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Contributions to the Natural History of Australian Ants.

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I SPENT the months of September, October and November (the spring in the Southern Hemisphere), 1862, in New South Wales, and paid some attention to the natural history of ants: I made collections of thirty-three species in the vicinity of Sidney, eighteen of which, as far as I have been able to ascertain, were new.

The following is a list of the species I obtained, with notes from my journal on their habits, and descriptions of the new species.

I take the present opportunity of acknowledging the assistance I have received, in comparing and naming specimens, from Mr. F. Smith, who has always afforded me valuable information in my researches.

Genus FORMICA.

Section I.

1. *F. purpurea*, Sm. — This is by far the commonest ant in the neighbourhood of Sidney. The workers were received from Melbourne before my visit. I discovered *F. detecta*, Sm., to be the female of this species, an insect which Mr. Smith placed in the first section of the genus, because the anterior wings present a discoidal cell; whilst he has placed the workers, *F. purpurea*, in the second, owing to the absence of ocelli. I have preferred to place the insect by the affinities of the wings, believing them to be the more important characters. The males have not hitherto been described.

Male 4 lines long, bright violet. Antennæ, except their first joint, and tarsi ferruginous. The first pair of legs almost ferruginous. Head, thorax and legs covered with a black pubescence. Wings subyhaline, nervures rufo-fuscous.

Abdomen having a bright green tinge in certain lights, and covered with a short silky pile.

I found the males and females swarming on the nests about the middle of October. The nest is a large hill, very like that of our *F. rufa* in size and shape, but covered by a dome of minute stones instead of sticks. These insects always form the exterior of the dome of some dark material: near Sidney, where minute fragments of chocolate-coloured ironstone abound, they form the hill entirely of it; but in other localities, where they are constrained to build with fragments of white limestone, they carefully cover the nest with a layer of charcoal, not more than one-eighth of an inch in thickness, probably to increase the temperature of the nest.

I have frequently observed the neuters of this species "milking" the larvæ of a small black Cicada with their antennæ and fore legs, and greedily feeding upon the milky secretion which the larvæ exude from excretory ducts near the anus. The hills of these insects smell strongly of formic acid.

2. *F. Smithii*, Lowne. — An undescribed species, very similar in appearance to the last when alive, and extremely abundant; yet I never found the nest or perfect insects.

Workers 3 lines long. Head and thorax bright red; antennæ and legs dusky red; scale of the peduncle and abdomen black. Head subemarginate behind and broad, narrowed in front so as to be almost triangular. Eyes small. Thorax with a deep strangulation between the meso- and metathorax. Scale of the peduncle small and narrow, its upper margin rounded and blunt. Abdomen ovate. Abdomen and legs covered thinly with gray pubescence.

3. *F. æneovirens*, Lowne. — Small worker scarcely 2 lines long. Ferruginous, thinly covered with short hairs; thorax and abdomen with a bright green tint. Head broadest before, and rounded behind. Eyes ovate and prominent, placed far back on the head. Ocelli very distinct. Mandibles strong, triangular, striated, and deeply dentated within. Clypeus carinated in its centre. Thorax rounded in front, the posterior portion compressed, with a strangulation between the meso- and metathorax. Scale of the peduncle ovate. Legs very long and slender.

The large workers are $3\frac{1}{2}$ lines long, with a nearly square bright red head, considerably broader than the thorax.

Sandy places near Port Jackson. They live underground, and make no hill: the openings to their nest are very small, and usually concealed under leaves or stones.

Section II.

4. *F. consobrina*, Erich. — These insects do, not secrete formic acid. The neuters are very helpless, and are much sought by children, who suck a sweet fluid from their bodies. Although this is one of the commonest ants in New South Wales, I could not find a single nest: I found those of a closely-allied species, *F. intrepida*, in abundance: I am informed that the nests are very similar.

5. *F. intrepida*, Kirby (large worker); *F. agilis*, Sm. (small worker). — These insects live underground, in small colonies of 200 or 300 individuals, throwing up a small rounded tumulus of clay about a foot high, excavated by a labyrinth of passages, and furnished with several openings in its sides: the hillock is so hard and strong that it is not easily kicked to pieces. These ants close the entrances to their nests at night, and form the breeding-chambers at a considerable depth beneath the surface. The large workers (*F. intrepida* of Kirby) are exceedingly numerous and pugnacious, probably forming one-fifth or one-sixth of the entire colony: these work with the small worker (*F. agilis* of Smith), apparently sharing every labour with them. The female is 8 lines long, and coloured like the small workers: I have never seen a specimen, except one I collected from a hill myself. The nest does not smell of formic acid, even when greatly disturbed.

