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**MYRMECIA INQUILINA NEW SPECIES:
THE FIRST PARASITE AMONG THE LOWER ANTS**

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Until one of us (Douglas, 1956) briefly announced the discovery of an inquiline species of the ant genus *Myrmecia* F., all of the many known species of socially parasitic ants belonged to the "higher" subfamilies of the *Formicidae*: *Dolichoderinae*, *Formicinae* and *Myrmicinae*, especially the last two. The specialized habits of the various kinds of army ants (*Dorylinae*, *Leptanillinae*) and the mass-raiding, myrmecophagous *Cerapachyinae* seem to render the development of parasitic habits unlikely in these, but there has been no obvious reason why the species-rich *Ponerinae* or the generalized *Myrmeciinae* (*Myrmeciinae* have been included in *Ponerinae* by many former authors) should not have evolved at least some parasites.

The discovery of the new *Myrmecia* parasite nevertheless comes as a surprise, because we seem to have grown used to the idea that the "lower" ants lacked something in their social-behavioral makeup that would allow the development of parasitic life-forms. We may now perhaps look forward to finding temporary or permanent social parasites in many groups of ants not now known to have them, including the *Ponerinae* and possibly even the army ants.

It is the purpose of the present paper to describe formally the new *Myrmecia* and to record some of the more significant circumstances of its discovery and some subsequent observations.

Myrmecia inquilina Douglas & Brown sp. nov.

Holotype female (compared to a dealate female of *M. vindex* Fr. Smith from the host nest): Smaller and more slightly built, with slender appendages. Measurements in mm. (figures in parentheses are dimensions of *vindex* host nest queen): Total outstretched length including closed mandibles 21.4 (24.4), L head including clypeus 2.9 (3.8), W head just behind compound eyes at level of anterior ocellus 2.8 (3.7). W head including compound eyes 3.2 (4.1), L antennal scape 3.5 (4.25), distance closed mandibles extend beyond median clypeal lobe 2.3 (2.7), absolute straightline length of left mandible from lateral insertion to apex 3.0 (3.9), width of alitrunk across tegulae 2.3 (2.6), L alitrunk including cervix 6.5 (8.3), L petiole 2.25 (2.85), greatest diameter of compound eye 1.25.

Shape of head and mandibles much as shown in Figure 1 (drawn from a paratype). Note the rather rounded occiput and the  arrow but conspi-

cuous cervical flange. Mandibles slender, with weakly concave lateral and weakly convex inner borders. Major teeth 4-5 in number, mostly acute, alternating with smaller paired or single teeth (tooth pattern varying somewhat in paratypes). Anterior clypeal corners subrectangular. Antennae as in *vindex*, but more slender and with slightly straighter scapes.

Alitrunk much like that of the *vindex* female, although smaller. Petiolar node a little lower and proportionately a little wider than in *vindex*, its anterior slope more gentle and evenly rounded into both the anterior peduncle and the nodal summit. Node longer than high, and longer than its peduncle, with a fine median carina extending its length. Postpetiole narrower than in *vindex* female, subtriangular, with nearly perfectly straight sides back to the widest part (sides more convex in *vindex*.)

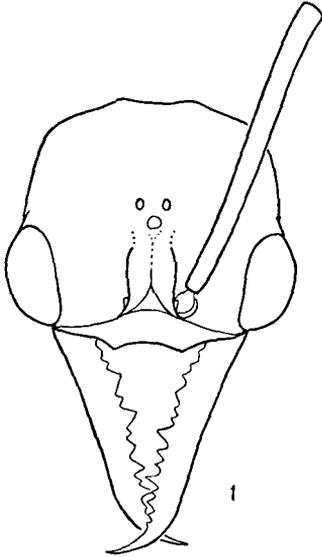


FIG. 1. — *Myrmecia inquilina*
Douglas et Brown, n. sp., head
of paratype female.

