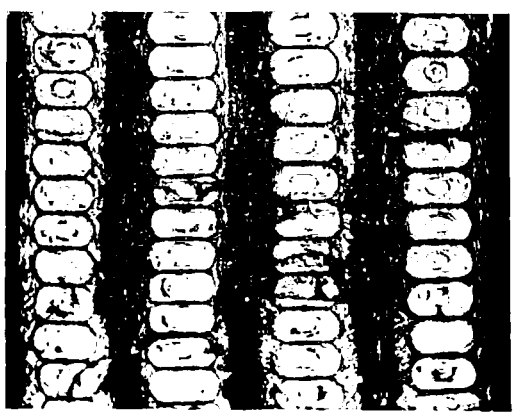
日本古生物学會報告・紀事

Transactions and Proceedings of the Palaeontological Society of Japan

New Series No. 41



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Palaeontological Society of Japan

April 10, 1961

CONTENTS

TRANSACTIONS

The fossil on the front page is *Xenoxylon latiporosum* (Cramer) Gothan 1910

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. 41, pp. 1-8, pl. 1, Apr. 10, 1961

394. THE MIOCENE MOLLUSCAN FOSSILS FROM THE AREA SOUTHWEST OF HIROSAKI CITY, AOMORI PREFECTURE, JAPAN*

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弘前市南西部の中新世軟体動物化石：弘前市南西部に発達している藍内川層（中新統）には至るところに介化石が含まれている。今回はそれらの産地のうち 13 箇所から 35 属 52 種の軟体動物を採集することが出来たので，その動物群の堆積物との関係，時代考察及び対比を行つた。

岩 井 武 彦

Introduction and Acknowledgements

The marine molluscan fossils upon which the present article is based comprises the collection of the present writer during his geological surveys in 1955 to 1958 in the area southwest of Hirosaki City, Aomori Prefecture, where Neogene deposits are very well developed but hitherto little studied. The treated fossils are from the Ainaigawa formation (T. KANAYA, 1949) and comprise the collection made from a total of 13 new fossil localities of the formation.

In this article the writer, from the determined fossils of 13 fossil localities and stratigraphic position of the stratigraphic unit which have yielded them, attempts correlation of them with previously known geological formations of Japan, their bearing on the geological age determination, and a short discussion is presented concerning the Ainaigawa formation.

* Received Jan. 23, 1960; read at the Annual Meeting of the Society at Sendai Jan. 17, 1960.

Here the writer wishes to express his hearty thanks to Professors Gunjiro SAKAI of the Hirosaki University in Aomori Prefecture and Kotora HATAI of the Tohoku University in Miyagi Prefecture, for their constant advice and supervision during the course of the present work. Acknowledgements are also due to Messers. Koichiro MASUDA, Shozo HAYASAKA and Tetsuo SHIOBARA, and Drs. Taro KANAYA and Tamio KOTAKA, all of the Tohoku University for their support in many ways.

Notes on the Geology of the Ainaigawa Formation

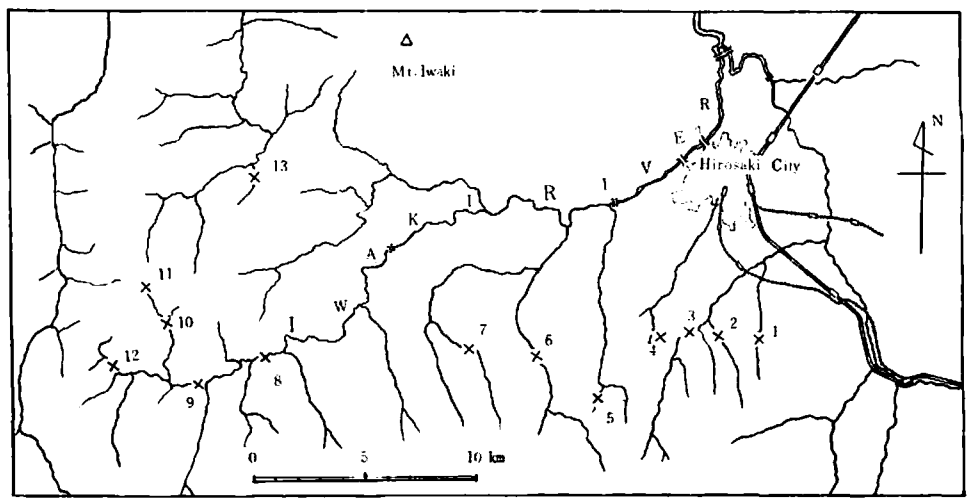
The Ainaigawa formation, first introduced by T. KANAYA (1949) as a stratigraphic unit, has its type locality at Ainaigawa, Soma-mura, Naka-Tsugaru-gun, Aomori Prefecture, where the rocks are well developed. This designated locality lies approximately in the central part of distribution of the formation. With regard to the formation, T. KANAYA (1949) described as follows.

The Ainaigawa formation is the lowest part of the Neogene Tertiary strata developed in the southwestern part of the

Hirosaki structural Basin, and comprises mainly green, bluish gray and dark colored tuffs and tuff breccia. The upper part of the Ainaigawa gradually changes from the lower into fine grained materials (light blue, grayish yellow and gray tuffaceous shale), and the lower part is dominantly of conglomeratic sandstone (granule size pebbles derived from andesite and Paleozoic rocks). In the eastern part of the Tochinai-gawa no volcanic materials are found. The western extension of the formation is characterized with basaltic andesite flows with minor amounts of conglomerate and sandstone. The thickness of the formation is estimated at 300 to 700 meters in total.

The Ainaigawa formation unconformably overlies the pre-Tertiary basement of granodiorite and Paleozoic rocks. The upper part of the formation gradually changes into the superjacent Owasawa formation, which comprises an alternation of green tuff and hard shale.

The Ainaigawa formation, from the present writer's observation, can be subdivided into two parts. The upper part is composed mainly of sandstone and conglomerate which yield molluscan fossils from the middle part. The basal part has yielded fish remains probably of freshwater origin, plant fossils and lignite. The lower part of the formation consists of green tuff, green tuff breccia and andesite lava flows at its lowermost. No marine fossils have been found from this part.



Text-figure 1. Index Map of the Fossil Localities

Collecting Localities and Molluscan Fauna

The specifically determined molluscan fossils, collected by the writer from 13 fossil localities within the southwestern part of the Hirosaki Basin, are from the upper part of the Ainaigawa formation, and these are abridged in Table 1. The fossil localities, their respective elements, and detail situations are given in the following list, Table 1, and Text-fig. 1, respectively.

The fossil localities are as follows, and the numbers before them refer to those

Table 1. Faunal List of the Ainaigawa Formation

Species Name \ Loc. No.	1	2	3	4	5	6	7	8	9	10	11	12	13
1 *Nucula* sp.					*								
2 *Acila divaricata* (HINDS), 1843 (Fig. 6)					*								
3 *Acila* sp.					*								
4 *Portlandia scapha* (YOKOYAMA), 1926 (Fig. 2)								*					
5 *Yoldia tokunagai* YOKOYAMA, 1925 (Fig. 3)								*					
6 *Glycymeris oinouyei* NOMURA, 1935 (Fig. 23)							*						
7 *Glycymeris* sp. A													*
8 *Glycymeris* sp. B						*							*
9 *Limopsis* sp.													*
10 *Mytilus* sp.							*						
11 *Chlamys akitana* (YOKOYAMA), 1926 (Fig. 27)													*
12 *Chlamys nisataiensis* OTUKA, 1943													*
13 *Chlamys* sp.								*					
14 *Patinopecten kimurai* (YOKOYAMA), 1925	*	*	*	*	*		*				*	*	
15 *Patinopecten kimurai ugoensis* HATAI and NISIYAMA, 1934									*				
16 *Patinopecten yamasakii iwasakiensis* (NOMURA), 1935 (Fig. 26)							*						
17 *Patinopecten* sp.												*	
18 *Venericardia siogamensis* NOMURA, 1935									*				*
19 *Venericardia* sp.		*	*										
20 *Corbicula* sp.													*
21 *Lucinoma acutilineatum* (CONRAD), 1849 (Fig. 10)								*					
22 *Pillucina yokoyamai* (OTUKA), 1934 (Fig. 9)										*			
23 *Vasticardium* n. sp. (*C. arenicola* (REEVE)-type)													*
24 *Laevicardium* sp. (Fig. 17)								*					
25 *Papyridea* sp. (*P.* cf. *kurodai* HATAI and NISIYAMA, 1953)													*
26 *Clinocardium* cf. *narusawaense* NOMURA, 1935								*					
27 *Clinocardium* cf. *shinjiense* (YOKOYAMA), 1923 (Fig. 18)					*								
28 *Nemocardium samarangae* MAKIYAMA, 1932	*												
29 *Dosinia kaneharai* YOKOYAMA, 1926 (Fig. 1)							*	*					
30 *Dosinia chikuzenensis* NAGAO, 1928 (Fig. 8)													*
31 *Dosinia akaisiana* NOMURA, 1935 (Fig. 7)							*						
32 *Dosinia odosensis* NOMURA, 1935 (Fig. 11)							*						
33 *Dosinia tugaruana* NOMURA, 1935 (Fig. 4)							*	*					
34 *Dosinia* sp.										*			
35 *Cyclina japonica* KAMADA, 1952 (Fig. 16)										*			
36 *Venus* cf. *toreuma* (GOULD), 1850								*					
37 *Venus* n. sp. A (Fig. 12)								*					
38 *Venus* n. sp. B (Fig. 13)					*								
39 *Mercenaria* cf. *chitaniana* (YOKOYAMA), 1926 (Fig. 5)													*
40 *Venerupis* n. sp.						*							
41 *Clementia* (?) sp.													*
42 *Macoma optiva* (YOKOYAMA), 1923 (Fig. 21)								*					
43 *Macoma* spp. (Figs. 20, 22)		*						*					
44 *Fabulina* n. sp. (*F.* cf. *nitidula* (DUNKER), 1860)							*						
45 *Peronidia* cf. *protovenulosa* (NOMURA), 1935								*					
46 *Cultellus izumoensis* YOKOYAMA, 1923 (Fig. 13)					*								
47 *Solen* cf. *gouldi* CONRAD, 1867					*								
48 *Panomya simotomensis* OTUKA, 1934 (Fig. 15)							*						
49 *Panope japonica* (A. ADAMS), 1849 (Fig. 14)								*					
50 *Turritella s-hataii* NOMURA, 1935 (Fig. 25)							*						
51 *Neptunea* cf. *hukusimensis anomalia* NOMURA and HATAI, 1936							*						
52 *Babylonia* cf. *kozaiense* NOMURA, 1939 (Fig. 24)								*					
53 *Balanus* sp.													*

in Text-fig. 1.

Loc. 1: Upper stream of the Inakari-zawa, Matsukitai, Hirosaki City.
Loc. 2: About one kilometer south of Owasawa along the Miyama-zawa, Hirosaki City.
Loc. 3: Under the bridge at the south end of Ichi-no-watari, Hirosaki City.
Loc. 4: About one kilometer northeast of Mt. Kudoji, Sakamoto, Hirosaki City.
Loc. 5: Upper stream of the Tochinai-gawa, Soma-mura, Naka-Tsugaru-gun.
Loc. 6: A right side cliff of the Ainai-gawa, Soma-mura, Naka-Tsugaru-gun.
Loc. 7: The Funauchi Mine, Soma-mura, Naka-Tsugaru-gun.
Loc. 8: Left side of the Iwaki River near the Kawara-tai, Nishi-meya-mura, Naka-Tsugaru-gun.
Loc. 9: Junction of the Iwaki River and the O-kawa, Kawara-tai, Nishi-meya-mura, Naka-Tsugaru-gun.
Loc. 10: Middle stream of the Onikawabe-zawa, Nishi-meya-mura, Naka-Tsugaru-gun.
Loc. 11: Head of the stream of the Onikawabe-zawa, Nishi-meya-mura, Naka-Tsugaru-gun.
Loc. 12: About one kilometer northwest of the Anmon Fall, Nishi-meya-mura, Naka-Tsugaru-gun.
Loc. 13: Upper stream of the Nakamura-gawa (Nagamatsu-no-sawa), Ajigasawa-machi, Nishi-Tsugaru-gun.

Remarks on the Molluscan Fauna

The 13 fossil localities according to lithology can be classified into four groups of A, B, C and D. A is characterized with bluish gray, greenish blue or greenish gray medium grained sandstone with or without pebble-bearing sandstone in association. Group B includes gray siltstone which becomes brown on weathered surface. Group C consists of pebble to granule conglomerate and brown tuffaceous sandstone, and is associated with muddy sandstone. Group D comprises gray to bluish gray coarse grained sandstone or greenish gray medium grained sandstone. The respective fauna of these groups may be summarized as follows:

Group A: *Patinopecten kimurai*, *Venericardia* sp., *Nucula* sp., *Macoma* sp., *Acila divaricata*, *Acila* sp., *Clinocardium* cf. *shinjiense*, *Venus* sp., *Cultellus izumoensis*, *Solen* cf. *gouldi*, *Glycymeris* sp. and *Venerupis* sp.

Group B: *Portlandia scapha*, *Yoldia tokunagai*, *Chlamys* sp., *Lucinoma acutilineatum*, *Laevicardium* sp., *Clinocardium* cf. *narusawaense*, *Dosinia kaneharai*, *D. tugaruana*, *Venus* cf. *toreuma*, *V.* sp., *Macoma optiva*, *M.* sp., *Peronidia* cf. *protovenulosa*, *Panope japonica*.

Group C: *Glycymeris oinouyei*, *Mytilus* sp., *Patinopecten kimurai*, *Pat. yamasakii iwasakiensis*, *Dosinia kaneharai*, *D. akaisiana*, *D. tugaruana*, *Fabulina* sp., *Panomya simotomensis*, *Turritella s-hataii*, *Neptunea* cf. *hukusimaensis*.

Group D: *Patinopecten kimurai*, *Nemocardium samarangae*, *Pillucina yokoyamai*, *Dosinia* sp., *Cyclina japonica*.

From the assemblages tentatively considered as related with bottom sediments in which the infauna lived, it seems that there existed some differences in their respective environments. Leaving aside the swimming forms (*Patiopecten*, *Chlamys*), and indeterminable specimens whose individual number is very few (*Venericardia*, *Nucula*, *Mytilus*, *Fabulina*, *Venerupis*), the following remarks may be presented with concern to the relationship between lithofacies and fauna.

The conditions under which Group A were buried may have been a very shallow sea not far from the strand line and of a depth less than about ten meters. This may be upheld by the presence of burrowing forms as *Cultellus* and *Solen*, two genera which occur in such regions in the present day seas

surrounding central to southern Japan. The presence of either *Acila* or *Clinocardium* does not hinder such a view.

In the case of Group B, the conditions appear to have been different from that of Group A, because from the occurrence of *Portlandia*, *Yoldia*, *Lucinoma*, a widely open embayment or open sea environment is more favorable to their flourishing than a closed bay open to the sea only with a narrow strait. The abundant occurrence of specimens of *Dosinia* and *Venus* together with the presence of deeply burrowing forms as *Panope* and shallowly burrowing ones as *Clinocardium*, *Dosinia* and *Peronidia*, it is suggested that the sea may not have been very deep, although deeper than that of Group A. Genera as *Lucinoma*, *Dosinia* and cockles are usually found on beaches where rather strong waves prevail and such may have been the environment of the present group.

Group C, which is characterized by abundant species of *Dosinia*, burrowing pelecypods as *Panomya* and *Glycymeris* together with epifauna gastropods as *Turritella* and *Neptunea*, evidently points to an environment locally governed by conditions different from those of Group A and B. Because of the epifauna, it is considered that no strong waves influenced this area, although it is not necessary that the region was sheltered.

Group D which has only three specifically determined species at present, is difficult to judge so far as the environment is conerned. However, from the presence of *Cyclina japonica*, a genus which thrives in brackish to very shallow waters of sheltered areas, it may be that the present area was also of such a place.

Definite conclusions regarding the environmental conditions of the four lithologically distinguished groups are withheld until further specimens are collected and until the details of the geology are worked out.

The number of species in common between each of the 13 fossil localities is small, but *Patinopecten kimurai* (Yokoyama) occurs most widely. The few number of species in common between each of the fossil localites may be explained by the local differences in ecological conditions, difficulty in collecting well preserved materials, bottom control of the sediments, situations within the sedimentary basin, and not by the difference in stratigraphic horizon because detail sections were taken and stratigraphic positions were determined. However, the occurrences of the fauna of each respective locality are considered important in proving the distribution of the neritic fauna within the said formation, and in extending the distibution of them within the Miocene deposits of Japan.

The molluscan fossils from the Ainaigawa formation, when compared with those reported from the Tanosawa formation (S. Nomura, 1935), reveal important characteristics, which indicate that the two may be contemporaneous in geological age. It is thought that this similarity between the Ainaigawa and Tanosawa formations will be further strengthened by the discovery of more materials from the Ainaigawa.

The molluscan fossils which are considered to be characteristic species in the Japanese Neogene and in common between the Ainaigawa and Tanosawa formations are: *Glycymeris oinouyei* Nomura, *Patinopecten kimurai* (Yokoyama), *Patinopecten iwasakiensis* (Nomura), *Venericardia siogamensis* Nomura, *Lucinoma acutilineatum* (Conrad), *Dosinia tugaruana* Nomura, *Dosinia odosensis* Nomura, *Dosinia akaisiana* Nomura, *Cultellus izumoensis* Yokoyama, *Panope*

japonica (A. ADAMS) and *Panomya simotomensis* OTUKA. Of these mentioned species, *Dosinia tugaruana*, *D. odosensis* and *D. akaisiana* all of NOMURA (1935) may yet prove to be *Dosinia chikuzenensis* NAGAO (1928). However, if such becomes the case, then the distribution of NAGAO's species will be extended and the geological significance strengthened.

That the Ainaigawa formation is nearly equivalent to the Tanosawa formation can readily be recongnized by the mutual species, and further, it may be added that the Shiogama formation in Miyagi Prefecture, whose fossils were described and illustrated by S. NOMURA (1935) is also approximately correlatable with the Ainaigawa. The molluscan species mutual between the Ainaigawa and Shiogama formation are: *Acila divaricata* (HINDS), *Patinopecten kimurai* (YOKOYAMA), *Lucinoma acutilineatum* (CONRAD), *Venericardia siogamensis* NOMURA, *Cultellus izumoensis* YOKOYAMA, *Panope japonica* (A. ADAMS) and *Turritella s-hataii* NOMURA. The last mentioned species is considered to be a good guide fossil in the early Miocene deposits of Japan.

Important in determination of the geological age and correlation, and occurring in the Ainaigawa formation are such species as *Dosinia* (*Kaneharaia*) *kaneharai* YOKOYAMA, *Cyclina japonica* KAMADA and *Macoma optiva* (YOKOYAMA), all of which have rather widespread distribution and rather short geological range.

From the extinct characteristic molluscan fossils occurring from the Ainaigawa formation, it is thought that the formations to be mentioned are its correlatives because of the mutual yield of identical species and stratigraphic realtionship of those formations to subjacent and superjacent ones in the areas in which they develop. These formations are: Sugota in Akita Prefecture, Higashi Innai in Ishikawa Prefecture, Kadonosawa and Narusawa in Iwate Prefecture, Moniwa and Shiogama in Miyagi Prefecture, and the Tanagura formation in Fukushima Prefecture.

