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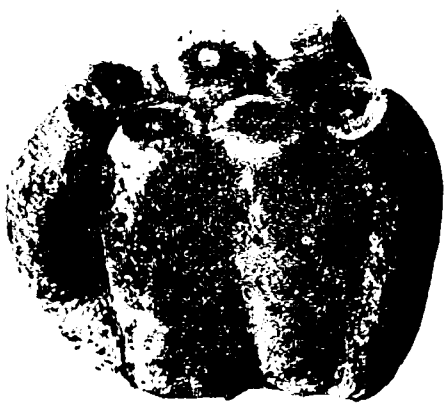

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TRANSACTIONS

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

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227. NOTES ON SOME PLANT FOSSILS FROM ENNICHI (YONGIL) GROUP IN SOUTHERN KOREA, II*

TOSHIMASA TANAI

Geological Survery of Japan

朝鮮延日層群産の化石植物に就て. II: 朝鮮の中新世の植物群は, 本邦の中新世のものに非常によく似ており, 多くの人々によつて各地から記載されている。筆者は, さきに, 延日層群から金原均二氏が採集した標本の一部について述べたが, 今回はブナ科及びモクセイ科のものを検討した。そして, *Fagus, Cyclobalanopsis, Lithocarpus, Quercus, Castanea* 及び *Fraxinus* などの 11 種を検出し, それらの主要な種の記載をした。 棚井敏雅

The geology of plant bearing beds has already been given by Dr. K. KANEHARA, whose paper also contains a list of plant fossils provisionally determined by him. The writer has studied critically these collections preserved at the Geological Institute of Tokyo University, and already described some interesting specimens on this first report.

Among these specimens, the writer reexamined some fossils of Fagaceae and Oleaceae from Ennichi group which develops in southern Korea, and determined the following species:

Fagaceae:

Fagus ferruginea AITON
F. Hayatae PALIB.
Lithocarpus miohypophaea TANAI, sp. nov.
L. protokonishii TANAI, sp. nov.
Cyclobalanopsis glauca THUNB.
C. Mandraliscae (GAUDIN), n. em.
C. Huziokai TANAI, sp. nov.
Quercus koraica TANAI, sp. nov.
Castanea castaneaefolia (UNGER)

Oleaceae:

Fraxinus insularis HEMSL.
F. ennichiensis TANAI, sp. nov.

These fossil materials occur as impressions of leaves, fruits and cupules which are fairly well-preserved. The impressions of leaves and fruits are comparatively plentiful; several of the species are represented by both leaves and fruits or cupules. Although no exact quantitative data are available, the relative abundance of the various species is approximately known. The leaves of ever-green oaks are by far the most abundant among the leaves of Fagaceae in the Ennichi flora. It is very interesting for the geographical distribution of the plant in Eastern Asia that most of the species determined at present closely resemble their allied species in Formosa.

The writer wishes to offer his thanks to Dr. Kinji KANEHARA for his material and information. Thanks are also due to Dr. Fuyuji TAKAI for his advice on this manuscript, Mr. Shoichi MITA and Heiichi TAKEHARA for their encouragements. This study was financed by a grant from the Science Research Fund of the Ministry of Education.

* Read Oct. 20, 1951; received July 21, 1952.

Descriptions of Some Noteworthy Species

Family Fagaceae

Genus *Fagus* Linné

Fagus Hayatae Palib.

Pl. 1, fig. 1

1936. *Fagus* sp. (cupula), Kanehara: *Jour. Geol. Soc. Japan vol. 43*, p. 83
1936. *F. Hayatae*, Miki: *Jap. Jour. Bot. vol. 11* p. 221, fig. 4, Q-S.

Leaves ovate, 5–6 cm. long, 2.8-3.0 cm. wide, base cuneate, apex acute; lateral nerves about 7–10 pairs ending at curved teeth, petiole 5 mm. long.

Cupula ovoid in general shape, 1.3 cm. long, 1.0 cm. wide, with many bristle-like bract; peduncle stout and short, about 5 mm. long.

Remarks:—A characteristic cupula and some incomplete leaves confirm the presence of *Fagus* in this fossil flora. These specimens are quite identical with the living *F. Hayatae* Palib. in Formosa.

The serrate leaf resembles that of *Fagus ferruginea* Aiton, but the species differs from it by its smaller leaf and shorter peduncle of the cupula.

Comparison of several cupules of fossil *Fagus*

	length	width	length of peduncle
Fagus japonica Maxim.	0.5 0.8 cm.	0.4 0.6 cm.	4.5±cm
F. crenata Blume	1.5-1.8	1.0-1.2	4.0±
F. multinervis Nakai	1.5-2.0	1.0±	3.0±
F. Hayatae Palib.	1.0-1.4	0.7-1.0	0.5-0.8
F. ferruginea Ait.	1.2-1.4	0.8-1.0	1.5±
F. microcarpa Miki	1.0±	0.5-0 9	0.4-0.5
F. Antipofi (Abich)	2.6±	1.5±	1.5±

Localities:—252, 765

Genus *Lithocarpus* Blume

Lithocarpus miohypophaea Tanai sp. nov.

Pl. 1, fig. 2, 3

1936. *Quercus* sp. (cupula), Kanehara: loc. cit. pp. 83

Description:—Leaves oblong-lanceolate or elliptic lanceolate, acuminated at apex, cuneate at base; length 5-8 cm., width 1–2 cm.; petiole stout, 0.7–1.0 cm. long; midrib stout, tapered at apex, straight or slightly curved; 10–13 pairs of secondaries, faible, alternate or subopposite, forming an angles of about 50° with the midvein, parallel, slightly upcurved and camptodrome to the margin, sometimes bifurcation about half the distance towards the margin; tertiaries irregularly percurrent; margin entire, slightly

back-rolled, texture thick, coriaceous.

Cupula patelliform, 20–24 mm. in diameter, 3.5 mm. in depth; margin contracted, with 7–10 concentric rings.

Remarks:—This description is founded on many leaves and a single, finely preserved cupula. Among many cupules of *Quercus*, *Cyclobalanopsis* and *Lithocarpus* with concentric rings, this specimen corresponds with *Lithocarpus hypophaea* HAYATA by its shape and compressed margin. The characters of the fossil leaves are so closely duplicated by similar characters in this living species as to establish a near relationship or absolute identity between them.

There is no previous record of *Lithocarpus* in the Tertiary of Japan and Korea, but this living genus is confined to western America and eastern Asia. *Lithocarpus hypophaea* grows on mountain slopes (about 300–700 m. from sea-level) in the eastern part of Kôshun-peninsula, Formosa.

Localities:—210, 226, 329, 571, 730

Lithocarpus protokonishii TANAI, sp. nov.

Pl. 1, fig. 4

1936. *Quercus* sp. (Kwannonzawa-type), KANEHARA: loc. cit. p. 83

Description:—Leaves medium size, evidently coriaceous, oblong-elliptical in outline, length 5–6 cm., width about 2 cm., base slightly asymetric, round or wedge-shaped, though acuminate at apex; margin serrate in the upper two-thirds of the leaf, the teeth small, slightly pointing upwards. Midnerve fairly strong, slightly arc; secondaries with 6–7 pairs, opposite, slightly curved upwards, occasionally falked, the upper ones camptodrome, arching along the margin, the lower ones craspedodrome, entering the teeth; nervilles numerous, strong, mainly percurrent, forming pentagonal meshes. Texture thick, coriaceous.

Remarks:—These fossil leaves are almost identical with the *Lithocarpus Konishii* HAYATA, which is found in bushy habitats (about 500 m. from sea-level) in southern Formosa. Texture, venation, serrate margin and acuminate apex of the fossil leaf best match with certain leaf of *Lithocarpus Konishii*, but it differs in the base from all the herbarium specimens in the Botanical Institute of Tokyo University.

The present materials do not correspond with any of figured specimens of fossil oak leaves from the Tertiary flora of Japan and Korea which have come to the writer's attention.

Localities:—1, 57, 211, 731, 947

Genus *Cyclobalanopsis* OERSTEDT

Cyclobalanopsis Mandraliscae (GAUDIN), TANAI n. em.

Pl. 1, fig. 6, 7, 8 and 9

1845. *Quercus drymeia*, UNGER: *Chl. Prot.* S. 113, Tf. 32, Figs. 1-4.

1858. *Q. mandraliscae*, GAUDIN: *Mém. querques Gisem. de la Toscane.* p. 33, pl. 2, fig. 11.

1859. *Q. drymeia* var. *Mandraliscae*, GAUDIN: *Contribution à la flore fossile Ita'ienne.* p. 45, pl. 4, figs. 2-5.

1936. *Q. drymeja*, KANEHARA: loc. cit. p. 83

Description:—Leaves narrowly lanceolate, 7–10 cm. long, 1.3–1.5 cm. wide, apex acuminate very longly; base cuneate or narrowly cuneate; margin bristle-like serrate in the upper two-thirds of the leaf, the teeth triangular and usually pointing upward, regularly disposed and small size; petiole stout, long, length 5–

10 mm.. Midrib stout, tapered to apex, slightly curved, being prominent on the lower surface of the leaf; about 13-16 pairs of well-defined subopposite secondaries, somewhat irregular as to course, spacing and angle with midnerve, angle vary from 35° to 70°; the secondaries camptodrome where the margin is entire, branching and forming a series of loops near the margin, irregularly branching and craspedodrome where the margin is serrate; tertiary venation irregularly percurrent or with reticulate areas; nervilles forming a fine quadrangular mesh. Texture thick, coriaceous.

Remarks:—The form of European fossil oak to which UNGER gave the name, *Quercus drymeia*, is also one of the common types in the Miocene floras of Japan and Korea. As GAUDIN has already pointed out, *Q. drymeia* has so many variants that it can be discriminated 6 variation-forms. The specimens from the Ennichi Group are quite identical with *Q. drymeia* var. *Mandraliscae* which was described by GAUDIN from Miocene flora of Arno province, Italy. Though these fossil leaves with six-variety-forms may be variants of the same botanical species, it is better for the standpoints of stratigraphy and even palaeobotany that they are divided to each independent species until some valid reason or many specimens shall be obtained.

The great variability of the leaves of oaks renders an exact comparison with the figured specimens extremely difficult. The present new species is more or less close to some type of *Quercus cosmilis* NEWBERRY and *Q. simulata* KNOWLTON which are two species of the most common oaks in the Miocene floras of western North America. But it differs by the serrate margin from them.

Among the living oaks of eastern Asia, this species is close to *Cyclobalanopsis longinux* HAYATA, which is common in the mountain-lands (400-800 m. from sea-level) of Formosa.

Locality:—1, 105, 112, 211, 227, 228, 311, 533

Cyclobalanopsis Huziokai TANAI, sp. nov.

