# THE ENTOMOLOGIST

VOL. XLV.] FEBRUARY, 1912. [No. 585

## A NEW SPECIES OF PHASMIDÆ OF THE GENUS *PRISOPUS*, CONSIDERED ESPECIALLY IN REFERENCE TO THE SUPPOSED AQUATIC HABITS OF THE GENUS.

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*Prisopus* is a genus of Phasmidæ which, owing to the singularity of its form and structure, cannot very well be described either as a "stick" insect or as a "leaf" insect; but it is one of exceptional interest, inasmuch as it was believed to live under water, and to be eminently adapted by its structure for that mode of life. The species of the genus inhabit tropical America, and those that are known are few in number and apparently rare, very few specimens having yet found their way into public or private collections.

I was glad, therefore, to be able to recognize as a member of this rare and interesting genus an insect which was recently brought to the British Museum and shown to me by Mr. F. G. Fisher, who discovered it at Xapury, a township on the River Acre, in the Amazon Valley. And I was still more pleased when Mr. Fisher very kindly offered to present it for the Museum collection, where we found we had no species quite like it. From investigations which I have since made, the species appears to be new; so I have ventured to name it *Prisopus fisheri* in honour of its discoverer. A more detailed description of this new species is given below. Here I wish more particularly to call attention to certain points about it which serve to throw a light upon the supposed aquatic habits of *Prisopus*; and to say something also in reference to another Phasmid genus, *Cotylosoma*, to which similar habits have been attributed.

When first I saw the specimen brought to me by Mr. Fisher, it struck me at once as being an extremely good and very beautiful example of protective resemblance. And then, though I felt there was no need for the question, I asked him where he found it. The answer was very much as I expected. Mr. Fisher

found the insect at rest in the daytime on the trunk of a tree; a small tree or sapling, he could not remember which, nor did he know the name of the tree, but that did not much matter. What chiefly impressed me about the creature was the great resemblance it had to an ordinary piece of bark, and how remarkably well its colours seemed adapted in combination with every other feature to bring about that resemblance. Not that there was anything wonderful in all that; resemblances of a similar kind, many of them quite as perfect, some even more so, are quite familiar to us; and they are especially abundant amongst the Phasmidæ. But we know that the "stick" insects and "leaf" insects do not go and hide themselves under water all day; and I had a vague recollection that that was what *Prisopus* was supposed to do. It was impossible to believe this of the insect before me; for, in such case, its colours and all the remarkable adaptations of structure I noticed could have no use and no signification. So I determined to refresh my memory, and to find out what was known about the habits of the genus.

Turning, first of all, to the 'Cambridge Natural History' where, as I knew, there was a most interesting account given of the Phasmidæ and their habits, I came upon the following statement:—"In Brazil a species of the genus *Prisopus* has the peculiar habit of seeking shelter under the stones submerged in the mountain streams; to enable it to do this it is remarkably constructed, the under side of the body being hollowed, and various parts set with a dense fringe of hairs; the insect is supposed to repel the air from the body in order to adhere to the upper surface of a stone, where it sits with its fore legs extended in front of its head, which is directed against the current."

That was a sufficiently startling statement about a species of Phasmidæ, and I felt certain that Dr. Sharp would not have made it except upon very good authority. Who or what was this authority I had now to find out. So I looked up the genus *Prisopus* in the most recent work on the family, an excellent monograph by Brunner von Wattenwyl and J. Redtenbacher, and very soon found what I wanted. The authors say of *Prisopus* that:—"This remarkable genus lives, according to Murray, in water, where with their hollowed-out ventral side the insects hold on to stones, with the body directed up stream." The same story again, more briefly stated, for which Murray, it appeared, was the authority.

Andrew Murray was a well-known scientific man, and an entomologist of wide experience, who had written much about various groups of insects, including the Phasmidæ, to which he had given a very fair amount of attention. What he had to say on the subject, therefore, was bound to be of considerable interest. It is to be found in his paper "On the Habits of the *Prisopi*,"

which was published in the 'Annals and Magazine of Natural History,' in the year 1866 (Ser. 3, vol. xviii. pp. 265-268). That paper is certainly well worth reading in full. But its chief point of interest for the moment is that it brings us to the fount and origin of that remarkable little story about *Prisopus* which has been repeated, as we have seen, by other writers.

The real author of the story, however, remains so far anonymous that he is only known to us as a "person," later on dignified by the title of "observer," in whose veracity Mr. Alexander Fry, to whom he first related the story, had the fullest confidence.

The story had reference only to one species of *Prisopus*—*P. flabelliformis*, but, as Murray very truly remarks:—"All the species are characterized by the same peculiarities of structure, and the habits of one will doubtless be the habits of all.