The stratigraphical evidences exhibited by the Ainaigawa formation as the nonmarine sediments of its lower part, the terrestrial conditions of its lower upper part and marine fossil bearing sediments of its upper part, indicate that although gradual subsidence was taking place, marine waters did not invade the present area until the middle upper part of the formation. This marine invasion which brought many warm thermal mollusca to their site of burial is considered to indicate the first stage of marine transgression of the Neogene in Aomori Prefecture. This mentioned phenomenon is a characteristic of the early Miocene of Japan, and may be recongnized in many areas outside of the present one.

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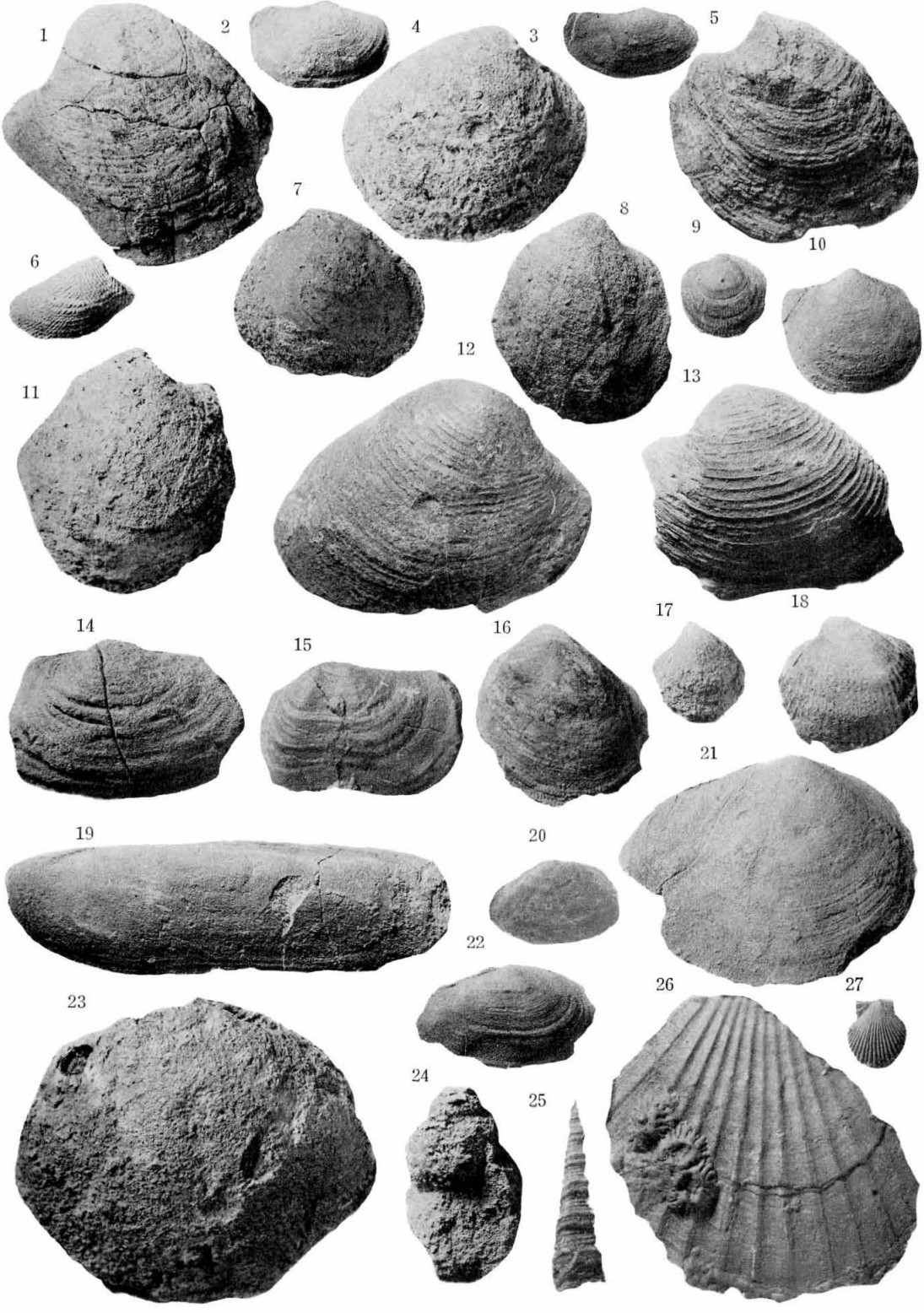
Explanation of Plate 1

(All figures in natural size except Fig. 25)

Fig. 1. *Dosinia* (*Kaneharaia*) *kaneharai* YOKOYAMA. Loc. No. 8. External cast of a left valve.
Fig. 2. *Portlandia scapha* (YOKOYAMA). Loc. No. 8. External cast of a left valve.
Fig. 3. *Yoldia tokunagai* YOKOYAMA. Loc. No. 8. External cast of a left valve.
Fig. 4. *Dosinia tugaruana* NOMURA. Loc. No. 7. Internal mould of a right valve.
Fig. 5. *Mercenaria* cf. *chitaniana* (YOKOYAMA). Loc. No. 8. External cast of a left valve.
Fig. 6. *Acila divaricata* (HINDS). Loc. 5. External cast of a right valve.
Fig. 7. *Dosinia akaisiana* NOMURA. Loc. No. 7. Internal mould of a left valve.
Fig. 8. *Dosinia chikuzensis* NAGAO. Loc. No. 13. External cast of a right valve.
Fig. 9. *Pillucina yokoyamai* (OTUKA). Loc. No. 10. External cast of a left valve.
Fig. 10. *Lucinoma actilineatum* (CONRAD). Loc. No. 10. Internal mould of a left valve.
Fig. 11. *Dosinia odosensis* NOMURA. Loc. No. 7. External cast of a left valve.
Fig. 12. *Venus* n. sp. A. Loc. No. 8. External cast of a right valve.
Fig. 13. *Venus* n. sp. B. Loc. No. 5. External cast of a left valve.
Fig. 14. *Panope japonica* (A. ADAMS). Loc. No. 8. Internal mould of a left valve.
Fig. 15. *Panomya simotomensis* OTUKA. Loc. No. 7. Rubber cast of a right valve.
Fig. 16. *Cyclina japonica* KAMADA. Loc. No. 10. External cast of a right valve.
Fig. 17. *Laevicardium* sp. Loc. No. 8. External cast of a left valve.
Fig. 18. *Clinocardium* cf. *shinjiensis* (YOKOYAMA). Loc. No. 8. External cast of a left valve.
Fig. 19. *Cultellus izumoensis* YOKOYAMA. Loc. No. 5. Internal mould of a left valve.
Fig. 20. *Macoma* sp. Loc. No. 8. Rubber cast of a right valve.
Fig. 21. *Macoma optiva* (YOKOYAMA). Loc. No. 8. External cast of a right valve.
Fig. 22. *Macoma* sp. Loc. No. 8. External cast of a right valve.
Fig. 23. *Glycymeris oinouyei* NOMURA. Loc. No. 7. Internal mould of a left valve.
Fig. 24. *Babylonia* cf. *kozaiensis* NOMURA. Loc. No. 8. External cast, showing front part view.
Fig. 25. *Turritella s-hataii* NOMURA. ×2. Loc. No. 7. Rubber cast of spire whorls.
Fig. 26. *Patinopecten yamasakii iwasakiensis* (NOMURA). Loc. No. 7. Rubber cast of a left valve.
Fig. 27. *Chlamys akitana* (YOKOYAMA). Loc. No. 13. Left valve of a younger shell.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Trans. Proc. Palaeont. Soc. Japan, N. S., No. 41, pp. 9-12, pl. 2, Apr. 10, 1961

395. A NEW PALAEOGENE SPECIES OF THE GENUS *EUCOMMIA* FROM HOKKAIDO, JAPAN*

KAZUO HUZIOKA

Institute of Mining Geology, Mining College, Akita University

北海道産古第三紀の *Eucommia* 新種：清水沢炭鉱より小林政雄氏が採集した *Eucommia Kobayashii* HUZIOKA (新種) を記載した。*Eucommia* は現生 1 種が中支に分布するのみであるが，化石は北半球の第三系より 3 種知られている。岐阜県の鮮新層より三木博士が現生種 *E. ulmoides* OLIVER の産出を報告した。この新種は旧大陸では唯一最古の古第三紀種である。

藤　岡　一　男

Lately, a new species of the genus *Eucommia* OLIVER has been collected by Mr. M. KOBAYAYASHI in the Eocene Yubari coal-bearing formation at the Shimizusawa coal-mine of Yubari in Ishikari coal-field of Hokkaido.

The monotypic species of the modern *Eucommia*, *E. ulmoides* OLIVER, now grows only in China its distribution confined to provinces of Hupeh, Szechwan, Anhwei and Chekiang (H. H. HU and W. H. CHUN, 1927). This deciduous large tree bears the novel fruit characteristic to the genus as shown in Pl. 43, Fig. 1-b.

The fossil *Eucommia* was first reported by CL. and E. M. REID (1907) as an undefinable fruit, which was later named *Eucommia europaea* MÄDLER (1939), from the Pliocene lignite-bearing deposits of Frankfurt am Main in Germany. Next, BERRY (1930) described some fruit-specimens of the Wilcox flora in Tennessee under the names of *Simarubites eocenicus* and *Carpolithus banisteroides*, both of which were corrected by BROWN (1940) to *Eucommia eocenica* (BERRY). Another fossil species of North America is *E. montana* BROWN (1940) from the Oligocene deposits of Montana. MIKI (1941) reported the occurrence of *Eucommia*-fruit, which is indistinguishable from the living *E. ulmoides*, from the Lower Pliocene *Pinus trifolia* Bed of Central Japan. The valid fossil species hitherto recorded are four as mentioned above, and to them *E. Kobayashii* HUZIOKA, sp. nov. has been added.

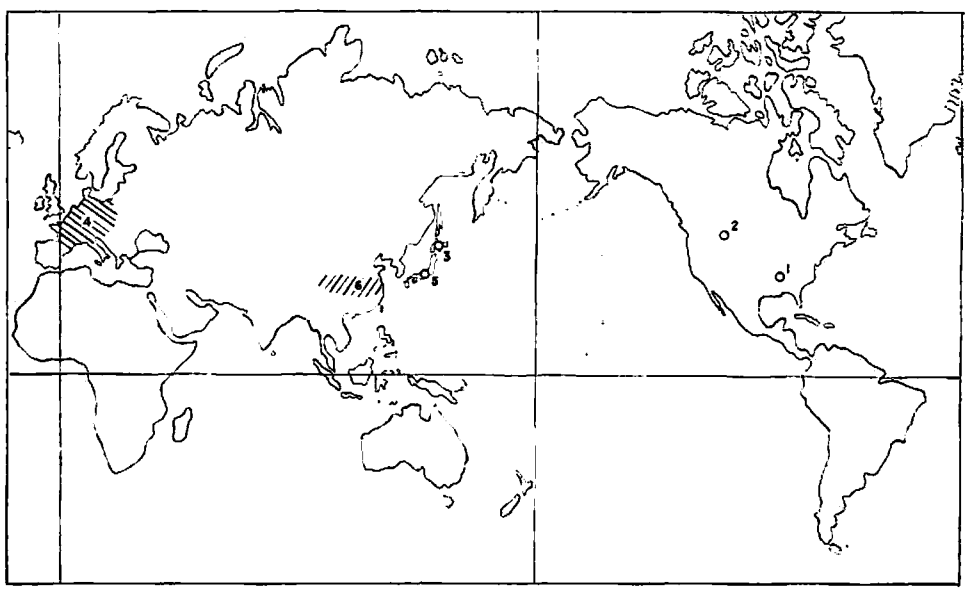
The four species of *Eucommia* and their occurrences are enumerated in the table and in the map (Text-fig. 1).

All fossil species hitherto known to us, as well as a new Japanese species, were found only on fruits without leaves and other organs. As far as fruit is concerned, all Neogene species of Europe and that of Japan are quite similar to the living *E. ulmoides*, but the Palaeogene forms including the present new species are considerablly remote in similarity from the living. It is believed that the appearance of the genus *Eucommia* may have been at latest in the Early Palaeogene Tertiary epoch and spread widely in the Northern Hemisphere through the Neogene until it was extinct from the most part of the area excepting the Yantze Valley region of China where *E. ulmoides* is seen existing.

* Read June 20, 1956; received Apr. 30, 1960.

Species of *Eucommia* and their occurrences

Species	Recent	Pliocene	Miocene	Oligocene	Eocene
E. ulmoides OLIVER	China (Hupeh, Chekiang and Szechwan)	Japan (Gihu pref.); Holland (Tegelen and Brunssum)	Poland (Rostov); France (Coiron)		
E. europaea MÄDLER		Hungary (Mizerma); Germany (Frankfurt a. M.)			
E. montana BROWN				U. S. A. (Grant, Montana)	
E. eocenica (BERRY) BROWN					U. S. A. (Holly Springs, Tennessee)
E. Kobayashii HUZIOKA					Japan (Hokkaido)



Text-fig. 1. Map showing the distribution of *Eucommia*.

1. *E. eocenica* (BERRY) BROWN..Eocene
2. *E. montana* BROWN .....Oligocene
3. *E. Kobayashii* HUZIOKA .....Eocene
4. *E. europaea* MÄDLER and *E. ulmoides* OLIVER.....Pliocene and Miocene
5. *E. ulmoides* OLIVER .....Pliocene
6. *E. ulmoides* OLIVER .....Recent

Eucommia Kobayashii, sp. nov. is the earliest species of the genus in the Old World being the first and only Palaeogene species.

The writer wishes to express his cordial thanks to Mr. Masao KOBAYASHI of the Hokkaido Tanko-Kisen Co. Ltd. who collected the specimens and sent them to him for study, and to Prof. S. MIKI of Osaka City University and Mr. S. ISHIDA of Kyoto University who kindly gave assistance to him in the determination of *Eucommia*.

Description of Species

Family Eucommiaceae

Genus *Eucommia* OLIVER

Eucommia Kobayashii HUZIOKA, sp. nov.

Pl. 2, Figures 5-10.

Description:—Fruit samaroid, coriaceous wing surrounding the nutlet. Samara with rigid peduncle 5-8 mm long, compressed, elliptic to oblong in outline, 20-30 mm long and 8-12 mm broad, inequilateral, rounded or obtuse at the apex, narrowly cuneate at the base, entire at the margin, markedly notched at a little below the apex. Nutlet oblong to lanceolate, 10-15 mm long and 3-4 mm wide, 1-seeded, suported by a stout rib from the apical notch, very fine fibrous membrane derived from the nutlet to the margin of samara.

The fruit-specimens are not so rare in the Yubari coal-bearing formation at the Shimizusawa coal-mine, but leaf-specimens of *Eucommia* have never been obtained in spite of the careful collection during past ten years. Fruit-specimens are represented mostly by distinct impressions on dark-coloured shale, but rarely by depressed remains. One of the remains, a nutlet covered by fibrous membrane, is shown in Pl. 43, Fig. 10.

Comparison:—Compared to *Eucommia ulmoides* OLIVER (Pl. 43, Fig. 1-b), which is a monotypic species living only in China, the present fossil fruit is very similar in the essential characters, but is generally smaller in size and distinctly inequilateral, the apical notch being situated at the lateral side. The known fossil species of *Eucommia* are *E. eocenica* (BERRY) BROWN (Pl. 43, Fig. 2a-b) (BERRY, 1930, p. 94, Pl. 44, Figs. 15 and 16, as *Simarubites eocenicus*; p. 134, Pl. 33, Figs. 5 and 6, as *Carpolithus banisteroides*; BROWN, 1940, p. 349) from the Wilcox flora in Tennessee, *E. montana* BROWN (Pl. 43, Fig. 3) (BROWN, 1940, p. 349, Text-fig. 3) from the Oligocene deposits of Montana, *E. europaea* MADLER (Pl. 43, Figs. 4a-b) (MADLER, 1939, p. 103, Pl. 8, Figs. 29-31; Pl. 9, Figs. 9-11) from the Pliocene lignite-bearing formation at Frankfurt am Main in Germany, and *E. ulmoides* OLIVER (MIKI, 1941, p. 277, Pl. 6E, Fig. 14F) of the Pliocene *Pinus trifolia* Bed at Ichinohara in Gihu prefecture of Central Japan. *E. Kobayashii* is easily distinguishable from all of them by the situation of the apical notch. In the new species, fruit is notched at the apical part of the lateral side as seen in the fruit of *Euptelea polyandra* SIEB. et ZUCC. (Pl. 43, Fig. 11).

Remarks:—The associated genera with *Eucommia Kobayashii* in the A plant-zonule of the type locality are as follows: *Ginkgo*, *Metasequoia*, *Glyptostrobus*, *Juglans*, *Alnus*, *Betula*, *Carpinus*, *Castanea*, *Quercus*, *Dryophyllum*, *Ulmus*, *Zelkowa*, *Planera*, *Cercidiphyllum*, *Magnolia*, *Hamamelis*, *Fothergilla*, *Liquidambar*, *Platanus*, *Crataegus*, *Mallotus*, *Rhus*, *Celastrus*, *Acer*, *Paliurus*, *Marlea*, *Fraxinus*, and etc. Judging from these generic association, the forest in which *E. Kobayashii* existed is

suposed to be the deciduous temperate forest which is closlely related to the modern forest in Central China where *E. ulmoides* now grows.

Occurrence:—The type locality: Shimizusawa coal-mine, Yubari city, Ishikari coal-field, Hokkaido; the A fossil-plants zonule of the Yubari coal-bearing formation; Eocene.

Coll. Masao KOBAYASHI.

Holotype: Fruit-specimen figured in Pl. 43, Fig. 5.

Depository: Institute of Mining Geology, Mining College, Akita University.

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Explanation of Plate 2

Figs. 1a-b. *Eucommia ulmoides* OLIVER (living leaf and fruits for comparison)
1a Leaf ×1/2, 1b fruits.

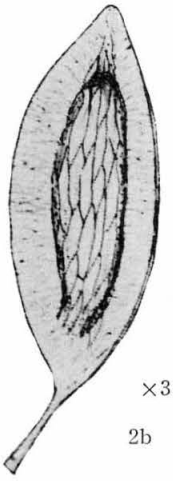
Figs. 2a-b. *Eucommia eocenica* (BERRY) BROWN (for comparison)
Type specimen, copy from BERRY (1930).

Fig. 3. *Eucommia montana* BROWN (for comparison)
Type specimen, copy from BROWN (1940).

Figs. 4a-b. *Eucommia europaea* MÄDLER (for comparison)
Type specimens (Fig. 4a is the holotype), copy from MÄDLER (1939).

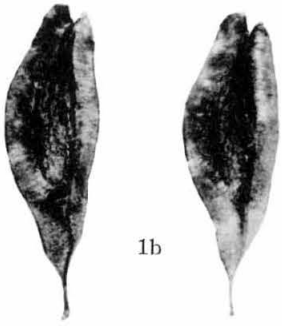
Figs. 5-10. *Eucommia Kobayashii* HUZIOKA, sp. nov.
Fig. 5 Holotype; Fig. 10 a nutlet remain covered by fibrous membrane, enlarged. (Loc. Shimizusawa coal-mine, Yubari, Ishikari coal-field, Hokkaido; Yubari coal-bearing formation; Eocene).

Fig. 11. *Euptelea polyandra* SIEB. et ZUCC. (living fruits for comparison) ×2.

