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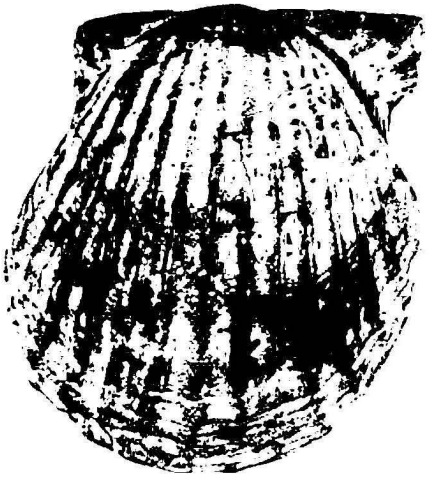

日本古生物学会

Palaeontological Society of Japan
April 20th, 1966

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TRANSACTIONS



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Geological Institute, Faculty of Science, University of Tokyo, Japan

Trans. Proc. Palaeont. Soc. Japan, N.S., No. 61, pp. 183-187, pl. 22, April 10, 1965

# 500. A NEW SPECIES OF A WHALE TYMPANIC BONE FROM TAIWAN, CHINA*

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台湾産鯨耳石の一新種：中華民国台湾省新竹県竹東鎮上大湖附近の下部卓蘭層より産出した鯨の耳石を新種 *Balaenoptera taiwanica* として記載した。 黄 敦 友

## Introduction

As already summarized by Ichiro HAYASAKA (1942), mammalian fossils are frequently found in the Toukoshan Foramation (Tokazan beds) of western Taiwan and about 11 species have been reported. However, fossil pelagic mammals (whale) have never been found from the geologic column of Taiwan. Therefore, the find of fossil tympanics is worthy of record.

In the summer of 1961, a tympanic bone was collected by Mr. Chao-Yi MENG, Chief Geologist of the Chinese Petroleum Corporation and Mr. Yu-Lai FAN, Geological Assistant of the same Corporation, in association with other fossil bones, shark-teeth (Pl. 22, figs. 10-22), Mollusca, Foraminifera, crab (*Galene granulifera* LIN), and miscellrneous plant remains from the lower part of the Cholan (Takuran) Formation in the Chutong Oil Field, near Hsinchu City. The tympanic bone is well preserved, and thus its taxonomic position can be determined. The record of occurrence of the tympanic is important because of its increasing the value of such fossils in correlation of geographically isolated geological formations, interpretation of the depositional environment and other problems as once mentioned by Kotora HATAI, et al. (1963).

* Received June 20, 1965; read June 20, 1965 at Kanazawa.

** Chinese Petroleum Corporation.

## Acknowledgements

The writer thanks Professor Kotora HATAI of the Institute of Geology and Paleontology, Faculty of Science, Tohoku University for his kindness with regard to this study and for reading the manuscript. He also expresses his sincere thanks to Mr. Chao-Yi MENG, Chief Geologist of the Chinese Petroleum Corporation for the opportunity to study the specimen and for the permition to publish this paper. Thanks are due to Mr. Kimiji KUMAGAI for his pho ographic works.

## Systematics

Order Cetacea

Family Balaenidae

Genus *Balaenoptera* LACEPEDE, 1804

Based upon YAMADA's (1953) descrip-

tion and comparative mophology of the tympanic bone of *Balaenoptera physalus* (LINNAEUS) (IGPS, Coll. Cat. No. 85968) labelled as from the Antarctic Ocean, and a gift from Miss Yoko SUZUKI, 1964, the fossil one from Shantahu can be referred to *Balaenoptera* without doubt. Further, its size, proportions and a the details suggest its intimate relation with the Recent species of *Balaenoptera*.

From comparative mophology with the known species of the genus now available to the writer, it is evident that the present tympanic is so different that it should be treated as a distinct species and a new specific name is proposed to distinguish it from that of *Balaenoptera physalus* (LNNAEUS).

*Balaenoptera taiwanica*, new species

Pl. 22, figs. 1-3

*Type*:—A single well preserved right tympanic bone, now deposited in Paleontolongical Laboratory, Geological Department, Chinese Petroleum Corporation, Miaoli, Taiwan.

*Type locality*:—The specimen was found at Shantabu in the Chutung Oil Field 3.6 kilometers south of Chutung-Chen, Hsinchu-Hsien, Taiwan (Fig. 1).

*Horizon*:—The specimen was discovered and excavated by Yi-Lai FAN, geological assistant of the Chinese Petroleum Corporation in the summer of 1961. It was dug out from a bluish gray mudstone bed situated at about 100 meters above the Chinshui (Kinsui) Shale and making the small hill near Shantahu in the Chutung Oil Field. The lithology of the exposed formations in the area are shown in Fig. 2. The lower part of Cholan Formation is composed chiefly of beds of loose, yellowish brown sandstone with bluish gray mud-

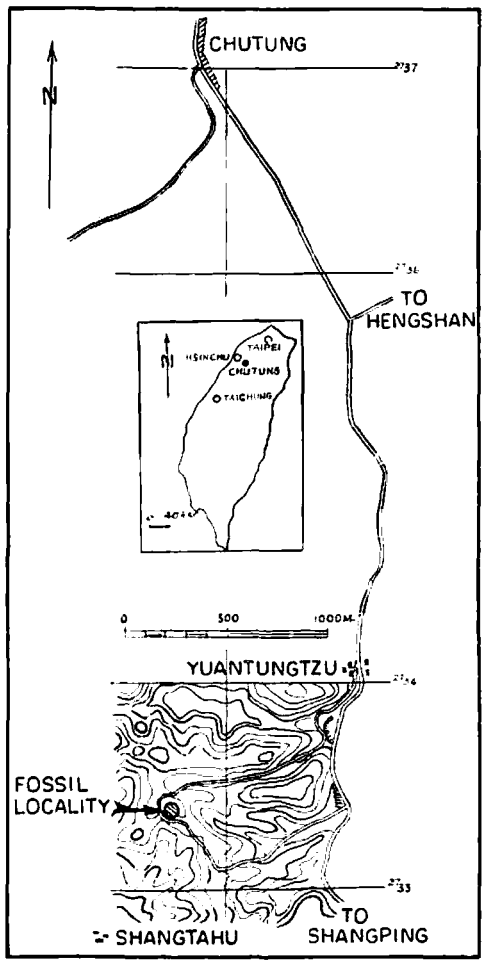


Fig. 1. Map showing the fossil locality (after MENG, 1961).

stone. The stratigraphic position of the Cholan Formation is shown in Fig. 2, from which it may be noticed that it lies with conformity upon the Chinshui Shale. On the basis of the fossil Foraminifera and Mollusca the age of the Cholan Formation is early Pliocene.

*Description of the tympanic*:—The tympanic bone (Pl. 22, figs. 1-3) was found in association with many large whalerib bones, marine molluscs, shark's

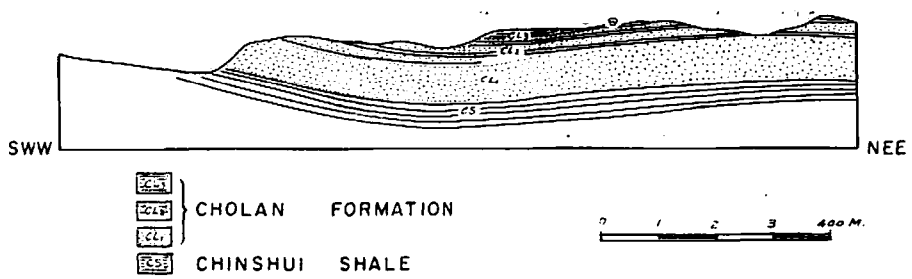


Fig. 2. Geologicsection near the fossil locality (after MENG, 1961).

teeth, crabs, and foraminifers. In this respect the occurrence of *Balaenoptera taiwanica* is quite similar to some of the tympanic bones from the Tatsunokuchi Formotion (HATAI, et al., 1963).

### Measurements of the tympanic bone

Greatest longth of bulla .....11.5 cm
Greatest width of bulla ..... 7.8 cm
Greatest thickness of bulla..... 6.6 cm
Distance from antero-internal end of tympanic to anterior end of involucrum ..... 1.5 cm

This right tympanic shows the form of the tympanic cavity which is bounded by the overarching outer lip, and the size as given in the table and the direction of its anterior outlet or tympanic aperture of the eustachian canal are quite characteristic.

*Remarks*:—This specimen resembles *Balaenoptera physalus* (LINNAEUS) (Pl. 22, figs. 4-6) in the relative thickness of the convex and the concave portions of the involucrum, in the outline of the eustachian end of the cavity. in the position of the posterior conical apophysis, and in the general outlines of the tympanic as a whole. However, the present one is distinguishable from that species by that the shape is rather renal and of courie-shall form with narrow tympanic cavity. The thick convex involuted portion of the tympanic, orinvolucrum, is unequally depressed on the overarching outerlip (Pl. 22, fig. 3).

A narrow and gentle depression (Pl. 22, fig. 1) extend along the columella from the anterior part to the posterior portion and near the inner lip.

The dorsal surface of the involucrum is almost smooth an gently convex (Pl. 22, fig. 2), and maintains more uniform breadth from the anterior to the posterior end (Pl. 22, fig. 1).

The surface of the middle part of the inner lip is gently concave and with many very weak grooves, all coverging towards the cavity.

The anterior process of the right tympanic, which unites with the periotic, is broken at the level of the outer lip. The anterior portion shows abruptly the limbation of the superior face. The next furrow is a distinct deep groove between the *processus sigoideus* and the so-called posterior conical apophysis. The posterior conical apophysis is not so well developed as in *Balaenoptera physalus* (LINNAEUS) but is rounded slightly above the superior face of the involucrum.

The posterior part projects mainly from the involucrum, although the outer lip posterior to the conical apophysis contributes to the thin edged outer margin.

The tympanic cavity is continued

forward to the anterior end of that bone and the outlet is relatively narrower than in *Balaenoptera physalus* (LINNAEUS).

Although the specimen is similar to the ear bone of *Balaenoptera physalus* (LINNAEUS), figured and described by YAMADA (1953) and with the Recent specimen from the Antarctic Ocean (IGPS, Coll. Cat. No. 85968), the present one differs from that species in the abrupt limbation and distinct deep furrow on the superior surface of the involucrum, gentle depresion and very weak grooves on the middle part of the inner lip, and narrow tympanic cavity.

As KELLOGG (1924) said, the characters derivable from the tympanic bone are sufficiently diagnostic to be used as a guide in the determination of species. The peculiar features of the tympanic described above are sufficiently marked to justify its being named as distinct species.

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## Explanation of Plate 22

Figs. 1-3. Right side of the tympanic bone of *Balaenoptera taiwanica*, new species, Holotype, ×2/3, from Shantahu, Chutung-Chen, Hsinchu-Hsien, Taiwan. 1, Superiorvew, notice the longitudinal groove; 2, External view, notice the abrupt limbation at the anterior portion, deep groove and the so-called posterior conical apophysis; 3, Interior view, notice the narrow tympanic cavity.

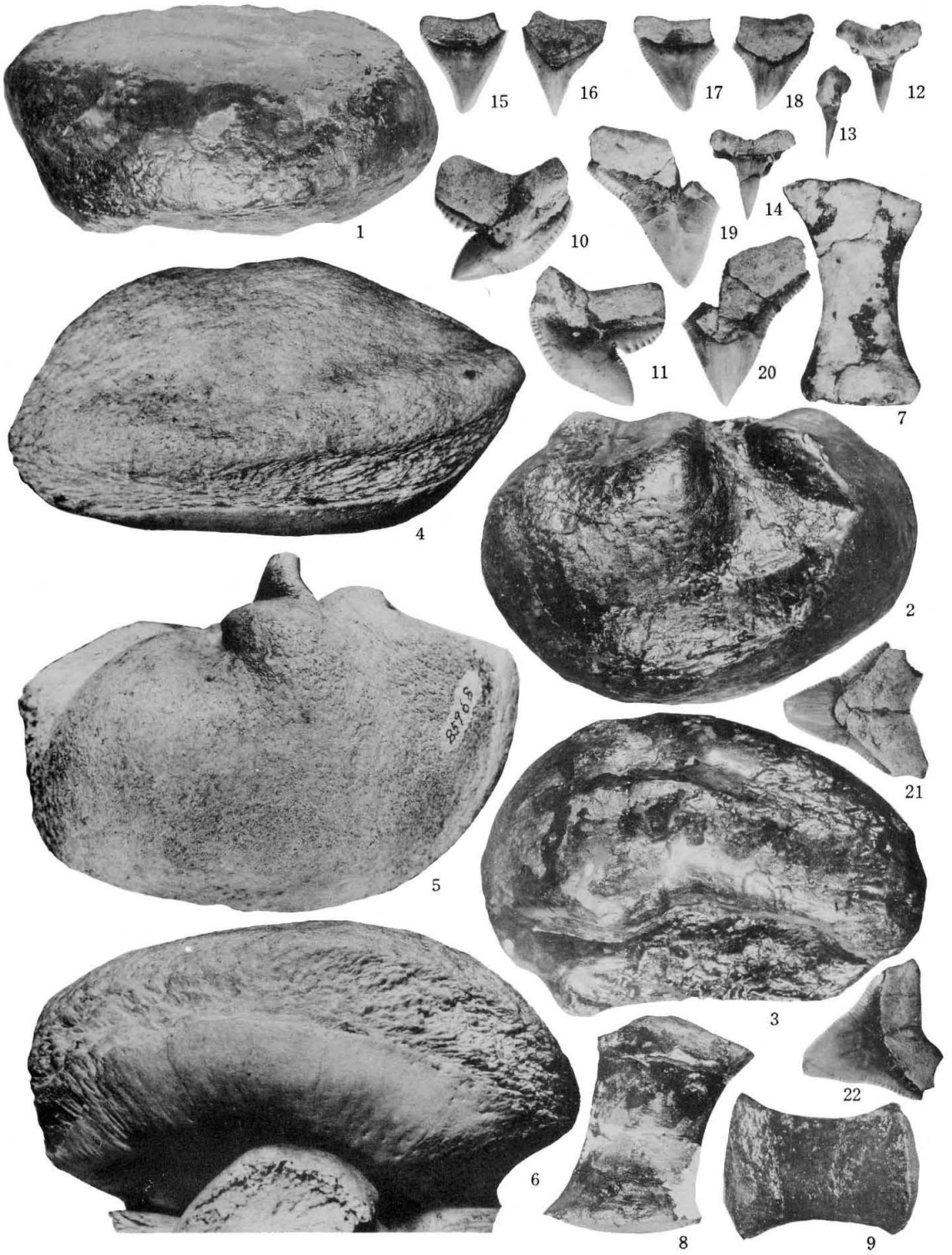
Figs. 4-6. Left side of the tympanic-periotic bone of *Balaenoptera physalus* (LINNAEUS). IGPS, Coll. Cat. No. 85968, ×2/3, from Antarctic Ocean, Recent.

