

distinct lines of sensory pores. Dorsal with 14 or 15 rays, originating at equal distance from occiput and from root of caudal. Anal exactly opposed to dorsal, with 15 or 16 rays. Pectoral  $\frac{3}{5}$  to  $\frac{2}{3}$  length of head. Caudal truncate. Caudal peduncle  $1\frac{1}{2}$  as long as deep. Scales thin, imbricate, with concentric striæ, 31 to 33 in a longitudinal series, 12 to 15 in a transverse series; belly and axillary region naked. Brownish above, with more or less numerous darker spots and dots and a blackish lateral streak; belly white; dorsal and caudal fins dotted with blackish.

Several specimens were collected by Mr. G. Ockenden at Tirapata, Eastern Peru, at an altitude of 13,000 feet. The largest female with mature ova measures only 65 millimetres.

In its small size this new species approaches *O. elegans*, Garman, in which the eyes are nearer together (one diameter apart), the origin of the dorsal fin is nearer the occiput than the root of the caudal, and the scales are smaller (34 to 36 in a longitudinal series) and so thin as to be hardly visible, according to Dr. Garman's description.

This species departs less than any other of the genus *Orestias* from the normal Cyprinodont pattern, and but for the absence of ventral fins would be taken for a *Fundulus*.

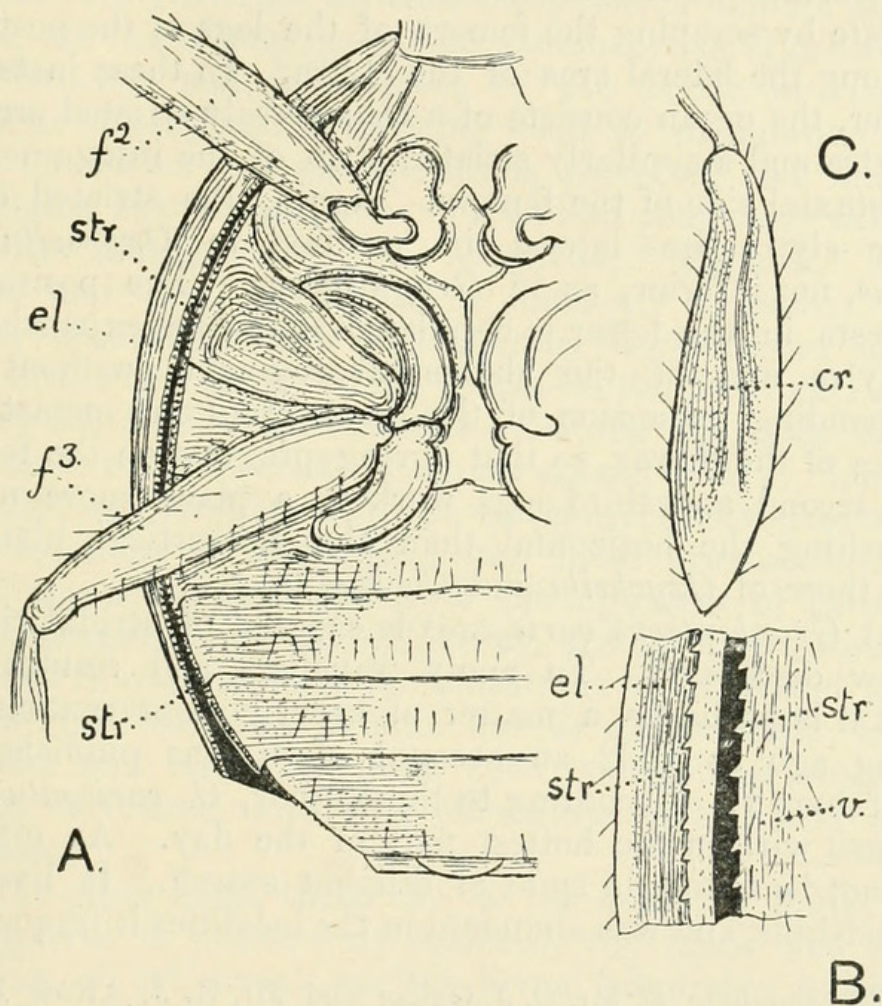
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XXI.—*The Stridulating-organ in the Egyptian Beetle,*  
*Graphipterus variegatus.* By R. I. Pocock.