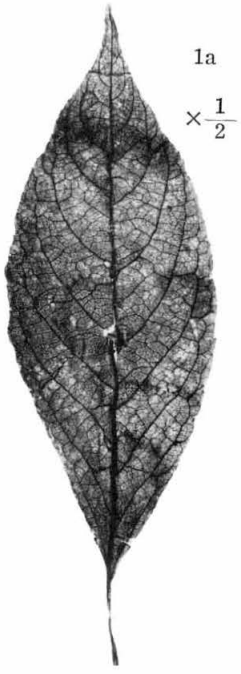


×3

2b



1b



1a

$\times\frac{1}{2}$

2a

3 ×2

10 ×2

4a

4b

11 ×2

5

6

7

8

9

K. SHIBATA photo.

Trans. Proc. Palaeont. Soc. Japan, N. S., No. 41, pp. 13-14, Apr. 10, 1961

396. A SUBFOSSIL *CUON* FROM ANG THONG, THAILAND*

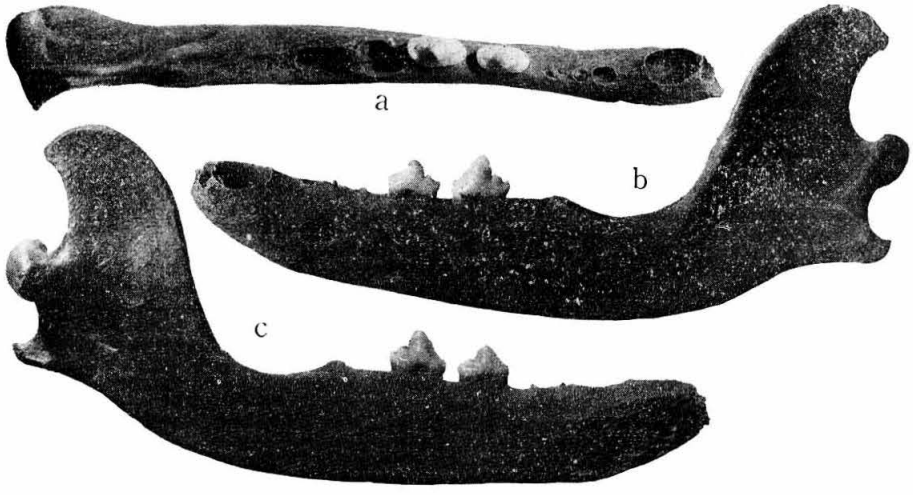
FUYUJI TAKAI

Geological Institute, University of Tokyo

泰国 Ang Thong 産 *Cuon* の半化石： バンコックの北約 100 km Ang Thong 附近から掘り出された *Cuon* の半化石はテナセリウム地方に現生している *Cuon alpinus infuscus* Pocock に同定される。 高井冬二

A subfossil of Wild dog was offered from Mr. Saman Buruvas, Chief, Geological Survey Division, Royal Bureau of Mines, Bangkok, Thailand, to me by favor of Prof. T. Kobayashi in order to identify it. The specimen has been unearthed from a river sand near Ang Thong situating about 100 km north from Bangkok. Judging from its preservation, it must be obtained from an alluvial deposits underlying the great central valley of the Chao Phraya.

The specimen is a left lower jaw of young individual and bears only two premolars (P3 and P4). From the alveolar aspect M1 belongs to the carnasial tooth, but M2 never appear. Judging from the number of molar and the reduction in size of M2, the specimen clearly belongs to the wild dog, *Cuon*



Text-figures 1a, b, c. Left ramus of *Cuon alpinus infuscus* Pocock
a, upper view; b, outer view; c, inner view.

* Read at the anual meeting of the Society at Tokyo, Dec. 6, 1958; received May 11, 1960.

alpinus PALLAS which lives in the continental Asia southward of north latitude 50° and eastward of east longitude 70° and the adjacent islands except Ceylon, Borneo, Philippines, Formosa and the Japanese islands. The following eleven geographical races are now discrimated by several anthors, namely *Cuon alpinus alpinus* PALLAS (Amurland, Manchuria, and Sakhalin), *javanicus* DESMAREST (Java), *sumatrensis* HARDWICKE (Sumatra and Malay Peninsula), *dukhunensis* SYKES (Peninsular India), *primaevus* HODGSON (Nepal and Bhutan), *lepturus* HEUDE (Kiangsi Province, China), *hesperius* AFANASIER and ZOLOTAREV (Eastern Russia), *infuscus* POCOCK (North Tenasserium and ? Annam), *fumosus* POCOCK (West Szechuan, China), *laniger* POCOCK (Kashmir and South Tibet), and *adistus* POCOCK (Upper Burma and Indochina).

According to the report from the Siamese Ministry of Commerce and Communications, "*Cuon rutilans* (S. MÜLLER)" which is a synonym of *Cuon alpinus javanicus*, is distributing widely in the whole territory of Thailand. On the other side C. B. KLOSS has reported two occurrences of "*Cyon javanicus*" from Bang Nara near Patani at Peninsular Thailand (Siam) and Lat Bua Kao at Korat Plateau. As the locality of types of *javanicus* and *rutilans* is Java, these occurrences of Javan race in Thailand is very questionable. I suppose that the Siamese specimens including this subfossil, must be rather assigned to *infuscus* from Moulmein in north Tenasserium and Kontaum in Annam than to *javanicus* from Java in view of their geographical distribution.

Cuon alpinus infuscus POCOCK

Locality of type:—Moulmein

Distribution:—Some glass land along the edge of jungle at North Tenasserium and possibly Annam.

Measurements of this subfossil (mm.):—

Length of the ramus measured from the symphysis to the condyle	127
Length of the ramus measured from the symphysis to the angular process	124
Height of the ascending ramus	47
Depth of the ramus at $\overline{P1}$	17
Thickness of the ramus at $\overline{P1}$	9
Depth of the ramus at M1	21.5
Thichness of the ramus at $\overline{M1}$	9.5
Transverse length of the condyle	20.5
Length of $\overline{P3}$	9.7
Width of $\overline{P4}$	4.5
Length of $\overline{P4}$	10.7
Width of $\overline{P4}$	5.5

Finally I express my cordial thanks to Mr. S. BURUVAS and prof. T. KOBAYASHI.

Trans. Proc. Palaeont. Soc. Japan, N. S., No. 41, pp. 15-20, pl. 3, Apr. 10, 1961

397. FORAMINIFERA FROM THE IMOZAWAGAWA FORMATION IN SENDAI, JAPAN*

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仙台の芋沢川層からの有孔虫：宮城県仙台市西部に分布する"鮮新統"の芋沢川層から，*Elphidiella hannai* と *Elphidium* cf. *oregonense* をともなう有孔虫化石群をみいだした。更新世初期の Amstelian フォーナに類似して，この地域の鮮新一更新世の境界をきめる上に興味がある。 青木直昭

Introduction

In the course of the foraminiferal study of the so-called "Pliocene" formations distributed in Sendai District, Pacific side of Northeast Japan, such peculiar fauna as has not been previously unknown in Japan, was found and is briefly reported in this paper, for it is of great interest to age-determination.

Before going, the writer wishes to express his thanks to all Professors of the Institute of Geology and Mineralogy, Tokyo University of Education for their kind guidances and encouragements, and to Dr. Hiroshi Ujiié for many valuable suggestions on the classification of foraminifera.

Localities

The Imozawagawa formation (about 40 meters in thickness) is characterized by bluish-gray mudstone and also comprises tuffaceous mudstone, fine to medium grained sandstone and small-pebble conglomerate, intercalating a few lignite seams. In the lower half horizon, two or three layers (0.5-1 meter thick) in which crowded the molluscan fossils, chiefly composed of the large shells of *Ostrea gigas* Thumberg, are well developed and continued laterally with some extents at the north of Ayashi, west of Sendai City.

All fossil assemblages and species of foraminifera recorded here are derived from these oyster-bed of the Imozawagawa. The seven samples had been collected from the following localities in Miyagi-mura, west of Sendai City, Miyagi Prefecture.

Three adjacent localities at Hongo, Ayashi. (Sample 1-3)

Hill-side cliff at Ogasso, Ayashi. (Sample 4)

River-side cliff of the Hirose River at Otake, Ochiai. (Sample 5)

Two adjacent outcrops in a stream at Yokote, Imozawa; about 4 km. north of Ayashi. (Sample 6, 7)

* Read and received May 21, 1960.

Table 1. Foraminifera from the Imozawagawa formation in Sendai (Number of specimens in 10 grs. of sediment)

Species \ Sample	1	2	3	4	5	6	7
Buccella frigida (CUSHMAN)	175	171	161	220	128	2	25
Elphidium clavatum CUSHMAN	103	31	538	119	13	5	13
Elphidiella hannai CUSHMAN and GRANT	11	14	107	15	12	14	17
Elphidium subgranulosum ASANO	1	1	25	5	2	3	3
Nonion pauciloculum CUSHMAN	3	8	1	5	2	—	3
Buliminella elegantissima (D'ORBIGNY)	1	4	1	6	4	—	—
Elphidium subgranulosum aureum AOKI	—	—	?2	—	—	?2	6
Elphidium cf. *oregonense* CUSHMAN and GRANT	3	—	1	—	—	4	—
Nonion 2 spp.	—	1	—	—	—	1	7
Pseudononion cf. *tredecum* ASANO	—	1	1	—	—	—	—
Discorbis globularis (D'ORBIGNY)	—	3	—	—	—	—	—
Discorbis cf. *plana* HERON-ALLEN and EARLAND	—	—	—	—	—	—	1
Valvulineria aff. *polita* PARR	—	—	1	—	—	—	—
Globigerinoides triloba immatura LEROY	—	—	2	—	—	—	—
Globigerina pachyderma (EHRENBERG)	—	—	1	—	—	—	—
Total	297	234	841	370	161	31	75

Fauna

Total number of foraminiferal tests taken out of 10 grammes of each rock-sample, varies from thirty to more than several hundreds. In spite of the abundance of specimens, the examined species are only 16 in total number including a few indeterminated forms and the two of the planktonic.

The present fossil assemblage is very simple and made of primarily the three species: that is, *Buccella frigida* (CUSHMAN), *Elphidium clavatum* CUSHMAN and *Elphidiella hannai* (CUSHMAN and GRANT) are extremely rich and take more than 90% of the population. In addition to them, *Elphidium subgranulosum* ASANO, *Nonion pauciloculum* CUSHMAN, *Buliminella elegantissima* (D'ORBIGNY) and *Elphidium* cf. *oregonense* CUSHMAN and GRANT are rarely occurred in several samples as accessory elements. The other remainders are very restricted in occurrence and are represented by a few specimens at hand. In general, the species belonging to both the families Nonioniidae and Elphidiidae are prominent in the present fauna.

Ecology

The above-cited species are seemed to be all important as the characteristics for analysis of the ecological conditions. Nearly all of the foraminiferal constituents have been mostly recorded in the Pliocene to Recent sediments of cold water in the temperate and the higher latitude regions. Moreover, some are typically living in the arctic region.

An arctic species, *Elphidium* cf. *oregonense* CUSHMAN and GRANT, though a few and small-sized specimens obtained, are associated with a rather high percentage (4-20+%) of *Elphidiella hannai* (CUSHMAN

and GRANT) which closely related to *Elphidiella arctica* (PARKER and JONES). So, the present fauna can be stated to show distinctly a cold water one and it suggests that the temperature of sea-water of the Imozawagawa would be lower than that of the Tatsunokuchi which has also been thought to be affected by a cold current (NOMURA, 1938 and TAKAYANAGI, 1950).

Considering from the lithology, paleogeography and the molluscan fossil fauna of the formation, the depositional site of this oyster-bed is inferred to be a central or an interior part of an inlet: in other words, a "littoral-brackish environment." The high frequency of *Buccella frigida* (CUSHMAN) and the existence of shallow water elements would support this interpretation. It is notable, however, *Rotalia beccarii* (LINNÉ) and its varieties that occur everywhere and commonly from the littoral environment are entirely absent in the fauna.

Age

There is no other example in Japan that the foraminiferal composition similar to the Imozawagawa fauna is found either in fossil or living. But, it calls our attention that the Amstelian fauna in Netherlands reported by VAN VOORTHUYSEN (1958) has a several points of resemblance to the present one. The composition of that lower Pleistocene fauna is such as follows:

Elphidium oregonense CUSHMAN and GRANT	3%
Elphidiella sp. cf. *E. arctica* (PARKER and JONES)	57
Quinqueloculina seminulum (LINNÉ)	27
Elphidium spp.	5
Streblus beccarii (LINNÉ)	3
Eponides frigidus (CUSHMAN)	1
others	4

Besides, the similar assemblages are known from the Pleistocene of Cape Blanco in Oregon (BANDY, 1950), and of a submarine beach in Alaska (CUSHMAN, 1941).

On the Netherland fauna, VAN VOORTHUYSEN (1953) remarked its prominent character of the abundant occurrence of *Elphidiella* cf. *arctica* (PARKER and JONES) together with *Elphidium oregonense* CUSHMAN and GRANT and he thought that the co-existence of the two conspicuous forms of arctic is to be an "important climatic indicator" and a good "guidemarker" to show the first refrigeration of sea-water in the Glacial age. Therefore, the oyster-bed yielding these two indices may be considered as well to represent the basal part of the Pleistocene period.

The Imozawagawa formation had been thought to be equivalent to the so-called "Lower Pliocene" Tatsunokuchi formation in Sendai, and is mistaken for a part of the latter. Recently, the writer (1960) could make clear that the former is lied on the latter interposed by the non-marine deposit of the Shimoda Tuff between the two. Thus, it comes to be of middle or upper Pliocene age, according to usage, which does not coincide with the above supposition on age from the view-point of the foraminiferal studies.

Remarks on Species

All specimens of the species listed below are deposited in the collections of the Institute of Geology and Mineralogy, Tokyo University of Education.

Nonion pauciloculum CUSHMAN, 1944

Pl. 3, figs. 2a, b

This is found rarely from the oyster-

bed of the Imozawagawa formation and characterized by the seven chambers in the last whorl and the strongly curved sutures on which whitish and opaque fine pustules are deposited. Most of our specimens are somewhat different from the type-figure by its less circular outline.

Nonion 2 species indet.

The two small-sized forms belonging to the genus *Nonion* could not be determined their specific names. Both have the umbilicus and sutures covered with secondary shell materials and slighly resemble to *Nonion pauciloculum* CUSHMAN in general appearances.

Pseudononion cf. *tredecum* ASANO, 1936

Pl. 3, figs. 11a, b

Two specimens at hand have more limbated sutures compared with the type form recorded from the Pliocene Setana formation in Hokkaido, and resembles to *Nonionella umekae* HUSEZIMA and MARUHASI from the Pliocene Haizume formation and also to *Pseudononion japonicum* ASANO from the Pleistocene Naganuma formation. This form seems to be rather widely distributed, at least, over the northern half of Japan.

Elphidium clavatum CUSHMAN, 1930

Pl. 3, figs. 8a, b

It shows a considerable variation in the umbilical and sutural characters. It is abundant in some localities, particularly rich in the sample from Ogasso, and has been recorded especially from the Pleistocene to Recent sediments of the cold water regions. "*Elphidium hughesi foraminosum*" of ASANO (1950, p. 8, figs. 46, 47) from the Pliocene Wakimoto formation in the Oga Peninsula, Akita Prefecture, may be clcsely related to the present species.

Elphidium subgranulosum aureum AOKI, 1960

Pl. 3, figs. 7a, b

This subspecies was originally described from the recent sediments in Tokyo Bay. It is characterized by a fewer number or chambers and the inflated last-formed chamber.

Elphidium cf. *oregonense* CUSHMAN and GRANT, 1927

Pl. 3, figs. 4, 6a, b

Twelve specimens came from the Imozawagawa formation had been examined. They have all small-sized tests and 14-15 chambers in the last whorl and may be of juvenile stage of this species. In Japan, the present species characteristic in cold water had been sometimes reported under the different name, "*Elphidium* (or *Cribroelphidium*) *ezoense* ASANO". Diameter of the largest one is 0.37 mm.

Elphidium subgranulosum ASANO, 1938

Pl. 3, figs. 9a, b

This coarsely perforated form, has somewhat inflated chambers and a depressed umbilical region without a boss.

Elphidiella hannai CUSHMAN and GRANT, 1927

Pl. 3, figs. 10a, b

The large and rather well preserved specimens of this species are commonly

found in the Imozawagawa formation and is also rarely in the Tatsunokuchi. Our specimens are all characterized by the "narrow sutures", the smooth and highly polished surface, and the fine granules on a few early chambers of the last whorl and the apertural face. It is identical to *Elphidiella nitida* CUSHMAN, which has been placed in synonym with *Elphidiella hannai* by BANDY (1950) and it may be also synonymous with "*Elphidiella* cf. *arctica*" of VAN VOORTHUYSEN from the Northwestern Europe. In our materials, there is a variety which has a round test in equatorial outline and corresponds to "B-type" of "*E.* cf. *arctica*" of VAN VOORTHUYSEN (1953), who well summarized the distribution of the species in Recent and Pleistocene age. This is a first record in Japan as fossil *Elphidiella hannai* CUSHMAN and GRANT, but the another form allied to *E. arctica* has been recorded as *Elphidiella nagaoi* ASANO from the Pliocene deposits of Japan.

Buliminella elegantissima
(D'ORBIGNY), 1839

Pl. 3, fig. 3

This widely distributed species were occurred in the Imozawagawa samples collected from the environs of Ayashi and also in the Tatsunokuchi.

Discorbis globularis (D'ORBIGNY), 1826

Three specimens are all of small size.

Discorbis cf. *plana* HERON-ALLEN and EARLAND, 1932

Pl. 3, figs. 1a-c

A single and juvenile specimen from Yokote is somewhat similar to *Discorbis plana* in general shape, but, owing to the lack of the mature specimen, the complete determination could not be done at present. The type was from the East Falkland Islands.

Buccella frigida (CUSHMAN), 1922

Pl. 3, figs. 5a-c

This familiar species had been recently re-defined and fully described by ANDERSEN (1952) in the monographic work of the genus *Buccella*. It is most predominant in our materials and occurred frequently from the Tatsunokuchi. This species inhabits in shallow and brackish waters of cold.

Valvulineria aff. *polita* PARR, 1950

Only one specimen is found from Hongo. It is somewhat resembled to *Valvulineria polita* PARR described from off Tasmania, but differs from the latter in having more inflated and less chambers.

Globigerina pachyderma
(EHRENBERG), 1861

A single specimen.

Globigerinoides triloba immatura
LEROY, 1939

The larger one is 0.28 mm in the largest diameter.

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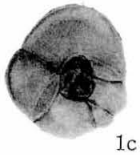
Explanation of Plate 3

(All figures are ×100 unless otherwise marked. a. side or dorsal view: b. edge view: c. ventral view.)

Fig. 1. *Discorbis* cf. *plana* (D'ORBIGNY), Reg. no. 51208, Loc. Yokote, Imozawa (Sample 7).
Fig. 2. *Nonion pauciloculum* CUSHMAN, Reg. no. 51199, Loc. Hongo, Ayashi (Sample 3).
Fig. 3. *Buliminella elegantissima* (D'ORBIGNY), Reg. no. 51207, Loc. Otake, Ochiai (Sample 5).
Fig. 4. *Elphidium* cf. *oregonense* CUSHMAN and GRANT, Reg. no. 51203, Loc. Yokote, Imozawa (Sample 6).
Fig. 5. *Buccella frigida* (CUSHMAN), Reg. no. 51209, Loc. Hongo, Ayashi (Sample 2).
Fig. 6. *Elphidium* cf. *oregonense* CUSHMAN and GRANT, Reg. no. 51204, Loc. Hongo, Ayashi (Sample 3).
Fig. 7. *Elphidium subgranulosum aureum* AOKI, Reg. no. 51202, Loc. Yokote, Imozawa (Sample 7).
Fig. 8. *Elphidium clavatum* CUSHMAN, ×70, Reg. no. 51201, Loc. Ogasso, Ayashi (Sample 4).
Fig. 9. *Elphidium subgranulosum* ASANO, Reg. no. 51205, Loc. Hongo, Ayashi (Sample 3).
Fig. 10. *Elphidiella hannai* (CUSHMAN and GRANT), ×70, Reg. no. 51206, Loc. Hongo, Ayashi (Sample 3).
Fig. 11. *Pseudononion* cf. *tredecum* ASANO, Reg. no. 51200, Loc. Hongo, Ayashi (Sample 2).

