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ORDINARY MEETING, 25th March, 1914, MR. H. B. MAUFE, President, in the chair. Mr. G. Arnold, M.Sc., A.R.C.S., F.E.S., read a paper on "Some Observations on the Nest-changing Migrations of two Species of Ants, *Myrmicaria eumenoides*, Gerst., and *Megaponera foetens*, Fab., together with the Descriptions of some new Species and Varieties of Ants of South Africa."

NEST-CHANGING MIGRATIONS OF TWO SPECIES OF ANTS.

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WITH the exception of the sub-family Dorylinae, it is usual for the nests of ants to be of a more or less permanent character, that is to say, the original site chosen by the queen and founder is retained by the colony until the latter dies out. It is, however, well known that sometimes, owing to various causes, the original nest is deserted by its inhabitants for new and more convenient quarters. I have recently witnessed two different species of ants in the act of making such a change, and the following observations made on those occasions are now brought forward, as they serve to shed an interesting light on the behaviour of the myrmecophilous insects living in the nests of ants. I will deal first with *Myrmicaria eumenoides*. This is a large ant, belonging to the sub-family Myrmicinae, and known to harbour many parasites in its nests. In November, last year, I dug up a part of a nest of this ant, situated just outside my garden, in order to obtain specimens of the winged males and females. At a depth of about one foot from the surface, one of the chambers of the nest was opened up, in which many males were found. I then extended the excavation all round this chamber, exposing thereby many other galleries containing larvae and pupae in all stages of development. As a rule, when a nest is disturbed, the workers' first care is to carry the larvae from the exposed chambers to the deeper parts of the nest for safety. In this case I noticed that the workers first seized hold of, not their own larvae, but certain brownish objects, which at first sight resembled the swollen abdomens of queen ants. These objects are probably the puparia of some fly; they are divided into distinct segments capable of a certain amount of movement, and are covered with a downy pubescence. Unfortunately, efforts to rear the adult insects from these puparia were not successful, so that it is not possible to decide for certain to what sort of insect they may belong. These puparia, together with the myrmecophilous insects to be mentioned later on,

will be described by Dr. Hans Brauns in the *Proceedings* of this Association. Dr. Brauns informs me that they are probably all new species, belonging in some cases perhaps to new genera. In this *Myrmicaria* nest a peculiar larva was also found, which was being carried away by a worker. Whether it is the larva which forms the puparium cannot be stated, but that it is the larva of an ant's nest parasite is certain, for in its structure it bears the stamp of an extreme adaptation to myrmecophily. This is to be seen in a peculiar circular tray covered with trichomes, and forming part of the posterior segments of the insect. Trichomes are masses of stiff hairs, often of a glistening golden colour, covering patches of unicellular glands, which produce an ethereal secretion for which ants have an inordinate fondness. They are constantly to be seen caressing those guests which possess such structures, so that they may be allowed to lick the appetising product of the glands.

I left this nest without filling up the hole, so that in about a week's time it was filled with rain after a heavy shower. The water must have filtered through the soil and almost saturated the nest, for it took nearly half an hour for all the water to disappear from the hole. This state of affairs had evidently made the nest so uncomfortable that the ants decided to move to new quarters about 9 feet away. They began to do this about seven o'clock that evening, or perhaps a little earlier, for the migration was in full swing when I came on the scene again at that hour. Remembering the reputation which this ant has for harbouring guests, and also the observations made by various entomologists on some European ants which, when moving to a new nest, are in the habit of carrying their guests with them, I decided to watch this migration very carefully. At first I could see no guests at all; the workers were carrying in their mandibles only their own larvae, pupae or males. In fact I was looking at the workers so attentively that I failed to notice their smaller companions on the road, to which my attention was directed by suddenly catching sight of a *Lepismid* running by. Going back then to the old nest, I saw at intervals various myrmecophiles crawling out of the pit made by my former excavation, and following the tracks of their hosts, to which they were guided, of course, by the sense of smell. These parasites included three different species of beetles, viz. a *Staphylinid*, and two species of *Pselaphids*, together with the common *Lepismid* found in the nests of nearly all our ants. No time was wasted by any of these insects, for once over the brow of the pit, they continued straight along the narrow path leading to the new quarters. While on the march they were entirely ignored by their hosts, but on arriving at the entrance of the new nest, it was noticed that some of the *Pselaphids* were seized by the ants dawdling around, and taken down into the nest. This change of dwelling took some hours to complete, for at midnight it was still in progress.

