

PSYCHE.

COMMUNAL COCOONS AND THE MOTHS WHICH WEAVE THEM.

BY W. J. HOLLAND, PH.D., PITTSBURGH, PENN.

[Annual address of the retiring president of the Cambridge Entomological Club, 13 January, 1893.]

One of the comparatively recent discoveries in the field of entomological investigation has been that of the curious habit possessed by certain lepidopterous larvae of living in communities and weaving for themselves a large outer cocoon, or envelope, in which they each subsequently spin a smaller cocoon in which they undergo transformation into the chrysalid state, and from which they subsequently emerge as moths. Thus far this habit has only been observed in the hyponomeutid genus *Hyphantidium*, the genera *Anaphe*, Walk., and *Hypsoides*, Butl. (*Coenostegia*, Mabille), which have been commonly referred to the *Noto-dontidae*,* and the pyralid genus *Coenodomus*, Walsingham. To this list I now have the pleasure of adding a liparid moth from tropical West Africa, for which I propose the generic name *Oecura*, and which I shall specifically designate by the name of its discoverer, the earnest and talented explorer, Rev. Dr. Good, to whom I have in recent

years been indebted for many notable acquisitions to my collection. I also append the description of two new species of *Anaphe*, from the tropical West Coast of Africa, *A. clara*, mihi, and *A. subsordida*, mihi (*vide infra*).

The first reference which I have been able to find to the curious habit to which I have made allusion is in an article communicated by Dr. Ch. Coquerel to the Entomological society of France at its meeting held Dec. 13, 1854, and published in the *Annales* for the year 1855.† He alludes to the great cocoons as well known objects, "On connaissait depuis longtemps ces grandes poches de soie qui garnissent souvent toutes les branches principales de plusieurs arbres de Madagascar appartenant pour la plupart à la famille de Légumineuses (*Sutria* ‡ *Madagascariensis*, *Mimosa Lebbek*, etc.) mais on n'avait jamais décrit les insectes qui forment ces cocons, avec

† Observations entomologiques sur divers insectes recueillis à Madagascar. 5me partie. Par M. le Dr. Ch. Coquerel, *Annales de la Soc. ent. de France*, 3me serie, vol. iii, p. 529 et seq.

* Probably more correctly referred to the Liparidae.

‡ *Intsia Madagascariensis*. "*Sutria*" is a misprint.

lesquels les Malgaches tissent des étoffes remarquable par leur éclat et leur solidité." He informs us that the caterpillars of *Bombyx* (*Hypsoides*) *Radama*, Coq., live after the manner of the common European processionaries, and after having woven in common an enormous pouch which is often several feet in length, each forms in its interior an individual cocoon, and there undergoes the final transformation. The species described by Coquerel in this paper are *Hypsoides Radama*, and *H. Diego*, and *Anaphe Panda*, Boisd., the latter from Natal, in reference to which Mons. Coquerel remarks that it has the same larval habits as the two Mascarene species, and that its silk is employed in the same way by the natives of the country in which it is found. Subsequently, in 1863, Dr. Coquerel and Mons. A. Vinson published another paper upon this subject in the Bulletin de la Société d'acclimatation et d'histoire naturelle de la Réunion, and followed it in 1866 by a paper in the Bulletin of the French Société d'acclimatation. The last article by Dr. Coquerel which treats of the subject is contained in the Annales of the Entomological society of France for 1866, having been presented at the meeting of the Society held in July of that year. This article is accompanied by a plate representing the cocoons and outer cocoon-bag woven by *H. Radama*. Meanwhile in 1859 Mr. A. W. Scott published in the Proceedings of the Zoological society of London a paper in which he described a moth found in New South Wales, which is referred to

the Hyponomeutidae, and to which he gave the name *Hyphantidium sericearium*. The social habits of the larvae of this insect are remotely related to those of the Mascarene insects described by Coquerel. The paper of Mr. Scott is accompanied by a plate giving anatomical details of *Hyphantidium*. For seventeen years after the publication of the last paper by Coquerel, or from 1866 to 1883, nothing appears to have been added to the literature of this interesting subject, though Mr. A. G. Butler in 1877 and again in 1878 described a species of *Anaphe*, the former from Ambriz, and the latter from Old Calabar; and in 1882 erected the genus *Hypsoides* for the reception of *H. bipars*, a new species from Madagascar, strictly congeneric with *Bombyx Radama*, Coq., and *Bombyx Diego*, Coq. In 1883 Carl Fromholz published an article in the Berliner entomologische zeitschrift (Band xxvii, pp. 9 *et seq.*), in which he gives an interesting account of the larval habits of *Anaphe panda*, Boisd., based upon material which had been presented to the entomological museum at Berlin by the German savant and traveller, Dr. Fischer. The paper is accompanied by a plate upon which the larva and the cocoon-bag of *A. panda* are depicted. According to the information given by Dr. Fischer the natives of the region about sixty miles inland from Dar-es-Salaam, where the cocoons were obtained, report that the caterpillars occupy the nest, which they weave as a common home, for two years before