1a

1b

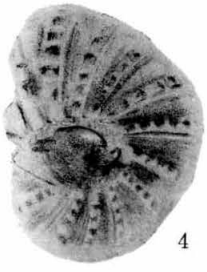


1c

2b

2a

3



4

5a

5b

5c

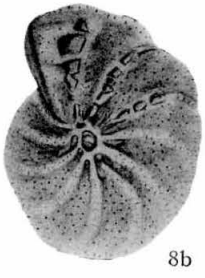
6a

6b

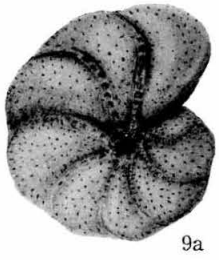
7a

7b

8a



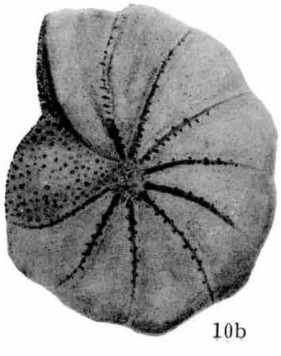
8b



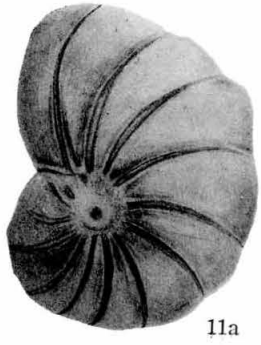
9a

9b

10a



10b



11a

11b

Trans. Proc. Palaeont. Soc. Japan, N. S., No. 41, pp. 21-32, pls. 4-6, Apr. 10, 1961

398. MESOZOIC PLANTS FROM THE ITOSHIRO SUB-GROUP, THE TETORI GROUP, CENTRAL HONSHU, JAPAN. PART 2*

TATSUAKI KIMURA

Meguro Gakuen

手取層群石徹白亜層群の中生代植物：小松市博物館は関戸信次を中心として石川県尾口村尾添，日付谷最上流に露出する石徹白亜層群から新らしく豊富な植物化石を採集した。ここに記載するのはその一部で，ベネチテス類に重点をおいた。とくに *Dictyozamites* は内帯植物区に特有な属である。

木村逸明

Preface

This study deals with some Mesozoic plants collected by Mr. Shinji SEKIDO and the members of the Komatsu City Museum, Ishikawa Prefecture in 1956, 1957 and 1959, from the alternation of sandstone and black shale members at the most upper course of the Mekkodani, Ozo, Oguchi-mura, Ishikawa prefecture, which are presumed to be an equivalent in geological age to the Kuwashima formation, the Itoshiro sub-group (Kochian; the lowest of the Japanese triple Lower Cretaceous).

It is a pleasure to record here writer's debt of gratitude to the following persons and organs for their help and support extended to him in conducting the present work. The present writer first expresses his sincere gratitude for the help of Dr. Seido ENDO who kindly guided him in the prosecution of this study. The chief collector Shinji SEKIDO owed much to Prof. Z. TSUKANO, Fukui University and Mr. H. MATSUO, Kanazawa University, both of whom kindly guided him in the study of fossil plants.

The present writer wishes, furthermore, to express his thanks to the members of the Conducting Commission of the Komatsu City Museum; Messrs. A. HAMASAKA, M. SEKIDO, I. KOSAKA, S. NAKAYAMA, Y. SHIROSAKI and Y. YAMAZAKI for their great help in collecting the fossil plants described here and elsewhere, and Mr. I. KIDOGUCHI for his kind help in furnishing lodgings. Finally, particular thanks are due to the Komatsu Board of Education and the Komatsu City Museum (president: Mr. N. OGAWA) for the grant in aid which has rendered possible the collection of the Mesozoic plants described here and later on.

* Read November 21, 1959 and January 17, 1960; received June 7, 1960.

Description of Species

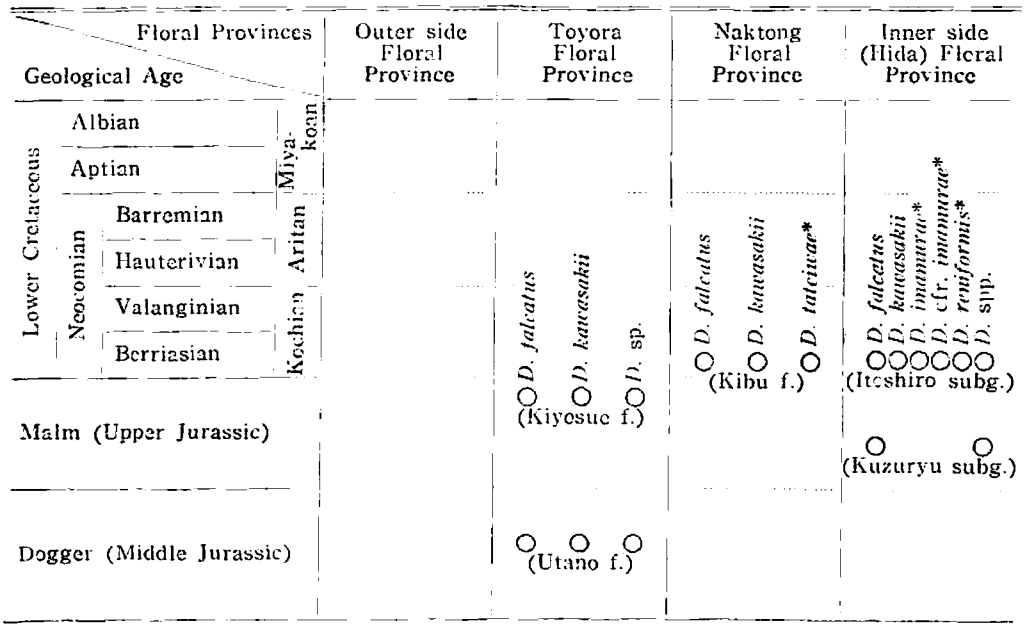
BENNETTITALES

Genus *Dictyozamites* OLDHAM

This genus is one of the most important and characteristic genera in considering the Mesozoic floral provinces of the Japanese Islands (proposed by T. KIMURA, 1959 MS) which are believed to have existed in geological age from the Domerian to at least the Albian; especially in considering the Inner side (the Hida) Floral Province.

In the Japanese Islands and South Korea, five distinct species and three undetermined specimens have already been described or recorded. Their vertical as well as horizontal distribution is shown in Table 1.

Table 1. The Occurrence of *Dictyozamites*



(* seems to be peculiar to each Floral Province)

This genus has so far been considered to be an important element of the Middle Jurassic floras as stated by SEWARD (1917) and also by ARNOLD (1947). But in the Japanese Islands and Korea Peninsula, most of all the species belonging to this genus occur from the Upper Jurassic and the Lower Cretaceous strata, especially from the latter.

In 1936, OISHI stated "The geological age of both the Tetori and the Naktong Series corresponds approximately to the Upper Jurassic in the European standard. Therefore, all of the Japanese species of this genus are the youngest records in the world". But the Kochian (the lowest of the Japanese triple Lower Cretaceous) age in which the main part of both series (or groups) was formed is now accepted by most stratigraphers and also palaeontologists.

It is a striking fact that no species belonging to this genus has yet been recorded from the Outer side Floral Province. This fact shows the difference of climate between the Outer and the Inner side Floral Provinces bounded by the median ridge. The Toyora and the Naktong Floral Provinces were the intermingled area of both floral elements, and the mingling be might explained by the palaeogeographical circumstances in both areas in those days.

It is also noteworthy that the *Dictyozamites* does not seem to have been yielded from the continental Mesozoic

strata of Asia, i.e., Siberia, Manchuria, China and so on.

The imperfect specimen formerly described by the writer (1958) from the dark greenish shale exposed on the mountainsides (Kuzuryu sub-group?) near Lake Kizaki, Nagano prefecture, under the name of *Dictyozamites* sp., now can be identified as a well-known species called *Dictyozamites falcatus* (MORRIS) OLDHAM by its outward appearance.

ARNOLD (1947) stated that this genus probably belongs to the Williamsoniaceae, but no evidence for testifying the above statement has yet been found in spite of the writer's strenuous efforts.

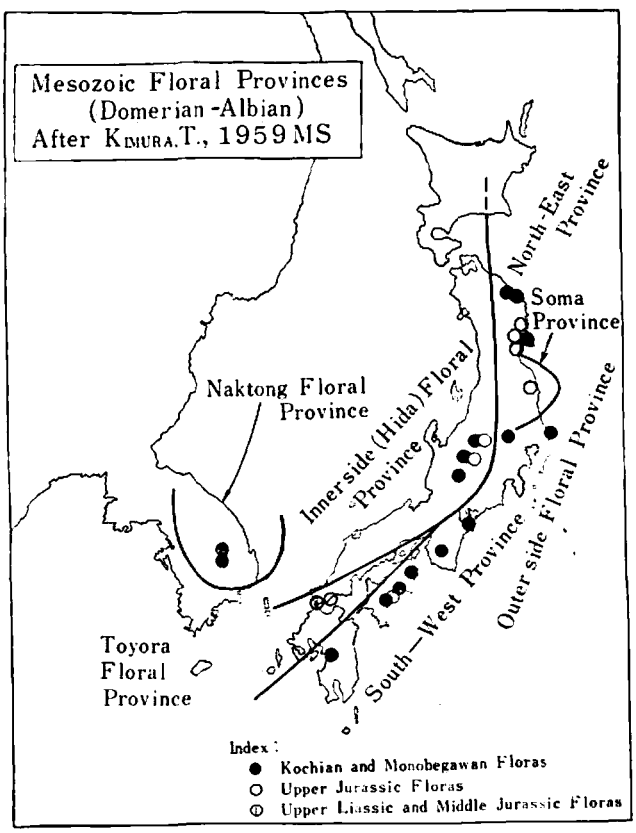
In describing the Japanese and Korea species belonging to this genus the writer had so far been compelled to depend only on the ill-preserved materials. The specimens he had obtained, however, were fortunately so good in preservation that the writer was strongly tempted to describe and illustrate them as follows.

Dictyozamites imamurae OISHI emend.

Pl. 5, fig. 1; Text-fig. 1

1936. *Dictyozamites imamurae* OISHI: p. 27, Pl. IX, figs. 2, 2a; Text-fig. 1.
1940. *Dictyozamites imamurae* OISHI: p. 326.

Emended Diagnosis: Frond, pinnate, large, more than 20 cm. long and 10 cm. wide probably oblanceolate to obovate in outline, contracting gradually towards the base and more or less abruptly towards the apex. The detail of the apical portion has not been made clear yet. Rachis slender 2-3 mm. thick measured on impression and alternately sending off the pinnae at a wide angle. Pinnae set closely together, touching or overlapping each other laterally; linear, slightly falcate, parallel-sided with the rounded apex and seem to be convex in their upper surface; the base asymmetrical, sessil and attached to the upper surface of rachis by a portion about 5-7 mm. wide at the central portion; upper half of base auriculated and lower base contracted; typical pinnae, 5.5 cm. long



Text-fig. 11. Mesozoic (Domerian-Albian) Floral Provinces of the Japanese Islands and Korea Peninsula. (After T. KIMURA, 1959 MS)

and 2 cm. wide. Nerves very crowded, divergent, anastomosed, the reticulum consisting of meshes; meshes in the central median region about 1 cm. long, the density being about 25 per cm. and become abruptly shorter and narrower towards the margin.

Description of specimens: Many fine specimens in good preservation were obtained. One of them is shown in Pl. 5, fig. 1 on which the present emended diagnosis is mainly based. The rachis seems to be buried into the rock material. The lower pinnae are strongly rolled backwards as shown in the left-hand-side of the rachis. Text-fig. 1 shows the outline of the pinnae.

Remarks: This species is well characterized by the more or less linear pinnae provided with rounded apex and by having asymmetrical and auriculated base.

Dictyozamites cfr. *imamurae* described by the writer in the present paper, the writer can not identify thoroughly the former with the present species owing to both disagreeable characters of obtusely pointed apex and of the convex upper margin in the former.

Dictyozamites tateiwae originally described by OISHI from the Naktong group is an allied form to the present species. But as formerly stated by OISHI (1936), in the former species the pinnae are elongated triangular in form and the apex of them is obtusely pointed instead of being parallel-sided and rounded respectively, and the nervation is less crowded.

Occurrence: Abundant.

Reg. No.: KM-598111.

Dictyozamites cfr. *imamurae* OISHI

Pl. 4, fig. 1; Pl. 5, fig. 2; Text-fig. 2

Many specimens were obtained. Pl. 4, fig. 1 shows a *Dictyozamites* frond, more than 14 cm. long and 10 cm. wide. The rachis slender, about 2 mm. across measured on impression and sending off alternately the pinnae at a wide angle, approximately 2.5 cm. distant on each side. The pinnae set closely together, touching or overlapping each other laterally; linear, lateral margin being nearly parallel-sided and apex obtusely pointed or rarely rounded. The basal part of pinnae is apparently sessil, auriculated and asymmetrical as seen in some of *Otozamites* pinnae, and attached to the upper surface of the rachis by the middle portion of the base. Nerves are very crowded, radiated and often reticularly anastomosed and end in the whole of the outer margin. The meshes in the central median region are approximately 1.0 cm. long, the density being about 25-28 per cm. and become shorter and narrower towards the margin.

Pl. 5, fig. 2 shows two pinnae belonging to *Dictyozamites*. They well represent the reason that the writer can not thoroughly identify such many fine specimens with *Dictyozamites imamurae* newly emended in this paper; pinnae set closely, nearly parallel-sided and end obtusely pointed apex; both margin, especially in the upper margin, are slightly convex. This specimen is a portion especially characterized, then it might be possible to distinguish so far as such a specimen from *Dictyozamites imamurae* or the other known species. Text-fig. 2 shows an outline of pinna illustrated here.

Occurrence: Abundant.

Reg. Nos.: KM-59006, KM-598112.

Dictyozamites kawasakii TATEIWA

Pl. 4, fig. 2; Text-figs. 7-8

1929. *Dictyozamites kawasakii* TATEIWA: Plate, figs. 6a-b.
1929. *Dictyozamites kawasakii* TATEIWA var. *grossinervis* TATEIWA: p. 2.
1936. *Dictyozamites kawasakii* OISHI: p. 27, Pl. IX, fig. 4; Text-fig. 2.
1940. *Dictyozamites kawasakii* OISHI: p. 325, Pl. XXIX, figs. 4-5.
1950. *Dictyozamites kawasakii* TAKAHASHI et NAITO: p. 188, Text-fig. 1.

A striking good specimens which agree all with TATEIWA's original specimens were obtained. Frond pinnate, large more than 15 cm. long and 8.5 cm. wide. Rachis probably slender. Pinnae alternate, reniform in outline, about 4.5 cm. long and 2.5-3 cm. wide, with rounded apex, and attached by a narrow portion about 4 mm. wide in the middle of the base to the upper surface of the rachis. Nerves numerous, divergent, anastomosed, the reticulum consisting of polygonal meshes. Pl. 4, fig 2 shows a good preserved specimen on which the above description was mainly based. The rachis seems to be buried in the rock material. Text-fig. 8 shows the outline of pinnae of this species which is to be distinguishable from *Dictyozamites reniformis* described in the present paper. Text-fig. 7 might show an anterior portion of the frond. The only outline of each pinna impression reminds us of that of *Podozamites* or *Otozamites* leaves, but its nervation is apparently divergent and reticulately anastomosed as well as the specimens described above.

In 1950, TAKAHASHI and NAITO reported the occurrence of this species from the Upper most of Jurassic, Kiyosue formation. According to them, their specimens were not distinguishable from *Dictyozamites kawasakii* and *D. reniformis*, and these two forms were quite continuous and they could be safely united into one species, *D. kawasakii*.

The present writer thinks that the above statement is possibly natural. In the writer's collection of a large quantity, however, there have yet been found no evidence showing that the two forms belong to the same species. So now the writer deals with them as distinct species respectively.

Occurrence: Common.
Reg. Nos.: KM-57001, KM-57002.

Dictyozamites reniformis OISHI

Text-fig. 3-4

1936. *Dictyozamites reniformis* OISHI: p. 29, Pl. IX, figs. 1, 1a.
1940. *Dictyozamites reniformis* OISHI: p. 327.
1950. ?*Dictyozamites kawasakii* TAKAHASHI et NAITO: p. 188, Text-fig. 2.

The writer's specimens, though they are not so good in preservation, agree all with OISHI's characteristic species derived from Yambara (the upper course of R. Kuzuryu, Fukui prefecture) of the Itoshiro sub-group.

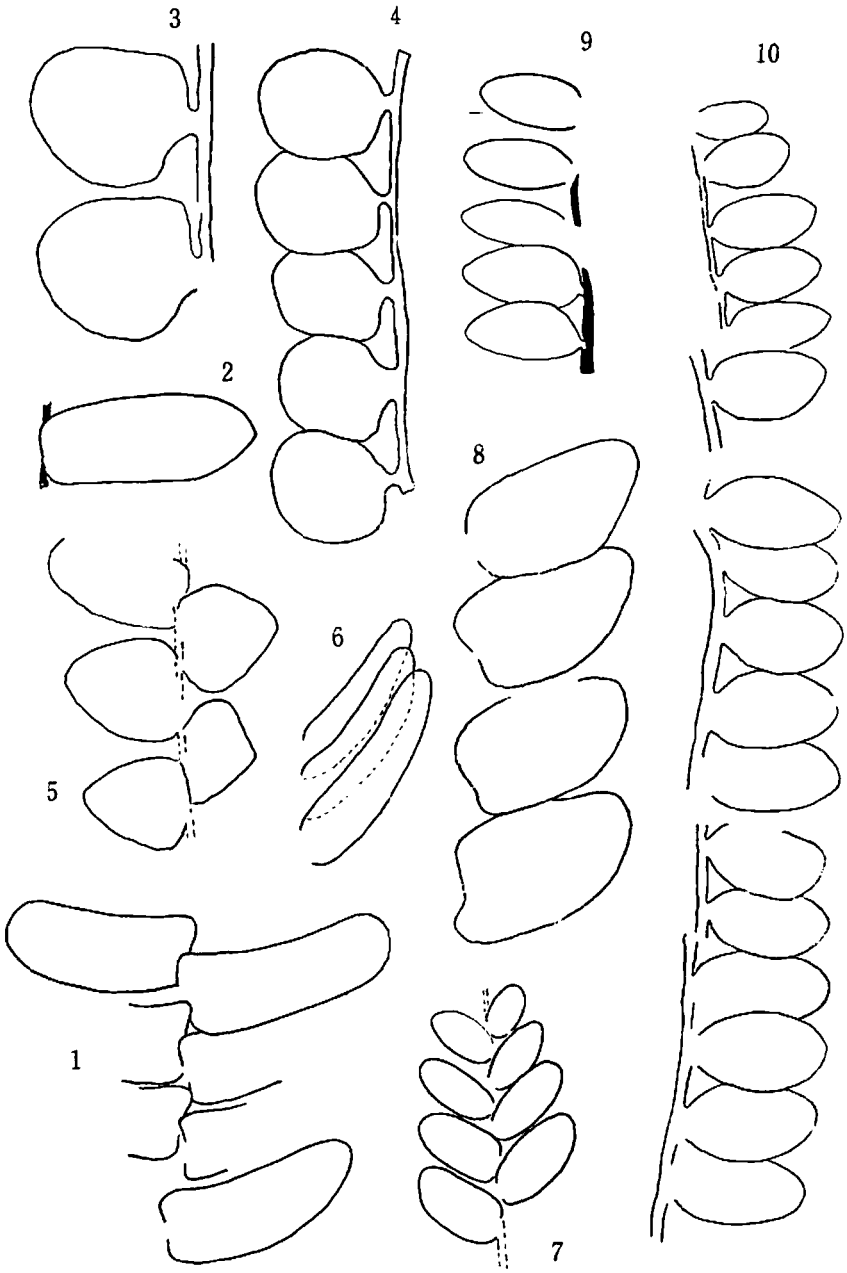
Pinnae reniform in outline, distinctly short stalked, set closely together and filled with reticulum consisting of fine meshes radiating from the top of the stalk and distributed in almost equal density over the lamina.

