XVI. *On a new cricket of aquatic habits, found in Fiji by Professor Gustave Gilson.* By Professor Lŏuis Compton Miall, F.R.S., and Professor Gustave Gilson.

[Read May 7th, 1902.]

Plates VII and VIII.

The aquatic cricket now to be described was obtained by Professor Gilson of Louvain in Viti-Levu, Fiji, on October 23rd, 1897. It was found on a branch of the Upper Navua river, a clear and rapid stream, flowing through a deep, rocky valley. Myriads of black specks were seen dancing on the surface of the water. When alarmed, they hid behind stones. They skated on the water, or jumped to a height of about six inches, usually several times in close succession, and were sometimes seen to leap upon very disturbed water. Now and then three or four of the crickets seemed to be playing at leap-frog, and jumping over one another, as if in sport. They were very hard to catch, though several men were employed in capturing them, and very few specimens were secured. Night interrupted the work, and next day an attack of malarial fever obliged Professor Gilson to desist. Rainy weather followed, the river rose, and no more was seen of the crickets.

The largest male specimen was 11 m.m. long, not including the antennæ, cerci, or wing-tips. In most respects the head resembles that of other Gryllidæ. The mandibles exhibit a peculiar structure, the masticatory surface consisting of three cutting ridges, alternating with molar surfaces, which are armed with close-set denticles (fig. 8). No ocelli were found. A pair of cerci project from the 7th abdominal segment.

The wing-covers of the male have the dorsal area largely membranous; the general arrangement of the veins is somewhat like that of the Gryllidæ in which the male stridulates, and altogether different from the venation of the female wing-cover. The roughened file, the chanterelle, the chords and the oblique veins are either

wanting or not functional, so that our cricket has no tambour in the sense of Saussure,* a fact which has some bearing upon its systematic position. It seems most probable that the wing-cover has been formerly adapted for stridulation (as in most male Trigonididæ) and that the power has subsequently been lost. The wings of the second pair resemble those of other Gryllidæ in their numerous radiating veins, which cover the whole surface; when folded, they project beyond the body like a pair of long tails.

The fore tibia has two auditory fenestræ and one terminal spur (fig. 13).† The tarsus is three-jointed, and the middle joint, which is short and heart-shaped, shows a very peculiar structure, viz. a fringe of rather long and close-set setæ, protected by a thin chitinous plate, which is perhaps double. A similar apparatus is found in the tarsus of the mid and hind legs also (figs. 10, 11); it is perhaps used as a comb for cleaning the body. From the tip of the basal joint of the tarsus stands off a stout spur, ending in a hook, and with one border serrated. The terminal joint in all the legs bears two pointed, laterally serrate claws. The mid leg differs from the fore leg chiefly in the absence of auditory fenestræ and the presence of two tibial spurs. The hind leg, as in other Gryllidæ, is adapted for leaping. The tibia of this leg bears three unequal spurs, two of which are serrate, and six articulated and setose spines, three internal and three external. The first tarsal joint bears two unequal spurs, one of which is serrate, the middle joint is short, heart-shaped, and provided with a comb, and the terminal joint, as in the other legs, bears two serrate claws. The hind leg greatly exceeds the others in length, and here only can we discover a special adaptation to leaping on water. The long and setose spines of the tibia are well fitted for striking the surface-film without breaking it. No very special modification for this purpose has been discovered in the mid and fore legs. It is possible, as every-day observation shows, for insects of small size, such as Nemoceran flies, to rest on the surface of water without possessing any

* Rech. Zool. du Méxique, VI, pp. 297, 309; Mélanges Orthopt., p. 513.

† The imperfect condition of the female specimens does not enable us to positively say that the fenestræ occur in that sex, as they almost certainly do; they are wanting in the larva.

peculiar structure in the leg. Even the common house-cricket, though nearly twice as long as the aquatic cricket from Fiji, and many times heavier, does not sink in water, and can propel itself awkwardly upon the surface, though it cannot leap upon it.