We now come to the case of the other ant, *Megaponera foetens*, commonly called the "Matabele Ant," which is so frequently seen

foraging in single or double file. (This is eminently a termitophagous species, and it is likely that it changes the site of its nest more often than is the case with the majority of our ants. When we bear in mind how continuous their assaults are on the colonies of termites, it seems very probable that the supply of the latter insects may be so diminished within the practical range of the camp of the raiders, that the latter may find it advantageous to move their quarters from time to time to new and more fruitful country. The migration of this ant which I am about to describe is of particular interest, apart from the behaviour of the guest-insects, because it was the occasion of the discovery of the true queen of the species. It should be remembered that the species is peculiar among Ponerine ants in having two forms of workers, which are sufficiently dissimilar to have led to their having been described as two distinct species. It had been suggested that the larger of these two forms was an ergatoid, *i.e.* worker-like, queen. In itself, this was not improbable, for in many species of Ponerinae no winged queens have ever been found, whereas ergatoid queens, differing from the worker only in size, pubescence and other minor details, are well known, and in some species are the only known form of queen. But considered in conjunction with the fact that the larger form of this species usually outnumbers the smaller by four to one, it must appear very unlikely that a nest should normally contain more queens than workers. The queen discovered on this occasion is certainly ergatoid, that is to say, wingless, and built more or less on the lines of the worker, but its structure is also radically different in some important respects from either that of the large or the small neuter. It follows, then, from the proof of the existence of a true queen, that the larger form is truly a worker and not a queen, and also that this species is unique among the Ponerinae in having dimorphic workers.

(My attention was attracted to this migration by seeing a mass of these ants assembled together with their larvae and pupae, in the open. On one side, many workers were to be seen bringing along the larvae in their jaws, on the other side of this mass a few workers were moving in the other direction, in a somewhat hesitating manner. Following the track backwards, I came to the site of the old nest, situated about 15 feet away. Returning to the camp, it was seen that some workers had started to pick up the larvae again, and were carrying them yet further away from the original nest, only to be laid down again at about another 15 feet further away. Subsequent observations showed that the migration was carried out in three stages, three temporary camps being formed between the old and the new nests, which were about 60 feet apart. The method adopted by the insects was as follows. First of all, the eggs, larvae, pupae and males were taken from the old nest and put down at the first camp, from which spot many workers were to be seen hurrying back to fetch away the rest of their charges. In the meantime, a few workers were to be seen pacing up and down on the other side of the camp. They did not carry any larvae,

and it would almost seem as though they had some idea of the numerical composition of the colony, and of what the volume of the first camp should be, before the old nest could be considered to have been emptied of its inhabitants, and the proper moment to have arrived for another start to be made. However, after about six or seven minutes, the march recommenced ; and within a short time the second camp had been made at a distance of about 15 feet from the first. Similarly a third and last camp was formed further on. It was while the first camp was about to break up that I saw an insect there much larger than the largest worker, and which, when captured in the third camp, proved, to my surprise, to be the queen.

The entrance to the old nest was a hole about 1 inch across, which ran down vertically for about 5 inches and then branched off at an angle. Looking down this hole, the various guests and parasites could be seen climbing up the walls in an almost continuous stream, hastening to join their hosts in their new home. These insects comprised a *Lepisma*, two species of Staphylinid beetles, a Histerid beetle and an Onthophagous beetle ; there was also a spider. The *Lepismas* as usual were very plentiful ; of the larger Staphylinid I saw only one specimen, but of the smaller sort and of the other beetles very many examples occurred, and during the half hour or so through which I watched the procession, about two dozen specimens of the spider were counted. Had it been possible to have cinematographed the scene, it would have furnished us with a film of surpassing interest. Here, as in the case of *Myrmecaria*, the myrmecophiles were able to follow the tracks of their hosts without any delay or uncertainty. Occasionally one of the smaller Staphylinids would leave the beaten track for a short distance and then return to it again a little further on, but to the majority of these commensals, the odour of their hosts had laid down a path as clearly marked as a macadamised road would be to our eyes, so that with the above exception, it was rare to see any of these insects swerve from the line of march by as much as an inch.

This motley crew of cringers, thieves, murderers and body-snatchers did not appear to attract the slightest attention from their victims the ants, which were too busy with the work in hand to waste any time on the rabble following in their wake. Of all this crowd, the spiders alone were able to keep pace all the time with the ants, but the slowest, the very small Histerid, even at its most feverish pace, did not succeed in covering more than 2 inches per minute, so that it would have arrived at the new nest about six hours after leaving the old. Those beetles which managed to reach the different camps, while these were still intact, buried themselves in the heap of larvae and cocoons, where they remained until the gradual depletion of the mass made it clear that they had not arrived at the site of the real nest, and that another wearisome journey had to be made to attain their goal.

