

広島大学学術情報リポジトリ
Hiroshima University Institutional Repository

Title	Glycymeris and Cultellus from the Tertiary Hioki (Ashiya) Group in the Yuya-wan Area, Yamaguchi Prefecture, Southwest Japan
Author(s)	OKAMOTO, Kazuo; NAKANO, Mitsuo
Citation	Geological report of the Hiroshima University , 12 : 531 - 539
Issue Date	1963-03-30
DOI	
Self DOI	10.15027/52549
URL	https://ir.lib.hiroshima-u.ac.jp/00052549
Right	
Relation	



***Glycymeris* and *Cultellus* from the Tertiary Hioki (Ashiya) Group in the Yuya-wan Area, Yamaguchi Prefecture, Southwest Japan**

By

Kazuo OKAMOTO and Mitsuo NAKANO

with 4 Text-figures and 1 Plate

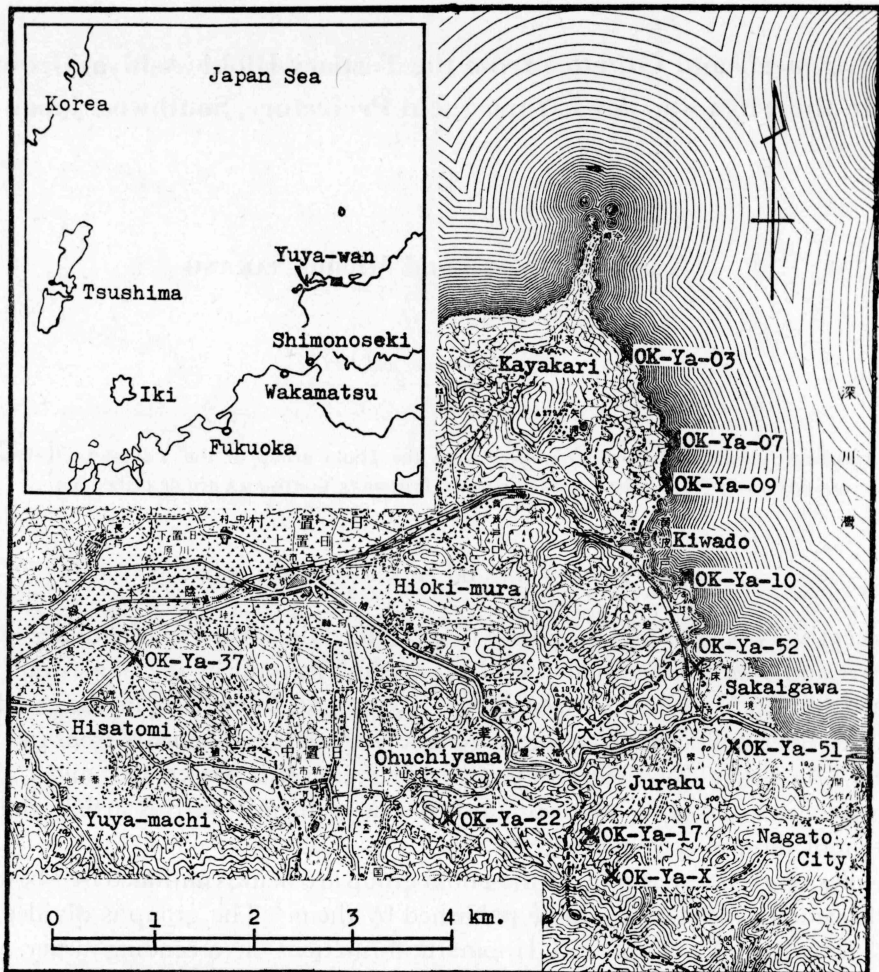
ABSTRACT: Among the fossil molluscs from the Hioki group of the Yuya-wan Tertiary, *Glycymeris cisshuensis* MAKIYAMA and *Cultellus* cf. *izumoensis* YOKOYAMA are described here.