Pl. 1, fig. 10

1936. *Quercus myrsinaefolia*, KANEHARA: loc. cit. p. 82

Description:—Leaves coriaceous, small in size, ovate to oblong, 4-5 cm. long, about 2 cm. wide, base obtuse or round, apex acute; margin aristate-serrate; midnerve slender, tapered to apex, straight or slightly curved; secondaries thin, 7-9 pairs, opposite or subopposite, mostly simple, slightly curved upwards and subparallel, craspedodrome, entering the arista-like teeth. Areolation distinctly preserved, forming the network of fine polygonal meshes; petiole stout, 5-7 mm. long.

Remarks:—This species has some resemblance to *Quercus mediterranea* UNGER and *Q. Szirmayana*, although it can be same, since the margin and type of venation are quite different.

Among the living oaks, the fossil leaves greatly resemble *Cyclobalanopsis tarokoensis* HAYATA in the outline, which is one of the endemic species in Formosa, but it is quite distinct from the latter by the length of petiole. It is also comparable to *Castanopsis chinensis* HANCE which is found in mountain-slope habitats from southern China.

This species is named in honor of Dr. K. HUZIOKA of the Department of mining at the College of Akita.

Locality:—1, 227

Genus *Quercus* LINNÉ

Quercus koraica TANAI sp. nov.

Pl. 1, fig. 11, 12

1926. *Quercus* sp., KRYSHTOFOVICH, *Ann. Russ. Pal. Soc. vol. 6*, Tab. 2, fig. 8
1936. *Quercus* sp, KANEHARA: loc. cit. p. 83

Description:—Leaves medium size in outline, oblong-ovate or ovate, 4.5–6.5 cm. long, 2.3–2.7 cm. wide; apex acuminate, base rounded or broadly cuneate; midrib slender, 10 pairs of secondaries, subopposite, regularly curved upwards and parallel or sub-parallel, craspedodrome to the marginal teeth; tertiaries irregularly percurrent, finer veins forming a network; margin serrate except near the base, with spine-tipped fowards-pointing teeth. Texture probably subcoriaceous, petiole slender, about 10 mm. in length.

Remarks:—This species seems to be distinct from the other species of oak in this flora though it is represented by somewhat incomplete specimens. There is a close resemblance between this species and the above-described species—*Cyclobalanopsis Huziokai*, but it has secondaries more regularly curved than the latter. But the difficulty of drawing well-marked specific lines between them is increased by the abundance of materials.

This new species has a great resemblance to *Quercus pregrahami* MAC GINITIE from the Weaverville flora of California, North America, though the type of tertiary venation is quite different. It is also closely similar to *Quercophyllum Lonchitis* UNGER which was figured by NATHORST from the Otuchimura, Prov. Kaga, Japan, but not so obtuse at the apex as in the latter.

The fossil leaves are close to some forms of leaves from the living *Castanopsis sclerophylla* SCHOTT. and the living *Cyclobalanopsis myrstnaefolia* (BLUME) which grow in China at present.

Locality:—211, 378

Genus *Castanea* MILL.

Castanea castaneaefolia (UNGER)

Pl. 1, fig. 13

1845. *Fagus castaneaefolia*, UNGER, *Chlor. Prot.* pt. 6, S. 79, Tf. 28, Fig. 1
1868. *F. castaneaefolia*, HEER, *Flora fossilis arctica*, S. 106 Tf. 10, Fig. 8; Tf. 46, Figs. 1-3.
1898. *Castanea castaneaefolia*, KNOWLTON, *U. S. Geol. Surv. Bull.* 152, p. 60
1926. *C. castaneaefolia*, KNOWLTON, *U. S. Geol. Surv. Prof. Pap. 140-A*, p. 35, pl. 18, figs. 7, 8; pl. 19, fig. 1.
1936. *C. castaneaefolia*, HOLLICK, *U. S. Geol. Surv. Prof. Pap. 182*, p. 97, pl. 53, figs. 4-6.
1936. *Dryophyllum* sp., KANEHARA: loc. cit. p. 82

Leaves predominantly lanceolate in outline, with acuminate apex and cuneate base. Margins entire for a short distance above the petiole, elsewhere set with remotely shallow-serrate teeth. Midrib stout, straight; secondaries stout, regularly spaced, 18–20 pairs, opposite or subopposite, slightly curving upward, craspedodrome, entering to teeth; tertiaries very thin, forming a fine angular mesh. Texture probably membranaceous.

Remarks:—The present materials appear to be identical with some type of *Castanea castaneaefolia* (UNGER), which is abundantly represented in the middle Tertiary flora of the old world. The

leaves of this species are so variable in their shapes and serrations that they have to be reexamined with many specimens. The present fossil leaves are close to the living *C. Bungeana* BLUME and *C. crenata* S. et Z. They are also very close to the leaves of *Tetracera castanaefolia* MACG., but they are so incomplete that the identification is impossible.

Locality:—1, 219, 311

Family Oleaceae

Genus *Fraxinus* LINNÉ

Fraxinus insularis HEMSL.

Pl. 1, fig. 14

Description:—Leaflets incomplete, oblong-ovale in outline, 5–6 cm. long, 2.0–2.5 cm. wide, acuminate or caudately acuminate at apex, cuneate or obtuse at base; midnerve stout, straight, tapered to apex, secondaries 12–16 pairs, subopposite, curving upward, camptodrome and looping with next secondary above, sometimes with abaxial branches near the margin; tertiary venation reticulate, texture membranaceous.

Remarks:—This description is founded on some incomplete impressions. The fossil leaves are closely similar to leaves from the living *Fraxinus insularis* HEMSL., and the both are unable to descriminate each other. This living species is widely distributed from the central and eastern China to Ryu-kyu islands.

Locality:—571

Fraxinus ennichiensis TANAI, sp. nov.

Pl. 1, fig. 15

Description:—Leaflets falcate or oblong-ovate, 6–7 cm. in length, about 2 cm. in width, with acuminate tips and rounded or broadly cuneate bases, petiolulate. Margin entire at base, above with somewhat variable and irregularly spaced serrate teeth; teeth direct upward, often finely pointed. Midrib stout, prominent, straight, slightly curved upward; secondaries 10–13 pairs, relatively thin, subparallel, camptodrome; tertiary venation obscure except for the tertiary veinlets entering the marginal teeth. Petiole short, stout, not over 3 mm. in length, texture subcoriaceous.

Remarks:—These leaf-impressions are assigned to the genus *Fraxinus* with some hesitation, although the similarities are marked. Leaves or leaflets similar to those have frequently been reffered to *Rhus*, *Myrica*, or some proteaceous genus, but their features of venation are rather close to those of *Fraxinus*.

Among the fossil leaves of *Fraxinus*, the present specimens are very close to some leaves of *F. leii* BERRY from the Lower Lance florule of North America.

Locality:—210, 731

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Explanation of Plate 1

Fig. 1 *Fagus Hayatae* PALIB.
Fig. 2 *Lithocarpus miohypophaea* TANAI, sp. nov.
Fig. 3 *Lithocarpus miohypophaea* TANAI, sp. nov. (cupula)
Fig. 4 *Lithocarpus protokonishii* TANAI, sp. nov.
Fig. 5 *Lithocarpus Konishii* HAYATA, (living leaf)
Figs. 6, 7, 8, 9 *Cyclobalanopsis Mandraliscae* (GAUDIN) n. em.
Fig. 10 *Cyclobalanopsis Huziokai* TANAI, sp. nov.
Figs. 11, 12 *Quercus koraica* TANAI, sp. nov.
Fig. 13 *Castanea castaneaefolia* (UNGER)
Fig. 14 *Fraxinus insularis* HEMSL.
Fig. 15 *Fraxinus ennichiensis* TANAI, sp. nov.

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Trans. Proc. Palaeont. Soc. Japan, N. S., No. 9, pp. 9—18, 3 text-figs. May, 31, 1953

228. NOTES ON THE MIOCENE MOLLUSCS FROM THE KUMANO GROUP IN THE SOUTH-EASTERN KII PENINSULA, JAPAN, WITH DESCRIPTIONS OF THREE NEW SPECIES*

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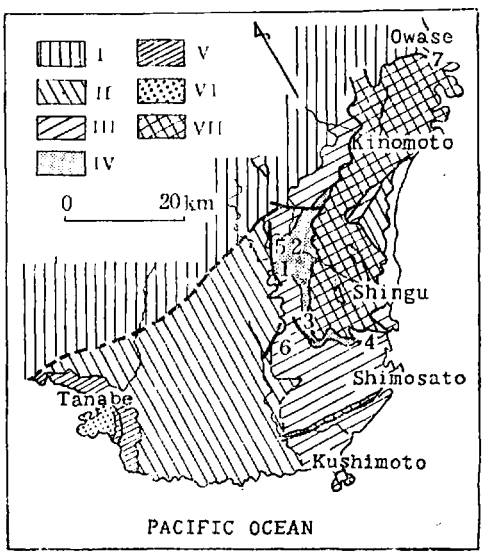
紀伊半島東南部熊野層群の中新世貝化石群集について　附 3 新種の記載：熊野層群，主に三津野累層の貝化石群集の古生態，同層群の地質年代をのべ，又次の 3 新種の記載を行なつた。*Anadara* (*Pectinatarca*) *kiiensis*, n. sp., *Anadara* (*Scapharca*) *nakamurai*, n. sp , *Timoclea nipponica*, n. sp.

水野篤行

The geological age of the Kumano group[1] has been discussed by some investigators since many years ago, but no view has been forwarded on the ecological characters of its molluscan fauna. The following discussions are offered on the basis of the fossils collected mainly from the Mitsuno formation by the writer during 1950-1951 and partly described by some previous researchers: (1) the ecological characters for a paleogeographic consideration; (2) the geological age of the Kumano group; and (3) the descriptions of three new species, *Anadara* (*Pectinatarca*) *kiiensis*, n. sp, *A.* (*Scapharca*) *nakamurai*, n. sp., *Timoclea nipponica*, n. sp.

Stratigraphy and modes of occurrences of fossil-coenoses: As shown in Fig. 1,[2]



I. "Unknown Mesozoic strata". II. Paleogene ? strata. III. Koguchi formation. IV. Mitsuno formation. V. Tanabe "group". VI. Kanayama "group". VII. Igneous rocks.

Figure 1. Geological map of the Southern Kii Peninsula.

* Read June 30, 1951; received August 1, 1952.

1) The writer previously proposed the name of Miyai group to the strata including the "Miyai series" (MIZUNO, 1951 b). Hereafter he will call the Kumano group for the Miyai group. Its detailed explanation will be given in another paper (TANAI and MIZUNO, 1953).