Figs. 7-9. Digit bone probably of *Balaenoptera taiwanica*, new species, ×1/2, from same locality as holotype.

Figs. 10-11. *Galeocerdo aduncus* AGASSIZ. (lower lateral teeth). ×1, from same locality as holotype. 10, Anterior view; 11, Posterior view.

Figs. 12-14. *Isurus hastalis* (AGASSIZ). (lower lateral tooth). ×1, from same locality as holotyye. 12, Anterior view; 13, Side view; 14, Posterior view.

Figs. 15-22. *Carcharhinus gangeticus* (MÜLLER and HENLE). ×1, from same locality as holotype. 16, 18, 20, 21, Anterior views; 15, 17, 19, 22, Posterior views.




KUMAGAI phota.

wan. *Shih Yu Tung Hsin, No. 220*, p. 2–4, figs. 1–7, (in Chinese).

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|---|---|---|---|
| Chihshui Shale | 錦水頁岩 | Hsinchu-Hsien | 新竹県 |
| Cholan Formation | 卓蘭層 | Shantahu | 上大湖 |
| Chutung-Chen | 竹東鎮 | Toukoshan Formation | 頭嵙山層 |

Trans. Proc. Palaeont. Soc. Japan, N. S., 61, pp. 188-190, pl. 23, April 10, 1966

# 501. ON THE GENUS *TILIA* FROM THE *WOODWARDIA* ZONE OF HOKKAIDO, WITH DESCRIPTION OF TWO NEW SPECIES*

SEIDO ENDO

*Tilia* 属には，現生種と化石種と合せて 52 種ばかりある。そのうち現生種はことごとく北半球の温帯に限られて居る。化石種は全部で 22 種ある。白亜紀からは確実なものは知られていないが，新生代には多く，古第三紀層からは約 10 種，新第三紀層及び第四紀更新世からは 12 種知られている。

今回は始新世のもの *Tilia eojaponica* ENDO と中新世のもの *Tilia protojaponica* ENDO とを記載する。両者は共に現生種 *Tilia japonica* SIMONK の祖先型と見られるものである。

遠藤誠道

The genus *Tilia* comprises 52 species, of which 22 occur as fossils (LAMOTTE, 1952, pp. 342-343) and 30 as living species (LEE, 1935, pp. 807-818, pls. 226, 227). Occurrence of living species is limited to the temperate regions of the northern hemisphere, including about 20 species and several varieties known in China.

As to the geologic age of the fossil species, 10 species belong to Paleogene and 12 to Neogene and Pleistocene, although some doubtful species are found in Cretaceous sediments (HOLLICK, 1930, p. 106, pl. 82, fig. 3).

The genus *Tilia* is identified by its leaves which are heart-shaped with one side developed better at the base. Margin of the leaves is usually serrated and strongly glandular-tipped. Flowers are arranged in a nearly radial cluster (cyme) on a long common stalk which is provided with a characteristic long and narrow leafy bract.

* Received July 9, 1965; read Jan. 24, 1965 at Tokyo.

The present paper describes two new species, *Tilia eojaponica* ENDO of Eocene and *Tilia protojaponica* ENDO of Miocene, both being regarded as ancestral forms of a living *Tilia japonica* SIMONK.

## *Tilia eojaponica* ENDO, n. sp.

Pl. 23, Figs. 1 and 2

*Description*:—Leaves simple, nearly orbicular in shape; tip prolonged acuminate; base deeply cordate, margins denticulate with glandular tip; length ±6 cm; width ±6 cm; petiole slender 1.5 cm preserved; palmately nerved with a strong midrib and usually 2 pairs of lateral primeries. The midrib stoutest; from it diverge 4 pairs of alternate or subopposite secondaries at angle of about 40°, runing directly to the margin or arching slightly toward the tip. The first pair of lateral primaries is weaker than that of the first pair; tertiary venations and areolation are obscure; texture firm.

*Remarks*: — The present species is quite similar to the existing *Tilia japonica* SIMK. in shape and nervation of the leaves. The former is less serrate than the latter. The primary nervations of the genus *Tilia* are generally slender and stout. The characteristic nervations are easily distinguishable from other genera. The genus *Tilia* includes 52 species, (22 species occur as fossils and 30 as living species). The present species was collected from the *Woodwardaia* zone of the Shin-yubari colliery, Yubari city. It is probably a remote ancestor of existing japanese *Tilia japonica* SIMK.

*Tilia protojaponica* ENDO, n. sp.

Pl. 23, Fig. 3

Seido ENDO: 1955 Icones of fossil plants from Japanese Islands, pl. 27, fig. 1.

*Description*:—Leaves nearly orbicular in shape; tip not preserved (probably prolonged slender tip); base deeply cordate; length ±5 cm; width 6 to 6.5 cm; petiole slender ±4 cm; margin denticulate with glandular tip. Palmately nerved with a stout midrib and usually 3 pairs of lateral primaries; the midrib stoutest; from it diverge about 3 pairs of alternate or subopposite secondaries at angles of about 35°, running directly to the margin or arching slightly toward the tips; the first pair of lateral primaries give off several (usually 4) abaxial secondaries; the second pair of lateral primaries is weaker and thinner than the first pair; tertiaries and areolations are obscure; texture firm.

*Remarks*:—The present material is quite similar to the existing *Tilia japonica*. This is more closer to *Tilia japonica* than *Tilia eojaponica* in shape and nervation of the leaves. The latter is less serrate than the former. The nervations of the genus *Tilia* are generally slender and stout. The characters are easily distinguishable from other similar genera in shape and nervation of the leaves. *Tilia* includes 52 species (22 as fossils and 30 as living species); and the present fossil is more likely to existing *Tilia japonica*, and this species must be an ancestor of *Tilia japonica* SIMK.

The material was collected by T. YAGI (ex-professor of Tohoku University) from Minase-mura, Okatsu-gun, Akita Prefecture, Northern Japan. (see Fig. 1, pl. 27 in "Icones of Fossil Plants from Japanese Islands" by S. ENDO, 1955.)

*Tilia japonica* SIMONK

Pl. 23, Figs. 4 and 5

Seido ENDO: 1940 A Pleistocene Flora from Shiobara, Japan. The Science Report, Tohoku Imp. Univ. Second Series Vol. XXI, No. 1, p. 68, pl. 1, fig. 1; pl. 5, figs. 7, 19.

*Description*:—Leaves cordate or orbicular-cordate, lamina somewhat inequilateral, apex caudate-acuminate. Length and width 5 to 9 cm. Margins denticulate with strongly glandular tip. Petiole slender, 3 to 5 cm long. Texture firm. Palmately 5 or 7 nerved, acordrome; secondary nerves of middle primary in 5 to 7 alternate or subopposite pairs and diverging from the primary at angle of 40 ± degrees, those of other primaries 3 or 4 in number issuing from the lower side of the primaries, camptodrome; tertiary nerves somewhat regularly arranged, straight or curved outwards, and connect the secondaries; areolation obscure. Bract entire, oblanceolate or oblong-oblaoceolate; reti-

culately nerved; 4 to 7 cm long with a short (1 cm long) peltate stalk.

*Remarks:* — The present material agrees quite well with the existing species. This species which now flourishes in the Japanese Islands and China, grow luxuriantly at the altitudes of about 800 to 1,300 meters above sea level in central Hondo. According to K. MIYABE and Y. KUDO (1929, p. 32), its distribution in Hokkaido is limited to its main-island and the islet of Oku-shiri; it grows usually on soils rich in moisture, associated with other deciduous tree such as *Kalopanax septenlobum* KOIDZ., *Quercus crispula* BL., *Fagus crenata* BL., *Ascer pictum* THUMB., *Cercidiphyllum japonicum* SIEB. et ZUCC., etc.

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|---|---|---|---|
| Shin-Yubari | 新夕張 | Minase-mura | 皆瀬村 |
| Okatsu-gun | 雄勝郡 | Numata-mura | 沼田村 |
| Uryu-gun | 南龍郡 | Shiobara Spa | 塩原温泉 |

## Explanation of Plate 23

Fig. 1. *Tillia eojaponica* ENDO ×1.
Locality: Shin-Yubari, Yubari city, Hokkaido (*Woodwardia* zone, Middle Eocene).

Fig. 2. *Tilia eojaponica* ENDO ×ca. 1.
Locality: Same as Fig. 1.

Fig. 3. *Tilia protojaponica* ENDO ×1.
Locality: Minase-mura, Okatsu-gun, Akita Prefecture (Upper Miocene).

Fig. 4. *Tilia japonica* SIMONK ×1.
Locality: Shiobara Spa, Tochigi Prefecture (Lower Pleistocene).

Fig. 5. *Tilia japonica* SIMONK ×1.
Living leaf, for comparison.
Locality: Numata-mura, Uryu-gun, Hokkaido.

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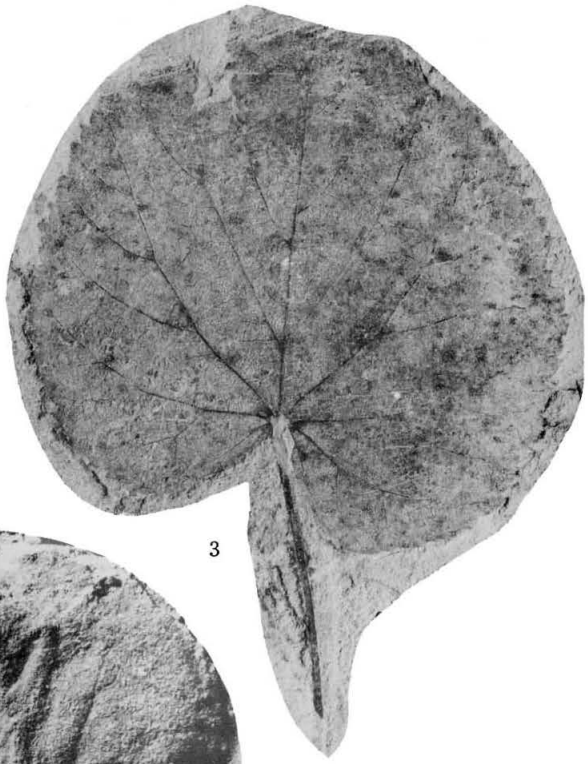

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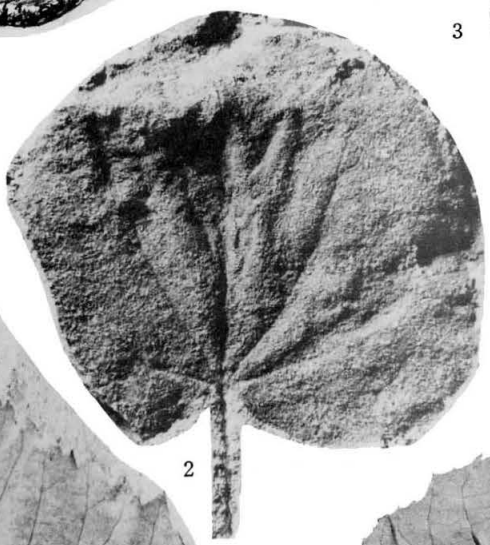

