

PALAEONTOLOGICAL SOCIETY OF JAPAN
SPECIAL PAPERS
NUMBER 3

Matajiro YOKOYAMA'S

**TERTIARY FOSSILS FROM VARIOUS
LOCALITIES IN JAPAN**

Part I.

Revised by
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PUBLISHED BY THE SOCIETY
August 31, 1957

Special Papers, Palaeontological Society of Japan

Number 1 (Issued September 25, 1951)

Bibliography of Japanese Palaeontology and Related Sciences, 1941-1950Riuji ENDO

Number 2 (Issued March 1, 1954)

Matajirō YOKOYAMA's The Pliocene and Later Faunas from the Kwanto Region in JapanRevised by Isao TAKI and Katsura OYAMA

Transactions and Proceedings of the Palaeontological Society of Japan

New Series No. 13 (Issued June 15, 1954)

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New Series No. 14 (Issued August 15, 1954)

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Introductory

Following the former special paper no. 2 entitled "Matajiro YOKOYAMA's the Pliocene and later faunas from the Kwantô region in Japan" revised by Isao TAKI and Katsura OYAMA, the other figures of Tertiary fossils prepared by Matajiro YOKOYAMA are republished with notes on the later acquisitions in taxonomy for the convenience of the students. His extensive works on the Tertiary fossils of this country are grouped in chronological order, and will be issued in three successive parts, of which this is the first part containing the figures printed during the ages between 1911 and 1925. Index of species will be added to the final part.

- I. Some Tertiary fossils from the Miike coal-field. Jour. Coll. Sci. Univ. Tokyo, vol. 27, art. 20, 1911 (3 plates).
- II. On some fossil shells from the island of Saishu in the strait of Tsushima. Jour. Coll. Sci. Univ. Tokyo, vol. 44, art. 7, 1923 (1 plate).
- III. On some fossil Mollusca from the Neogene of Izumo. Jap. Jour. Geol. Geogr., vol. 2, pp. 1-9, 1923 (2 plates).
- IV. Tertiary fossils from Kii. Jap. Jour. Geol. Geogr., vol. 2, pp. 47-58, 1923 (2 plates).
- V. Tertiary Mollusca from Dainichi in Tôtômi. Jour. Coll. Sci. Univ. Tokyo, vol. 45, art. 2, 1923 (2 plates).
- VI. Molluscan remains from the lowest part of the Jôban coal-field. Jour. Coll. Sci. Univ. Tokyo, vol. 45, art. 3, 1924 (5 plates).
- VII. Molluscan remains from the uppermost part of the Jôban coal-field. Jour. Coll. Sci. Univ. Tokyo, vol. 45, art. 5, 1925 (6 plates).
- VIII. Molluscan remains from the middle part of the Jôban coal-field. Jour. Coll. Sci. Univ. Tokyo, vol. 45, art. 7, 1925 (3 plates).

The numbering of the figures in each plate is original, while the plates are renumbered after the compilation. The title of each paper is printed below in short.

Every even page opposite to each plate contains the original explanations of the figures and the most important taxonomic validation by authors. The original names of formations and localities are cited. The current available scientific name of each figure is printed in blackletter. Several new names and new species proposed to the mis-identified figures seem to be invalid according to the rule, no differential mark having been given.

Inquisition of the localities and the geological occurrences are added under the head of "Remarks".

Special abbreviation shall be avoidable. However, the common usages and very obvious short words may be used. Only three abbreviations of the references are as follows:

K. & H., 1952, Tokubei KURODA and Tadashige H_AB_E: Check list and bibliography of the recent marine Mollusca of Japan.

H. & N., 1952, Kitora H_AT_AI and Syozo N_IS_IY_AM_A: Check list of Japanese Tertiary marine Mollusca; Sci. Rep. Tohoku Univ., ser. 2, special volume number 3.

T. & O., 1954, Isao T_AK_I and Katsura O_YA_MA: Y_OK_OY_AM_A's Pliocene and later faunas from the Kwanto region; Pal. Soc. Jap. sp. pap. no. 3.

Remark:—The numerals in parentheses following the original names represent the numbering of the paper indicated above and the pages of original description. No comma before this numeral means that the original name was proposed as a new species.

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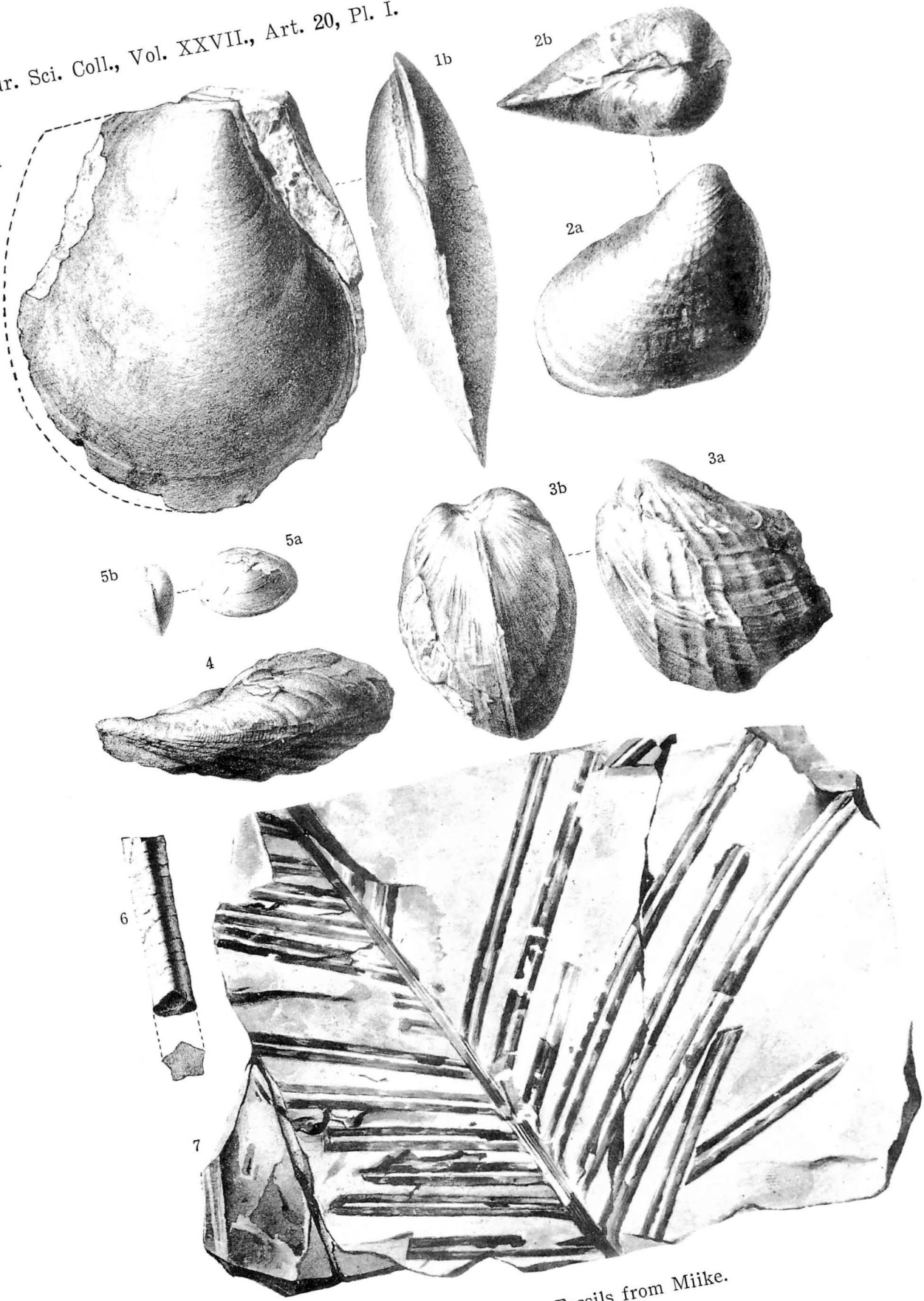
PLATE 1.

1. *Perna nishiyamai* YOKOYAMA, 1911 (I, 7). Miike, (underground 625 feet). *Lima (Acesta) nishiyamai* YOK. *fide* H. & N., 1952. ***Perna ? nishiyamai***.
2. *Pholadomya margaritacea* (SOWERBY), (I, 10). Miike, (underground 401 feet). *Pholadmya* cf. *nasuta* (CONRAD), *fide* H. & N., 1952, typographical error; ***Pholadomya*** sp.
3. Do. Sakasegawa.
4. Do. Deformed. Miike.
5. *Venus mitsuiana* YOKOYAMA, 1911 (I, 10). Miike, (underground 277 feet), Manda mine. ***Venus ? mitsuiana***.
6. ***Pentacrinus ariakensis*** YOKOYAMA, 1911 (I, 5). (Miike, underground 403 feet).
7. ***Cycas Fujiiiana*** YOKOYAMA, 1911 (I, 4). (Miike, underground 538 feet).

Remarks.

Geography—The figured specimens were obtained from a shaft of Manda mine, Miike, Kyûshû, 32°59'50"N, 130°27'04"E, at various depths.

Stratigraphy—The rocks belong to the Upper Eocene, most probably the Yotsuyama formation.



I. Tertiary Fossils from Miike.

PLATE 2.

1. *Crassatella fusca* YOKOYAMA, 1911 (I, 15). deformed. Miike. *C. fusca* preoccupied, *Crassatellites nipponensis* YOKOYAMA (Geol. Surv. Jap. Rep. 101, p. 89).
2. Do. Right valve showing two divergent teeth. b, the same showing the lunule. Miike.
3. Do. A normal form. Miike.
4. Do. Inner cast. Hangôchi.
5. Do. Left valve showing the hinge and the inner surface. Miike.
6. Do. A somewhat worn specimen. Miike.
7. *Fusus* sp. YOKOYAMA, 1911. Miike. *Pseudoperissolax* cf. *blakei* (CONRAD), *vide* NAGAO, 1928 (Sci. Rep. Tohoku Univ., ser. 2, vol. 12, p. 114).
8. *Cardita mandaica* YOKOYAMA, 1911 (I, 9). Miike.

Remarks.

Geography—Miike: A shaft of Manda mine, about 150 m NE of the large pond and 700 m E of the contact point of the two main roads at Manda, 32°59'50" N, 130°27'04" E (H. & N. 1952). Fig. 7 (*Fusus* sp.) at 405 feet depth. *Crassatellites nipponensis* at 358, 384 and 650 feet. *Cardita mandaica* from 405 and 609 feet.

Hongôchi: along a river 400 m NE of the contact point of the two roads east of Hongôchi, Hondo, Amakusa.

Stratigraphy—Miike: Yotsuyama formation, Upper Eocene; Hongôchi: Icchôda formation, Upper Eocene.

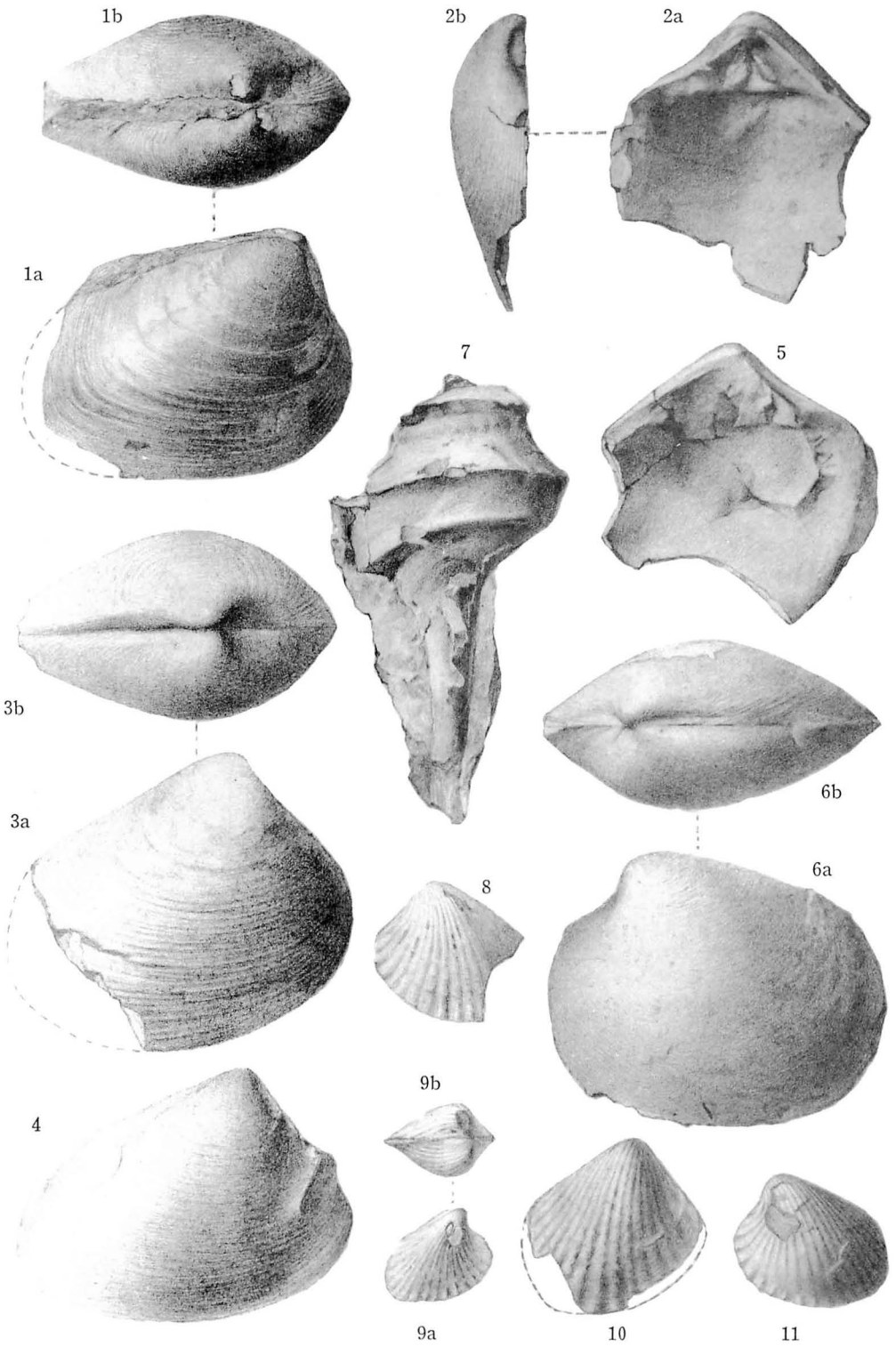


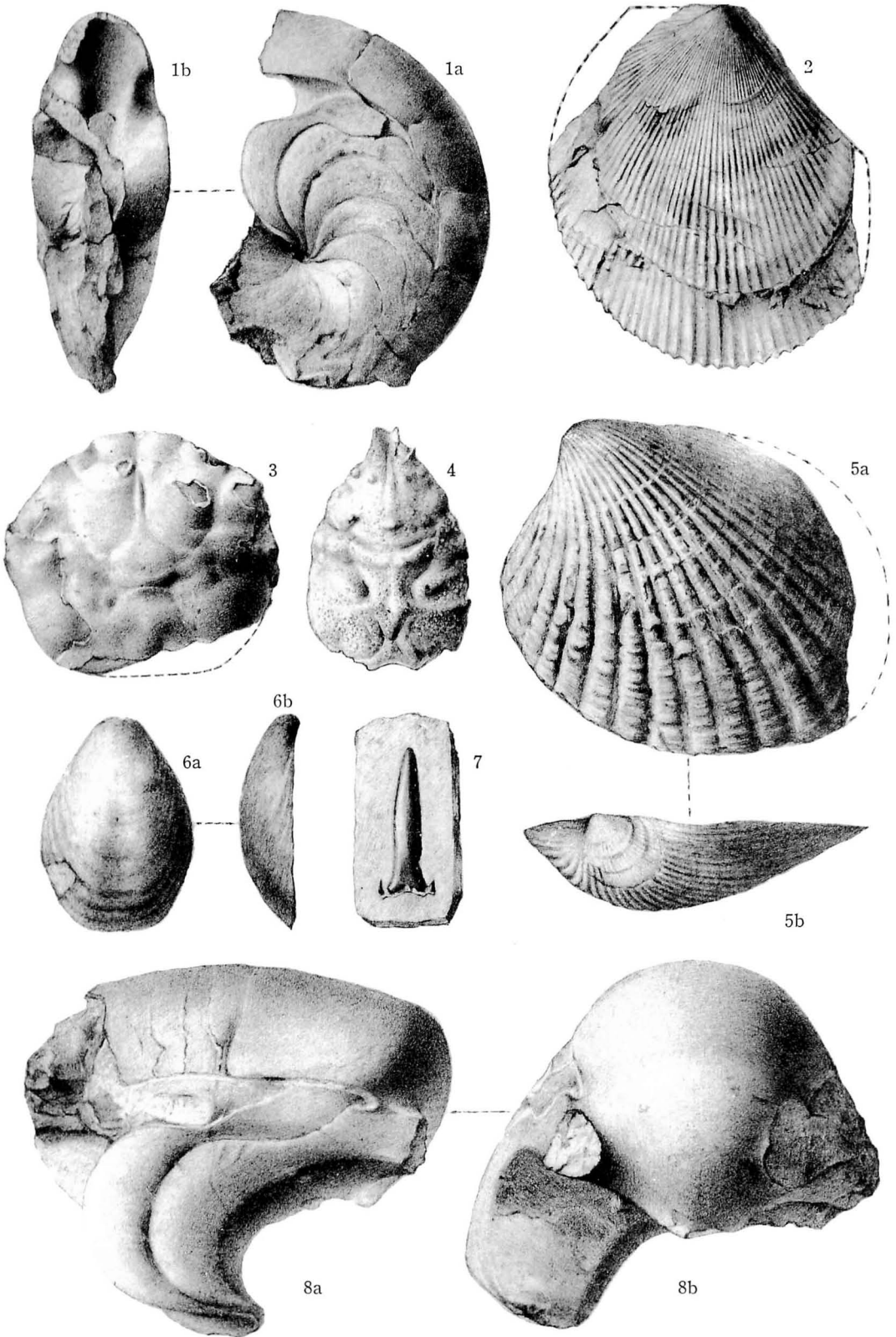
PLATE 3.

1. *Aturia ziczac* (SOWERBY), (I, 11). Miike (613 feet).
2. *Lima amaxensis* YOKOYAMA, 1911 (I, 15). Amakusa (exact loc. unknown). *Lima* (*Acesta*) *amaxensis*, *fide* H. & N., 1952.
3. *Xanthilites pentagonalis* YOKOYAMA, 1911, $\times 1.5$, (I, 13). Miike (484 feet).
4. *Homolopsis japonicus* YOKOYAMA, 1911, $\times 2$, (I, 12). Miike (489 feet).
5. *Venericardia nipponica* YOKOYAMA, 1911 (I, 8). Miike (depth?). *Venericardia* (*Venericor*) *nipponica*, *fide* H. & N., 1952.
6. *Terebratula miikensis* YOKOYAMA, 1911 (I, 6). Miike (240 feet).
7. *Lamna* cf. *cuspidata* AGASSIZ, (I, 14). Miike (393 feet?).

Remarks.

Geography—Miike: see remarks, pl. 2. Amakusa: exact loc. unknown, but H. & N., 1952 states *Lima amaxensis* of fig. 2 came from Hongôchi (road-side cutting on the NW foot of Samedake, $32^{\circ}26'48''$ N, $130^{\circ}09'18''$ E). *Venericardia nipponica* occurred at various depths of the shaft, Manda mine, 280, 300, 358, 405 and 842 feet, but horizon of the figured specimen is not known.

Stratigraphy—see pl. 2, remarks.



Ishizaki del.

