一以上の出席をもつて成立する。
会長は会員の三分の一以上の者が会議の目的たる事項および召集の理由を記載した書面をもつて総会召集の請求を受けた場合は臨時総会を召集する。

第 19 条　総会に出席しない会員は他の出席会員にその議決権の行使を委任することができる。但し，欠席会員の議決権の代行は 1 人 1 名に限る。

第 20 条　総会の議決は多数決により，可否同数の時は議長がこれを決める。

第 21 条　会長および評議員は評議員会を組織し，総会の決議による基本方針に従い運営要項を審議決定する。

第 22 条　常務委員は常務委員会を組織し評議員会の決議に基づいて会務を執行する。

第 23 条　本会の会計年度は毎年 1 月 1 日に始まり 12 月 31 日に終る。

第 24 条　本会会則を変更するには総会に付議し，その出席会員の三分の二以上の同意を得なければならない。

付　則　1) 評議員会の議決は総て無記名投票による。