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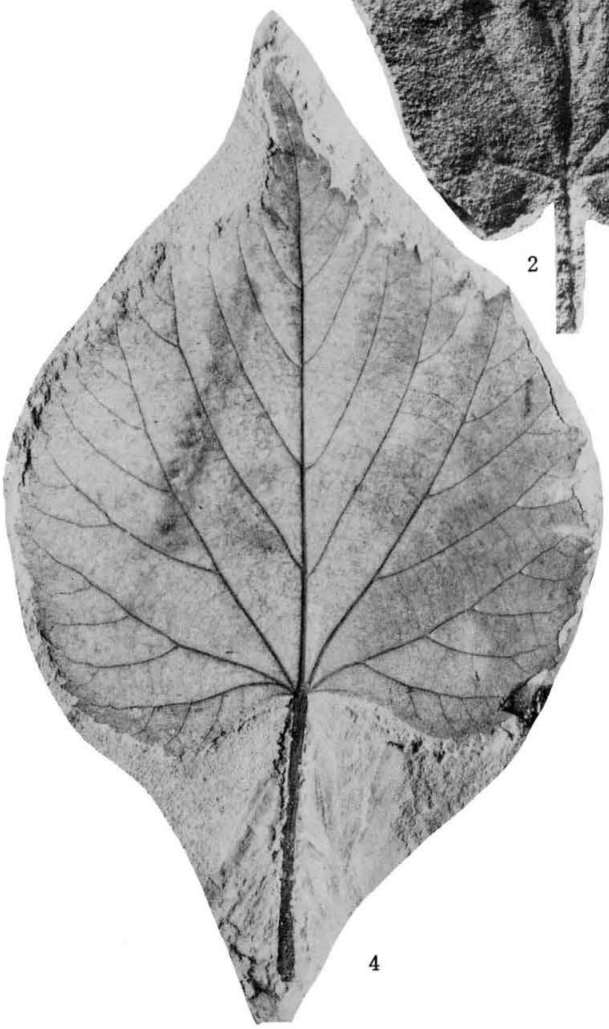

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Trans. Proc. Palaeont. Soc. Japan, N.S., No. 61, pp. 191-200, pls. 24, 25, April 10, 1966

# 502. SHELL STRUCTURE OF JAPANESE SMALLER FORAMINIFERA PART 2. *PARAROTALIA NIPPONICA* (ASANO, 1936)*

HIROSHI UJIIÉ

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日本産小型有孔虫類の殻構造：その 2. *Pararotalia nipponica* (ASANO, 1936)：*Rotalia nipponica* ASANO の内部構造をくわしく記載し，それが *Pararotalia* 属に入るとした。また，その構造と文献の検討より，同属にみられる諸性質，特に歯板とその周辺部の従来の記載について，大いに修正すべき点を見出した。なお，*Rotalia ozawai* ASANO, 1951, が本種の幼小型にすぎないことも，殻構造や現世堆積物中の産状から確めた。　　氏家　宏

## Materials and Occurrence

Since *Rotalia nipponica* ASANO, 1936, was described from the Pliocene Tomioka Formation in Kanagawa Prefecture, it has been found to be a species common in the Neogene to Quaternary strata or in the Recent shallow water sediments of the Japanese Islands and their adjacent areas. Its geographic distribution seems to be restricted to the region south of Honshû, although YOSHIDA (1958) reported it from the Miocene Okawa and Ikushima Formations of western Hokkaidô. His figure shows clearly many different characters from those of the true "*Rotalia*" *nipponica*. So far as the writer knows, its geologic occurrence appears to be limited to the strata younger than the late Pliocene. ASANO (1951) regarded *Rotalia ikebei* INOUE and NAKASEKO, 1951, from the Miocene Sakuma Formation of Chiba Prefecture, to be an aberrant form of this species. The present Miocene "*Rotalia*", however, has many features different from "*R.*" *nipponica*; e. g. rounded transverse periphery of test, *Ammonia*-type aperture, no large internal tooth-plate, etc.

*Rotalia ozawai* ASANO, 1951, described first from the Pliocene Sawane Formation in Niigata Prefecture, has been reported from various localities extending from Honshû to the seas of South China and the Philippine Islands. As fossil it occurs mostly from the Pliocene and later deposits as well as in the shallow water sediments.

From the writer's experience, the two species mentioned above are always found in association in the same sample of sediments. Such a co-existence in specimens from Taiwan was noticed by HUANG (1964) between *Pararotalia ozawai* (=*Rotalia ozawai* ASANO) and *Pararotalia taiwanica* (NAKAMURA), which is really "*Rotalia*" *nipponica* according to the writer's opinion. On the other hand, the figure of HUANG's *Ammonia nipponica* evidently shows that it may belong to a distinct genus. HUANG attributed this co-existence to a phylogenetic intergradation of morphology between "*Para-*

* Received Oct. 4, 1965; read Jan. 24, 1965 at Tokyo.

*rotalia ozawai*" and "*Pararotalia taiwanica*". In the writer's observations on the co-existence of those two species from Japan, the coarser fractions of sediments contain many specimens of the so-called "*Rotalia*" *nipponica* but none of the so-called "*Rotalia*" *ozawai*, whereas the latter "species" is exclusively found in the finer fractions of the same sediments. Unfortunately such a relation between the test-size and the particle-size of the sediments had not been recognized in any published reports on these "species". An exceptional case is TAKAYANAGI's investigation (1955) on the distribution of the foraminifera in the inlet of Matsukawa-ura and its adjacent sea. Judging from the list of the foraminifers and their distribution shown by him and the data of mechanical analysis of the same sediments made by MII (1955), it is evident that "*Rotalia nipponica*" and "*R. ozawai*" occur very commonly and always in association in the Isobe facies, namely off-shore facies of Matsukawa-ura, and less commonly in the Matsukawa-minato subfacies, namely the entrance area of Matsukawa-ura. Within the latter area, "*R. ozawai*" is found only in areas of medium- to fine-grained sands, while the occurrences of "*R. nipponica*" without "*R. ozawai*" are restricted to areas of medium- to coarse-grained sands. At Loc. L-3 of coarse-grained sands, there is reported an abundant occurrence of "*R. nipponica*", amounting to 2.7 per cent of the total specimens of foraminifera.

The above-mentioned field-evidence that "*Rotalia ozawai*" is merely a young form of "*Rotalia nipponica*" is supported by the detailed investigation on the test-morphology and its internal structure as stated in later paragraphs. Many specimens of both "species" in the same sediment-sample from the sea coast of Katase in Kanagawa Prefecture were dissected or sectioned. The results were re-examined by observations on many topotypic materials of "*R. nipponica*" and on the holotype of "*R. ozawai*" through the courtesy of Prof. K. ASANO.

The detailed re-examination not only clarifies the true generic position of these "*Rotalia*" but also suggests the necessity for a re-consideration of the generic definition of *Pararotalia*, to which both "species" belong.

## Description

Family Rotaliidae EHRENBERG, 1839

Genus *Pararotalia* LE CALVEZ, 1949

*Pararotalia nipponica* (ASANO, 1939)

(Text-figs. 1-3; Pl. 24, figs. 1-7; Pl. 25, figs. 1-5)

*Rotalia nipponica* ASANO, 1936, p. 614, pl. 31, figs. 2a-c. —ASANO, 1951, p. 15, text-figs. 112-114. —TAKAYANAGI, 1955, pl. 2, fig. 14. —MATSUNAGA, 1963, pl. 45, figs. 9a-c.

Not *Rotalia nipponica* ASANO. —YOSHIDA, 1958, p. 270, pl. 3, figs. 6a-c.

Not *Ammonia nipponica* (ASANO). —HUANG, 1964, p. 54, pl. 2, fig. 1.

*Rotalia ozawai* ASANO, 1951, p. 15, text-figs. 115-117. —TAKAYANAGI, 1955, pl. 2, fig. 17.

"*Rotalia*" *ozawai* ASANO. —GRAHAM and MILITANTE, 1959, p. 100, pl. 15, figs. 6-8.

*Neorotalia ozawai* (ASANO). —POLSKI, 1955, p. 576. —WALLER, 1960, p. 1180.

*Pararotalia ozawai* (ASANO). —HUANG, 1964, p. 56, pl. 1, figs. 14a-c.

Cf. *Rotalia ozawai* ASANO. —MATSUNAGA, 1963, pl. 46, figs. 9a-c.

*Pararotalia taiwanica* (NAKAMURA). —HUANG, 1964, pp. 56-58, pl. 2, figs. 2a-c.

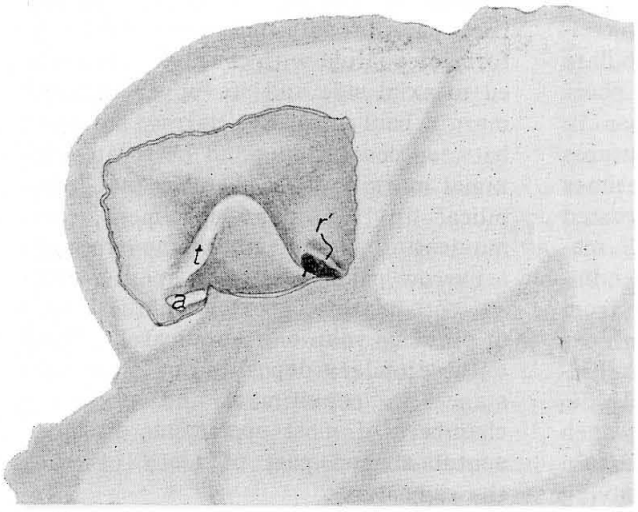
Cf. *Rotalia taiwanica* NAKAMURA, 1937, p. 141, pl. 12, figs. 6a-c.

*Description*: Test free, biconvex to

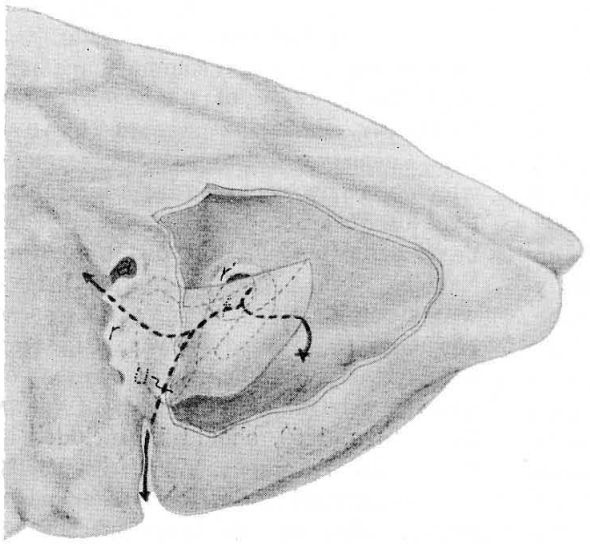
plano-convex, low trochospiral coil of three volutions; periphery weakly keeled, peripheral outline slightly lobulate or smooth in adult, but with a short and solid spine on each chamber in many young specimens; spiral sutures limbate and flush on surface, sometimes remaining spinate protrusions encrusted with secondary deposition of shell materials in earlier parts; chambers numerous, increase with shell-growth from six or seven up to nine and half per one volution; intercameral sutures limbate and flush on spiral side, deeply depressed on umbilical side, forming open ventral fissures; intercameral septum imperforate, secondarily double, leaving open space on umbilical side, but perfectly closed on spiral side, towards which anterior lamella thins out; spirothecal wall distinctly perforate, of radially fibrous calcite; spiral surface smooth but umbilical one sometimes with secondary deposition of clear shell materials in form of very small buttons; umbilicus with open umbilical-ventral fissures along intercameral sutures and large central plug throughout, umbilical plug extending inward to proloculus, forming a single clear and imperforate pillar of shell meterial without canal; aperture interiomarginal-basal arch on umbilical side, its spiral end slightly extending towards shell-periphery, with weakly indented and distinct rim along its distal (dorso-peripheral) margin; intercameral foramen areal, comma-shaped, converted from aperture by attachment of tooth plate at its proximal margin, remaining rim intact; tooth plate imperforate, extending from proximal margin of last intercameral foramen to distal (peripheral) margin of aperture, adhering its basal (umbilical) margin on proximal margin of spirothecal wall of last chamber throughout whole chamber-length, developing its upper (dorsal) free part broadly but very thinly in form of spatula with concave face turned to axial side and its upper anterior margin bent inwardly; narrow slit open between central plug and perforate proximal margin of last chamber (not "umbilical lip") in many specimens, communicating with chamber-lumen through a narrow passage between spatula-shaped tooth plate and extra-umbilical wall of previous volution; umbilical slit closed with secondary deposition of shell substance in penultimate and preceding chambers of most specimens, dissolved spatula-shaped part of tooth plate at the same time.

*Hypotypes*: Reg. Nos. 5887 to 5903, Nat. Sci. Mus. from the sea coast of Katase, near the boundary of Kamakura City and Fujisawa City, Kanagawa Prefecture (Lat. 35°18′N; Long. 139°29.5′E).