Occurrence: Not rare.
Reg. Nos.: KM-57003, KM-59010.

Genus *Otozamites* F. W. BRAUN

In the Japanese Islands, this genus seems to be an Older Mesozoic element, flourishing in Jurassic and becoming to decline in the early stage of Cretaceous. Eight distinct species and several undetermined specimens have already been described; *O. huzisawae*, *O. lancifolius* and *O. molinianus* from the Saragaian (mainly Norian in European standard) strata, *O. fujimotoi* and *O. molinianus* from the Liassic (Lower-Middle) strata,

O. beani from the Middle to Upper Jurassic strata in the North-East and the Hida Floral Provinces respectively. As to the Cretaceous species, only *O. klipsteinii* has been known commonly from both Outer and Inner side Floral



Text-figures 1–10

Provinces.

The specimens described by OISHI (1932) from the Shitaka Coal Field, Kyoto prefecture, under the name *Otozamites klipsteinii* are so imperfect that his identification has need of reexamination about them.

Except some exceptional cases, it might be admitted to consider that each species belong to this genus is respectively peculiar to a certain floral province.

Otozamites sp. described by the present writer (1958) from the Kuzuryu subgroup in Hida massif is a characteristic form, but its specific identification has not been done yet owing to its ill-preservation.

Otozamites cfr. *beani* (LINDLEY et HUTTON) BRONGNIART

Text-fig. 5

Comparable specimens:

1940. *Otozamites beani* OISHI: p. 328, Pl. XXIX, figs. 7, 8a.
1944. *Otozamites beani* HARRIS: p. 419, figs. 1A-C, 1E.

Text-fig. 5 shows an imperfect portion of the frond. Rachis obscure owing to being covered with closely set pinnae. Pinnae broad deltoid in outline with rounded or obtusely pointed apex. The bases, though the detail is obvious because of ill-preservation of material, are somewhat asymmetrical, but not so strongly auriculated. Nerves probably originating from the point of attachment, fine, often forking, straight and diverging to the margin of the lamina.

The writer's specimen closely resembles in general habit those described by OISHI from the Kiyosue formation and also by HARRIS from the Gristhorp Bed (Middle Estuarine, Bajocian) under the name of *Otozamites beani*.

The writer, however, hesitates to identify the present specimen with the European species because he concerns anxiously himself about the following reasons, i.e., the present specimen is imperfect in preservation and furthermore, in *Otozamites*, it is common that the outline of pinnae widely varies according to the position of a frond, then only a part of the frond makes it identification impossible or very difficult.

Occurrence: Rare.

Reg. No.: KM-59005.

Otozamites endoi KIMURA sp. nov.

Pl. 5, fig. 4; Text-fig. 6

Description of species: Frond pinnate, unknown size, more than 12 cm. long

Explanation of Text-figures

Text-fig. 1: *Dictyozamites imamurae* OISHI emend; (Reg. No. KM-598111) ×½
Text-fig. 2: *Dictyozamites* cfr. *imamurae* OISHI; (Reg. No. KM-598112) ×½
Text-fig. 3: *Dictyozamites reniformis* OISHI; (Reg. No. KM-57003) ×½
Text-fig. 4: *Dictyozamites reniformis* OISHI: (Reg. No. KM-59010) ×½
Text-fig. 5: *Otozamites* cfr. *beani* (LINDLEY et HUTTON) BRONGNIART; (Reg. No. KM-59005) ×½
Text-fig. 6: *Otozamites endoi* KIMURA sp. nov.; (Reg. No. KM-59011) ×½
Text-fig. 7: *Dictyozamites kawasakii* TATEIWA: (Reg. No. KM-57002) ×½
Text-fig. 8: *Dictyozamites kawasakii* TATEIWA; (Reg. No. KM-57001) ×½
Text-fig. 9: *Otozamites* sp.: (Reg. No. KM-59002) ×½
Text-fig. 10: *Otozamites* sp.; (Reg. No. KM-59001) ×½

and 5 cm. wide. Rachis slender about 2 cm. across measured on impression. Pinnae elongated oval in shape, approximately 5 mm. long and 1-1.3 cm. wide at the widest portion, apex rounded and base contracted but the upper base slightly auriculated; attached to the upper surface of the rachis with the lower half of base and strongly directed forward; set closely together, overlapping each other laterally. Nerves fine and delicate, originating from the point of attachment, parallel each other near the base and radiating to the whole of margin, not anastomosed.

Pl. 5, fig. 4 shows a specimen on which above diagnosis was based and Text-fig. 6 shows the outline of pinna of this characteristic species.

Remarks and Comparison: A single figured specimen has been examined. The writer's species is well characterized by having elongated pinnae strongly directed forward, and there is no comparable species of this genus, though the specimen is not a satisfactory one.

An anterior portion of *Otozamites graphicus* (LECKENBY) figured by HARRIS (1949, p. 561, Fig. 2A) somewhat resembles the present specimen in outline of pinnae, but smaller and more strongly auriculated than the latter.

Otozamites lancifolius originally described by OISHI from the Saragaian Nariwa group is allied form to the present specimen, but the former is different in having acutely pointed apex and representing coarse nervation from the latter.

It might be possible to obtain further good specimens than the present one from the same locality sometime in future.

Occurrence: Probably rare.

Reg. No.: KM-59011.

Otozamites sp.

Text-figs. 9-10

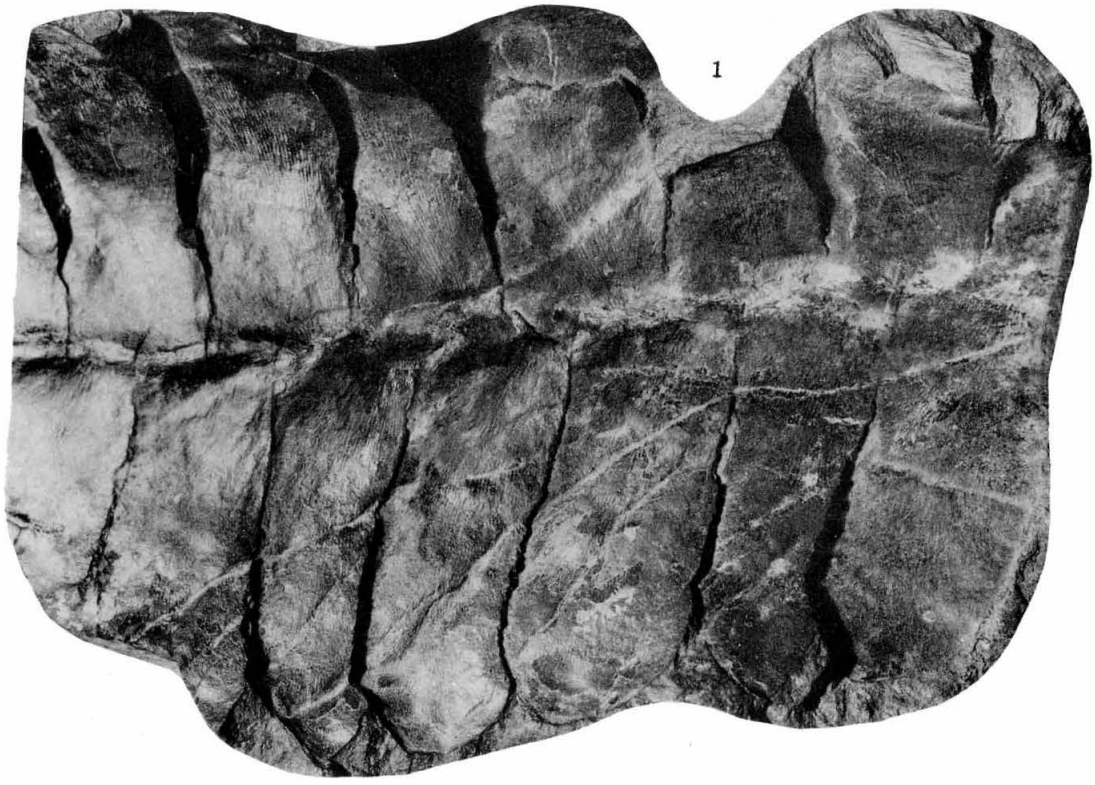
Large specimens, though they are imperfect, were obtained as shown in Text-fig. 10. Frond long and narrow, nearly parallel-sided, more than 30 cm. long and probably 7 cm. wide, both of apical and basal portion missing. Rachis considerably thick, 3 mm. across measured on impression. Pinnae alternate, oblong or oval in shape, apex bluntly rounded, about 3 cm. long and 1.5 cm. wide at the widest portion; bases almost symmetrical and not auriculated and attached to the upper surface of the rachis by their middle portion. Text-fig. 9 shows probably an anterior portion of the frond; pinnae seem to be short petioled. Nerves indistinct because of ill-preservation of material, but seem to be forking near the broad point of attachment, nearly parallel, ending in the outer margin and considerably coarse in density.

The present specimens closely resemble *Otozamites kondoi* described by OISHI from the Mone formation (Upper Jurassic) at the northern Pacific coast of the Japanese Islands, in the shape of frond and also of pinnae, mode of attachment to the rachis and the nervation. But the former species is approximately twice as large as the latter.

Explanation of Plate 4

Fig. 1. *Dictyozamites* cfr. *imamurae* OISHI; (Reg. No. KM-598112)

Fig. 2. *Dictyozamites kawasakii* TATEIWA; (Reg. No. KM-57001)



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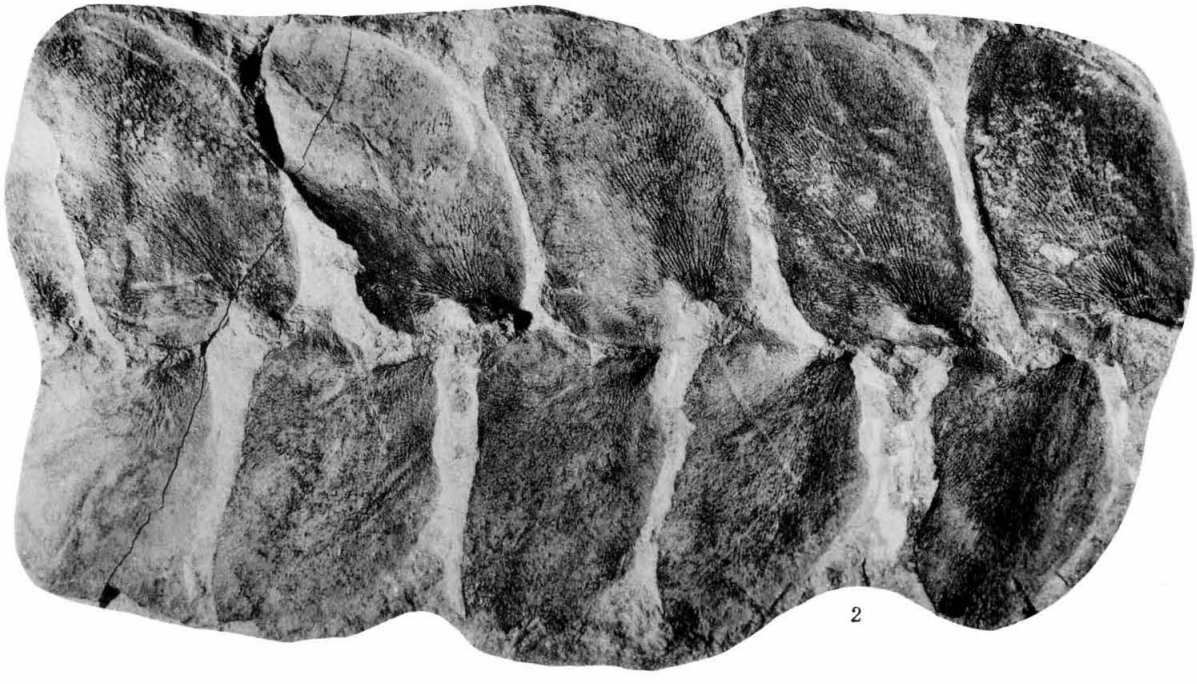

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Otozamites molinianus ZIGNO is an another allied form to the present specimens. But in the former species, the base of pinna is slightly auriculated instead of symmetrical and the size of pinna is smaller than the latter.

It also can be expected to obtain more good specimens than the present ones from the same locality.

Occurrence: Not rare.

Reg. Nos.: KM-59001, KM-59002.

CYCADOPHYTA

Cycadales

Genus *Nilssonia* (BRONGNIART)

Nilssonia kotoi (YOKOYAMA) OISHI

Pl. 5, fig. 3

1889. *Dioonites kotoi* YOKOYAMA: p. 44, Pl. VII, figs. 1a-c, e; Pl. XIV, fig. 14.
1905. *Dioonites* ? sp. YABE: p. 14, Pl. III, fig. 7.
1905. *Ctenophyllum* ? sp. YABE: p. 15, Pl. IV, fig. 7.
1940. *Nilssonia kotoi* OISHI: p. 302, Pl. XXV, figs. 3, 3a; Pl. XLIV, fig. 3b.

The writer's specimens are closely referable in general feature to those originally described by YOKOYAMA from Kuwashima (Shimamura) and Tanimura of the Itoshiro sub-group. Frond simple and delicate. Rachis slender, being 1 mm. wide measured on impression and narrowly grooved longitudinally on the upper surface. Lateral lamina deeply cut up to the rachis into long and narrow segments; segments opposite or alternate, lightly curved and directed forward. Nerves considerably fine, mostly simple or rarely once forking near the base, parallel to each other and to the upper margin of the segment, running obliquely downwards in the grooved surface of the rachis to its median line.

This species closely resembles the specimens described by YOKOYAMA and YABE and OISHI under the name of *Nilssonia sinensis* from the Jurassic strata of Manchuria (Sha-ho-tsu and Wei-chia-pu-tzu, Liaoning), and Jurassic strata of Ussuriland and Vladivostok (KRYSHTOFOVICH: 1916, 1923).

It is the writer's preliminary opinion that these Japanese and the continental specimens might possibly belong to a same species. This species has not yet been recorded from the Outer side Floral Province of the Japanese Islands in those days.

Occurrence: Not rare.

Reg. No.: KM-57111.

Genus *Ctenis* LINDLEY et HUTTON

Ctenis kaneharai YOKOYAMA

Pl. 6, figs. 1-2

1906. *Ctenis kaneharai* YOKOYAMA: p. 29, Pl. IX, figs. 1, 1a.
1933. *Ctenis kaneharai* YABE et OISHI: p. 32.
1940. *Ctenis kaneharai* OISHI: p. 296, Pl. XXIV, fig. 1.
1950. *Ctenis kaneharai* HARRIS: p. 1001, Text-figs. 1A-C, 2A-C, 3A-B.

Description of specimens: Frond large, unknown size, pinnate. Rachis attaining a width of 0.6 cm. across measured on impression, the ornamentation of its surface not clear. Pinnae apparently subopposite, attached to the lateral sides of the rachis, either in contact or slightly separated in the lower part of the frond, becoming more widely spaced in the middle and upper part of the frond. Pinnae arising nearly at right angle to the rachis. Pl. 6, fig. 1 shows the middle or upper part of the frond which is closely referable to the specimens des-

cribed originally by YOKOYAMA from Nien-tzu-kou Coal-field (Middle Jurassic ?), Liaoning, Manchuria, by OISHI from the Kuwashima formation and by HARRIS from the Lower Estuarine; pinnae elongated, somewhat inclined forward, mostly parallel-sided, contracted at the base, never expanded; the length of pinnae is not known, as they are not wholly preserved, but the width in one of them is 30 mm. which diminishes to 17 mm. at base.

Owing to its intimate occurrence with the specimen described above, Pl. 6, fig. 2 seems to show the lower part of the frond of the same species, though such a type of pinnae has not been recorded so far; pinnae set closely together, 9.5-10.5 cm. long and 3 cm. wide at the middle portion, tapering to an acute apices and more or less contracted at base. Nerves strong near the base, becoming comparatively fine towards the apex, often dichotomizing and also uniting so as to form elongated meshes. Density 9-10 per cm. at the base, rather more crowded, 13-15 per cm. near the apex.

Remarks: In this species, the apical nature of pinnae was more cleared up by the present specimens, and still more, it might be possible to obtain the complete specimens from the same locality in future.

In 1950, HARRIS emended the diagnosis of this species adding the detail of its cuticle. In the Japanese specimens, it is regretted that an anatomical study has not yet succeeded on account of the state of preservation, in spite of the writer's exertion.

In the Japanese Islands, this species has only been known from the Kochian of the Inner side Floral Province.

Occurrence: Not rare.

Reg. Nos.: KM-59101, KM-57101.

GINKGOPHYTA

Genus *Phoenicopsis* HEER

This Ginkgoalean genus is considered to be a continental one which has been widely known from the Mesozoic strata of Siberia, Manchuria, the Northern and Western part of China, Korea and the Arctic region, while it has been rare in the Japanese Mesozoic.