I. Tertiary Fossils from Miike.

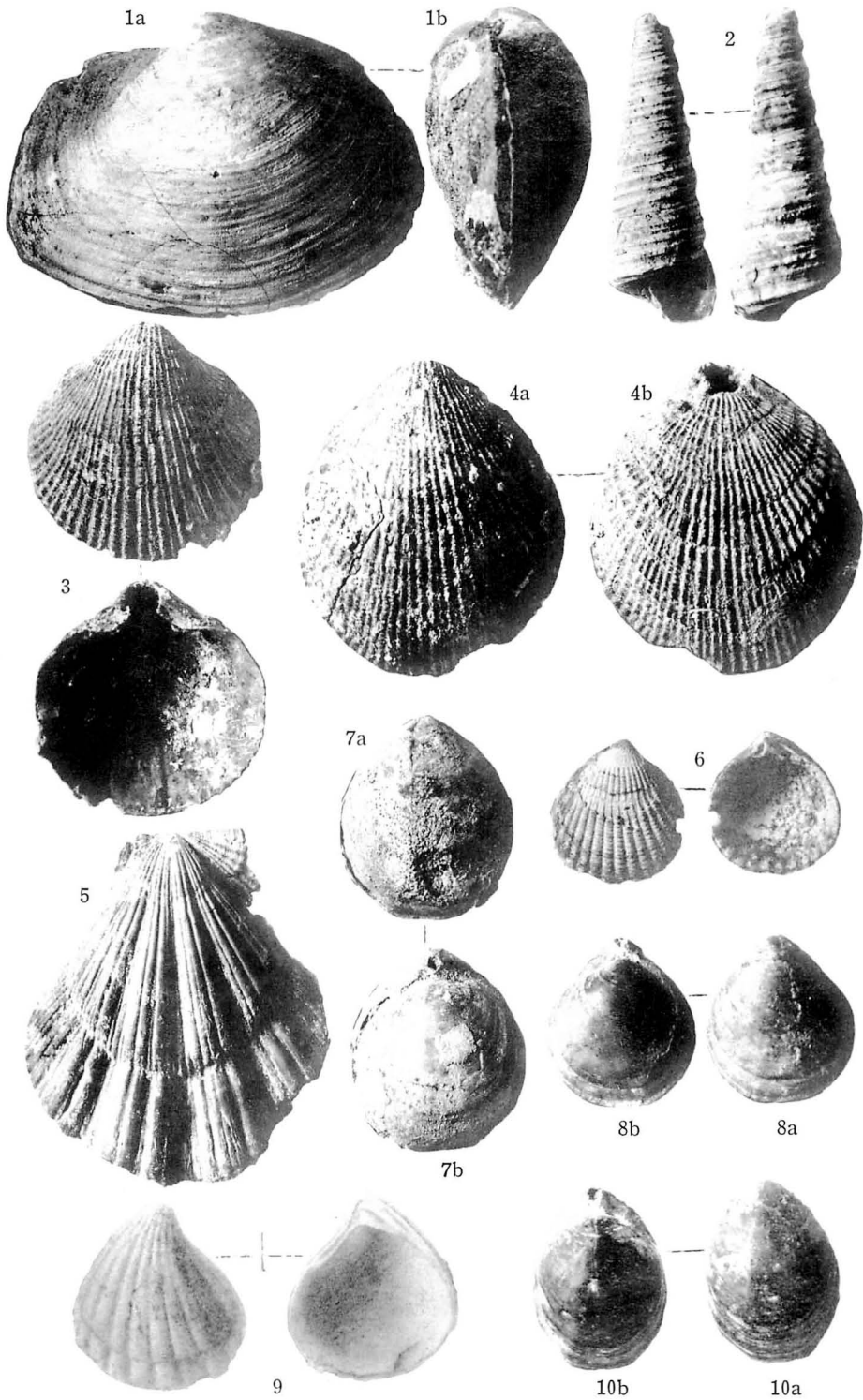
PLATE 4.

1. *Thracia pubescens* (PULTENY 1799), (II, 5). Seikiho, Saishu. not PULTENY's species, *Thracia kakumana* (YOKOYAMA, 1927), *vide* K. & H., 1952.
2. *Turritella saishuensis* YOKOYAMA, 1923 (II, 3). Seikiho, Saishu.
- 3, 4. *Terebratella ? excelsa* YOKOYAMA, 1923 (II, 8). Seikiho, Saishu.
5. *Pecten cosibensis* YOKOYAMA, (II, 7). Seikiho, Shaishu. *Chlamys cosibensis* (YOKOYAMA, 1920).
6. *Venericardia ferruginea* (ADAMS) var. *orbicularis* YOKOYAMA, 1923 (II, 5). Seikiho, Saishu. *Venericardia (Cyclocardia) ferruginea orbicularis* YOK.
- 7, 8. *Endesia ?* sp. Seikiho, Saishu. *Endesia* sp. in p. 9.
9. *Venericardia nakamurai* YOKOYAMA, 1923 (II, 5). Seikiho, Saishu. enlarged, very young.
10. *Terebratella ?* sp. Seikiho, Saishu.

Remarks.

Geography—The locality is a sea-cliff near the brook flowing at the western end of Seikiho, a small anchorage on the southern coast of Saishu island (Quelpart), Korea.

Stratigraphy—The sand about a hundred feet thick below the volcanics. Upper Pliocene.



II. Fossil Shells from Saishu.

PLATE 5.

1. *Pecten kagamianus* YOKOYAMA, 1923 $\times \frac{4}{5}$ (III, 8). Kagami, Shimane pref. *Decatopecten kagamianus* H. & N., 1952.
2. *Cardium pauperculum* YOKOYAMA, (III, 6). Kami-Ichiba, Shimane pref. not *Cardium arakawaense* H. & N., 1952. *Serripes* cf. *groelandicus* (BRUGUIÈRE)*.
3. *Turritella* aff. *saishuensis* YOKOYAMA, $\times 1 \frac{1}{2}$, (III, 4). Fujina, Shimane pref., misprint in p. 4: *Turritilla*.
4. *Galeodea (Sconsia) japonica*** YOKOYAMA, 1923 (III, 3). Kagami, Shimane pref. *Shichiheia yokoyamai* (NOMURA & HATAI, 1949); *Doliocassis japonica* (YOK.).
5. *Venus (Mercenaria) stimpsoni* GOULD, 1861. Kagami, Shimane pref. *Mercenaria yokoyamai* (MAKIYAMA, 1927), *fide* H. & N., 1952.

Remarks.

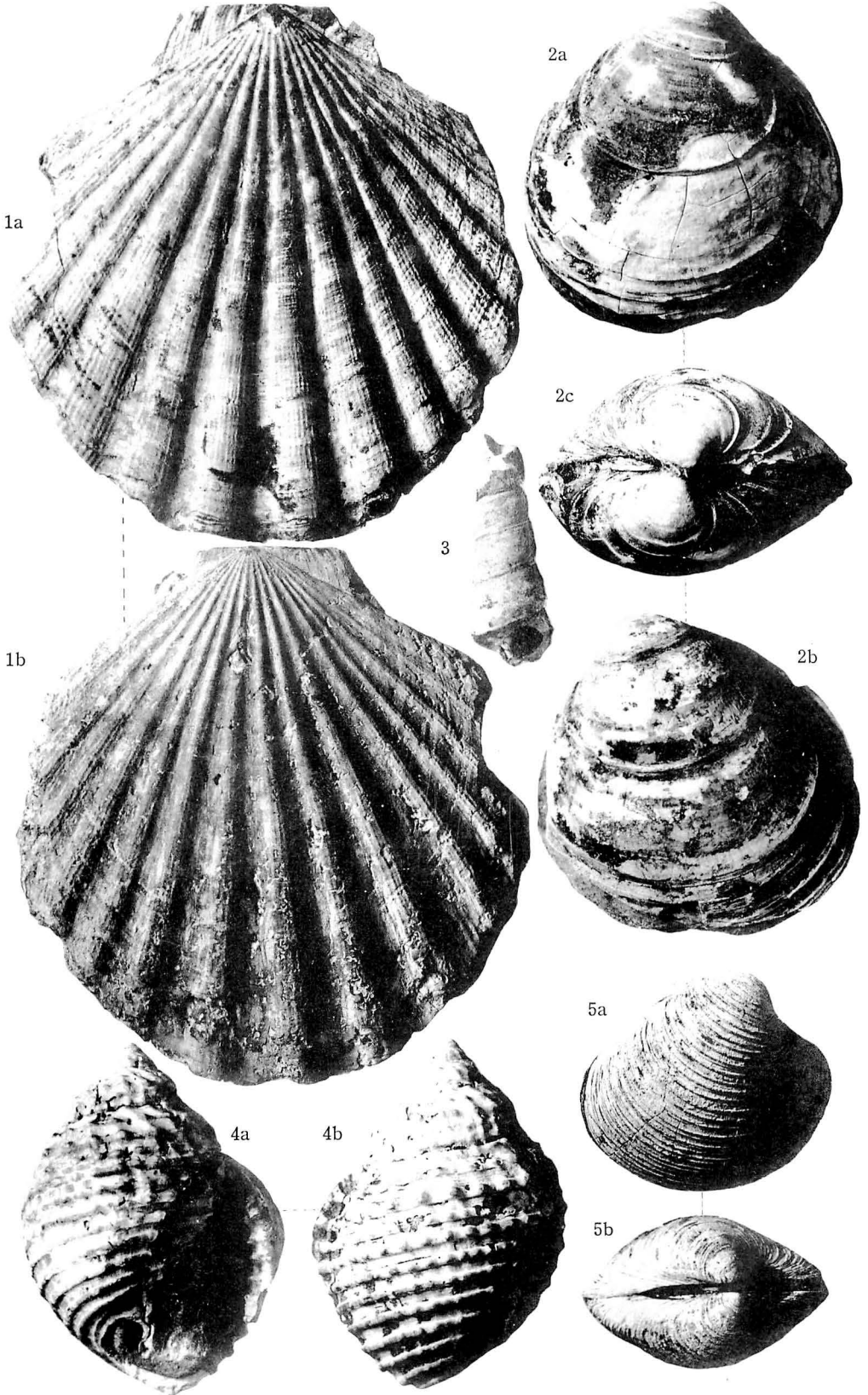
Geography—Kagami: lake shore, 200 m west of the cross roads at north of Kagami in Kimachi village, Yatsuka district, Shimane pref., 35°25' N, 132°58' E.

Fujina: lake cliff 300 m NW of Jakusan, N of Fujina in Tamayu village, Yatsuka district, Shimane pref., 35°26' N, 133°02' E.

Stratigraphy—Fujina Miocene.

* Oral information, KURODA.

** Type of *Doliocassis* KURODA, 1933.



III. Fossil Mollusca from Izumo.

PLATE G

1. *Callitrus izumensis* YOKOYAMA, 1923 (III, 6). Fujita, Shimane pref. *Parvus izumensis* (Yok.), *Abt. H. & N.* 1922; *Callitrus izumensis* KAWA, 1926.
2. *Machia fujimensis* YOKOYAMA, 1923 (III, 6). Fujita, Shimane pref. *Sciripes fujimensis* (Yok.), *Abt. H. & N.* 1922. *Abt. S. (Parvus)* (Fuzuyama)*.
3. *Yellina optiva* YOKOYAMA, 1923 (III, 6). Fujita, Shimane pref. *Maconia optiva* (Yok.), *Abt. H. & N.* 1922.
4. *Yellina exilis* YOKOYAMA, 1923 (III, 6). Kawan, Shimane pref. *Forlaniella (Macroselid)* (Yok.), *Abt. H. & N.* 1922.
5. *Cardium shintzensis* YOKOYAMA, 1923 (III, 7). Fujita, Shimane pref. *Cardiobuccina (Cama-corum) shintzensis* (Yok.), *Abt. H. & N.* 1922; *Climacarium shintzensis* (Yok.) *Abt. C. (Mollusca) Fabricius*.*

Remarks.

See remarks on pl. F.

* Original illustration from T. Kuroda.

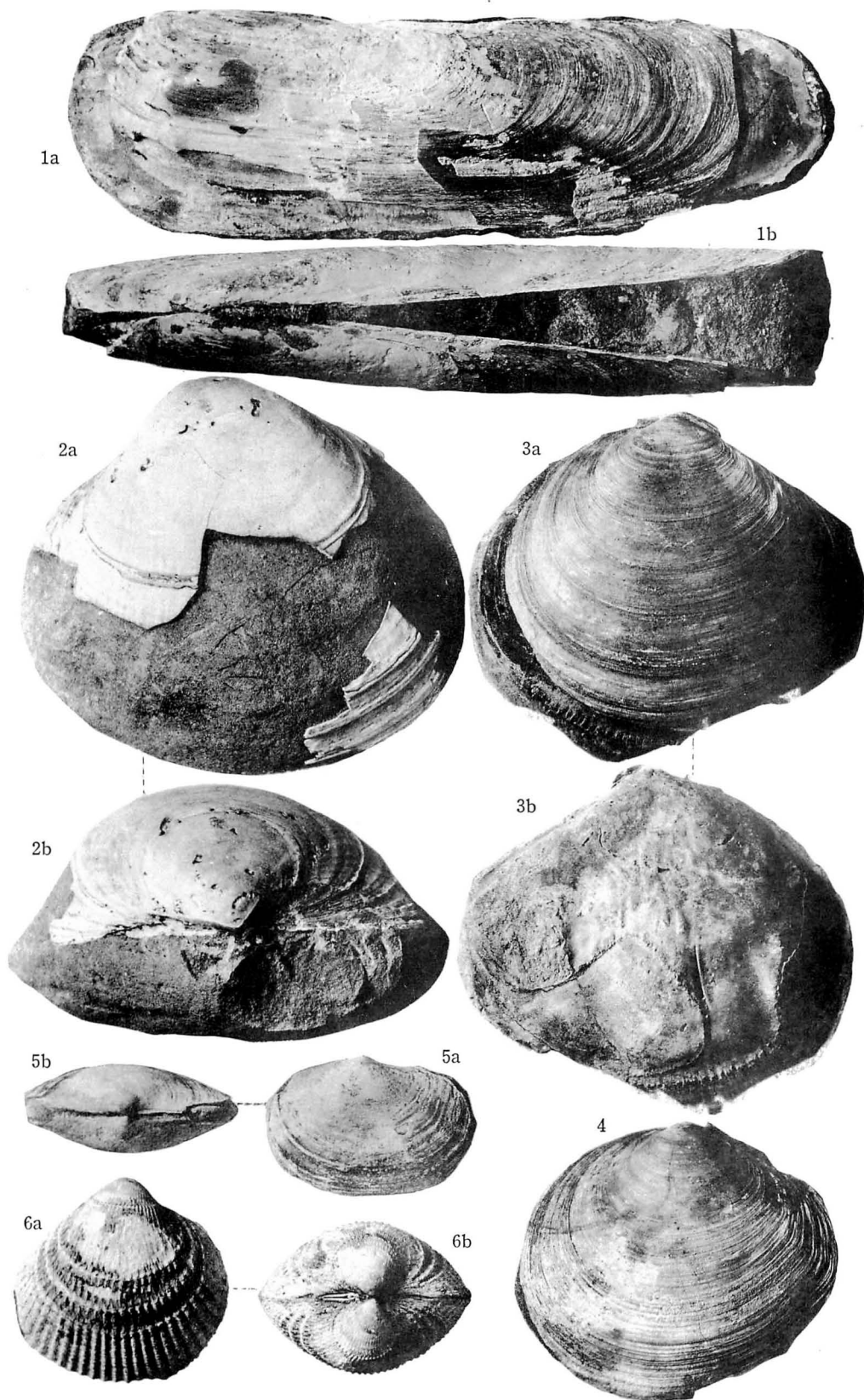
PLATE 6.

1. *Cultellus izumoensis* YOKOYAMA, 1923 (III, 5). Fujina, Shimane pref. **Phaxus izumoensis** (YOK.), *fide* H. & N., 1952; *Cultellus izumocnsis* KANNO, 1956.
2. *Mactra fujinensis* YOKOYAMA, 1923 (III, 5). Fujina, Shimane pref. **Serripes fujinensis** (YOK.), *fide* H. & N., 1952. aff. *S. lperousi* (DESHAYES)*.
- 3, 4. *Tellina optiva* YOKOYAMA, 1923 (III, 6). Fujina, Shimane pref. **Macoma optiva** (YOK.).
5. *Yoldia gratiosa* YOKOYAMA, 1923 (III, 8). Kagami, Shimane pref. **Portlandia (Megayoldia) gratiosa** (YOK.), *fide* H. & N., 1952.
6. *Cardium shinjiensis* YOKOYAMA, 1923 (III, 7). Fujina, Shimane pref. **Cerastoderma (Clinocardium) shinjiense** (YOK.), *fide* H. & N., 1952; **Clinocardium shinjiense** (YOK.) aff. *C. ciliatum* (FABRICIUS).*

Remarks.

See remarks on pl. 5.

* Oral information from T. KURODA.



III. Fossil Mollusca from Izumo.

PLATE V.

1. *Wesolus* cf. *Wesolus* (Lachner, 1871) (IV, 51) Near Tonda, III. *Heberina* list. III (Lachner?)
- 2, 3. *Meloboris* cf. *Meloboris* (Lachner, 1871) (IV, 52) Tonda, *Wesolus* near.
4. *Wesolus* sp. (IV, 52) Tonda, *Wesolus* near.
5. *Wesolus* (Lachner, 1871) (IV, 51) Tonda, *Wesolus* near.
6. *Wesolus* (Lachner, 1871) (IV, 51) Tonda, *Wesolus* near.
7. *Meloboris* sp. (IV, 52) Tonda, *Wesolus* near.
8. *Wesolus* cf. *Wesolus* (Lachner, 1871) (IV, 51) Tonda, *Wesolus* near.
9. *Wesolus* cf. *Wesolus* (Lachner, 1871) (IV, 51) Tonda, *Wesolus* near.
10. *Turtella* cf. *Turtella* (Lachner, 1871) (IV, 52) Tonda, *Wesolus* near.
11. *Wesolus* cf. *Wesolus* (Lachner, 1871) (IV, 51) Tonda, *Wesolus* near.
12. *Wesolus* cf. *Wesolus* (Lachner, 1871) (IV, 51) Tonda, *Wesolus* near.
13. *Wesolus* cf. *Wesolus* (Lachner, 1871) (IV, 51) Tonda, *Wesolus* near.
14. *Wesolus* cf. *Wesolus* (Lachner, 1871) (IV, 51) Tonda, *Wesolus* near.
15. *Wesolus* cf. *Wesolus* (Lachner, 1871) (IV, 51) Tonda, *Wesolus* near.
16. *Wesolus* cf. *Wesolus* (Lachner, 1871) (IV, 51) Tonda, *Wesolus* near.
17. *Wesolus* cf. *Wesolus* (Lachner, 1871) (IV, 51) Tonda, *Wesolus* near.
18. *Wesolus* cf. *Wesolus* (Lachner, 1871) (IV, 51) Tonda, *Wesolus* near.
19. *Wesolus* cf. *Wesolus* (Lachner, 1871) (IV, 51) Tonda, *Wesolus* near.
20. *Wesolus* cf. *Wesolus* (Lachner, 1871) (IV, 51) Tonda, *Wesolus* near.

Remarks.

Generally, the specimens of the present series, being Tonda, are on the NE side of channel 100 m SW of Tonda in slope village 32°41'57" N, 132°23'11" E. Tonda, *Wesolus* near. In Tonda, the specimens are on the SW slope of hill, 150 m NE of village, near Tonda, *Wesolus* near. See also remarks on pl. 2.

PLATE 7.