*Remarks*: In 1943, ISHIZAKI pointed out that the "aperture" (really last intercameral foramen) of *Rotalia nipponica* ASANO is areal comma-shape just the same as those of *Calcarina calcar* D'ORBIGNY, *Calcarina venusta* (BRADY), and *Calcarina taiwanica* (NAKAMURA), which are now regarded as representatives of *Pararotalia*. He followed FINLAY's definition of the genus *Calcarina*. Namely, FINLAY (1939) accepted GALLOWAY's opinion (1933) that *Nautilus spengleri* GMELIN, 1788, which was designated subsequently as the type species of *Calcarina* D'ORBIGNY, 1826, by PARKER and JONES, 1859, should be included in the genus *Tinoporus* MONTFORT, 1808, and recognized *Calcarina calcar* D'ORBIGNY, 1826, as the type species by tautonymy. Differing from GALLOWAY's opinion, however, the validation of the genus *Tinoporus* was doubted by CUSHMAN (1921) and suppressed by LOEBLICH and TAPPAN (1962). The latter authors



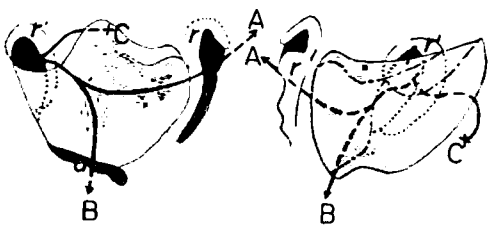

Text-fig. 1. Specimen dissected at spiral part of spirothecal wall of the last chamber, to show a very thin internal tooth plate of spatula form; *a*: aperture, *f*: last intercameral foramen, *r'*: its rim, *t*: upper and anterior margin flared inwardly of tooth plate; Reg. No. 5890.




Text-fig. 2. Spiral-apertural view of specimen dissected at spiral-anterior part of the last chamber-wall, to show the situation of the tooth plate. Thick arrow line indicates the connection between the inside and the outside of the test; *a*: aperture, *r*: its rim, *f*: last intercameral foramen, *r'*: its rim; Reg. No. 5891.

concluded that the type species of *Calcarina* is *Nautilus spengleri* GMELIN, because *Calcarina calcar* was "included in the Modèles, but neither described nor figured, hence a *nomen nudum*, and in spite of the tautonymous name cannot be the type species." If it validated later, *Calcarina calcar* may belong to *Pararotalia* as suggested by REISS and MERLING (1958) and HOFKER (1960).

According to the writer's observation on the holotype of *Rotalia ozawai* ASANO, 1951, this specimen shows somewhat chalky appearance so that the sutures on its spiral side are obscure as seen in the original figure. This situation was also reported by POLSKI (1959) and by WALLER (1960) in many specimens from off China. If it is due to preservation during fossilization as POLSKI believed, this species has the same characters as *Rotalia nipponica* ASANO, 1936, except for the smaller size of test and the peripheral spines of the former species. As stated already, the smaller and spinate *ozawai* occurs almost always together with the larger and non-spinate *nipponica*, if there was no sorting effect which separated those specimens into these two "species" after death, although the smaller but non-spinate forms are found exceptionally (for example, Pl. 1, fig. 3; GRAHAM and MILITANTE, 1959, Pl. 15, fig. 6). When the adult specimen of




Text-fig. 3b. Text-fig. 3a.

Text-fig. 3. Schematic figure showing morphology of the tooth plate and its relation with the aperture and the intercameral foramen; 3a: same view as Text-fig. 2; 3b: view from proximal (axial) side; *u*: umbilical slit between umbilical end of chamber wall (or umbilical margin of tooth plate) and spirothecal wall of the previous volution; other abbreviations same as in Text-fig. 2.

*nipponica*-type is immersed in glycerin or sectioned near at the spiral surface, some peripheral spines are observed to be preserved in the earlier parts. Such an ontogenetic degeneration of the peripheral spines as seen in *Pararotalia nipponica* (ASANO) seems to be the reverse to what LOEBLICH and TAPPAN (1957) supposed in the phylogenetic development of spines in their lineage from *Pararotalia macneili* LOEBLICH and TAPPAN to *Pararotalia armata* (D'ORBIGNY). This argument may be not so important, because the spines of this genus are caused only by the chamber-shape.

NAKAMURA (1937) described *Rotalia taiwanica* NAKAMURA from the Upper Byôritsu beds (Pliocene) of West Taiwan and remarked as follows: "This species closely resembles *R. nipponica* ASANO, but differs from it in lobulated periphery and fewer chambers." They may be conspecific judging from his obscure figure and description and from the "re-examination" by HUANG (1964), who appears to have misidentified the true *Rotalia nipponica* as *Rotalia taiwanica*. It seems to be necessary to re-study the topotypic materials of the latter species in the light of modern taxonomy.

## Comments on the Generic Definition of *Pararotalia*

This genus was restudied in detail by LOEBLICH and TAPPAN (1957) using several species including the type species. In the following year (1958), REISS and MERLING published their work on this genus from the view-point of internal structure and pointed out some discrepancies from LOEBLICH and TAPPAN's emendation. Two important different features are concerned with the composition of the intercameral septal wall and the tooth plate.

What the intercameral septal wall is secondarily double was revealed by REISS and MERLING and also by HOFKER (1960) who, however, denied it later (1962). This feature seems to have been accepted in a synthetic text-book by LOEBLICH and TAPPAN (1964), because they place this genus in the subfamily Rotaliinae, a procedure different from their previous view. It is better, the writer thinks, that this character should be more clearly stated in the generic description of *Pararotalia*, although the two lamellae of the septal wall sometimes adhere to each other so closely that the open space between them or even their boundary can not be recognized, especially near the spiral surface of the test.

Concerning the tooth plate and its adjacent parts, REISS and MERLING (1958) criticized LOEBLICH and TAPPAN's description (1957) as follows: "What they have described as secondary umbilical plates in *Pararotalia* refers to

actual chamber walls; the internal septum described in the latter genus by those authors is formed by the tooth-plate. — The toothplates are primarily formed structures and no secondary umbilical plates are formed in *Pararotalia*." At least parts of the present discussion seem to be adopted in the text-book by LOEBLICH and TAPPAN (1964), although the diagnosis of the tooth plate is too simple.

These authors, however, retained a part of the previous description (1957) as " —, umbilical region of each chamber partially covered by secondary umbilical plates" and this was changed slightly as follows: " —, umbilical region of each chamber partially covered by umbilical flap; —." REISS and MERLING (1958) rated this umbilical "plate" as merely a part of the chamber wall but such a treatment may be superficial. According to the writer's observation on *Pararotalia nipponica*, the secondary deposition of shell materials occurs like plaster over an umbilical slit between the spirothecal wall of the previous volution and the proximal (axial) end of each chamber wall of the following volution. It is not a mere chamber wall and its remnant, as evidenced after the dissection of the wall, may be shaped like "plate" or "flap". This filling-up is already seen at the penultimate chamber in many cases and rarely even at the last chamber, although the umbilical slit of the last or often the penultimate chamber is usually open.

REISS and MERLING (1958) seem to overlook the presence of this kind of umbilical slit ("umbilical labial aperture"), which can not be seen in the dissected specimen shown by these authors (Pl. 5, figs. 17-20), because it is screened from view by the tooth plate (probably its basal part, strictly speaking).

The basal (umbilical) margin of the tooth plate adheres to the proximal (axial) and of the spirothecal wall of the last chamber and the upper (dorsal) margin develops highly so that there is developed an internal partition within the last chamber. Although LOEBLICH and TAPPAN (1957) recognized such a role of the tooth plate calling it internal septum, they overlooked its poreless structure, which is characteristic in the true tooth plate and, besides, an important discontinuity between the proximal margin of chamber wall and the umbilical margin of the tooth plate (1957, Pl. 1, fig. 2; 1964, Fig. 486-2). In the same figure of the type species (*Rotalia inermis* TERQUEM), both authors showed the mode of tooth plate which runs from the proximal margin of the last intercameral foramen towards the anterior side within the last chamber but is cut off at a half distance of the chamber-length and never reaches the aperture. Previously the writer (1963) also reported a similar situation of the tooth plate of *Pararotalia murrayi* (HERON-ALLEN and EARLAND). The mode might be caused by the breakdown of the anterior half of the whole tooth plate at the time of dissection. On the other hand, REISS and MERLING (1958) figured the tooth plate of *Pararotalia inermis* (TERQUEM) running from the preceding foramen to the aperture and restricted in its height to be very low. This condition suggests that it might have been made by the partial disolution of the upper free part of an originally higher tooth plate.

There is seen a large difference between LOEBLICH and TAPPAN's opinion and REISS and MERLING's one concerning the shape of the tooth plate of the

same species, *Pararotalia inermis*. If it is supposed that the observations of both authors are actual figures but only a partial remnant of the same shaped tooth plate owing to slightly rough dissection, the true shape of the tooth plate of this type species would be very similar to that of *Pararotalia nipponica*: namely, a very thin tooth plate which starts from the proximal (axial) margin of the last intercameral foramen near the spirothecal wall of the previous volution, then intersects the whole chamber-length attaching its basal (umbilical) margin on the proximal margin of the chamber and its upper (dorsal) part developing broadly in form of a spatula, and reaches to the distal (peripheral) margin of the aperture. The writer believes that many species of *Pararotalia* including the type species should be re-examined with very careful dissection of the chamber wall of the spiral side and with skillful technique of sectioning. Concerning *Pararotalia tuberculifera* (REISS), HOFKER (1960) stated "the toothplate is formed at first at the sutural part of the aperture, then runs over its dorsal part, and flares off at the distal part of the aperture, thus, as REISS believes, forming the poreless part of the double septum in case that a next chamber is formed." Really the tooth plate and REISS's sepal flap are quite different as stated by REISS and MERLING (1958). The "tooth plate" shown by HOFKER in four figures attaches on the distal margin of the foramen and extends within the chamber-lumen towards the anterior side considerably. It resembles REISS's rim or LOEBLICH and TAPPAN's lip, except for its extreme development and, therefore, it may not be a true tooth plate. "Rim" on the anterior side of the foramen never continues to the previous tooth plate attached on the posterior side of the same foramen as revealed in the preceding description (see also Pl. 25, figs. 2 and 3).

## Taxonomic Position of the Genus *Pararotalia*

In a monographic work on *Pararotalia*, LOEBLICH and TAPPAN (1957) stated: "It [*Pararotalia*] does not have radial canals or fissures, nor does it have intraseptal and subsutural canals and thus does not belong to the Rotaliidae" but probably to the Discorbidae. This opinion, however, was denied by REISS and MERLING (1958) who presented several photographs of sectioned tests of *Pararotalia* showing clearly the double intercameral septa. Later, LOEBLICH and TAPPAN (1964) recognized this feature and re-assigned the genus *Pararotalia* as a member of the family Rotaliidae in their new system of foraminiferal classification. Meanwhile, HOFKER (1960) also reported the presence of a double septal wall but later (1962) expressed the opposite view as follows: "the septa between the chambers in *Pararotalia* are simple, and a complicated tooth plate, as is found in *Rotalia trochidaeformis* LAMARCK and in *Streblus beccarii* (LINNÉ), does not occur in *Pararotalia*. — So it must be quite uncertain that *Pararotalia* has anything to do with the Rotaliidae." Instead he stressed on the close relationship between this genus and *Globorotalia* since 1957 and suggested its derivation from the latter genus. REISS (1963) criticised the present view and said that *Globorotalia* has bilamellid wall differing from *Pararotalia*.

Following SMOUT's suggestion (1955), REISS and MERLING (1957) emphasized on the close relationship between *Pararotalia* and some members of the Mis-

cellaneidae and, most recently, REISS (1963) established a new subfamily Pararotaliinae as one of the two subdivisions of the family Miscellaneidae SIGAL, 1952, separating it from the family Rotaliidae. Such a treatment appears to depend upon the original definition of the Miscellaneidae; namely, "Le caractère essentiel est l'absence de corde marginale et donc de tout système canaliculaire longitudinal; il n'y a que des canaux intraseptaux et verticaux (ou radiaux), le plus souvent très développés." In his definition of the family Miscellaneidae, REISS (1963) stated "— Intraseptal passages communicate with tubular vertical, radial and sutural canals, which may be divergent and opening in double rows, or through canals and fissures with grooves (marginal, lateral or divergent (chevron shaped) sutural), or with intramural, lateral and /or marginal cavities which is turn lead into canals." According to REISS and MERLING (1958), "Intraseptal spaces between a previous distal chamber-wall and subsequently built septal flap are not true canals." In *Pararotalia*, therefore, there is no true canal and its intraseptal spaces always remains open towards the outside of the test. The system of intraseptal passages resembles rather that of *Ammonia*, the main member of the Rotaliidae. On the other hand, "two genera of the subfamily Pararotaliinae" (*Cuvillierina* and *Laffiteina*) have well developed and complicate canal-system and, besides, different major construction of test. If *Pararotalia* is considered as a probable but direct ancester of the two genera as REISS thought, therefore, some transitional forms should be supposed between them. These three genera, moreover, possess some considerable differences from the proper subfamily of the Miscellaneidae (i.e. Miscellaneinae) and seem to belong to the other family as treated by many authors.

**Acknowledgements**

The writer was given an oppotunity to examine the type specimens of *Ro-*

Explanation of Plate 24

Fig. 1. Full-grown specimen with smooth peripheral outline; i.e. *nipponica*-type, a: spiral side, b: umbilical side, c: apertural side, ×70; Reg. No. 5887.

Fig. 2. Young specimen with distinctly spinate peripheral outline; i.e. *ozawai*-type, a: spiral side, b: umbilical side, c: apertural side, ×70; Reg. No. 5888.

