Poulton, 1918

favourable, as there is bound to have been a great mortality amongst young birds. Two young owls, full-fledged and fending for themselves, that frequented my coffee plantation were both found dead, emaciated and with empty stomachs. *Directly* it must have been very unfavourable to butterflies at any rate: it will be interesting to note the numbers in which they appear later."]

The Sesias mimics and not models of the Hymenoptera.—Prof. Poulton said that he wished to draw attention to an unfortunate misconception in the recently issued part of M. Charles Oberthür's beautiful work, "Études de Lépidoptérologie comparée," Fasc. xiv, 1917. On p. 131 M. Oberthür makes the following statement in a passage kindly translated by Mr. E. A. Elliott:—

"All insect hunters have testified (constaté) that the *Sesias* are imitated by a considerable number of insects of various Orders, especially Hymenoptera and Diptera, but also Orthoptera. These insects, mimicking the external appearance of the *Sesias*, live at the same time and in the same places as they do. When searching at Monterfil for that same *Sesia uroceriformis* which I have already mentioned several times, I have been entirely deceived by the flies and even by grasshoppers which, when among the clumps of furze, present an appearance analogous to that of the Lepidoptera. I fancied first that I saw a *Sesia*, but was never long before I detected the deception caused by this mimicry."

Prof. Poulton said that it was important to correct this statement as promptly as possible. So far from the view expressed above being the generally received one, it was the first time he had heard of it, and it was contradicted by all the names ending in *-formis* which were so plentiful in the group. It was unnecessary to refer to the number of memoirs in which the Sesias were spoken of as mimics of the Hymenoptera.

E. B. Poulton

Harpagomyia and other Diptera fed by Cremastogaster ants in S. Nigeria.—Prof. Poulton said that he had just received a letter from Mr. C. O. Farquharson, dated Dec. 13, 1917, from Ibadan, describing this most remarkable association in an entirely new part of the world. Mr. Donis-

Proc. Ent. Soc. London for 1918, pp. xxix–xl.

thorpe had kindly informed him that, so far as he was aware, the only published record was that of Edward Jacobson, who observed *Harpagomyia splendens*, Meij., fed by the ant *Cremastogaster difformis*, Smith, in his garden at Batavia (Tijd. v. Entom. **52**, 158–74 (1909): Notes from the Leyden Museum, **31**, 246 (1909)) and subsequently at Samarang, Central Java—Tijd. v. Entom. **54**, 158–61 (1911), 3 Plates. Jacobson figured the larva and pupa and reproduced photographs of the gnat being fed by the ant.

It was to be hoped that specimens would soon arrive so that the Nigerian species of *Cremastogaster*, as well as the other Diptera which Mr. Farquharson observed being fed by them, might be studied and if possible determined.

"Many things remain incomplete, but I can honestly tell you that I have never described what I was not certain that I actually did see. At times, indeed, I have seen such curious things that I was afraid to describe them on one observation in case I were wrong, for I could scarcely credit the evidence of my own senses. On one occasion, for example, I was certain that I actually saw a mosquito (at Agege) obtain regurgitated food from a *Cremastogaster*. I am sure it was a *Stegomyia*. . . .

"I've just come back from my evening stroll. I went down to our old haunt (Lamborn's and mine) to look into the welfare of two Lycaenid larvae that have, for the last few days, been slowly devouring a happy family of Coccidae (? *Lecanium*) on a young plant of *Imbricaria maxima*. Of them more anon. Having still a little daylight to spare I went to the old '*Hewitsonia* tree,' and there saw at least half a dozen mosquitoes hovering over the *Cremastogaster* 'campus.' There was light enough clearly to see three of them at the same game—not Stegomyias and not Anophelines. I had no tubes to collect them; I was tired when I went out and didn't expect to get the length of the old tree, but I know now that I'll see them again. But I wish I'd been in time for the mail. I took the *Stegomyia* at Agege in a tube which I failed to notice at the time to be moist. When next I looked at it I found it dead and sticking to the wall of the tube. I had a reaction, doubted my eyesight, left the tube

lying about, and saw the mosquito next floating in the alcohol between those *Catochrysops* pupae. These I had accidentally put into the same tube a day or two later, and the observation must have been made about that time."

