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## Tertiary Shells from Tosa

By

Matajiro YOKOYAMA, *Rigakuhakushi*

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With 1 Plate

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In the spring of this year, Mr. T. Suzuki of the Imperial Geological Survey brought back from the province of Tosa fossil shells which, though not great in number, contain some interesting forms.

The fossil locality is Ōno<sup>1)</sup>, near the village of Yasuda in the county of Aki, where horizontal layers of clay over twenty metres in thickness are exposed, resting below on older rocks of an unknown age and covered above by beds which are most likely Pleistocene.

The clay, excepting the upper one-fourth, is arenaceous, and in the upper one-third of this arenaceous portion shells are scattered without any regularity, while above in the non-arenaceous portion, about one metre above its lower boundary, pieces of black carbonized stems of plants form a zone.

The shells obtained belong to the following species :

1. *Terebra naumanni* Yok.
2. *Pleurotoma subdeclivis* Yok.
3. *Drillia principalis* Pils.
4. *Cancellaria spengleriana* Desh.
5. *Ancilla okawai* Yok.
6. *Voluta megaspira* Sow.
7. *Calyptrea mammilaris* Brod.
8. *Polinices ampla* (Phil).
9. *Niso interrupta* Sow.
10. *Cadulus gordonis* Yok.
11. *Dentalium weinkauffii* Dkr.
12. *Corbula peregrina* Yok.
13. *Mya arenaria* L.
14. *Meretrix* (*Callista*) *chinensis* (Chem.)

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1) 安藝郡安田村大野

15. *Clementia speciosa* Yok.
16. *Chione casinaeformis* Yok.
17. *Cardium muticum* Rve.
18. *Aspergillum giganteum* Pils.
19. *Arca suzukii* n. sp.
20. *Pectunculus vestitus* Dkr.
21. *Myodora reeviana* Sm.
22. *Limopsis woodwardi* Dkr.
23. *Limopsis areolata* Yok.
24. *Nucula mirabilis* Ad. et Rve.

Besides, there are an indeterminable species of *Tellina* and a coral belonging to the genus *Flabellum*.

Of the twenty-four species above enumerated, those hitherto known only in a *living state* are only two, viz., *Niso interrupta* and *Aspergillum giganteum*, while those hitherto occurring only as fossils are the following eight:

1. *Terebra naumanni*.
2. *Pleurotoma subdeclivis*.
3. *Ancilla okawai*.
4. *Cadulus gordonis*.
5. *Corbula peregrina*.
6. *Clementia speciosa*.
7. *Arca suzukii*.
8. *Limopsis areolata*.

Of these eight species, one (*Pleurotoma subdeclivis*) occurs in the *Pliocene* as well as in the *Miocene*, five (*Terebra naumanni*, *Ancilla okawai*, *Cadulus gordonis*, *Corbula peregrina*, and *Clementia speciosa*) in the *Pliocene*, one (*Limopsis areolata*) in the *Upper Musashino* and one (*Arca suzukii*) is entirely new.

Of the remaining fourteen species, five are *Recent* as well as *fossil*, five (*Voluta megaspira*, *Calyptrea mammilaris*, *Meretrix chinensis*, *Chione casinaeformis* and *Pectunculus vestitus*) go up into the *Miocene*, eight (*Drillia principalis*, *Cancellaria spengleriana*, *Polinices ampla*, *Dentalium weinkauffii*, *Mya arenaria*, *Cardium muticum*, *Nucula mirabilis* and *Myodora reeviana*) into the *Pliocene* and one (*Limopsis woodwardi*) into the *Upper Musashino*.

Thus we see that the greatest weight falls on the *Pliocene*. It is probable that the Ōno fossils belong to an age approximately contemporaneous with that of the *Satsuka Beds* of Southern Tōtōmi which probably belongs to the middle part of the *Pliocene*.

## Description of New or Rare Species

1. *Pleurotoma subdeclivis*, YOKOYAMA

Pl. XLII. Fig. 4.

*Pleurotoma subdeclivis*. Yokoyama, Tert. Moll. South. Tôtômi, p. 329, pl. XXXVIII, fig. 8.