In the Japanese Islands, *Phoenicopsis* spp. have been described by OISHI (1932) from the Norian Nariwa group and also by OISHI (1931) and KIMURA (1959) respectively from the Lower-Middle Liassic Kuruma group. These were all impressions of incomplete and detached leaves. The following genera, i.e., *Czekanowskia*, *Hartzia*, *Windwardia*, *Torrellia* and *Phoenicopsis*, possess long, slender, ribbon-like leaves growing in clusters upon scaly dwarf shoots. Without researting into the epidermal and stomal characters, it is very difficult to distinguish one from another in connection with the above genera, while dealing only with incomplete or detached leaves. The generic name of *Phoenicopsis* being

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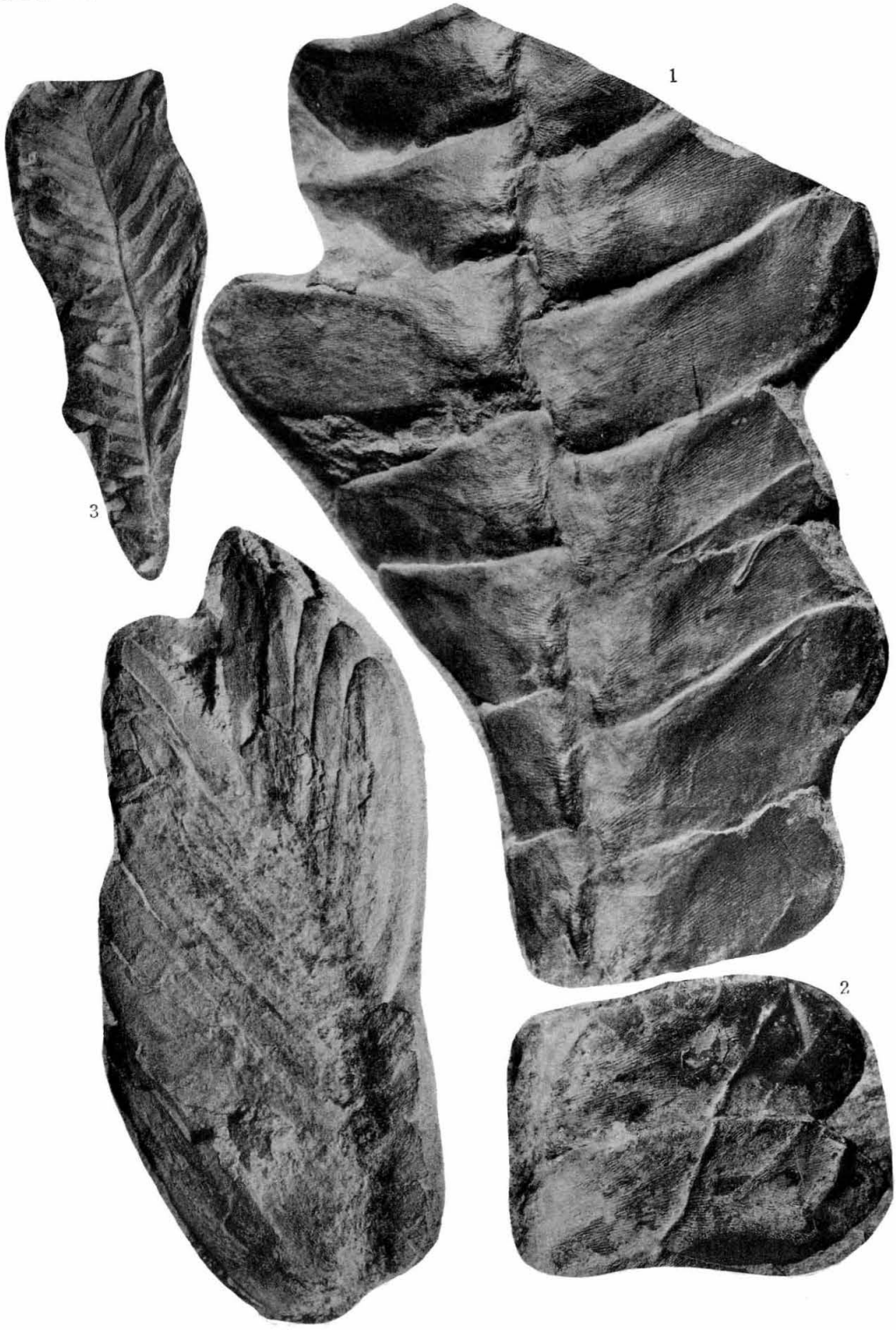
Explanation of Plate 5

Fig. 1. *Dictyozamites imamurae* OISHI emend; (Reg. No. KM-598111)
Fig. 2. *Dictyozamites* cfr. *imamurae* OISHI; (Reg. No. KM-598113)
Fig. 3. *Nilssonia kotoi* (YOKOYAMA) OISHI; (Reg. No. KM-57111)
Fig. 4. *Otozamites endoi* KIMURA sp. nov.; (Reg. No. KM-59011)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given to the Japanese specimens already described, they are probably referable either to the well-known species in the Jurassic of Eastern Asia, *Phoenicopsis angustifolia* HEER or to *P. manchuris* originally described by YABE and OISHI.

Phoenicopsis ? sp. cfr. *P. speciosa* HEER

Pl. 6, fig. 3

Only a specimen shown in Pl. 6, fig. 3 was obtained. This is represented by cluster of detached leaves attaining 13 cm. long and 0.6-1.0 cm. wide, narrowing very gradually into slender basal portion, apex is missing. Nerves are distinct, parallel, about 15 in number and faintly marked interstitials between each pair of them being able to seen.

In the present specimen, it is regreted that both the apical and the basal portions are broken away but the general habit of the leaves reminds us of *Phoenicopsis*, especially *Phoenicopsis speciosa* originally described by HEER from the Jurassic of Siberia.

The specimens described by KAWASAKI (1925) from the Daido Series of Korea under the name of *Phoenicopsis speciosa* is an allied form to the present specimen. The designation titled above being precisely given to it, the present specimen is the youngest record of this genus in Eastern Asia. At any rate, this genus is a continental element and rare in the Japanese Islands and it has not yielded yet in the Outer side Floral Province.

Occurrence: Very rare.

Reg. No.: KM-57008.

Addendum

The writer has been conducting researches on the occurrence of fossil plants, especially on the relation between the stratigraphical horizon and its bearing species.

As to the occurrence of fossil plants, we have more or less known that for instance, tree or shrub species was dominant in a certain horizon, while grass species was dominant in another horizon. According to the writer's experience, good example showing the above fact can be seen in the Iwamuro formation (Lower-Middle Liassic) and also in the Itoshiro subgroup studied in detail.

So far as at least the sphere of geological unit of a member or a formation is concerned, the distinction of the yielded species among various horizons should be explained so much by the vertical range of plant evolution as by the rise and fall of the sedimentary basin having much to do with the vegetation and its variation growing around the basin.

It is interesting to note that tree and shrub species are dominant in the present locality, though such is not the case in its lower horizons. The detail will be stated by the writer sometime in future.

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Explanation of Plate 6

Fig. 1. *Ctenis kaneharai* YOKOYAMA; (Reg. No. KM-59101)
Fig. 2. *Ctenis kaneharai* YOKOYAMA; (Reg. No. KM-57101)
Fig. 3. *Phoenicopsis* ? sp. cfr. *P. speciosa* HEER; (Reg. No. KM-59112)

(All specimens illustrated here are in natural size)
Photogr. by S. AOKI

All specimens described here are deposited in Department of Geology of the Komatsu City Museum, Ishikawa Prefecture.


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Trans. Proc. Palaeont. Soc. Japan, N. S., No. 41, pp. 33-40, pls. 7-8, Apr. 10, 1961

399. TWO NEW SPECIES OF THE *PARAFUSULINA YABEI* TYPE FROM TOMURO, TOTIGI PREFECTURE, CENTRAL JAPAN

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and

YOSHINARI TAKAOKA

Toho Gakuen

栃木県戸室より *Parafusulina* 型の2新種：栃木県葛生産 *Parafusulina yabei* 型の2新種 *Parafusulina tomuroensis*, *P. nabeyamensis* の2新種を記載．曾つて小沢が秋吉より *Parafusulina kaerimizensis* として戸室産のものを報告したがこれは *Parafusulina tomuroensis* ではないかと思う。さらに本邦において記載されている *Parafusulina* を2つのグループ，*P. yabei* 型，*P. japonica* 型にわけ，*P. yabei* 型タイプの *Parafusulina* に似ていることを論じた。

森川六郎・高岡善成

It is well known that Tomuro, Totigi Prefecture, yields abundant fusulinids and many authors have described them. YABE (1899) first described *Fusulina japonica* GÜMBEL var. Subsequently, HANZAWA (1942) restudied it and proposed for it a new specific name, *Parafusulina yabei*.

OZAWA (1925) described *Parafusulina kaerimizensis* from the same locality, including the specimens of *P. kaerimizensis* from Kaerimizu. Recently TORIYAMA, in his monograph of the Fusulinids from Akiyoshi, made a restudy on *P. kaerimizensis* in detail. According to him *P. kaerimizensis* reported by OZAWA from Tomuro differs from the holotype of Kaerimizu.

The specimens from Kaerimizu resemble the ones from Tomuro in the elongate form, size of proloculus, rate of volution-expansion, but compared the latter, the former has heavier axial filling and, less intense fluting of septa, especially in the polar regions. As above cited, they are not conspecific with each other. We should like to propose a new specific name, *Parafusulina tomuroensis* for *Parafusulina kaerimizensis* reported by OZAWA from Tomuro. *Parafusulina tomuroensis* rather resembles *Parafusulina yabei* in its strong and regular fluting of septa, and their thin septa, especially in the polar regions and in that the chamberlets reach the next spirotheca, but the former is more elongate, and has a smaller proloculus than the latter.

We discovered another new species described in this paper as *Parafusulina nabeyamensis*: this is inflated fusiform, and some of the species show distorted fluting of the septa, its fluting resembles that of *Parafusulina truncata*.

Parafusulina yabei, *Paraf. tomuroensis* and *Paraf. nabeyamensis* are closely allied to *Parafusulina wordensis* from North America in their thin spirotheca and septa, especially thin in the polar region, and strong septal fluting and in that the

chamberlets reach the next spirotheca.

Beside the above cited species, the following species from Japan resemble *Parafusulina wordensis* in their important characters.

Parafusulina yabei HANZAWA, HANZAWA 1942. Loc. Kuzu.

Parafusulina yabei HANZAWA, MORIKAWA 1898. Loc. Akasaka.

Parafusulina HANZAWA, IGO, 1959. Loc. Hirayu.

Parafusulina kinosakii (MORIKAWA), MRIKAWA 1958. Loc. Akasaka.

Parafusulina truncata (OZAWA), IGO et OGAWA 1958. Loc. Funafuseyama.

Parafusulina japonica var. *truncata* (OZAWA), OZAWA 1927. Loc. Akasaka.

Parafusulina japonica var. *truncata*, IGO 1959. Loc. Hirayu.

Parafusulina truncata (OZAWA), IGO et OGAWA 1958. Loc. Funafuseyama.

Parafusulina truncata (OZAWA), MORIKAWA 1958. Loc. Akasaka.

Parafusulina nakamigawai MORIKAWA and HORIGUCHI, 1956. Loc. Kuzu.

Parafusulina nakamigawai IGO and OGAWA 1957. Loc. Funafuseyama.

Parafusulina iisakai IGO and OGAWA, IGO and OGAWA 1957. Loc. Funafuseyama.

Parafusulina annamitheca (DEPRAT) 1914. Loc. Akasaka.

Parafusulina uenoensis KOBAYASHI, KOBAYASHI 1957. Loc. Hirayu.

Schwagerina gigantojaponica KOBAYASHI. KOBAYASHI 1957. Loc. Ibuki.

Schwagerina ibukiensis KOBAYASHI. KOBAYASHI 1957. Loc. Ibuki.

Parafusulina hirayuensis IGO, IGO 1959. Loc. Hirayu.

Parafusulina ? sp. IGO. 1959. Loc. Hirayu.

Parafusulina sp. A. KOBAYASHI 1957. Loc. Ibuki.

Parafusulina sp. IGO and OGAWA 1958. Loc. Funafuseyama.

Parafusulina ambigua (DEPRAT), KOBAYASHI 1957. Loc. Ibuki.

Schwagerina sp. aff. *S. japonica* (GÜMBEL) var. *cincta* (REICHEL) IGO 1959. Loc. Hirayu.

Pseudofusulina crassitectoria (DUNBAR et SKINNER), KOBAYASHI 1957. Loc. Ibuki.

Parafusulina ozawai (IISAKA), IISAKA 1932. Loc. Nyukawa.

Parafusulina nakamigawai is longer than *Parafusulina tomuroensis* and resembles *Parafusulina wordensis*, but has no strong axial filling.

Parafusulina truncata resembles *Parafusulina nabeyamensis* but is shorter than the latter. *Parafusulina kinosakii* has a smaller proloculus than *Parafusulina yabei*. *Parafusulina annamitheca* (not original) from Akasaka described by DEPRAT has stronger axial filling, and a larger proloculus than *Parafusulina kinosakii*. *Parafusulina undata* from Akasaka resembles *Parafusulina yabei*, but has a larger and more inflated fusiform shell and thick spirotheca.

Parafusulina uenoensis and *Parafusulina gigantojaponica* from Ibukiyama may be referable to *Parafusulina yabei* in their important characters. *Parafusulina ibukiensis* is more inflated fusiform and has a larger proloculus than *Parafusulina yabei*. *Parafusulina hirayuensis* is elongate fusiform and resembles *Parafusulina iisakai*. *Parafusulina hayashii* has loosely fluting septa and its chamberlets are rough if compared with *Parafusulina yabei*. *Parafusulina* ? sp. described by IGO from Hirayu is a so ill-oriented section that its specific position can not be determined. However it very closely resembles *Parafusulina hirayuensis* and *Parafusulina iisakai*.

Parafusulina japonica is one of the most common species of Schwagerinids in Japan. It differs from *Parafusulina yabei* and its allied species in its thick and less intensely fluted septa and thick spirotheca. The following species in Japan resemble *Parafusulina japonica* in their important characters.

Parafusulina japonica (GÜMBEL), SCHWAGER 1883. Loc. Akasaka.
Parafusulina japonica (GÜMBEL), OZAWA 1925. Loc. Akiyoshi.
Parafusulina japonica (GÜMBEL), OZAWA 1927. Loc. Akasaka.
Parafusulina japonica (GÜMBEL), FUJIMOTO 1936. Loc. Kanto.
Parafusulina japonica (GÜMBEL), MORIKAWA 1958. Loc. Akasaka.
Parafusulina japonica (GÜMBEL), KOBAYASHI 1957. Loc. Ibuki.
Parafusulina cf. *japonica* (GÜMBEL), SAKAGAMI 1959. Loc. Tama.
Schwagerina japonica var. *hayasakai* (LEE), FUJIMOTO 1936. Loc. Kanto.
Schwagerina gigantojaponica KOBAYASHI, MORIKAWA 1955. Loc. Akasaka.
Parafusulina tomeganensis MORIKAWA, MORIKAWA 1958. Loc. Akasaka.
Parafusulina kaerimizensis (OZAWA), KANUMA 1959. Loc. Oppara.
Parafusulina mizutanii MORIKAWA, MORIKAWA 1958. Loc. Akasaka.
Parafusulina taniyashikiensis MORIKAWA, MORIKAWA 1958. Loc. Akasaka.
Parafusulina japonica var. *kinsyoensis* MORIKAWA, MORIKAWA 1958. Loc. Akasaka.
Parafusulina lutugini (SCHELLWIEN), OZAWA 1925. Loc. Akiyoshi.
Parafusulina lutugini TORIYAMA 1958. Loc. Akiyoshi.
Parafusulina sapperi (STAFF), KOKAYASHI 1957. Loc. Ibuki.
Parafusulina gigas KOBAYASHI, KOBAYASHI 1957. Loc. Ibuki.
Parafusulina ambigua (DEPRAT), MORIKAWA 1958. Loc. Akasaka.
Parafusulina ambigua (DEPRAT), OZAWA 1925. Loc. Akiyoshi.
Parafusulina ambigua (DEPRAT), OZAWA 1927. Loc. Akasaka.
Parafusulina ambigua (DEPRAT), FUJIMOTO 1936. Loc. Kanto.
Parafusulina ambigua (DEPRAT), KANUMA 1959. Loc. Oppara.
Parafusulina exilis (SCHWAGER), SCHWAGER 1883. Loc. Akasaka.
Parafusulina exilis (SCHWAGER), DEPRAT 1914. Loc. Akasaka.
Parafusulina exilis (SCHWAGER), OZAWA 1925. Loc. Akiyoshi.
Parafusulina exilis (SCHWAGER), MORIKAWA 1958. Loc. Akasaka.
Parafusulina exilis var. *takeii* MORIKAWA, MORIKAWA 1958. Loc. Akasaka.
Schwagerina guembeli var. *Pseudoregularis* (DUNBAR and SKINNER) KOBAYASHI 1957. Loc. Ibuki.
Parafusulina guembeli var. *pseudoregularis* KOBAYASHI 1957. Loc. Ibuki.
Parafusulina richthofeni (SCHWAGER), OZAWA 1927. Loc. Akasaka.
Parafusulina cf. *kattaensis* (SCHWAGER), OZAWA 1925. Loc. Akiyoshi.
Parafusulina subobsoleta var. *okuboensis* (OZAWA), OZAWA 1927. Loc. Akasaka.
Parafusulina okuboensis (OZAWA) emend MORIKAWA, MORIKAWA 1958. Loc. Akasaka.
Parafusulina sp. a. KOBAYASHI 1957. Loc. Ibuki.
Parafusulina sp. a. TORIYAMA 1958. Loc. Akiyoshi.
Parafusulina KANMERA 1954. Loc. Kumamoto.
Parafusulina splendens (DUNBAR and SKINNER), MORIKAWA 1958. Loc. Akasaka.
Parafusulina undata MORIKAWA, MORIKAWA 1958. Loc. Akasaka.
Parafusulina gigantea (DEPRAT) ?, TORIYAMA 1958. Loc. Akiyoshi.
Parafusulina edoensis (OZAWA), OZAWA 1925. Loc. Akiyoshi.
Parafusulina edoensis (OZAWA), TORIYAMA 1958. Loc. Akiyoshi.
Parafusulina kaerimizensis (OZAWA), OZAWA 1925. Loc. Akiyoshi.
Parafusulina kaerimizensis (OZAWA), FUJIMOTO 1936. Loc. Nyukawa.
Parafusulina kaerimizensis (OZAWA), TORIYAMA 1958. Loc. Akiyoshi.
Parafusulina kaerimizensis (OZAWA), MORIKAWA 1955. Loc. Shomaru.
Parafusulina kaerimizensis (OZAWA), KOBAYASHI 1957. Loc. Ibuki.
Parafusulina paraguembeli (MORIKAWA), MORIKAWA 1955. Loc. Shomaru.
Parafusulina odakaii MORIKAWA 1955. Loc. Shomaru.
Parafusulina gifuensis MORIKAWA, MORIKAWA 1958. Loc. Akasaka.

Parafusulina cayeuxi (DEPRAT). MORIKAWA 1958. Loc. Akasaka.
Parafusulina sp. B. ? IGO 1959. Loc. Hirayu.
Parafusulina matsubaishi FUJIMOTO 1956. Loc. Kitakami.

We tentatievly divided the above listed species into two groups, typified by *Parafusulina yabei* and *Parafusulina japonica*. *Parafusulina yabei* and its allied species resemble *Parafusulina wordensis*, the type species of *Parafusulina*. These two groups are considered to have been derived from different stocks phylogenetically, namely, the *Parafusulina japonica* group is thought to have come from *Pseudofusulina*, whereas, the *Parafusulina yabei* group from *Quasifusulina*.

Japanese students on fusulinids seem to emphasize too much importance of the strong septal fluting and apparently do not recognize the value of their thin spirotheca and septa. Accordingly, it is most desirable to restudy *Parafusulina* with concern to the above mentioned characters.

Here we express our thanks to Prof. Haruyoshi FUJIMOTO of the Yamagata University for his kind guidance. Our thanks are due also to Dr. Mosaburo KANUMA, Assistant Professor of the Tokyo Gakugei Daigaku, Mr. Hisayoshi IGO and Saburo AKAGI of the Tokyo University of Education for their encouragement. Their thanks also due to Prof. Kotora HATAI of the Department of Geology, Tohoku University for reading of this manuscript.

Parafusulina tomuroensis MORIKAWA and TAKAOKA, n. sp.

Pl. 7, Figs. 1-7.

Description:—Shell large, subcylindrical fusiform, with nearly straight to slightly curved axis of coiling, rounded poles, and slightly convex lateral surfaces. Large specimens of seven to eight volutions (commonly eight) are 9.0 to 12.5 mm. long and 3.8 to 4.5 mm. wide, giving form ratios of 3.3 to 4.1. The first volution is subcylindrical fusiform, and the shell maintains closely similar shape through growth.

