

On the Peculiar Apertures in the Vertebral Centra of *Hemidactylus flaviviridis* Rüppel.

IN the Patna Session (1933) of the Indian Science Congress, Mookerjee and Das read a paper¹ before the Section of Zoology on the presence in *Typhlops braminus* of an aperture in the middle of the ventral surface of the centrum of each vertebra towards the anterior half. Later, Mookerjee² published a paper in the *Proceedings of the Zoological Society* about them. He claims that these apertures have been recorded for the first time by him. Apparently, nobody after him has so far mentioned any other animal which shows these apertures, and hence I should like to mention the case of another Indian reptile, where similar apertures are present.

For the last two years, I have been engaged in an intensive study of the Bionomics, Anatomy and Distribution of the common Indian House-Gecko, *Hemidactylus flaviviridis* Rüppel, my purpose being to supply a detailed monograph for the Series "Indian Zoological Memoirs". During the course of this work, I have prepared alizarin-stained skeletons of every stage of this gecko from the just-hatched young one to the adult. In all cases, my preparations show the presence of two apertures on the ventral aspect of each vertebral centrum, these being placed one on each side of the median line. The apertures appear to serve for the passing in of blood-vessels and are quite unmistakable, when viewed under the lower magnifications (20-40) of a microscope. It is remarkable that the apertures in this case are *two*, and not one on each centrum, as described by Mookerjee for *Typhlops*. A detailed account of the main peculiarities of the endoskeleton of *Hemidactylus flaviviridis* is in course of preparation and will be published shortly elsewhere.

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¹ H. K. Mookerjee and G. M. Das, "Notes on the peculiar apertures in the vertebral centra of *Typhlops braminus*."

² Mookerjee, H. K., "On the peculiar apertures in the vertebral centra of *Typhlops braminus*," *Proc. Zool. Soc.*, 1933, p. 283.

On the *Modus operandi* of Certain Ossicles in the Gastric Armature of Decapod Crustacea.

MOCQUARD¹ (1883), Pearson² (1908) and Patwardhan^{3,4,5,6} (1934-35) have pointed out that the active movement of the gastric armature in *Decapoda* is brought about entirely by the anterior gastric muscles. Huxley⁷ (1880) stated that the operation is effected by the anterior as well as the posterior gastric muscles. But the author^{8,9,10} is of opinion that the active movement is the result of the contraction of the posterior gastric muscles, while the anterior gastric muscles and the cardio-pyloric constrictor muscles are mainly concerned in the restoration of the armature to its position of rest.

If the anterior gastric muscles were mainly responsible for the collision of the three teeth-bearing ossicles as suggested by Mocquard (1883), Pearson (1908) and Patwardhan (1934-35), one of the most essential factors, namely, the pressing down of the urocardiac tooth, to meet the colliding zygocardiac teeth could not be accomplished due to the reverted disposition of the propyloric ossicle (Figs. 1, 2 and 3, P.P.). For bringing the urocardiac tooth downwards, the posterior border of the propyloric ossicle which is bent over to the anterior side, has to be drawn backwards. This is possible only by contraction of the posterior gastric muscles. The anteriorly directed posterior border of the propyloric ossicle is wedged in between the exopyloric ossicles which give attachment to the posterior gastric muscles. The contraction of the said muscles results in pulling back the propyloric ossicle which, owing to the roof of the cardiac chamber, presses down the urocardiac tooth to meet the zygocardiac teeth.

The suggestions of Pearson (1908) and Patwardhan (1934-35) seem to have been entirely influenced by the statement of Mocquard (1883) who observed the action of the anterior gastric muscles in a living *Stenorynchus* having a remarkably transparent carapace. The author is of opinion that a re-investigation of *Stenorynchus* is desirable. In the fresh-water crayfish, *Astacus*, *Portunus*, American lobster, lobster, *Cancer*, *Nephrops* and *Paratelphusa*, described by Parker¹¹ (1876), Huxley (1880), Vitzou¹² (1882), Herrick¹³ (1895), Williams¹⁴ (1907), Pearson (1908), Yonge¹⁵ (1924), Patwardhan (1934-35) respectively, the pro-