"According to this observer, then, the insect was obtained by him in the mountains of Brazil; and its habits were to spend the whole of the day under water, in a stream or rivulet, fixed firmly to a stone in the rapid part of the stream, but on the approach of dusk to sally forth into the night air."

Murray believed this story; he was not so much struck by its great improbability, as by the lack of perception on the part of other distinguished entomologists, who had not discovered in the structure of the genus the most admirable and most perfect adaptation for the very purpose explained by the "person." And the rest of his paper is almost wholly taken up with a very detailed description of the insect, in which he proceeds to show how every single detail of its structure fitted in with the story told about its aquatic habits.

The details which he has given of the structure are, with one exception, and apart from the interpretation he placed upon them, very accurate, and may be quoted here *in extenso*, since they apply almost equally as well to the species discovered by Mr. Fisher. The one exception refers to his account of the tegmina or wing-covers. These structures do not reach to the end of the body, nor do they completely cover over the under wings, in any known species of the genus. So that if his description is correct, the species described could not have been *flabelliformis*. But it looks to me as if Murray, in his haste to see "waterproof" structures everywhere, mistook for a continuation of the wing-covers that considerable part of the under wings which projects beyond them, and which is usually coloured so exactly like them in resemblance to bark. It is to be noticed, too, in his description which follows that not a word is said about the coloration of the insect:—

"The whole underside, even the head, is hollowed out like the half of a reed. The surface of that side is flexible, smooth, and highly polished. The margins are thinned off, and the

segments of the abdomen, where not fitted to the posterior legs, are provided with flaps or quasi claspers. All the legs fit most beautifully and closely to the side of the abdomen [body rather]. Their outer margin is dentate and provided with a thick fringe of hair, which, like the feathers of a duck, repels water. Moreover, at the knee-joint [this applies only to the front legs] where there is unavoidably an opening or unprotected space, it is provided with a flap, or side knee-pan—a provision which occurs in no other insect with which I am acquainted. This flap hangs down, filling up the opening, and is furnished, like the rest of the outer margins of the leg and body, with a supply of hair impervious to water. The posture of the animal in the water is: fastened to the upper surface of a stone, and with its head turned up stream in opposition to the current. It sits with its forelegs extended forwards in front of the head, and the inner side of the thighs is hollowed out exactly to fit the sides of the head, and the thigh itself is bent down so as to form a continuation of the sides of the long cup or saucer which the underside of the animal represents. The antennæ fold back on the upper-side of the head, where there is a depression to receive them. In the other Phasmidæ the tegmina or upper wing-cases are usually short, narrow and coriaceous, and apparently not fitted for much use. Here they are as long as the body, so as to cover the whole of the large underwings when folded up; they are broad enough to do so; and the whole are only of a semi-coriaceous texture, flexible and pergaminous, but most so at the base, thinning away at the termination into a finer texture, approaching that of the lower wings. The claws of the tarsi are strong, powerful, and well adapted for clinging."

Not satisfied with the proofs thus set forth of its aquatic habits, Murray next goes on to endow the insect with powers possessed by no other insect known:—

"In this animal we seem to have a combination of two plans of structure: there are the claws and claspers and flaps for holding on by; there is the hollow underside for adhering, by exhausting the air between it and the stone it clings to, on the principle of the air pump. If, when it settles on the stone and adjusts itself, its tracheæ are full of air, and it then expels the air and by muscular power draws in the skin of the abdomen and underside generally, it must, of course, leave a vacuum, and consequently adhere like a sucker."

We need not dwell upon the extravagance of the suggestions put forward here by Andrew Murray. It is enough for us to know that there is an insect, in all essential respects exactly like the one described by him, which has the habit, not of clinging to stones under water, but of spending the day in clinging by means of its strong claws alone to the bark of a tree. We can see how well this insect is adapted by its colours for concealment

in such a situation, and we can see also that the so-called claspers on the abdomen, the knee-pans, the fringes of hair, the dentate margins of the legs, &c., are only so many further adaptations, all of which lend themselves obviously to the same purpose of concealment. The under side of the insect's body is smooth and polished, and of a reddish-brown colour marked a little with black; but that is just the part which, when the insect is at rest, cannot be seen. That it should act like a sucker, seems a physical impossibility; and one needs only to examine the insect awhile to see how absurd is all the talk about the imperviousness to water of its various structures.

As evidence, therefore, of the aquatic habits of *Prisopus*, all the wealth of "corroborative detail" supplied by Murray must be regarded as absolutely valueless, although, no doubt, it did succeed in giving "artistic verisimilitude to a bald and unconvincing narrative," and must have exercised a strong influence on the judgment of subsequent writers, who, without it, we may be well persuaded, would not for a moment have given credit to a story so highly improbable, so utterly opposed to everything known about the habits of the Phasmidæ.