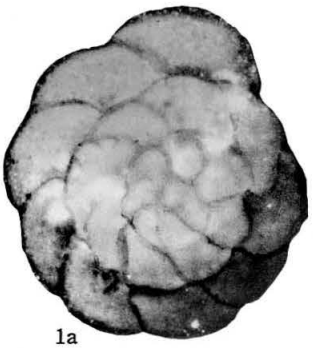
Fig. 3. Rare young specimen with rather smooth peripheral outline: spiral side, ×70; Reg. No. 5889.

Fig. 4. Vertical section of a young specimen, showing the last intercameral foramen with distinct trace of rim (r) and of tooth plate (t), ×150; Reg. No. 5899.

Fig. 5. Vertical section of an adult specimen, in particular, showing the aperture and its adjacent area, where the umbilical spirothecal wall of the last chamber was damaged. ×150; Reg. No. 5898.

Fig. 6. Vertical section of an adult specimen, in particular, showing a partial trace of a very thin and curved tooth plate (t) within the last chamber-lumen and an open umbilical slit (u), ×200; Reg. No. 5897.

Fig. 7. Enlarged photograph of the apertural area of the specimen shown in Fig. 5, showing distinct rim (r), no trace of tooth plate, and open umbilical side of aperture, ×750.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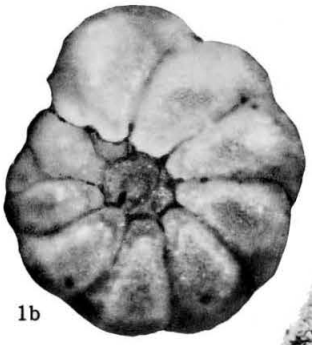
1c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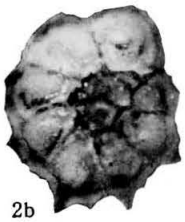
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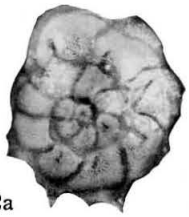
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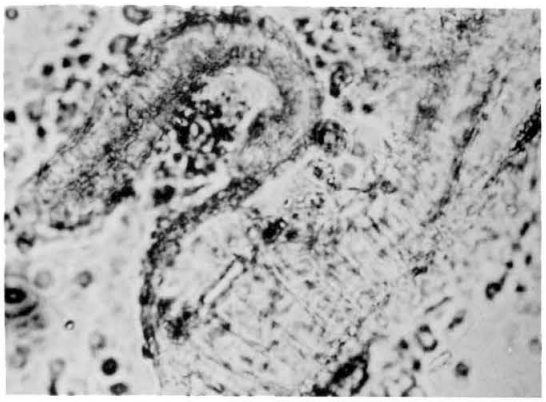
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Isobe facies 磯部相
Katase 片瀬
Matsukawa-minato 松川港
Matsukawa-ura 松川浦

## Explanation of Plate 25

(×150)

Fig. 1. Horizontal section cut near the spiral surface of an adult specimen with smooth peripheral outline, in particular, showing the earlier peripheral spines (s) encrusted by secondary shell substance. It seems that most intercameral septa are composed of a single lamella at a glance, because of the compact adhering of two lamellae and of the upward thinning-out of an anterior lamella ; Reg. No. 5892.

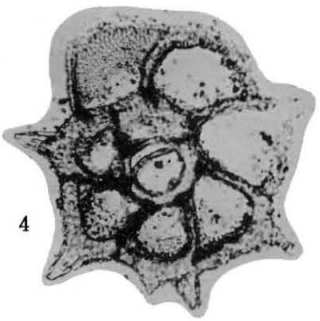
Fig. 2. Horizontal section cut at the more umbilical side than Fig. 1, in particular, showing rim (r) and proxial (axial) trace of tooth plate (t) ; Reg. No. 5893.

Fig. 3. Horizontal section cut at slightly more umbilical side than Fig. 2, in particular, showing proximal and distal traces of tooth plate (t). In this figure, there are recognized the open spaces between the last four chambers. The earlier volutions of this figure, as well as Fig. 2, include the closed spaces (c) between the adjacent chambers and between chambers and central plug ; Reg. No. 5894.

Fig. 4. Horizontal section cut near the spiral surface of a spinate young specimen, in particular, showing solid spines without any internal canal ; Reg. No. 5895.

Fig. 5. Horizontal section cut near the spiral surface of a rare young specimen with smooth peripheral outline ; Reg. No. 5896.

1



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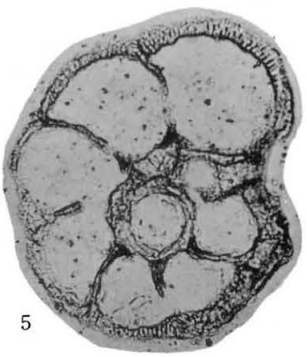

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Trans. Proc. Palaeont. Soc. Japan, N.S., No. 61, pp. 201-206, pl. 26, April 10, 1966

# 503. NOTES ON *AMMONITES BOURGEOISI* D'ORBIGNY FROM THE UPPER CRETACEOUS OF FRANCE*

TATSURO MATSUMOTO

Department of Geology, Kyushu University

フランスの上部白亜系産 *Ammonites bourgeoisi* D'ORBIGNY について：本種の原模本を検討して，6個の総模式標本中の1つを後模式標本に選定し，その図を添えて，くわしく記述した。他の標本もこれと同一種とみなされるが，かなりの範囲の変異を示す。GROSSOUVRE (1894) の記載した標本は D'ORBIGNY より後のコレクションに属するが，上記の後模式標本によく似たものから，変異を示す他の標本に似たものまである。本種は *Protexanites* MATSUMOTO, 1955 の模式種であるが，今回の記述により，同属の特性や他属との関係は一そう明確となつた。

松本達郎

## Introduction

When I discussed the origin of *Texanites* and the evolution of the subfamily Texanitinae, I established genus *Protexanites* designating *Ammonites bourgeoisi* D'ORBIGNY, from the Coniacian of France, as the type-species. As regards this French species DE GROSSOUVRE (1894, p. 73, pl. 13, fig. 2; pl. 14, figs. 2-5) described in detail and gave fine illustration under the generic name of *Mortoniceras*. I myself depended on GROSSOUVRE to understand the diagnosis of the species.

For some reason GROSSOUVRE did not illustrate D'ORBIGNY's original specimens but showed the pictures of the specimens of LE MESLE's subsequent collection. D'ORBIGNY's definition of *Ammonites Bourgeoisianus* was very brief, as quoted here from his original description (D'ORBIGNY, 1850, p. 212): "Belle espèce voisine de l'*Ammonites varians*, mais pourvue de côtes simples, ornées chacune près du dos de trois ou quatre tubercules externes; une carène munie de sillons latéraux. Villedieu (Loir-et-Cher), Saint-Frimbault (Sarthe)." His description was shown as item no. 16 under the Senonian species. Although no specimens were illustrated in his original book, six specimens are now available in the Collection of D'ORBIGNY at the Muséum National d'Histoire Naturelle, Paris. By courtesy of Dr. J. P. LEHMAN and Dr. Jacques SORNAY I have had recently an opportunity of studying them. This paper presents a result of the study.

The six syntypes differ to a considerable extent one from another. One of them which rather shows mean characters, is selected here as the lectotype, as defined below. The others seem to show the extent of variation of the same species. The syntypes have been registered at the Muséum with the same number No. 7181: with suffix A for the five specimens from Saint-Frimbault (Sarthe) and without A for the one from Villedieu (Loir-et-Cher). For convenience'

* Received Nov. 6, 1965; read Nov. 7, 1965 at Chiba.

sake I temporarily call them No. 7181A-1 to No. 7181A-5 and No. 7181-6.

Before going further I acknowledge here my heartfelt thanks to the Director, Dr. J. P. LEHMAN, and Dr. Jacques SORNAY who gave me every facility for the study at the Institut de Paléontologie, Muséum National d'Histoire Naturelle, Paris. The published photographs have been provided there.

**Lectotype of *Ammonites bourgeoisi* D'ORBIGNY**

Pl. 26, Fig. 1a, b; Text-fig. 1a, b

The lectotype, here designated, is No. 7181A-1 of D'ORBIGNY's collection in the Muséum, Paris (illustrated in this paper, Pl. 26, Figs. 1a, b; Text-fig. 1a, b). It is wholly septate and, accordingly, the full-grown whorl must have been considerably large.

The measurements follow:

| | Diameter | Umbilicus | U./D. | Height | Breadth | | B./H. | |
|---|---|---|---|---|---|---|---|---|
| | | | | | costal | intercostal | c. | i. c. |
| | 119.0 | 52.4 | 0.44 | 46.2 | *c.* 45.5 | — | 0.98 | |
| -1/6 vol. | 110.0 | 45.0 | 0.41 | 39.0 | 38.5 | 34 | 0.98 | 0.87 |
| -2/3 vol. | — | — | — | 26.0 | 27.5 | 23 | 1.05 | 0.88 |

As is shown by the above figures, the umbilicus is fairly wide, occupying slightly over 40 percent of the shell diameter. Only the ventral part, outside the ventrolateral tubercles, of the inner whorl is overlapped by the outer. The whorl is subquadrate in cross section, nearly as high as broad in costal section, slightly higher than broad in intercostal section, and broadest above the umbilical shoulder; the umbilical wall is vertical, the flanks are slightly convergent, and the ventrolateral shoulder is sloping.

The ribs are all simple, as far as the observable parts are concerned. They are slightly prorsiradiate; some are nearly straight, others are slightly flexuous or concave. They are moderately strong and separated by wider interspaces. On the whorl of 120 mm. in diameter there are 24 ribs, of which 20 have umbilical bullae and 4 are slightly shorter and have no bullae. The umbilical bullae are highest somewhat above the shoulder. They are moder-

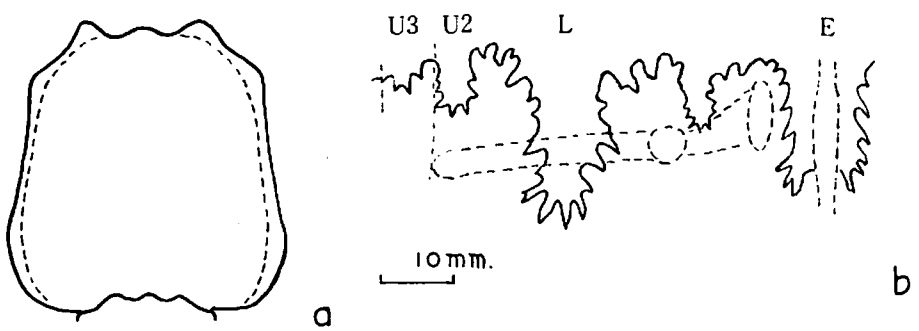



Fig. 1. Lebtotype of *Protexanites bourgeoisi* (D'ORBIGNY).
Whorl-section (a) along a rib at the stage about 1/3 volution behind the anterior end, with an approximate outline of intercostal section (dotted line) immediately behind the rib.

ately strong but may be weak on some ribs. Each rib has a rounded, moderately strong tubercle at the ventrolateral shoulder and an elevated clavus at its ventral end. The median ventral keel on the internal mould is somewhat lower than the top of the ventral clavi. It is slightly wavy, for it is slightly more elevated at the position corresponding to the ventral clavi. The ventral clavus is closer to the ventral keel than to the ventrolaleral tubercle.

The suture is of normal collignoniceratid type. The saddle between E and L is broad, subquadrate in rough outline and divided. The first lateral lobe (L) is situated at about the middle of the flank, somewhat deeper and narrower than the ventral lobe (E), and indistinctly bipartite. The second lateral lobe (U2) is much smaller than L. Its inner margin is approximately situated at the umbilical shoulder. The subdivisions of U3 are small and not numerous.

## Other Syntypes of *Ammonites bourgeoisi*

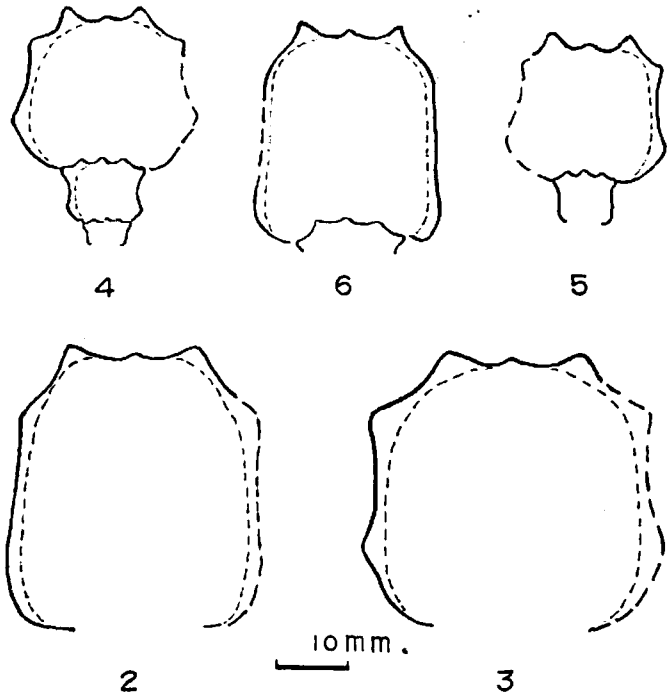
The rest of the available syntypes exhibits essentially the same character as the lectotype but shows a considerable variability in detail. The measurements come at first.

| Specimen | Diameter | Umbilicus | U./D. | Height | Breadth costal | Breadth interc. | B./H. |
|---|---|---|---|---|---|---|---|
| No. 7181A-2 | max.120 | | | | | | |
| ,, | 112.0 | 42.0 | 0.375 | 37 | 36 | | 0.97 |
| No. 7181A-3 | 107.0 | 46.0 | 0.43 | 37 | *c.* 40 | | 1.08 |
| | | | | 34.5 | | 32.8 | 0.95 |
| No. 7181A-4 | max. 70 | 30.5 | 0.435 | — | — | | |
| | — | — | | 21.3 | 26 | | 1.22 |
| | | | | 19.8 | | 21.6 | 1.09 |
| No. 7181A-5 | max. 80 | 31.5 | 0.39 | | | | |
| ,, (-1/2vol.) | — | — | | 19.8 | 21.5 | | 1.08 |
| ,, (-3/2vol.) | — | — | | 8.3 | 8.4 | | 1.01 |
| No. 7181-6 | 74.0 | 27.0 | 0.36 | 28.8 | 26.4 | | 0.91 |

The specimen No. 7181A-2 agrees in many respects with the lectotype, but it has a narrower umbilicus.