The spiders moved about in the camps in a very easy and unconcerned manner, making no attempts to hide under the piles of cocoons. They ran over the backs of the ants, mingling in a friendly way with the crowd; yet even in the hurry and bustle of this march, it was not possible for these animals to conceal entirely their method of earning a living. A worker ant, carrying a larva in its jaws, was seen just about to pass a spider standing on the edge of the camp. The spider ran up to the worker, stroked it with its front pair of legs for a second or two, and then plunged its fangs into the larva. The latter was released by the ant after a little hesitation, and within five minutes had been sucked dry by the spider. We know that there are many ant parasites which live chiefly on the young of their hosts; but usually these insects offer, on various parts of their bodies, those bribes in the shape of trichomes which make the ants careless of, or oblivious to the true nature of their guests. On the other hand, there are the synoeketes, or indifferently tolerated guests, with which perhaps the Histerid and Onthophagus beetles found on this occasion should be classed, which do not usually bear trichomes. They owe their immunity from attack on the part of the ants, either to their insignificant size, or to their awkward shape, which prevents the ants from seizing hold of them. But it is difficult to understand how the spiders can live unmolested in the nests of such a powerful and vicious ant as *Megaponera foetens* and be allowed to feed on the larvae, without apparently the mildest protest. They do not possess trichomes, nor are they so constructed, by smoothness or hardness of texture, as to prevent the ants from seizing hold of them.

The Staphylinids are probably to be placed in the category of synechthrans, or inimically persecuted intruders, which includes a number of insects which skulk about ants' nests, and get a living by rummaging about in the refuse heaps or kitchen-middens, or by attacking solitary workers in the lonely corners and by-ways of the settlement.

On the other hand, the Pselaphids found in the nest of *Myrmecaria* are true guests or symphiles. As they possess trichomes, they are welcomed by the ants, and as we noticed before, were eagerly taken down the nest, when they arrived at the end of their journey, whereas the Staphylinids were left to look after themselves.

In conclusion, it should be pointed out that in these latitudes, migrations of ants can be expected to take place only after sunset, or if earlier, only on dull and cloudy days, as was the case with *Megaponera*, since the delicate larvae cannot bear a lengthy exposure to the rays of the sun.

Meranoplus excisus, n. sp. (Fig. 9.)

♂ 3.3 mm. Head, thorax, petiole, legs and antennae yellowish brown, the head, scape and club of antenna a little darker, abdomen brownish black. The body is densely clothed with long pale hairs, more abundantly than in *M. Simoni*, Em. The legs

and antennae more sparsely clothed with short and oblique hairs. Head and clypeus longitudinally rugose, the rugosities somewhat uneven and, on the head, connected by a few transverse ridges; the space between the rugosities smooth and slightly shining. Thorax reticulately rugose, and with the ridges rather emphasised longitudinally, the intervening spaces sub-nitidulous. Face of the 1st node of the petiole smooth and shining, the 2nd node reticulately rugose above. First segment of abdomen shining, very finely rugose and feebly punctured. Legs smooth and moderately shining.

Head very little wider behind than in front, as long as wide. Eyes very convex and prominent, placed a little behind the middle of the sides. Clypeus sub-triangular, wider behind than in front, anterior margin slightly convex, posterior margin not clearly defined. Mandibles longitudinally and sharply striate, masticatory margin furnished with five small teeth, the apical tooth sub-acute and larger than the rest. An antennal scrobe lies on each side of the head above the eyes. It is smooth and shining and extends back beyond the eyes almost to the posterior angles of the head; anteriorly the scrobe is divided by a longitudinal ridge into two halves for the reception of the folded scape and flagellum. The scape is thickest a little in front of the middle, and is as long as the flagellum less the apical joint. The 1st joint of the flagellum is as long as wide, the 3rd-5th joints wider than long.

The anterior margin of the pro-mesonotal disc is convex, and produced at the anterior corners into a sharp angle on each side; in the middle, on each side, the disc is semi-circularly and rather abruptly excised, and in front and behind this excision the lateral margins of the disc are slightly concave. The posterior angles of the disc are produced into two small acute teeth, which are a little longer than they are wide at the base. Between the lateral teeth, the posterior margin also bears two smaller triangular teeth. The epinotum is margined laterally, and produced on each side into a sharp spine, which is at least twice as long as it is broad at the base. The declivity of the epinotum is widest between the bases of the spines. First node of the petiole wedge-shaped, almost linear above, and as wide at the base as it is high, the anterior face of the node, seen from above, vertical; 2nd node globose and as wide as the 1st. The sides of the thorax and epinotum are transversely and sparsely rugose.

Hab. Estcourt, Natal. leg. R. C. Wroughton.

This species is easily distinguished from *M. Peringueyi* by the much larger lateral excisions of the pro-mesonotal disc, by the smaller size and feebler sculpture. From *Simoni*, Emery, and *inermis*, Emery, in which the lateral excision is absent, it differs by the shape of the posterior margin of the disc, and from *Simoni*, race *suturalis*, For., which is known to me only from the description, it appears to differ in the larger lateral excision of the disc, in the absence of even a trace of a transverse line indicating the pro-

mesonotal suture, and in having the epinotal spines much longer than the mesonotal.