Sculpture with the rugose or costulate elements suppressed in comparison with *vindex* female, but with fine micropunctuation better developed and dense, so that the surface tends to be less coarsely irregular, but still largely opaque. Rugulation corresponding to that of *vindex* is still present, transverse-arched on pronotum and transverse on propodeum, but weaker; feeble traces of rugulae can be seen in some lights on the posterior pleura and across the anterior face of the node. The dense micropunctuation creates an effect of fine near-opaque granularity over head, alitrunk and petiole; clypeus,

frontal triangle, legs and antennae finely and densely punctulate, weakly shining. Post-petiole and gaster densely and evenly micropunctate, but with smooth interspaces averaging about the same as or very slightly greater than the punctural diameters (in *vindex* female, the micropunctures are shallower, less distinct and less abundant, with average interpunctural spaces averaging 2 or more diameters); the micropunctuation renders these surfaces only weakly shining (strongly shining in clean *vindex* female).

Superimposed on the fine sculpture of the head is a coarser but shallow, contiguous punctation occupying the space behind the eyes and ocelli, but obsolescent on the median occiput. (In *vindex*, the cephalic dorsum is more coarsely sculptured, and clearcut ridges between the punctures form a coarse reticulum oriented more or less longitudinally.) Space enclosed by eyes and ocelli with coarse, spaced, predominantly longitudinal rugulae, much as in *vindex*. Underside of head densely micropunctate, with numerous rather indistinct coarser punctures (in *vindex*, coarsely rugose-punctate.) Mandibles smooth and shining, each with a single dorsal row

of coarse setigerous punctures (in *vindex*, dorsal mandibular surfaces very finely shagreened, only weakly shining above and with shallow longitudinal to oblique punctures or grooves).

Compared to the fairly hairy *vindex* female, that of *M. inquilina* is virtually without erect pilosity. The mandibular setae and a few small setae at the gastric apex are the only conspicuous hairs. Occasional short, delicate decumbent hairs are found on various parts of the legs and dorsal thoracic sclerites, including cervix.

Pubescence finer than in *vindex*, and more abundant and generally distributed, but not hiding the surface. On the clypeus and appendages pubescence shorter and less conspicuous than in *vindex*, but on post-petiole and gaster, dense, fine, grayish, short, appressed pubescence is conspicuous, tending to converge on the gastric dorsal midline, and further weakening the shine of the integument.

Color: head and gaster black (brownish-black under magnification), the head shading into reddish brown on clypeus and between frontal carinae. Alitrunk, both nodes and legs light brownish-red, the legs becoming more yellowish apicad; antennae, under mouthparts and mandibles brownish-yellow; mandibular teeth with blackish edges. Except for the black head, the color is much like that of the *vindex* female (in which the head is brownish-red).

Holotype female from a mixed nest with *M. vindex* taken March 23, 1955, at Badjanning Rocks, 4 miles NW of Wagin, Western Australia. Holotype deposited in the Western Australian Museum, Perth. Two paratype dealate females taken with the holotype are very similar except in their variable mandibular dentition; their measurements are nearly identical (Western Australian Museum and Museum of Comparative Zoology, Harvard University.) Another paratype dealate female from the same locality, March 26, 1955, is slightly darker than the holotype in color.

The *M. inquilina* female can be distinguished from workers and females of its hosts at a glance by its black head, hairless body, and less shining gaster, the latter densely micropunctate and pubescent, and by the reduced cephalic sculpture. From *M. nigriceps* Mayr, which is similarly colored and usually pubescent, *M. inquilina* can be distinguished by its almost complete lack of erect hairs, by its smaller size (in the female caste), by its relatively reduced coarse sculpture, and by the rounder head shape.

So far, a worker caste differing from that of *vindex*, or corresponding to the *inquilina* female, has not been detected, and it seems likely that the species is a workerless parasite.

Five winged males from the type nest of *inquilina* are presumed to belong to this species, but since they are much like males of *vindex*, the host species, and since variation in *vindex* males is not well known, their identity should not be considered as fully safely confirmed. These males have been compared with a single male reared from a pure *vindex* colony by Mr. J. Meem, of Charlottesville, Virginia. This colony is part of a stock of *M. vindex* secured by Dr. C. P. Haskins in Western Australia

some years ago, and maintained by him in the United States since then.

