Mem. Asiat. Soc. Bengal, Vol. VI.

ZOOLOGICAL RESULTS OF A TOUR IN THE FAR EAST.

THE VIVIPAROUS WATER-SNAIL OF LAKE BIWA, JAPAN.

By N. ANNANDALE, *D.Sc., F.A.S.B.* (*Zoological Survey of India, Calcutta*).

CONTENTS.

ZOOLOGICAL RESULTS OF A TOUR IN THE FAR EAST.

THE VIVIPAROUS WATER-SNAIL OF LAKE BIWA, JAPAN.

By N. ANNANDALE, *D.Sc., F.A.S.B.* (*Zoological Survey of India, Calcutta*).

In revising the Indian Viviparidae I have had occasion to re-examine the large collection from Japan and China preserved in the Indian Museum, including the specimens collected by myself in 1915. The result has been, so far as the Japanese forms are concerned, to throw light on an interesting species from Lake Biwa which has hitherto been confused with *Vivipara sclateri*, Frauenfeld, but, as a study of the development of the shell demonstrates, is distinct from that species generically.

Vivipara sclateri was described in 1865 by Frauenfeld,[1] who gave a good figure, but no locality more precise than "Japan." Kobelt[2] in his monograph of the land and freshwater molluscs of Japan originated the confusion about the Biwa species, which he figured under the name *Paludina ingallsiana*. All his figures under this name, however, do not represent it, but only fig. 17 on his plate X (young) and fig. 2 on plate XI (adult). The confusion was perpetuated by Iwakawa[3] in his account of the Japanese Viviparidae and Pilsbry[4] did not put the matter straight in his observations on the same subject. Kobelt[5] in his later work in the *Conch. Cab.* left it where it was, and finally in my own account of the molluscs of Lake Biwa[6] I accepted the identifications supplied to me by conchologists, being then interested in the molluscs from a biological rather than a systematic point of view.

The key to the whole confusion is to be found in figs. 13 and 17 of pl. X in Kobelt's paper (1879), which illustrate clearly the differences between the young shell of *V. sclateri* and that of the Biwa species.

With this introduction I may now describe the latter.

Fam. VIVIPARIDAE.

Genus **Heterogen**, nov.

Adult shell fairly thick, of large size, high and narrow, subbiconical, imperforate or rimately perforate, with the aperture rather small and the collumellar callus not

1 Frauenfeld, *Verh. Zool. bot. Ges. Wien* XV, p. 531, pl. 22 (1865).
2 Kobelt, *Abh. Sencken. Nat. Ges.* XI (1879).
3 Iwakawa, *Annot. Zool. Japon.* I, p. 85 (1897).
4 Pilsbry, *Proc. Ac. Nat. Sci. Philadelphia* LIV, p. 118 (1902).
5 Kobelt, *Paludina* in Chemnitz's *Conch. Cab.* (1909).
6 Annandale, *Mem. As. Soc. Bengal* VI, p. 46 (1916).

expanded or plate-like; the upper part sculptured with more or less obsolescent, thick spiral ridges, the lower part, below the periphery of the body-whorl, nearly smooth.

Embryonic shell of relatively large size, subcylindrical, with the apex minutely blunted, the suture deeply and broadly depressed and each whorl bearing on its

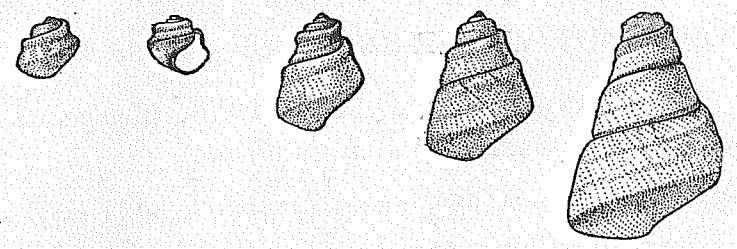

FIG. 1.—Young shells of *Heterogen turris*, sp. nov. (nat. size).

surface two prominent, smooth spiral ridges separated by a broad and deep concave region.

Operculum rather thin, with an unthickened margin and a well-defined funnel-shaped concavity on the external surface, corresponding to a prominent boss on the internal surface surrounded by a thickened muscular scar.

Nothing is known of the anatomy of the animal.

Type-species.—*Heterogen turris*, sp. nov.

Heterogen turris, sp. nov.

