

probably fed on the grass, that he was familiar with a hirsute species (*L. rubiginosa* Lec.) in Kansas which was very abundant in the early evening about the 1st of June on a low perennial plant (*Ceanothus americanus*), and he thought it very possible that the species observed by Mr. Schwarz would be found to feed on some low perennial and not on grass, especially as grass had never been recorded as a food-plant of adult *Lachnosternas*.

Mr. Mann remarked that various day-flyers are frequently attracted to the light and referred to the fact reported by Scudder of the flight at night of butterflies.

Mr. Schwarz said that by no means every insect attracted by electric and other strong lights could be considered as a night-flying species. The rays of light awakened many day-insects in their resting places in the vicinity of the light and these insects would then naturally fly towards the light, but they would rest quietly during the whole night if there were no lights near by.

Mr. Howard remarked that perhaps some of the beetles considered as night-flyers were so classed simply on the fact of their being commonly attracted to light.

Mr. Mann also referred to the migration of butterflies as a further illustration of the night flying of insects commonly considered to be diurnal in habit.

Mr. Schwarz said that this should be considered not as the normal, but as a seasonal habit and had an entirely different explanation.

Mr. Howard read the following paper :

THE HABITS OF MELITTOBIA.

BY L. O. HOWARD.

In Mr. Ashmead's interesting paper upon this curious genus of parasites, read before the last meeting of the Society, the question of the priority of this genus over *Anthophorabia* Newport is once more brought up. There should be no question as to the priority of Newport's name; it does not date from the publication of his description in the Proceedings of the Linnean Society of London, but from the Gardener's Chronicle for March 24th, 1849. With the morality of Mr. Newport's course we have nothing to do. The question resolves itself to

the acceptance of the Gardener's Chronicle as a medium for scientific description, as to the identity of the two forms, and as to the sufficiency of Newport's description. Westwood and Newport themselves had a polemical discussion of the matter in the Annals of Natural History, Vols. III and IV, and their relative descriptions were published in this periodical as well as in the Gardener's Chronicle, Proceedings of the Linnean Society of London, and Transactions of the Entomological Society of London. In the general opinion of naturalists, the Gardener's Chronicle was at that time a valid medium. Fred'k Smith has vouched for the identity of the forms, and although Newport's description of the female is indefinite, that of the male is unmistakable. The few words published by Westwood in 1847, however accurately we now know the insect to which he referred, would never be considered by a systematic zoologist of to-day as competent to fix a generic name. They were in fact, not so intended.

Mr. Ashmead's paper being mainly structural, a resumé of the habits of this curious parasite will be appropriate at this time. The first mention occurs in Westwood's Introduction to the Modern Classification of Insects, Vol. II, p. 160 (1840), in which he gives an account of the transmission of specimens to him by Audouin, who had found them in the provisioned nests of *Odynerus*, *Anthophora*, and *Osmia*. The second mention is that of Westwood in the Proceedings of the Entomological Society of London for 1847, p. xviii. Then followed Newport's and Westwood's descriptions previously referred to, the most important, biologically, of these contributions being the first one by Newport in the Proceedings of the Linnean Society. In this paper he states that his personal observations dated back to August, 1831, and we cannot doubt that after having known these insects so long, his desire not to be anticipated in publication by Westwood, whose possession of facts he first became aware of at the meeting of the Entomological Society of July 5th, 1847, induced him to rush hastily into print in the Gardener's Chronicle, and placed him in the very unenviable light to which Mr. Ashmead has called such strong attention, 43 years later. Newport found the larvæ filling the cells of *Anthophora*, of the larvæ of which scarcely a vestige was left. In the paper read before the Linnean Society February 3d, 1852, he details finding the larvæ of the parasite attached to the larva of the bee in November. They were minute in size, and were not observed to grow during the winter. He thus considered *Anthophorabia* a primary parasite.

Frederick Smith, in the Transactions of the Entomological Society of London for 1853 (new series, Vol. II, p. 248) details a series of observations by himself upon the same insect. He

found the parasitic larva feeding upon *Monodontomerus*, itself a primary parasite of *Anthophora*. His observations were full and undoubtedly correct. No more than three eggs or larvæ were found upon a single host larva, and 12 or 14 days appear to be the time occupied in feeding. He reared the adult insects and found that the male lives on an average seven weeks, and is very salacious, copulating with several females. The males were few compared to the females, and as they are wingless they must necessarily be long lived. He found that the *Melittobia* preferred the primary parasite to the bee larva. He placed larvæ of the *Monodontomerus* and also of the bee in a box with the *Melittobias*, and found that they invariably first attached themselves to the cells containing the parasitic larvæ, although in a number of cases they also oviposited upon the bee larva. The females continue egg-laying for a long time (42 days). Smith expresses the opinion that *Melittobia* and *Anthophorabia* are identical.