6. *F. nigroænea*, Sm. (large worker). — The small workers appear not to have been hitherto described. They are 2 lines long, black, with a green tinge. Head as wide as the thorax, elongated, and rounded behind. Clypeus neither carinated nor notched, thinly covered with golden hairs. In other respects the small workers are exactly like the large ones: they are very conspicuous when alive, on account of the bright golden pubescence which covers the abdomen: I know nothing of their habits, except that I have always found them on the ground.

7. *F. nitida*, Lowne. — I only know this species by one large worker, 3 lines long. Head, thorax and abdomen black;

antennæ and legs testaceous. Head broader than the thorax, broadest before and emarginate behind. Mandibles rufo-piceous, thick and strongly dentate within. Thorax very broad and rounded in front, much narrowed behind. Scale of the peduncle ovate, pointed above. Abdomen ovate, the apical margins of its segments testaceous. The whole insect thinly covered with long, pale, silky hairs.

8. *F. terebrans*, Lowne.—Small worker 4 lines long. Head and abdomen black; antennæ, thorax and legs piceous. Head large, broader than the thorax, rounded behind, rufo-piceous anteriorly. Mandibles large, triangular, strongly dentate within and obscurely rufo-piceous. Antennæ long and slender. Eyes large, ovate and prominent. Thorax rounded anteriorly; the meso- and metathorax much compressed laterally; with a small raised ocellate spot on each side of the mesothorax. Scale of the peduncle ovate, pointed above. Abdomen ovate, the apical margins of its segments testaceous, thinly covered with pale silky hairs.

Large worker 5 lines long, with a very large head.

Female 6 lines long. Black. Wings subhyaline, with fuscous nervures.

These insects excavate the hard dead stumps of gum trees (*Eucalypti*) with complicated galleries. Early in October I found winged females only in a nest: they were apparently hibernating, as they were packed closely in closed galleries, which I cut into by accident whilst searching for wood-boring beetles. A few days after I found swarms of the winged females, clustering about the flowers of *Boronias* and other *Rutaceæ*, for several days. In December I found numerous colonies of these insects, with abundance of large and small workers, but I sought for the sexes in vain.

9. *F. erythrocephala*, Fab.—I never saw but one specimen of this remarkable insect alive: it was running upon the ground in the bush; it frequently took a leap of nearly three inches; it does not run so fast as its form would lead one to suppose.

10. *F. itinerans*, Lowne.—I only know this species by the workers, which are 1 line long. Black or obscurely rufo-piceous, with the abdomen sometimes tinged with blue or purple; thinly covered with a ghost-pale pubescence. Head nearly twice as broad as the thorax, emarginate

behind. Eyes ovate, slightly prominent, placed forward on the sides of the head. Mandibles rufo-piceous, large, stout, triangular, strongly dentated with two large and several small teeth at their inner border, deeply punctured above, and covered thinly with short yellow silky hairs. Antennæ rufo-piceous; scape shorter than the head; flagellum thick, clavate. Thorax rounded before, with a tubercle above; the meso- and metathorax flattened laterally, and having a deep strangulation between them. Scale of the peduncle very large, ovate, and pointed above. Abdomen ovate, the apical margin of its segments piceous. Legs of moderate length. Tarsi fuscous. The joints of the tarsi and antennæ fringed with yellow silky hairs.

These small ants are far from being the least remarkable species I collected. Their nest is made underground, and occasionally in the substance of hard sandstone; sometimes in cracks and fissures of the rock: they appear to bore the sandstone with ease. They emit a very strong smell of formic acid when disturbed; but the most peculiar instinct possessed by these insects is that of always marching to and from their nest in dense regular files, like the foraging parties of predatory *Ecitons* in South America: however far these insects wander, a compact line of them may always be traced back to the nest: so regular are their tracts that I have frequently found the sandstone slightly grooved by them. I have been led to the belief that this wonderful instinct has been given them to protect them from the ravages of the predatory *Myrmecias* and *Myrmicas*, which are so abundant in the same localities. On the 31st of October, observing several individuals of *Myrmecia gulosa* carrying *Formica purpurea* in their huge jaws, I watched them carefully, and found that the great *Myrmecias*, four times the size of the *Formica* at least, feared the latter in open ground, and laid in wait for them on the outskirts of their nest, until they got an opportunity to slip out and seize one that had been unwary enough to stray from its companions into the vicinity of its great enemies' ambush. Had these insects the same instinct as their little congeners they would escape the danger. I always found that two or three individuals of *Formica purpurea* or *Smithii* put to flight the largest *Myrmecias*.