2) The geological map was compiled partly on the basis of the unpublished data of M. MURAYAMA, a geologist of the Geological Survey of Japan.

the Kumano group is widely distributed in the south-eastern Kii Peninsula and rests with a distinct clino-unconformity on the basements characterized by a distinctive folding structure. It can be classified into two formations in the vicinity of the Kumano Coal-field; namely the Mitsuno and Koguchi formations. The former (the upper half of the group) is characterized by quartzose coarse sandstone, and the latter (the lower half of the group) by a large quantity of siltstone. (Fig. 2)

The molluscan fossil-coenoses reported here were gathered from the following seven localities and the specific names are given in the accompanying seven tables. Also, their modes of occurrences are as follows.

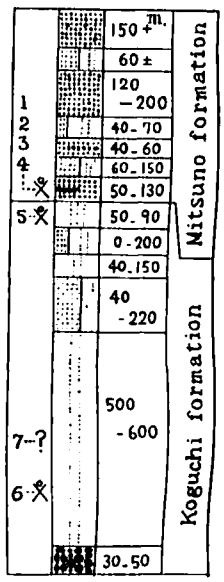


Figure 2. Columnar section of the Kumano group near the Kumano Coal-field.

Table 1. List of species from the locality 1 (Collected by the writer.)

Specific name	1	2	3	4
Anadara (*Scapharca*) *nakamurai* n. sp.	C	(N_1—N_3)	(H)	
Trapezium (*Neotrapezium*) cfr. *japonicum*	C	N_0—N_1	W	

Table 2. List of species from the locality 2 (Collected by the previous investigator)

Specific name	1	2	3	4
Turritella kiiensis	—	(N_3—N_4)	(H)	
Natica sp.	—	N_1—N_4	C	
Nassarius (*Hinia*) *simizui*	—	(N_1—N_2)	(W)	(*)
Anadara (*Scapharca*) *setoensis*	A	(N_1—N_3)	(H)	
Ostrea sp.	—	N_0—N_1 (—N_4)	H, W	
Cardita sp.	—	N_0—N_4	H, W	
"*Cyclina* cfr. *sinensis*"	—	(N_1—N_2)	(W)	(*)
Aloidis succincta	—	(N_0—N_1)	(H)	(*)

Table 3. List of species from the locality 3 (Collected by the writer)

Specific name	1	1′	2	3	4
"*Trochus*" sp.	C	β	N_3—N_4	H	
Turritella kiiensis	A	β	(N_3—N_4)	(H)	
T. (*Haustator*) *kadonosawaensis*	C	α	(N_3—N_4)	(W)	
T. (*H.*) *s-hataii sagai*	C	α>β	(N_3—N_4)	(W)	
Neverita cfr. *didyma*	C	α>β	N_1—N_2	W	
Natica (*Tectonatica*) *janthostoma*	R	α>β	N_1—N_4	C	

Specific name	1	1′	2	3	4
Neptunea cfr. *arthritica*	R	α	N_1—N_4	C	
Nassarius (*Hinia*) cfr. *japonicus*	C	α	N_1—N_2	W	(*)
Nassarius (*Niotha*) *seclusus*	R	α	N_1—N_2	H	(*)
Olivella cfr. *iwakiensis*	C	α	(N_1—N_4)	(W)	
Conus (*Chelyconus*) *tokunagai*	R	α	(N_0—N_1)	(W)	
Dentalium cfr. *lentum*	C	α	(N_2—N_4)	(H)	
Saccella congiensis	A	β	(N_2—N_3)	(W)	
Anadara (*Scapharca*) *nakamurai*	C	β	(N_1—N_3)	(H)	
A. (*S.*) *setoensis*	C	β	(N_1—N_3)	(H)	
A. (*Pectinatarca*) *kiiensis*	A	β	(N_1—N_3)	(H)	
Barbatia sp.	R	α	N_0—N_1	H, W	
Glycymeris vestitoides	A	β	(N_1—N_3)	(W)	
G. sp.	C	α>β	(N_1—N_3)	(H)	
G. junghuhuni	A	α	(N_1—N_3)	(H)	
Pecten sp.	R	α	(N_1—N_4)	W, C	
Monia cfr. *radiata*	A	α	N_1—N_4	W	
Crassatellites nanus	R	β	N_3—N_4	H	
Vasticardium sp.	R	α	N_1—N_4	H, W	
Felaniella ferruginata	C	α	(N_1—N_4)		
Callista macra	R	α	(N_1—N_2)	(H)	
Meretrix cfr. *meretrix*	R	α	N_1	H	*
Dosinia (*Dosinella*) *anguloides*	C	β	(N_1—N_3)	(W)	
D. (*Phacosoma*) *nomurai*	C	α>β	(N_1—N_3)	(W)	
D. (*P.*) *akaisiana*	A	α>β	(N_1—N_3)	(W)	
D. (*P.*) *odosensis*	C	β	(N_1—N_3)	(W)	
Timoclea nipponica n. sp.	A	α>β	(N_1)	(H)	(*)
Venerupis (*Siratoria*) *siratoriensis*	C	α	(N_1)	(W)	(*)
Gari sp.	R	α	(N_1—N_4)	H, W	
Macoma tokyoensis	R	α	N_1—N_2	W	*
Angulus (*Peronidia*) cfr. *venulosus*	R	α	N_1	C	*
Glauconome sp.	R	α	N_0—N_1	W	*
Phaxas sp.	C	α>β	N_1—N_4	W	
Solen cfr. *gouldi*	C	α	N_0—N_1	W	*

Table 4. List of species from the locality 4 (Collected by the previous investigators and the writer.)

Specific name	1	2	3	4
Arca sp.	C	N_1—N_4	H, W	
Ostrea sp.	—	N_0—N_1 (—N_4)	H, W	
Pecten sp.	R	N_1—N_4	W, C	
Vasticardium sp.	C	N_1—N_4	H, W	
Tapes sp.	—	N_1	H, W	*

Table 5. List of species from the locality 5 (Collected by the previous investigator)

Specific name	1	2	3	4
Pecten sp. (small type)	R	N_1—N_4	W, C	

Table 6. List of species from the locality 6 (Collected by the writer.)

Specific name	1	2	3	4
Turritella (Haustator) kadonosawaensis	R	(N_3—N_4)	(W)	
T. (H.) s-hataii	C	(N_3—N_4)	(W)	
Solemya (Acharax) tokunagai	C	(N_4—B)	(C)	
Portlandia (Portlandella) tokunagai	A	(N_4—B)	(C)	
Thyasira (Conchocele) bisecta	A	(N_4—B)	(C)	
Lucinoma izirii	R	(N_4—B)	(C)	
Lucinoma kamenooensis	C	(N_4—B)	(C)	
Macoma optiva	R	(N_1—N_4)	(W)	

Table 7. List of species from the locality 7 (Collected by the previous investigators.)

Specific name	1	2	3	4
Lucina sp.	—	N_1—N_4, B	H, W C	
Periploma owasensis	—	(N_1—N_4)	C	
Macoma aomoriensis	—	(N_1—N_4)	(W)	
Aloidis sp.	—	N_1 N_4	H, W	

Abbreviations :—

1 Frequency of occurrence : R···rare, C···common, A···abundant.

1′ Mode of occurrence at the locality 3 : α···α-group, β···β group.

2 Depth of habitat (according to OYAMA's method of division) (OYAMA, 1952)
N_0·····tidal fascia, N_1·····euneritic fascia, N_2·····mesoneritic fascia,
N_3·····subneritic fascia, N_4·····bathyneritic fascia, B·····hemibathyal fascia.

3 Horizontal distribution : H·····stenothermal warm character.
W·····eurithermal warm character.
C·····eurithermal cold character.

4 *·····dwellers in the head of an inner bay.
( ) Descriptions on the extinct species were made by comparing with their similar species in recent.

——The fossil-coenoses from the Mitsuno formation——

(1)[3] Banzai-toge, Mitsuno-mura :—A boulder of very fine grained (silty) sandstone, in which several fossils are scattering along a bedding plane. (Table 1)

(2) Miyai, Kuju-mura :—Many boulders of sandstone, from which fossils are abundantly yielded. (Table 2) (quoted from some previous works.)

(3) Komugi, Irokawa-mura :—A number of fossils are crowded in several beds of medium or fine grained sand-

3) The numbers 1, 2—7 used here all correspond with those in Figs. 1 and 2.

stone, forming remarkable cross-laminations, and it is easily recognizable that the corpses of molluscs were accumulated to the present place from their original habitats owing to some rapid bottom currents.

The fossils will be classified into the following two groups from their modes of arrangements.

α-group: Numerous small shells are closely crowded, irregularly arranged as constituents of cross-lamination, in the medium grained sandstone (partly "shell-sandstone"). The shells are mostly small in size, remarkably broken, and there are rarely found fragments of large sized shells. The surfaces of all are well defaced.

β-group: Comparably large sized shells are by themselves thinly scattered in the fine grained sandstone, being regularly arranged along the other planes of lamination than of the α-group or sometimes dotted, not taking part in cross-laminations. The shells are scarcely broken and scarcely defaced. Especially in the present case, the individuals that belong to the same genus or species tend to be crowded with one another.

The valves are always detached through the both groups.

The species belong to each group are marked by the marks α, β and $\alpha \geqslant \beta$ in Table 3.

(4) Izeki, Nachi-machi:—Fossils are thinly scattered in massive medium sandstone, (Table 4) (partly quoted from previous works.)

——The fossil-coenoses from the Koguchi formation——

(5) Miyai, Kuju-mura:—*Pecten* sp. are rarely found in siltstone together with numerous shells of *Cyclammina* sp. (Table 5) (quoted from previous works.)

(6) The upper stream of the River Narumi, Kogawa-mura:—To the south of the present locality, many fossils are included in siltstone at several localities, which seem to be of the almost same horison. Shells are arranged along bedding planes, being rather scattered. Valves are mostly conjoined. (Table 6)

(7) Gyo-no-ura, Owase-machi:—Several fossils are included in sandstone. Detailed modes of occurrences are not clear. (Table 7) (quoted from previous works.)

Ecological descriptions and inferences on the fossil-coenoses from the Mitsuno formation:—

1. The fossil-coenoses from the localities 1 and 2 consist mainly of the subtidal dwellers in the head of an inner bay, rarely of brackish water inhabitant and also of mesoneritic to subneritic dwellers and each species is of eury or stenothermal warm character.

