

prey by spitting a gummy secretion with poisonous properties at them, and in a lecture I gave to the Natural History Section of the Siam Society in Bangkok on January 15th, 1931, I recorded this observation made on four different species of this family in Malaya and Siam*; but on my return to England I found that an Italian naturalist † had seen the same thing two years previously ‡. His observations on *Scytodes thoracica*, Latr., have been confirmed by Dr. I. Millot, of Paris, and supplemented by two able papers by that author §, in which his careful histological work is described.

My observations were made on *Scytodes venusta*, Thor., *S. marmorata*, L. K., *S. domesticus*, Dol., and an undescribed Sicariid collected in the Batu Caves near Kuala Lumpur, and they agree closely with what has been written by Monterosso and Millot. At a distance of about a quarter to half an inch the spider gives a convulsive jerk of its entire body, and the next thing one sees is that the insect is in difficulties. Under a microscope it was found that the insect was securely stuck to the ground and entangled by parallel bars of viscid gum. These bars, which vary in number from ten to twenty, are probably formed according to some law of surface tension. They are at right angles to the longitudinal axis of the spider. I have seen this ejaculation of gum on at least fifty occasions, but so rapidly did it take place that I could not satisfy myself as to whether the gum emanated from the mouth or the fangs. Dr. Millot's dissections show conclusively that the glands open out into the chelicerae. On several occasions I noticed that the insects died as a result of contact with the fluid; some small nematoceros flies died within a quarter of a minute, but in other cases the effect was much slower and did not always result in death. This also is explained by Dr. Millot's work, for he shows that the size of the glands in different individuals of the same age and species vary markedly. Monterosso did not observe the poisonous properties of the gum; Millot, on the other hand, not only saw the poisonous effect, but also conclusively showed, by making sections of the

* An account of the lecture was published in the 'Bangkok Times' and the 'Siam Observer' on Jan. 15th, 1931.

† M. Monterosso, Arch. zool. Ital. vol. ii. p. 63 (1923).

‡ Prof. Gerhardt has noticed that the male spits at the female before mating (Zeit. Morph. Oekol. Tiero A, 1926).

§ C. R. Acad. Sc. Paris, Juillet 1929, p. 119; Bull. de la Soc. Zool. de Fr. lv. 1930, p. 150.

cephalothorax, that the large glands which exist are partially subdivided and that one division contains a gummy and the other a poisonous fluid. This discovery is an interesting confirmation of the theory that the spinning-glands of certain Arachnids, such as the Pseudoscorpions, and the poison-glands of spiders is homologous. I made this suggestion in my lecture to the Siam Society, and Dr. Millot deals at some length with the same conclusion. The Sicariids are a primitive family in many respects, and here we have a transition from the one function to the other. Dr. Millot shows that in the genus *Scytodes* the poison- and gum-producing glands are both present, but in the genus *Loxosceles* the latter are wanting or vestigial.

Spiders of the family Sicariidæ are restricted to the warmer parts of the world, and the species on which Monterosso and Millot have experimented, *Scytodes thoracica*, Latr., is a Mediterranean one. There it is found under stones, and I have taken it in abundance in such situations in Majorca, but further north it is rare and takes to living in houses. It has been found on rare occasions in southern England, Oxford (twice) being its most northerly record, and Dorset being the county in which most specimens have been taken (Studland, Bloxworth, Weymouth). The Rev. J. E. Hull tells me that he was sent no less than twelve specimens from Studland a few years ago. It has also been recorded from Guernsey, Dover, Tunbridge Wells, and Hastings. The Sicariids are nocturnal in habits, their movements are slow, and their jaws small, so that arachnologists have wondered how they ever managed to catch or overpower anything. Now we know.

LXIV.—Notes on the Biology of Spiders.—VII. Flies that triumph over Spiders. By W. S. BRISTOWE, B.A., F.Z.S.

“Will you walk into my parlour,
Said the Spider to the Fly.”

ALTHOUGH flies must be looked upon as being the staple diet of spiders, there are some that never or scarcely ever eat flies. Many of the Linyphiids probably subsist mainly on Collembola, although small Nematoceros flies are certainly captured as well; but the Drassids (*Drassodes* and *Zelotes*) will usually refuse flying insects and feed on the crawling forms of life that they meet with under stones and at the

roots of herbage. This is the first rebuff to popular belief, but there is much more to follow, for some flies play with spiders, if we may be permitted to use an anthropomorphism, others share house with them, some parasitize them or their eggs, and yet others actually attack and eat them!