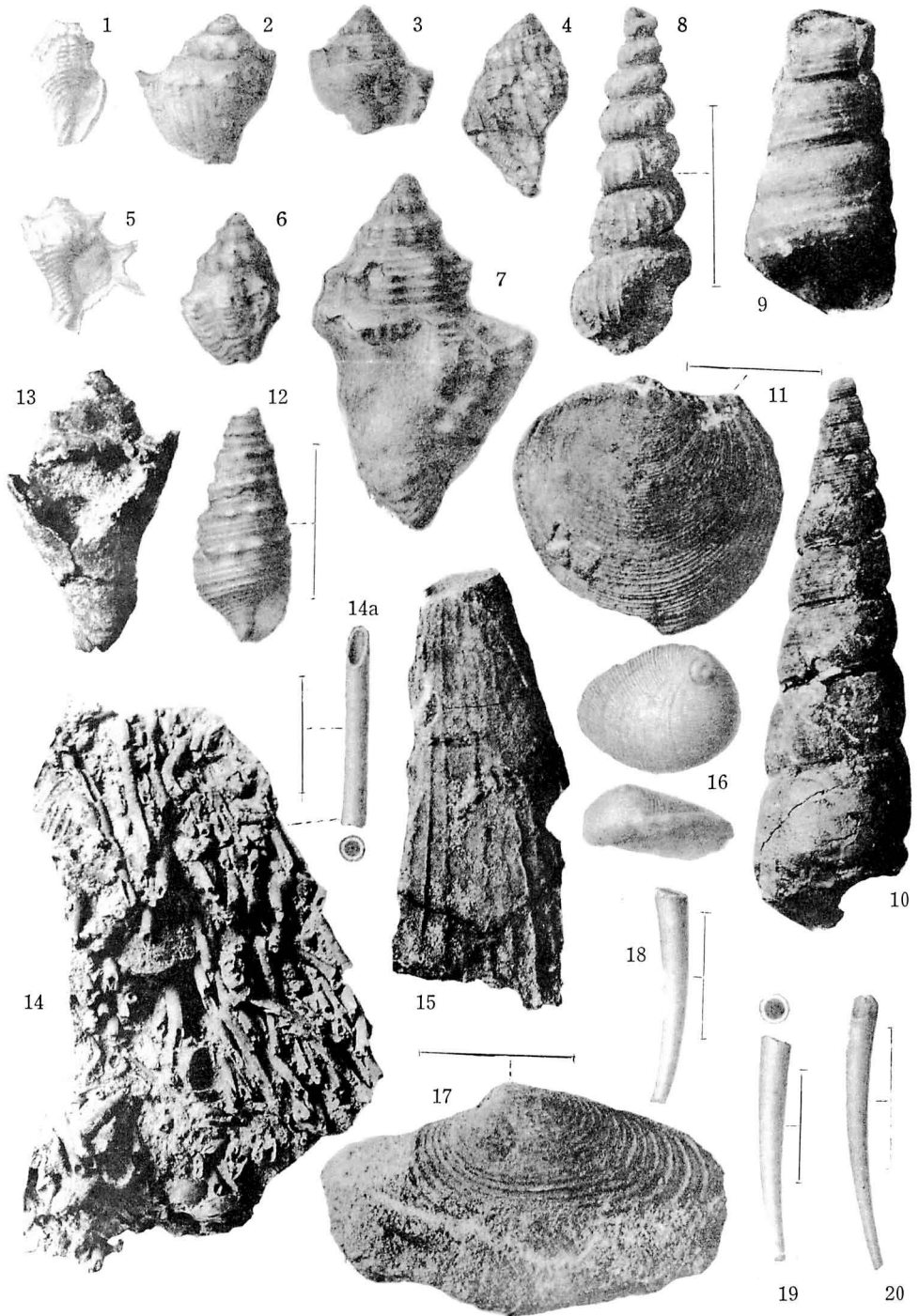
1. *Urosalpinx* cf. *birileffi* (LISCHKE, 1871), (IV, 51). Near Tanabe, Kii. **Bedevina birileffi** (LISCHKE)?
- 2, 3, 13. *Melongena pugilina* (BORN, 1778), (IV, 50). Takinai, Wakayama pref.
4. *Cancellaria* sp. (IV, 50). Takinai, Wakayama pref.
- 5, 6. *Murex* (*Phyllonotus*) *bullocki* YOKOYAMA, 1923 (IV, 51). Takinai, Wakayama pref. **Ocenebra bullocki** (YOK.).
7. *Melongena*? sp. (IV, 50). Takinai, Wakayama pref.
8. *Scala amoena* YOKOYAMA, 1923 (IV, 54). Niigishi, Wakayama pref. *Epitonium* (*Hyaloscala*) *amoenus* (YOK.), *fide* H. & N., 1952; not *Scalaria amoena* PHILIPPI, 1844, Tertiary of Germany. **Epitonium niigishiense** MAKIYAMA, 1957 *nom. nov.*
- 9, 10. *Turritella kiiensis* YOKOYAMA, 1923 (IV, 52). Niigishi, Wakayama pref.
11. *Lucina borealis* LINNÉ. Niigishi, Wakayama pref. *Lucinoma acutilineatum* (CONRAD), *fide* H. & N., 1952; *Lucinoma annulata* (REEVE, 1843), see p. 40.
12. *Cerithium baculum* YOKOYAMA, 1923 (IV, 52). Niigishi, Wakayama pref. **Vicaryella bacula** (YOK.).
14. *Serpula mirifica* YOKOYAMA, 1923 (IV, 58). Ezurabama, Wakayama pref.
15. *Pinna* sp. (IV, 57). Takinai, Wakayama pref.
16. *Sigaretus ineptus* YOKOYAMA, 1923 (IV, 53). Niigishi, Wakayama pref. **Sinum ineptum** (YOK.).
17. *Tapes euglyptus* (PHILIPPI, 1848), (IV, 56). Takinai, Wakayama pref. Not *euglyptus*, *Paphia amabilis kiiensis* HATAI & NISIYAMA 1952, *nom. nud.*
- 18-20. *Dentalium lentum* YOKOYAMA, 1923 (IV, 54). Takinai, Wakayama pref. Subgenus: **Laevidentalium**, H. & N., 1952.

Remarks.

Geography—Takinai: Atono-ura, end of the promontory facing Tanabe bay, on the NE side of channel, 700 m SW of Takinai in Shinjo village, 33°41'57" N, 135°23'24" E.

Niigishi: Fujishima, wave cut bench, in Tonda vill., 33°41'03" N, 135°22'31" E.

Near Tanabe: Atonoura, quarry on the SW slope of hill, 150 m NE of Mikohama cross, Tanabe city, 33°43'04" N, 135°23'12" E. See also remarks on pl. 8.



IV. Tertiary Fossils from Kii.

PLATE 8

1. *Arao talienensis* YOKOYAMA, 1933 (IV, 31). Nihonshi, Wakayama pref. *Anabara valentini* (Yok.).
- 2-7. *Corbula succinea* YOKOYAMA, 1933 (IV, 30). Nihonshi, Wakayama pref. *Aloides succinea* (Yok.).
8. *Corbula tanobensis* YOKOYAMA, 1933 (IV, 32). Nihonshi, Wakayama pref. *Aloides* (Canto).
- 9-12. *Corbula petryni* YOKOYAMA, 1933 (IV, 35). Nihonshi, Wakayama pref. *Aloides* (Canto).
13. *Arao setensis* YOKOYAMA, 1933 (IV, 33). Nihonshi, Wakayama pref. *Anabara setensis* (Yok.).
14. *Corbula tanobensis* YOKOYAMA, 1933 (IV, 32). Nihonshi, Wakayama pref. Synonymous with *Aloides petryni* (Yok.) (No. H. & N., 1933).

Remarks.

Geography—See the description on pl. 7.
 Stratigraphy—Kansayama Miocene; most probably a member of the Tanabe group; all localities in pl. 7 & 8.

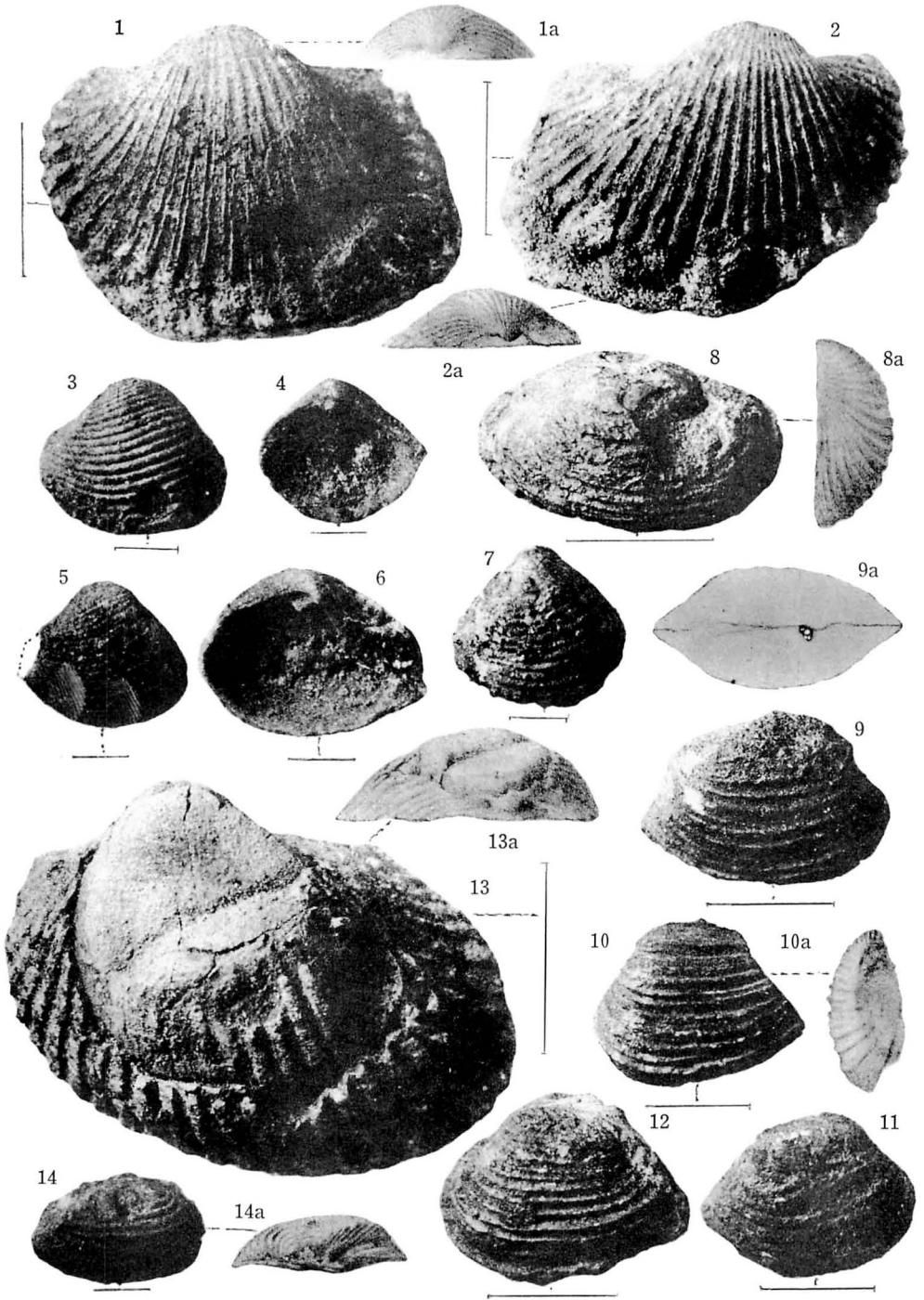
PLATE 8.

- 1, 2. *Arca valentula* YOKOYAMA, 1923 (IV, 51). Niigishi, Wakayama pref. **Anadara valentula** (YOK.).
- 3-7. *Corbula succincta* YOKOYAMA, 1923 (IV, 56). Niigishi, Wakayama pref. **Aloidis succincta** (YOK.).
8. *Corbula tanabensis* YOKOYAMA, 1923 (IV, 55). Niigishi, Wakayama pref. **Aloidis** (*Cuneo-**corbula*) **tanabensis** (YOK.), *fide* H. & N., 1952.
- 9-12. *Corbula peregrina* YOKOYAMA, 1923 (IV, 55). Niigishi, Wakayama pref. **Aloidis** (*Cuneo-**corbula*) **peregrina** (YOK.), *fide* H. & N., 1952.
13. *Arca setoensis* YOKOYAMA, 1923 (IV, 58). Niigishi, Wakayama pref. **Anadara setoensis** (YOK.).
14. *Corbula tsukaharai* YOKOYAMA, 1923 (IV, 55). Niigishi, Wakayama pref. Synonymous with *Aloidis peregrina* (YOK.), *fide* H. & N., 1952.

Remarks.

Geography—See the description on pl. 7.

Stratigraphy—Kanayama Miocene, most probably a facies of the Tanabe group: all localities in pl. 7 & 8.



IV. Tertiary Fossils from Kii.

PLATE 9.

1. *Dahlia sobrina* YOKOYAMA 1933 (V. 5). Turricula (Suzuki) sobrina (Yok.)
2. *Dahlia japonensis* YOKOYAMA 1933 (V. 6). Clavata (Pardollia) dainichiensis (Yok.)
(Type species of *Pardollia*, MAKIYAMA: Jour. Gard. Soc. Jap., 17, 1931)
3. *Cancellaria cristata* SOWERBY 1855 (V. 7). *Trigonostoma kurahai* MAKIYAMA 1937, non
C. cristata—C. STEIN SOWERBY 1851.
- 4-5. *Ancilla ornata* YOKOYAMA 1933 (V. 10). Probably local varieties of *Ancilla* (Bartsch)
albocollata (LACHON 1874) MAKIYAMA 1937.
- 6-12. *Murex nitens* YOKOYAMA 1933 (V. 13). *Cancellaria pristina* (Yok.) MAKIYAMA 1937
non *Murex*.
- 13-15. *Siphonaria caesiostriata* (REVE) (Yok.) YOKOYAMA 1933. *Siphonaria declivis*
YOKOYAMA 1933, see also MAKIYAMA 1937*
- 16-17. *Lepeta elata* YOKOYAMA 1933 (V. 9). *Hapylonia elata* (Yok.)

Remarks.

Geography.—All the figured specimens were obtained at Dainichi, Loc. 6157K (Kyoto Univ. loc.) brook side near north of Dainichi (about 50 m NW of the entrance of the over-land path to Mori) 34° 48' N, 137° 50' E, in Ugarri village of Yamashiro township, Sachi district, Shinshu prefecture.
Stratigraphy.—The Dainichi sand of Kakawa group, type of the Sachi stage of the Kakawa Division.

* MAKIYAMA, Jiro: Mem. Coll. Sci. Kyoto Univ., B3, pp. 1-147, 1937.
** MAKIYAMA, Jiro: Mem. Coll. Sci. Kyoto Univ., B18, pp. 73-93, 1941.

PLATE 9.

1. *Drillia sobrina* YOKOYAMA, 1923 (V, 5). **Turricula (Surcula) sobrina** (YOK.).
2. *Drillia dainichiensis* YOKOYAMA, 1923 (V, 6). **Clavatula (Paradrillia) dainichiensis** (YOK.), type species of *Paradrillia*, MAKIYAMA: Jour. Geol. Soc. Jap., 47, 133, 1940.
3. *Cancellaria crispata* SOWERBY, 1855, (V, 7). **Trigonostoma kurodai** MAKIYAMA, 1927*, not *C. crispata*=*C. crispa* SOWERBY, 1841.
- 4-7. *Ancilla okawai* YOKOYAMA, 1923 (V, 7). Probably local varieties of **Ancilla (Baryspira) albocallosa** (LISCHKE, 1874), MAKIYAMA, 1927.
- 8-12. *Mitra pristina* YOKOYAMA, 1923 (V, 5). **Cancellaria pristina** (YOK.), MAKIYAMA, 1927, not *Mitra*.
- 13-15. *Siphonalia cassidariaeformis* (REEVE), (V, 4). YOKOYAMA, 1923. **Siphonalia declivis** YOKOYAMA, 1926, see also MAKIYAMA, 1941.**
- 16, 17. *Eburna elata* YOKOTAMA, 1923 (V, 9). **Babylonia elata** (YOK.).

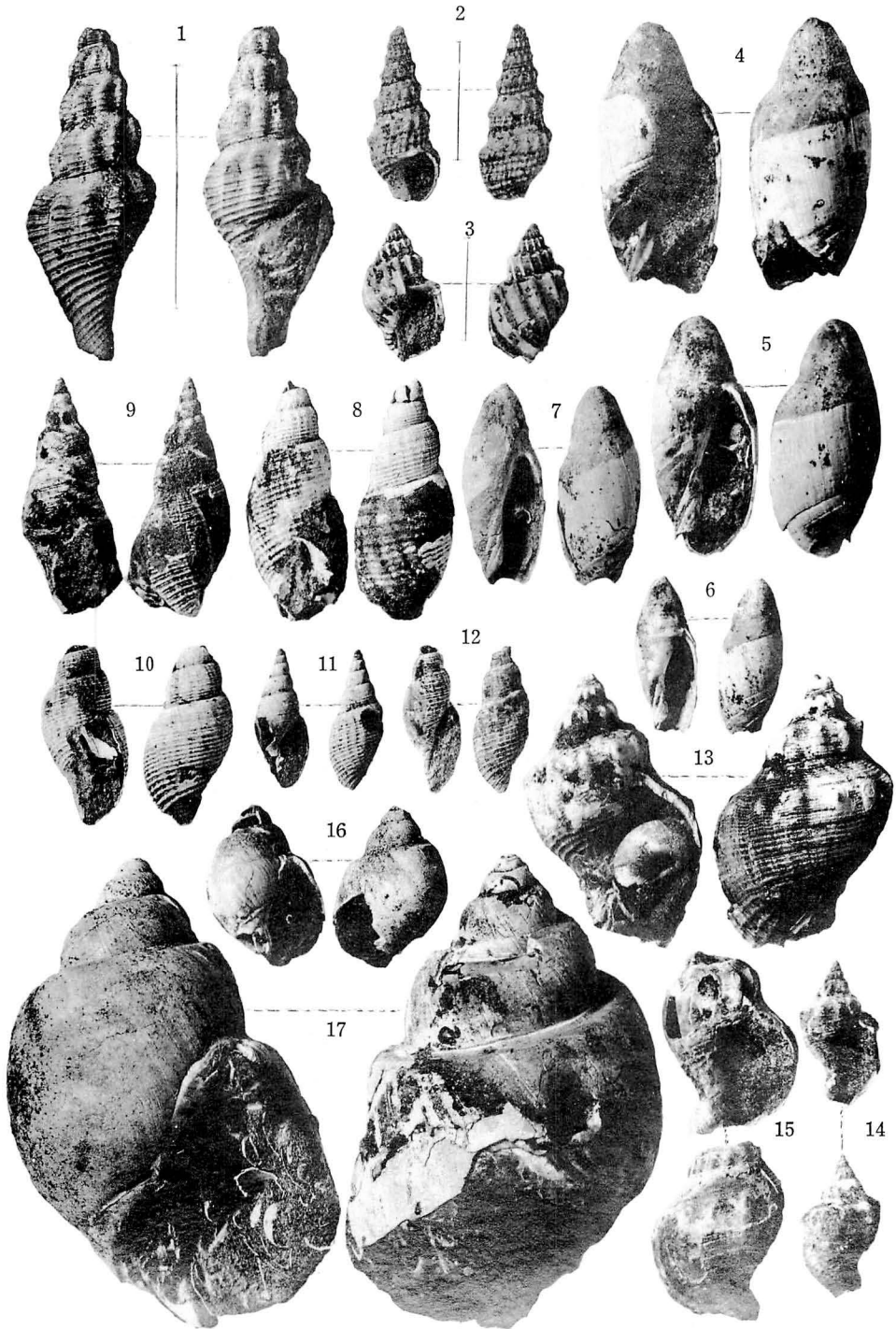
Remarks.

Geography—All the figured specimens were obtained at Dainichi, Loc. 612TK (Kyoto Univ. loc.), brook side crag north of Dainichi (about 50 m NW of the entrance of the over-hill path to Mori, 34°48' N, 137°56' E, in Ugari village of Yamanashi township, Súchi district, Shizuoka pref.

Stratigraphy—The Dainichi sand of Kakegawa group, type of the Suchian stage of the Kakegawa Pliocene.

* MAKIYAMA, JIRO: Mem. Coll. Sci. Kyoto Univ., B3, pp. 1-147, 1927.

** MAKIYAMA, JIRO: Mem. Coll. Sci. Kyoto Univ., B16, pp. 75-93, 1941.



V. Tertiary Mollusca from Dainichi.

PLATE 10.

1. *Umbonium suchianum* (Suchian) Suchian, 1924. (V. 13.)
- 2-5. *Turritella peterebra* Yokoyama, 1923. (V. 11.)
6. *Umbonium mysticum* Yokoyama, 1923. (V. 13.)
7. *Nassarius (Cassia) demissus* (Yok.) See Makino, 1927. (V. 10.)
8. *Arachis castellata* (Yok.) of Arakawa, 1927. (V. 11.)
- 9-13. *Clementia* species Yokoyama, 1923. (V. 13.)
14. *Clementia* species Yokoyama, 1923. (V. 13.)
15. Not Dainichi example, but a better specimen from the place near Tokyo (Mitsumi-Tama) to the west, exact loc. unknown).

Remarks.

