

Some Veneridae from the Shimantogawa Group* in the Outer Zone of Shikoku, Japan

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Introduction

In 1952 the senior author reported on some molluscan fossils from the Shimantogawa Group, north of the Nakasuji Graben in the Ashizuri Peninsula, Kochi Prefecture, Shikoku. The molluscan fossils described in this article are the specimens collected by the senior author and reported as *Aphrodina* (3 specimens) and *Anofia* (1 specimen) in a previous work (Katto, 1952).

The Shimantogawa Group, north of the Nakasuji Graben, consists of a thick alternation of sandstone and shale with intercalated limestone (Katto, 1952). The molluscan specimens were collected by Katto (*op. cit.*) from the sandstone and the limestone, the former located at Kageji and the latter at Sada, both in Nakamura City, Kochi Prefecture (Katto *et al.*, 1961).

The Genus *Aphrodina* has been recorded from the Upper Cretaceous strata of the Japanese Islands and together with the Genus *Anofia*, are known also from the foreign Upper Cretaceous. The chronological range of the former genus may be from the Turonian to the Maestrichtian, and that of the latter from the Senonian (*s. s.*) to the Maestrichtian (*s. l.*), therefore, the horizons of the Shimantogawa Group which yielded the fossils may be Upper Cretaceous in age.

Because of the few numbers of specimens and the incomplete state of preservation the internal characters could not be studied. However, from the external morphological characters, the writers were able to propose one new species of *Aphrodina*.

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Systematic Description

Superfamily Veneracea
Family Veneridae

Genus *Aphrodina* Conrad, 1869

Genotype: *Meretrix tippiana* Conrad (Upper Cretaceous of Tennessee U. S. A)

* The Nakamura Formation (Hetonaiian) of Katto *et al.*, (1961).

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Subgenus *Aphrodina* s. s.*Aphrodina* (*Aphrodina*) *hataii* Katto and Hattori, n. sp.

Pl. 1, Figs. 1-6

Description: Shell roundly trigonal, convex, rather abruptly narrowing towards anterior margin. Antero-dorsal margin nearly straightly sloping, slightly concave, short, postero-dorsal margin almost straight, sloping, slightly convex. Ventral margin broadly rounded. Umbones prominent, pointed, curved and directed anteriorly. Escutcheon depressed, elongate, rather sharply bounded, lunule rather shallow cordate. Surface with concentric growth lines only.

<i>Dimension</i> :	Length	Height	Breadth
(1)	45.6	40.0	23.4 (mm)
(Holotype)	(100)	(87.72)	(51.32)
(2)	75.4	70.2	44.3
	(100)	(93.10)	(58.75)

Remarks: The present specimen is very similar to *Aphrodina* (*Aphrodina*) *angustosinuosa* (Riedel) (Darteville et Freneix, 1957) from the Senonian of Angola and Cameroun in outline of the shell, but the former is distinguishable from the latter by the more trigonal outline of the shell. Another species resembling the present one is *Aphrodina tippiana* (Conrad) from the Maestrichtian of Crowleys Ridge (Stephenson, 1955), but the present species has a more convex ventral margin.

Occurrence: Limestone of the Shimantogawa Group at Sada, Nakamura City, Kochi Prefecture.

Subgenus *Sechurina* Olsson, 1944

Genotype: *Aphrodina* (*Sechurina*) *australis* Olsson (Upper Cretaceous of northern Peru, 1944, p. 57, 58, pl. 14, figs. 3, 5, 6.)

Aphrodina (*Sechurina*) cf. *pseudoplana* (Yabe and Nagao)

Pl. 1, Figs. 7-9

1925 *Callista pseudoplana* Yabe and Nagao: p. 120, 121, pl. 28, figs. 9, 9a, 9b, 10; pl. 29, figs. 1, 1a, 1b, 1c, 2, 3, 4, 4a, 5, 5a, 6.

1938 *Aphrodina* cf. *pseudoplana* (Yabe and Nagao): Nagao and Otatume, p. 46, 47, pl. III, figs. 1-3, 6-10.

1952 Cf. *Aphrodina pseudoplana* (Yabe and Nagao): Hatai in Katto, p. 39.

Remarks: The present specimen though poorly preserved, is considerably similar to *Aphrodina* (*Sechurina*) *pseudoplana* (Yabe and Nagao), especially var. *rotundata* which has prominent, anteriorly curved, pointed umbones, well defined lunule and rounded trigonal shape of large convex shell.

As concerns the outline, the present specimen is also similar to *Aphrodina* (*Sechurina*) *australis* Olsson (1944) from the Upper Cretaceous (Upper Senonian) of northern Peru, but differs in details.