In Ceylon, India, and Malaya I have frequently seen rows of long-legged Tipulid flies (*Thrypticomys* sp.) hanging by their two front legs on the stay-lines of Epeirid spiders' webs, like washing hung out to dry on a clothes-line; and in England I have seen Cecidomyiids behaving somewhat in the same fashion. Mr. F. W. Edwards tells me this has also been recorded for W. Africa, and that in England he has found the mosquito, *Theobaldia morsitans*, making similar use of spiders' webs. The stay-lines of the web are not sticky, and the flies take to flight if they are disturbed; so it would appear as though this is simply a case of their finding it to be a comfortable resting-place.

On one occasion at Cobham I saw *Scatophaga stercoraria*, Linn. (Cordyluridæ), the common dung-fly, sitting in the web of *Epeira diademata*, Clerck, the garden spider, and sucking the juices of an insect which had been wrapped up by the spider. This stealing from Epeirid spiders' webs is also resorted to by wasps. In England I have seen *Vespa vulgaris* drag a struggling fly out of the web of *Epeira diademata* before the owner had time to get there; and in Malaya, near Kuala Lumpur, I have seen a Crabronid carefully examining the small flies caught in the giant web of *Nephila maculata*, giving each a little tug, and finally pulling one free by force and flying off home with it.

Flies have been seen sitting on the backs of spiders, and the explanation of this habit is not so clear. In a letter (29. x. 28) Mr. J. E. Collin writes:—"In some cases riding flies acquire the habit because they get a lift to some substance upon which to lay eggs. For example, *Limosina sacra* and *L. equitans* riding on Dung Beetles." This may be true for certain flies, but others choose this dangerous seat with food and/or parasitism in view. H. Kramer (Abh. Naturf. ges. Görlitz, 1917, p. 348), for instance, records finding a white spider (almost certainly *Thomisus onustus*, Walck., or *Misumena vatia*, Clerck) sharing its meal of a dead hive bee with some Miliichiid flies, *Desmometopa sordida*, Fall., and Mr. O. W. Richards tells me he has seen the same thing. In his case the spider was definitely *Thomisus onustus*, Walck., and the fly probably *D. sordida*. The flies of this family have frequently been seen sitting on the backs of spiders,

waiting, it would seem, in the light of these observations, until the spider catches an insect (see McCook, 'American Spiders and their Spinning Work,' vol. i. p. 256: "Many small flies sharing the food of *Argiope aurantia*, Luc. (= *A. cophinaria*) and sitting on her back").

In 1927 Mr. G. L. R. Hancock sent me a large Epeirid spider, *Cyrtophora* sp., from Uganda, on whose back he had found considerable numbers of small (1 mm.) black Chloropid flies of the genus *Gaurax*. It would appear as though parasitism was here their purpose, for flies of this genus, of *Siphonella*, *Oscinella*, and *Trimerina* have been bred from the egg-cocoons of spiders (Coquillet, Bull. 10, New Series, Div. of Ent. U.S.A. 1898, and Proc. U.S. Nat. Mus. xxii. p. 265). The *Cyrtophora* was gravid, though whether the flies were aware of this is difficult to say.

The family Acroceridae appear to specialize on the parasitism of spiders and their eggs. The fly, it is said, lays eggs on stems of plants or other appropriate places, and the larva finds the spider or the eggs itself. Brauer has described the habits of a European species, *Astomella lindeni*, which he bred from a trapdoor-spider, *Cteniza ariana* (Verh. Ges. Wien, xix. 1869, p. 737), Emerton of an American *Acrocera* parasitic on the Amaurobiid, *Amaurobius bennettii*, Bl. (= *A. sylvestris*, Em.), and E. Nielsen of *Acrocera globulus*, Panz., on a Lycosid in Denmark ('De Danske Edderkoppers Biologi,' 1928, p. 677). In the first and last of the above observations the larva emerged from the abdomen of the spider to pupate, and the spider died. In the second observation no trace of the spider was found, but the full-grown larva was in the spider's web, so it was presumed that the spider had been killed.

Mr. G. H. Locket recently bred a British Acrocerid, *Oncodes pallipes*, Latr., from the Lycosid *Tarentula barbipes*, Walek. ('Entomologist,' Nov. 1930, p. 241). Prior to this Giard had found a pupa of this fly near the remains of a spider of the genus *Clubiona* (Bull. Soc. Ent. Fr. 1894, cliii.), and Menge bred either this species or *Heuops marginalis*, Meig., from *Clubiona putris*, Koch ('Preussische Spinnen,' p. 37). Locket's spider was a male, and an interesting feature noted by him was that this male constructed a burrow two days before its death, after the manner of the females of this species. He suggests that this is to be explained by the "internal pressure on the body" which in the female "will be produced by the eggs." It seems possible, however, that

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parasitic castration similar to that found in crabs parasitized by *Sacculina* may be the explanation. Mr. Locket tells me that the male showed no outward differences from a typical male, but this would hardly be expected in spiders if we assume that parasitization took place after the last moult.