The adult shell varies somewhat in outlines and proportions and two types, perhaps sexual, can be distinguished, in one of which (? the female, fig. 2A) the shape is less elongate than in the other (? the male, fig. 2B). In both the upper part of the shell is conical but has the apical whorls invariably eroded. There are

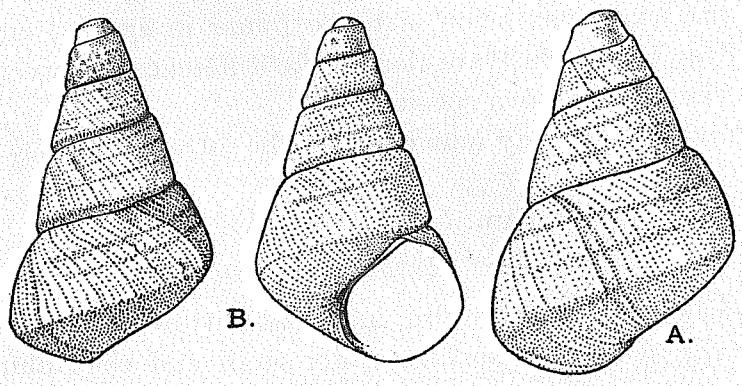

FIG. 2.—Adult shells of *Heterogen turris*, sp. nov. (nat. size).

in all $6\frac{1}{2}$ or 7 whorls, or would be if the shell were complete, but as a rule only the last three remain perfectly intact. These whorls are often almost smooth except for the presence of rather fine but irregular longitudinal striae, but three obscure coarse spiral ridges can usually be distinguished on each. There is a well-defined

peripheral carina on the body-whorl and the region below it is entirely without spiral ridges. This region is relatively short and recedes abruptly below the peripheral keel on the body-whorl. The suture in vertical section is distinctly V-shaped. It is moderately oblique. The aperture is subcircular, sometimes subpentagonal owing to the peripheral keel forming a distinct angle on the outer lip and the upper extremity being truncate. The umbilicus is a mere chink or altogether closed. The whole shell is pale olivaceous green more or less densely clouded with black and with a dull polish. The aperture when complete is narrowly edged with black and the interior is bluish white. The eroded apical region is chalky white.

The embryonic shell differs from that of any other Viviparid with which I am acquainted. It is rather broader than high and rather thick. There are $3\frac{1}{2}$ whorls, the apical whorl and a half being very small. The obliquity of the suture increases rapidly so that the outer margin of the penultimate whorl is much deeper than the inner. The spiral ridges on the body-whorl are extremely broad and prominent. The minute sculpture consists of longitudinal striae and very fine transverse striae. The latter are not punctate. The aperture is relatively large and is produced above. The shell is of a very pale olive-green colour with the uppermost half-whorl brownish and the body-whorl sometimes irregularly streaked with black.

Type-series No. 509 and M $\frac{10230}{2}$ Z.S.I. (J. Anderson and N. Annandale *coll.*).

Habitat. The species is apparently peculiar to Lake Biwa. It is a true lacustrine mollusc and occurs from the marginal region to a depth of over 300 feet.

From that of *L. sclateri* (fig. 3), a species found in rice-fields round Lake Biwa, the adult shell is readily distinguished by its texture and sculpture and by the strictly conical outline of the upper region. The young shell is totally different in the two species, that of *L. sclateri* being normal and closely resembling that of other species of the genus *Lecythoconcha*.[1] The embryonic shell of *H. turris* perhaps resembles that of the Chinese genus *Rivularia*, Heude, but I can only judge of this by comparison with adult shells of the latter. It bears a quite superficial resemblance to that of *Margarya* from Western China.

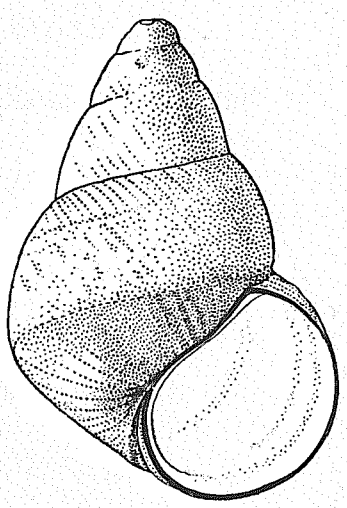

FIG. 3.—Large shell of *Lecythoconcha sclateri* (Fld.) (nat. size), from rice-field near L. Biwa.

The species of Viviparidae found round Lake Biwa in pools of water (*malleata*, Reeve) and in rice-fields (*sclateri*, Frauenfeld and *japonica*, V. Martens), I assign provisionally to my new genus *Lecythoconcha*.

[1] For this group of species I have just proposed this new generic name, largely on anatomical grounds. The description has been published in the *Records of the Indian Museum*, vol. XIX, p. 111 (1920).