2. That from the locality 4 also consists of subtidal dwellers in the head of an inner bay.

3. That from the locality 3 may be classified into few specific groups from their habitats. The first comprises "*Trochus*", *Turritella, Natica, Dentalium, Saccella, Anadara, Glycymeris, Crassatellites* and *Dosinia*, all of them claiming nearly same ecological conditions, namely, being mesoneritic to subneritic, (or bathyneritic) sand dwellers in the middle part of the bay somewhat influenced by an oceanic current, and being of eury- or stenothermal warm characters: (though *Natica* seems to be of eurythermal cold character.) The second comprises *Nassarius, Neverita, Conus, Barbatia, Monia, Vasticardium, Felaniella, Callista, Meretrix, Timoclea,*

Venerupis, Macoma, Angulus, Glauconome and *Solen*, all of them being tidal to euneritic sand, muddy sand dwellers in the innermost area of a bay or an inlet, though there being mixed steno- and eurythermal warm species and fuw eurythermal cold species. In their modes of occurrences, the species belonging to α-group are *Natica, Turritella kadonosawaensis* and *T. s-hataii sagai, Glycymeris junghuhuni* and *G.* sp. in the first group, and are the all species of the second group. The remaining species belong to β-group.

4. It is remarkable that as a whole the fossil-coenoses consist of numerous individuals rich in aariations and numbers of species, while poor in numbers of genera and poor in gastropods, or the individuals other of *Turritella kiiensis* are much smaller than those from the other areas. The facts are very significant on paleoecology. Probably, they may be explained by the specialization of environmental factors, but the detailed studies are necessary in future.

From the preceding descriptions the followings are inferred.

1. The fossil-coenoses from the localities 1 and 2 may be partly parautochthonous, considering from the fact that coal seams are included only in the vicinity of the localities and they are in nearly the same horizon with the fossil bearing strata.

2. It is unknown whether that from the locality 4 is autochthonous or not from the field evidences.

3. The fossil-coenosis from the locality 3 may be considered as follows: the first group except *Turritella kadonosawaensis, T. s-hataii sagai. Glycymeris junghuhuni*, may be parautochthonous; the second group and a part of the first group may be allochthonous.

4. The whole fossil-coenoses from the Mitsuno formation seem to represent a part of the biocoenoses in the large bay with inlets and with rather wide entrance, somewhat influenced by an oceanic current. The bay is able to be compared with the present Suruga or Sagami Bays.

5. Moreover, the condition of the bay when the making of the Mitsuno formation began is roughly inferred. The strand-lines near the localities 1 and 2 would almost correspond with the present boundary-line between the Mitsuno and Koguchi formations, though they are not clear to the east and north of the places because of the lack of the data. The water, being in the head of bay, was probably brackish in the vicinity of the said places. The condition near the locality 3 might be somewhat influenced by an oceanic current, and the strand-line probably stood further west, thus leaving the place off-shore. The strand-lines east or south of the places probably stood generally along the boundary-line between the both formations, considering from the rock-facies of the Mitsuno formation distributed there, though they cannot be inferred from the mode of fossil-coenosis from the locality 4.

Ecological descriptions and inferences on the fossil-coenoses from the Koguchi formation:—The fossil-coenoses mainly consist of bathyneritic or hemibathyal, sandy mud or mud dwellers in an open sea, and most of them seem to be of eurythermal cold character. Moreover, it may be parautochthonous, considering from the modes of occurrences. The fossil-coenosis from the locality 6 suggests the so-called "*Conchocele-Lucinoma* community" (OYAMA, 1952b). Detailed descriptions will be given, when the field-surveyes of the unsurveyed area will be

completed.

Correlations and the geological age of the Kumano group:—From the above-mentioned data, it is suggested that the view of SUZUKI and ITO (1946) as to the geological age of the group[4] may be reasonable.

The fossil-coenoses from the Mitsuno formation and the Kanayama "group" lying on the west of the Kii Peninsula are discriminated into the following two. The one includes *Turritella kiiensis*, *Anadara setoensis* and *Dentalium* cfr. *lentum* among the neritic fauna, and the other *Aloidis succincta* among the subtidal in the innermost area of a bay. The latter fauna of the Kanayama "group" abounds with *Vicaryella bacula* which is commonly found in the middle Miocene strata of the inner bay influenced by a warm water.

The fossil-coenoses from the Kanayama "group" is more rich in the dwellers of the innermost area of a bay, than that of the Mitsuno formation.

Also the present fossil-coenoses are rich in the common species with those from the middle Miocene sandy strata with the "*Operculina-Miogypsina* fauna" destributed in Japan (for example, the Mizunami, Kadonosawa and Oirase groups).

Moreover, they includes such common or similar species with those from the upper Miocene strata of Java and Burma, such as *Nassarius seclusus*, *Anadara nakamurai*, n. sp., and *Callista macra*.

The fossil-coenoses from the Koguchi formation, which are rich in hemibathyal, muddy dwellers, are similar to those from the Taga, Shirado and Yunagaya groups (IWAI, 1950) in the Joban Coalfield, the latter two groups including *Vicarya*, *Vicaryella* or *Desmostylus*.

From the above-mentioned respects, the writer concludes that the Kumano group is correlated to the Kanayama and Tanabe "group" and the other middle Miocene strata in Japan, and its gelogical age is assigned to be middle Miocene (F_2—F_3 in IKEBE's letter-nomination).

From the characters of its fossil-coenoses the Mitsuno formation can be clearly correlated to the Kanayama group, but it is not clear whether the Koguchi formation is correlated to the Kanayama or Tanabe groups, the latter of which underlying the former with partial unconformity, owing to the poorness of the fossil-coenoses of the latter. From the stratigraphical relationship, the Koguchi formation is probably correlated to the Tanabe group.

DESCRIPTIONS OF NEW SPECIES

BIVALVIA

Arcidae

Genus *Anadara* GRAY, 1847

Anadara (*Scapharca*) *nakamurai*, n. sp.

Figure 3

Descriptions:—Shell small, inflated, transversely oblong, inequilateral. Anterior border forming nearly right angle with hinge one, obliquely passing into long, broadly arched ventral one; posterior border convex, forming very obtuse angle with hinge one. Beaks prominent, inflated, incurved, at the anterior two-fifths of shell. Area long, narrow. Hinge consists of numerous small teeth. Surface of shell sculptured with radial ribs and concertric growthlines. Ribs somewhat nodose, about twenty-six in number, and separated by wider valleys.

Dimensions of the holotype:—Length, 13 mm.; height, 9.4 mm.; depth, 3.0 mm.

4) As to their "Shimosato series", the writer considers another view.

somewhat similar to *A.* (*S.*) *theobaldi*.

Comparison:—The new species is *rotuntada* (NOETLING, 1899, p. 135, pl. 5, figs. 11, 12.) from the upper Miocene of Burma, but distinguished from it in having less inflation of shell and less prossogyrate beaks.

Occurrence:—Komugi, Irokawa-mura; the Mitsuno formation.

Anadara (*Pectinatarca*) *kiiensis*, n. sp.

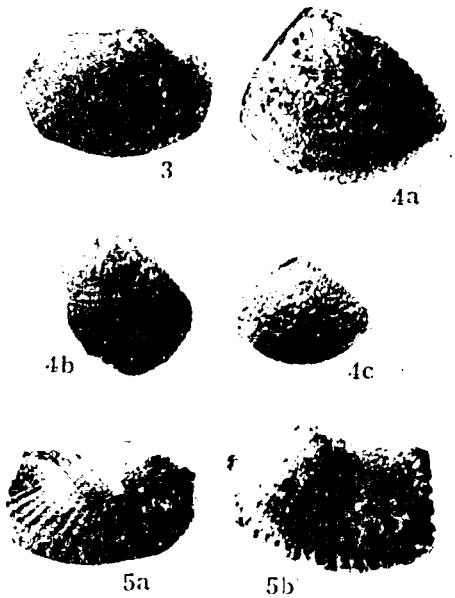
Figures 5a, b.

Description:—Shell, inflated, transversely elongated, very inequilateral. Ventral border nearly straight or broadly convex, nearly parallel to the straight hinge border, suddenly turned to the anterior and posterior ones, the both making somewhat obtuse angles with hinge one. Beaks rather small, inflated, situated at the anterior two-fifths of hinge line. Area narrow and long. Hinge consists of numberous small teeth. Surface of shell scuptured with radial ribs, twenty-nine in number, somewhat nodose, crossing concertric growthlines.

Dimensions of the holotype:—Length, 12.9 mm.; height, 9.2 mm.; depth, 2.5 mm.

Comparison;—*A.* (*P.*) *gubernaculum* (REEVE, 1844, pl. III, Species 14), the living species near Phillippines and formosa, resembles the new species, but the former is larger and higher in outline.

Occurrence:—Komugi, Irokawa-mura; the Mitsuno formation.



Explanations of Figures 3-5

Figure 3. *Anadara* (*Scapharca*) *nakamurai*, n. sp.
Internal mould of the right valve, ×2, the holotype.

Figures 4a. b, c. *Timoclea nipponica*, n. sp.
a. Internal mould of the left valve, ×3, the holotype.
b. External mould of the left valve, ×3, the paratype.
c. External mould of the right valve, ×3, the paratype.

Figures 5a, b. *Anadara* (*Pectinatarca*) *kiiensis*, n. sp.
a. External mould of the right valve, ×2, the holotype.
b. Internal mould of the left valve, ×2, the paratype.

(All specimens are kept in the Geological Institute, University of Tokyo.)

Veneridae

Genus *Timoclea* BROWN, 1827

Timoclea nipponica, n. sp.

Figures 4a, b, c.

Description:—Shell very small, very inflated, obliquely trigonal. Anterior end broadly rounded, posterior one subangulate; ventral border broadly convex, somewhat being concave near posteroventral corner. Beaks small, pointed. Hinge small and narrow, consisting of two cardinal teeth and two thin lateral

teeth on the right valve. Pallial sinus broad, shallow, triangular and pointed at the end. Surface sculptured with radial ribs and growth lines, the former strong on the posterior one-third of the shell, about eight to ten in number, and becomes weaker or absent at the anterior part.

Dimensions of the holotype:—Length, 10.0 mm.; height, 8.4 mm.; depth, 3.0 mm.

Comparison:—The new species resembles *T. subspadicea* (COSSMANN, 1909, p. 363, pl. 14, figs. 36-40) in outline, but the latter is much larger in size.

Remarks:—Several specimens were examined. The modes of ribs are somewhat variable.

Occurrence:—Komugi, Mitsuno-mura; the Mitsuno formation.

The writer is greatly indebted to Messr. K. OYAMA and S. OGOSE for their kind advices and criticisms, and also to Drs. T. SAKAMOTO and F. TAKAI for looking over the manuscript.