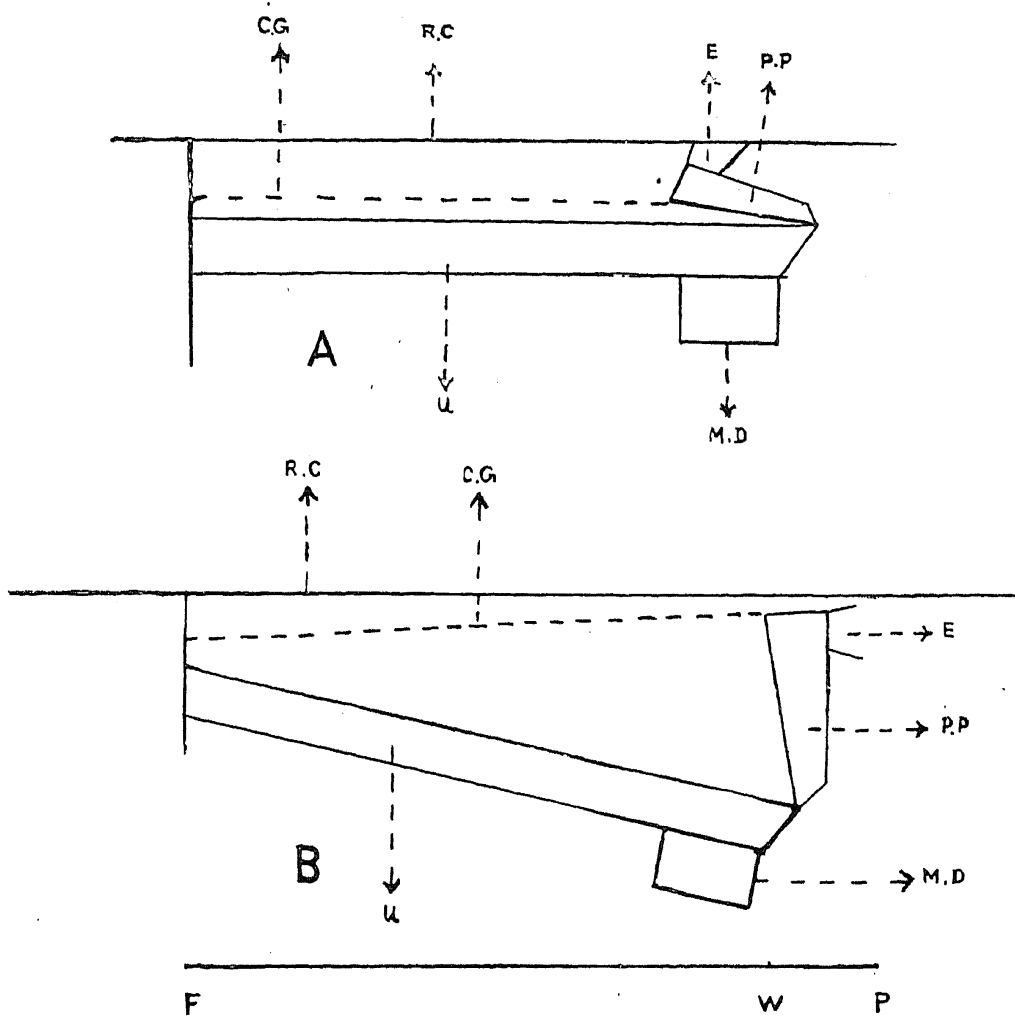


Fig. 1.

To show the action of the urocardiac ossicle.

A—Position at rest; B—Position at action.