Proloculus of medium size, with outside diameter of about 0.2 to 0.4 mm, averaging 0.3 mm. for six specimens. Shell remains rather loosely coiled throughout. Chambers are about uniform in height in a central third of the shell but become slightly higher as poles are approached. Average height of chambers above the tunnel in the first to seventh volution in five specimens is 0.08, 0.16, 0.20, 0.26, 0.30, 0.32 and 0.36 mm respectively.

Spirotheca thin and finely alveolar in all volutions. Spirotheca of same thickness throughout its length. Average thickness of the spirotheca in the first to seventh volution in five specimens is 0.02, 0.03, 0.04, 0.05, 0.05, 0.06 and 0.06 mm respectively.

Septa closely spaced and highly fluted throughout the length of shell. Fluting brings the septa in contact with each other for about half their height. Septal intervals in outer volutions are 0.8 mm.

Tunnel narrow with slightly irregular path. Intense fluting of the septa make tunnel sides difficult to identify in all parts of all specimens.

Chomata indistinct.

Axial filling commonly fills completely the chambers along the axis from near the middle to the ends.

Measurements of this species are given in Table 1.

Comparison:—*Parafusulina kaerimizensis* which was reported by OZAWA in 1925 from Tomuro is a different species from Kaerimizu, Akiyoshi, according to TORIYAMA (1958) and may be an elongate

form of *Parafusulina tomuroensis*. *Paraf. tomuroensis* resembles *Parafusulina yabei* but is distinguished from the latter by the smaller proloculus and more elongate subcylindrical form. Although it is also similar to *Parafusulina nabeyamensis* it is distinguished therefrom by its elongate subcylindrical form.

Occurrence:—Okada Quarry, Nabeyama.

Parafusulina nabeyamensis Morikawa and Takaoka, n. sp.

Pl. 8, Figs. 1-9.

Description:—Shell large, inflated fusiform, with nearly straight to slightly curved axis of coiling, round poles, and slightly concave lateral surface. Large specimens of seven to eight volution are 6.5 to 8.0 mm. long and 3.3 to 4.5 mm. wide, giving form ratios of 1.8 to 1.9.

First volution fusiform and the shell grows gradually throughout its growth.

Proloculus of medium size with outside diameter of about 0.24 to 0.36 mm., averaging 0.34 mm. far seven specimens.

Shell regularly coiled throughout growth. The chambers expand slowly in height but become rapidly higher along the axis. Average height of chambers above tunnel in the first to seventh specimens is 0.06, 0.14, 0.22, 0.26, 0.30, 0.32, and 0.32 mm. respectively.

Spirotheca thin and fine alveoli develops through all volutions, its thickness from first to eighth volution is 0.04 0.04, 0.03, 0.04, 0.05, 0.08 and 0.08 mm. respectively.

Septa thin and reach outer spirotheca and some of them have distorted fluting, septal fluting strong and regular. The intense fluting of the septa makes the tunnel side difficult to identify in all parts of all specimens. Septal intervals about 0.8 mm in outer volutions. Chomata indistinct and secondary deposit fills from first to fourth volution.

Measurements of this species are given in Table 2.

Comparison:—This species is characterized by the large shell inflated fusiform, thin septa and spirotheca and axial deposit which fills both sides of the proloculus as in *Parafusulina yabei*. But the septa in some specimens are distorted to one direction and the septal fluting is strong. The present form differs from *Parafusulina yabei* in its inflated fusiform and smaller proloculus.

Occurrence:—This is abundant in Tomuro.

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Table 1. Measurements of *Parafusulina*

SP.	Pl.	Fig.	Slide No.	L.	W.	F. R.	N. V.	D. P.	Height of Volutions						
									1	2	3	4	5	6	7
1	1	1	KZ 6—7	13.5	3.3	4.1	7	.25	.08	.15	.15	.20	.20	.25	.25
2	1	2	KZ 6—16	13.5	3.8	3.5	7	.35	.08	.15	.20	.23	.25	.30	
3	1	3	KZ 6—14	12.0	3.6	3.3	7	.50			.15	.15	.25	.30	.35
4	1	4	KZ 6—37		3.5		7	.34	.10	.14	.16	.22	.30	.30	

Table 2. Measurements of *Parafusulina*

SP.	Pl.	Fig.	Sljde No.	L.	W.	F. R.	N. V.	D. P.	Height of Volutions							
									1	2	3	4	5	6	7	8
1	2	1	KZ 15—21	8.0	4.5	1.8	8	.34	.10	.16	.24	.28	.40	.30	.40	
2	2	2	KZ 15—18a	7.5	4.0	1.9	8	.36	.10	.20	.24	.20	.26	.30	.26	.26
3	2	3	KZ 15—16b	7.0	3.3	2.1	6	.24	.12	.14	.20	.30	.30	.32		
4	2	4	KZ 15—22b	6.5	3.5	1.8	8	.32	.06	.10	.14	.20	.28	.30	.32	
5	2	6	KZ 15—16c		4.5		8	.30	.10	.12	.20	.26	.34	.34	.28	.30
6	2	7	KZ 15—23a		3.6		8	.34	.06	.14	.22	.36			.32	
7	2	8	KZ 15—4		4.3		8	.32	.08	.16	.22	.26	.28	.36	.32	.36

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tomuroensis MORIKAWA and TAKAOKA n. sp.

Thickness of Spirotheca

1	2	3	4	5	6	7
.03	.03	.04	.04	.06	.06	.10
.03	.04	.05	.06	.06	.06	
.04	.04	.06	.06	.08	.10	.10
.02	.04	.04	.05	.06	.08	

Septal count

SP.	1	2	3	4	5	6
4	10	16	24	26	31	36

L—Length N. V.—Number of volution
W—Width D. P.—Diameter of proloculus
F. R.—Form ratio *—half length or width

nabeyamensis MORIKAWA and TAKAOKA n. sp.

Thickness of Spirotheca

1	2	3	4	5	6	7	8
.04	.03	.03	.04	.05	.06	.08	
.04	.06	.05	.04	.06	.06	.08	.08
.03	.04	.03	.04	.05	.06		
.01	.03	.03	.05	.05	.06		
.02	.02	.03	.04	.05	.05	.06	.06
.03	.02	.03	.03		.05	.05	
.02	.03	.04	.04	.04	.06	.06	

Septal count

SP.	1	2	3	4	5	6
5	13	19	20	31	34	37
6	13	23	29	34		
7	11	17				

L—Length N. V.—Number of volution
W—Width D. P.—Diameter of proloculus
F. R.—Form ratio *—half length or width

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Explanation of Plate 7

Figs. 1-7. *Parafusulina tomuroensis* MORIKAWA and TAKAOKA n. sp.
1. Axial section of the holotype, ×10.
2, 3. Axial sections. ×10
4. Sagittal section. ×10

Loc. Okuda Quarry, Nabeyama.

Explanation of Plate 8

Figs. 1-9. *Parafusulina nabeyamensis* MORIKAWA and TAKAOKA n. sp.
1. Axial section of the holotype. ×10
2-4. Axial sections. ×10
5. Axial section of young stage. ×10
6-8. Sagittal sections. ×10
9. Oblique section. ×10

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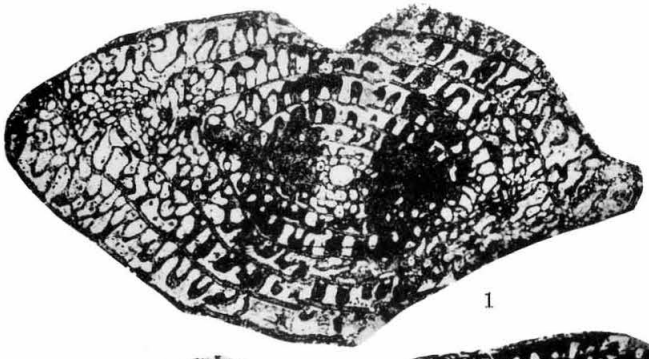

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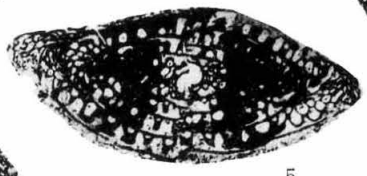

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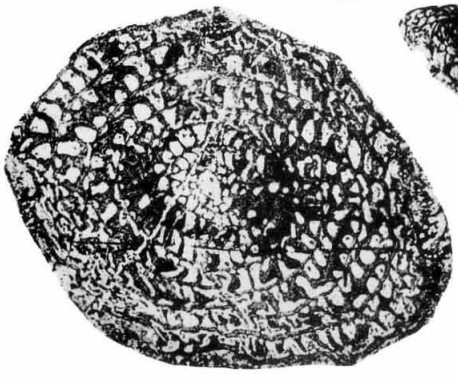

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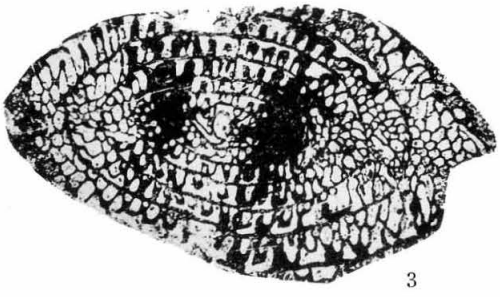

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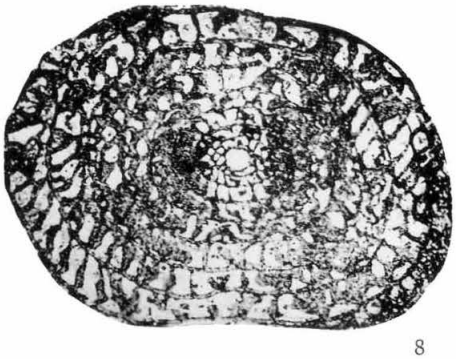

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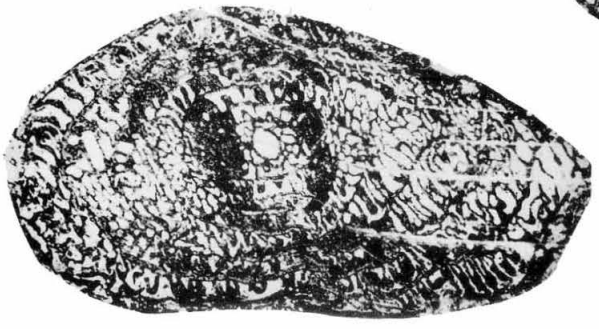

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Trans. Proc. Palaeont. Soc. Japan, N.S., No. 41, pp. 41-44, Apr. 10, 1961

400. A NEW SPECIES OF MIOCENE GASTROPODA (MOLLUSCA) FROM THE GINZAN HOT-SPRING, YAMAGATA PREFECTURE, NORTHEAST HONSHU, JAPAN*

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山形県銀山温泉産新巻貝：銀山温泉附近の中新統より産する巻貝の 1 新種を記載し，その生態的意義について若干の考察をおこなった。 畑井小虎・小高民夫

In the previous paper (1959), the writers described three new species of Gastropoda based upon the collection of Mr. Tsunemasa SAITO of the Institute of Geology and Paleontology, Tohoku University from near the Ginzan Hot-Spring in Yamagata Prefecture. In that paper it was stated that another new species was also discriminated among his collection, but owing to the unfavorable preservation it was not described but merely left in manuscript form under the name of *Monodonta* (?) *saitoi* HATAI and KOTAKA (MS), and this name was refered to by T. SAITO (1960) in his description of the geology of the area in which the Ginzan Hot-Spring is situated.

Fortunately the junior writer during his visit to the type locality of the gastropods described in the previous article (HATAI and KOTAKA, 1959), collected additional specimens of the gastropod species left in manuscript form. The description of the species based upon the additional material is given in this article.

* Received Oct. 1, 1960; read at 76th meeting of the Society at Matsue, Sept. 24, 1960.

Family Trochidae D'ORBIGNY, 1837

Subfamily Margaritinae STOLICZKA, 1868

Genus *Turcica* A. ADAMS, 1854

Turcica A. ADAMS, 1854, Proc. Zool. Soc., London, pt. 22, p. 37. Type species (Monotype): *Turcica monilifera* A. ADAMS, 1854.

Generic Diagnosis: Shell conoidal, thin, subdiaphanous, imperforate, whorls with transverse series of granules, the last rounded at the periphery; columella solid, spirally twisted at the upper part, ending below or anteriorly in an obtuse prominent point; outer lip thin, simple, acute. (A. ADAMS, 1854, p. 37)

Turcica saitoi HATAI and KOTAKA, n. sp.

Text-figs. 1-5

Description: Shell solid and heavy, spire broadly conical. Apex lacking, body whorl slightly convex and the younger ones nearly flat in profile. Whorls sculptured with five prominent spiral cords, subequal in strength and breadth, abapical one usually covered with succeeding whorls except on body

whorl. Spiral cords form rows of elongated beads, interspaces between each spiral rather narrow and smooth, about one third of spiral in breadth, deeply excavated. Suture distinct, narrow and deep. Base of body whorl convex and ornamentated with three distinct and one obsolete spiral cords, also form rows of elongated beads.

Aperture round and inclined posteriorly, outer lip thin and sharp, composed of lateral and basal lips, inner periphery smooth in lateral lip, with prominent crest in basal lip; parietal and columellar lips form inner lip and covered with thin callus, the former indistinct and flatly covers base of whorls, the latter distinct and with two prominent teeth.

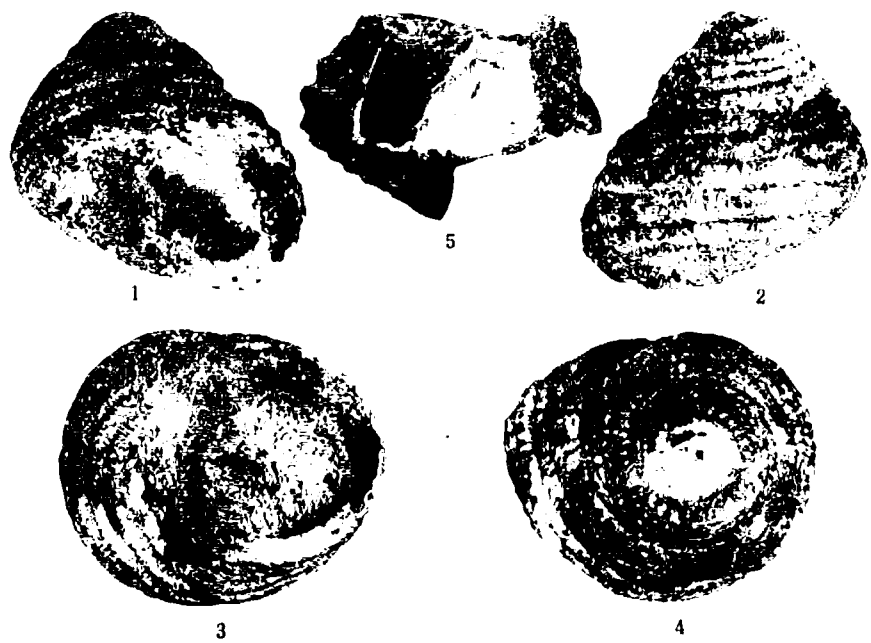
Columella straight with two folds of which adapical one rather prominent and abapical one very weak. On columellar lip or at terminals of columellar folds, two prominent teeth preserved.

Dimensions (in mm.):

Holotype (IGPS coll. cat. no. 77799; apex lacking, three whorls preserved), Height approximately 40, width of body whorl 41, diameter of aperture approximately 30, pleural angle about 70. Paratypes (IGPS coll. cat. no 77800, not measured because of preservation not being good).

Type locality and horizon: Upstream of the Okamami-zawa, Tamano area, Obanazawa-machi, Kita-Murayama-gun, Yamagata Prefecture. The Kaminohata member of the Ginzan formation. Miocene.

Remarks: The specimens examined all lack their apex, thus the true shape



Text-figs. 1-4. *Turcica saitoi* HATAI and KOTAKA, n. sp. Front, top, lateral and basal views of the holotype specimen in natural size. IGPS coll. cat. no. 77799.

Text-fig. 5. *Turcica saitoi* HATAI and KOTAKA, n. sp. Columellar folds of paratype specimen natural size. IGPS coll. cat. no. 77800.

of the younger whorls or spire remains unknown. However, the spire seems to have attained considerable height judging from the rate in increase of the succeding whorls. The general features of the shell, especially the shape of the spire so far as preserved and the characters of the aperture agree well with the generic diagnosis given by A. ADAMS (1854). According to W. WENZ (1938, p. 271), the apertural characters of the genus *Turcica* are:

"Nabel durch eine Schwiele bedeckt; Müdung schief, rundlich; Aussenrand dünn, scharf, Basalrand bogig ausgeschnitten: Spindel verdickt, oben mit einer Zahnfalte, darunter ein kräftiger Zahn".

Certain trochid shells resembling in shape of spire and surface sculptures to the present form are distinguished from *Turcica* in having distinct umbilicus and rather flat side and base of the whorls.

Some species of the genera *Monodonta* and *Clanculus* have whorls and spiral sculptures resembling the present new species, but differ in their distinct dentitions along the inner periphery of the aperture, and the genus *Clanculus* has a prominent umbilicus.

The genus *Calliostoma* is also more or less similar to the present new gastropod in the type of spiral cording, but has no columellar folds nor teeth on the columellar lip of the aperture.

Turcica saitoi resembles *T. monilifera* A. ADAMS, the type species of the genus in the apertural characters as above-mentioned, but the former is distinguished from the latter in having a rather low spire, heavy shell, subequal five spiral beads, rather narrow interspaces between each spiral, and by the less number of basal spirals of the whorls.

Turcica imperialis A. ADAMS (= *Turcica coreensis* PEASE) figured by G. W. TRYON (1889, p. 414, pl. 63, fig. 30) is also similar to the present new species, but may be distinguished from it by the rather thick shell, prominent cords and the state of the callus on the parietal lip.

The gastropod fauna derived from the Ginzan formation is interesting in comprising such species as, *Apollen sazanami* HATAI and KOTAKA, *Nucella freycincti saitoi* HATAI and KOTAKA, *Ocenebra adunca protoadunca* HATAI and KOTAKA, and *Turcica saitoi* HATAI and KOTAKA, besides *Olivella iwakiensis* NOMURA and HATAI, *Calliostoma* sp., *Lemintina* sp., and *Neverita* cf. *didyma*. This assemblage is of particular interest because the listed gastropods are those which are commonly found in the inner neritic zone crawling over rocky places on which sea-weeds are growing (*Olivella*, *Calliostoma*), on rocky shores close to the tidal zone (*Ocenebra*), attached to rocky bottoms, rocky shores above low tide level or on foreign materials (*Lemintina*), sandy bottoms (*Neverita*), to fairly deep water (*Apollon*, *Turcica*). Since none of the specimens show abrasion of their shells it may be inferred that they were quickly covered with sediments to become well preserved and not transported from a distance. All of the genera can be found in beach collections along the seas of southwest Japan, which suggests that they can inhabit shallow waters very near to the strand line. This may also be supported from the occurrence of pelecypods belonging to such genera as *Anadara*, *Volsella*, *Ostrea*, *Callista*, *Pitar*, *Dosinia*, *Spisula*, *Macoma* and *Solen* as well as of *Mya*. All of these pelecypod genera are common in shallow waters and can often be found just below the low tide level or even above it (*Ostrea*, *Volsella*).

From the given evidence it is thought that the shore line must have been very

close to the place where they were buried and that the depth estimated from the bathymetrical ranges of the genera mentioned above in the seas of Japan can be, at the minimum, placed near the strand line, and at the maximum at depths shallower than 20 meters. Should further data accumulate, it may be possible to judge the position of the ancient shore line.