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Postscripts:—Recently Mr. S. HADA found the parautochthonous fossil-coenosis consisting of *Cyclina lunulata* and *Striarca* sp. from fine grained sandstone near Hase, Nachi-machi, the sandstone being considered stratigraphically to be of the same horizon with one of the locality 4. *Cyclina lunulata* is considered as the subtidal, sand or sandy mud dweller at the inner-most part of bay. So, the preceding inferences as to the modes of strand-lines east or south of the locality 3 will be now verified by the occurrence of the present fossil-coenosis, and moreover that the bay during the making of the lowest part of the Mitsuno formation would opened its mouth widely to east is thus explained from the paleontological data. On the other hand, the writer ascertained the distribution of the Koguchi formation at the south-west of the so-called Kumano acidic rocks as shown in Fig. 1, from which many fossils of hemi-

bathyal, mud dwellers were found. The whole strand-lines of the bay during the making of the lower parts of the Koguchi formation probably stood further west of the boundary-line between the Kumano group and the basements, being parallel to the present strand-line of the south-eastern part of the Kii peninsula.

This paper was issued as one process for the clarification of the Neogene history at the south-eastern part of the Kii peninsula.

Trans. Proc. Palaeont. Soc. Japan, N. S., No. 9, pp. 19—26, Pl. 2, 4 text-figs., May 31, 1953

229. ON A NEW LAND TURTLE FROM PALAEOGENE OF HOKKAIDO*

TOKIO SHIKAMA

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北海道古第三系産の新陸亀： 1946 年空知郡歌志内炭礦の坑内産と 16 年前奈井江炭坑より産した陸亀を同一種の新種とし，北米及び中国の古第三系陸亀と比較して，*Sinohadrianus ezoensis* と呼ぶことにした。産出層は美唄夾炭層で，この亀よりみて本層を上部始新世のものとするにさしつかえない。 鹿間時夫

Few chelonian remains are known from the Japanese Palaeogene; i. e. *Geoemyda* (*Geoliemys*) *takasago* MATSUMOTO from Tikuhô coalfield, north Kyusyu (holotype stored in the Institute of Geology and Palaeontology, Tôhoku University) (MATSUMOTO, 1929) and *G.* (*G.*) cf. *takasago* MATSUMOTO, TAKAI from the bottom of Sasebo harbour (specimen stored in the Biological Laboratory of the Imperial Household) (TAKAI, 1938) belong to Asiya group (Early Oligocene), the horizon of the latter specimen being in the opinion of Dr. TAKAI the Aiura formation of the Lower Matuura group of Dr. T. UEJI (1938) and *Trionyx ubeensis* CHITANI (CHITANI, 1925) from the "Hitoe" and "Ôha" coal seams of the Ube coal-bearing group of the Ube Coal Mine (Uppermost Eocene).

Hitherto we did not know any occurrence of fossil Chelonia from the Palaeogene coal-bearing group (Isikari group) of Hokkaido except a specimen collected about 16 years ago from inside the Naie Coal Mine (Bibai coal-bearing formation). A gypsum model made by the late Dr. T. NAGAO is preserved in the Institute of Geology and Mineralogy, Hokkaidô University, but it is uncertain where the original specimen is.

On Oct. 26, 1946, Mr. Y. ÔTAGAKI of Seika Mining Company found a chelonian specimen in the Utasinai Coal Mine, Sorati-gun. The specimen was discovered during coal mining in incline No. 19, and the horizon from which it was obtained is clearly the Bibai coal-bearing formation, the same as for the Naie specimen. Dr. M. MINATO of the Institute of Geology and Mineralogy, Hokkaidô University, kindly submitted these specimens to the writer.

Utasinai Coal Mine lies about 15 km. northeast of Naie Coal Mine. Both are situated in the northern region of the so-called Isikari coalfield, where the Isikari group composes the thickest part, about 3150 m., and the Bibai coal-bearing formation lies in the middle horizon of the group. According to Dr. S. TASIRO's recent conclusion, the Isikari group may be divided as follows, in ascending order:

1. Noborikawa coal-bearing formation; ca. 600 m., contemporaneous with the Sunagawa coal-bearing formation of Asibetu, Utasinai, and Bibai regions (Sorati district).

*) Read June 5, 1952; received Aug. 22, 1952

2. Horokabetu shale formation; ca. 150 m., contemporaneous with the Kamui shale formation of Sorati district.
3. Yûbari coal-bearing formation; ca. 300 m., contemporaneous with the Utasinai coal-bearing formation of Sorati district.
4. Wakkanabe formation of Sorati district.
5. Bibai coal-bearing formation; ca. 200 m., absent or very insufficently known from the middle to southern region of the Isikari coalfield.
6. Lower *Corbicula*-bearing formation; correlated with the Akabira fossiliferous formation (Utasinai) and Itinosawa sandstone formation (Bibai-Naie-Sunagawa).
7. Takane formation (Takane coal-bearing formation); ca. 600 m., together with the preceding formation.
8. *Woodwardia* sandstone formation; ca. 22 m.
9. Upper *Corbicula*-bearing formation and Penke-Poronai formation; ca. 500 m., corresponding to Hiragisi fossiliferous formation.
10. Asibetu coal-bearing formation; ca. 400 m.

According to Dr. TASIRO, the so-called Ikusyunbetu coal-bearing formation of the middle-southern region corresponds to the 8th to 10th formations. The Wakkanabe formation and the Akabira fossiliferous formation both contain some marine shells. According to him, the Bibai coal-bearing formation contains some plant remains and shells, such as *Sabalites nipponica* (KRYSHTOFOVICH), *Glyptostrobus* sp., *Taxodium distichum miocenum* HEER. *Sequoia Langsdorfii* BRONGNIART, *Cinnamomum* sp., *Populus* sp., *Ostrea* sp., *Corbicula* sp., *Modiola* sp., *Unio* sp., *Paludina* sp. etc. (TASIRO, 1949, '50) Dr. K. SUZUKI reports the following non-marine shells from the formations from the Wakkanabe to the lower *Corbicula*-bearing (SUZUKI, 1949); *Viviparus* (*Cipangopaludina*) *jimboi* SUZUKI, *V.* (*C.*) *ishikariensis* SUZUKI, *V.* (*Sinotaia*) *mabutii* SUZUKI, *Margaritifera perdahurica* (YOKOYAMA), *Cristaria sasai* SUZUKI, *Inverisidens ishikariana* SUZUKI, *Lanceolaria pisciformis* (YOKOYAMA), *Polymesoda* (*Geloina*) *hokkaidoensis* NAGAO & ÔTATUME, *P.* (*G.*) *takaoi* NAGAO & ÔTATUME, *Corbicula* (*Batissa*) *sitakaraensis* SUZUKI, *C.* (*Cyrenobatissa*) *muratai* (NAGAO & ÔTATUME), *C.* (*C.*) *nisikawai* (ÔTATUME), *C. japonica iburica* (YOKOYAMA), *C. tokudai* (YOKOYAMA). The Isikari group is considered by him to be Oligocene in age. Dr. F. TAKAI, reporting the occurrence of *Amynodon watanabei* (TOKUNAGA) from the Tatibetu formation of Uryu coalfield which is correlated to the Takane formation, regarded the horizon of Tatibetu-Takane to be Latest Eocene in age (TAKAI, 1950). He proposed the name of Ubean (represented by Ube coal-bearing formation) or Hôsanian (represented by Hôzan (Ponsan) formation in North Korea) for this horizon and considered it to be contemporaneous with the Bartonian in Europe and the Uintan in America. Hence, the Bibai coal-bearing formation is at least older than Latest Eocene in age.

The writer wishes to thank Dr. M. MINATO who entrusted the specimens to the writer for study, and to Drs. H. YABE, Y. SASA, F. TAKAI, R. ENDO, S. HANZAWA, H. OZAKI and R. ZANGERL who gave the writer much help and many suggestions in the preparation of this manuscript.

Sinohadrianus ezoensis sp. nov.

Pl. 2, Text-figs. 1-4

Holotype:—Carapace from Utasinai

Coal Mine, stored in the Institute of Geology and Mineralogy, Hokkaidô University.

Referred specimens:—Gypsum model of shell from Naie Coal Mine, stored in the Institute of Geology and Mineralogy, Hokkaidô University.

Horizon and locality:—Bibai coal-bearing formation of Isikari group: Late Eocene.

Description:

Holotype Plastral side of the shell unknown; shell preserved in dark grey marly claystone. Large parts of carapace broken away except distal parts of right 5th, 6th, left 1st, 2nd, 4th, 5th and 6th costal, peripheral bones of right, from 6th to 11th, and left, 1st, 2nd and from 6th to 10th. One right peripheral preserved beside 2nd costal. Left half of nuchal also preserved. Neural, suprapygal, and pygal unknown entirely, but their general outline indicated by inner cast of carapace.

Shell, oval to nearly quadrate in general outline, not much vaulted, rather flat, about 170 mm. in median longitudinal length, 149.6 mm. in maximum transverse width. Carapace consists of 1 nuchal, 8 neural, 2 suprapygal, 2 pygal, 8 pairs of costal, and 11 pairs of peripheral.

Nuchal bone pentagonal, with longest fore-and shortest aft borders; anterio-lateral border running straight but fore- and posterio-lateral borders a little curved. Bone 38.8 mm. and 31.8 mm. in maximum transverse and longitudinal length respectively; left antero-lateral border 20.0 mm. long and left postero-lateral border 21.7 mm. in direct length.

First neural bone elongate quadrate, narrow and longest of all neurals, with both lateral borders straight and posterior border much convex backward. Second neural bone hexangular, with straight and longest postero-lateral border, shortest anterio-lateral border and aft border slightly convex backward. Third neural bone largest of all neurals, broader and longer than second, elongate hexagonal, with shortest antero-lateral borders, straight running and longest postero-lateral borders, and aft border slightly curved backward. Fourth neural at middle of carapace, as broad as long, shorter than third neural, also hexangular. Fifth and sixth neurals resemble fourth; antero-lateral border shortest and postero-lateral border longest and straight. Seventh neural bone much broader than long, quadrangular, with longest fore border, gently convex forward, lateral and posterior borders straight. Eighth neural bone smallest of all neurals, quadrangular, elongate transversally, with straight anterior and posterior borders, and much curved lateral borders. In median portion of neurals a column of vertebral centrum runs straight antero-posteriorly, about 31 to 33 mm. in width.

Dimensions of neural bones follow:

	1	2	3	4	
Median length	18.2	14.3	16.8	15.0	mm.
Maximum width	12.0	15.2	16.0	15.8	
	5	6	7	8	
Median length	17.8	11.5	10.4	4.9	mm.
Maximum width	15.2	15.0	16.9	12.1	

First suprapygal bone quadrangular, broader than long, longer than eighth neural and with straight borders; bone 7.9 and 11.5 mm. in median length and maximum width respectively. Second suprapygal irregular trapezoid, with longest and gently curved posterior border and with straight and shortest anterior border, former 41.9 mm. and latter 9.4 mm. long; lateral border nearly straight and 25.0 mm. long; bone 16.1 mm. in median length.