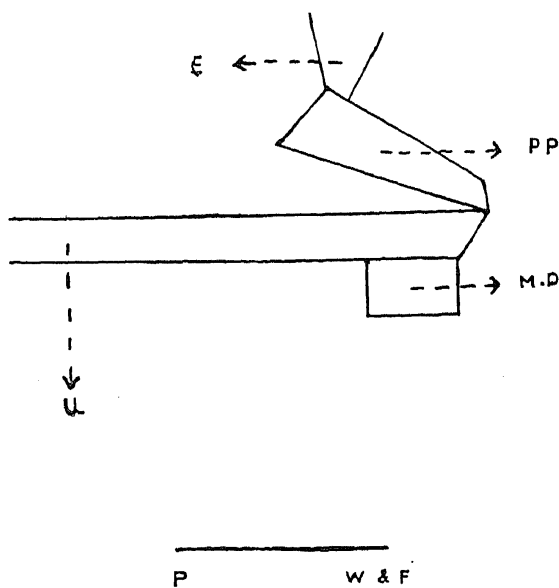


Fig. 2.

To show the action of the propyloric ossicle.

contraction of the posterior gastric muscles as indicated in Fig. 1, A and B.

Both the urocardiac and propyloric ossicles represent levers of the second order. In the case of the urocardiac ossicle (Fig. 1, A and B) the fulcrum is situated at its attachment with the mesocardiac ossicle while the power is applied at its hindermost extremity just behind the urocardiac tooth, by the anterior border of the propyloric ossicle. The power is the result of the contraction of the posterior gastric muscles and transferred to that point by means of the exopyloric and propyloric ossicles. The work is performed in the region of the urocardiac tooth. In the case of the propyloric ossicle (Fig. 2) the fulcrum is at the attachment of its anterior border with the hind end of the urocardiac ossicle and the power is applied by the exopyloric ossicles at its posterior border, while the work is done at a point near the fulcrum in pressing down the urocardiac tooth.

pyloric ossicle is definitely of a reverted disposition. Hence active movement of the gastric armature is possible only by the