It is well known that another genus of cricket (Tridactylus, placed by Saussure in the tribe of Gryllotalpidæ) is capable of leaping on water. Here the hind tibia bears two rows of articulated and flattened plates, four on one side and three on the other. From the extremity of the joint project two pairs of spurs and the rudimentary tarsus. Tridactylus differs so conspicuously from other crickets in the antennæ and wings that it cannot be supposed to be nearly related to our cricket, and the similarity in the hind tibia is no doubt purely adaptive.* In Scelymena, Serv., a genus of Tettigidæ, of which several species occur in Ceylon, Java and Burmah, the hind tibia ends in four strong, articulated spines, and the first tarsal joint may be dilated. These insects live on the margins of streams and ponds; some of them have been seen to leap on water.† Dr. Brunner von Wattenwyl tells us that several groups of Phasmidæ are known to him as possessing the same power. The long hairy spines of Pseudonemobius pictus (Gryllidæ) from Cashmere suggest that this insect also may leap upon water, but its habits have not been described. Certain Hemiptera, such as Gerris (Hydrometra) lacustris, and some Collembola, such as Podura aquatica and Isotoma palustris, can also leap upon water, a faculty which becomes less remarkable as the size of the insect diminishes. The Fijian cricket attains a length of 11 m.m., Tridactylus variegatus 6 m.m., Gerris lacustris 9 m.m., while neither of the Collembola exceeds 2 m.m.

The female insect differs most conspicuously from the male in the presence of a rather long, curved ovipositor, and in the quite different pattern of the wing-cover. The ovipositor resembles that of some other Trigonididæ.‡

The larva has no wings, no ovipositor, no auditory

* The mode of life of Tridactylus is carefully described by Saussure, Recherches, VI, pp. 321–3.

† Saussure, Études sur quelques Orthoptères du Musée de Genève; Ann. Soc. Ent. Fr., 4e sér., tom. I, pp. 467–494 (1861).

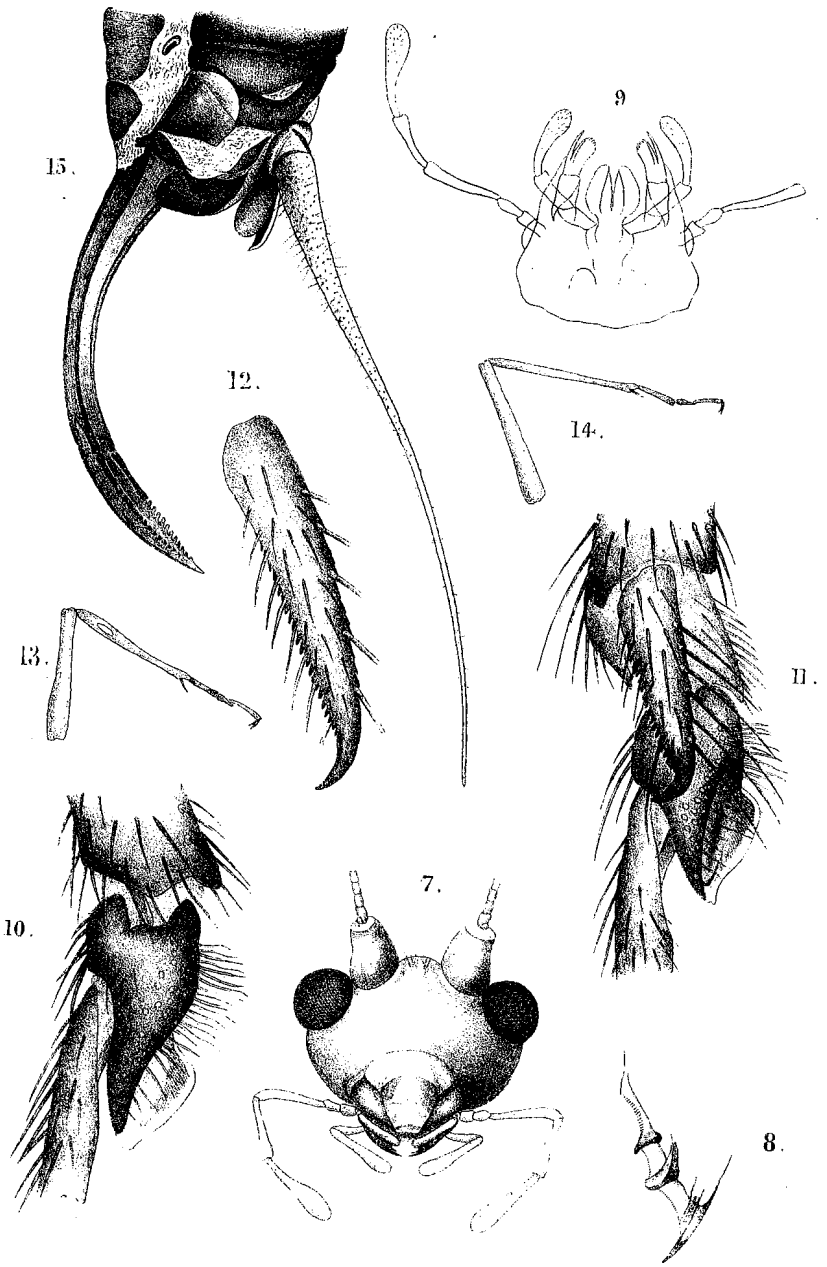
‡ Saussure, Mélanges Orthopt., tom. II, pp. 522–531, and Fig. LXXIX.