Dec. 19, 1917.—"I had to go to Agege to pay the labour there; on Friday, Dec. 14, the day before I left for there, I thought I'd like to go down to the famous *Cremastogaster-Hewitsonia-Argiolaus* tree (I forgot *Iridopsis*) just to have another look at the mosquitoes, to make sure that they really were there. I captured two, easily enough, in little glass tubes, one with its precise ant and the other not. The precise ant, finding itself imprisoned and annoyed, attacked the unfortunate mosquito and killed it. (In a confined space they will kill the softer Lycaenid larvae.) Hence I had to forego the precise ant in the case of the other. On the tree I could make out what looked like white banding on the mosquito, and went home to look more leisurely at my find. Landed there, I got a bad attack of what is known as 'cold feet.' I knew little or nothing about mosquitoes, but had vague recollections of a picture in a wonderful official compilation known as the 'West African Pocket Book,' that of a *Stegomyia*, described in the accompanying letterpress as exhibiting the pattern of a football jersey. (No wonder the unfortunate animal is a victim of yellow fever!). But somehow the proboscis of my myrmecophile didn't seem to fit into the scheme of things. Its proboscis wouldn't, anyhow. *It* produced the local 'chill,' for I couldn't recall any mosquito like it. I began to wonder if it could really be a mosquito after all, but its 'poise' when alive, with its hind legs *en l'air*, and everything else appeared to be unimpeachable. None the less I decided that I couldn't wait till I heard from England, so I decided to take it down to my friend Mrs. Connal at Yabe when I went to Agege. This I did. I sent it down a day ahead of myself with solemn injunctions not to treat the matter with levity, it being no common mosquito, being in fact a myrmecophile. When I reached Yabe I found that there is next to nothing new under the sun! I'm quite sure *now* that what I'll get back from Lamborn will be a callous recommendation to go to his old office library cupboard, find

therein a work of somewhat forbidding exterior described as 'A Monograph of the Culicidae of the World,' by F. V. Theobald (vol. v), in which, on pp. 547 *et seqq.*, I shall find out all about it. Mrs. Connal assures me that it is at least a new *Nigerian* record. She had never met a *Harpagomyia* before—it is *H. trichorostris*, Theobald—but there can be no doubt that that is the correct identity of my find. And there, on p. 548, it is set down without comment, 'They are myrmecophilous insects'! If the British Museum hadn't bound that work in such a cover, I'd probably have found it out for myself. I am ashamed to confess that I had never even looked inside it. The book, of course, is devoted to melancholy facts of existence out here, which is one reason why I didn't care to look into it, but really publishers ought to exhibit a little more psychological insight. It really is a pity that it has not as worthy a cover as, for instance, 'Wheeler on Ants.' I am puzzled about the name *Harpagomyia*, which I take to be derived from ἁρπάζω, to seize, and μῦια, a fly. The name suggests a synechthran rather than a symphile. From my observations I should class it as a symphile rather than a synechthran. Wheeler's bibliography makes no reference to Meijere, but the latter's description of the genus would, I imagine, have just about synchronised with Wheeler's publication. At the worst it is a mild ἔχθρα, in the form of highway robbery without violence, if not indeed mere alms solicitation by a sturdy beggar."

Dec. 23, 1917.—"I reached *the* tree just after ten; I had seen an *Iridopsis* larva yesterday which I thought I might safely leave for a day or two, and went along to see that it was all right. I hope it is, for I regret to say I couldn't find it again. I may, however, find the pupa on further search. I saw quite half a dozen *Argiolaus* pupae (the 'gall' species). I saw their larvae coming down a day or two ago. One I found to be parasitised by a *Cordyceps*, only the conidial (Isaria) stage being present. I next examined a half-calabash of water that I had placed in a hollow of the tree to see whether any mosquitoes had oviposited—I am in hopes of inducing *Harpagomyia* to do so. I failed to get one in the house. I found a number of 'rafts,' but I don't think they

are those of *Harpagomyia*. I am in hopes, too, that I may get ova of a very large mosquito, I think a *Toxorhynchites*, at the same time, for I frequently see them near the tree. *They* do not bite man, and I am wondering whether they have anything to do with ants. I then had a look at some Lycaenids (Epitolas, I think) feasting on Coccid secretions on a shrub hard by the ant tree, the Coccids being *Cremastogaster* attended. I noticed a few small Dipterous flies apparently trying to get a share of the Coccid good things, but just then decided that they didn't look very interesting. Hard by the ant tree are one or two Funtumias (native rubber—*Apocynaceae*), on the stems of which the ants also run about, and on which I captured on previous evenings some of the *Harpagomyiae*, 'in flagrante delicto.' I thought I'd have a look at that too, and to my surprise found quite a number of the mosquitoes as busy as could be, I think more of them than I have seen at dusk. I didn't leave the neighbourhood till a little after noon, and they were still there. The place is moderately shady, but by no means 'forest' shade. I was there again at three this afternoon, and they were still busy. They are unquestionably day fliers [also observed by Jacobson]—like *Stegomyia*, curiously enough. But for the time they became of secondary interest. For almost the first thing I saw was a small fly [2 species of *Milichia*] apparently 'chivying' an unwilling ant in a very daring manner. The ant stopped, apparently in despair of shaking off the importunate Dipteron. Immediately there occurred the usual osculation which signifies that one ant is about to offer, or at any rate part with, a drop of regurgitated food to another, but in this case to the fly. At first I thought the fly might be predaceous and was about to attack the ant much as a *Bengalia* attacks the Driver pupa. When a *Harpagomyia* solicits food of the ant it stands directly in front, but this fly, having induced the ant to stop, or rather in order to induce it to stop, comes up from the side, and the ant, if willing to oblige, turns its head half round. The flies—for I saw quite a number of them at it—frequently, having got a little at one side, rush round to the other before the ant has time to move away, and get a little more. They are