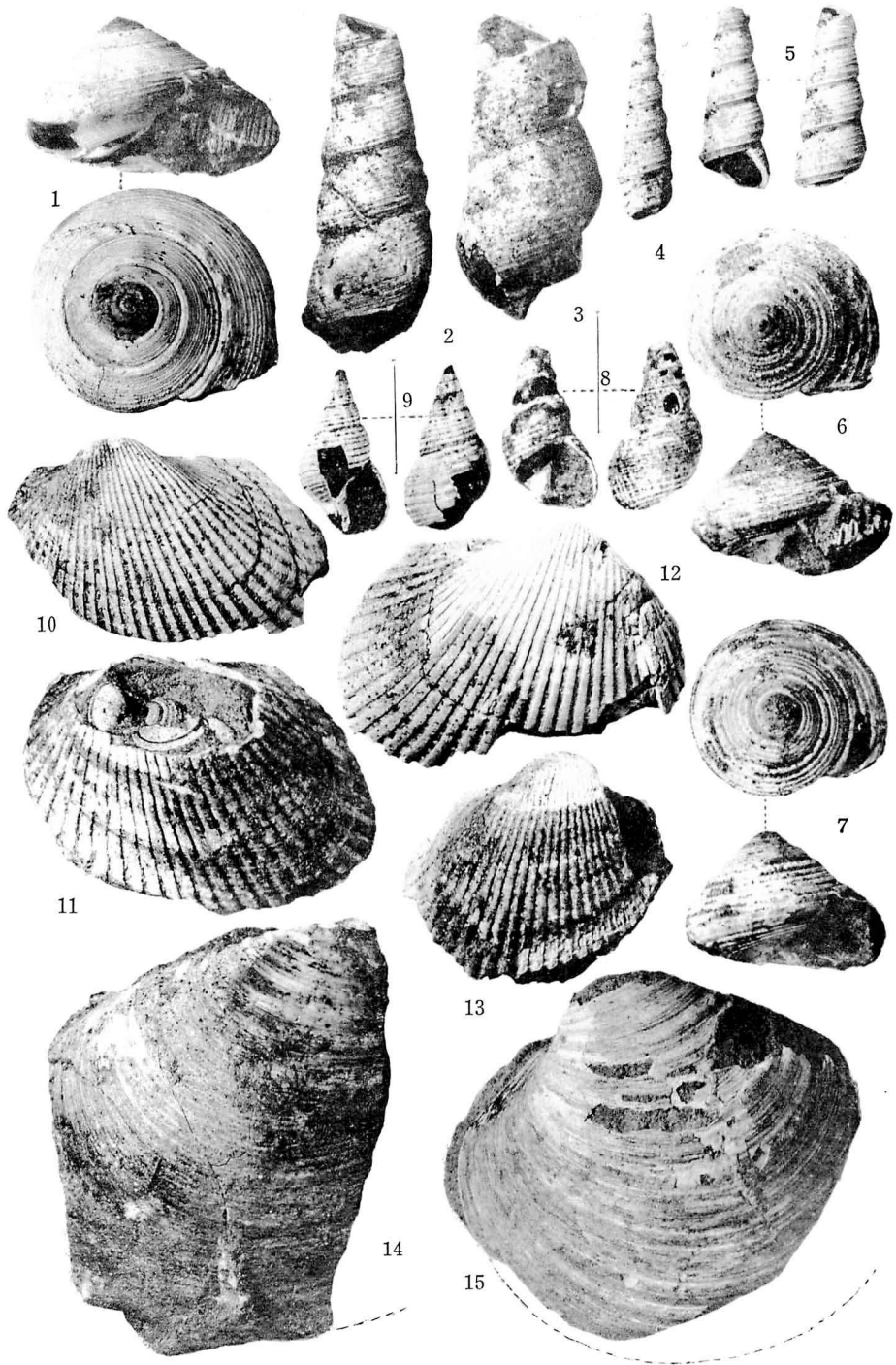
Locality—Dainichi see the remarks mentioned in pl. 9.

PLATE 10.

1. *Umbonium suchiense* YOKOYAMA, 1923 (V, 13). *Umbonium* (*Suchium*) *suchiense* YOKOYAMA, type species of *Suchium* MAKIYAMA, 1924.
- 2-5. *Turritella perterebra* YOKOYAMA, 1923 (V, 11).
- 6, 7. *Umbonium mysticum* YOKOYAMA, 1923 (V, 13). *Umbonium* (*Suchium*) *mysticum* YOKOYAMA.
- 8, 9. *Nassa demissa* YOKOYAMA, 1923 (V, 10). *Nassarius* (*Caesia*) *demissus* (YOK.), see MAKIYAMA, 1927, *op. cit.*
- 10-13. *Arca castellata* YOKOYAMA, 1923 (V, 17). *Anadara castellata* (YOK.), or *Anadara satowi castellata* (YOK.).
14. *Clementia speciosa* YOKOYAMA, 1923 (V, 15). Synonymy: *Clementia vatheleti* MABILE, 1901.
15. Do. Not Dainichi example, but a better specimen from the Pliocene near Tokyo (Minami-Tama, to the west; exact loc. unknown).

Remarks.

Locality—Dainichi, see the remarks mentioned in pl. 9.



V. Tertiary Mollusca from Dainichi.

PLATE II.

- 1-3. *Ombrya tsurenensis* YOKOYAMA, 1934 (VI, 10). The lower Bd. Tsuruta, *Ombrya tsurenensis* YOKOYAMA, 1934 (VI, 10). Orthostrophical rectification.
 4. *Vassa* sp. (VI, 9). Tsuruta.
 5. *Crepidula ovata* YOKOYAMA, 1934 (VI, 11). Koblen, Asagai Bd. Freocquid, non HALL, 1834. *Crepidula matazoi* MAKIYAMA, 1954, non n. sp.
 6. *Turritella imperialis* YOKOYAMA, 1934 (VI, 10). Yatsuhara sea-side, Asagai Bd.
 7-10. *Turritella tozuzayai* YOKOYAMA, 1934 (VI, 10). Tsuruta, Asagai Bd.
 11-16. *Mya* cf. *Mya* *grewingki* MAKIYAMA, 1934. (VI, 12). Non Grewing sp. 1856. Yatsuhara sea-side, Asagai Bd. *Mya grewingki* MAKIYAMA, 1934.
 17. *Calyptra monilata* (HALL, 1834) (VI, 11). Cf. T. & O., 1933, pl. 3, f. 3. The lower Bd. neither *C. monilata* nor *C. rotorua* Kuroda, 1933. Akizawa, Asagai Bd. Cf. plates *tozuzayai* H. & N., 1952, non n. sp., proposed for this figure.
 18. *Umbonium* sp. (VI, 12). Tsuruta, Asagai Bd. *Margarites makiyamai* HIRAYAMA, 1954. valid; *M. makiyamai* H. & N., 1952, invalid, non n. sp.
 20. *Natica janthostoma* (HALL, 1834) (VI, 12). Tsuruta, Asagai Bd. *Ampullina nishimurae* MAKIYAMA, 1934.

Remarks.

Geography—Tsuruta (1-3) in the eastward incline of Tsuruta, Tsuruta containing in Ushigo near Tsuruta 37°02' N, 140°52' E.
 Tsuruta; Asagai sea exposure at Ushigama, Tsuruta containing area in Futaba district, Fukushima pref. 37°17'00" N, 140°59' E.
 Tsuruta; near Yotsukura, Fukushima pref. 37°07' N, 141° E.
 Tsuruta; sea-cliff and wave-cut bench at the north end of the town Fukushima pref. Asagai sea.
 Akizawa; in Ushigo near Tsuruta, Fukushima pref. 37°01'55" N, 140°51' E. Asagai sea.
 Obita; Koblen in Obita, Futaba district, Fukushima pref. 37°08'53" N, 141° E.
 * *Calyptra monilata* Brod., 1831; *C. monilata*, 1834.

PLATE 11.

- 1-3. *Ocenebra tsuzurensis* YOKOYAMA, 1924 (VI, 10,). The Iwaki Bd., Tsuzura. **Ocenebra tsuzurensis** YOK., orthographical rectification.
4. *Nassa* sp. (VI, 9). Tatsuta.
5. *Crepidula auricula* YOKOYAMA, 1924 (VI, 11). Kobisa, Asagai Bd. Preoccupied, non BLAINVILLE, 1824; *Crepidula matajiroi* MAKIYAMA, 1957, *nom. nov.*
- 6, 7. *Turritella importuna* YOKOYAMA, 1924 (VI, 10). Yotsukura sea-side, Asagai Bd.
- 8-10. *Turritella tokunagai* YOKOYAMA, 1924 (VI, 10). Tanoami, Asagai Bd.
- 11-16. *Mya crassa* GREWINGK, (VI, 12), non GREWINGK sp. 1850. Yotsukura sea-cliff, Asagai Bd. **Mya grewingki** MAKIYAMA, 1934.
17. *Calyptreaa mamilaris** (BRODERIP, 1834), (VI, 11), cf. T. & O., 1952, pl. 5, f. 5, The fossil is neither *C. mamilaris*, nor *C. yokoyamai* KURODA, 1929. Akiyama, Asagai Bd. *Calyptreaa tokunagai* H. & N., 1952, *nom. nud.*, proposed for this figure.
- 18, 19. *Umbonium* sp. (VI, 12); Tatsuta, Asagai Bd. **Margarites makiyamai** HIRAYAMA, 1954, valid; *M. makiyamai* H. & N., 1952, invalid, *nom. nud.*
20. *Natica janthostoma* DESHAYES, 1839, (VI, 12). Tatsuta, Asagai Bd. **Ampullina asagaiensis** MAKIYAMA, 1934.

Remarks.

Geography—Tsuzura (f. 1-3), in the eastward incline at Tsuzura, Iwaki coal-mine, in Uchigo near Taira, 37°02' N, 140°52' E.

Tatsuta: Asagai ss. exposure at Dainoyama, Tatsuta coal-mine area in Futaba district, Fukushima pref., 37°17'06" N, 140°59' E.

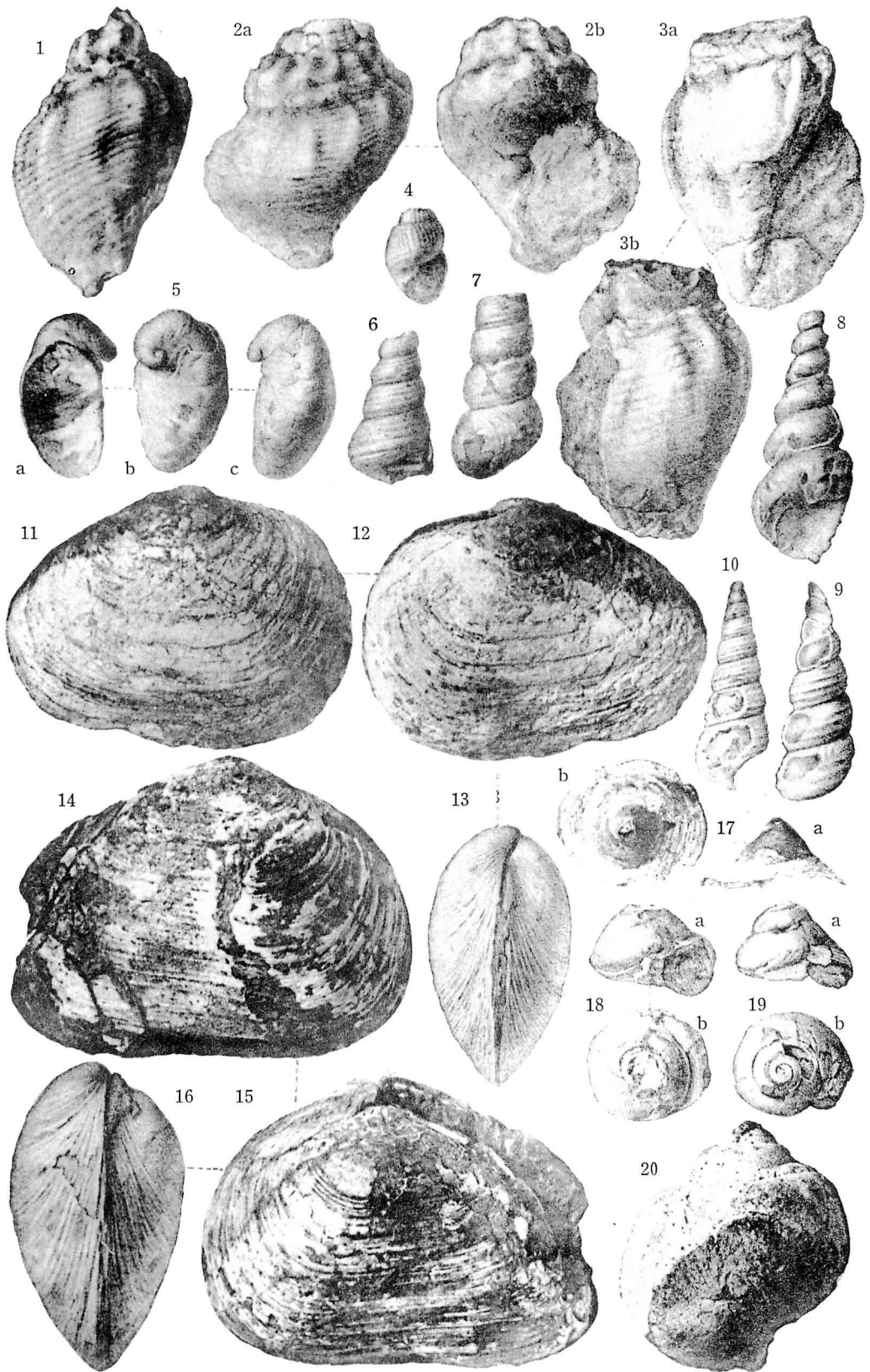
Tanoami: near Yotsukura, Fukushima pref., 37°07' N, 141° E.

Yotsukura: sea-cliff and wave-cut bench at the north end of the town, Fukushima pref., Asagai ss.

Akiyama: in Uchigo near Taira, Fukushima pref., 37°01'05" N, 140°51' E, Asagai ss.

Obisa: Kobisa in Obisa, Futaba district, Fukushima pref., 37°08'05" N, 141° E.

* *Calyptreaa mamilaris* BROD., 1831; *C. mamilaris*, 1834.



VI. Molluscan Remains from the Jô-Ban Coal-Field.

PLATE 12.

- 1-5. *Tellina besenianis* YOKOYAMA, 1934 (VI, 14), Asagai Bd. at Bessho. *Tellinoma beseno-*
ensis (YOK.) belong to the subgenus *Aegla* Stodolner, 1935.
 6. *Venus lutea* YOKOYAMA, 1934 (VI, 15), Asagai Bd. at Ohsa. *Lioyema lutea* (YOK.)
 7. *Alicata* (*Collisla*) *chinensis* HOLLER, 1902, CHEMNITZ (VI, 14), Iwaki Bd. at Dobara.
 This is not the living form, but the following name was proposed for the figure only:
Collisla chinensis H. & N., 1952, nom. nov.
 8-11. *Tellina setigera* YOKOYAMA, 1934 (VI, 14), Asagai Bd. at Bessho. *Marcus setigera*
 (YOK.)
 12-13. *Cardium (Lioecardium) japonicum* YOKOYAMA, 1934 (VI, 15), Iwaki Bd. at Tokamae.
Kamidaki, *Lioecardium japonica* (YOK.) H. & N., 1952.
 14. *Venus terrena* YOKOYAMA, 1934 (VI, 15), Asagai Bd. at Tokamae. *Oyamada*, *Lioyema*
terrena (YOK.)
 15. *Tellina alternata* SAY var. *chibana* YOKOYAMA, 1932 (VI, 13); the subspecies from the
 Pleistocene of Chiba is referable to *Angulus tenuis* (SCHEERER), T. & O., pl. 39, f. 5.
 Asagai Bd. at Wariyama. *Akai*, *Pionidia akai* (WOOD), H. & N., 1952.

Remarks.

Geography—Bessho: in Iwazaki valley 150 m NW of Tesho bridge, Iwaki district, Fuken-
 shima pref. 36°59'07" N, 140°19'05" E.
 Tokamae: in Kamidaki of Kubota village, Iwaki district, Fukushima pref. 36°50'03" N,
 140°14' E.
 Tokamae: in Oyamada Ohsa, Futaba district, Fukushima pref. 37°02'04" N, 140°17'00" E.
 Wariyama: in Akai village, Iwaki district, Fukushima pref.
 Dobara: Misawa in Kubota village, Iwaki district, Fukushima pref.
Bibliography—MURAYAMA, 1934, Mem. Coll. Sci. Kyoto Univ. 13, pp. 121-167.

PLATE 12.

- 1-5. *Tellina besshoensis* YOKOYAMA, 1924 (VI, 14). Asagai Bd. at Bessho. **Periploma besshoensis** (YOK.), belong to the subgenus *Aelga* SLODKIEWITSCH, 1935.
6. *Venus furtiva* YOKOYAMA, 1924 (VI, 15). Asagai Bd. at Obisa. **Liocyma furtiva** (YOK.).
- 7, 8. *Meretrix (Callista) chinensis* HOLTEN, 1802, CHEMNITZ, (VI, 14). Iwaki Bd. at Dôdaira. This is not the living form, but the following name was proposed for the figure only: *Callista misawaensis* H. & N. 1952, *nom. nud.*
- 9-11. *Tellina sejugata* YOKOYAMA, 1924 (VI, 14). Asagai Bd. at Bessho. **Macoma sejugata** (YOK.).
- 12-18. *Cardium (Laevicardium) jobanicum* YOKOYAMA, 1924 (VI, 15). Iwaki Bd. at Tenjinmae, Kamidaki. **Protothaca jobanica** (YOK.), *vide* H. & N., 1952.
19. *Venus terrena* YOKOYAMA, 1924 (VI, 15). Asagai Bd. at Tegasawa, Oyamada. **Liocyma terrena** (YOK.).
20. *Tellina alternata* SAY var. *chibana* YOKOYAMA, 1922, (VI, 13); the subspecies from the Pleistocene of Chiba is referable to *Angulus venulosa* (SCHRENCK), T. & O., pl. 30, f. 5. Asagai Bd. at Wariyama, Akai. **Peronidia lutea** (WOOD), *vide* H. & N., 1952.

Remarks.

Geography—Bessho: in Iwasaki, valley 150 m NW of Bessho bridge, Iwaki district, Fukushima pref., 36°59'07" N, 140°49'05" E.

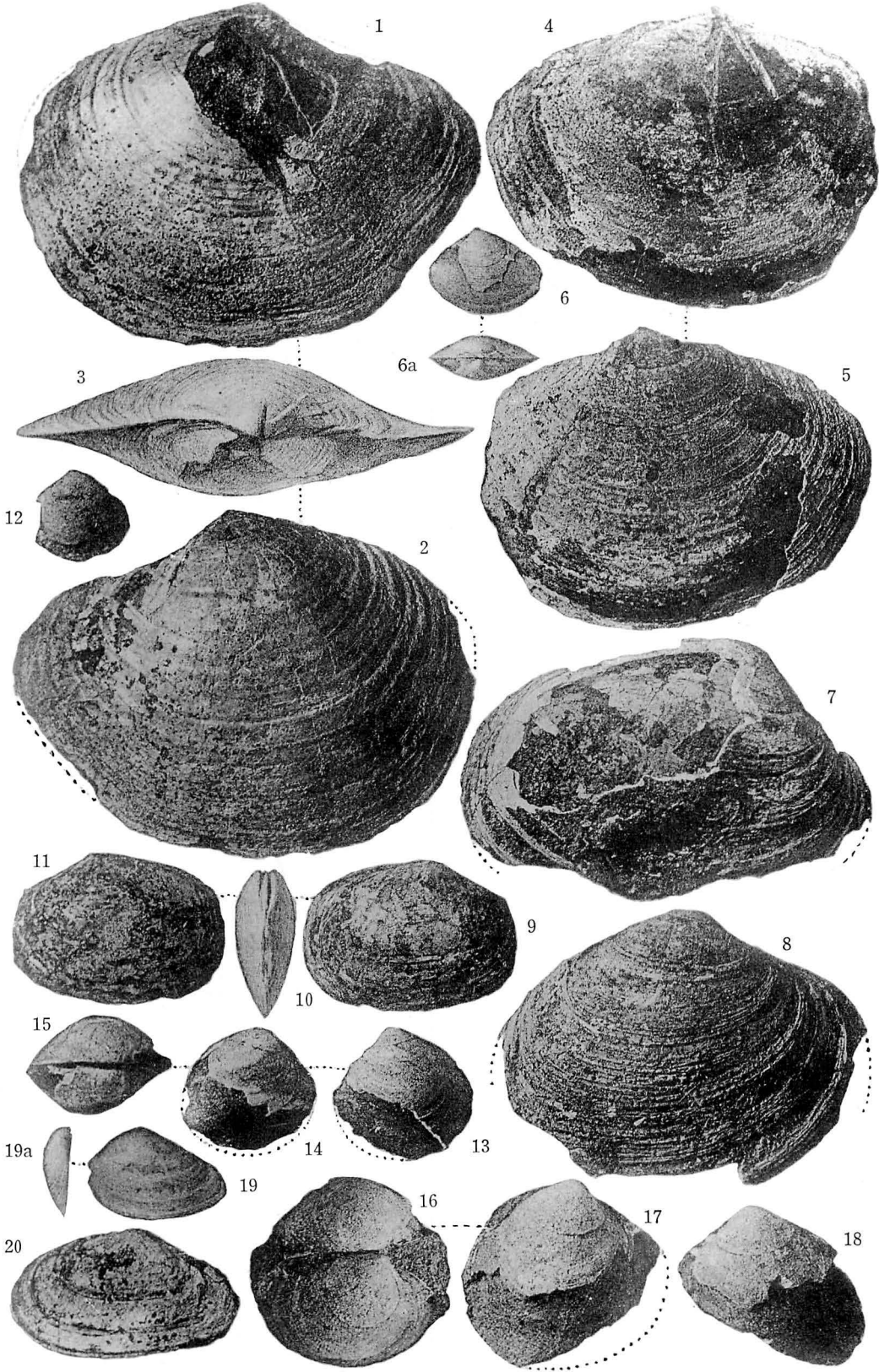
Tenjinmae: in Kamidaki of Kadono village, Iwaki district, Fukushima pref. 36°59'05" N, 140°44' E.