The specimen No. 7181A-3 is as widely umbilicate as the lectotype. Its whorl is broader and squarish in section; its ribs are slightly more distant, about 21 per whorl, all equally long and provided with umbilical bullae, without shorter intercalated ones. The umbilical bullae are prorsiradiate and highest at some distance from the umbilical margin. The ribs on the main part of the flank are less prorsiradiate than those of the lectotype, and especially so on the last part of the whorl. The tubercles are also somewhat stronger.

The specimen No. 7181A-4 has the strongest ornament. The ribs are all simple, rigid and distant. The tubercles are also prominent. The costal whorl-section is, accordingly, rather polygonal, being broadest between the umbilical tubercles. In the intercostal section the whorl is subrounded with whorl-height not much different from the breadth. On the inner whorl of this specimen with diameters below 15 mm. the umbilical tubercles are not yet well developed, but the ventrolateral tubercles are very prominent. The ventral clavi are narrow and close to the keel in the




Figs. 2-6. *Protexanites bourgeoisi* D'(ORBIGNY).
Whorl-sections of the syntypes. No. 7181A-2 to 7181A-5 and No. 7181-6.
A restored part is drawn with a broken line.

young stage, but they are prominent and aligned at some distance from the keel on the outer whorl. The keel is faintly undulated on the outer whorl of this and preceding specimens as in the lectotype. In this specimen the saddle between E and L is divided by a comparatively deeper lobule. Otherwise the suture is essentially of the same pattern as that of the lectotype.

The specimen No. 7181A-5, which is less perfectly preserved than others, shows similar whorl-section and ornamentation as the specimen No. 7181A-3, but has a slightly narrower umbilicus.

The specimen No. 7181-6 has a more compressed whorl, more flattened flanks and a narrower umbilicus than the lectotype. The ribs are comparatively numerous, 27 on the outer whorl, less distant, and more prorsiradiate, with more intercalated or branched shorter ribs. The tubercles are weaker than those of the lectotype and other specimens. The highest point of the umbilical tubercle is closer to the umbilical margin.

### Remarks

The lectotype of *Ammonites bourgeoisi* D'ORBIGNY, described and illustrated in this paper, agrees in many respects with the largest illustrated specimen of *Mortoniceras bourgeoisi* (D'ORBIGNY) of GROSSOUVRE (1894, p. 73, pl. 13, fig. 2, Coll. LE MESLE).

GROSSOUVRE (1894) described at length the change of characters with growth and also a certain extent of variation.

The same is true for D'ORBIGNY's original syntypes. As in other well studied species of Texanitinae, such as *Submortoniceras chicoense* (TRASK) (MATSUMOTO, 1959, p. 126, pl. 32, fig. 1; pl. 33, fig. 1; pl. 34, figs. 1-3; figs. 1, 2), there seem to be a considerable extent of variation in the relative size of umbilicus, proportion of whorl-breadth to height, mode of ribbing, such as strength, distance and inclination, and strength of tubercles. It would be reasonable and natural to regard all the above described syntypes of D'ORBIGNY as well as the hypotypes of DE GROSSOUVRE as representing one, fairly variable species, *Protexanites bourgeoisi* (D'ORBIGNY).

The specimen No. 7181-6 is fairly similar to the holotype of *Protexanites bontanti* DE GROSSOUVRE (1894, p. 77, pl. 17, fig. 2), but is still distinguished by its wider umbilicus, less compressed whorl, less flexuous and less crowded ribs, of which branched or intercalated ones are fewer, and stronger and more rounded ventrolateral tubercles. In *P. bontanti* the umbilical tubercles are most elevated at the margin and the umbilical wall is overhung. This character is never seen in any example of *P. bourgeoisi*. Therefore I would regard the specimen No. 7181-6 as an example of *P. bourgeoisi*, although it may be an extreme variant.

Through the study of the original specimens it is noticed that *Protexanites bourgeoisi* (D'ORBIGNY) considerably resembles *Subprionocyclus branneri* (ANDERSON, 1902) [=*Prionotropis cristatum* BILLINGHURST, 1927] (see MATSUMOTO, 1959, p. 109; MATSUMOTO, 1965, p. 50), from the Upper Turonian of England and probably corresponding stage of California and Japan, in the whorl-shape, mode of coiling, ribbing and tuberculation, as well as in the pattern of suture. The distinctive difference is in that the keel is strongly serrate in *Subprionocyclus branneri* while it is almost entire in *Protexanites bourgeoisi*. The faint undulation on the keel of some specimens of the latter may be reminiscent of the strong serration of the former. In *S. branneri* the whorl is somewhat more compressed and the outer and inner ventrolateral tubercles are closer to each other than in *P. bourgeoisi*. In the latter the outer ventrolateral tubercles are shifted outward, elongated longitudinally, and, thus, can be called the ventral clavi. This and the smooth keel are the characteristic features common to the members of the Texanitinae. Anyhow, on the grounds of stratigraphic occurrence and the morphological resemblance, *Protexanites bourgeoisi* is judged to have been derived probably from such a species as *Subprionocyclus branneri*.

The lectotype, over 120 mm. in diameter, and DE GROSSOUVRE's largest specimen, about 150 mm. in diameter, are still septate. Therefore we do not know exactly the characters of the adult body-whorl. It is, however, observed in these and other specimens that the ventrolateral tubercles are relatively more prominent on the inner whorl of an earlier growth-stage. In other words it is little likely that the hypernodosity occurs on the outer whorl of the present species.

The faint serration which may be seen on the keel of some specimens of *P. bourgeoisi* corresponds to each rib as in the species of *Subprionocyclus*. On the other hand *Prionocyclus* and *Prionocycloceras* have minute serrations on the ventral keel which are more numerous than the ribs. The serrations may be apparently obscured on some internal moulds of outer whorls. A con-

fusion which might occur in such a case should not make a reason to unite *Protexanites*, a member of Texanitinae, with *Prionocycloceras*, that of Collignoniceratinae (see MATSUMOTO, 1965).

GROSSOUVRE (1894) mentioned at length the similarity and distinction between the present species and *Ammonites serratomarginatus* REDTENBACHER (1873, p. 110, pl. 25, fig. 2; GROSSOUVRE, 1894, p. 69, pl. 16, fig. 1). The latter has two ventrolateral tubercles in addition to the ventral ones and is the type-species of *Parabevahites* COLLIGNON, 1948. The two species may be parallel derivatives from a common or closely allied ancestor.

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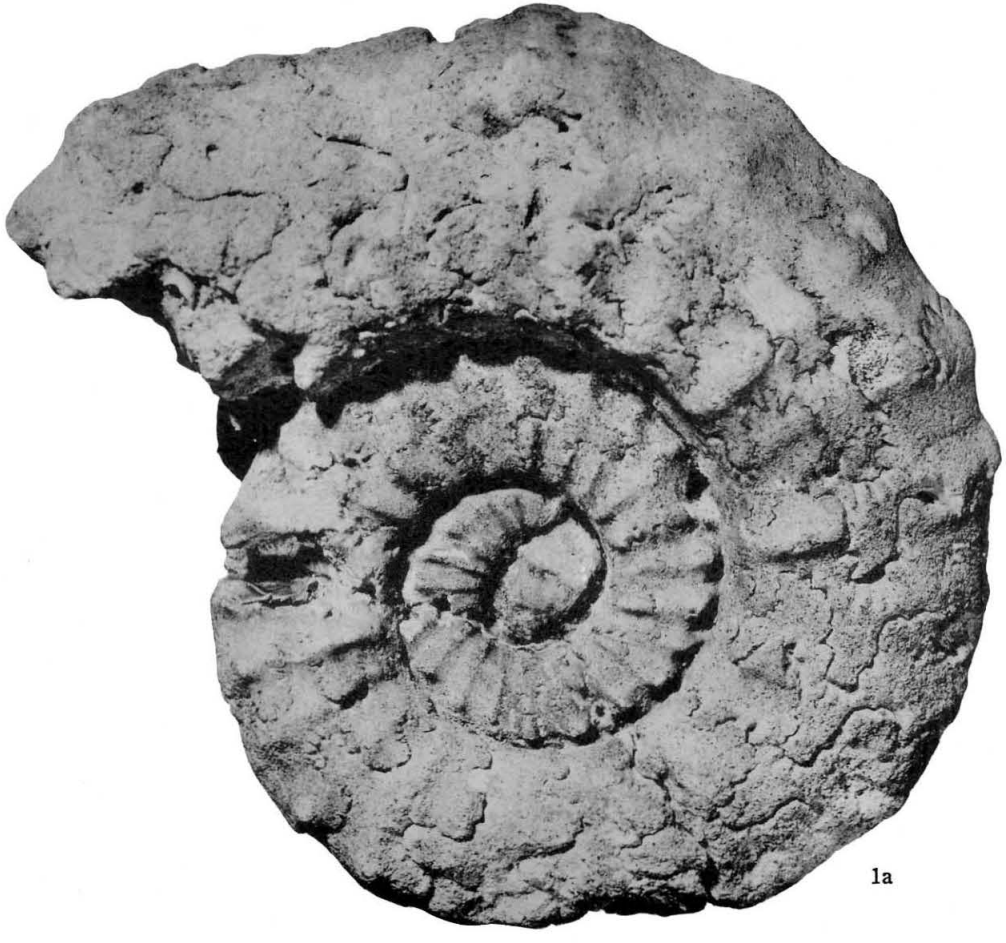
## Explanation of Plate 26

Fig. 1. *Protexanites bourgeoisi* (D'ORBIGNY).
Lectotype, from Saint-Frimbault (Sarthe), France, D'ORBIGNY's Collection No. 7181-A, Muséum National d'Histoire Naturelle, Paris. Lateral (a) and ventral (b) views, natural size.



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Trans. Proc. Palaeont. Soc. Japan, N. S., No. 61, pp. 207-214, April 10, 1966

# 504. THE SIGNIFICANCE OF THE MAGNESIUM AND CALCIUM RATIOS OF FOSSIL SHELLS OF *UMBONIUM COSTATUM* (KIENER) FROM THE DEPOSITS SINCE THE PLIOCENE IN THE SOUTHERN KANTO REGION, JAPAN*

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南関東の鮮新世以後のキサゴ化石の貝殻中のマグネシウムとカルシウム含有比の意味：1962年，三橋達雄は著者が関東南部の洪積世以来の多くの地層中から採集した化石のエゾタマキガイの貝殻の中に含有されているマグネシウムとカルシウムの原子数の比（%）を測定して，その比が年代の新しくなるにつれ増大した事を報告したが，今回著者は南関東の鮮新世以来現代迄のキサゴの貝殻について上記の比を地層別に分析測定した結果ほゞ似た結果を得た事をこゝに報告すると共に是等に関聯した地質学上興味ある事実に付いての報告と著者の見解とを併せ記載した。

永沢譲次

## I. Introduction

In 1963-1964, by the chelate-titration method, the values of the ratios of magnesium and calcium, namely the atomic percent ratios between magnesium and calcium, calculated in terms of the number of atoms were determined in the Recent and fossil shells of *Umbonium costatum* (KIENER), a gastropod now living at a depth ranging from below low tide to 10 m in the south Kanto region of Japan.

In this paper are presented the relationships between the magnesium and calcium ratios, geological horizons, the water temperatures in which the animal lived and the importance of the chemical method for determining or correlating the horizon or age of the geological formation which yielded the univalve animal.

The results of the chemical analysis of the shells are shown in Table I, from which can be noticed the fluctuations of the magnesium and calcium ratio during the Quaternary period in the south Kanto region, Japan.

This fact seems to have some significant relations with the problem of the Quaternary thermal changes of the sea water in Japan.

## II. Acknowledgements

The writer wishes to express his thanks to Dr. Tatsuo MITSUHASHI, Professor of chemistry of the Tokyo Gakugei University for kind guidance in the analysis of the shells by means of the chelate-titration method and for his encouragement during the course of this study.