SOME six or seven years ago Mr. Erskine Nicol told me that there is a spotted ground-beetle in Egypt which makes an audible scraping sound as it runs over the sand. I supposed from his description that the insect belonged to the Carabid genus *Anthia*; and knowing that Mr. C. J. Gahan was collecting facts for a paper upon the stridulating-organs of the Coleoptera, I suggested that an examination of *Anthia* might bring to light a new organ of this nature. No such organ, however, could be found; and there the matter was allowed to rest. In July of the present year, however, Mr. J. E. Nicol brought to me, with some Arachnids and insects collected at El Khanka, near Cairo, a specimen of *Anthia* and two other beetles of the smaller but allied form *Graphipterus variegatus*, Fabr. Pointing to the latter, he said, "That is the beetle that makes the noise, not the large kind. When running, it sounds as if it were hollow and partly filled with grains of dry sand."



Microscopical examination at once showed the position and structure of the organ that causes the sound. It consists, on the one hand, of two finely toothed or serrated ridges on each side of the body, one running along the admedian edge of the lateral inturned area of the elytron, the other along the adjacent edges of the sterna of the abdominal somites (figs. A, B, *str.*); and, on the other hand, of a smooth angular crest traversing the postaxial side of the femur of the third leg, and lying in a general way parallel to the long axis of this segment (see fig. C, *cr.*). This crest is not a



Stridulating-organ of *Graphipterus variegatus* (Fabr.).

- A. Ventral surface of right half of abdomen and of posterior somites of thorax.  $f^2, f^3$ , femora of second and third legs; *el.*, inturned edge of right elytron; *str.*, serrated stridulating-crests on elytron and adjacent margins of abdominal sterna.
- B. Piece of the right elytron (*el.*) and of one of the abdominal sterna (*v.*), with adjacent serrated stridulating-crests (*str.*).
- C. Postaxial side of femur of third leg, showing the smooth crest (*cr.*).

sharply defined upstanding ridge, but resembles rather an angular elevation, such as would be produced by pinching up the horny integument of the femoral segment. A similar



but weaker crest is also developed upon the distal portion of the corresponding surface of the femur of the second leg.

The points of the denticulations on the elytra and abdominal sterna are directed obliquely outwards and backwards, so as to cause the greatest friction and produce the loudest sound when the ridges of the femora are scraped against them with the forward stroke of these segments\*.

No mechanism exactly resembling this in structure and situation has yet been figured and described in the Coleoptera. The nearest approach to it is to be found in the Cicindelid genus *Oxycheila* and the Heteromerous genus *Cacicus*†, both of which stridulate by scraping the femora of the legs of the posterior pair along the lateral area of the elytra. In these instances, however, the organ consists of a transversely striated crest on the elytra and a similarly striated strip of the integument of the postaxial side of the femora. Again, the striated crests on the elytra are lateral in position in *Oxycheila* and *Cacicus*, not inferior, as in *Graphipterus*. The position of the crests in the latter is correlated with the expansion of the elytra and of the abdominal segments without any corresponding expansion of the mesosternal and metasternal sclerites of the thorax, so that during progression the femora of the second and third legs work in a plane more nearly approaching the horizontal than the subvertical plane in which those of *Oxycheila* and *Cacicus* move.

That *Graphipterus variegatus* is capable of stridulation is no new discovery. To many travellers and residents in Egypt it is probably a matter of everyday observation, and so long ago as 1832 an account of it was published by M. Lefebvre‡. According to this author, *G. variegatus* was to be met with in the hottest part of the day. At night it could not be found, in spite of diligent search. It lived on the sand-hills, and was abundant in the localities it frequented.

\* With the help of Mr. C. J. Gahan and Mr. G. J. Arrow I have ascertained that this organ is present in most of the North-African species referred to *Graphipterus* and absent in those assigned to the same genus from South Africa. The former also have a peculiar type of coloration, not exhibited by the latter, which probably indicates a life amid sandy surroundings.

† C. J. Gahan, Tr. Ent. Soc. London, 1900, p. 448, pl. vii. figs. 8, 8a.

‡ Ann. Soc. Ent. Fr. i. p. 311. I am indebted to Mr. C. J. Gahan for this reference. Lefebvre's account was apparently unknown both to Darwin and to Landois, if we may judge from the absence of all reference to it in the former's 'Descent of Man' (1883) and the latter's 'Thierstimmen' (1874). To this defect in the last-mentioned historical account of sounding-organs is presumably to be traced the oblivion in which Lefebvre's observations have seemingly rested since the time of Lacordaire.