First pygal bone lenticular with sharply projected both ends; bone 5.3 mm. and 26.8 mm.± in median length and transverse width respectively. Second pygal bone large, quadrate, broader than long, with nearly straight lateral border and with gently curved anterio and posterior borders; bone above 21.8 mm. and 30.8 mm. in median length and transverse width respectively.

Antero-lateral portion of right first costal bone broken away, and distal portion of left costal bones from first to fourth rather poor in preservation. First costal bone bordered by nuchal; first and second neural and second costal bones, irregularly quadrate, broader than long, and with longest posterior border. Second costal bone bordered proximally by second and third neurals and anterio-posteriorly by first and third costal bones; elongate quadrate and slightly expanded antero-posteriorly in distal portion; anterior and posterior borders nearly straight or slightly curved; distal border a little convex outward. Third to seventh costal bones liked second costal in general outline and relative position; of them third is largest and seventh smallest. Fifth costal bone bordered distally by seventh and eighth peripheral bones, and sixth costal by eighth and ninth peripheral bones. Eighth costal bone irregularly quadrate with shortest proximal and longest distal borders; anterior border convex foreward and posterior border nearly straight. Costal bones moderately thick, about 2.8 mm. at distal portion of left fifth. Surface of fourth to sixth costal bones carinated. Dimensions of costal bones follow:

			Right	Left
Costal	1	T. L.	56.0	42.2+ mm.
		P. W.	15 8	16 8
„	2	T. L.	59.5	56.4+
		P. W.	16 0	16.0
		D. W.	19.0	20.0
„	3	T. L.	61.0	58.0+
		P. W.	18.3	17.2
		D. W.	23.8	23.5
„	4	T. L.	60.0	60.4
		P. W.	13.8	14.5
		D. W.	18.7	18.2±
Costal	5	T. L.	55.7	55.8
		P. W.	13.6	13.3
		D. W.	19.0	18.0
„	6	T. L.	52 2	52.2
		P. W.	12.2	12.6
		D. W.	16.8	15.7
„	7	T. L.	42.0	43.0
		P. W.	11.8	12.2
		D. W.	18.2	17.1
„	8	T. L.	32.8	35.8
		P. W.	9.8	7.8+
		D. W.	18.0	19.2

T. L. : Maximum transverse length. P. W. : Proximal fore- and hind width.
D. W. : Distal fore and hind width.

Anterior part of peripheral bones before sixth detached and unpreserved, except right fourth (?) and left first and fifth peripheral bones, the first mentioned being attached to distal border of left second costal bone, and the latter two being preserved along lateral border of nuchal bone. First peripheral bone quadrate, longer than broad, with straight lateral- and slightly curved proximal- and distal borders. Fifth peripheral bone liked first in general outline, but broader than it proximo-distally. Sixth to eighth peripheral bones much broader than long proximo-distally; their proximal and distal borders gently curved while lateral borders almost straight. Ninth peripheral nearly rectangular. Distal portion of tenth and eleventh peripheral bones broken away, but they seem to be broader than long proximo-distally. Left eleventh peripheral bone

unpreserved. Distal free margin of peripheral bones acute or subacute. Dimensions of peripheral bones as follows:

			Right	Left
Peripheral	1	B.	——	13.7 mm.
		P.	——	17.2
		L.	——	15.2
,,	5	B.	——	16.6
		P.	——	——
		L.	——	16.5±
,,	6	B.	19.0	——
		P.	20.5±	——
		L.	13.5±	——
,,	7	B.	20.0	——
		P.	21.9	——
		L.	15.4	——
Peripheral	8	B.	19.8	19.4
		P.	23.8	22.0±
		L.	17.8	18.2±
,,	9	B.	18.9	18.3
		P.	23.0±	22.3±
		L.	21.6	15.0+
,,	10	B.	17.8	16.2
		P.	22.8	——
		L.	18.8	14.8+
,,	11	B.	12.2±	——
		P.	21.0	——
		L.	17.8±	——

B.: Length along inner border. P.: Length along periphery.
L.: Proximo-distal length along fore border.

Owing to poor preservation of carapace bones, it is difficult to determine the precise outline of scutes, especially those of median vertebral scutes. The writer is inclined to assume the following.

First vertebral scute nearly pentagonal, rather longer than broad; posterior lateral sulcus runs through surface of posterior lateral angle of nuchal bone. Second interlateral sulcus runs through posterior part of fourth costal bone, and third interlateral sulcus also through those of sixth costal bone. Sulcus of posterior border of fifth vertebral scute probably runs along anterior border of second pygal bone, and sulcus of anterior border of fifth vertebral scute probably runs through surface of first suprapygal bone. Fifth vertebral scute irregularly trapezoidal, very broad transversally. Second, third and fourth lateral scutes generally quadrangular or pentangular with straight interlateral sulci. Third lateral scute broadening proximally; proximal border of it 36.4 mm. in length. Marginal scutes quadrangular. Dimensions of eighth, ninth, and tenth marginal scutes follow.

		8	9	10	
Length along inner border	Right	19.7	22.6	—	mm.
	Left	—	21.8	20.8	
Width along anterior border	Right	16.1	18.8	22.7	
	Left	—	16.8	14.8	

Referred Specimen.

Described by a gypsum model showing only sulci, and general outline and interrelationship of scutes showing the specimen conspecific with the holotype. Shell oval, rather flat, not high and damaged in anterior region and peripheral portions distal to costo-marginal sulci; 127.0 mm. in median longitudinal length as preserved, 112.0 mm. in maximum transverse width, and 44.0 mm. in maximum height. If anterior part of nuchal and last pygal bones restored, about 40 mm. added to length of the specimen as preserved, and original length becomes about 167 mm.; likewise original width may be near 140 mm.; and dimensions of the specimen of reference becomes near that of the holotype. Outline of each of bones unknown.

Second vertebral scute hexagonal in general outline, rather longer than broad, broadest at middle length; posterior

border straight while lateral borders curved. Third vertebral scute also hexagonal, broader than long, with straight anterior- and posterior borders; anterior- and posterior lateral borders curved. Fourth vertebral scute hexagonal, much broader than long and with straight anterior-, curved posterior- and lateral borders. Surface of vertebral scutes from second to third very flat, while those of fourth gently sloped posteriorly and those of fifth much inclined backward.

Second lateral scute quadrangular with acute anterio-inner- and posterioperipheral angles and obtuse anterior-peripheral and posterio-inner angles; anterior- and posterior borders straight, both lateral borders curved. Third lateral scute irregularly trapezoidal in general outline, with shortest and straight inner border, longest and straight anterior border; posterior border also straight; outer border crenulated.

Marginal scutes all precisely unknown. Shell mostly eminently vaulted at one third breadth from inner lateral borders. Surface of shell rather rugose. Dimensions of scutes are:

Vertebral scute	2	3	4
Median length	34.5±	28.7	24.0 mm.
Maximum width	34.2	36.5	36.2±

Lateral scute	1		2		3		4	
	Right	Left	Right	Left	Right	Left	Right	Left
Maximum transverse length	——	38.0	46.0	46.8	46.2±	46.8	27.0±	30.5±
Width along inner border	——	24.0	33.5	32.8	26.0	23.0±	18.0±	——
Ditto along peripheral border	——	54.5	33.0	31.3	38.2	32.5	——	24.5±

Plastron oval in general outline, 12) mm. long as preserved along median longitudinal sulcus seems to be a little truncated. Femoral scute irregularly quadrangular with shortest, straight inner and longest, curved peripheral borders; anterior border straight, vertical to median longitudinal sulcus. Anal scute longer than wide, triangular in general outline, with longest straight median-inner- and shortest curved peripheral borders. Dimensions are:

	Right femoral	Right anal
Length along inner border	20.0	28.0 mm.
Ditto along peripheral border	40.0±	25.0
Ditto along anterior border	38.0±	28.0

Relationship:—This species is most related in general size and shape to *Sinohadrianus sinchuanensis* PING from the Upper Eocene of Fan Chuang, Si Chuan Hsien, Honan (Fan Chuang Sereis correlated with Irdin Manha formation in Mongolia) (PING, 1929), but distinguished from it by relatively broader vertebral scutes, straight running inter-vertebral sulcus, more distinct hexagonal outline of vertebral scutes and neural bones, posterior border of fourth vertebral scute running through first suprapygal bone; in *sinchuanensis* the border above mentioned runs through eighth neural bone. Distinct from the American *Hadrianus* by generally smaller and more flat shell, shorter fourth neural bone, less projected outline of sixth neural, and by first vertebral scute much broader and expanded anteriorly. . Some species of *Echmatemys*, as *stewensoniana* LEIDY

or *wyomingensis* LEIDY may be near to this species, but distinguishable by lack of the first pygal bone, by narrower vertebral scutes, and by latero-marginal sulci of posterior region separated from the corresponding costo-peripheral sutures (HAY, 1908).

Remarks:—Among Far Eastern Palaeogene turtles, there are known, besides those of Japan and Honan, *Anosteira manchuriana* ZANGERL (Upper Eocene of Fu-schun series, S. Manchuria), *A. mongoliensis* GILMORE (Ulan Shireh and Irdin Manha formations of Mongolia), *Adocus orientalis* GILMORE (Irdin Manha formation), *Sharemys hemispherica* GILMORE and *Palaeochelys elongata* GILMORE (Ulan Gochu formation of Mongolia), and several species of *Testudo* and *Trionyx*; they are all quite different from this species. The occurrence of *Sinohardrianus* from Bibai coal-bearing formation is rather significant, supporting the opinion that the upper part of the Isikari group is at least Late Eocene in age.