astonishingly active and expert at getting out of the way of ants that come up behind them. They rarely settled outside the track of the ants. I concluded that one or two that I saw in that position were, for the time, replete. When I brought a little glass tube up to them—to within a quarter of an inch, and not with any great caution either—they flew an inch or so over the stem of the tree, and if their flight took them once more amongst the ants, they simply, as it were, 'watched points,' taking care not to let an ant get them from behind, but making no attempt to importune them as they passed. I saw several, presumably hungry, flies alight right in the 'busiest' part of the track and immediately begin 'chivying' the ants—that is really as good a descriptive term as I can find. An ant coming up to meet a fly would dodge to the side. The fly immediately turned round and ran after it. Their actions were extraordinarily like those of the importunate beggar. If the ant took no notice, further than to keep on dodging out of the way, the fly didn't waste much time, but turned round and importuned another. Those that refused to be 'bled' or 'touched' seemed to show no serious resentment and made no attempt to drive off the beggar by force. Cremastogasters running up and down a tree are constantly making little regurgitory exchanges, a momentary 'osculation,' and each hurries on its way. If anything the fly and ant exchange lasted rather longer, but the ant continued on its usual hurried way just as if it had met one of its own kind. It is just the same when *Harpagomyia* is the other party in the transaction. *Harpagomyia*, however, hovers an inch or less over the line of ants (at times resting on the stem and dodging out of the way when necessary), till it sees what is presumably a likely ant. If the ant is running downwards the mosquito drops down (in flight) also, keeping a little in front of the ant—as near as possible without touching it. The ant tries to evade it, but the mosquito as a rule declines to be put off, and the ant at last stops. The mosquito quickly settles and the usual rapid exchange begins, the mosquito thrusting out its proboscis which when not in action is carried bent under the body much like the rostrum of a Reduviid bug—so that the swollen

end is practically within the ant's jaws. I have seen the ant's palpi (*not* the antennae) vibrating on it. The swollen portion of the proboscis is undoubtedly capable of independent movement. I may say that the mosquito is not 'nervous,' and I have had no difficulty in several cases in standing with my eyes sufficiently close to the two insects to make out the ant palpi and the proboscis movement in the mosquito. The ant raises its head slightly when the exchange takes place."

Dec. 27, 1917.—"On Xmas Day also I made another quaint observation. I have been looking about for other Dipterous myrmecophiles. In my search I came on a large crowd of *Cremastogaster* sp. on the trunk of a Saman tree (*Enterolobium saman*)—an introduced shade tree. I thought from the appearance of them that they were about to start up a new nest. All were workers, but I think they came from another large nest not far away. On closer examination I was astonished to see that there were a large number of dead ones sticking to the rough bark of the tree in all sorts of attitudes, but looking as if they had died there and had not been carried up and afterwards 'dumped' by tired workers. Some were in fact still moribund. I soon noticed some curious little Diptera [*Rhynchopsilopa* sp., *Ephydridae*] which I thought might be the same as those I had seen on the *Harpagomyia* hunt. They are, however, quite different. I soon became interested in their doings, for they settled among the ants, dodging about when a worker approached them, but refusing to go far away. I thought I had only to wait and see more able-bodied beggary. What I saw was something quite new. I saw it repeatedly, as often as I liked, and so tame were they that I could actually study their doings through my pocket lens. When they saw a dead ant, that had expired in such a position that its abdomen was easily accessible, they alighted on it. For such small flies they have a huge proboscis. This they thrust into the appropriate orifice and fed, not this time on stomadeal food, but on proctodeal. Pirouetting neatly on the abdomen of the dead ant, they were themselves—but for the wings, which when in rest stick up from the body at rather a high angle—not unlike ants. When in the act of ingesting the abdomen

was raised and lowered gently, and I could also make out the brilliant white halteres in motion upwards and downwards. When the abdomen was raised the halteres were depressed together. I really think their association with ants is not accidental. I got two or three pairs, and have been trying to induce the females to oviposit on stale fruit, but without success. I cannot account for the death of so many ants. Hundreds of a *Pheidole* were running about, in many cases carrying off dead Cremastogasters, with little or no molestation. I do not for a moment think the Pheidoles, numerous though they were, could have caused the slaughter. I am inclined to think the ants must have come from a 'foul' brood. I have put up a lot in spirit for examination, and am keeping the nest under observation. They are still in the same place, and the little flies are still busy in their curious and rather unpleasant way."