fenestræ, and only three articulated spines on the inner side of the tibia.

The aquatic cricket from Fiji agrees with the Trigonididæ among the tribes of Gryllidæ,* except in the number of the articulated spines of the hind tibia and the character of the male wing-cover. Saussure, who, of course, was unacquainted with this form, says (*loc. cit.*, p. 599), that in male Trigonididæ the elytra are sometimes devoid of tambour (stridulating apparatus), and are then identical with the elytra of the female; or they may be furnished with a complete and well-developed tambour. In our insect the male elytron or wing-cover differs greatly from that of the female, and yet is not completely equipped for stridulation. The ovipositor of the female closely resembles the peculiar ovipositor of Cyrtoxiphus,† and the partly coriaceous, partly membranous wing-covers, as well as the presence of two fenestræ in the fore tibia, also approximate it to the genus Cyrtoxiphus. Brunner von Wattenwyl ‡ has described a genus of Trigonididæ (Amusurgus), in which the male elytron has no tambour or stridulating organ, and the new Fijian cricket seems to come very near both to Amusurgus and to Cyrtoxiphus. Few details of the male elytron of Amusurgus are given, but it appears to differ from the same part in our cricket, being narrow and silky ("angusta, holosericea"). The hind tibia has four movable spines on each side.

It is necessary, we think, to place our aquatic cricket in the tribe Trigonididæ, where it will be distinguished by the male elytron being partly membranous and altogether unlike that of the female, but without functional stridulating organ, while the hind tibia bears two series of articulated spines. It seems necessary to recognize the genus as distinct, and we propose for it the name of *Hydropedeticus*.§ The species may be named *H. vitiensis*. Dr. Brunner von Wattenwyl, to whom we have submitted our description and drawings, tells us that he has no doubt of the correctness of the systematic position thus assigned to the new cricket from Fiji.

* Saussure, Mélanges Orthopt., tom. II, p. 185.
† *Ibid.*, p. 601.
‡ Rév. du Syst. des Orthoptères, 1893, pp. 207, 212.
§ Suggested by Mr. B. M. Connal, lecturer in Latin to the Yorkshire College. *Hydropedeticus* means *leaping on water*.



A. Hammond del. et lith.

Hydropedeticus vitiensis.

Mintern Bros. imp.

Explanation of Plate VII.

Fig. 1. Male *Hydropedeticus*, the right wing-cover and wing extended × 3.

2. Left wing-cover of the male. The dorsal and lateral areas, which do not lie in the same plane, are drawn separately, a clear space intervening.

3. Right wing-cover of the female, the dorsal and lateral areas separated.

4. Tibia and tarsus of hind leg, showing the adaptation for leaping on water. Three of the spines are foreshortened, and their setæ are not shown.