The five males are very similar to the *vindex* male in size and form, but the entire gaster and, to a lesser extent, the head are darker in color, contrasting with the alitrunk. In two of the specimens, there is a feeble suffusion of reddish-brown at the base of the first gastric (second postpetiolar) segment, but this is nothing like as light or as widespread as in the *vindex* male. The *inquilina* males tend to have three teeth clustered at the basal angle of the reduced mandibles, though this is very variable. Also, the *inquilina* males have less distinct micropunctures and less dense pubescence, so that the postpetiole and gaster are more shining than in *vindex*. The apices of the parameres were notably less acute in an *inquilina* male dissected than in the one *vindex* male. Genitalia were generally similar otherwise, but comparisons mean very little in the absence of a comprehensive study of the male terminalia in *Myrmecia*—a study which, incidentally, should aid greatly in completing the revision of this difficult genus.

Ecology and Behavior.

The sole locality at which *M. inquilina* has been taken is Badjanning Rocks, near Wagin, which is about 140 miles southeast of Perth. The site is a granite outcrop wooded with marri (*Eucalyptus calophylla*), jam tree (*Acacia acuminata*) and large *Casuarina*, probably *C. huegeliana*. The upper part of the hill is still wooded, but the lower slopes and adjoining land are cleared, or are being cleared, for agriculture.

From Douglas' notes: At the time of the first collection in 1955, many large fallen trees were present. Under these were numerous nests of *Camponotus* and an occasional nest of *Myrmecia*. I turned over a large log and began to collect the workers and some pupae of a small *Myrmecia* colony. The nest was 8 feet from a large marri tree. In the first gallery uncovered, I found the first *inquilina* female. It was near some larvae. I opened the nest completely and collected the whole colony. In the lower galleries, up to 10 inches down, were three more of the black-headed inquilines, all of which were near the *vindex* nest queen and some larvae. (The *vindex* nest queen can be distinguished from the *vindex* females in incipient nests, and from virgin females, by her darker color.)

In 1956, I made repeated trips to the Wagin area and opened up nests throughout the district, but I could find no *inquilina* except at Badjanning Rocks. I brought home two *inquilina* females and placed them, together with the *vindex* nest queen and some *vindex* workers with larvae and pupae, in an artificial nest without access to vegetation. The workers repeatedly stroked the heads of the inquilines with their antennae. Each time this happened, the inquilines took up a curious crouching position with head down and scapes retracted against the head. The workers plied the inquilines vigorously with their glossae. Twice an inquiline was

seen with her head and jaws resting lightly on a three-quarter-grown larva.

On one occasion I recorded possible proctodaeal transfer from worker to inquiline, but since reading Freeland's paper on trophic egg-laying by *Myrmecia* workers (1958), I am inclined to think that what I saw was an inquiline feeding on a worker egg. After the transfer, the worker spent some time glossating the area of its gastric apex. In my absence, this nest

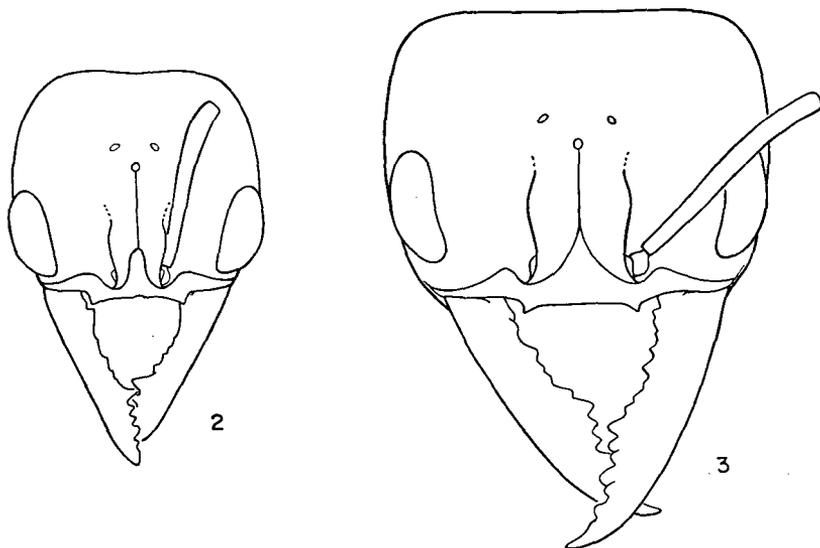


FIG. 2. — *Myrmecia swalei* Crawley, head of female from Albany, W. A., leg. J. Clark; tips of mandibles much worn.