emerging as moths. The nests, according to the same authority, are collected by the blacks, and in times of want are added to the stores of the native larder.

The next contribution to the literature of the subject is the masterly article by Lord Walsingham published in the Transactions of the Linnean Society for the year 1885, founded largely upon material communicated to the writer by Col. J. H. Bowker. This article is profusely illustrated, and Walsingham describes and figures two new species of the genus *Anaphe*, *A. infracta* and *A. carteri*. According to information given Lord Walsingham by Col. Bowker, the natives of South Africa use the silk of the cocoon-bags in cases of injury very much as oiled silk is used by surgeons in more civilized lands. Lord Walsingham followed his paper upon the genus *Anaphe* by a paper published in the Transactions of the Linnean Society for 1887 upon *Coenodomus Hockingii*, Wls., a curious pyralid moth found in the Punjab, which has larval habits somewhat closely allied to those of the African genera *Anaphe* and *Hypsoides*. This paper is accompanied by a most excellent plate, giving full details.

In 1888 Mr. H. Druce described in the Proceedings of the Zoological society of London a new species of *Anaphe* from Gambia, which he names after its discoverer, *A. Moloneyi*. Mr. Druce says that the cocoon of this species, which had been presented to him by Capt. Moloney, was "almost the shape of a large pear, about five inches long, and

was found hanging from the branch of a tree by a fine silken thread." He also notes the fact that he had recently received from Mr. A. Higgins a specimen of the cocoon of *A. infracta*, Wls., obtained at "Ile Ife, about fifty miles inland from Lagos, where they are very common, hanging from trees." He adds "The natives eat the larvae, which are of a reddish brown color; they fry them in palm-oil. Mr. Higgins informs me that they are of a sweetish taste when cooked. They also make use of the silk, taking it from the cocoons, washing it, and forming it into hanks, which they sell in the market-places; it is also made into rough cloths by the women." The cocoon given to Mr. Druce by Capt. Moloney yielded Mr. Druce about sixty moths, and I am personally indebted to him for a fine suite of this species now in my collection. Thus far I have not received any specimens of *Anaphe infracta* from any of those persons, who have collected for me upon the West African coast south of Cape Lopez, but I have received several cocoons of *A. Moloneyi*, from one of which, represented in the plate, about eighty moths had emerged previous to shipment. The last cocoon sent me was delayed in transit, and upon opening the tin box containing it, I found the remains of a large number of moths which had emerged and perished upon the journey.

The cocoons of *A. Moloneyi* which I have received have not been suspended by a thread of silk, but are firmly fixed among the outer twigs of branches. The

cocoon represented upon the plate is $6\frac{1}{2}$ inches in the major, and $3\frac{3}{4}$ inches in the minor diameter. The cocoon of *Oecura Goodii* depicted upon the same plate is flattish and was found attached to the trunk of a tree, and superficially in form and color strikingly resembles a reddish brown fungoid growth. It is $6\frac{3}{4}$ inches long and $4\frac{1}{2}$ inches wide upon the longest diameters, and at the deepest point in the middle not more than 1 inch thick. Dissected across the middle its section presents the form of an arc, the chord of which represents the base by which it was attached to the bark of the tree. The inner cocoons are less than an inch in length and about one-third of an inch in diameter, and are arranged with the longer axis in a position vertical to the base in the middle, and as the outer circumference is reached with the longer axis sloping inwardly, while just at the edge a few cocoons are disposed horizontally to the base. The cocoons are very compact, and imbedded in layers of soft silk. The outer investiture or covering is composed of several distinct layers and superficially is smoother and more compact than in the cocoon of *A. Moloneyi*. When the insect emerges from the inner cocoon it has also to force its way out through the tissues of the external envelope, which yield to the advance, but close again, leaving hardly any trace of the perforation. There is no common passage for exit.