He also expresses his thanks to the following persons of the same university, Miss Setsuko ENDO, Assistant of chemis-

* Received November, 9, 1965; read November 7, 1965, at Chiba.

try, Dr. Jisuke SEKI, Professor of chemistry, Dr. Ryutaro NAGAI, Professor of physics and Dr. Takashi TORII, Professor of agricultural chemistry, for their kind helps during the course of this work.

He is also indebted to Professor Dr. Kotora HATAI of the Institute of Geology and Paleontology, Tohoku University for his kindness in reading the original manuscript.

## III. Historical Review

In 1922, F. W. CLARKE and W. C. WHEELER called attention to that the proportion of magnesium carbonate in the shells of crinoids and alcyonarians is dependent upon temperature.

In 1935, by the analytical investigations of shells of the fresh water gastropod *Semisulcospira libertina* (GOULD), T. OUYE and T. KATO reported that the iron content in the shells shows local variations, but it is greater in the water with abundant iron than in that with a less amount of it.

In 1952, J. L. KULP, K. TUREKIAN and D. W. BOYD concluded that the primary factor determining the Sr/Ca ratio in a shell is the Sr/Ca ratio of the water in which deposition take place.

The second influence upon the ratio is the type of crystal lattice of the calcium carbonate.

In 1954, K. E. CHAVE showed by a series of analysis that the magnesium content in the calcite skeleton of numerous invertebrates varies with the temperature of the water in which the animal lived.

In 1955, from the result of analytical investigations of the shells of the fresh water gastropod *Bulimus manchouricus japonicus* (PILSBRY) and the marine gastropod *Haliotis gigantea* GMELIN, T. MITSUHASHI presumed that the magnesium-calcium ratio in the shells is influenced by the ratio of magnesium ion to calcium ion in the water habitat.

In 1956, by H. J. M. BOWEN, stated that the range of the calcium and magnesium ratio in Cambrian to Ordovician limestone was from 1.6 to 270 and that in younger carbonate rocks from 3 to 3.6.

In 1956, G. V. CHILINGER reported that the fossil coral reefs had lower strontium content than the Recent coral reefs.

In 1962, T. MITSUHASHI reported as follows: "The magnesium-calcium ratios in the shells belonging to *Glycymeris yessoensis*, from the Pleistocene to Recent of the Boso Peninsula in Japan gradually decrease with ascending age. The decreasing rate of the ratios are 0.13-0.28 per one hundred thousand years calculated in terms of the number of atoms.

It may therefore be supposed that the ratio of magnesium ion to calcium ion in sea-water became smaller with ascending age during the above period.

The quantities of conchiolin and pigment extant in fossil shells also decrease with ascending age."

These results may provide a method for deciding the age of the deposits yielding the fossil shells and also of importance in stratigraphy.

## IV. Water temperature and magnesium and calcium ratios in the shells of the Recent marine molluscs, their interrelationships

Considering from the analytical results of Dr. T. MITSUHASHI (1955), the differences of magnesium and calcium ratio between the shell of *Haliotis gigantea* GMELIN (ear-shell) from the San-riku coast in northeastern Japan and the one from Hachijo Island at about 33°N. lat., far south of Tokyo, is 0.1 and the an-

nual mean water temperature between the above two localities is about 8°C. and further, from the result of the writer, the difference of magnesium and calcium ratio between the shell of *Umbonium costatum* (KIENER) from the vicinity of Hakodate, Hokkaido in northern Japan, and the one from Shibushi Bay, Kagoshima Prefecture in southern Japan is 0.3 and the annual mean water temperature between the two localities is about 8° to 9°C, which is near to the annual mean water temperature between the coast of northeastern Japan and Hachijo Island as mentioned above.

In other words, the value of the difference of the magnesium and calcium ratio corresponds to the difference of the annual mean water temperature, that is about 8°C for temperature and 0.3 for the ratio in the case of the shell of *Umbonium costatum*.

This value is rather small, but is still smaller in the case of *Haliotis gigantea* (0.1).

## V. Outline of the Paleogeography of the Kanto Region since the Pliocene

To progress the discussions it seems necessary to give outline of the Paleogeography of the Kanto Region since the Pliocene.

During the Pliocene, the sea extended over the eastern part of Kanagawa Prefecture and the larger part of Chiba Prefecture except for some parts of the Miura and Boso Peninsulas, which remained as land.

During the Pleistocene, Paleo-Tokyo Bay extended over the area, from Tokyo City, the eastern parts of Saitama and Kanagawa Prefectures and the southern part of Ibaragi Prefecture to the northern half of Chiba Prefecture.

In the older Holocene, the new shallow sea covered the area over the margins of the Boso and Miura Peninsulas and Tokyo City to the eastern part of Saitama Prefecture. This is called the Prehistoric-Tokyo Bay.

From the sediments deposited in these seas, abundant fossil shells have been collected and among them *Umbonium costatum* (KIENER) is dealt with in this paper.

## VI. The interrelation between the geological ages, formations and the magnesium and calcium ratios of Recent and fossil *Umbonium costatum* from the south Kanto region, Japan

The interrelation between the geological ages, formations and the magnesium and calcium ratios of the Recent and fossil *Umbonium costatum* (KIENER) collected from Tokyo Bay and the fossil sediments in the Boso, Miura Peninsulas and its adjacent area, are shown in Table I.

Although the values of the magnesium and calcium ratio of *U. costatum* measured by the writer and those of *Glycymeris yessoensis* and others by T. MITSUHASHI (1962) from the same shell bed are slightly different from one another, this is thought to be due to the differences in the specific characters and to other features.

However, a similar phenomenon is found between *Umbonium* and *Glycymeris* as shown in Table II, in the fluctuations of their magnesium and calcium ratios during the Quaternary period.

The shell beds listed in Table I are arranged in the order of younger to older in downward succession.

The Yamamoto shell bed at Yamamoto, Takikawa, Tateno-mura, Awa-gun, Chiba

Table I.

| Geological Age | Boso Peninsula | | | Miura Peninsula and its adjacent area | |
|---|---|---|---|---|---|
| | Localities & Formations | | Mg/Ca (%), atomic ratios | Localities & Formations | Mg/Ca (%), atomic ratios |
| Recent | Hirasaura | | 1.5 | | |
| | Iwai | | 1.4 | | |
| | Tateyama | | 2.3 | | |
| Holocene | Matsudo | | 1.8 | | |
| Pleistocene | Upper Part | Omori Shell Bed | 1.2 | | |
| | | Boyatsu Shell Bed | 1.2 | | |
| | | Oyaru Shell Bed | 1.2 | Kikuna Shell Bed | 1.2 |
| | | Banba Shell Bed | 1.5 | | |
| | Lower Part | Kiyokawa Shell Bed | 0.8 | | |
| | | Atebi Shell Bed | 0.9 | | |
| | | Nishiyatsu Up. Shell Bed | 0.9 | Wada Shell Bed | 0.9 |
| | | Sanuki Silt | 1.0 | Naganuma Shell Bed | 0.9 |
| Villafranchian to Pliocene | Yamamoto Shell Bed | | 1.2 | Iimuro Shell Bed | 1.2 |

Prefecture may be correlated with the middle Pliocene and the Iimuro shell bed at Inada-noborito, Kawasaki City, with the Villafranchian or the upper Pliocene.

The sample from Matsudo was collected at the entrance of the Matsudo Shrine, that from Kiyokawa, at a cliff 150 m southeast of the Kiyokawa Station, that from Wada, at Wada, Shimomiyata, Miura City, and those from Omori, at a cliff of Omori, Inzei-machi, Chiba-gun, Chiba Prefecture.

Banba is thought to belong to the same horizon as that of Semata-no-seki.

The Naganuma shell bed belongs to the so-called Naganuma fourth zone.

The values of the above ratios were obtained from one or two specimens per one fossil bed. In Table II, the molluscan shells subjected to analyses comprised the following species.

1. *Glycymeris vestita* (DUNKER) from the coast of Kuju-kuri, Chiba Prefecture, a warm water form now living at the depth of 10–40 m in Japan.

2. *Saxidomus purpuratus* (SOWERBY) from Urayasu-machi, Chiba Prefecture. It is now living at a depth of about 5 m in Japan.

3. *Glycymeris yessoensis* (SOWERBY) from the vicinity of the Shizu Railway Station. The shell bed at Shizu is considered to be equivalent to that of

Table II. Correlative values of the magnesium and calcium ratios from analyses of shells of different species by MITSUHASHI (1962) and NAGASAWA (1964).

| Geological Age | Localities & Formations | | Mg/Ca (%), ratios of *U. costatum*, by NAGASAWA | Mg/Ca (%), ratios of *Glycymeris*, by MITSUHASHI |
|---|---|---|---|---|
| Recent | Chiba Prefecture | | 1.4–2.3 | 2.2[1] |
| Holocene | Chiba Prefecture | | 1.2 | 2.0[2] |
| Pleistocene | Upper Part | Omori Shell Bed | 1.2 | 1.9[3] |
| | | Boyatsu Shell Bed | 1.2 | 2.0* |
| | | Oyaru Shell Bed | 1.2 | 1.9* |
| | | Banba Shell Bed | 1.5 | 1.9* |
| | Lower Part | Kiyokawa Shell Bed | 0.8 | 1.1* |
| | | Atebi Shell Bed | 0.9 | 0.7[4] |
| | | Nishiyatsu Upper Shell Bed | 0.9 | 1.7* |
| | | Sanuki Silt | 1.0 | 0.7* |

Omori.

4. *Glycymeris rotunda* (DUNKER) from the Jizodo Shell Bed, Chibe Prefecture, which is about equivalent to that of Atebi. This species inhabits a depth of 40–200 m along the Pacific coast of Honshu, Japan.

* *Glycymeris yessoensis*. This species inhabits a depth of 40–200 m in northern Japan and is a cold water one.

## VII. The magnesium and calcium ratios of *Umbonium costatum* from the shell beds of the same geological horizon

The values of the magnesium and calcium ratios of the fossil *Umbonium costatum* from various shell beds which are judged to belong to the same geological horizon in the upper part of the Narita Formation deposited in the fossil basin of Paleo-Tokyo Bay show about the same value, being 1.2 for the Omori shell bed, 1.2 from the Izumi shell bed, 1.3 from the Matsudo shell bed, respectively. All of these localities are distributed in the area east of Tokyo City.

The relations of the distances between each of the fossil localities are as follows: Omori, about 13 km north of Shizu; Izumi, about 2.5 km southwest of Omori; and Matsudo, about 22 km southwest of Omori.

## VIII. The horizon of the Kikuna shell bed

The value of the magnesium and calcium ratio of the shells from the Kikuna shell bed, situated southwest of Tokyo City, can be correlated with the ones from the upper part of the Narita Formation in the Boso Peninsula by other methods, present the same value of 1.3 as already obtained for the shells from the eastern localities above mentioned.

Therefore, the horizon of the Kikuna shell bed must belong to the upper part of the Narita Formation.

## IX. The magnesium and calcium ratios of *Umbonium costatum* from the lower part of the Pleistocene formations in the Miura and Boso Peninsulas

The values of the magnesium and calcium ratios for the shells from the shell beds correlated to the lower part of the Pleistocene formations by both paleontological and stratigraphic data are about 0.9, respectively as known from that values from the shells of the Naganuma shell bed at Naganuma-machi, Yokohama City, in the northern border of the Miura Peninsula, from the Wada shell bed at Shimomiyata in the southern part of the Miura Peninsula and from the shell beds at Kiyokawa, Atebi, Nishiyatsu and Sanuki in the Boso Peninsula as shown in Table I.

Among the above named shell beds, the Naganuma shell bed has been considered geologically to have been deposited in an independent bay : the Paleo-Sagami Bay, which was separated from the Paleo-Tokyo Bay during the older stage of the Pleistocene.

The writer is confident that the results described above give us important evidence for the application of the magnesium and calcium ratio method to the correlation of geological formations.

## X. On the fossil shell beds of unknown horizons

Considering from the results mentioned above, the Tako shell bed at Watta, Tako-machi, Chiba Prefecture and the Hashirimizu shell bed at a cliff, near the temple, Enshoji, Hashirimizu in the Miura Peninsula, are uncertain as to their exact horizons. However, they may be correlated with any bed or horizon in the upper part of the Pleistocene formations by reason of their magnesium and calcium ratios. The said ratios of the shells from Tako and Hashirimizu, measured by the writer, were 1.2, 1.2 respectively.

## XI. The existence of an unconformity is expected from the abrupt change in the value of the magnesium and calcium ratio

From Table I, distinct changes can be recognized in the values of the magnesium and calcium ratios between the Holocene beds, the upper part of the Pleistocene formations and the lower part of them, corresponding to the actual existence of the unconformities between these three formations as already known from field evidence.

From the above fact, we may expect in general the existence of an unconformity by the abrupt change of value of that ratio.

## XII. The change of the water temperature during the Pleistocene in the south Kanto region assumed from the magnesium and calcium ratio

As already mentioned in earlier lines, the magnesium and calcium ratio of the shells is considered to be determined not only by the composition of the water habitat but also by the temperature. The ratios of magnesium and calcium presented by the writer shows that the value increased with descending age as shown in Table I.

