

ART. XXVIII.—*Bionomic Notes on some New Zealand Spiders, with a Plea for the Validity of the Species Araneus orientalis Urquhart.*

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[Read before the Wellington Philosophical Society, 27th October, 1920; received by Editor, 31st December, 1920; issued separately, 20th July, 1921.]

THE following notes, representing some of the results of observations in the insectary and in the field, extending over a considerable period, are merely preliminary indications of the fact that our native spiders as well repay study as those more favoured French species immortalized by Fabre.

*Hemicloea alacris* de Dalmas.

Below the bark which fits closely on old logs and stumps are found the egg-cocoons of this species. In appearance each is a disc about 1 in. in diameter, adhering closely to the log, since it is not disturbed when the tight-covering bark is stripped off. An edging of flocculent looser silk fastens it to the wood. On a closer examination the nest is found to be composed of two similar circular pieces of close-textured, smooth, white silk, fastened at the circumference and closely imprisoning the eggs, which are whitish in colour and, unlike those of many other species, non-adherent to one another. The young are white or colourless, with large swelling abdomina, dorsally convex, and thus offering a striking contrast to the thin bodies of the adults, which are dorsoventrally flattened to an extreme degree—an admirable adaptation to their life beneath the bark. It seems probable that the rounded abdomina of the young point to a descent from typical Drassids (Gnaphosids) with normal abdomina. When opened the nest is found to contain nothing in the nature of packing. Doubtless the soft bedding protecting the eggs of many other spiders is here rendered unnecessary by the sheltered position beneath the bark.

Other flat-bodied bark-spiders of the genus *Hemicloea* are frequently observed in the course of entomological field-work, but only this species, with its egg-cocoon, has been determined with certainty.

*Argiope protensa* L. Koch.

This striking and handsome species haunts low herbage and rushes, among which its egg-cocoon may be found in February and March. It is suspended by a loose envelope of white fluffy silk in which the cocoon is supported by stays in several directions. The cocoon itself, with a length of  $\frac{1}{2}$  in., is cylindrical, rounded at the bottom, with a flat and dilated top. Its material is very close-textured lustrous silk, bearing a considerable resemblance to the case-stuff of the bag-moth (*Oeceticus omnivorus*), but exhibiting a much smoother surface. Its attractive appearance is heightened by its colours of greenish-white below, merging into a dark greenish-brown above, where the flat top with its crenate edges resembles, and probably functions as, a lid. As is almost invariably the case, the nest, at least in captivity, is built in a single night.

**Chiracanthium stratioticum L. Koch.**

Until recently the study of spiders in New Zealand has been almost entirely neglected ; and, since I was unable to ascertain the scientific name of this species, I knew it as "the brown manuka-spider," a name still used when Latin polysyllables sound too pedantic. The retreat is a den of transparent silk in a spray of leafy manuka. This retreat is fairly large, built of smooth, white silk, and has only one opening—a neat circular hole—near which sits the spider, her front legs on the edge of the orifice, ready for prey. I kept a specimen for several weeks. Once she caught a house-fly by chase, unaided by silk either to entangle the prey or to swathe it, as does the *Epeira* (*Araneus*). However, she had stretched entanglements of fine non-adhesive silk near the den, and flies were caught in these ; but in no case were the flies rolled up in silk, *Epeira*-fashion. The wings and head were disjointed or torn off.