INTRODUCTION and ACKNOWLEDGMENTS

Recently, NAKANO and OKAMOTO (1962) studied the fossil molluscs under genera *Chlamys* and *Venericardia* from the Hioki (Ashiya) group in the Yuya-wan area, Yamaguchi Prefecture, Southwest Japan. After that, the writers investigated successively the specimens belonging to genera *Glycymeris* and *Cultellus* from the same group. As a result of their study, *Glycymeris cisshuensis* MAKIYAMA and *Cultellus* cf. *izumoensis* YOKOYAMA are distinguished among them. In this article the description of the two species are given.

Studies on the stratigraphy of the Hioki group are being continued by OKAMOTO and IMAMURA, and details will be published by them. The group is divided into the Sakaigawa, Taoyama and Hitomaru formations in ascending order. The Sakaigawa and Taoyama formations yield abundant marine molluscs belonging to the "Ashiya fauna", and are considered to be correlated probably to the lower and middle parts of the Ashiya group (Lower Miocene) in the Chikuhō coal-field of North Kyushu to the south-southwest of this area.

The writers express their sincere thanks to Prof. Sotoji IMAMURA of the Institute of Geology and Mineralogy, Faculty of Science, Hiroshima University for his kind guidance and offer of the specimens. The writers are indebted to Prof. Hisashi KUSUMI of the Shinonome Branch School, Faculty of Education of the same university for his encouragement. Acknowledgments are due to Dr. Saburo KANNO of the Tokyo University of Education and Dr. Tsugio SHUTO of the Kyushu University for their valuable criticism. Thanks are also due to Dr. Yoshiro TAI of the Hiroshima University, Mr. Tsuyoshi WADA of the Funairi High School and Mr. Hiroshi ONOGAWA of the Ondo High School for the privilege of studying their collections.



TEXT-FIG. 1. Map showing the fossil localities in the area to the east of Yuya-wan, Yamaguchi Prefecture.

DESCRIPTION

Family Glycymeridae

Genus *Glycymeris* Da COSTA, 1778

Glycymeris cisshuensis MAKIYAMA

Pl. 57, Figs. 1-3 and Text-figs. 2-4.

1826. ? *Pectunculus* sp. by YOKOYAMA, *Jour. Fac. Sci., Imp. Univ. Tokyo, Sec. 2, Vol. 1, Pt. 4*, p. 136, pl. 16, fig. 5.
1926. *Glycymeris cisshuensis* MAKIYAMA, *Mem. Coll. Sci., Kyoto Imp. Univ., Ser. B, Vol. 2, No. 3*, pp. 155-156, pl. 13, figs. 2-3.
1928. *Glycymeris cisshuensis* NAGAO, *Sci. Rep. Tohoku Imp. Univ., 2nd Ser., Vol. 12, No. 1*, pp. 29-30, pl. 2,