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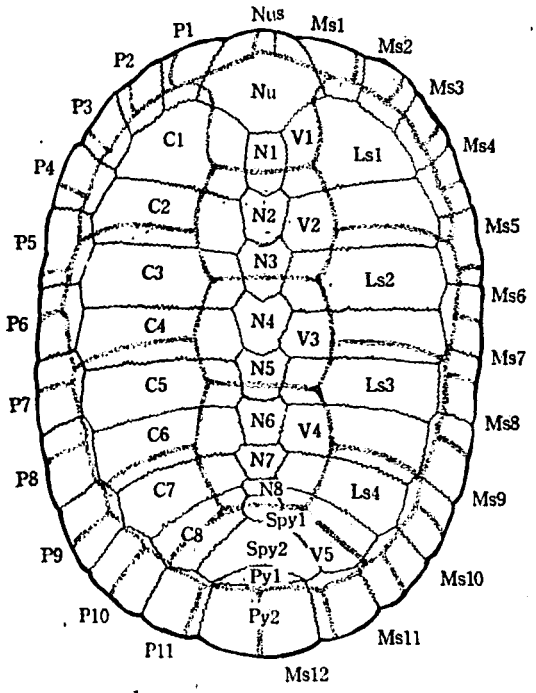

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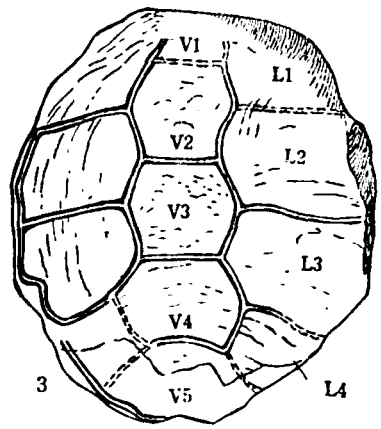

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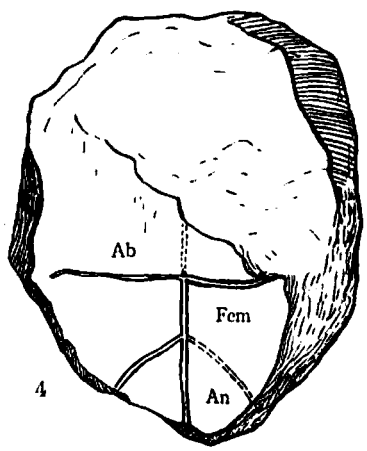

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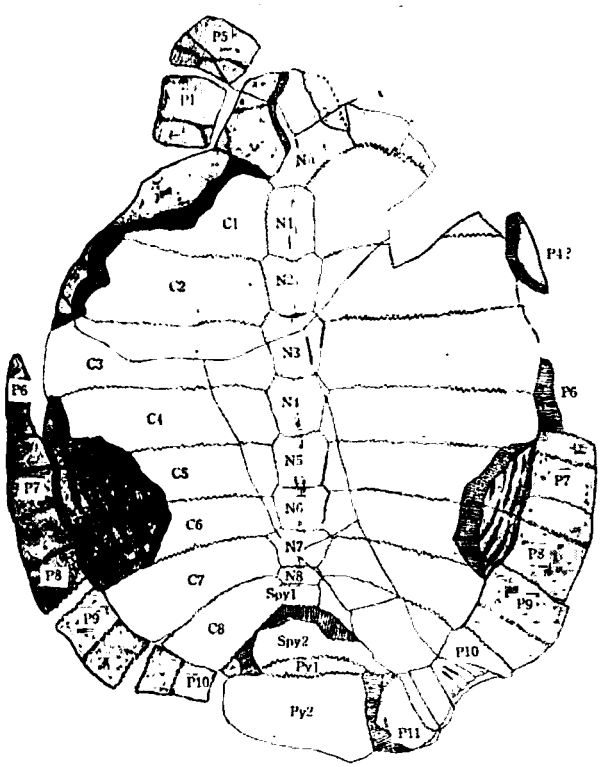

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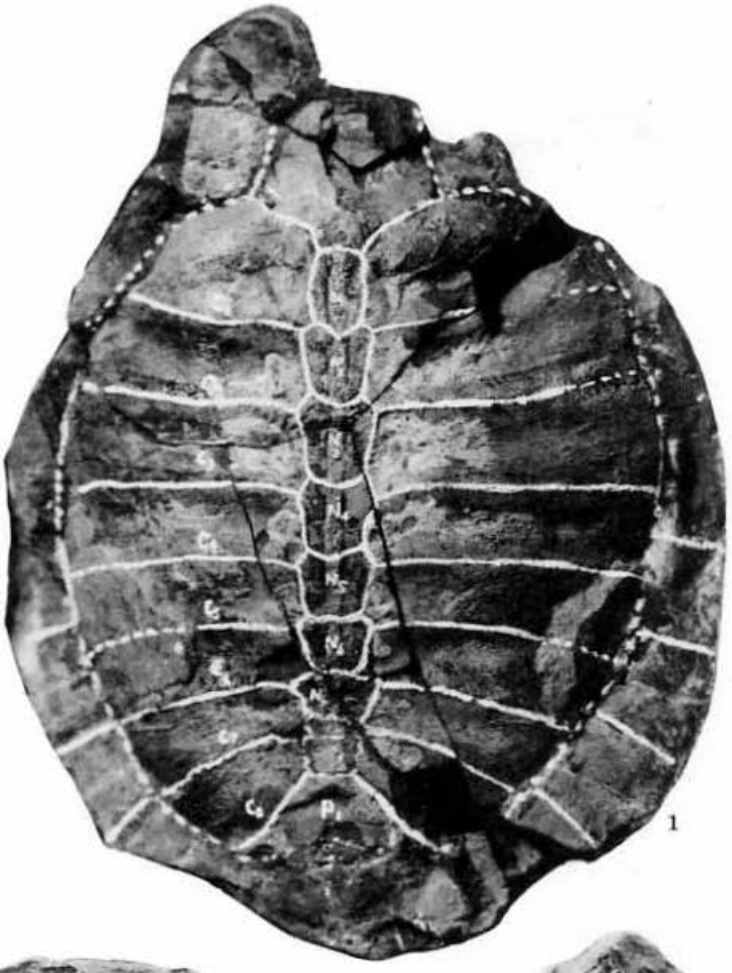
Explanation of Plate 2

Sinohadrianus ezoensis sp. nov.

Figure 1. Holotype (carapace side) ×0.63

Figure 2. Referred specimen (carapace side) ×0.64

Figure 3. Referred specimen (left lateral side) ×0.64



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Trans. Proc. Palaeont. Soc. Japan, N. S., No. 9, pp. 27—29, Pl. 3, May, 31, 1953

230. FOSSIL SPECIES OF THE PALAEOPNEUSTIDAE FROM JAPAN*

AKIRA MORISHITA

Kyoto University

日本産 Palaeopneustidae の化石群について：日本に Palaeopneustidae に属する海膽化石の産出する事は既に知られているが記載は今回が初めてである。手元にある標本は *Palaeopneustes cf. cristatus* A. AGASSIZ, *Archaeopneustes cf. hystrix* (A. AGASSIZ) に同定したが，何れも本邦鮮新層下部の特に互層部より見出された事は注目すべき事実である。 森 下 晶

The occurrence of fossil echinoid *Palaeopneustes* from Neogene strata of Nakamura, Fukushima Prefecture has been reported by S. NISIYAMA without description.

Three specimens of Palaeopneustidae at hand will be described herein. *Palaeopneustes* seems very much allied to *Linopneustes* in various points. *Palaeopneustes* may be identified for lack of fascioles which are very important feature of *Linopneustes*. Unfortunately fascioles of fossil Spatangoidal echinoids are badly preserved. Therefore other generic features were considered in this occasion too. It is a remarkable fact that they occur invariably in the alternating sands and muds of the typical Tertiary formation (Lower Pliocene, H_1).

I wish to acknowledge my indebtedness to Professor J. MAKIYAMA for his kind revision of English and to Mr. K. NAKASEKO of Osaka University for his kind offer of the specimen.

DESCRIPTION OF SPECIES

Palaeopneustes cf. cristatus A. AGASSIZ

Pl. 3, fig. 1

1878 *P. cristatus*, A. AGASSIZ, p. 192
1880 *P. cristatus*, A. AGASSIZ, p. 81
1885 *P. cristatus*, R. RUTHBUN, p. 615
1886 *P. cristatus*, R. RUTHBUN, p. 287
1933 *P. cristatus*, S. NISIYAMA, p. 50, figs. 65A, B
1950 *P. cristatus*, Th. MORTENSEN, p. 191, pls. IV (fig. 2); VIII (fig. 1); XXII (figs. 7, 9-12, 18, 19); XXIII (figs. 11, 12, 20)

Description:—The test is roundly conical in shape, comparatively high. The oral side is flat. The frontal depression is lacking. The aboral side is usually evenly arched from the margin of test to the apex.

The ambulacra are not depressed, distinctly petaloid and open distally. They are gradually widened towards the distal ends of the petals. The odd anterior one is narrower and longer than the other four. The paired ambulacra are longer than the 3/4 radius of test. The interporiferous zones are broad and occupy the 2/3 width of petals.

* Read June 22, 1952; received July 16, 1952.

The apical system is central. The genital pores and madreporite are indistinct. The periproct is indistinct because of the lacking of the posterior margin of test. The marginal and subanal fascioles are wanting.

The posterior paired ambulacra on the oral side are naked. The peristome is at the 1/6 diameter from the anterior ambitus. The labrum is considerably prominent.

Measurements:—

Longitudinal diameter:	about 89 mm.
Transverse diameter:	85 mm.
Height:	30 mm.

Remarks:—The posterior part of the specimen under examination is broken, missing about 1/5 of the longitudinal diameter, but the oral and aboral sides are considerably well preserved.

According to A. AGASSIZ (1880) *Palaeopneustes hystrix* is more flattened than *Palaeopneustes cristatus*. In spite of the smaller height and the longer ambulacra this specimen belongs to *P. cristatus* in view of the various features.

Geological Horizon:—Nadachi Formation (Lower Pliocene, H).

Locality:—Sendo, Isobe-Mura, Nishi-Kubiki-Gun, Niigata Prefecture.

Archaeopneustes cf. hystrix (A. AGASSIZ)

Pl. 3 figs. 2, 3

1880 *P. hystrix*, A. AGASSIZ, p. 82
1895 *P. hystrix*, R. RUTHBUN, p. 615
1886 *P. hystrix*, R. RUTHBUN, p. 288
1892 *A. hystrix*, J. W. GREGORY, p. 163
1950 *A. hystrix*, TH. MORTENSEN, p. 195, pls. IV (fig. 1); V (figs. 1-2); VI (fig. 1); VII (figs. 1-2); XXII (figs. 2-4, 8, 13, 15 17); XXIII (figs. 1, 14)

Description:—The test is large elliptical in shape and gently arched from the ambitus to the apex. The oral side is flat. There is no frontal depression.

The ambulacra are not depressed, distinctly petaloid and open distally.

They are remarkably widened from the apex to the ambitus. The odd anterior one is narrower than the other four. The paired ambulacra are as long as the 3/4 radius of test. The odd anterior and posterior paired one are indistinct in length because of the damage of posterior margin. The width of poriferous zone of petals is nearly the same as the interporiferous zone.

The apical system situates at the centre and the apex of test. The periproct is not distinct, but it seems to be at the posterior margin. The marginal and subanal fascioles are wanting.