Tegasawa: in Oyamada, Obisa, Futaba district, Fukushima pref., 37°08'04" N, 140°57'06" E.

Wariyama: in Akai village, Iwaki district, Fukushima pref.

Dôdaira: Misawa in Kubota village, Iwaki district, Fukushima pref.

Bibliography—MAKIYAMA, 1934: Mem. Coll. Sci. Kyoto Univ., B 10, pp. 121-167.



VI. Molluscan Remains from the Jô-Ban Coal-Field.

PLATE 13.

1. *Candollea (Candolle) spathulifera* YOKOYAMA, 1931 (VI, 10). Iwaki Mt. at Dobaita, *Sarripes*
spathulifera (Yok.) Mas. H. & N., 1933.
2. *Thysanota discata* (Gussone) 1849 (VI, 13). Upper course of Okagasaki, Iwaki, *Sarripes*
 Iwaki Mt. 1866; Status quo ante the Gonsara's name is valid.
3. *Thysanota (Candolle) nipponica* YOKOYAMA, 1931 (VI, 17). Asagi Mt. at Yamaoka, *Sarripes*
 Tama no Gorge. *Pezizales* *hartmannii* BULL., 1904.
4. *Candollea (Candolle) trichotoma* YOKOYAMA, 1931 (VI, 19). Asagi Mt. at Yamaoka,
 Iwaki Mt. & right side. *Nomophila trichotoma* (Yok.) Mas. H. & N., 1933; *Nomophila*
trichotoma.
5. *Nomophila* sp. (VI, 19). Iwaki Mt. at Dobaita. *Cyclocarpus velutinus* H. & N., 1933.
- 6-12. *Nomophila velutina* YOKOYAMA, 1931 (VI, 18). Asagi Mt. at Otsu. *Cyclocarpus*
okuyamae (Yok.)
- 13-17. *Candollea velutina* YOKOYAMA, 1933 (VI, 18). Asagi Mt. at Yamaoka. *Cinnocarpium*
velutina YOKOYAMA, 1934.
- 18-19. *Thysanota veluta* YOKOYAMA, 1931 (VI, 19). Asagi Mt. at Yamaoka. *Thysanota*
veluta (Yok.)

Remarks.

Candollea—*Okagasaki*: Upper course of brook Okagasaki, Tama no Gorge in Utsunomiya Prefecture,
 pref. Utsunomiya, 1931.
Thysanota *velutina*: in Futaba district, Fukushima pref., 37°17'02" N, 140°57'08" E.
Yamaoka: *velutina* in *Hirono* village, Futaba district, Fukushima pref., 37°14'00" N,
 140°50'08" E.
Otsu: *Otsu* in Otsu village, Futaba district, 37°09'08" N, 140°50'08" E.
Yamaoka *sp.*: on hill and intertidal rocky beach.
Dobaita: see pl. 12.

PLATE 13.

1. *Cardium (Laevicardium) squalidum* YOKOYAMA, 1924 (VI, 16). Iwaki Bd. at Dôdaira. **Serripes squalidum** (YOK.), *fide* H. & N., 1952.
2. *Thyasira bisecta* (CONRAD, 1849), (VI, 18). Upper course of Okegasaku, Uchigô. *Conchocele disjuncta* GABB, 1866; *Status quo ante* the CONRAD's name is valid.
- 3, 4. *Papyridea (Fulvia) nipponica* YOKOYAMA, 1924 (VI, 17). Asagai Bd. at entrance-side of Tatsuta coal-mine. **Papyridea harrimani** DALL, 1904.
- 5, 6. *Cardium (Laevicardium) tristiculum* YOKOYAMA, 1924 (VI, 19). Asagai Bd. at Yamadaoka. f. 5, left, f. 6, right valve. *Nemocardium tristiculum* (YOK.), *fide* H. & N., 1952; *Keenaea tristicula* ?
7. Do. Numanosaku.
- 8, 9. *Venericardia* sp. (VI, 19). Iwaki Bd. at Dôdaira. *Cyclocardia dodairensis* H. & N., 1952, *nom. nud.*, *V. ferruginea*, (YOKOYAMA, VII).
- 10-12. *Venericardia tokunagai* YOKOYAMA, 1924 (VI, 18). Asagai Bd. at Obisa. **Cyclocardia tokunagai** (YOK.).
- 13-15. *Cardium shinjiense* YOKOYAMA, 1923, (VI, 16). Asagai Bd. at Yamadaoka. **Clinocardium asagaiense** MAKIYAMA, 1934.
- 16-18. *Venericardia laxata* YOKOYAMA, 1924 (VI, 19). Asagai Bd. at Yotsukura shore. **Cyclocardia laxata** (YOK.).

Remarks.

Geography—Okegasaku: Upper course of brook Okegasaku, Tsuzura in Uchigô, Fukushima pref. 37°02' N, 140°51' E.

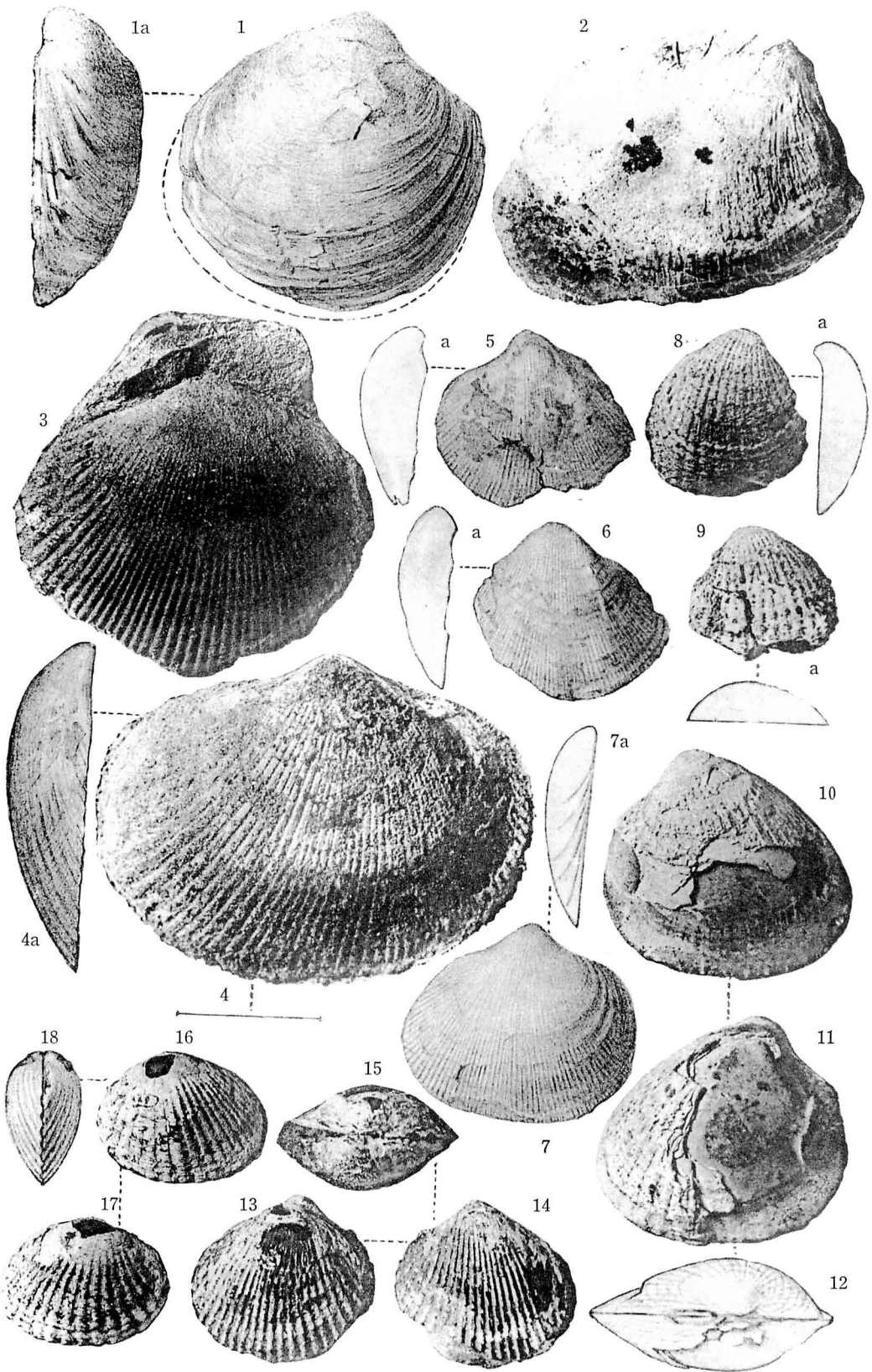
Tatsuta coal-mine: in Futaba district, Fukushima pref., 37°17'02" N, 140°57'08" E.

Yamadaoka: coal-mine in Hirono village, Futaba district, Fukushima pref., 37°14'06" N, 140°59'08" E.

Obisa: Obisa in Obisa village, Futaba district, 37°08'08" N, 140°58' E.

Yotukura shore: sea-cliff and intertidal rocky bench.

Dôdaira: see pl. 12.



VI. Molluscan Remains from the Jô-Ban Coal-Field.

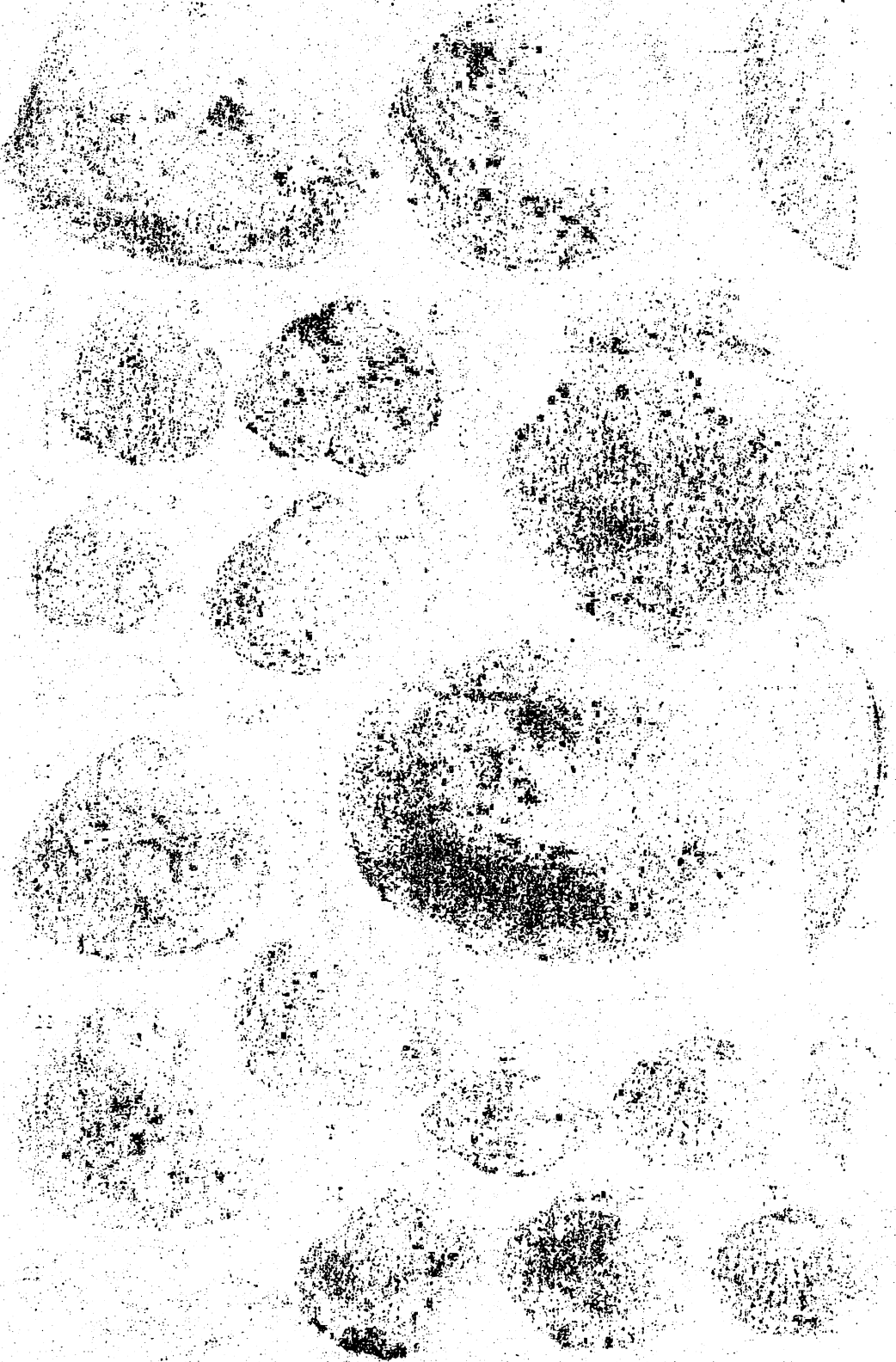


PLATE II.

1. *Trichostema pacificum* YOKOYAMA, 1934 (VI, 18). Asagi Mt. at Hamanaka, Yamaguchi Pref. (YOK), No. II & N., 1932.
2. *Lama yamamotoensis* YOKOYAMA, 1934 (VI, 20). Asagi Mt. at Dainoyama.
3. *Aspilota pacificus* YOKOYAMA, 1934 (VI, 20). Iwaki Mt. at Asagi, Otsu II & N., 1932. This form is a subspecies of *M. crassifemur*.
4. *Mytilus takienis* YOKOYAMA, 1934 (VI, 20). Iwaki Mt. at Taki containing.
5. *Aspilota nodulosa* (Link.) (VI, 20). E. T. Iwaki; both from Iwaki.
6. *Aspilota yamamotoi* H. & N., 1932, nom. nuda, not *Aspilota nodulosa* Link.
7. *Aspilota yamamotoi* H. & N., 1932. Asagi Mt. at Torigawa of Oyamada, Yamanashi Pref. (YOK), a doubtful subspecies: *Aspilota*, No. II & N., 1932.
8. *Ystia laudabilis* YOKOYAMA, 1934 (VI, 22). Asagi Mt. at Shin'yashiki, Yamaguchi Pref. (YOK), No. II & N., 1932; Yama (Yama) (Yama) (Yama) Yamaguchi, 1934.

Remarks.

Aspilota-*Shin'yashiki*: in creek of Shin'yashiki, Hamanaka, Yamaguchi district, Iwaki-shima Pref., 37°10'N, 141°12'E.

Lama yamamotoi: in Yoshima, Iwaki district, Fukushima Pref., 37°04'N, 140°51'E.

Dainoyama: in Yumoto, Fukushima Pref., 37°01'N, 140°18'00"E.

Asagi: east side, north of Oya in Yamada village, Iwaki district, Fukushima Pref., 36°56'N, 141°17'08"E.

Taki: east-south, 600 m SW of Taki in Kadono village, Iwaki district, Fukushima Pref., 36°53'50"N, 140°41'00"E.

Iwaki and *Torigawa*: see pl. 12.

PLATE 14.

- 1, 2. *Venericardia pacifera* YOKOYAMA, 1924 (VI, 18). Asagai Bd. at Hannukizawa. *Cyclocardia pacifera* (YOK.), *vide* H. & N., 1952.
3. *Lima yumotoensis* YOKOYAMA, 1924 (VI, 20). Asagai Bd. at Dainoyama.
4. *Mytilus luciferus* YOKOYAMA, 1924 (IV, 20). Iwaki Bd. at Araya, Oya. H. & N., 1952 refer this form to a subspecies of *M. crassitesta*.
- 5, 6. *Mytilus takiensis* YOKOYAMA, 1924 (VI, 20). Iwaki Bd. at Taki coal-mine.
- 7, 8. *Modiola modiolus* (LINNÉ), (VI, 20). f. 7, Dôdaira; f. 8, Takinakayama; both from Iwaki Bd. *Volsella yokoyamai* H. & N., 1952, *nom. nud.*, not *Mytilus modiolus* LINNÉ.
- 9, 10. *Leda yabei* YOKOYAMA, 1924 (VI, 22). Asagai Bd. at Têngasawa of Oyamada. *Yoldia yabei* (YOK.), f. 9 doubtful, subgenus: *Cnesterium*, *vide* H. & N., 1952.
- 11, 12. *Yoldia laudabilis* YOKOYAMA, 1924 (VI, 22). Asagai Bd. at Shin'yashiki, Suetsugu. *Portlandia laudabilis*, H. & N., 1952; *Yoldia (Yoldia) laudabilis*, HIRAYAMA, 1954.

Remarks.

Geography—Shin'yashiki: in creek of Shimoyashiki, Hisanohama, Futaba district, Fukushima pref., 37°10' N, 141° E.

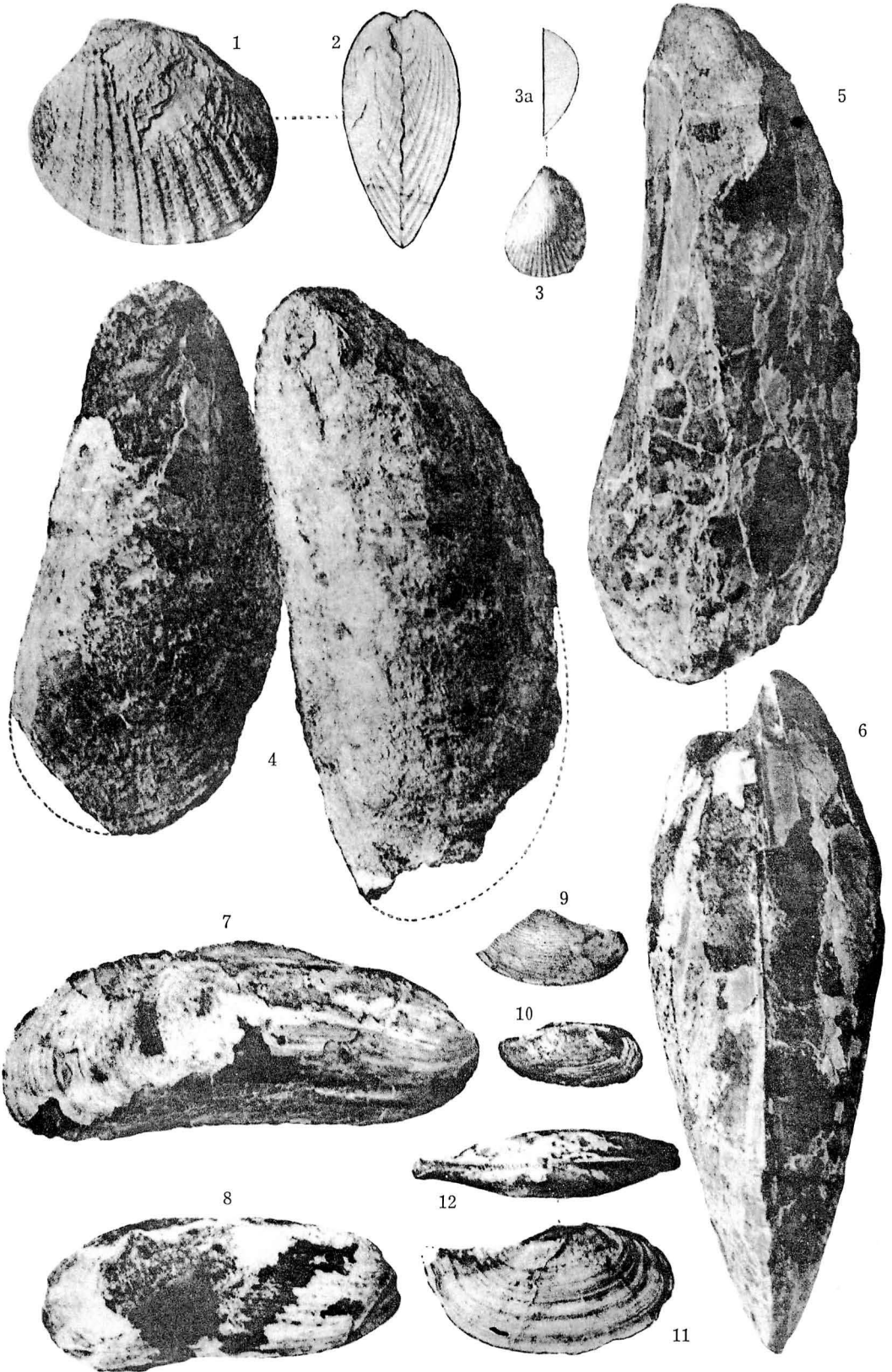
Hannukizawa: in Yoshima, Iwaki district, Fukushima pref., 37°04' N, 140°51' E.