- figs. 1-3; pl. 3, figs. 1-2, and (?)3; pl. 4, figs. 22-25.
1928. *Glycymeris cisshuensis* var. *compressa* NAGAO, *Ibid.*, Vol. 12, No. 1, p. 30, figs. 25 and 25a-c.
1936. *Glycymeris cisshuensis* MAKIYAMA, *Mem. Coll. Sci., Kyoto Imp. Univ., Ser. B, Vol. 11, No. 4*, p. 206 (non fig.).
1937. ? *Glycymeris cisshuensis* NOMURA and HATAI, *Saito Ho-on Kai Mus., Res. Bull. No. 13*, p. 125, pl. 17, fig. 7.
1954. *Glycymeris cisshuensis* SHIKAMA, *Sci. Rep. Yokohama Nat. Univ., Sec. 2, No. 3*, pl. 4, fig. 14.
1956. *Glycymeris cisshuensis* HIRAYAMA, *Sci. Rep. Tokyo Kyoiku Daigaku, Sec. C, Vol. 5, No. 45*, p. 103 (non fig.).
1956. *Glycymeris cisshuensis* ITOIGAWA, *Mem. Coll. Sci., Univ. Kyoto, Ser. B, Vol. 23, No. 2*, p. 180, pl. 2, fig. 1.
1958. ? *Glycymeris cisshuensis* MAKIYAMA, *Palaeont. Soc. Japan, Sp. Paps., No. 4*, pl. 34, fig. 5.
1960. *Glycymeris cisshuensis* KANNO, *Tert. Syst. Chichibu Basin, Saitama Pref., Cent. Japan. Pt. 2, Paleont.*, pp. 207-208, pl. 31, figs. 34-35.
1960. *Glycymeris cisshuensis* OYAMA, MIZUNO and SAKAMOTO, *Illust. Handb. Japan. Paleog. Moll.*, pp. 106-107, pl. 22, figs. 4a-b; pl. 23, figs. 1a-c (non figs. 1d-e).
1960. *Glycymeris cisshuensis compressa* OYAMA, MIZUNO and SAKAMOTO *Ibid.*, p. 107, pl. 23, figs. 2a-d.
1961. *Glycymeris cisshuensis* HASHIMOTO, *Rep. Ear. Sci. Dep. Gen. Edu. Kyushu Univ., Vol. 7*, pp. 81-82, pl. 9, figs. 3-6.
1962. *Glycymeris cisshuensis* KAMADA, *Palaeont. Soc. Japan, Sp. Paps., No. 8*, pp. 62-63, pl. 3, figs. 1-3.

Material:—Holotype, MAKIYAMA's original adult left valve specimen, from the Mankodô formation of the Meisen group (Miocene) at Kinshôdô near Meisen, Kankyôhoku-dô, Korea.

A great number of more or less well preserved specimens were collected from various horizons and localities in the Yuya-wan area. Among them, fairly well preserved specimens, OK-Ya-03-002~006, occurred in the upper horizon of the Sakaigawa formation on the east coast of Kayakari, Hioki-mura, Ohtsu-gun, Yamaguchi Prefecture. OK-Ya-07-001 and OK-Ya-10-001~005 were obtained from the same horizon on the north and south coasts of Kiwado, Hioki-mura. OK-Ya-17-001~002 and OK-Ya-52-001 were collected from the same horizon in the south of Juraku and in the north of Sakaigawa of Nagato City, Yamaguchi Prefecture. OK-Ya-X-002 was derived probably from the Sakaigawa formation in the vicinity of Juraku of Nagato City.

Besides them the writers examined some materials from the Yamaga formation of the Ashiya group in Hiko-shima, Shimonoseki City, Yamaguchi Prefecture (OK-H-01-001) and from the Sakamizu formation of the same group on the south coast of Iwaya, Wakamatsu City, Fukuoka Prefecture, North Kyushu (OK-W-01-001~002).

Description:—Shell medium to fairly large in size, suborbicular to trigonally ovate in outline, more or less inequilateral, slightly oblique, a little broader than high and gently convex from the umbo to the venter and from the anterior to the posterior; antero-dorsal margin short and nearly straight or slightly convex; antero-ventral rounded and transmitting gradually into broadly arcuated ventral; postero-dorsal short and almost straight; postero-ventral rounded or slightly convex but

sometimes subangulated at junction with dorsal or ventral margin. Umbo large and fairly prominent; beak orthogyrous or slightly opisthogyrous and subcentral.

Radial sculpture composed of about 50, low, broad, flat-topped costae with narrow and shallow grooves, except for the anterior and posterior extremities where the radial ornamentation is indistinct.

Ligamental area triangular, rather broad, almost equilateral, transversely and divergently striated but ligamental chevrons not well observable. Hinge-plate thick, large and moderately arcuated, with converging teeth; 4 to 5 hook-shaped, thick teeth present in the anterior and posterior sides; central about 12 straight, oblique to subvertical and fairly thick in the outer but vertical and thin in the center.

Internally, weak radial striae well observed and thickened at the intersections with the pallial-line; adductor scars fairly large and well marked, bounded respectively by a sharp ridge which becomes indistinct toward the beak; anterior one slightly larger than that of posterior; pallial-line well-marked and simple but minute sinuses are recognized in the vicinities of the adductors; ventral margin alternately plicated by strong and weak crenulations.