It is worthy of note that these insects appear to be peculiarly subject to the attacks of parasitic enemies. Fromholz

describes a lepidopterous parasite to which he gives the name *Zophodiopsis hyaenella*, and which from the description and figure I judge to be identical with the insect described by Coquerel in 1885 as *Chilo carnifex*. The same insect is found upon the West African coast. Walsingham figures a Tachina, *T. Onchestus*, Walk., which preys upon the larvae. I have a series of Tachina which emerged from the cocoons figured upon the plate, but which do not appear to be identical with the species named by Walker.

I append some extracts from the notes sent me by Mr. Good.

No. 100. (*Oecura Goodii*, Holl.)

“March 7th, 1891. Seven days ago, March 1st, my boy returned from down river with the queer object labelled No. 100. He found it attached to the trunk of a tree and pulled it off. Three days ago I saw it first, and pulled off one of the cocoon cells. Cutting it open I found a caterpillar about half changed to a chrysalis. They must only have just spun up when they were discovered.

May 9th. Three moths came out in the box in which this “comb” of cocoons was kept. I thought they came from it, but I could only find very small rents in its face, so I waited for more to emerge. No more came out till May 11th, when, to make certain that they had not come from something I had forgotten in the ground at the bottom of the box in which they were, I turned out all the earth.

May 19th. Today two more of these

moths came out, but one had damaged itself.

May 22nd. Another moth emerged.

May 23rd. Another moth hatched.

May 30th. Another moth has come out.

A large number of flies, not moths, (*Tachina*), also came out of this mass of cocoons, each one of which had of course destroyed a chrysalis. Two of these I send pinned and numbered 100."

No. 121. (*Anaphe Moloneyi*, Druce.)

"Sept. 29th, 1891. This morning a native brought me the cocoon numbered 121. I have seen several similar cocoons before. I supposed this to have been spun up by a single very large caterpillar. I bought it and laid it down on my table till I could finish what I was doing, when the boys called to me, and pointed out that a moth had come out, and there it was, creeping up the wall, where it finally settled in order to allow its wings to develop. I now realize that I have another multiple cocoon like No. 100. There must be a number of species which spin such cocoons, for I have seen several others like this one but differing in important particulars.

Oct. 5th. Four more of the moths have hatched.

Oct. 6th. Three more came out today. I remark that all of these moths so far have emerged from the cocoon between 9 and 10 A.M. All African butterflies come out in the morning from the chrysalis, and all moths so far as I have observed in the afternoon, or during the

night. I at first thought these might be day-flying moths, but they seem not to be, as they do not stir all day long. As was the case with No. 100, so here, a great many flies are emerging from this cocoon. I should say two flies come out for every moth. I send a couple of them pinned and numbered 121." (They are of the same species as that which emerged from the cocoon of *Oecura*.)

"Oct. 24th. The flies have ceased to emerge, but the moths are still coming. At first mostly males came out, then males and females, later only females. Three or four days ago I thought all the moths were out. All had apparently come out of one side, that from which the twigs project, and I supposed that these were all that the nest contained. But a day or two ago they began to come out from the other side and today four emerged, all males. I suppose the females will come later." From the dates on the envelopes it is plain that this surmise was correct.

It only remains to be said that in the economy of these insects we have a wonderful illustration of instinct, scarcely less remarkable than that displayed by the bee, and especially wonderful because exhibited by the insect in its larval, and therefore immature, state.

OECURA,* *gen. nov.*

Palpi minute, porrect, compressed, heavily clothed with short hairs, the third joint short and clothed with hair to its tip, and almost lost in the hairy vestiture of the second joint.

* *Οικουρα* = *Domi rectrix*.

The antennae of the male are moderately short, heavily pectinated, of the female equally long but less heavily pectinated. The pectinations are margined on both sides with delicate hairs and have a spur on the outer edge near the extremity. The legs are hirsute with two spurs upon the tibiae of the last pair. The abdomen in the male has two minute tufts upon the dorsal line back of the thorax. The radial on the primaries and the secondaries springs from near the bottom of the cell. The primaries are subtriangular with the costa very moderately convex, or nearly straight for two-thirds of the distance from the base with the apex rounded and the outer margin evenly convex, the inner angle is rounded, and the inner margin slightly convex before the base. The secondaries are sub-pyriform with the outer margin evenly rounded. The prevalent coloration is obscure brown and gray. The larva is characterized by the habit of forming social cocoons, a multitude of individuals weaving a common covering of silk, which is applied to the trunks of trees and similar situations and presents the appearance of a fungoid growth, within which each larva weaves a smaller cocoon in which it undergoes final transformation.