Dec. 29, 1917.—"I have been laying traps for *Harpagomyia* ova in the form of bits of calabash with water placed in the hollow stem of the ant tree. I've got hosts of larvae of different sorts, but four have outstripped all the others—great red forms with white undersides which are predaceous on the others. I feel sure they are *Toxorhynchites*; I think the other larvae are *Stegomyia*."

Mr. Donisthorpe said it was of the greatest interest that Mr. Farquharson had observed in S. Nigeria the same extraordinary phenomena that Mr. Jacobson had first discovered and described in Java. He stated that the behaviour of the gnat as described by the two observers, although on the whole similar, differed slightly in some respects. Jacobson records that the Dipteron stood in the track of the ants, and that when an ant ran between its legs it supplicated for food, and was then fed as described by Farquharson. During the process the wings of the gnat were so rapidly vibrated that the nervures of the wings did not appear in photographs taken of them while feeding. Jacobson had discovered and figured the larva and pupa of the *Harpagomyia*. He says, however, that the eggs, which he does not figure, are laid in branches of trees which the *Cremastogaster* had deserted on account of their having been flooded by rain. The eggs may

also be laid elsewhere, inasmuch as the larvae appeared in the bowl of water in the glass case (containing the captive ants) into which he had introduced a number of gnats. The larvae are easily recognised by their yellowish-white colour and by their habit of lying on the bottom of the vessel. Jacobson records that those nests of *Cremastogaster* which were most freely attended by the *Harpagomyia* consisted almost entirely of the small type of workers, and he considered that this was brought about by the amount of food taken from the ants, and therefore diverted from their larvae. He furthermore states that he had never found females, but only males and workers, in such nests. Mr. Donisthorpe said that this observation was of special interest to himself, as he had been working for some years on the causes by which females are produced in ants' nests. He had, for three years running, bred winged females from eggs laid in captivity by a community he had kept in an observation nest for over seven years, and for the first time last year in another community he had observed during five years, and he was of opinion that these positive results had been brought about by the amount of food with which these two nests had been supplied. Ants have been kept in captivity by very many myrmecologists for over 100 years, and in all that time winged females have only once before been produced from eggs laid in captivity, viz. when Lord Avebury bred five winged *fusca* females in an observation nest in 1880. The last-named observer also thought that his success might be accounted for by the fact that this community had been very well fed.

Some authorities also considered that the presence of pseudogynes in ants' nests was brought about by the ants taking too much interest in the beetle *Lomechusa* and its larvae, and in consequence neglecting their own brood. It will be of much importance if Mr. Farquharson should find that those nests of *Cremastogaster* which are most attended by the *Harpagomyia* in S. Nigeria are also unable to produce females.

Mr. Donisthorpe had also found flies of the genus *Miltechia* associated with ants in this country, viz. *M. ludens*, Wahl., with *A. (D.) fuliginosus* at Darenth Wood in 1909, and again

at Oxshott. It was always so scarce that there was no chance of watching its habits.

Mr. F. Muir said that he first saw *H. splendens* at Mr. Jacobson's house in Batavia at the time when he was making observations on them. His published figures and photographs of them and his description of their habits were very accurate. Mr. Muir afterwards saw them in the field in Buitenzorg and Pasoeroean (East Java), and in the latter part of 1915 discovered another species (still undescribed) in Taihoku in N. Formosa. Charles Banks had described similar habits in a mosquito in the Philippines.