It was more easily heard than seen, on account of the tolerably distinct stridulation, resembling the word *xéxé* continually repeated, which it produced by rubbing the inner side of the femur of the posterior legs against the edges of the elytra which border the abdomen. When several were shut in a bottle, they speedily tore each other to pieces with a fury greater than that of all other Carabidæ.

This account contains many observations of interest. In the first place, the author, although apparently unacquainted with the structure of the stridulator, noticed that the sound proceeded from friction between the posterior femora and the elytra. In the second place, the statements as to the abundance, ferocity, and fearlessness of the beetle in roaming abroad in midday and advertising itself by stridulation point to the conclusion that the species is protected and that the stridulation has the same function as that commonly assigned to similar sounds emitted by scorpions, "Mygales," rattlesnakes, and other poisonous or nauseous animals. This opinion is strengthened by the equal development of the organ in the two sexes, which precludes the likelihood of its primary use as a sexual stridulator helping the male to find the female or *vice versâ*. Anyone accustomed to handling Carabidæ, and familiar with the extreme offensiveness of the odour so many of them give out under provocation, will readily appreciate the cogency of the argument in favour of the distastefulness of *Graphipterus*, seeing how intimately connected in ourselves are the sensations of taste and smell. The shining black or metallic hue so characteristic of the Carabidæ and rendering them such conspicuous objects is perhaps correlated with this offensiveness, and acts as its advertiser.

On the other hand, there can be no doubt, I think, that *Graphipterus* is protectively coloured, the black and white speckling of its dorsal surface being admirably suited to harmonize with the mottled tint of the sand in which it lives; and the expanded and somewhat flattened shape of the abdomen suggests that when the necessity for concealment for capture of prey or escape from enemies supervenes, the beetle sinks into the sand, leaving only the upperside of its body exposed on the surface.

The combination of procryptic coloration with aposematic characters is by no means uncommon in the animal kingdom. The cobra furnishes an instance amongst snakes\*, and the Indian Mygale known as *Pœcilotheria* amongst spiders. The

\* Wallace, 'Darwinism,' p. 262.



latter is spotted and banded with grey and brown on the dorsal side, to harmonize with the colouring of the lichen-patched tree-trunks it frequents; but when attacked it starts into a characteristic attitude of defence, raising its anterior legs and palpi to display the black and yellow slashes of their underside, and stridulates at the same time, as a double warning to enemies to keep aloof.

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XXII.—On *Marmosa marmota* and *elegans*, with Descriptions of new Subspecies of the latter. By OLDFIELD THOMAS.

SINCE I wrote my paper on the small Paraguayan opossum (*Marmosa marmota*, or, as it was then termed, *Micoureus griseus*) \* the British Museum has received, firstly, a further consignment of the same interesting animal from Mr. R. Perrens; secondly, a valuable series of the true *M. elegans* from Valparaiso, collected and presented by Mr. J. A. Wolffsohn; thirdly, some specimens of the same group from Tucuman (coll. L. Dinelli); and, lastly, a number of specimens from Peru and Bolivia collected by the late Mr. Perry O. Simons. These specimens, amounting to about fifty in number, enable me more exactly to trace the characters and distribution of the two forms.

In 1894 I stated that *M. marmota* differed from *M. elegans* cranially by its more sharply edged supraorbital region, but that externally "the two species were widely different."

The further material induces me to modify this statement, for fresh specimens show that the two are closely similar externally, and were it not that well-defined supraorbital processes are present in *M. marmota* and entirely absent in the oldest *M. elegans*, I should look upon the Paraguayan species as but another local subspecies of the widely-spread Andean form. It may, however, be just distinguished from the most white-bellied of the races of *M. elegans* by the fact that the under surface, pure white throughout, is sharply defined laterally from the grey colour of the sides, none of the lower hairs having any slaty at all at their bases.

The recognition of *M. marmota* and *M. elegans* as species, and the different races of the latter as subspecies, is in agreement with their geography, for while all the known localities of *M. elegans*, far apart as they are, are connected with each other by mountainous country, *M. marmota*, in Paraguay, is

\* Ann. & Mag. Nat. Hist. (6) xiv, p. 184 (1894).



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