Oecura Goodii, sp. nov. ♂. Palpi, front and collar dark brown. Antennae testaceous. The patagiae are brown margined externally and internally by a few grayish hairs, or scales. The upper part of the abdomen immediately back of the thorax is grayish, the remainder of the abdomen is pale brown with an ochraceous tint on the sides. The underside of the thorax and the abdomen is obscure ochraceous. The legs are brown with the tibiae and tarsi annulated with whitish. The primaries are dark brown with some greenish-gray markings near the base, a broad greenish-gray spot on the inner margin near the middle succeeded by a transverse crenulate limbal line of black. The margin is marked on the interspaces with greenish-gray spots,

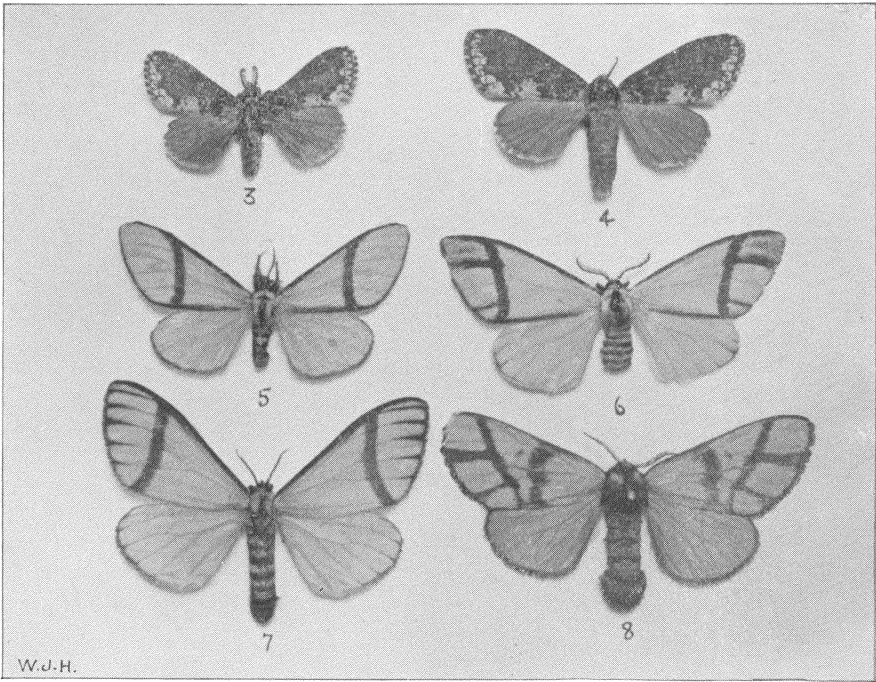
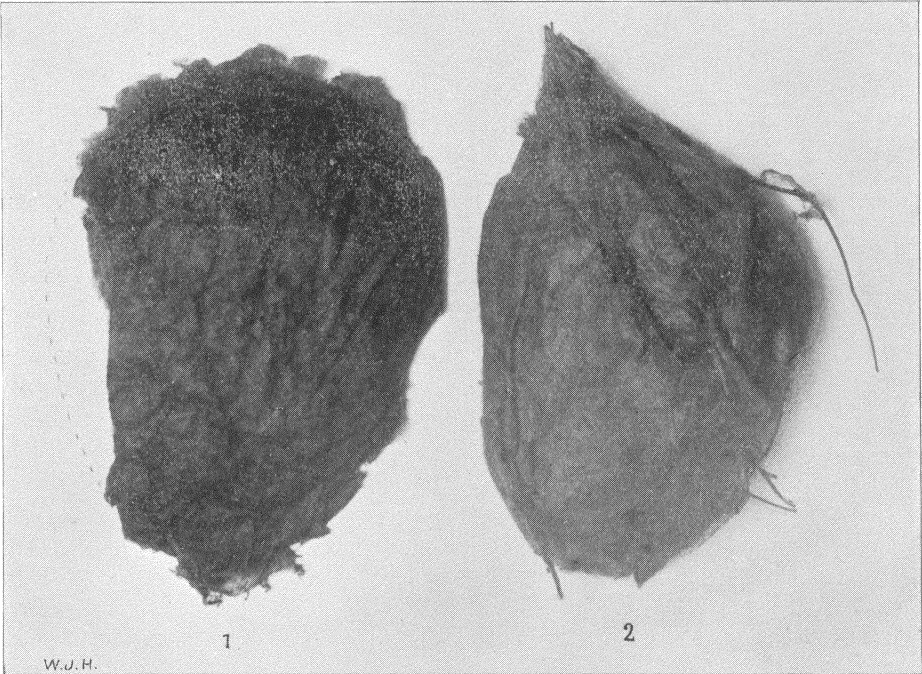
which increase from the apex as far as the third median nervule, then diminish and widen again to the outer angle, which is whitish. These spots are all marked on the middle by a narrow dark line. The fringes are dark brown checked with pale gray at the ends of the nervules, but at the outer angle the fringe is whitish. The secondaries are fuscous with an obscure discocellular mark and a submarginal transverse band. The fringes are as on the primaries from the outer angle to just before the anal angle, at which they are uniformly gray. The under side is pale fuscous with the middle area of the primaries clouded with pale fuliginous. Both wings have an obscure discal dot at the end of the cell. Both are traversed from the costa by an incomplete brownish transverse median line. The primaries have in addition a parallel transverse submarginal band.