Wood-Mason, well known as an authority on the morphology of insects, was one of those who fully accepted Murray's account of the habits of *Prisopus*; and when his attention was called to another Phasmid, apparently closely related to that genus and distinguished by having a row of five flat oval, fringed structures attached to each side of the metathorax, he at once jumped to the conclusion that these structures were tracheal gills, and he has described them as such, giving to the insect the name of *Cotylosoma dipneusticum*. "This insect," he writes, "is closely related to the *Prisopi*, but is even more profoundly modified for an aquatic life; for it breathes, not only in the ordinary fashion amongst insects by means of tracheæ opening by stigmata to the exterior of the body, but also by the structures known as tracheal gills." His statement seems to have passed unchallenged until, in 1895, both Dr. Sharp and Mr. C. O. Waterhouse called attention to it, and expressed their doubts about the function attributed to the so-called tracheal gills. The question, however, as to the true nature of the structures was left undecided. Having examined them lately, I have come to the conclusion that they cannot possibly be tracheal gills. In the first place, they exhibit no traces whatever of tracheæ, and, secondly, they are dotted all over with dark pigment spots. They are to a certain extent movable, and they are in form and structure, as Waterhouse has pointed out, very like the two flat oval appendages at the base of the front tibiæ in *Prisopus*, the so-called "knee-pans" described by Murray. And it appears to me that their purpose is the same—to effect the better concealment of a part which, without them, would be somewhat too

easily seen. For this purpose it is an advantage that they should be movable, since they could be adjusted to slope down from the sides of the body to the surface on which the insect rests, playing the same part for the metathorax as the hind legs do for the abdomen, and the middle legs for the fore part of the body. It will be noticed that in the new species of *Prisopus* there is a well-marked triangular process on each side of the metathorax, corresponding in position with the movable appendages of *Cotylosoma*; and as to the meaning of this process there can be very little doubt.

Apart from the assumption made by Wood-Mason, there is no reason whatever for believing that *Cotylosoma* is aquatic in its habits. On the contrary, we have very good reason for believing that it is not. Before Wood-Mason wrote his paper, some years even before Murray's paper appeared, MacGillivray described as *Prisopus carlottæ* a species which really belongs to the genus *Cotylosoma* and which is very closely indeed allied to *dipneusticum*. Concerning this species he tells us:—"The colour is variable; it is either a dull greyish-green, finely and irregularly mottled, or silvery-grey, also mottled, having greenish and yellowish shades, altogether reminding me of some of the lichens." Very unusual colours for an aquatic insect, but by no means exceptional in an insect which "is said," as MacGillivray further states, "to be found on the trunks of trees."

*Prisopus fisheri*, n. sp.

Colour: on the exposed parts of the head, thorax, femora, and tibiæ light yellowish brown, with a more or less considerable admixture of ashy white and greenish white; on the elytra, dark green at the base and over the basal prominences, dark brown beneath these on each side, yellowish brown, varied with greenish grey over the rest of the surface, but becoming darker towards the apex, and with two dark brown spots on each elytron a little past the middle; pale grey on the upper surface of the anterior segments of the abdomen, dark brown on the posterior segments; exposed parts of the under wings coloured like the posterior half of the elytra, the folded parts pale green, mottled irregularly with dark brown; body beneath chocolate-brown on the abdomen, pale testaceous on thorax, with blackish hind border to the meso- and meta-sternum.

Head without spines, but with four short rows of small tubercles above extending forwards from the occiput, and with a crenulate carina, beneath which is a dark line, along each side. Pronotum without spines, and bearing only a few very inconspicuous granules. Mesonotum relatively rather short. Metathorax with a conspicuous triangular process on each side, whose edges are somewhat dentate, and with a few lateral cariniform tubercles placed anteriorly. Elytra furnished each with a large, laterally prominent, hump or tubercle near the base.

*Length :* of body, from front of head to apex of abdomen, 67 mm.; of pronotum, 4¼ mm.; of mesonotum, 5½ mm.; of elytra, 36 mm.

*Breadth :* of metathorax, measured below the elytral prominences, 13 mm.

*Hab.* Xapury, on the River Acre, Amazon Valley.

This species appears, on the whole, to be most nearly allied to *P. horstokkii*, de Haan, but is readily to be distinguished from

Photo H. Main.

H. Knight del.

that species and from all others of the genus by the strong triangular process on each side of the metathorax.

One of the figures is from a drawing made by Mr. Horace Knight to show the insect in what we conceive to be its resting position, with the legs placed, slanting outwards, alongside the body; the other, from a photograph for which I am indebted to Mr. Hugh Main, represents the insect just as it was received—the middle legs hidden through being tucked in under the body, and the flexible lobes at the sides of the mesothorax and abdomen bent in more than would be quite natural in the living insect.