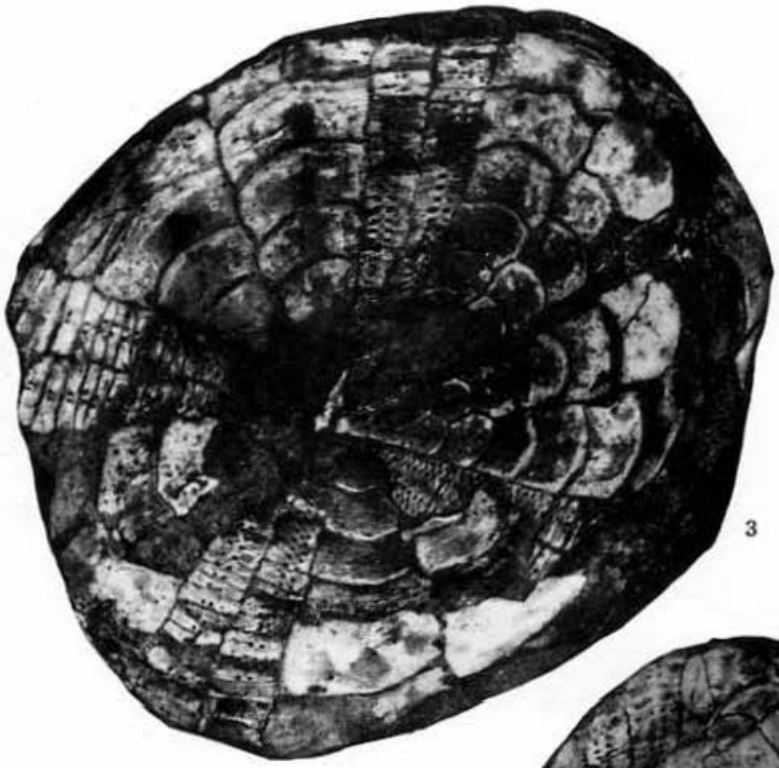
The posterior paired ambulacra on the oral side are naked. The peristome is remarkably partial at the 1/6 diameter from the anterior ambitus. The labrum forms a prominent lip.

Measurements:—

	Specimen from Shizuoka	Specimen from Miyazaki
Longitudinal diameter:	126 mm.	93 mm.
Transverse diameter:	107 mm.	105 mm.
Height:	38 mm.	17 mm.

Remarks:—Two specimens are at my disposal. One was collected from Shizuoka Prefecture, and another from Miyazaki Prefecture. The latter is considerably pressed and deformed. Although this specimens are very much allied to *Linopneustes*, I identified it as *Archaeopneustes*, because it has no depression of anterior ambitus and fascioles. Preservation of the specimen from Shizuoka is very well, except the damage of posterior margin. The description is based upon this specimen.

This species is different from *Palaeo-*



3

2

1

pneustes cristatus in the flattened test, the distant pores of ambulacra and the uniformly spreading of ambulacra. It differs from *Palaeopneustes grandis* in point of the longer ambulacra, too.

Geological Horizons: Tenno Sandstone (Lower Pliocene, H_1)?
Kiyotake Alternation (Lower Pliocene, H_1).

Localities:—Near Kakegawa-Cho, Ogasa-Gun, Shizuoka Prefecture.
West of Kiyotake Station, Kiyotake-Mura, Miyazaki-Gun, Miyazaki Prefecture.

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Explanation of Plate 3

Figure 1. *Palaeopneustes cf. cristatus* A. AGASSIZ. Loc. Niigata Pref., Nadachi Formation. Aboral side.

Figure 2. *Archaeopneustes cf. hystrix* (A. AGASSIZ). Loc. Miyazaki Pref., Kiyotake Alternation. Aboral side.

Figure 3. *Archaeopneustes cf. hystrix* (A. AGASSIZ). Loc. Shizuoka Pref., Tenno Sandstone. Aboral side.

PROCEEDINGS OF THE PALAEONTOLOGICAL SOCIETY OF JAPAN

「日本古生物学会第 51 回例会」昭和 27 年 9 月 27 日秋田大学鉱山学部鉱床学教室に於て開催す（参会者 26 名）。講演者並に講演題目次の如し。猶 9 月 28～30 日男鹿半島方面の見学旅行を行つた（参加者 21 名）。

阿仁合植物群と台島植物群の層位的並びに組成的研究……藤岡一男
朝鮮産第三紀植物化石 IV……藤岡一男
秋田県生保内植物群……藤岡一男・高安泰助
Miocene Foraminifera from Shintotsugawa Area, Kabato-gun, Hokkaido……Kiyoshi ASANO
Miocene Foraminifera from the Honya Shale, Joban Coal-field……Kiyoshi ASANO
万願寺有孔虫群の組成的並びに推積的考察……藤岡一男・古藤次郎
秋田県八森油田の古生物に就いて……井上寛生
青森県大釈迦油田大釈迦及び鶴ケ坂化石帯の腕足類について……古藤次郎
Fossil Assemblages of Molluscs and Brachiopods of Super-Normal Sizes from the Permian of Japan……Ichiro HAYASAKA and Syozo HAYASAKA
Mya-Bed in Hokkaido; a Preliminary Note……Ichiro HAYASAKA
仙台附近中新世の Pectinidae（その 2）……畑井小虎・増田孝一郎
秋田県男鹿半島西黒沢層の動物化石群について……小高民夫
黒瀬谷累層下部及び上部の古生物群に認められる特長及び之と他地域の古生物群との比較（予報）……津田禾粒
黒瀬谷累層中に見られる古生物群と堆積環境との関係……津田禾粒
長崎県崎戸附近古第三紀層化石群（その 2）（代読）……水野篤行
Neogene Echinoids from Gihu Prefecture（代読）……Akira MORISHITA
佐渡産デスモチルスの層準にまつわる 2・3 の問題……西田彰一

「日本古生物学第 52 回例会」昭和 27 年 12 月 6 日京都大学理学部地質学鉱物学教室に於て開催す（参会者 16 名）

菱の進化について……三木 茂
長野県土尻川流域の第三紀有孔虫群……千地万造・沢井 清
四国の“久米統”産放散虫化石について（代読）……市川浩一郎
琉球産 *Brissus* の現生及化石種について……森下晶
長野県下新第三系の化石ウニについて……森下晶
仙台附近中新世産 Pectinidae（その 3）（代読）……増田孝一郎
本邦古第三紀層産 *Eucrassatella* について（代読）……水野篤行
二枚介 Acila について……黒田徳米
成羽層の頭足類について（予報）……中沢圭二
岡山県川上郡高山村付近の中新世層より産した甲殻類 *Bathynomus* sp. オオグソクシ（代読）……今泉力蔵

「日本古生物学会第 53 回例会」昭和 28 年 2 月 28 日東北大学理学部地質学古生物学教室に於て開催す（参会者 25 名）。

仙台付近上部中新統よりの淡水化石珪藻……金谷太郎
本渓湖産 *Callipteridium* の 1 新種について……浅間一男
秋田県本荘地区の有孔虫化石群……岩佐三郎
高知県唐ノ浜層産の有孔虫新種について……高柳洋吉
常磐炭田石城郡中山層の有孔虫化石……浅野 清
北海道赤平の若鍋層有孔虫化石……浅野 清
近畿地方新生代の化石海膽数種（代読）……森下 晶
On the Miocene Pectinidae from the Environs of Sendai pt. 4……Koichiro MASUDA
常磐炭田産 *Vicarya* 及び *Vicaryella* について（代読）……鎌田泰彦
常磐炭田石城層より淡水貝化石の発見（予報）（代読）……鎌田泰彦
Patinopecten kobiyamai, a New Miocene Scallop from the Joban Coal-field（代読）……Yasuhiko KAMADA
いわゆる佐世保層群の海棲貝化石群（代読）……水野篤行
A Find of *Pseudaspidoceras* from Hokkaido, Japan（代読）……Tatsuro MATSUMOTO and Wataru HASHIMOTO
Hamatella, a New Permian Genus of Brachiopoda, and a New Species from the Kitakami Mountains, Japan（代読）……Ichiro HAYASAKA
Callianassa Tayamai n. sp. from the Donney Formation of Saipan……Rikizo IMAIZUMI
日本産の *Callianassa* 化石について……今泉力蔵

1953 年度例会開催予定

	開催地	開催日	講演申込〆切日
第 54 回	福岡	6月 6日	5月 15日
第 55 回	仙台	10月 10日	9月 20日
第 56 回	大阪	12月 19日	11月 30日
第 57 回	札幌	未定	未定

講演御希望の方は本会宛御申込下さい

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CONSTITUTION
of the
PALAEONTOLOGICAL SOCIETY OF JAPAN

ARTICLE 1. Name

The Society shall be known as the Palaeontological Society of Japan. The Society is a section of the Geological Society of Japan.

ARTICLE 2. Object

The object of the Society shall be to promote the study of palaeontology and related sciences.

ARTICLE 3. Achievement

The Society in order to execute Article 2 shall (a) issue the Society journal and other publications, (b) hold or sponsor scientific lectures and meetings, and (c) sponsor collecting or field trips, and lectures.

ARTICLE 4. Membership

The Society shall be composed of persons who are active of interested in palaeontology or related sciences, and shall be known as regular members, honorary members, and patrons.

ARTICLE 5. The members of the Society shall be obliged to pay annual dues to the Society, for which they shall enjoy the privilege of receiving the Society's journal and of submitting papers which have been read and discussed at the meetings for publication in the Society's journal.

ARTICLE 6. Administration

The Society shall have the following organizations for its administration.

(a) General meeting. The general meeting shall be composed of the Society members. More than one tenth of regular members shall be present to hold general meetings. Administrative affairs shall be decided during the general meeting.

(b) President. The president shall be elected from among the regular members. The president shall represent the Society and supervise its business matters.

(c) Council. The council shall be composed of councillors who are elected from among the regular members. The council shall discuss administrative affairs.

(d) Business council. The business councillors shall be elected from among the council members, and shall administer business affairs.

(e) Officers shall be elected by vote of returned mail ballots, as a general rule.

ARTICLE 7. Amendments to the constitution shall be by decision of the general meeting.

By-Laws and Administration

ARTICLE 8. The Society's journal shall be issued three times a year.

ARTICLE 9. Regular members shall be persons who have knowledge, experience, or interest in palaeontology or related sciences.

ARTICLE 10. Patrons shall be selected individuals or organizations who give special support to the objectives of the Society.

ARTICLE 11. Honorary members shall be persons of distinguished achievement in palaeontology. The council shall nominate honorary members for decision by the general meeting.

ARTICLE 12. Applicants for membership to the Society shall submit their full name, mailing address, date of birth, occupation, and name of school from which they graduated.

Dues

ARTICLE 13. Rates for annual dues of the Society shall be decided during the general meeting. Annual dues for regular members is Yen 400.00 (domestic members) and U.S. $2.00 (foreign members). Patrons are individuals or organizations donating more than Yen 10,000.00 annually. Honorary members are free from obligations.

ARTICLE 14. The Society income shall be from membership dues and bestowals.

ARTICLE 15. The Society shall have one chairman, fifteen councillors, and several business councillors, whose term of office shall be two years. They may be re-elected.

Addendum

ARTICLE 1. There shall be four business councillors for the present.

ARTICLE 2. The Society journal shall be issued three times a year for the present.