As the magnesium content of the shells is considered to be proportional, approximately, to the water temperature, if we assume that in these shells the calcium content (%) was constant, but the

magnesium content varied only with the water temperature since the Pliocene, then we may conclude, from Table I, that the water temperature of the Pleistocene must have been lower than that of the Holocene and Recent and attained the lowest temperature indicated by 0.8 in the magnesium and calcium ratio during the depositional period of the Yabu Formation and increased gradually with descending age during the whole period, but a distinct thermal change had taken place between the Holocene and Pleistocene.

## XIII. Conclusions

1. In order to foreknow or correlate the horizon and the unconformity within a single area or a comparatively limited area, the application of the magnesium and calcium method for fossil shells is proved to be effective.

2. By the application of the magnesium and calcium method to fossil shells, to determine the water temperatures and the magnesium and calcium contents in the sea waters during the geological periods seems to be in need of further considerations and investigations.

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| | | | |
|---|---|---|---|
| Atebi | 当日 | Inzei-machi | 印西町 |
| Awa-gun | 安房郡 | Izumi | 和泉 |
| Banba | 番場 | Iwai | 岩井 |
| Boso Peninsula | 房総半島 | Kanto Region | 関東地方 |
| Boyatsu | 坊谷津 | Kawasaki | 川崎 |
| Chiba (=Tiba) | 千葉 | Kagoshima | 鹿児島 |
| Hakodate | 函館 | Kanagawa | 神奈川 |
| Hachijo Island | 八丈島 | Kikuna | 菊名 |
| Hokkaido | 北海道 | Kiyokawa | 清川 |
| Hirasaura | 平砂浦 | Matsudo | 松戸 |
| Hashirimizu | 走水 | Miura Peninsula | 三浦半島 |
| Ibaragi | 茨城 | Narita Formation | 成田層群 |
| Iimuro | 飯室 | Naganuma | 長沼 |
| Inada-noborito | 稲田登戸 | Nishiyatsu | 西谷 |

| | | | |
|---|---|---|---|
| Omori | 大森 | Tako | 多古 |
| Oyaru | 大谷流 | Takikawa | 滝川 |
| Saitama | 埼玉 | Tateno-mura | 館野村 |
| San-riku | 三陸 | Tateyama | 館山 |
| Sanuki | 佐貫 | Urayasu-machi | 浦安町 |
| Semata-no-seki | 瀬又の堰 | Wada | 和田 |
| Shibushi Bay | 志布志湾 | Watta | 割田 |
| Shizu | 志津 | Yamamoto | 山本 |
| Shimomiyata | 下宮田 | Zizodo | 地蔵堂 |
| Shinagawa | 品川 | | |

# PROCEEDINGS OF THE PALAEONTOLOGICAL SOCIETY OF JAPAN

日本古生物学会第91回例会および「東南アジア及び中近東の古生物と地史」に関するシンポジウムは1965年11月6-7日（土，日）千葉大学文理学部および留学生部において開催され，関係各方面からの絶大な御援助により盛会裡に終了した（参加者79名）。

## 個人講演

On some interesting Mesozoic plant remains from the Itoshiro Subgroup ..... Tatsuaki KIMURA

北海道石狩統産植物化石2新種について ..... 遠藤誠道

千葉県ガス田の有孔虫化石相とその問題点について ..... 樋口 雄

Shell structure of Japanese smaller Foraminifera. Pt. 4 ..... Hiroshi UJIIÉ

北上山地南部気仙沼市附近の紡錘虫化石について ..... 鹿股信雄・千坂武志

Upper Permian Fusulinids from Taishaku Limestone Plateau, West Japan (代読) ..... Kimiyoshi SADA and Tsuruo YOKOYAMA

Ordovician and Silurian conodonts from Malaya ..... Hisayoshi IGO and Toshio KOIKE

Discovery of Upper Triassic conodonts from Malaya ..... Yasuo NOGAMI and Ken'ichi ISHII

タイ及びマラヤの上部古生代蘚虫類 ..... 坂上澄夫

Some younger Mesozoic plants from Malaya ..... Enzo KONNO

マレーシアの Kelantan, Pahang 州で新しく発見されたペルム紀・トリアス紀古世の化石群について ..... 石井健一・波田重熙・市川浩一郎

Notes on the Myophorian Sandstones in Malaya ..... Teiichi KOBAYASHI and Minoru TAMURA

Some *Myophorella* from the Tetori Group in the Arimine District, Central Japan ..... Shiro MAEDA and Tetsuya KAWABE

長崎県男女群島沖海底採集大型ホタテ貝化石と鹿角化石 ..... 永沢譲次

南関東の鮮新世以後のキサゴの貝殻中のマグネシウムとカルシウム含有比の意味 ..... 永沢譲次

Notes on *Ammonites bourgeoisi* D'ORBIGNY from the Upper Cretaceous of France (代読) ..... Tatsuro MATSUMOTO

*Yabeiceras* に似て非なるアンモナイト（代読） ..... 松本達郎

An Acanthoceratid ammonite from Sakhalin ..... Tatsuro MATSUMOTO and Ikuwo OBATA

デスモスチルス類の進化 ..... 鹿間時夫

〔シンポジウム〕

「東南アジア及び中近東の古生物と地史」

台湾北港試掘井産白堊紀軟体動物化石の研究 ..
.....速水 格・松本達郎・橋本 亘
台湾の有孔虫研究の現況 .....黄敦友
フィリピン群島特に Cebu 島の地質について..
.....浅野 清
カンボジア西部の二畳系 —— シソフォン・バッ
タンバン石灰岩の層序について.....石井健一
タイ国 Khorat 高原の中生界.....
.....岩井淳一・浅間一男
タイ国ペチャブンの二畳紀植物化石 ....浅間一男
Waagenophyllid corals from Thailand ....
..... Rucha Ingavat
Rat Buri 石灰岩の紡錘虫化石帯（予報）.....
.....鳥山隆三・勘米良亀齢・柳田寿一
馬来半島西岸におけるノーチラスの死後漂着 ....
.....浜田隆士
インドネシアの石油採鉱と古生物調査 ..岩佐三郎
カフジ油田において対比の鍵となる有孔虫化石
.....大炊御門経輝
アムッド人の発掘 ..高井冬二・鈴木尚・鎮西清高
タイ・マラヤから日本までの褶曲山脈の層位学
的古生物学的調査研究.....小林貞一

日本古生物学会 1966 年度総会および年会は 1966 年 1 月 24–25 日（月，火）東北大学理学部地質学古生物学教室講義室において開催され，関係方面からの絶大な援助のもとに盛会裡に終了した（参加者 47 名）。

特 別 講 演

日本古生物学界 30 年を省みて.....小林貞一
古生物学についての随想 .....早坂一郎

会 長 講 演

古日本海の出現.....浅野 清

個 人 講 演

On the Hamamelidaceae from the Paleogene of Hokkaido, Japan (代読).....
.....Toshimasa TANAI
手取川上流鵞ヶ谷に産出した *Taeniopteris* について.....松尾秀邦・大村一夫
山西省で発見された巨大 *Sphenophyllum* について.....浅間一男
房総半島上総層群最下部からの有孔虫化石群について.....青木直昭
*Lepidolina* 問題補遺.....矢部長克
鎌倉産大円行ガニ *Geryon* 化石.....今泉力蔵
Triassic insect fossils from Omine, Japan
.....Ienori FUJIYAMA
Note on *Apiotrigonia* from the Futaba Formation in the Joban district, North Japan.....Shiro MAEDA, Haruo TAZUKE and Tetsuya KAWABE
On some *Pterotrigonia* from the Todai Formation in the Akaishi Mountains, Central Japan.....
..Shiro MAEDA and Tateharu KITAMURA
*Valdedorsella* from the Miyako Group (Studies of the Cretaceous ammonites from the Miyako Group. Pt. 1) .....
.....Ikuwo OBATA
Notes on *Ammonites flaccidicosta* RÖMER from the Cretaceous of Texas .....
..... Tatsuro MATSUMOTO
A Mesozoic ammonite from Amami-Oshima
.....Tatsuro MATSMOTO, Hideo ISHIKAWA and Shiro YAMAGUCHI

## News

◎ 第23回 International Geological Congress は 1968 年 8 月 19 日より 28 日まで，Prague で開催される。近着の First Circular によれば古生物に関係あるセクションには次のようなものがある。
Genesis and classification of sedimentary rocks; Stratigraphy of Central European Lower Palaeozoic and its correlation with other area; Tertiary/Quaternary boundary; Origin of coal and problems of its deposition.
会議に関する問合せ先きは
The Secretary-General, XXIII Session, International Geological Congress
Ústřední ústav geologický, Malostranské nám. 19, Prague 1, Czechoslovakia
申込みは 1966 年 4 月 30 日まで，なお，First Circular は学会庶務に若干の余裕があるので希望者は至急申込むこと。

◎ 日米科学協力事業について簡単に説明したパンフレットが発行された。希望者は下記に申込めば入手できる。
東京都千代田区神田一ツ橋 1 の 1　日本学術振興会　日米科学協力係

◎ 第 7 回 International Sedimentological Congress は 1967 年 8 月 11 日より 15 日まで英国の Reading 及び Edinburgh で開催される。　会議に関する問合せ先きは
Secretariat, VII International Sedimentological Congress, Sedimentary Research Laboratory, Department of Geology, The University, Whiteknights Park, Reading, England.

◎ 第 6 回 International Congress of Carboniferous Stratigraphy and Geology は 1967 年 9 月 11 日より 16 日まで英国の Sheffield で開催される。
First Circular によると本会議では石炭紀の層位学・古生物学・岩石学と堆積学・地化学・応用地質学などが議せられ Bristol-Mendip area, Southwest England, 南ウエールス Pennines, スコットランドの Midland Valley などの石炭系の巡検が計画されている。連絡先きは下記である。
The Secretary-General, 6th International Congress of Carboniferous Stratigraphy and Geological Survey of Great Britain, Ring Road Halton, Leeds 15, England.

◎ 本会特別出版物第 11 号 西山省三著 日本及び近海産の海胆類動物群 其の 1 (Palaeontological Society of Japan, Special Papers, no. 11, The Echinoid Fauna from Japan and Adjacent Regions, Part 1) が 2 月 20 日に出版された，227 頁 18 図版で特価 (送料を含む) は 5000 円 (但し本年中に限る) である。

## 会員消息

◎ 会員氏家宏君は本年 2 月上旬より University of Southern California において有孔虫を研究中で 3 月下旬に帰国の予定である。

◎ 会員菅野三郎，木村敏雄，佐藤 正，徳山 明，橋本 亘の 5 君は地質学古生学調査のため昨年 11 月中旬より本年 2 月上旬までフィリッピン・タイ・台湾に出張した。

## 例会通知

| | 開催地 | 開催日 | 講演申込締切日 |
|---|---|---|---|
| 第93回例会 | 東京教育大学 | 1966年6月18日 | 1965年5月18日 |
| 第94回例会 | 秋田大学 | 1966年9月 | 1966年8月 |
| 第95回例会 | 名古屋大学 | 1966年11月下旬 | 1966年10月下旬 |

## 学会記事

◎ 1965年度中に特別会員丹桂之助君が死亡された。

◎ 1965年度の退会者（敬称略）市村賢一，兼子 勝，片岡 純，宮島圭司，大脇康孝，鈴木好一，辻 富夫，若林隆幸，M. L. THOMPSON

◎ 1966年度よりの入会者（申込順・敬称略）J. H. LIPPS, 五十嵐誠，大場忠道，新妻信明，三井 忍，山田営三，中島輝允，杉本幹博，松丸国照，Rucha INGAVAT, 鹿股信雄，川辺鉄哉，北村健治，渡辺貞夫，大村明雄，清水 勇，栗原謙二，多田元彦，川沢啓三，津村孝平，W. H. HAMLIN, 野田雅之，上野輝弥，小沢智生

◎ 1966年総会の決議により会員早坂一郎，槇山次郎，半沢正四郎の三君が名誉会員に推戴された。

◎ 会員半沢正四郎，小林貞一両君の学術上の功績にたいし，日本古生物学会賞が贈られた。これは昭和36年矢部長克名誉会長の授賞に続くものである。

◎ 会員猪郷久義君の「古生代の紡錘虫及びコノドントの研究」に学術奨励金が贈られた。

◎ 本会30周年を記念して新たに設定された学会誌論文賞は小畠郁生君の「Allometry of *Reesidites minimus*, a Cretaceous ammonite species」に贈られた。

◎ 本会誌の出版は一部文部省研究成果刊行費による。

1966年4月15日　印刷
1966年4月20日　発行

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学術図書印刷株式会社　富田元

# 日本古生物学会会則　(1964, 1, 18)

第 1 条　本会は日本古生物学会という。

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

第 3 条　本会は第 2 条の目的を達するため次の事業を行う。

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

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

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

第 6 条　会員を分けて普通会員・特別会員・賛助会員および名誉会員とする。

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

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

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

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

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

第 12 条　会費の金額は総会に計って定める。会費は普通会員年 1,000 円，特別会員年 1,500 円，賛助会員年 10,000 円以上とする。名誉会員は会費納入の義務がない。在外の会員は年 4 弗とする。

第 13 条　本会の経費は会費・寄付金・補助金などによる。

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

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

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

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

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

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

第 20 条　総会の議決は多数決により，可否同数の時は議長がこれを決める。

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

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

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

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

付　則　1) 評議員会の議決は総て無記名投票による。