FIG. 3. — *Myrmecia chasei* Forel, head of female from Perth, W. A. drawn to same scale as Figures 2 and 4.

was wiped out by accidental contamination with dieldrin spray during the government's Argentine ant control program.

In late 1956, the area around Badjanning Rocks was completely cleared by means of scrub roller. I managed to locate two of my old nests, and replaced logs on them. Later, I made a quick visit and found that these two nests had reorganized. Since it was apparent that the land was to be burned over, I removed the logs and replaced them with flat rocks. In May, 1958, one nest is still intact, and I believe it still houses inquilines.

All *vindex* nests containing inquilines have scanty populations, and they were all situated on the flat land near the base of the rocky hill. Numerous *vindex* colonies have been found on the slopes and top of the hill, but none contained inquilines. I have opened over 400 nests of *M. vindex*, *M. nigriceps* Mayr and *M. basirufa* Forel over a wide area of southwestern Australia, but, except at Badjanning Rocks, I never found inquilinous *Myrmecia*.

From the information available, it seems reasonably clear that *M. inquilinea* is a workerless permanent social parasite of *M. vindex*, and that the

parasitism is of a type in which the parasite females and the host nest queen can coexist indefinitely. Two to several dealate *inquilina* females have been found in a single *vindex* nest, and it seems likely that at least some of these were reared in the nests in which they were found. If so, their wingless condition suggests that, like *M. regularis* Crawley, they possess feeble wings that are lost soon after they eclose from the pupal cocoon. It would be very interesting to know how the inquiline females are mated, how they disperse and find host nests, and how they gain acceptance once the host nest is reached.

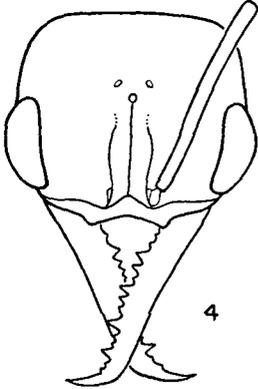


FIG. 4. — *M. chasei* Forel, head of worker mounted on same pin as the *M. swalei* female of Figure 2.

The confirmed inquilinism of *M. inquilina* brings to mind a puzzling pin of *Myrmecia* from Albany, Western Australia (J. Clark leg.), now in the Museum of Comparative Zoology. This pin contains a dealate female with badly worn mandibular apices (Fig. 2) belonging to *M. swalei* Crawley, and a worker of *M. chasei* Forel (Fig. 4). It is possible that these two specimens were wrongly put together after collection or during mounting and labelling of the specimens, in which case their being on the same pin is of no significance. The fact remains, however, that usually only nestmates are put on one pin together, so we should consider the possibility that *M. swalei* may start its nests by parasitizing colonies of *M. chasei*. In line with this possibility, the aberrant mandibles and small size of the *swalei* female are interesting; the female of *chasei* (Fig. 3) is a very large insect compared to its workers—proportionately larger than in any other species of the genus *Myrmecia*. The two species have a similar range—from the Perth district to the sandplain east of Esperance, especially near the coast, and are often found nesting near each other. The little workers are superficially similar in their conspicuous red-and-black coloration, which is probably aposematic in agreement with their diurnal foraging habits and painful stings. Of the two, *swalei* is less common, and the nests seem less populous than those of *chasei*.

If parasitism is found to hold in this case, it will have to be of the "temporary social parasitism" kind, in which the queen of the parasite species enters the nest of the host, following which the host queen is killed, the parasite queen takes her place, and finally, after a period during which the nest is of mixed type, the host workers are entirely replaced by worker offspring of the parasite. Examples of temporary social parasitism are well known or suspected in *Formica*, *Lasius* and other formicine genera, and this mode of colony foundation is probably followed by myrmicine genera such as *Acidomyrmex*, *Rhoptromyrmex*, and some groups of *Crematogaster*. But it should be emphasized that we are by no means sure that *M. swalei* is a parasite.

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