Dainoyama: in Yumoto, Fukushima pref., 37°01' N, 140°49'46" E.

Araya: coal mine, north of Ooya in Yamada village, Iwaki district, Fukushima pref., 36°56' N, 141°44'08" E.

Taki: coal-mine, 600 m SW of Taki in Kadono village, Iwaki district, Fukushima pref., 36°59'02" N, 140°44'05" E.

Dôdaira and Têngasawa: see pl. 12.



VI. Molluscan Remains from the Jô-Ban Coal-Field.

PLATE 16

- 1. Office of Geology, Yokoyama, 1934 (VI, 21). Iwaki Bk. in front of the building (Geology) of Nakoso coal-mine, Kubota.
- 2. Office of Geology, Yokoyama, 1934 (VI, 21). Iwaki Bk. at Taki coal-mine, Nakoso.
- 3. Office of Geology, Yokoyama, 1934 (VI, 20). Iwaki Bk. at Iwaki coal-mine, Takano.

Remarks:

Geography—Loc. of Ozean of Iwaki: NW of Takano station, Utsunomiya city, Fukushima pref., 37°20'02" N, 140°50'52" E.
 Takano: 600 m SW of Taki, Iwaki district, Fukushima pref., 36°59'02" N, 140°41'38" E.
 Nakoso coal-mine: the exposure in front of the dormitory of Daishuwan Coal-Mine Co. at Dawa in Kubota, Iwaki district, Fukushima pref., 36°53' N, 140°44'07" E.
 Stratigraphy—Iwaki Bk.: known as Iwaki sandstone, brickish and littoral water lodes of the thick coarse to medium-grained grey sandstone over the coal measures.
 Azaagi Bk.: The Azaagi sandstone, the marine fine to superfine blue sandstone over the Iwaki sandstone; both the beds cited here are believed to be Oligocene in age.

PLATE 15.

- 1, 2. *Ostrea* cf. *gigas* THUNBERG, (VI, 20). Iwaki Bd. at Iwaki coal-mine, Tsuzura.
3. *Ostrea takiana* YOKOYAMA, 1924 (VI, 21). Iwaki Bd. at Taki coal-mine, Kadono.
4. *Ostrea mundana* YOKOYAMA, 1924 (VI, 21). Iwaki Bd. in front of the building (dormitory) of Nakoso coal-mine, Kubota.

Remarks.

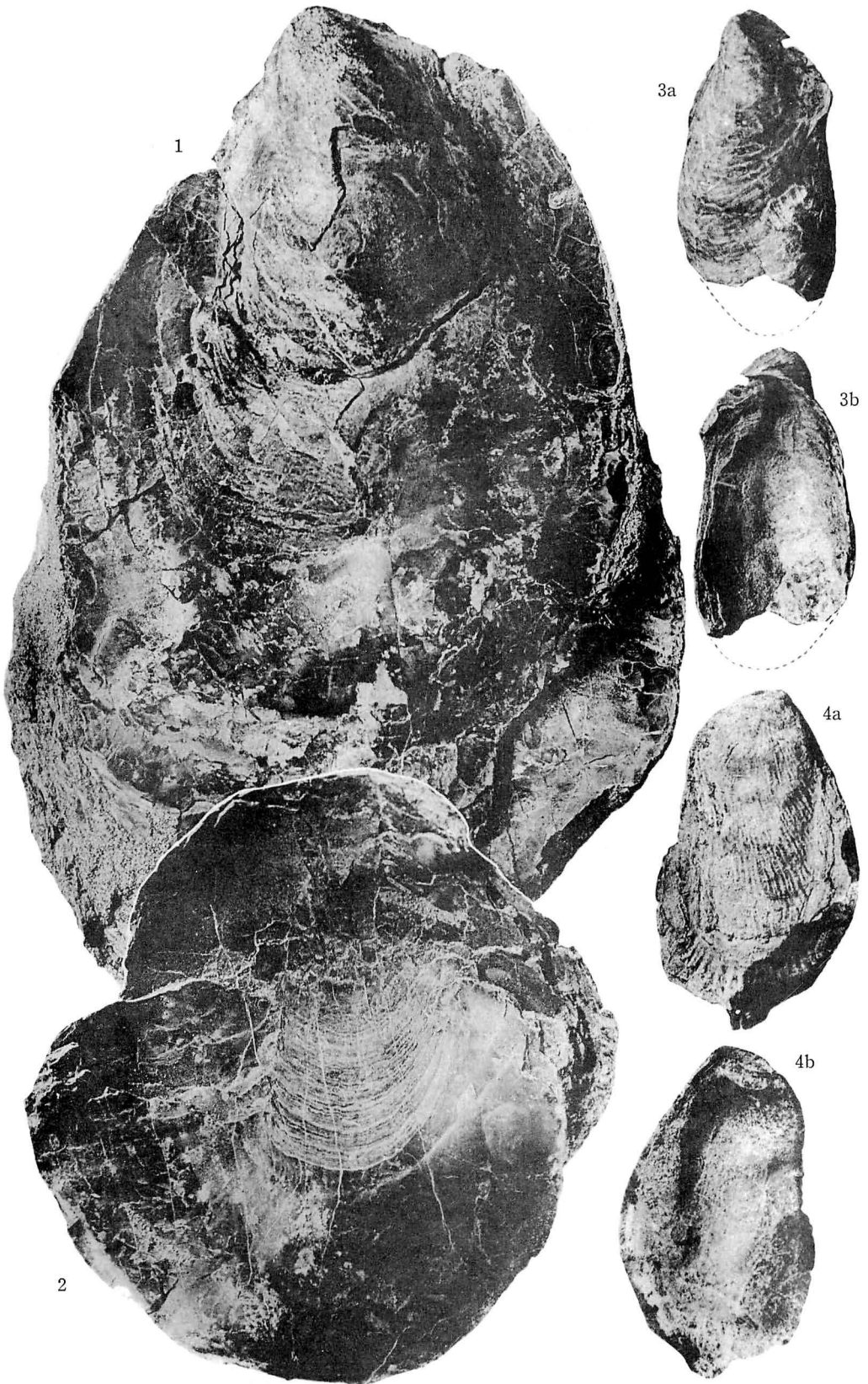
Geography—Loc. of *Ostrea* cf. *gigas*: NW of Tsuzura station, Uchigo city, Fukushima pref., 37°20'02" N, 140°50'03" E.

Taki: 600 m SW of Taki, Iwaki district, Fukushima pref., 36°59'02" N, 140°44'05" E.

Nakoso coal-mine: the exposure in front of the dormitory of Dainippon Coal-Mine Co., at Dezo in Kubota, Iwaki district, Fukushima pref., 36°53' N, 140°44'07" E.

Stratigraphy—Iwaki Bd.: known as Iwaki sandstone, brackish and littoral water facies of the thick coarse to medium-grained grey sandstone over the coal measures.

Asagai Bd.: The Asagai sandstone, the marine fine to superfine blue sandstone over the Iwaki sandstone; both the beds cited here are believed to be Oligocene in age.



VI. Molluscan Remains from the Jô-Ban Coal-Field.

PLATE 16.

1. *Chrysodomus phoeniceus* DALL, 1891, (VII, 10). "Shirado Bd.", Tsurushihama, Sukegawa. *Neptunea yokoyamai* H. & N., 1952 *nom. nud.*, non OYAMA, 1954. *Neptunea* sp.
2. *Chrysodomus pericochlion* SCHRENCK, 1867, (VII, 10). Tsurushihama, Sukegawa. *Japellion hirasei* PILSBRY, 1891, *fide* H. & N., 1952.
3. *Bathybembix argenteo-nitens* LISCHKE, (VII, 14). Tsurushihama, Sukegawa. *Lischkeia argenteonitens* (LISCHKE, 1874).
4. *Helcioniscus pallidus* (GOULD), (VII, 15). Tsurushihama, Sukegawa. *Tectura pallida* (GOULD, 1859).
5. *Cassis japonica* REEVE, (VII, 11) Tsurushihama, Sukegawa. *Semicassis japonica* (REEVE, 1848).
6. *Clementia speciosa* YOKOYAMA, (VII, 21). "Shirado Bd." of railway cutting, Nakoso. *Clementia nakosoensis* H. & N., 1952 *nom. nud.*
- 7, 8. *Mactra spectabilis* LISCHKE, 1871, (VII, 17). "Shirado Pliocene" of Izura (f. 7) and Tsuchibashi, Kadono (f. 8).
9. *Pleurotoma* sp. (VII, 8). "Shirado Bd." of Izura. *Megasurcula yokoyamai* OTUKA, 1934.
10. *Galeodea (Sconsia) japonica* YOKOYAMA, 1923, (VII, 11). "Shirado Bd.", Tōzenji, Yunami. *Doliocassis japonica* (YOK.), see pl. 5, f. 4.
11. *Thracia pubescens* (PULTENEY, 1799), (VII, 25). "Shirado Bd." of Gomasawa, Taira. *Thracia yokoyamai* H. & N., 1952 *nom. nud.*

Remarks.

Geography—Tsurushihama, Sukegawa: sea side below the Hamamiya gardens, Hitachi city, Ibaraki pref., about a kilometer NE of the station, 36°35'05" N, 140°40'03" E.

Nakoso: railway cutting by the first tunnel, SE of Nakoso, Ibaraki pref., 36°52' N, 140°47'04" E.

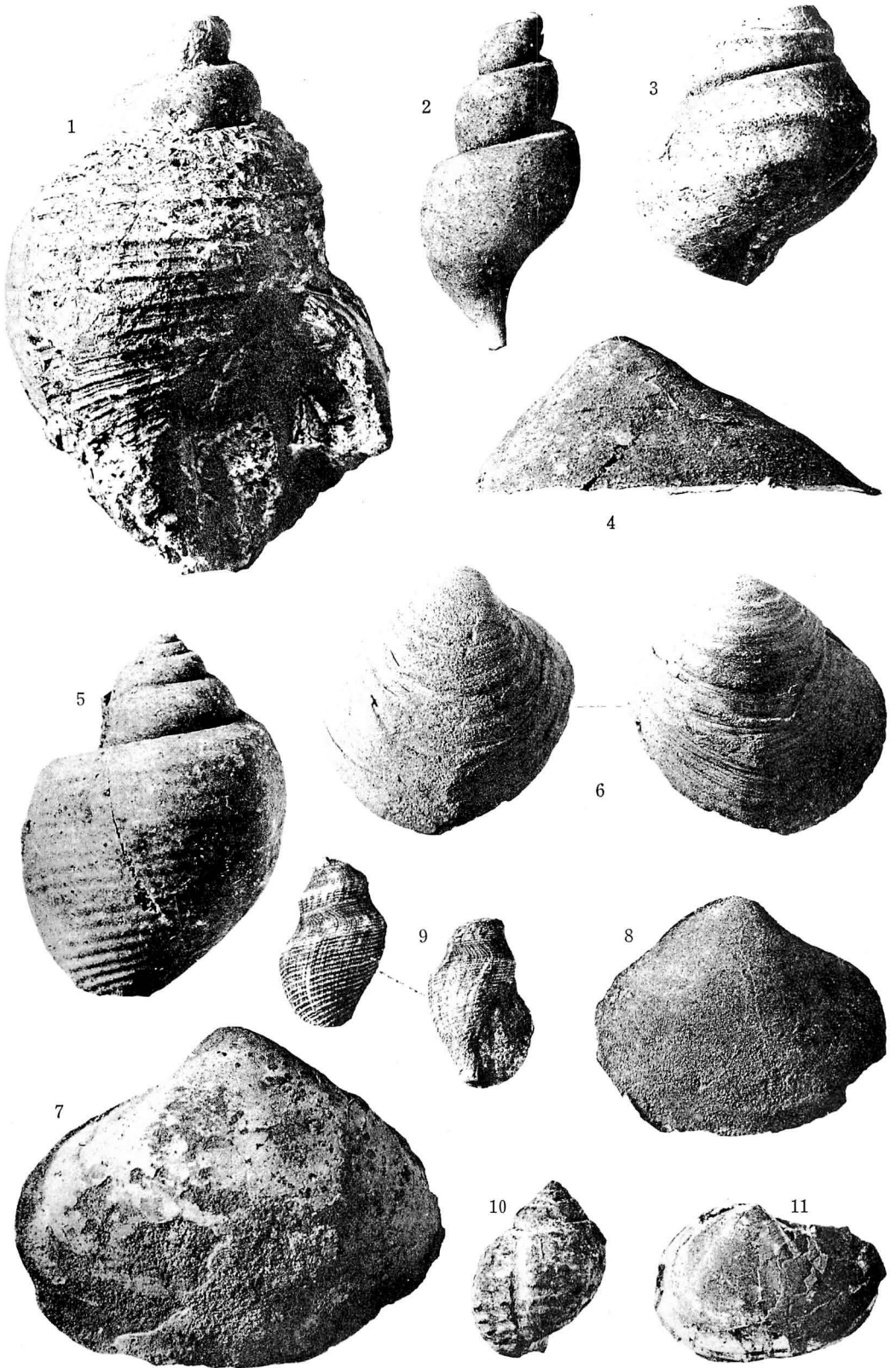
Izura: sea-cliff north of Ootsu town in NE part of Ibaraki pref., 36°49'06" N, 140°48'02" E.

Tsuchibashi: river cliff in Tsuchibashi, Kadono, Iwaki district, Fukushima pref., 37°01' N, 140°45' E.

Gomasawa: 30 m west of the temple in Gomasawa, Taira city, Fukushima pref., 37°03'06" N, 140°53'01" E.

Tōzenji: west side of cross-roads, 100 m E of Yunami, Sekinan, Taga district, Ibaraki pref., 36°50'03" N, 140°45'02" E.

Stratigraphy—"Shirado Bd., Pliocene" in 1920 is now differentiated:—of Tsurushihama: the Taga formation; of Nakoso: the Nakayama formation, Miocene; of Izura: Kokozura formation, Miocene; of Tōzenji: Kokozura; of Tsuchibashi: Mizunoya formation, Miocene; of Gomasawa: the Misawa formation.



VII. Molluscan Remains from the Jô-Ban Coal-Field.

PLATE 17.

1. *Pecten swiftii* BERNARDI, (VII, 27). Tsurushihama, Sukegawa. **Chlamys (Swiftopecten) swiftii** BERNARDI, 1858.
2. *Yoldia lischkei* SMITH, (VII, 30). Tsurushihama, Sukegawa. **Portlandia lischkei** (SMITH, 1885).
3. *Stomatella japonica* A. ADAMS, (VII, 15). Tsurushihama, Sukegawa. *S. japonica* A. ADAMS, 1850 ? aff. *S. lyrata* PILSBRY, 1890.
4. *Pecten kimurai* YOKOYAMA, 1925 (VII, 27). Izura. **Patinopecten kimurai** (YOK.)
5. *Solen gouldii* CONRAD, 1867, (VII, 18). Tôzenji, Yunami.
6. *Cerithium baculum* YOKOYAMA, 1923, (VII, 12). "Shirado Bd." at Yamoto in Kadono. **Vicaryella bacula** (YOK.), see pl. 7.
7. *Cerithium* sp. (VII, 12). Yamoto. **Vicaryella** sp.
8. *Turritella nipponica* YOKOYAMA, 1920, (VII, 13). Izura. subgenus: *Haustator*.
9. *Dentalium complexum* DALL, 1895, (VII, 16). Tempizan. **Dentalium yokoyamai** MAKIYAMA, 1931, not DALL's species.
10. *Mytilus grayanus* DUNKER, 1853, (VII, 25). Tempizan.
11. *Spisula grayana* (SCHRENCK, 1867), (VII, 17). Tsurushihama, Sukegawa.
12. *Tellina izurensis* YOKOYAMA, 1925 (VII, 19). Izura. **Macoma izurensis** (YOK.), *vide* H. & N., 1952.

Remarks.

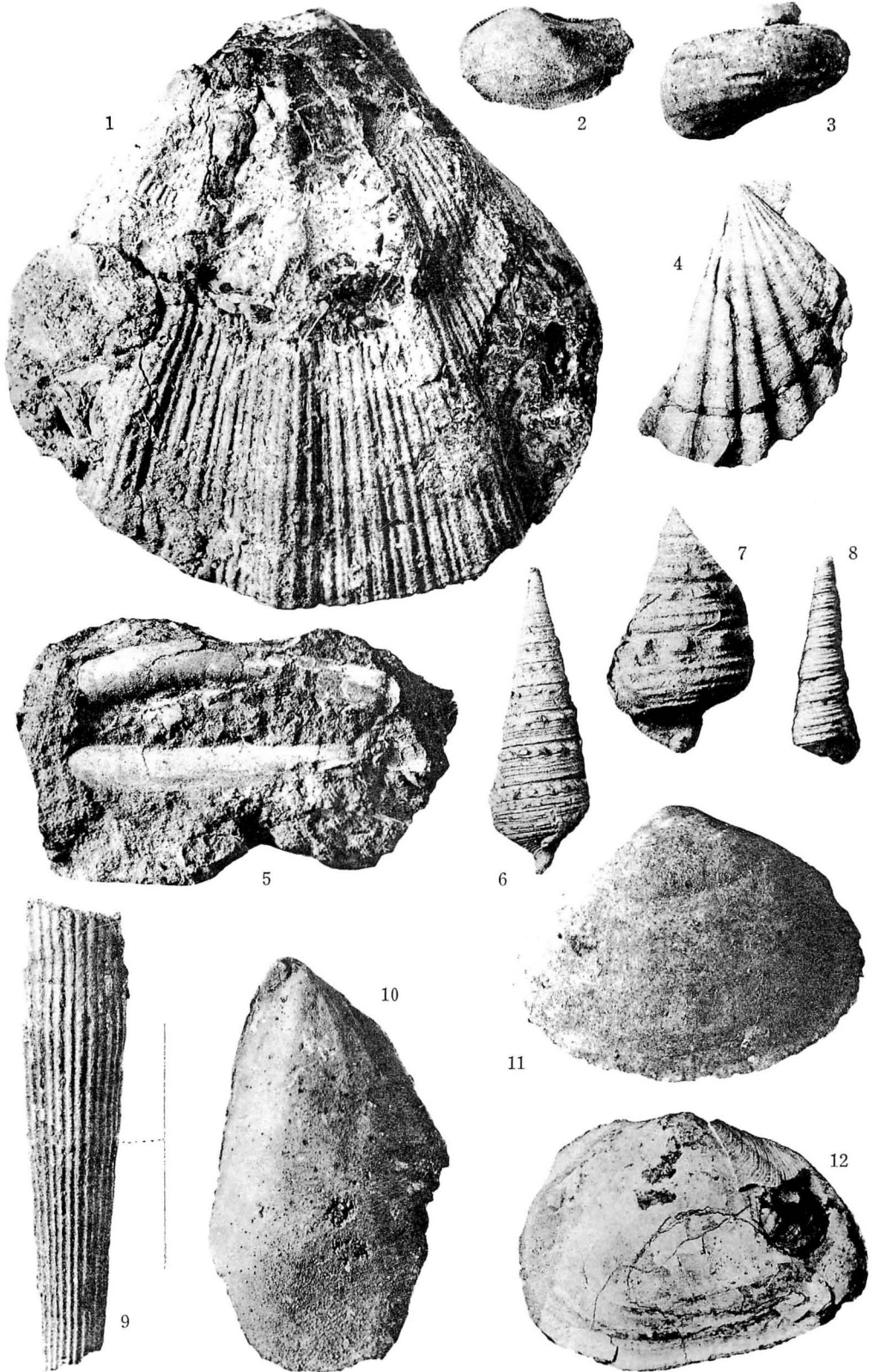
Geography—Yamoto: in Kadono village, Iwaki district, Fukushima pref., precise locality ? 37°01' N, 140°44' E.

Tempizan: sea shore by Tempizan, below the hotel, in Isohara, Taga district, Ibaraki pref., 36°47'04" N, 140°45'06" E.

Tsurushihama; Izura; Tôzenji: see pl. 16.

Stratigraphy—Yamoto: the Shirado formation, middle Miocene, or Taga Miocene (H. & N.).

Tempizan: not in the Shirado, but the Kokozura formation, Miocene.