*The Nest.*—I have found this in March. Several nearly parallel manuka-twigs are bound together to form a rough cylinder, by a sheet of stiff white silk of very close texture. Both the top and the bottom of the cylinder (length 1.2 in.) are flat and closely covered with the same material. However, this close, opaque sheeting is interrupted, both above and below, by a small window of jagged outline, covered with silk so thin as to be quite transparent and thus serve the purpose of a pane of glass. These are the loopholes of the fortress, at which, either at top or bottom, the self-immured spider is usually to be seen watching. Disturb the window with a twig, and the wildly waving legs of the female spider are immediately perceived, just below the transparent covering. Thus might the ingress of an insect enemy easily be prevented. Thirteen approximately parallel twigs are incorporated in the structure of the cylinder-walls, and act as strengthening-pillars. Between two of these uprights I cut the fabric longitudinally, to expose the contents of the nest. No sooner was a slit made than the head of the spider, with extended chelicerae, appeared in the opening, ready to repel invasion. A pen offered to her was attacked with great fury, the spider attempting to seize the point with her very long and slender fangs. She had presumably been a considerable time in the nest without food, her abdomen being small and shrivelled, scarcely a third the size of a specimen of equal age but lacking a nest. The egg-ball was approximately spherical, and was bound tightly to the side of the nest by a silken envelope, which also kept together the very large yellow eggs. I had kept this nest for a week without opening it, and in that time the spider did not emerge from the nest. I consider it probable that the female of this species remains self-imprisoned with her eggs to guard them until they hatch, when she probably dies. However, I found a nest on the 22nd March which contained young, the mother being still shut in with them, and exhibiting great activity in their defence.

***Philodromus rubrofrontus* Urquhart.**

Of this species the generic position is uncertain, but fairly abundant material is in hand for determining it. The spider itself is easily recognized by Urquhart's description. This crab-spider inhabits manuka-bushes, where its green colour renders it almost invisible. The nest, formed by joining leafy manuka-twigs with silk and covering the resulting oval with criss-crossed threads of fine, shining white silk, is about 1 in. long by  $\frac{3}{4}$  in. wide. There is one fairly round opening on one side, clear of silk and leaves,

but with these materials forming a network a short distance in front of it, so that an intruder would thread the maze and discover the entrance only with the greatest difficulty. With scissors I carefully cut away this labyrinth and widened the entrance; then cut down the side and spread out the nest book-wise. On one side, down the length of the nest was an irregular mass of white faintly green-tinged eggs, surrounded by a silk sheet which bound them tightly to the main fabric. Unlike those of some spiders, the eggs were not mutually adhesive, but fell apart when their enclosing silk was loosened. The female crouched near by. Another nest contained young spiders in company with their mother.

Genus ARANEUS (EPEIRA).

Of the common spiders with which I propose to deal here, we come now to this fascinating genus, the garden-spider. The following key will serve to distinguish the egg-cocoons of the commoner members of the genus:—

- Covering, flocculent silk; shape hemispherical—
  - Colour greenish .. .. . *A. pustulosus* Walck.
  - Colour orange .. .. . *A. browni* Urq.
  - Colour white .. .. . *A. sacitalis* Urq.
- Covering, smooth, white, close-textured silk; shape irregular,  
varying with exigencies of position .. .. . *A. crassus* Walck.

*Araneus browni* Urquhart.

This species is the largest *Epeira* in the Wanganui district, and, as most specimens show a more or less distinct crescent on the surface of the abdomen, near the cephalothorax, I call it the “crescent *Epeira*.” A nest was built in captivity in a single night in February. The ball of salmon-pink eggs was covered and securely fastened to the side of the jar and to a stick by a soft, thick layer of downy silk which was in parts white and in parts orange. This orange colour was not due to the tint of the eggs showing through the silk. The female was, naturally, much decreased in bulk, was very lethargic, taking no food, so that I thought her work was done and she was about to die. After three days’ abstinence, however, she ate daily and well. In twenty-seven days from the time of laying the eggs hatched, and on the same morning I found the mother dead. It would be interesting to know whether she had performed some last office, such as opening the cocoon for the young. The young remained in the same position in the nest and displayed but little signs of life until disturbed, when the whole living ball pulsated in a queer manner, owing to the individual struggles of the minute spiders. In sixteen days from the time of hatching—that is, in the middle of March—the young left the nest. The details of this exodus resemble those so graphically described by Fabre in *The Life of the Spider* (English translation). In the early morning or previous night the young spiders had swarmed out of the perforated lid of their jar and were scattered over a film-like web fastened at several points to the wall above the nest. The web was 3 ft. high, and extended irregularly laterally for nearly 4 ft. When touched the tiny spiders immediately dropped, but rapidly climbed to their former positions up the thread they had produced in their descent. Next day some still remained in the jar, but the nest itself was deserted. The web was widened considerably towards the open door of the shed in which the spider was kept, and the young spiders were gradually moving farther from the nest,

toward the light. On the 19th March the spiders were, for the most part, about 6 in. farther from the nest than on the 17th, but still a few stragglers remained in the jar. On the 23rd, seven days after first leaving the nest, all had left the jar, and not a single spider was in sight. All their movements had taken place at night: during the day they had maintained the same positions in the web; and yet they all moved toward the light of the open doorway.