In Brazil, near Rio de Janeiro, I found several Phorid flies of a hitherto unknown species, which Dr. Borgmeier is calling *Pericyclopera arachnophila*, living in the burrows of an Aviculariid spider, *Trechona venosa*. The flies, which were too small to attract the spider's attention, were fulfilling the function of housemaids, and breeding in the remains of the spider's meal. In England I have bred *Aphiochata rata*, Wood, from the remains of a *Theridion ovatum*, Clerck, which presumably had died before the fly laid its eggs. Another fly of the same genus, however, laid its eggs on spiders, *Trochosa terricola*, Thor., paralyzed by the wasp *Psammochares viaticus*, Linn., before they died.

To complete these preliminary notes on the relationship of flies to spiders, I must cite the records known to me of flies actually attacking and eating spiders. Miss E. K. Pearce, in her book on 'Typical Flies,' published by the Cambridge University Press in 1915, says on p. vii.: "certain flies prey on insects and spiders." On being asked for details she informed me that this referred to an observation made by Prof. Theobald on an Asilid, but neither she nor Prof. Theobald could give me the species of fly. D. Melin records *Leptogaster cylindrica*, Deb., preying on "a small spider" (Zool. Bidrag Upsala, 1923, p. 1). Apart from this, there are my own records on an Asilid in Brazil* and an Empid in Ireland. Near Rio de Janeiro I saw two males of the Asilid *Plesiomma fuliginosa*, Wied., seize Epeirid spiders, *Epeira grayi*, Bl., which were sitting in the centre of their webs, and calmly remain seated in the web whilst they devoured the owner. The commotion in one of the webs attracted the attention of the male spider, which came down to see what was happening and then beat a hasty retreat. My other observation was made at Fenit (Co. Kerry) on June 28th, 1929. Spiders were massed on a wall for migration, and an Empid, identified by Mr. J. E. Collin as *Tachydromia pallidiventris*, Mg., was seen eating a female *Erigone dentipalpis*, Wid.

Thus spiders do not have it all their own way.

* "Notes on the Habits of Insects and Spiders in Brazil," Trans. Ent. Soc., Feb. 1925, p. 483.

LXV.—Hydroconophora and Hydrokerion: Two new Genera of Cretaceous Hydractiniidae. By Prof. J. W. GREGORY, LL.D., D.Sc., F.R.S.

[Plates XVIII. & XIX.]

THE Hydractiniidae of Allman* is a group of which but few certain fossil representatives are known, but is of interest—as shown in 1877 by Carter in Ann. & Mag. Nat. Hist. ser. 4, vol. xix. pp. 44-76, pl. viii., in the paper that laid the basis of the geological history of the family—from its possible affinities to the Stromatoporidæ and such genera as *Porosphaera* and *Parkeria*. Mr. G. E. Dibley, F.G.S., of Rochester, has collected from the Kent Chalk some flat cone-bearing fossils which are now in the Hunterian Museum, Glasgow, and in the Rochester Museum. Preliminary examination of these fossils, made at Mr. Dibley's request, showed an apparent combination of the characters of *Hydractinia* and *Porosphaera*. They therefore appeared to support the view of Steinmann and von Zittel as to the near affinity of these genera; for Steinmann † included them both in one family, the Corynidae, and von Zittel ‡ placed them both in one order, the Tubulariæ, which he did not divide into families. These views are opposed to the conclusion of Delage and Hérouard §, who refer *Hydractinia* and *Porosphaera* to widely separate divisions; for they include *Hydractinia* in a family of the suborder Gymnoblasiidae; they place *Porosphaera* among the Hydrocorallida, but consider that it may be a Foraminifera.

The material sent by Mr. Dibley in connection with the cone-bearing fossils included four series of structures—large thin encrusting sheets with conspicuous cones, fossils composed of a sheet of polygonal plates with a raised aperture at or near the middle of each plate, some molluscs with isolated cones, and three specimens of hemimorphic crystals of calcite. Despite the extreme differences between these four sets of specimens, they have at least one point in

* J. G. Allman, 'Monograph of the Gymnoblasiæ or Tubularian Hydroids,' Ray Soc. 1871, p. 342.

† G. Steinmann, "Ueber fossile Hydrozoen, aus dem Familie der Coryniden," Palæontogr. 1878, xxv. p. 103.

‡ von Zittel, 'Handbuch der Palæontologie,' vol. i. pt. 1, 1870, p. 282; and 'Grundzüge der Palæontologie,' 1895, pp. 101-2; 'Textbook of Pal.' vol. i. 1900, pp. 110-11.

§ 'Traité de Zoologie Concrète,' vol. ii. pt. 2, 1901; 'Les Coelentérés,' pp. 71-74, 113.