♀. Female almost exactly like the male but larger. Expanse, ♂, 33 mm.; ♀, 45 mm.

ANAPHE, Walk.

A. clara, sp. nov. ♂. Very like *A. Moloneyi*, Druce, but readily distinguished from that species by the fact that the nervules are not black at their extremities upon the upper side, and by the fact that on the lower side the primaries have the cell clouded with chocolate and the apex as far as the third median is heavily marked with blackish scales. There is also a dark brown mark upon the secondaries at the middle of the costa. The species is also prevalently smaller in size than *A. Moloneyi*. Expanse ♂, 30 to 40 mm.; ♀, 65 mm.

A. subsordida, sp. nov. ♀. Allied to *A. Moloneyi* but with the wings narrower and more elongate, having but one transverse black line which is connected with the dark outer margin by a heavy black ray running along the radial and by a similar black ray on the extremity of the first median nervule. On the under side the markings of the upper side reappear, but almost the entire apical



area enclosed between the transverse line and the radial ray is dark reddish-brown. In addition to the two rays of the upper surface, there is a dark ray upon the lower side upon the second median. Expanse ♀ 55 mm.

EXPLANATION OF PLATE 9.

Fig. 1. Cocoon-bag of *Oecura Goodii*, Holl. The dotted line indicates a portion removed for purposes of dissection.

Fig. 2. Cocoon-bag of *Anaphe Moloneyi*, Druce.

Fig. 3. *Oecura Goodii*, ♂, sp. n.

Fig. 4. *Oecura Goodii*, ♀, sp. n.

Fig. 5. *Anaphe clara*, ♂, sp. n.

Fig. 6. *Anaphe subsordida*, ♀, sp. n.

Fig. 7. *Anaphe moloneyi*, ♀, Druce.

Fig. 8. *Anaphe infracta*, ♀, Wls.

ON THE ATTRACTION OF LIGHT FOR THE TWO SEXES OF COLEOPTERA.

BY HENRY FREDERICK WICKHAM, IOWA CITY, IOWA.

Referring to the capture of moths, Dr. A. S. Packard writes, in a foot-note on page 246 of his "Entomology for Beginners," "It is a curious fact that in general the males alone are attracted to light; the same is probably true of beetles, especially the June beetle." As this statement does not agree very well with my own experience in collecting Coleoptera I have been led to go over a portion of my material and embody the results in the following table. With the exception of the specimens from Tucson, which were taken at street gas-lamps, all were captured at electric light.

Fifteen sets of insects have been examined. These are numbered in the table and I have subjoined the locality in which each was taken as I find that a set from one locality will give a different proportion of a certain sex than that from another. With the imperfect data at hand it is impossible for me

to determine what relation the date of capture may have to the proportion of either sex (since it sometimes happens that one sex appears somewhat earlier than the other) and I leave this for future studies. As a rule only a few days were spent at any one collecting point and the set of each species represents the work of two or three consecutive evenings, never of more than a week.

The insects have been taken at random from several different families, chiefly using genera, however, in which the male secondary sexual characters are sufficiently well developed to enable the sexes to be separated without too much trouble or chance of error.

Of these sets, those marked 1, 3, 9, 12 are from Tucson, Arizona; 2, 4, 5, 10, 15, from Albuquerque, New Mexico; 13, 14, from Spokane Falls, Washington, all collected by myself. The remainder are from Lincoln, Nebraska