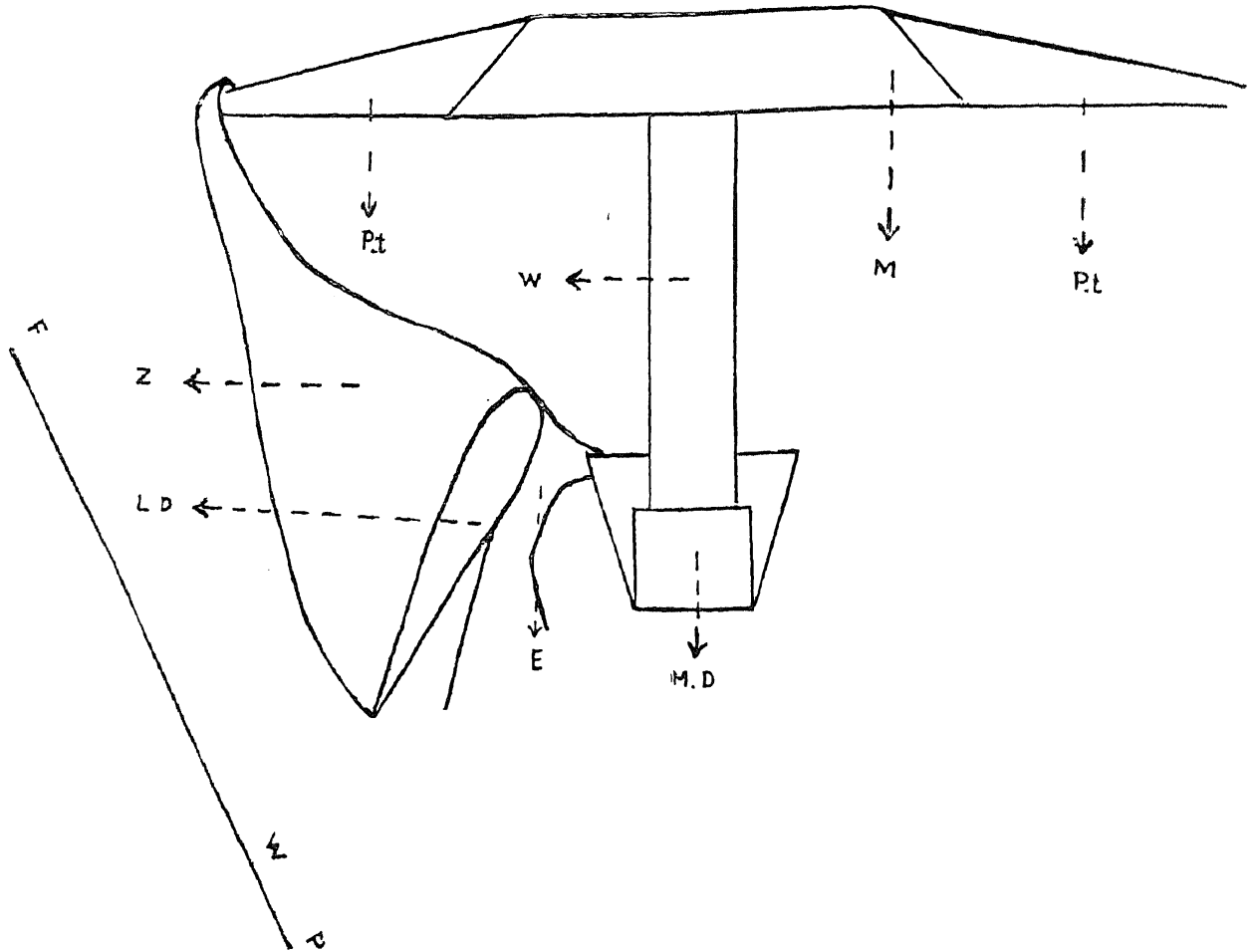


Fig. 3.

To show the action of the zygocardiac ossicle.

C. G.—Cardiopyloric Constrictor muscles; E.—Exopyloric ossicle; F.—Fulcrum; L. D.—Zygocardiac tooth; M.—Mesocardiac ossicle; M. D. Urocardiac tooth; P.—Power; Pt.—Pterocardiac ossicle; P. P.—Propyloric ossicle; R. C.—Roof of the Cardiac chamber; U—Urocardiac ossicle; W.—Weight; Z.—Zygocardiac ossicle.

Pearson (1908) on the supposition that the operation of the armature is effected by the anterior gastric muscles, locates both the point of application of power and fulcrum at the place of articulation of the zygocardiac ossicle with the outer end of the pterocardiac ossicle, while the work is turned out at the zygocardiac tooth and describes the action of the zygocardiac tooth as that of a lever of the second order considering the zygocardiac and exopyloric ossicles as a single bar. With the conditions described by him neither the zygocardiac ossicle with the exopyloric is a lever of the second order, nor is movement possible when power acts at the fulcrum. But if the power were to act at the exopyloric ossicle—as it should by the contraction of the posterior gastric muscles—then the action of the combined ossicles is that of a lever of the second order, with the fulcrum at the anterior end of the zygocardiac ossicle,

the work being turned out in the region of the zygocardiac tooth and the power being applied at the exopyloric ossicle as illustrated in Fig. 3.

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June 28, 1935.

¹ Mocquard, A., "Recherches anat. sur l'estomac des Crustacés podophthalmes", *Ann. Sc. Nat.*, 1883, **6**, t. 60.

² Pearson, J., "Cancer," *L.M.B.C. Memoirs*, 1908, **16**.

³ Patwardhan, S. S., "On the structure and mechanism of the gastric mill in *Decapoda*. 1. The gastric mill of *Paratelson guerinii* M. Edw.," *Proc. Ind. Acad. Sci.*, 1934, **1**, No. 5.

⁴ Patwardhan, S. S., "On the structure and mechanism of the gastric mill in *Decapoda*. 2. *Brachyura*," *op. cit.*, **1**, No. 7.

⁵ Patwardhan, S. S., "On the structure and mechanism of the gastric mill in *Decapoda*. 3. *Anomura*," *op. cit.*, **1**, No. 8.

⁶ Patwardhan, S. S., "On the structure and mechanism of the gastric mill in *Decapoda*. 4. *Macrura Reptantia*," *op. cit.*, **1**, No. 8.