Growth-lines distinct, and wrinkled in the vicinity of the venter in the later stages. Test thick, and it measures about 5 mm. in common adult forms.

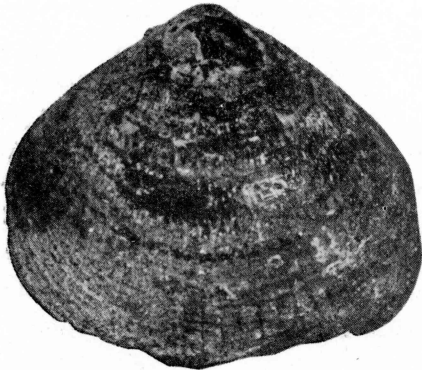
Measurements in mm.

Specimen	Valve	Length	Height	1/2 Thickness	L/H	T/L (%)
OK-Ya-03-005	Right	53.5	52.5	—	1.02	—
" -07-001	Left	58.5	56.1	—	1.04	—
" -10-003	Bivalved	62.8	57.8	19.1	1.09	60.8
" -10-004	Bivalved	62.5	60.0	20.9	1.04	66.9
" -10-005	Left	49.2	47.5	—	1.04	—
" -52-001	Bivalved	56.0	52.8	18.5	1.06	66.0
" -X-002	Bivalved	55.0	54.8	18.5	1.00	67.3
OK-H-01-001	Right	69.6	65.6	22.0	1.06	63.2
OK-W-01-001	Left	53.9	49.9	18.5	1.08	68.6
" -01-002	Left	68.9	63.0	24.0	1.09	69.7
Holotype	Left	67	62	22	1.1	66

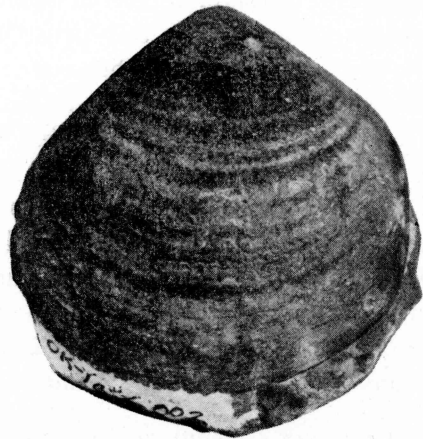
Remarks:—This species is fairly constant in essential characters through growth. The outline is subcircular to trigonally ovate, and the beak is located at the position of central to about two-fifths from the anterior end. The height-length proportion ranges 1:1.00 to 1:1.10. Convexity ratio (T/L) in adult form is 61 to 70%. The shell is in many cases gently convex from the anterior to the posterior, but the postero-dorsal part is flattened in a plane almost at right angles to the commissure in some specimens. Because of ill-preservation, fine longitudinal striation on the flat-topped radial costae is not well observable. It is, however, recognized that some fine longitudinal striae are presented on the flat-topped costae.

In 1928, NAGAO (p. 30, pl. 3, figs. 25 and 25a-c) distinguished variety *compressa*

nov. from *Glycymeris cisshuensis* MAKIYAMA, and he noted that *compressa* has the less convex shell and its ligamental area is narrower than that of the typical *cisshuensis*. OYAMA *et al.* (1960, p. 107, pl. 23, figs. 2a-d) promoted var. *compressa* to the subspecific rank. Its validity is, however, dubious, because *compressa* looks to have not so much compressed shell and narrow ligamental area as compared with the typical forms. Therefore, it is difficult for the writers to segregate *compressa* out of *cisshuensis*.



TEXT-FIG. 2.



TEXT-FIG. 3.



TEXT-FIG. 4.

EXPLANATION OF TEXT-FIGS. 2-4.

All \times c. 0.9

Glycymeris cisshuensis MAKIYAMA

FIG. 2. Lateral view of an imperfect adult bivalved specimen (OK-Ya-10-003). South coast of Kiwado, Hioki-mura, Ohtsugun, Yamaguchi Prefecture (Sakaigawa formation).