Strumigenys havilandi, Forel, race *Marleyi*, n. st. (Fig. 10).

♂ 2.6 mm. This race differs from the type in the following characters. The mandibles are shorter and much less than half as long as the head. The latter (measured from the anterior margin of clypeus to the level of the posterior angles) is twice and a half as long as the mandibles. The last joint of the flagellum is not longer than the remaining joints taken together. The dorsum of the epinotum is wider than long, and the sides of the thorax are not smooth as in the type, but distinctly reticulate-punctate and dull. Other characters as in the type.

Hab. Durban, Natal. Two specimens in a nest of *Pheidole punctulata*.

It gives me much pleasure in naming this race after its discoverer, Mr. H. W. Bell-Marley, who has given me much valuable assistance in collecting the ants of Durban and neighbourhood.

Sima ambigua, Emery, race *Rhodesiana*, Forel.

(*Ann. Soc. Ent. Belg.*, vol. 57, p. 112, 1913.)

This species possesses dimorphic workers. I am not aware that dimorphism in the ♀ caste has hitherto been recorded in this genus, and it is possible that in some cases the two forms have been described as two distinct species.

The examples about to be described below were found in dry twigs of *Acacia horrida*, together with numerous examples of the ♂♂ minor and many larvae. On disturbing the twigs, only the ♀♀ minor emerge from the very small holes leading to the galleries, and it was only on breaking open the twigs that the larger forms were seen. They were only slightly less plentiful than the ♂♂ minor. The galleries, obviously excavated by the ants themselves, were exceedingly tenuous, permitting the passage of only one ant at a time.

♂ major, 5.8-6 mm. (♀ minor, 5.5-5.5 mm.). (Fig. 11.) This differs from the ♀ minor, not only in its larger size but also by the structure and sculpture of the head. The anterior angles of the head are much more prominent. The clypeus has the anterior margin produced into three distinct short teeth, which are only indicated by slight protuberances in the ♀ minor. The frontal carinae are also wider anteriorly and longer, reaching just beyond the anterior margin of the eyes. The mandibles are strongly striated. The sculpturation of the head differs entirely from that of the ♀ minor, which has the surface more or less entirely alutaceous. In the ♀ major, the posterior half of the vertex is deeply and transversely striated, the region in front of the eyes and below them is reticulate-striate, and the frontal carinae longitudinally and rather finely striated. The posterior ocelli of the ♀ minor are

just distinguishable, whereas in this form they are barely represented by three shallow and minute indentations. Otherwise similar to the ♀ minor.

Habitat, Bembesi, S. Rhodesia.

DESCRIPTIONS OF SOME NEW SPECIES OF MYRMECO-PHILOUS BEETLES FROM SOUTHERN RHODESIA.

BY DR. H. BRAUNS, M.D.

TOGETHER WITH A DESCRIPTION OF A NEW SPECIES OF ACRITUS.

BY DR. H. BICKHARDT (Cassel).

Rhoprotridinardea, n. gen., Aleocharinorum (Dinardinarum).

Genus forma corporis Dinardae et Allodinardae simillimum.

A *Dinarda* differt; *tarsis anticis* 4- (haud 5-) *articulatis*. Oculis prominentibus. Sculptura crassa rugoso antennarum forma.

Ab *Allodinarda* differt; Antennis incrassatis, in toto fusiformibus. Elytrorum-epipleuris, i.e. (margine laterali elytrorum) *elevatis et carinatis*. Sculptura rugoso. Prothoracis lateribus depressis.

The genus *Rhoprotridinardea* is related in its structure to the palaeartic genus *Dinarda*, Leach, and the Ethiopian genus *Allodinarda*, differing from both in the characters given above.

The mouth-parts have not at present been examined, since I have but two examples before me. The genus has the depressed upper surface which characterises the genus *Dinarda*. The antennae are incrassate towards the apex and distinctly flattened, fusiform and clavate, the 4th-10th joints much wider than long. As in the two related genera, the antennae are inserted below the projecting lateral margin of the vertex. The broad pronotum has the posterior angles very prominent, as in *Dinarda*; it is also considerably flattened and moderately depressed laterally. The elytra are also flattened as in *Dinarda*, their lateral margins are sharply carinate, whereas in *Allodinarda* the elytra are simply convex and the margins evenly rounded. *Allodinarda* has narrower antennae, also thickened towards the apex, but not abruptly clavate, a more convex head, a moderately and evenly arched pronotum the sides of which are not flattened and depressed. The abdomen of *Rhoprotridinardea* is shaped like that of the two allied genera, but wider and flatter than in *Allodinarda*, the lateral margins broad and reflexed upwards.