[Since the meeting of Feb. 6, Prof. Poulton had received an answer from Mr. Farquharson to some of the questions suggested by Mr. Donisthorpe :—

Mar. 22, 1918.—" You wish to know whether the associated ant-nests produce winged forms. They do. There's no doubt of that whatever. I should say that it is entirely unlikely that the Harpagomyias would have any effect at all, for their numbers are relatively very few. I may say that of five *Cremastogaster* nests known to me, I mean intimately, that I visit regularly, all are frequented by the mosquitoes, but one doesn't see more than half a dozen at a time. Besides, the ants, if not omnivorous, are certainly at times carnivorous, and at other times—regularly almost—frequent the glands of plants, collecting nectar all day long, in addition to 'farming' *Coccidae* of different kinds. I doubt if even the largest colonies, which must contain enormous numbers of inhabitants, ever experience anything like famine conditions or even moderate scarcity of food. I should think there would always be enough and to spare. You know how worker ants stop each other and exchange a little regurgitated food, a momentary transaction almost, both passing quickly on their way. The mosquitoes do exactly the same. They will drop downwards just over an ant that is hastening along in the usual way. The ant may stop and give an alms to the beggar, passing on a moment or two later as if it had just met a friend, and the mosquito flies up and down again till another obliging ant is met. At times the selected ant simply ignores the mendicant, but shows no resentment, nor does the me-

quite press his or her attentions. (By the way, I haven't verified whether the habit is confined to either sex or not. I must look into that.) I had Dr. and Mrs. Connal here on a visit not long ago, and was able to demonstrate them at the top of their form. I also had the pleasure of showing them at work to Mr. H. N. Thompson (the Chief Conservator of Forests), a useful array of witnesses for any doubters to tackle. I was also able to demonstrate the other Diptera."]

Wednesday, March 6th, 1918.

Dr. C. J. Gahan, M.A., D.Sc., President, in the Chair.

Election of Fellows.

Col. Wilfrid Wm. Ogilvy Beveridge, R.A.M.C., C.B., D.S.O. (on active service), c/o J. H. Durrant, Esq., Natural History Museum, S. Kensington, S.W., and Messrs. Patrick Aubrey Hugh Smith, Sconner House, St. German's, Cornwall, and 28, Bruton Street, Berkeley Square, W., and Lionel Julian Walford, The Cavalry Club, Piccadilly, W., were elected Fellows of the Society.

Exhibitions.

Myrmecophile Diptera collected and the Culicid Toxorhynchites bred by Mr. C. O. Farquharson in S. Nigeria.—Prof. Poulton exhibited the specimens referred to in Mr. Farquharson's notes communicated to the last meeting of the Society (p. xxix), and received at a later date. The accompanying letter, written Jan. 26, 1918, contained the following paragraph: "I've sent two little sets of the 'ant-flies' and some Harpagomyias, besides the huge *Toxorhynchites* with a larva of the species. The larva is red dorsally and white ventrally like a tiny fish. They are predaceous as larvae on things like Stegomyias and even Psychodid larvae. As imagos they don't bite, but are said to be anthophilous.

I've had no luck in getting *Harpagomyia* bred, except that the *Toxorhynchites* oviposited in my calabashes."

The specimens exhibited included 2 ♂ and 2 ♀ *Toxorhynchites brevipalpis*, Theo., with their pupa-cases, 3 ♂ and 3 ♀ *Harpagomyia trichorostris*, Theo., one of the males being specially associated with a ♀ ant—*Cremastogaster buchneri*, Forel, near the ♂ *alligatrix*, Forel. The two *Culicidae* had kindly been compared with the types by Dr. G. A. K. Marshall, the ant with specimens named by Forel by Mr. A. H. Hamm. The "ant-flies," also exhibited, had been kindly examined by Capt. J. E. Collin, who found that the "mendicants" were represented by two distinct species of *Milichia*, while the "proctodeal feeder" was a new species of the genus *Rhynchopsilopa*, Hendel (*Ephydridae*). The type species was from Formosa. It was of much interest that the males and females of *Harpagomyia* appear equally to solicit the ants for food. Jacobson mentioned the males and females occurring together in Java, but did not record this fact.

The nidification of Osmia aurulenta, Panz.: a correction.—Prof. Poulton said that he had recently received a letter from Dr. G. Arnold, in Bulawayo, correcting the statement, on p. xxxiii of the Proc. Ent. Soc. for 1916, that he had bred *Osmia aurulenta* from whelk shells, on the Wallasey sand-hills. The shells were a species of *Helix*, probably *nemoralis*.

Capt. W. A. Lamborn's journeys with the East African Veterinary Corps in 1916.—Prof. Poulton said that he felt sure that Capt. Lamborn's letters, written from the localities at which he took the butterflies mentioned in Dr. H. Eltringham's paper in our Transactions for last year (p. 322), would be of interest, not only in relation to the insects but also because of the brief descriptions of a part of late German East Africa:—

"*c/o Veterinary Department,*
"*Nairobi, British East Africa,*
"12. 4. 16.

"I left Nyasaland in late January and only reached Mombasa in the last week of March, having had to wait a considerable time both at Beira and at Chinde for steamers. It