This species first described by me from Southern Tôtômi is found also in Tosa. Although the specimens are only two in number, still they are better preserved than those of Tôtômi; therefore I give the figure of one of them.

Fossil occurrence.—Sagara Beds (Miocene). Uchida Beds (Lower Pliocene).

2. *Niso interrupta*, SOWERBY

Pl. XLII. Fig. 5.

*Niso interrupta*. Sowerby, Thes. Conch., vol. II, p. 801, Pl. 170, fig. 9. Dunker Index Moll., p. 89.

This is a living species found for the first time as a fossil. The specimen is the only one. It is small, acuminate-pyramidal and glossy. The whorls number about ten, are nearly flat and somewhat receding near the lower suture so that this part shows a slight convexity. Periphery subangulate. Umbilicus small, funnel-shaped. Aperture ovate, bluntly pointed behind, with peristome continuous. Height 7.3 millim. Diameter 3 millim.

Living.—Western Japan. Central America.

3. *Corbula peregrina*, YOKOYAMA

Pl. XLII. Fig. 8.

*Corbula peregrina*. Yokoyama, Tert. Foss. Kii, p. 55, pl. VII, figs. 9-12.

The specimens of this species found in Kii were not particularly rare, but there was none showing the inner side of the shell. A single left valve obtained in Tosa, however, shows it quite distinctly. The pallial sinus is hardly indicated, the pallial line at this place looking as if irregularly truncated in a vertical direction.

Fossil occurrence.—Pliocene of Tanabé Bay, Kii.

4. *Chione casinaeformis*, YOKOYAMA

Pl. XLII. Fig. 3.

*Chione casinaeformis*. Yokoyama, Tert. Moll. South. Tôtômi, p. 352, pl. XXXIX, fig. s. 7-9.

This species is interesting on account of its rarity, fossil as well as living. The specimen obtained resembles the recent one much more closely than that of the Sagara Beds of Tôtômi.

Fossil occurrence.—Sagara Beds. Horinouchi Beds.

5. *Aspergillum giganteum*, PILSBRY

Pl. XLII. Figs. 1, 2.

*Aspergillum giganteum*. Pilsbry, Cat. Mar. Moll. Japan, p. 136, pl. III, fig. 1.

Two fragmentary specimens, both belonging to a part of the tube with the shell intact. The one is over 60 millim. long and 25 millim. in diameter. The other is 50 millim. long and 27 millim. in diameter. The shell is thin and irregularly oblong-rhomboidal with the surface irregularly corrugated concentrically so that there is no doubt of its being Pilsbry's species.

This shell is living in Western Japan.

6. *Arca suzukii*, nov. sp.

Pl. XLII. Figs. 6, 7.