FIG. 3. Lateral view of an early adult bivalved specimen (OK-Ya-X-002). Probably Juraku, Nagato City, Yamaguchi Prefecture (Sakaigawa formation).

FIG. 4. Lateral view of internal mould of an adult right valve specimen (OK-Ya-17-002). Juraku, Nagato City (Sakaigawa formation).

Abundant occurrence of *Glycymeris cisshuensis* MAKIYAMA was reported by OTUKA (1938) from the Kawazu tuff member of the Matsue formation (Pliocene) at Kawazu of Matsue City in Shimane Prefecture. However, the writers discriminate two types in Glycymerid specimens collected by TAI from Kawazu. One is easily distinguishable from typical *cisshuensis* by the small and compressed shell and the surface sculpture which is usually bi- or tripartite. In this aspect, this form may be a new to science. While, the others have the round-topped or roof-like costation and its shell is smaller and more compressed than those of the typical form. This form is, therefore, distinct from the typical one.

As mentioned above, this species has a certain degree of variation. For instance, the outline is not always the same even in specimens of similar size. The holotype, NAGAO's specimens (1928, pl. 3, fig. 1 and 25), KAMADA's forms (1962, pl. 3, figs. 1-3), and the illustrated ones (pl. 64, figs. 1-2; text-fig. 3) have the suborbicular outline, while HASHIMOTO's (pl. 9, figs. 5-6) and NAGAO's (pl. 2, figs. 1 and 2a; pl. 3, fig. 2) specimens are trigonally ovate in shape. The illustrated specimen of fig. 1 on pl. 57 has a flattened vertical plane on the postero-dorsal area, but it is indistinct in the holotype and the others. On the convexity ratio, it is 61 to 70% in the Yuya-wan forms but in KAMADA's ones it ranges from 52 to 66%. NAGAO's specimens of figs. 2, 2a, 25 and 25a-c on pl. 3 are moderately inflated, while his others (pl. 2, figs. 1, 1a-b, 2 and 2a) seem to have the somewhat inflated shell.

Occurrence:—Abundant in pebble conglomerate to coarse-grained sandstone layers of the Sakaigawa and Taoyama formations.

On the east coast of Kayakari in Hioki-mura, this form is associated with *Chlamys* (*Chlamys*) *ashiyaensis* (NAGAO), *Ch. sp.*, *Ostrea sp.*, *Crassatellites* (*Eucrassatella*) *yabei* NAGAO, *Venericardia* (*Venericor*) *subnipponica* NAGAO, *Pitar ashiyaensis* NAGAO, *Dosinia* (*Phacosoma*) *chikuzensis* NAGAO, and *Spisula* (*Pseudocardium*) *sp.* In the other places, this form is sometimes accompanied with *Mytilus sp.*, *Gallista hanzawai* NAGAO, *Euspira ashiyaensis* (NAGAO) and *Fulgoraria sp.*, and of course fossils collected in Kayakari are recognizable.

Family Solenidae

Genus *Cultellus* SCHMACHER, 1817

KANNO's proposal (1956, pp. 212-213) are here accepted.

Cultellus cf. izumoensis YOKOYAMA

Pl. 57, Figs. 4-9.

Compare:—

- 1923. *Cultellus izumoensis* YOKOYAMA, *Japan. Jour. Geol. Geogr.*, Vol. 2, No. 1, p. 5; pl. 2, figs. 1a-b.
- 1928. *Cultellus sp.*: aff. *Cultellus izumoensis* NAGAO, *Sci. Rep. Tohoku Imp. Univ.*, 2nd Ser., Vol. 12, No. 1, p. 85, pl. 4, figs. (?) 1, 3, and 4 (non fig. 2).
- 1941. *Cultellus izumoensis* OTUKA, *Japan. Jour. Geol. Geogr.*, Vol. 18, Nos. 1-2, pp. 23-24, text-fig. 4.
- 1955. *Phaxas aff. izumoensis* KANNO, *Trans. Proc. Palaeont. Soc. Japan, N.S.*, No. 18, p. 35, pl. 6, fig. 16.