*Summary of Life-history of Araneus browni.*—2nd February, nest built and eggs laid; 1st March, young hatched, mother died; 16th March, young left nest; 17th, some still in jar near nest; 18th, moving farther from nest; 19th some not yet left jar; 23rd, not a spider in sight.

#### *Araneus pustulosus* Walck.

This is throughout the country one of the commonest Epeirids, exhibiting a truly surprising variation in colouring and size, but always recognized by, among other characters, the black ventral quadrangular area on the abdomen, with the corners marked in white, and by the group of five posterior prominences.

A captive female built, as usual, in one night a nest in the form of a hemispheric dome of soft, dark greyish-green silk, covering a ball of pink eggs, and itself confined by a transparent veil composed of loose but strong strands of fluffy reddish silk, serving to fasten the whole nest to a support. The outer veil is too thin to affect the general grey-green hue. In this case the flat base of the dome was attached to the lid of the jar. The spider had shrunk in size, but was as active and fed as well as before. In about seventeen days after laying, the eggs hatched; but two days before, to my intense surprise, the old spider built a second nest upon the first. The young of the first nest dispersed in the usual manner, and the second batch of eggs hatched in about twenty days. This, however, was not to be the end, for nine days after these had hatched the indefatigable spider constructed a third nest, joined to the other two, and containing the usual ball of pink eggs. I think this is an unusual procedure—the making of three separate nests containing fertile eggs, within a few weeks of one another, the female being enclosed the whole time, without any possibility of communication with a male; but there is nothing to show that it may not be a normal occurrence, since nests built in contiguity or even one on another are by no means rare.

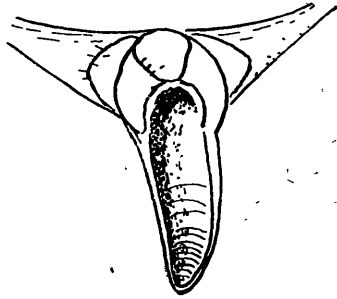
#### *Araneus orientalis* Urquhart.

With regard to this very beautiful species, de Dalmas maintains, probably correctly, that the male described under this name by Urquhart is really that of *Araneus browni*; but I wish to point out that the female of *A. orientalis* is indubitably a distinct species, however much the males may have been confused. This conclusion is based on the following bionomic and morphological characters:—

The nest, built in captivity in a single night, is almost exactly like that of *A. pustulosus*, but is slightly larger and rather more than a hemisphere. Its silk is dark grey-green in colour, quite different from the flaming orange fabric of *A. browni*. The flat base is built on a foundation of strong white silk. The female spider which constructed this nest agreed in every detail with the description of *A. orientalis* (female) of Urquhart. In addition, after nest-building she regained her appetite and recovered completely,

after the manner of *A. pustulosus*, but contrary to the ascertained habit of *A. browni*. From the much commoner *A. pustulosus*, *A. orientalis* is readily distinguished by her heavily annulated legs and the two pronounced antero-dorsal prominences of the abdomen, in both of which characters she approaches *A. browni*. She differs from both in the almost complete absence of a posterior prominence.

With regard to the epigyne, Urquhart (*Trans. N.Z. Inst.*, vol. 20, p. 121, 1888) gives the following description: "In mature examples a black, somewhat oval, rather pointed, deep-margined lip about half as broad as long, one-fourth longer than breadth of vulva, projects backwards from beneath the semi-pendulous process of the corpus vulvae." Three mature females have been carefully examined, and the external genitalia found to agree substantially with Urquhart's description. The long grooved lip is especially noticeable and very distinct from anything possessed by *A. browni* or *A. pustulosus*. The parts are a deep, shining black. (See figure.)