VII. Molluscan Remains from the Jō-Ban Coal-Field.

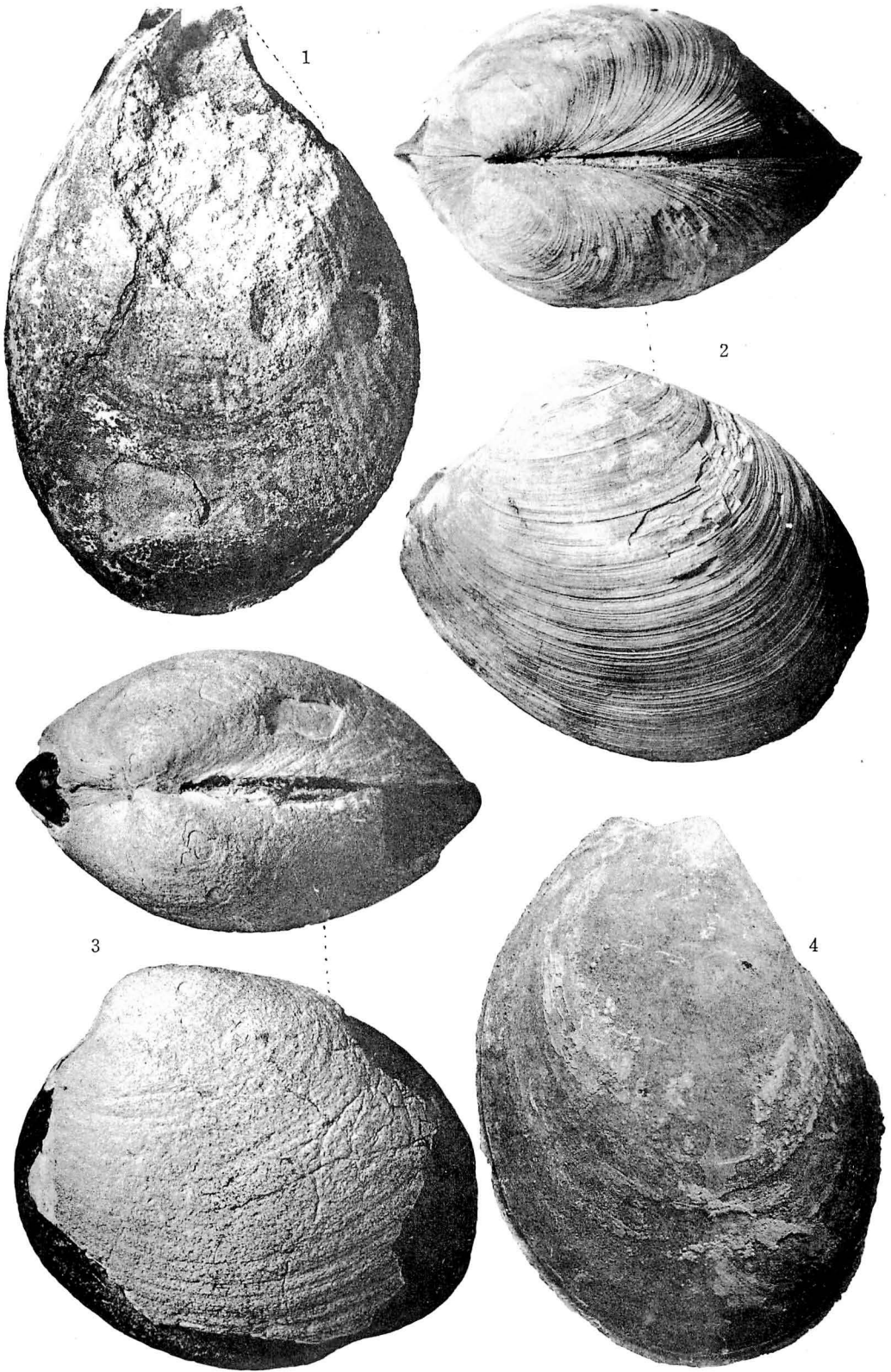
PLATE 18.

1. **Lima goliath** SOWERBY, 1883, (VII, 26). Kamamae, Kadono; Shirado Bd. subgenus: *Acesta*.
- 2, 3. *Meretrix iizukai* YOKOYAMA, 1925 (VII, 20). Izura. **Clementia (Compsomyax) iizukai** (YOK.), *fide* H. & N., 1952.
4. **Lima goliath**, see f. 1. Tsurushihama, Sukegawa.

Remarks.

Geography—Kamamae, Kadono: in Iwaki district, Fukushima pref., 37°00'07" N, 140°45'08" E.

Geography and stratigraphy—Izura and Tsurushihama: see pl. 16.



VII. Molluscan Remains from the Jô-Ban Coal-Field.

PLATE 19.

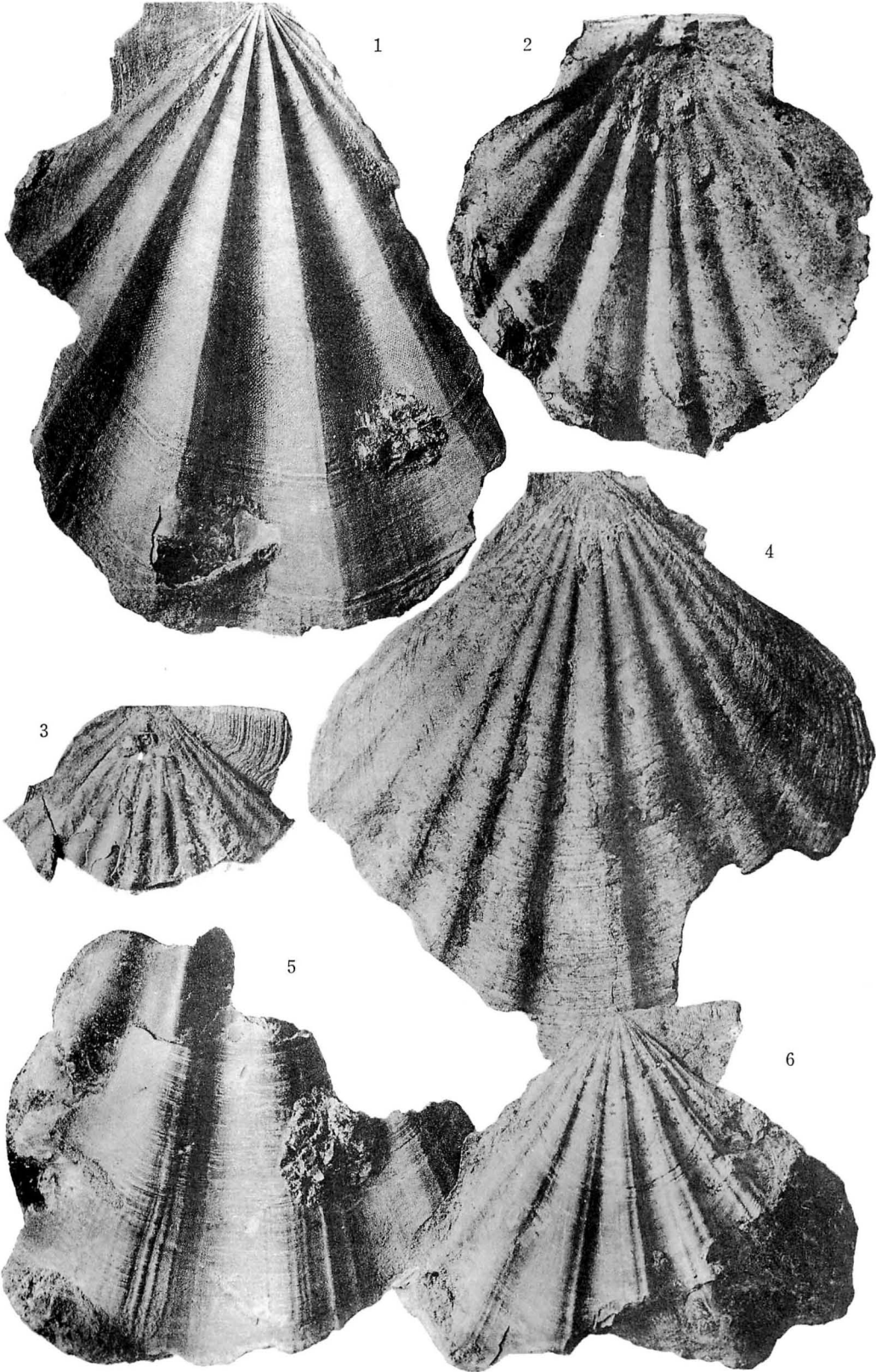
Pecten kimurai YOKOYAMA, 1925 (VII, 27); see p. 34, pl. 17, f. 4.

1. Izura. Left.
2. Do. Inside.
3. Do. Right.
4. Tamaye, Kobisa. Right, water worn.
5. The other valve of the individual of f. 1.
6. Izura. Right.

Remarks.

Geography—Tamaye, Kobisa: in Futaba district, Fukushima pref. 37°07'02" N, 139°59'04" E.
Izura: *op. cit.*

Stratigraphy—"Shirado Bd." of Tamae: Kamenoo shale, *vide* H. & N., 1952.



VII. Molluscan Remains from the Jô-Ban Coal-Field.

PLATE 20.

1. *Tapes undulatus* (BORN, 1780), (VII, 22). Hatsuzaki in Sukegawa. **Paphia (Paratapes) undulata** (BORN).
- 2, 3. *Cultellus izumoensis* YOKOYAMA, 1923, (VII, 18). "Shirado Bd." at Nakoso (f. 2) and Iida, Kashima. *Phaxus izumoensis*, H. & N., 1952; *Cultellus izumoensis jobanicus* KANNO, 1951; **Phaxus izumoensis jobanicus** (KANNO).
4. *Venericardia ferruginea* (ADAMS, MS), (VII, 24). Izura (not seen in the localities list of p. 25.) ? not *V. ferruginea* CLESSIN, 1888 (ADAMS MS); **Cyclocardia siogamensis** NOMURA, 1935.
- 5-8. *Lucina (Phacoides) borealis* (LINNÉ), (VII, 24). Tsurushihama (f. 5) and Izura (f. 6-f. 8). *Lucinoma acutilineatum* (CONRAD, 1849), *fide* H. & N., 1952; **Lucinoma annulata** (REEVE, 1843), *fide* K. & H., 1952.
9. *Macoma dissimilis* (MARTENS, not DESHAYES), (VII, 20). Kokozura (this loc. name not mentioned in p. 20) ? **Macoma tokyoensis** MAKIYAMA, 1927.

Remarks.

Geography—Hatsuzaki: sea-cliff near Sukegawa (Hidachi city), 1 km SE of the railway station, 36°34'07" N, 140°40' E.

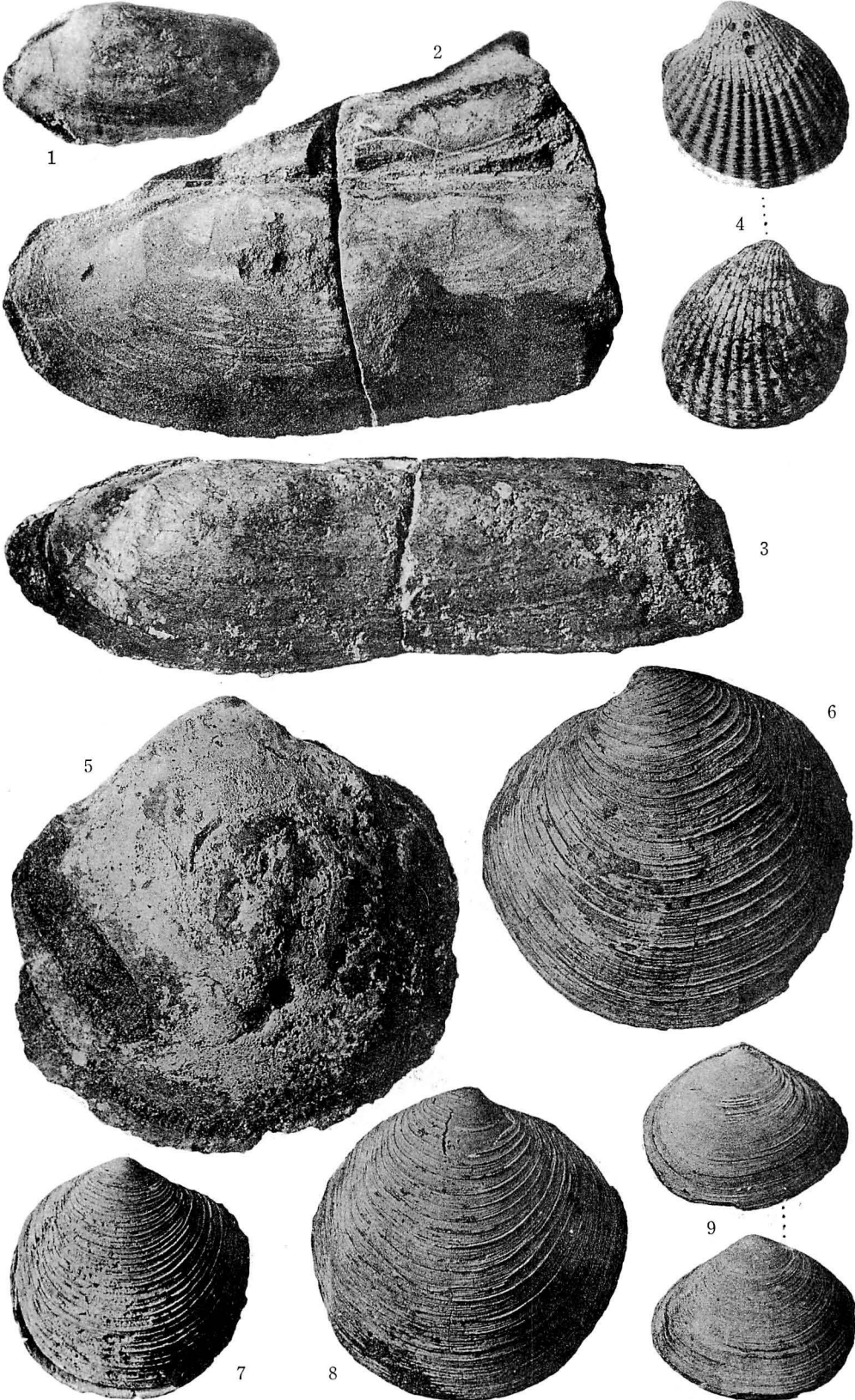
Nakoso: beach 150 m north of second tunnel of main road south of Nakoso station, 36°51'05" N, 140°47'06" E.

Iida: stream cliff 150 m north of main road, 800 m east of temple in Kami-Kuramochi, Kashima, Iwaki district, Fukushima pref., 36°59'01" N, 140°56'01" E.

Kokozura: cliff in front of grocery store at northern entrance of Kokozura, Iwaki district, Fukushima pref., 36°51'03" N, 140°47'05" E.

Stratigraphy—Hatsuzaki and Tsurushihama: Taga formation. Nakoso, Izura and Kokozura: Kokozura formation.

Iida: Hon'ya formation.



VII. Molluscan Remains from the Jô-Ban Coal-Field.

PLATE 21.

- 1-3. **Solemya tokunagai** YOKOYAMA, 1925 (VII, 31). Tsuchibashi in Kadono (f. 1); Shiogu in Tatsuta (f. 2); Enamura Quarry. Subgenus: *Acharax*, *fide* H. & N., 1952.
4. *Mya arenaria* LINNÉ var. *japonica* JAY, 1857, (VII, 16). Tôzenji in Yunami. **Mya (Arenomya) japonica** JAY,
5. **Thyasira bisecta** CONRAD, (VII, 24). Taira park. See p. 26. *Conchocele disjuncta* GABB.
6. *Panope generosa* (GOULD, 1852), (VII, 16). Iida in Kashima. **Panope japonica** (A. ADAMS, 1850).
7. *Pinna japonica* HANLEY, (VII, 28). Iida in Kashima. **Atrina pectinata japonica** (REEVE, 1858), HANLEY name only.

Remarks.

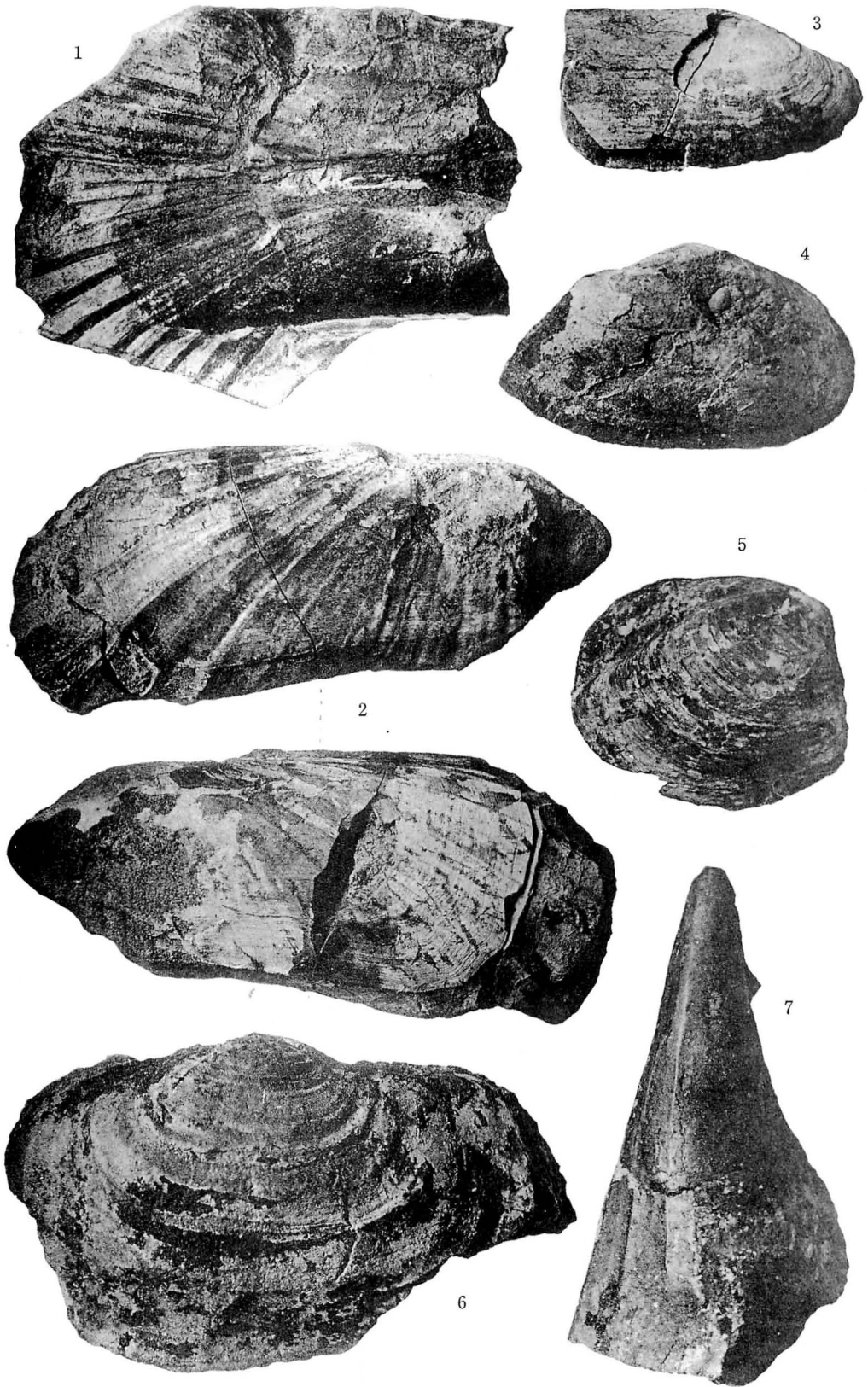
Geography—Shiogu: road cutting at Shiogu in Tatsuta village, Futaba district, Fukushima pref., 37°18' N, 140°58' E.

Enamura Quarry: road side quarry (abandoned), NW entrance to Ena, Iwaki district, Fukushima pref., 36°58' N, 140°57'05" E.

Taira park: east main entrance of city public gardens (castle hill), 37°03'04" N, 140°53'06" E.

Tsuchibashi, Iida and Tôzenji: *op. cit.*

Stratigraphy—Shiogu: Hon'ya formation. Enamura Q.: Kamenoo formation. Taira park: Misawa formation?