1956. *Cultellus izumoensis* KANNO, *Sci. Rep. Tokyo Kyoiku Daigaku, Ser. C, Vol. 4, No. 34*, pp. 213-214, pl. 6, figs. 8a-b.
 1957. *Phaxas izumoensis* MAKIYAMA, *Palaeont. Soc. Japan, Sp. Paps., No. 3*, pl. 6, figs. 1a-b.
 1960. *Phaxas izumoensis* OYAMA, MIZUNO and SAKAMOTO, *Illust. Handb. Japan. Paleog. Moll.*, p. 205, pl. 63, figs. 6a-c.
 1962. *Phaxas izumoensis* MATSUMOTO *et al.*, *Kyushu Region*. p. 268, fig. 78-1.

Material:—Fairly well preserved several specimens are at hand. OK-Ya-09-003b and OK-Ya-22-001 were respectively collected from the upper horizon of the Sakaigawa formation on the north coast of Kiwado and in the southwest of Ohuchiyama, Hioki-mura. OK-Ya-51-001a-b~002A-B occurred probably in the same horizon in the south of Sakaigawa, Nagato City. OK-Ya-37-001 was obtained from the lower horizon of the Taoyama formation in the east of Hisatomi, Yuyamachi. Beside them some unregistered materials from the Yuya-wan area were examined.

Description:—Shell medium to fairly large in size, thin-tested, rather compressed, elongately trapezoidal or transversely elongated, very inequilateral, posterior side being about 3 to 4 times as long as the anterior one, very much longer than high; antero-dorsal margin short and nearly straight or slightly convex, forming an angle of about 160 degrees against with postero-dorsal; postero-dorsal long and almost straight or a little convex; anterior and posterior extremities gently curved but sometimes subangulated at junction with dorsal or ventral margin; antero- and postero-ventral broadly arcuated and passing gradually into almost straight or slightly arched ventral which is often sinuated in the central part. Umbo low, blunt and not conspicuous; beak orthogyrous. Surface provided with numerous fine concentric striae or sometimes with irregular wrinkles which are somewhat distinct in the anterior and posterior parts. Ligament opisthodontic, external and fairly small; two weak teeth observable in some right valve specimens; adductor scars and pallial-line not well known.

Measurements in mm.

Specimen	Valve	Length	Height	PI*	L/H	PI*/L (%)
OK-Ya-09-003b	Right	66.3	21.0	17.5	3.16	26.4
" -22-001	Right	49.8	16.7	8.5	2.98	17.1
" -37-001	Left	46.5	14.2	—	—	—
" -51-001a	Right	63.5	19.1	16.0	3.32	25.2
" -51-002A	Right	43.0	14.0	10.3	3.07	24.0

PI*—Pre-umbonal length

Remarks:—The present specimens are somewhat constant in surface sculpture, but fairly variable in shell form. The specimens at hand are 43-66 mm. long and 14-21 mm. high, and the height-length proportion ranges 1:3.0 to 1:3.3. Beak is situated at one-sixth to three-tenths from the anterior, but usually at one-fourth to one-fifth.

The ventral margin is broadly arcuated in the illustrated specimen (pl. 57, fig. 8), but it is almost straight in the other (pl. 57, fig. 7) and slightly sinuated in a specimen of fig. 5 on pl. 57. The common forms have the elongated rectangular outline and the dorsal margin is subparallel to the venter. While, it is somewhat cuneiform in the illustrated form (pl. 57, figs. 4a-b). Concentric striations on the surface are well developed in the illustrated ones (pl. 57, figs. 5 and 7), but the other form (pl. 57, fig. 6) has irregular wrinkles.