That careful observer, Dr. J. Giraud, in the *Annales de la Société Entomologique de France* for 1869, pp. 151-156, gives a series of observations upon the same insect made by himself near Vienna and Grenoble. He proved to his perfect satisfaction that the insect prefers to lay its eggs upon primary parasites in the cells of bees rather than upon the bee larvæ. Thus he observed them feeding upon the larva of *Monodontomerus* again and also upon the larvæ and pupæ of *Leucospis*, a Chalcidid which attacks various mason bees. He has reared the *Melittobia* from the cells of the following genera of *Aculeata*: *Chalicodoma*, *Stelis*, *Osmia*, *Anthidium*, *Bombus*, *Trypoxylon*, and *Odynerus*. He found that the eggs hatch in eight days and that four or five larvæ remain attached to each host larva, whose body began to diminish in size. Fifteen days afterwards they ceased to feed, transformed to pupæ and in eight days transformed to adults. He was able to follow three generations in the space of three months. Smith had remarked upon the large size of the eggs, but Giraud states that after being deposited they acquire a turgescence which augments their volume. The presence of the eggs upon the body of the host larvæ appears to cause no inconvenience, and after they have been removed with tweezers the host successfully transforms. Giraud found it difficult to understand how these little parasites, which have only a very weak and short ovipositor, could reach the larva upon which they oviposited. To penetrate a hard parchment-like cell such as that of *Chalicodoma* or other bees and to reach the larva which does not always exactly fill the cell appeared to him beyond their power, but he found that the female after walking around upon the intact cell for awhile

finally stops at a given point and begins to gnaw the membrane until a perforation has been made. She then crawls through this hole into the cell and deposits her eggs upon the body of the larva, remaining inside and continuing oviposition for several days.

Another host-insect was added by Sir Sidney Saunders, who exhibited before the Entomological Society of London in 1880 specimens of *Melittobia* reared from a briar inhabited by *Prosopis rubicola* (See Trans. Entom. Soc. Lond. 1880, Proc. p. xvii).

With Packard's observations upon the species which he found in this country parasitic in the cells of the leaf-cutter bee (*Megachile*) we are all familiar. It is noteworthy, however, that with the species which he described as *Anthophorabia megachilis* 150 larvæ were found clustering upon the outside of the dead and dry bee larva, thus establishing primary parasitism with this species. This extraordinary number of specimens upon a single host larva is very remarkable in view of the observations of Newport, Smith and Giraud. Packard also records a rearing from the cells of *Ceratina*.

Mr. Ashmead's paper adds two entirely new hosts in *Pelopæus* and *Chalybion*, and, as I pointed out at the last meeting, were it not for the earlier rearings of European workers, the true host relations would be difficult to ascertain on account of the heterogeneous nature of the contents of these mud-dauber cells. Mr. Ashmead did not ascertain whether with these wasp-cells the parasitism was primary or secondary.

Mr. Ashmead also mentions Professor Riley's rearing of *A. megachilis* from the cells of *Anthophora* in 1877, and it is interesting to note that Professor Riley also reared a *Monodontomerus* from the cells of the same insect.

A most interesting variation in the habits so far recorded has been contained in Prof. Riley's unpublished notes bearing on the life-history of *Hornia* and *Anthophora* for the last thirteen years and has not before been published. It is here mentioned with Dr. Riley's permission. On October 9, 1877, a number of dipterous puparia were found in the cells of *Anthophora retusa*. In April and May, 1878, a number of the adults issued and proved to belong to the genus *Syllegoptera*. Previously, however (Mar. 18), a number of *Melittobia* parasites issued from the puparia and were mounted.

This very remarkable variation in habit was not to remain unique, however, for on September 25, 1891, Mr. A. N. Caudell, of Indian Territory, sent in to the Division of Entomology specimens of the same species reared by Mr. Ashmead from *Pelopæus*, which he had also reared from a mud-dauber's cell. He, however, had broken open the cell and had

discovered that the parasite came from the *puparium of a dipterous insect* occurring therein. He did not succeed in breeding the dipteran, although it occurred very abundantly in the mud-daubers' nests, but sent four of the puparia from which specimens of the parasite issued both on the journey and after receipt. Forty-one specimens were reared after their arrival in Washington, four being males and the rest females. They were observed in copulation, and both sexes appeared to be very active.

I append a tabulated list showing the host-relations of the different species.

TABLE OF THE HOST RELATIONS OF ANTHOPHORABIA-MELITTOBIA.

<i>Host.</i>	<i>Species.</i>	<i>Observer.</i>
Anthophora	A. acaste (Walker)	Audouin. Newport. Smith. Giraud.
Osmia	"	Audouin. Giraud.
Odynerus	"	Audouin. Giraud.
Chalicodoma	"	Giraud.
Stelis	"	"
Anthidium	"	"
Bombus	"	"
Trypoxylon	"	"
Monodontomerus	"	Smith. Giraud.
Leucospis	"	"
Prosopis	"	Saunders.
Megachile	A. megachilis (Packard).	Packard.
Ceratina	"	"
Anthophora	"	Riley.
Monodontomerus	"	"
Pelopæus	A. pelopœi (Ashmead)	Ashmead.
Chalicodoma	"	Pergande.
Anthomyiid puparia	"	Caudell.
Syllegoptera	"	Riley.

In the discussion Mr. Ashmead stated also that the question of priority was of course settled if Newport published his description in the Gardeners' Chronicle before Westwood.

There followed a paper, read by Mr. Howard, recording the conjoint observations of Messrs. Howard, Chittenden and Marlatt. The communication in substance was as follows :