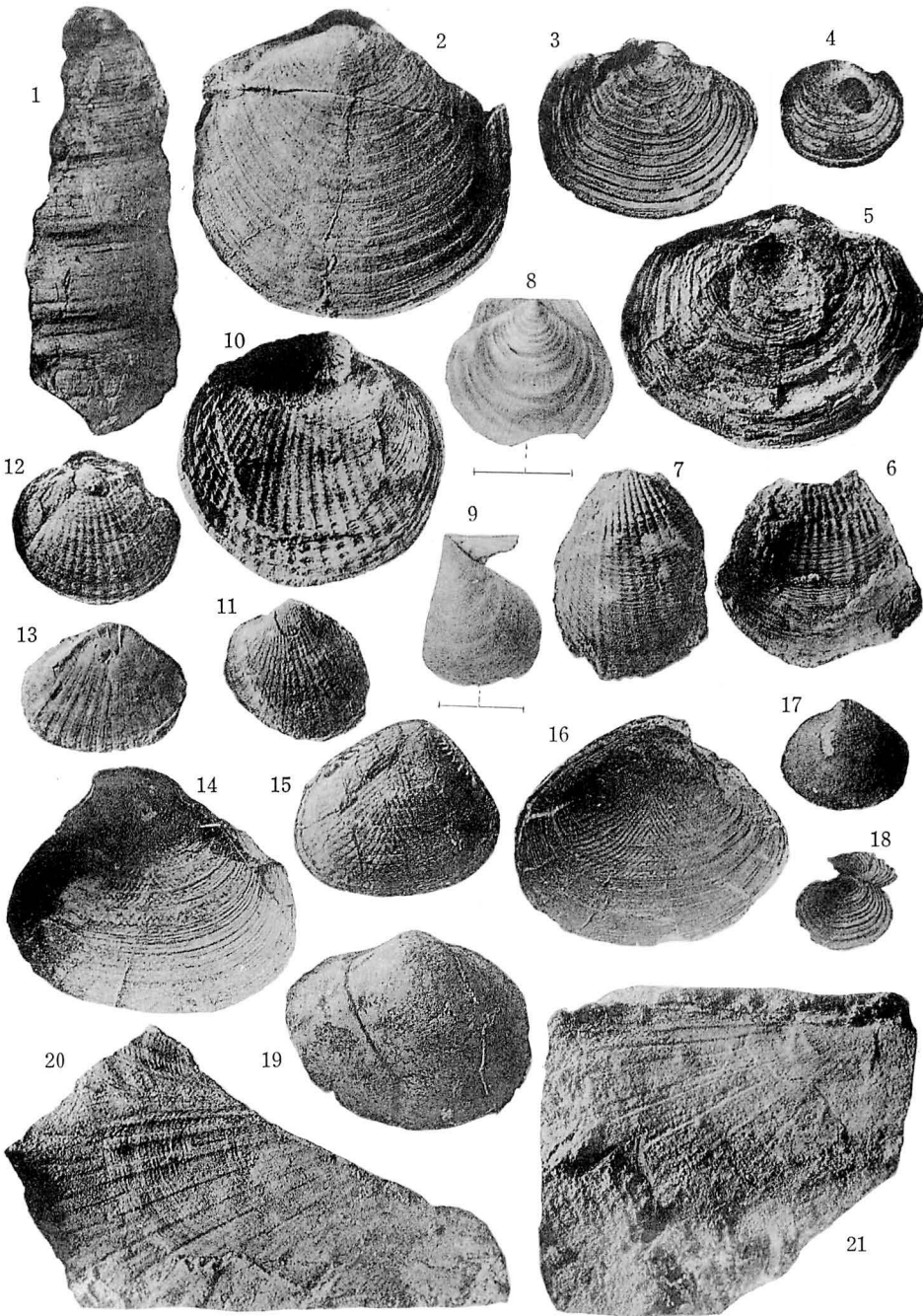
VII. Molluscan Remains from the Jô-Ban Coal-Field.

PLATE. 22.

1. *Turritella* sp. (VIII, 6). Mizunoya Bd., Nakagô, Kubota.
2. *Lucina* (*Phacoides*) *borealis* LINNÉ, (VIII, 7). Kamenoo Bd., Fukuda in Sekimoto. **Lucinoma annulata**, see pl. 20, f. 5-8.
- 3-5. *Lucina* (*Phacoides*) sp. (VIII, 7). Kamenoo Bd.: f. 3, Ishimoriyama, f. 4, Oodate, Taira, f. 5, Ishibatake, Nishiki. f. 3, *Lucinoma otukai* H. & N., 1952, *nom. nud.*, f. 4, do.; f. 5, *Lucinoma acutilineatum* (CONRAD) *op. cit.*
- 6, 7. *Venericardia ferruginea* ADAMS, (VIII, 8). Tsuchibashi in Kadôno. **Cyclocardia siogamensis** NOMURA, 1935, H. & N., 1952.
- 8, 9. *Pecten tairanus* YOKOYAMA, 1925 (VIII, 8). Kamenoo Bd., Kubo street, Taira. **Hyalopecten tairanus** (YOK.), *fide* H. & N., 1952.
10. *Venericardia orbica* YOKOYAMA, 1925 (VIII, 8). Kamenoo Bd., at Ishibatake in Nishiki. **Cyclocardia orbica** (YOK.).
- 11, 12. *Venericardia laxata* YOKOYAMA, 1924, (VIII, 7). Kamenoo Bd.: f. 11, Shimo-Yunagaya, Yumoto; f. 12? Ebata, Yamada. **Cyclocardia laxata** (YOK.).
13. *Venericardia pacifera* YOKOYAMA, 1924, (VIII, 8). Kamenoo Bd. at Daikatsu bore-hole in Yokonesawa, Uchigo. **Cyclocardia pacifera** ?
- 14-16. *Nucula eximia* YOKOYAMA, 1925 (VIII, 11). Kamenoo Bd.: f. 14, Kamenoo-sawa, f. 15, Hayashisaku, Iino, f. 16, Saku, Iino. **Acila** (**Truncacila**) *eximia* (YOK.).
17. *Pectunculus* sp. (VIII, 9). Kamenoo Bd. at Miyanosaku, Shimoyata. *Glycymeris kamenoensis* H. & N., 1952, *nom. nud.*
18. *Lucina* (*Phacoides*) sp. (VIII, 7). Kamenoo Bd. at Tabasaka, Yumoto.
19. *Macoma dissimilis* MARTENS ? (VIII, 6). Kamenoo Bd. at Yunami. **Macoma tokyoensis** MAKIYAMA, see pl. 20, f. 9.
- 20, 21. **Solemya tokunagai** YOKOYAMA, 1924, (VIII, 11). Kamenoo Bd. west of Fukuda, see pl. 21, f. 1.

Remarks.

Geography—Nakago: near Onahama, Fukushima pref., 36°54' N, 140°45' E.
 Fukuda: in Sekimoto, Taga district, Ibaraki pref., 36°50' N, 140°46' E.
 Ishimoriyama: name of hill in Iwaki district, Fukushima pref., north foot of, 37°06' N, 140°54'30" E.
 Ishibatake: in Nishiki, Iwaki district, Fukushima pref., exact loc. unknown.
 Tabasaka: in Yumoto, Fukushima pref., 36°59'04" N, 140°47'05" E.
 Tsuchibashi: river cliff south of Kadôno, Iwaki district, Fukushima pref., 37° N, 140°45' E.
 Shimo-Yunagaya: in Yumoto, Fukushima pref., 36°50' N, 140°50' E.
 Kamenoo-sawa: type loc. of the Kamenoo shale, in Yumoto, Fukushima pref., 36°59' N, 140°51' E.
 Hayashisaku: in Iino near Taira, 37°01'06" N, 140°53' E.
 Saku, Iino: not far from Taira, 37°02' N, 140°54' E.
 Miyanosaku: in Shimoyata, cliff by creek, W of Shimoyata, Kashima village, Iwaki district, Fukushima pref., 37°00'03" N, 140°54'05" E.
 Yunami: exact loc. unknown, Taga district, Ibaraki pref.
 Fukuda (west of): in Sekimoto, Taga district, Ibaraki pref. 36°51' N, 140° 45' E.



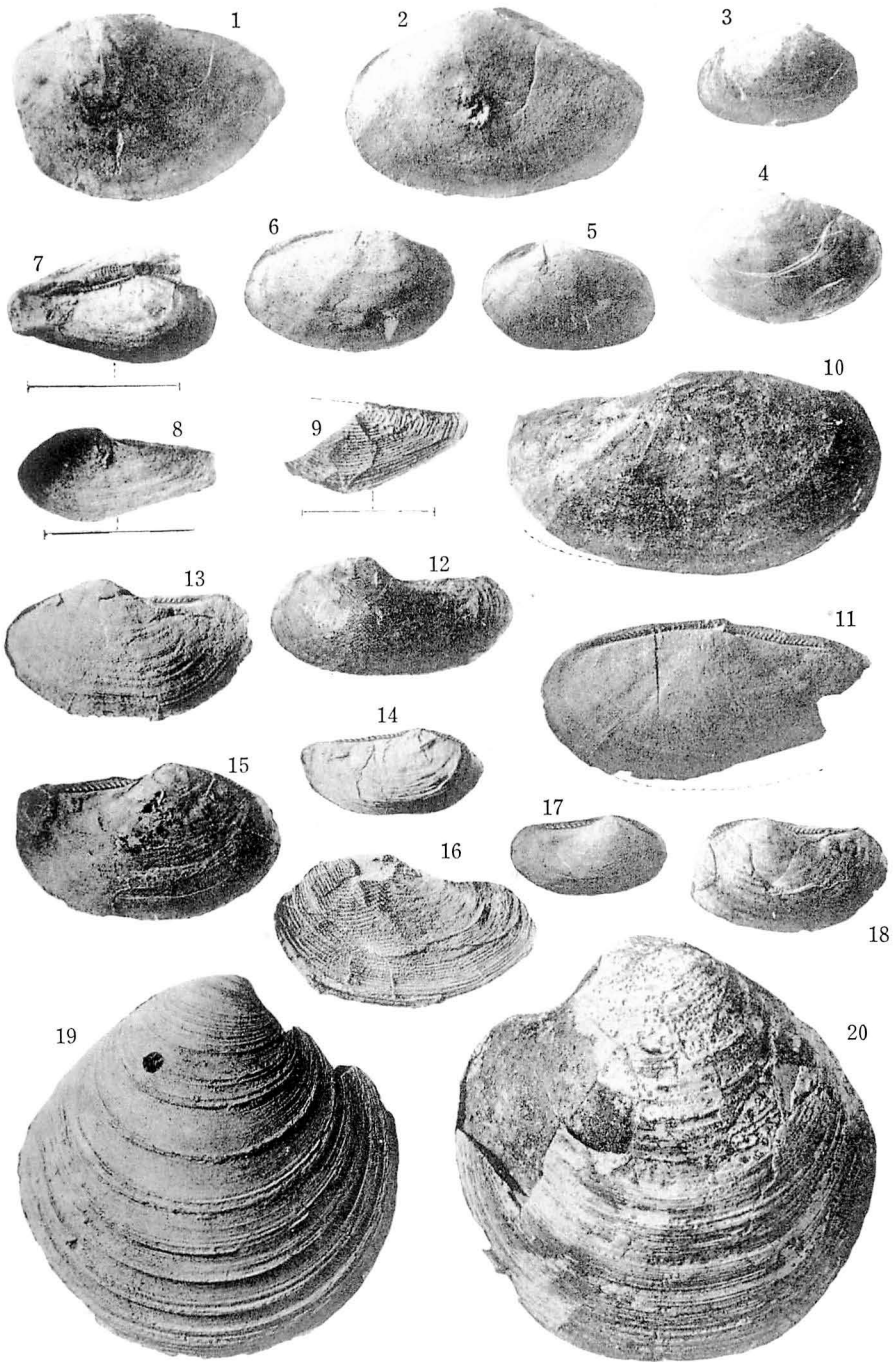
VIII. Molluscan Remains from the Jô-Ban Coal-Field.

PLATE 23.

- 1-6. *Leda inermis* YOKOYAMA, 1925 (VIII, 9). Kamenoo Bd.: f. 1, 2, Inoue, Ueda; f. 3, 5, Osaku, Nakoso; f. 4, Tamatsuyu, Izumi; f. 6, Hirakata sea-side. **Nuculana inermis** (YOK.), *vide* H. & N., 1952.
- 7-9. *Leda pennula* YOKOYAMA, 1925 (VIII, 9). Kamenoo Bd.: f. 7, Saku, Iino; f. 8, Takinosaku, Iino; f. 9, Daikatsu bore-hole, Yokonesawa. **Nuculana pennula** (YOK.), *vide* H. & N., 1952.
- 10, 11. *Yoldia sagittaria* YOKOYAMA, 1925 (VIII, 10). Mizunoya Bd.: f. 10, Nagako, Kubota; f. 11, between Kosai and Aburahira, Sekimoto.
- 12-18. *Yoldia tokunagai* YOKOYAMA, 1925 (VIII, 10). Kamenoo Bd.: f. 12, Hon'ya, Izumi; f. 13, Takinosaku; f. 14, Ishimoriyama; f. 15, 18, Saku; f. 16, Miyanosaku; f. 17, Kami-Kabeya.
- 19, 20. *Dosinia angulosa* PHILIPPI, 1845, (VIII, 17). Minato Bd.: f. 19, Hiraiso; f. 20, Shibahara. **Dosinia anguloides** NOMURA, 1935.

Remarks.

Geography—Inoue: in Ueda, Iwaki district, Fukushima pref., 36°55' N, 140°45' E.
Osaku: near Nakoso station, Fukushima pref., 36°52' N, 140°46' E.
Tamatsuyu: near Izumi, Iwaki district, Fukushima pref., 36°57' N, 140°50' E.
Hirakata: sea-side, Iwaki district, Fukushima pref., 36°50' N, 140°48' E.
Saku: in Iino village, Iwaki district, Fukushima pref., 37°02' N, 140°54' E.
Takinosaku: in Iino (see 'Saku').
Daikatsu: bore hole in Yokonezawa, Uchigo, Fukushima pref., 37°02' N, 140°50' E.
Nagako: in Kubota, Iwaki district, Fukushima pref., 36°54' N, 140°45' E.
Kosai & Aburahira: in Sekimoto, Taga district, Ibaraki pref., 36°50' N, 140°46' E.
Hon'ya: in Izumi, Iwaki district, Fukushima pref., 36°57' N, 140°50' E.
Miyanosaku: in Shimoyata, side of creek, Iwaki district, Fukushima pref., 37° N, 141°58' E.
Hiraiso: sea-side of Hiraiso town, Ibaraki pref., 36°20' N, 140°37' E.
Shibahara: west of Ogawa, Iwaki district, Fukushima pref., 36°53' N, 140°43' E. Shirado formation.



VIII. Molluscan Remains from the Jô-Ban Coal-Field.

PLATE 24.

- 1, 2. *Lucina (Phacoides) borealis* LINNÉ, (VIII, 18). Minato Bd., Shibahara, Shimo-Ogawa.
Lucinoma annulata, see pl. 20, f. 5-8.
3. *Crepidula convexa* YOKOYAMA, 1925 (VIII, 14). Minato Bd., Ushikubo in Minato. **Crepidula zyobanica** NOMURA et HATAI, 1936, non *C. convexa* SAY, 1822, homonymy.
- 4, 5 **Turritella nipponica** YOKOYAMA, 1920, (VIII,13). Minato Bd., Ushikubo in Minato.
Subgenus: *Haustator*.
6. *Nucula mirabilis* ADAMS et REEVE, 1850, (VIII, 21). Minato Bd., Ochiai, Shimo-Ogawa.
Acila divaricata (HINDS, 1843).
7. *Fissuridea humilis* YOKOYAMA, 1925 (VIII, 15). Minato Bd. at Hiraiso. **Diadora humilis** (YOK.) *fide* H. & N., 1952.
- 8, 9. *Crepidula aculeata* (GMELIN, 1790), (VIII, 13). Minato Bd. at Hiraiso. **Crepidula gravi-spinosa** KURODA et HABA, 1950, (Illust. Cat. Jap. Shells, 4).
- 10, 11. *Cardium shinjiense* YOKOYAMA, 1923, (VIII, 18). Minato Bd. at Shibahara, Shimo-Ogawa. **Cerastoderma** sp., H. & N., 1952.
12. *Pecten iwakianus* YOKOYAMA, 1925, (VIII, 19). Minato Bd. ? between Tateishi and Shiogu.
Chlamys iwakianus (YOK.), *fide* H. & N., 1952.
13. *Tapes variegatus* HANLEY, (VIII, 18). Minato Bd., Isozaki. Not *Venerupis variegata* (SOWERBY, 1855), HANLEY MS only, *Paphia isozakiensis* H. & N., 1952, *nom. nud.*

Remarks.

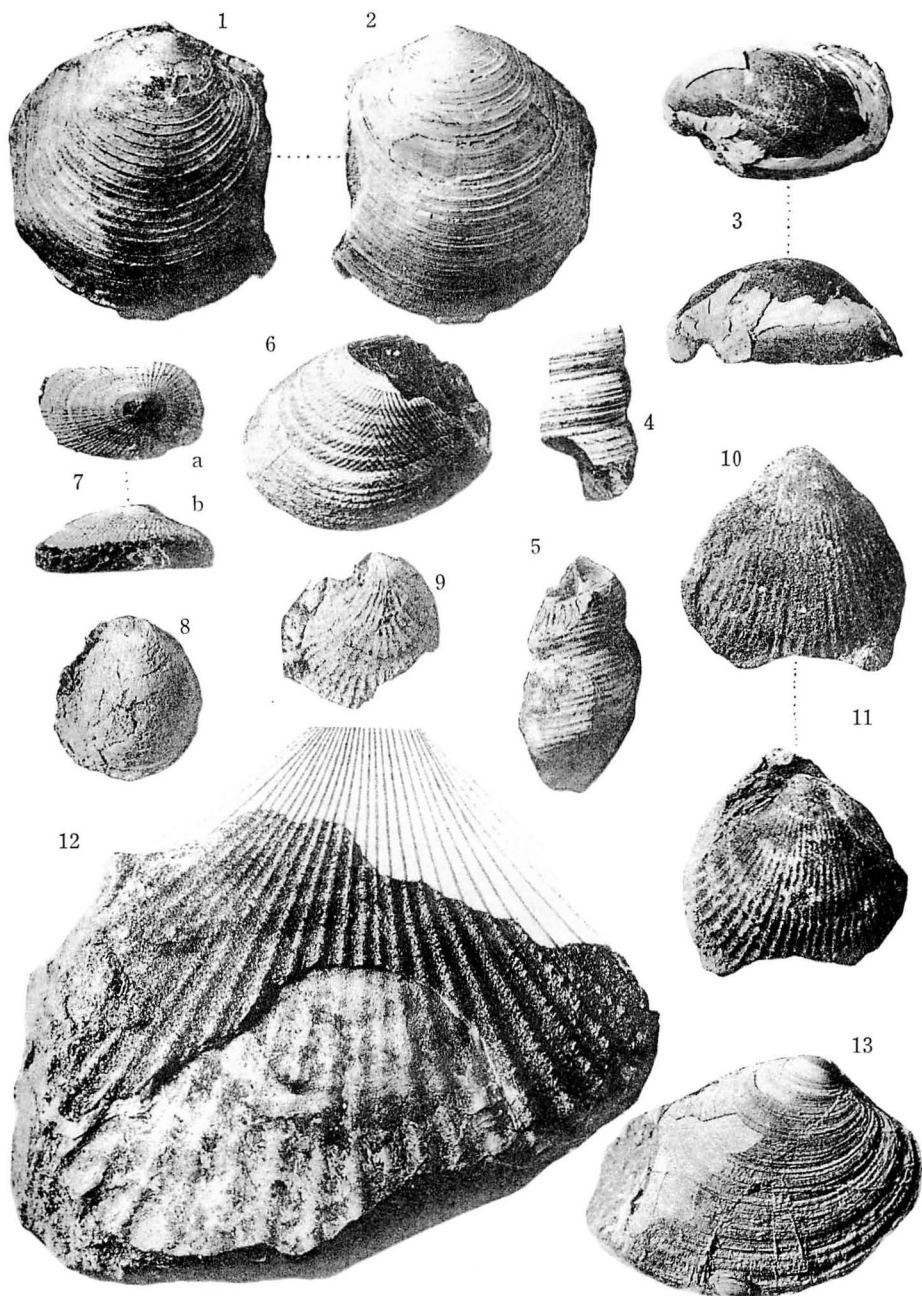
Geography—Shibahara: in Ochiai, west of Ogawa, Iwaki district, Fukushima pref., 36°53' N, 140°43' E.

Minato: sea-side of Ushikubo in Minato, Ooka district, Ibaraki pref., 36°20' N, 140°36' E.

Hiraiso: sea-side of Hiraiso, Ibaraki pref., 36°20' N, 140°37' E.

Tateishi and Shiogu: in Futaba district, Fukushima pref., 37°17' N, 140°58' E.

Isozaki: sea-side of Isozaki near Hiraiso, 36°22' N, 140°36' E.



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

1957年8月25日 印刷

1957年8月31日 発行

定価 650 円

在外会員 Foreign subscribers

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U. S. \$ 2.00

郵送料共 Mailing charges inclusive in all cases

東京大学理学部地質学教室内

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編 集 者 小 林 貞 一

発 行 者 市 川 健 雄

(振替口座東京 84780 番)

印 刷 者 東 京 都 港 区 芝 浦 1 丁 目 1

株 式 へ ラ ル ド 社 富 田 元
会 社

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東京都千代田区神田神保町1丁目7

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