The present form has some resemblances to *Cultellus izumoensis* YOKOYAMA, (1923, pl. 2, figs. 1a-b) (= *Phaxas izumoensis* by MAKIYAMA, 1957, pl. 6, figs. 1a-b) from the Lower Fujina formation (Upper Miocene) of Izumo in outline and surface sculpture, but the former is distinct from the latter by its small-sized shell. In the external characters, this form is also quite similar to some specimens of *Cultellus rectangulus* KANNO (1956, pl. 5, figs. 6-7 non figs. 3-5) from the Akahira group (Lower Miocene) in Saitama Prefecture.

Occurrence:—Rare in shale or shaly rock layers of the Sakaigawa and Taoyama formations. In most localities, this form is associated with *Saccella?* sp., *Acila* (*Acila*) *ashiyaensis* (NAGAO), *Venericardia* (*Venericor*) *subnipponica* NAGAO, *Angulus* (*Tellimides*) *maximus* (NAGAO) etc. *Dosinia* (*Phacosoma*) *chikuzensis* NAGAO, *Periploma besshoense* (YOKOYAMA), *Euspira ashiyaensis* (NAGAO), and the above-mentioned forms are accompanied with this species on the north coast of Kiwado, Hioki-mura.

REFERENCES

- HASHIMOTO, I. (1961): Tertiary Molluscan Fossils from the Kadogawa Formation, Miyazaki Prefecture, Japan. *Rep. Ear. Sci. Dep. Gen. Edu. Kyushu Univ.*, (7), 69-94, 3 pls.
- HATAI, K. and NISHIYAMA, S. (1952): Check List of Japanese Tertiary Marine Mollusca. *Sci. Rep. Tohoku Univ.*, 2nd Ser., Sp. Vol., (3).
- HIRAYAMA, K. (1956): Tertiary Mollusca from Hikoshima, Yamaguchi Prefecture, Japan, with Remarks on the Geological Age of the "Ashiya Fauna". *Sci. Rep. Tokyo Kyoiku Daigaku, Sec. C*, 5, (45), 81-127, 3 pls.
- ITOIGAWA, J. (1956): Molluscan Fauna of the Tsuzuki Group in Kyoto Prefecture, Japan. *Mem. Coll. Sci., Univ. Kyoto, Ser. B*, 23, (2), 179-192, 2 pls.
- KAMADA, Y. (1962): Tertiary Marine Mollusca from the Joban Coal-Field, Japan. *Palaeont. Soc. Japan, Sp. Paps.*, (8).
- KANNO, S. (1955): Tertiary Mollusca from Tsushima, Nagasaki Prefecture, Japan. *Trans. Proc. Palaeont. Soc. Japan. N. S.*, (18), 31-36, 1 pl.
- (1956): Fossil and Recent Species of the Cultellid Mollusca from Japan. *Sci. Rep. Tokyo Kyoiku Daigaku, Sec. C*, 4, (34), 209-218, 2 pls.
- (1960): *The Tertiary System of the Chichibu Basin, Saitama Prefecture, Central Japan. Pt. 2, Paleontology.* Japan Soc. Promot. Sci., Tokyo.
- MAKIYAMA, J. (1926): Tertiary Fossils from North Kankyô-dô, Korea. *Mem. Coll. Sci., Kyoto Imp. Univ.*, Ser. B, 2, (3), 143-160, 2 pls.
- (1936): The Meisen Miocene of North Korea. *Ibid.*, Ser. B, 11, (4), 193-228, 2 pls.
- (1957-'58): M. YOKOYAMA's Tertiary Fossils from Various Localities in Japan, Pts. 1-2. *Palaeont. Soc. Japan, Sp. Paps.*, (3-4).