11. *F. rufonigra*, Lowne. — Worker $1\frac{1}{2}$ line long, rufo-

piceous, thinly covered with very short pale hairs. Head broader than the thorax, emarginate behind. Eyes large, ovate, prominent, and situated anteriorly on the sides of the head. Mandibles stout, triangular, strongly dentated within, and punctured on their upper surface. Scape of the antennæ strongly curved, as long as the head. Flagellum clavate, with the last joint the longest. Thorax rounded anteriorly, with a very deep strangulation between the meso- and metathorax. Scale of the peduncle large, ovate, and pointed above. Abdomen elongated, so as to be nearly cylindrical as in *Ponera*.

I found this insect on the ground, but know nothing of its habits.

12. *F. gracilis*, Lowne. — Worker $1\frac{1}{2}$ line long. Black or obscurely piceous, with a faint violet tint, covered with a very short pale pubescence; the legs often dusky, and the antennæ and tarsi testaceous. Its form is remarkably elongate. The head is elongate, broader than the thorax and rounded behind, but narrowed anteriorly. Mandibles long, triangular, and slightly curved inwards at their extremity, toothed along their inner margin, testaceous. Eyes large, ovate and prominent. Antennæ slender, as large as the body. The flagellum slightly enlarged at its distal extremity. Thorax rounded before, with a slight constriction between the meso- and metathorax. Scale of the peduncle ovate, pointed above. Abdomen ovate, thinly covered with short pale hairs. Legs elongate, the posterior pair considerably longer than the body.

Found running on the ground commonly near Sidney. I never succeeded in finding the nest.

(To be continued). B. T. LOWNE.

Life-history of Acherontia Atropos (Death's-head Hawk-moth).—The eggs, which are very large, are most commonly laid on the upper surface of the leaves of the potato, but also on *Atropa belladonna* (deadly nightshade), *Lonicera periclymenum* (honeysuckle), *Ligustrum vulgare* (privet), *Datura Stramonium* (thornapple), *Cannabis sativa* (hemp), *Genista tinctoria* (dyer's-weed), *Euonymus europæus* (spindle-tree), and *Jasminum officinale* (white jasmín), beside the mulberry,

pear and strawberry in the gardens on the Continent. The young larvæ emerge in about twelve days, and feed on the leaves of all these plants, and also occasionally on the tuber of the potato, at first eating little and growing very slowly, but afterwards devouring the leaves most voraciously, and increasing in size with almost incredible rapidity: by the end of July the larva has attained its greatest dimensions, and is then full five inches in length, and thick in proportion. The head is prone, narrower than the 2nd segment, into which it can be partially withdrawn, at the pleasure of the animal, in the intervals of eating, which are few and far between; it is widest at the mouth, and is thence gradually narrowed to the crown, which is rounded, and has a very slight median notch; the 3rd and 4th segments are very much wider than the 2nd, are folded transversely, and have a conspicuous skinfold on each side; the following segments, from the 5th to the 11th, both inclusive, are nearly uniform and nearly cylindrical, the dorsal surface transversely divided into narrow sections, and the sides folded both transversely and longitudinally; the 12th segment bears a medio-dorsal and very scabrous horn, which is bent *downwards* almost close to its junction with the body, and *upwards* at the extreme tip. Colour of the head dull orange-yellow, with a conspicuous brown stripe on the outer side of each cheek, extending from the crown to the mouth; body dull orange or lemon-yellow, inclining to green on the sides and beneath; the 2nd, 3rd and 4th segments are immaculate and velvety; the following segments are variegated dorsally with numerous oval, almost circular, dark purple spots, each of which emits a minute bristle from the middle; these segments are also decorated with V-shaped markings of a dull violet-colour, and often bordered below with a whitish margin: each of these V-shaped markings consists of two oblique stripes, commencing, one on each side, a little in advance of the black, white-margined spiracle, passes upwards and backwards through two segments, and meets the corresponding stripe on the medio-dorsal line of the back; the last of these V-shaped markings terminates in the dorsal horn which forms its apex; the horn itself is yellow above and blackish beneath, and all the scabrous points are tipped with black. A very beautiful variety of this larva occurred plentifully during the July and August of 1858;