5. Auditory fenestræ of fore tibia, superposed.

6. Immature *Hydropedeticus* (larva) × 3.

Explanation of Plate VIII.

Fig. 7. Head of *Hydropedeticus* with antennæ, eyes and mouth-parts.

8. Edge of mandible, showing the cutting ridges alternating with molar surfaces.

9. Maxillæ and labium, seen from behind.

10. Middle tarsal joint of mid leg. To the right is seen the thin chitinous plate and the fringe of setæ.

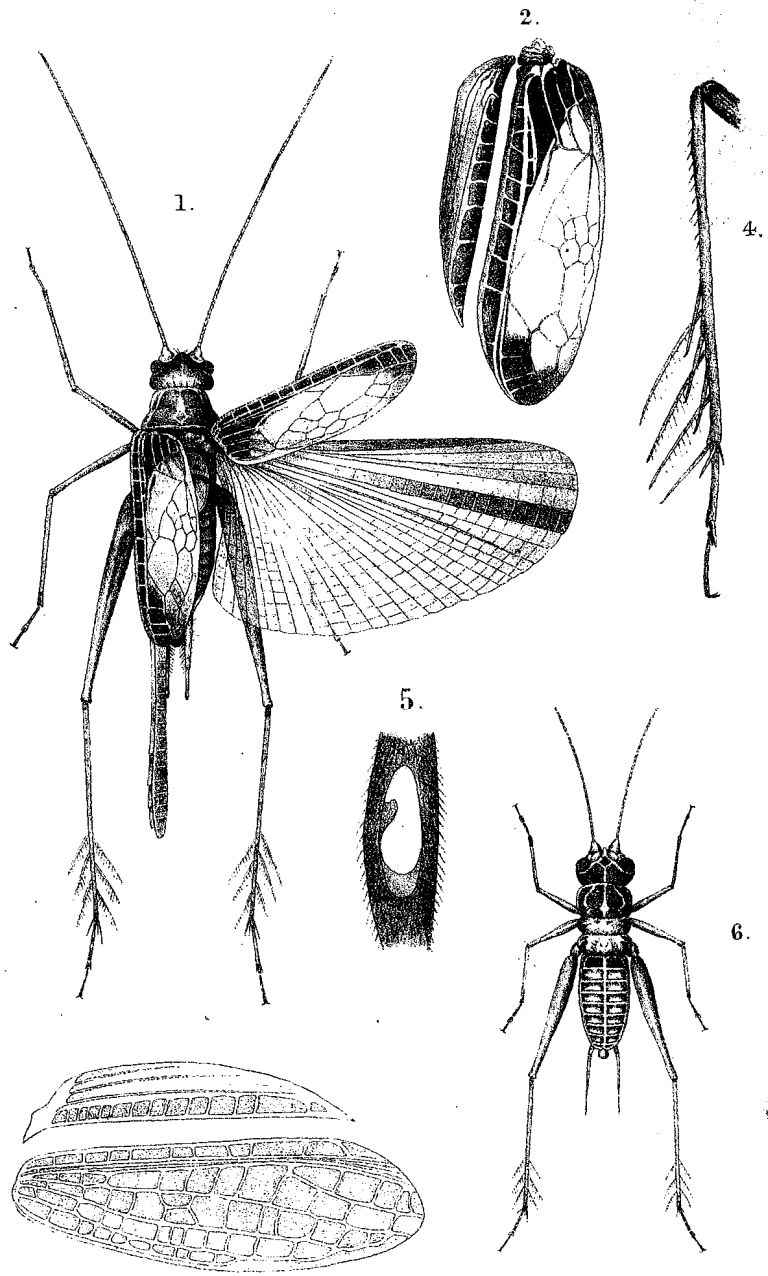
11. The same part of the hind leg, with the smaller serrated spur of the basal joint.

12. The larger serrated spur of the basal tarsal joint (hind leg). Only the bases of the long setæ on the outer margin are shown.

13. Fore leg with auditory fenestra.

14. Mid leg.

15. Extremity of female abdomen in side-view, with one of the cerci and the ovipositor. A spiracle is seen between the dorsal and ventral plates.



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