- MATSUMOTO, T., NODA, M. and MIYAHISA, M. (1962): *Regional Geology in Japan Kyushu Region* (in Japanese). Asakura Book Co., Tokyo.
- NAGAO, T. (1928): Palaeogene Fossils of the Island of Kyushu, Japan, Pt. 2. *Sci. Rep. Tohoku Imp. Univ., 2nd Ser.*, 12, (1), 11 (1)-140 (130), 17 pls.
- NAKANO, M. and OKAMOTO, K. (1962): *Chlamys* and *Venericardia* from the "Ashiya" Group in the Yuya-wan area, Yamaguchi Prefecture, Southwest Japan. *Trans. Proc. Palaeont. Soc. Japan, N. S.*, (48), 311-320, 1 pl.
- NOMURA, S. and HATAI, K. (1937): A List of Miocene Mollusca and Brachiopoda Collected from the Region Lying North of the Nanakita River in the Vicinity of Sendai, Rikuzen Province, Japan. *Saito Ho-on Kai Mus., Res. Bull.*, (13), 121-145, 5 pls.
- OKAMOTO, K. and IMAMURA, S. (1962): Tertiary Formations in the Environs of Yuya-wan, Yamaguchi Prefecture—With Special Reference to the "Ashiya" Group (in Japanese). *Jour. Geol. Soc. Japan*, 68, (802), 413-414.
- OTUKA, Y. (1938): Tertiary Fossils from the Northern Shore of Sinzi Lake, Shimane Prefecture (in Japanese). *Jour. Geol. Soc. Japan*, 45, (535), 367-368.
- (1941): Fossil Mollusca from Tazima, Hyōgo Prefecture, Japan. *Japan. Jour. Geol. Geogr.*, 18, (1-2), 21-24, 5 text-figs.
- OYAMA, K., MIZUNO, A. and SAKAMOTO, T. (1960): *Illustrated Handbook of Japanese Paleogene Molluscs*. Geol. Surv. Japan.
- SHIKAMA, T. (1957): On the Tertiary Formations of Tomikusa in South Nagano Prefecture (in Japanese). *Sci. Rep. Yokohama Nat. Univ., Sec. 2*, (3), 71-108, 5 pls.
- YOKOYAMA, M. (1923): On Some Fossil Mollusca from the Neogene of Izumo. *Japan. Jour. Geol. Geogr.*, 2, (1), 1-9, 2 pls.

K. OKAMOTO : LABORATORY OF GEOLOGY, SHINONOME BRANCH SCHOOL,
FACULTY OF EDUCATION, HIROSHIMA UNIVERSITY

M. NAKANO : INSTITUTE OF GEOLOGY AND MINEROLOGY, FACULTY OF
SCIENCE, HIROSHIMA UNIVERSITY

EXPLANATION OF PLATE LVII

All \times c. 0.9

- Glycymeris cisshuensis* MAKIYAMA Page 532
- FIGS. 1a-b. Lateral and antero-dorsal views of an adult bivalved specimen (OK-Ya-10-004). South coast of Kiwado, Hioki-mura, Ohtsu-gun, Yamaguchi Prefecture (Sakaigawa formation).
- FIGS. 2a-b. Lateral and posterior views of an adult right valve specimen (OK-H-01-001). Hiko-shima, Shimonoseki City, Yamaguchi Prefecture (Yamaga formation).
- FIG. 3. Right internal mould showing taxodont denticles. Probably near Kiwado, Hioki-mura (Probably Sakaigawa formation).
- Cultellus cf. izumoensis* YOKOYAMA Page 536
- FIGS. 4a-b. Lateral views of internal cast and external mould of an imperfect right valve specimen (OK-Ya-51-002A-B). South of Sakaigawa, Nagato City, Yamaguchi Prefecture (Probably Sakaigawa formation).
- FIG. 5. Lateral view of external cast of an imperfect left valve specimen (OK-Ya-51-001b). Loc. ditto.
- FIG. 6. Lateral view of internal mould of an imperfect right valve specimen (OK-Ya-51-001a). Loc. ditto.
- FIG. 7. Lateral view of external cast of a left valve specimen (OK-Ya-37-001). Hisatomi, Yuyamachi, Ohtsu-gun, Yamaguchi Prefecture (Taoyama formation).
- FIG. 8. Lateral view of internal mould of a right valve specimen (OK-Ya-22-001). Southwest of Ohuchiyama, Hioki-mura (Sakaigawa formation).
- FIG. 9. Lateral view of an imperfect external right valve specimen (OK-Ya-09-003). North coast of Kiwado, Hioki-mura (Sakaigawa formation).