Geologic age: *Aphrodina* (*Sechurina*) *pseudoplana* in Hokkaido occurs from the *Trigonia* Sandstone (Yabe and Nagao, 1925). According to Nakano (1960) the age of the upper part of the *Trigonia* Sandstone is Turonian (Upper Gyliakian).

Occurrence: Sandstone of the Shimantogawa Group at Kageji, Nakamura City, Kochi Prefecture.

Genus *Anofia* Reyment, 1955

Genotype: *Anofia aro* Reyment, 1955 (Maestrichtian of Nigeria)

Anofia sp.

Pl. 1, Figs. 10-12

Description: Shell large, oval, moderately convex, length a little greater than height. Antero-dorsal margin slightly concave, short. Postero-dorsal margin slightly convex, posterior margin broken. Umbo bluntly rounded, somewhat swollen, with lunule in front. Ventral margin well rounded. Surface ornamented with fine concentric striae, some stronger than others.

<i>Dimension</i> :	Length	Height	Breadth
	58.8	56.0	28.0 (mm)
	(100)	(95.24)	(47.62)

Remarks: Compared with the dimensions of *Anofia aro* given by Darteville and Freneix (1957), the present specimen comes close to their paratype specimens but is not identical.

Geologic age of the Genus Anofia: *Cyprimeria*? (*Cyclorisma*?) cf. *analoga* from Pondol and (Rennie, 1930) may be Upper Maestrichtian. *Anofia aro* from Gabon, Moyen-Congo, Bus-Congo ranges from Senonian to Maestrichtian (Darteville and Freneix, 1957).

Occurrence: Sandstone of the Shimantogawa Group at Kageji, Nakanura City, Kochi Prefecture.

Geological and Geographical Distribution of the Genus

Aphrodina in the Japanese Islands

The *Trigonia* Sandstone in the Ishikari coal-field has yielded abundant specimens of *Aphrodina* (*Sechurina*) *pseudoplana*. The geological age of the formation is Gyliakian (Nakano, 1960). From the Upper Ammonite Bed in the Iburi district, Nagao (1932) reported *Aphrodina*? sp. cf. *Aphrodina arata* (Gabb) (Popenoe, 1937, 1942). The age of this horizon is Senonian but includes some part of the Turonian. The Hakobuchi Sandstone, which is now subdivided into the Lower and Upper Hetonai Group, has yielded *Aphrodina* (*Sechurina*) cf. *pseudoplana* (Nagao and Otatume, 1938). According to Nakano (1960), the age of the Hakobuchi Group ranges from Upper Campanian to Maestrichtian.

In the southwest part of Shikoku, *Aphrodina* (*Aphrodina*) and *Aphrodina* (*Sechurina*) were reported from the Susaki Formation (presumed Gyliakian) and the Nakamura Formation (Hetonaiian) respectively by Katto *et al.* (1961).

In the Amakusa Islands, shallow sea and deltaic deposits of the Goshonoura Group yielded

Callista cf. *plana* Sowerby (Yehara, 1924). According to Nagao (1930) that specimen is "probably identical with *Callista pseudoplana* Yabe and Nagao var. *alata*." The age of the Goshonoura Group is Gyliakian (Nakano, 1960).

In the Japanese Islands, as well as abroad, the Genus *Aphrodina* ranges from Turonian to Maestrichtian. From this chronological range, it is evident that the specimens treated in this article are Upper Cretaceous in age.

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PLATE I

Explanation of Plate 1

(all in natural size)

- Figs. 1-3. *Aphrodina (Aphrodina) hataii* Katto and Hattori, n. sp.
1, Dorsal view. 2, Right valve. 3, Left valve, Holotype, Coll. Dept. Geol. Kochi Univ., Shimantogawa Group. Locality:- Sada, Nakamura City, Kochi Prefecture.
- Figs. 4-6. *Aphrodina (Aphrodina) hataii* Katto and Hattori, n. sp.
4, Dorsal view. 5, Left valve. 6, Right valve, Coll. Dept. Geol., Kochi Univ., Shimantogawa Group. Locality:- same as above.
- Figs. 7-9. *Aphrodina (Sechurina) cf. pseudoplana* (Yabe and Nagao).
7, Left valve. 8, Right valve. 9, Posterior view. Coll. Dept. Geol., Kochi Univ., Shimantogawa Group. Locality:- Kageji, Nakamura City, Kochi Prefecture.
- Figs. 10-12. *Anofia* sp.
10, Posterior view. 11, Dorsal view. 12, Left valve. Coll. Dept. Geol., Kochi Univ., Shimantogawa Group. Locality: same as above.