*Araneus orientalis*: ♀ Epigyne. × 18.

While the pattern of the abdomen seems constant, the ground-colour may be a deep velvety reddish or an equally lustrous green, the whole effect rendering Urquhart's name singularly appropriate. Recent experience also has corroborated Urquhart's statements both with regard to the sub-globose, dark-green cocoon, and the scanty irregularity of the web. The male has not yet been found. Mature females occurred at Wanganui in March and early April.

#### *Araneus crassus* Walck.

This exceedingly common species exhibits several well-marked varieties, all easily recognizable by the genital palp of the male and the epigyne of the female, both well figured by de Dalmas. A variety with tessellated abdomen and a transverse dorsal bar of china-white is exceptionally handsome.

The egg-cocoons may be found abundantly in late autumn. Dead twigs, branching finely, may be incorporated in an angular capsule of smooth, white, very tough silk, about  $\frac{3}{4}$  in. in greatest length, containing the eggs surrounded by soft flocculent silk. Outside the cocoon is an entanglement of fine light lines, sometimes extending in every direction for 3 in. Unlike most Epeirids, the mother, extremely shrunk after laying, may often be seen crouching on the cocoon, in defence of which she will bestir herself with unexpected vigour. Whole leaves may be joined and covered with silk to form a portion of the nest, which owes its irregularity to these chance supports.

#### GENERAL NOTES.

The drone-fly (*Eristalis tenax*) was eaten with the greatest willingness by *Araneus pustulosus* and by other species, in captivity and in the field. This experiment is not, however, important, as both the fly and the bee

which it is supposed to mimic are introduced; and, in any case, bees are sometimes caught by spiders, though they are handled with great caution.

On the same subject of mimicry and warning coloration the following experiments offer more interest:—

*Araneus browni* in captivity repeatedly refused *Nyctemera annulata*, the black-and-yellow day-flying Hypsid moth. The same moth was rejected time after time by the large hunting-spider, *Dolomedes imperiosus (minor)* L. Koch. It is suggestive that both these spiders ate readily many other moths, from Pyralids to Porinae. The following experiment was tried on a free specimen of *Araneus browni* in its fully-formed web between two rose-bushes. By lamp-light, in the evening, I placed in its web the following live moths: first *Nyctemera annulata*, then *Declana floccosa*, and lastly *Rhapha scotosialis*—all fair-sized moths. The spider sprang on each in turn and first applied its chelicerae, without discriminating between the moths. Then the victims were rotated and swathed in silk in the usual way, the three cylindrical parcels thus obtained being left hanging in the parts of the web where they had each been caught. The untimely destruction of the web prevented my ascertaining whether all these moths were finally eaten.

Spiders, owing to the ease with which they may be induced to build their nests in captivity, and the many unexpected peculiarities of habit which they display, should become favourite objects of study to those interested in the life-processes of the lower animals.

In conclusion, I should like to express my thanks to the Comte de Dalmas, of Paris, and to Mr. E. K. Lomas, for their invaluable assistance in the identification of specimens and in the procuring of spider literature. *Araignées de Nouvelle-Zélande (Ann. Soc. Ent. de France)*, by Comte de Dalmas, is indispensable. To Professor H. B. Kirk and Mr Lomas I am indebted for reading the manuscript.

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ART. XXIX.—*Notes on the Hemiptera of the Kermadec Islands, with an Addition to the Hemiptera Fauna of the New Zealand Subregion.*

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THOUGH the kindness of the Dominion Museum authorities I have been enabled to examine a small collection of Hemiptera made in the Kermadecs during 1908 by W. L. Wallace, of the W. R. B. Oliver expedition. Of the eight species represented, one is not in a condition to be determined with accuracy; one is pelagic, with a wide distribution in the Pacific; one is common to Australia and New Zealand, though rare in the latter; one is probably new; while all the rest are New Zealand species.