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Trans. Proc. Palaeont. Soc. Japan, N.S., No. 41, pp. 45-47, Apr. 10, 1961

ADDRESS TO THE TWENTY-FIFTH ANNIVERSARY OF THE PALAEONTOLOGICAL SOCIETY OF JAPAN

It is our great pleasure to have had the twenty-fifth anniversary of this society last spring. Its celebration was, however, postponed for several months for preparation. On behalf of the society I wish to express at the outset, the most cordial thanks to the Ministry of Education, Geological Society of Japan and other related societies and mining and industrial companies as well as sustaining persons for their warm assistances and cooperation which we have received since the foundation of this society.

The History of Palaeontology of Japan will be detailed in the writing now in preparation by the Honorary President H. YABE with a few joint authors. At any rate the history of research does not go as far back as a century, putting aside the study of medicine stones and the knowledge of stone curiosity. During the Showa epoch (1926-) the number of palaeontologists was gradually increased as much as a society can be established. Stimulated by the constitution of the International Palaeontological Union, 1933, this society was established at length on the 29th of June, 1935.

Among the societies of natural history in Japan the oldest is the Hakubutsu-Tomo-Non Kai (Meiji 11, 1878). It was the progenitor of the botanical and zoological societies (1882, 1885), in addition to the geological society or Chigaku-Kai (1882-1892) which was, however, later annexed with the Tokyo Geographic Society (1884). Not only these but also the Anthoropological Society of Tokyo, Nippon (1884) and the Geological Society of Tokyo, Japan (Meiji 26, 1893) were successively founded more than half a century ago.[1] These are senior societies, but there are some juniors, the Society of Mining Geologists of Japan (1950) and the Mineralogical Society of Japan (1952), for example.

The oldest among the societies of this science is the Palaeontographical Society which was instituted in 1847 for publishing monographs of British fossils. Since then the societies were founded in Switzerland (1874), the United States (1909), Germany (1914), Russia (1917), Austria (1933) and so forth.[2] However, even in the United Kingdom it was in 1957 that the Paleontological Association which holds meetings and demonstrations beside the publication of its journal has been founded. The Palaeontological Society of China was founded in 1929, but its activity has not been commenced before 1948.[3] Lately more companion societies were founded in Argentina (1955), India (1956) and Brazil (1958). In looking through them this society may be said middle among the ages of foundation.

Retrospecting these 25 years, the history of this society is not simple. In late spring, 1935, the general assembly

1) Geological Society of Japan (1953), History of the Geological Society of Japan, Commemoration of its Sixtieth Anniversary.

2) SCHINDEWOLF, O.H. (1956), A Note on Palaeontological Societies. *Jour. Pal. Soc. India, Vol. 1, No. 1.*

3) CHAO, C.K. (1948), Foundation and History of the Palaeontological Society of China. *Bull. Pal. Soc. China, No. 1.*

was held at the University of Tokyo for its foundation as a section of the Geological Society of Japan; the first meeting held at the Geological Institute of the university at the end of November. The papers were published in the section of the society in the journal of the Geological Society. Their reprints were compiled quarterly for distribution to its members. Thus the *Transactions and Proceedings of the Palaeontological Society of Japan* has been published 21 numbers by 1941. This dual publication, however, became impossible during the Second Great War. Consequently, Transactions Numbers 123-191 were printed only in the journal.

This society has held in each year four meetings at various towns, but this activity ceased with the 38th meeting at Fukuoka, February, 1945. The meetings were, however, resumed from June, 1948. Since 1954 one general assembly and three local meetings were held in each year. Thus 77 meetings and 6 assemblies are countable by the end of last year.

According to Dr. YABE'S suggestion this society followed the Paleontological Society in its relation to the Geological Society of America. The Paleontological Society, however, became independent from the Geological Society and since 1926 it began to publish *Journal of Paleontology* jointly with the Association of Economic Mineralogists and Paleontologists. Similarly this society became independent from the Geological Society of Japan in 1957. This parallelism is noteworthy because it shows the general tendency for the differentiation of sciences through their development.

New Series of Transactions and Proceedings and *Special Papers* were first published in 1951. They are mostly written in English. The former is quarterly, while the latter is occasional and 6 numbers have been already published. In addition, the initial number of *Fossil* or *Kwaseki* which is in Japanese, has appeared last year. It comprises the symposium on the fusulinids. Beside them, *Catalogue of Type Specimens of Fossils in Japan* will soon come out as a Twenty-Fifth Anniversary Publication. The other new activities are special lectures and symposia at the local meetings and general assemblies.

Needless to say, palaeontology is inseparably related to neontology on one side and to stratigraphy on the other. Therefore this society comprises geologists as well as biologists as its members. It is not a big society but bears some international aspects. One of them is its foreign members which attain more than 10 percents of the total. Is it accidental that this percentage is approximately the same with that of the Paleontological Society occupied by the members resident outside North America? The Paleontological Society combined with A. E. M. P. is, however, considerably greater, having several times more members than this society.

Recent Volumes of *Journal of Paleontology* each consists of about 1150 pages, while 40 numbers of New Series in past 10 years total about 1450 pages. This relation roughly corresponds to the annual membership due which is about ten times greater for the former than the latter.[4] Likewise, the Penrose bequest for the former may be compared to the publication subsidy to the latter from the goverment.

As shown by the history of the societies, palaeontography must precede

4) This means the domestic membership due which excludes the cost of Special Paper, whereas the foreign membership due is inclusive of the cost.

palaeontology, because the latter does not exist without the former. Therefore 101 new species, 12 new genera and 5 new families and 293 new species, 28 new genera and 2 new families established respectively through the old and new series of *Transactions and Proceedings* must be highly evaluated. If the non-serial part of the publication in 1941-1950 is brought into account, the total number of new species, subspecies, genera and subgenera described in this journal attain respectively 420, 42, 43 and 5. It means that about one-tenth of the total new species and subspecies so far described by Japanese palaeontologists made their debuts in this journal.

Naturally various groups of fossils in the fields of palaeobotany, vertebrate and invertebrate palaeontology and micropalaeontology are dealt with in 393 transactions. Many of these works are not merely descriptive, but various problems are discussed from different points of views, namely, morphology, anatomy, taxonomy, terminology, phylogeny, ontogeny, ecology, ichnology, speleology, biostratigraphy, palaeogeography, palaeoclimatology, biometry, fossilization, applied palaeontology and so forth. One of them is dealt with ancient documents of the so-called dragon's skeleton. Most fossils were collected from Japan or eastern Asia, but some papers concern various fossils from the Philippines, Viet-Nam, Thailand, Timor, Java, Nicobar, the Americas and other continents. I appreciate a few papers which have been contributed by foreign members.

Here I have tried to orientate the society in the spheres of palaeontology and also of natural history of Japan and to summarize the past activities of this society, because the history and the present status are two important basis for the future planning. Through the most difficult time the society has made slow but steady advancements. It is still only 25 years old, and its future improvement depends principally on the efforts and cooperation of its members.

Finally, as an executive councillor since the day of its foundation, I am very happy to have had the honour to present this address on this memorial occasion and thank you all.

T. KOBAYASHI, President

PROCEEDINGS OF THE PALAEONTOLOGICAL SOCIETY OF JAPAN

日本古生物学会第 77 回例会は 1960 年 11 月 19 日、名古屋地学会と共催で名古屋大学において開催された（参加者 26 名）。例会における講演者並びに講演題目は次の通りである。

特　別　講　演

日本の洪積世人類について（スライド使用）.... ..... 高井冬二

例　会　講　演

Profusulina の wall structure について .... 佐田公好

新属 *Metadoliolina* について .... 石井健一・野上裕生

A Faraminiferal sequence of the Yûrakuchô Formation (Holocene) in Tokyo City.. Try to represent the Foraminiferal Zon-

ation statistically .....Hiroshi UJIIE
Brachiopoda of the upper Permian Gujo Formation, Kyoto Prefecture, Southwest Japan .....清水大吉郎
On the Occurrence of Ordovician Nautiloids in North Thailand....Teiichi KOBAYASHI
Ordovician nautiloid distribution of North China .....小幡忠宏
八王子産 *Sepia* の化石について(代読).....
.....橋本 亘・菅野三郎
北海道より *Oxytropidoceras* の発見(代読)....
.....橋本 亘・猪間明俊
古第三紀空知湯と夕張湾の貝類相について—"若鍋動物群"の古生態学的研究—(代読)....
..... 水野篤行
西南日本外帯地域の古第三紀貝類群の総括(代読).....水野篤行
幌内層群産の *Venericardia* 属の分類学的研究—"幌内動物群"(古第三紀)の分類学的研究 その 1(代読).....水野篤行・井上正昭
幌内層群産の Crassatellitidae および Tellinidae の新種について—"幌内動物群"の分類学的研究 その 2(代読).....
..... 井下正昭・水野篤行
On some Miocene Mollusks from the Mizunami Group, Japan .....糸魚川淳二
Scutellidae の lunule と slit の意義 ....森下 晶
四国宇和島産白亜紀海胆化石 *Hemiaster*..森下 晶
A new Genus of the Phillipsidae from Thailand .....Teiichi KOBAYASHI
Equid fossils from Hiramaki Formation ..
....Shinji YOSHIDA and Tokio SHIKAMA
On the *Neomeris* (スナメリ) from Onsen-gun, Ehime Prefecture.....長谷川善和

日本古生物学会昭和 35 年度年会は 1961 年 1 月 15 日 東京大学理学部地質学教室において開催された(参会者 57 名)。年会における講演者並びに講演題目は次の通りである。

特 別 講 演

第 5 回国際古生物学連合及び第 21 回万国地質学会議に出席して .....小林貞一

学 術 講 演

Umbilicated *Pseudoschwagerina* from Japan
..... Hisayashi IGO
Stratigraphical occurrence of the genus *Acerroschwagerina* .....Hisayashi IGO
On the variation of *Parafusulina yabei* HANZAWA .....Hisayashi IGO
On the specific variation of *Neoschwagerina margarita* DEPRAT and *Yabeina globosa* YABE .....Kimiyoshi SADA
Uralian *Triticites* from the Atetsu limestone, Okayama Prefecture.....
..... Kimiyoshi SADA
信州白骨温泉産 *Cancellina* について....森川六郎
岐阜県高山市東方の紡錘虫について .....
..... 森川六郎・三島栄一
Planktonic Foraminifera from the Nobori Formation .....Yokichi TAKAYANAGI and Tsunemasa SAITO
Revision of the Terebridae from Japanese Tertiary .....Katsura OYAMA
南関東のウミニナ化石と層位との関係に就いて
..... 永沢譲次
Ecological and Geographical Distribution of Jurassic Pelecypods in Japan .....
..... Itaru HAYAMI
Note on *Heterotrigonia subovalis* (JIMBO) ..
..... Mitsuo NAKANO
On some Gyliakian *Pterotrigonia* from Kyushu and Hokkaido .....Mitsuo NAKANO
On some consideration of the molluscan fauna from the Asagai formation, Fukushima Prefecture .....Saburo KAN'NO
On the Asagaian Cardiidae (Pelecypoda) and its geological distribution in the Joban Coal-field .....Yasuhiko KAMATA
Palaeosynecology of the Younger Tertiary Deposits in the Mabuchi River valley, Northeast Japan .....Kiyotaka CHINZEI
Ammonites Oxfordiennes de l'île de Mindoro, Philippines .....Tadashi SATO
オストラコーダの Desmodont と Lophodont の関係 .....花井哲郎
志津川 Lias より *Ichthyosaurus* 頭骨の発見..
.....高井冬二・佐藤 正
Fossil *Felis* from the Maru-hon Quarry in the northeastern part of the Mikatabara fan deposits..T. SHIKAMA, Y. HASEGAWA and Tokai-Gakuen Chigaku Club
Eugonophyllum, a new Permo-Pennsylvanian algal genus .....
..... Kenji KONISHI and John L. WRAY

日本古生物学会創立25周年記念事業報告

本会は昭和35年6月29日をもって創立25周年を迎えたのでこれを記念して下記のごとく記念事業を行った。

祝賀会・記念講演会・晩餐会は昭和36年1月14日神田学士会館で開催され参加者多数(72名)をえて盛大であった。会の次第は次の通りである。祝賀会 開会の辞・会長挨拶・来賓祝詞(日本地質学会兼子勝会長より下記のような祝詞があった)・祝詞及び祝電披露 (International Palaeontological Union の C. POULSEN 会長よりのお祝いの手紙をはじめ下記の各国学会・研究所・個人などより祝詞・祝電があった)・学会賞メダル贈呈(矢部長克名誉会員に学会賞及び図のようなメダルが贈呈された*)・学術奨励金授与(花井哲郎・金谷太郎・小高民夫・首藤次男の四君に学術奨励金が授与された)・事務功労者表彰(市川健雄君に表彰状及び金一封がおくられた)・閉会の辞。記念講演会 白堊紀アンモナイトの進化について(松本達郎君)・浮游性有孔虫化石と国際対比(浅野 清君)・分布と進化(前川文夫君)。晩餐会 (カリフォルニア大学の R. W. CHANEY 博士・イリノイ州立地質調査所の M. L. THOMPSON 博士夫妻の他会員多数出席し盛会であった)。

祝賀会によせられた祝詞

祝　詞

日本古生物学会の創立25周年記念日に当たり,本会の発達を祝福いたします。今や我国の経済は,所謂高度経済と言われ,この経済上昇は,技術の発達によることが,漸く,広く世間に認識せらるるようになりました。然し乍ら,技術の基礎をなすものは,基礎科学であります。技術,技術と申されてはいますが,その基礎をなす,基礎科学の発達があって技術の発達があり,それが引いては国民生活の向上に役立つものと考えられます。最近,我々所謂,広い意味のゼオロジストの間で,地質学の近代化について,真剣に論議せられておることは,本会員諸兄が既に十二分に御承知のことであります。

科学の発達は無限であることに思いを致し,他の科学界の発達とともに,会員各位の御研鑽に基く,本学会の発展をお祈りし,祝福の辞といたします。

昭和36年1月14日

日本地質学会会長

兼子　勝

The rapid development of Palaeontological research in Japan and the excellent achievements of Japanese Palaeontologists are recognized in all countries as contributions of world-wide importance. It is therefore a pleasure to participate in the celebration of the 25th anniversary of the PALAEONTOLOGICAL SOCIETY OF JAPAN. On behalf of the INTERNATIONAL PALAEONTOLOGICAL UNION I welcome this opportunity to send our congratulations and expression of our most cordial wishes for the growth and prosperity of your Society. I am confident that you will contribute much during the years to come to the advancement of palaeontology and related sciences, and that Japanese palaeontological research will continue to be of great importance not only to Japan but to the entire scientific world.

Nov. 23, 1960

Christian POULSEN, President
International Palaeontological Union

* This commemorates also the centenary of the birth of Prof. M. YOKOYAMA, father of Japanese Palaeontology.

この他 The Palaeontological Society の N. D. NEWELL 会長, The Palaeontological Society of India の M. R. SAHNI 会長, Tübingen 大学の O. H. SCHINDEWOLF 教授, 台湾大学の馬廷英教授, Société Géologique de France の A. F. DE LAPPARENT 会長, The Palaeontological Institute of the Academy of Sciences of USSR のアカデミー会員 Y. A. ORLOV 博士, Société Géologique de Pologne の H. ŚWIDZIŃSKI 会長, The Palaeontological Association の O. M. B. BULMAN 会長, 北京大学の孫雲鋳教授などより祝詞・祝電があった。

なお文部省より配当された研究成果刊行費により「Catalogue of Type Specimens of Fossils in Japan」が出版された, 定価 1800 円, 其の他記念出版として 1800 年代に出版された古典 (GEYLER, NAUMANN, NATHORST, SCHWAGER, MOJSISOVICS など) 図版の翻刻なども予定している。

会　員　消　息

会員松本達郎君の「日本及び北アメリカ白堊紀菊石の研究」に対し朝日新聞社より朝日賞が授与された。

会員 M. L. Thompson 君は本年 1 月中旬フルブライト交換教授を終えて帰米した。

会員大野作太郎君は愛媛県より教育文化賞を授与された。

会員今村外治君の中国地方の地質学的研究の成果ならびに地学普及上の貢献にたいして中国新聞社より中国文化賞が授与された。

News

後記の様に会則第 3 条が変更され会員の研究業績のうち特にすぐれたものを表彰することがあるが, これは本誌に研究発表をしたことのある者に限りたいとの意見が多いのでどしどし本誌に御投稿下さる様御願いします。

例　会　通　知

	開催地	開催日	講演申込締切日
第 78 回例会	秋田大学	1961 年 5 月 13, 14 日	1961 年 4 月 30 日
第 79 回例会	金沢大学	1961 年 9 月 23, 24 日	1961 年 8 月 31 日
第 80 回例会	九州大学	1961 年 11 月 18 日	1961 年 10 月 25 日

○ 1961 年 5 月 13 日（土）に秋田で開催される本会第 78 回例会に際し，油田古生物に関する討論会が計画されている。又新生代植物研究グループは翌 14 日（日）に "日本の中新世植物群" に関する討論会を計画中；そのプログラムは例会のプログラムと同時にお知らせします。世話役　藤岡一男・棚井敏雅。

○ 1961 年 9 月 23 日（土）に金沢で開催される本会第 79 回例会には微古植物学（珪藻・石灰藻など）に関する討論会を計画中です。世話役　市川　渡。

会則および出版規定変更

1961 年 1 月 15 日　東京大学で開かれた日本古生物学会総会で次の如く会則第 3 条及び出版規定 2, 3, 7 項が変更された。

1. 会則第 3 条の第 4 項として次の項目を追加する。
   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。
2. 投稿規定 2, 3, 7 項を次の様に変更する。
   2. 原稿は欧文に限りタイプライター用紙（22.5×27.5 cm）にパイカ字体にて 1 行おきに明瞭にタイプライトし，学名はイタリックに著者自身指定する。［アンダーラインした部分の字句を挿入する。］
   3. 原稿（挿図・地図・付表を含む）は 12 印刷頁（タイプライター用紙約 30 枚）［規定変更前は 8 印刷頁（タイプライター用紙約 18 枚）］を限度とする。
   7. 以上の限度を超える場合は著者がその費用を負担する但し図版については編集委員が認める場合は 4 印刷頁のかわりに 1 図版を加えることができる。［アンダーラインした部分の字句を挿入する。］

1960 年 1 月 17 日より 1961 年 4 月 3 日までの会員移動は次の通りである。

入会者	小野山邦子	照沼　義夫	鈴木順雄	橘　行一	Ralph W. Chaney	杉田宗満
	野田　浩司	猪間　明俊	岩崎泰顕	大島一精	兼子　勝	長尾捨一
	蟹江　康夫	長谷川美行	佐藤誠司	若林隆幸	藤　則雄	井上英二
退会者	森島正夫(死亡)	樋浦　侶文	堀江正治	豊田清修	松井　愈	佐藤敏彦
	小笠原謙三	H. G. Schenck(死亡)		井尻正二		

購読御希望の方は本会宛御申込下さい

1961 年 4 月 1 日　印　刷
1961 年 4 月 10 日　発　行

日本古生物学会報告・紀事
新　篇　第 41 号
250 円

東京大学理学部地質学教室内
日本古生物学会
編　集　者　高　井　冬　二
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　山　元

日本古生物学会会則　(1961, 1, 15)

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 600 円，特別会員年 1,000 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 3 弗とし会誌および特別出版物の配布を受ける。

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 ヶ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。名誉会長は評議委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。

会長は会員の三の分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。