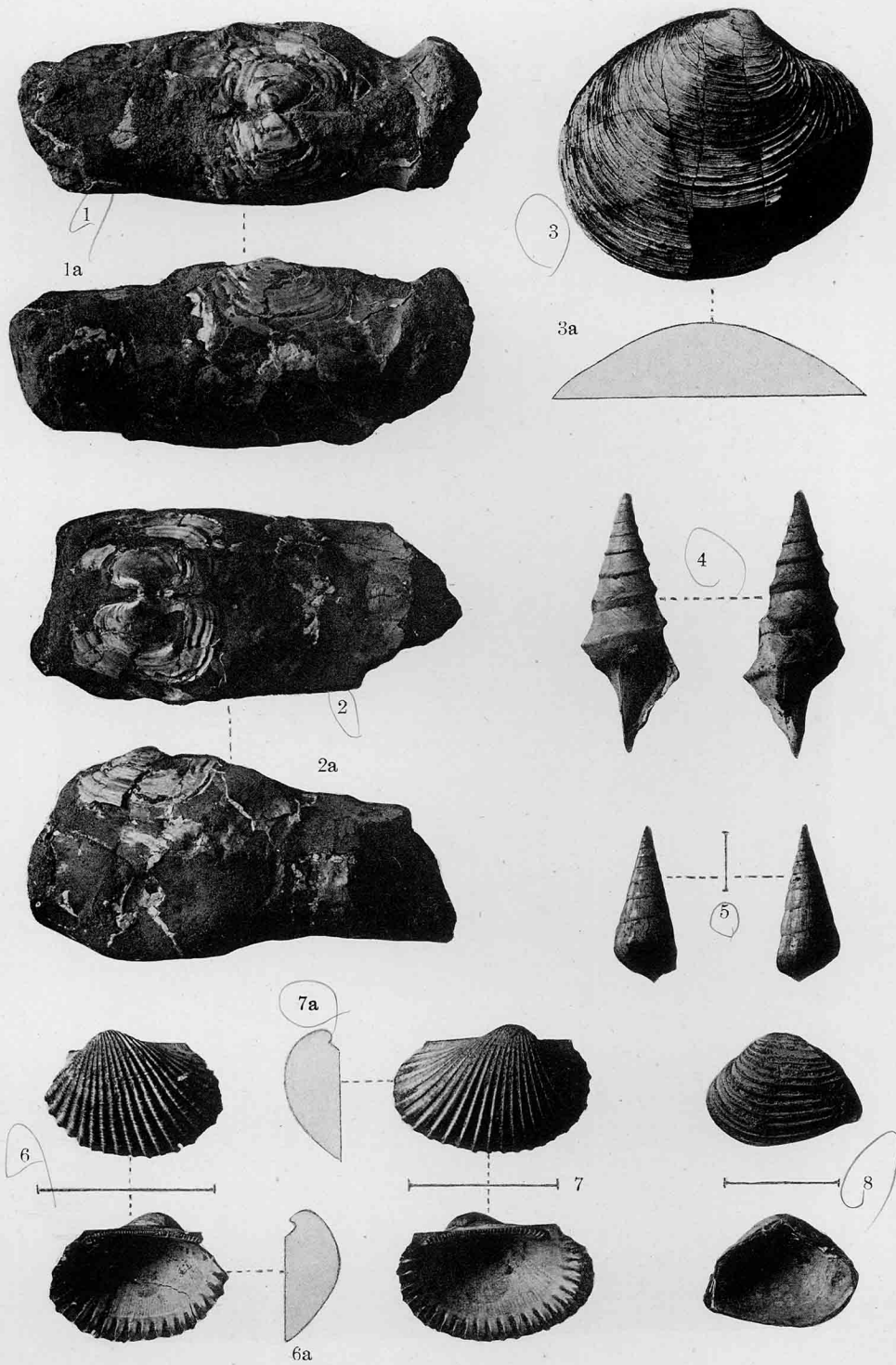
Shell rather small, thick, convex, transversely oblong, inequilateral, the posterior side being somewhat less than twice the anterior, rounded both in front and behind, with ventral border broadly arched and passing gradually into the anterior as well as to the posterior without forming any marked angle; antero-dorsal and postero-dorsal borders straight and forming with the anterior border as well as with the posterior an angle which is greater than a right angle. Surface radiately ribbed; ribs twenty-four in number, elevated, flat-topped with interstices varying in breadth, sometimes broader, sometimes narrower than the ribs themselves, crossed by prominent lines of growth which in the interstices are elevated like lamellae, while on the ribs they are more like transverse striae or crenulations. Beaks more or less swollen with ends pointed and incurved, rather approaching each other. Area narrow, with unequal striations parallel to the hinge-line. Teeth small, nearly forty in number.

A right and a left valve. The former is 20.3 millim. long, 13.7 millim. high and 6 millim. deep, while the latter is 25.5 millim. long, 18.7 millim. high and 8 millim. deep.

Plate XLII

- Figs. 1, 2. *Aspergillum giganteum* Pils. Views from beak side. a. Views from lateral side. P. 368
- Fig. 3. *Chione casinaeformis* Yok. P. 368
- Fig. 4. *Pleurotoma subdeclivis* Yok. P. 367
- Fig. 5. *Niso interrupta* Sow. P. 367
- Figs. 6, 7. *Arca suzukii* Yok. a. Shows depth. P. 368
- Fig. 8. *Corbula peregrina* Yok. P. 367







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