

CONCERNING SOME ANT GYNANDROMORPHS

BY WILLIAM MORTON WHEELER

I. *Dinergatandromorphs*

In the twenty-sixth volume of *Psyche* (1919) I described and figured a peculiar gynandromorph of *Camponotus (Colobopsis) albocinctus* Ashmead from the Philippines and designated it as a "dinergatandromorph" because the left half of its head was that of a male. This individual, therefore, was unlike all previously described ant gynandromorphs, which are combinations either of male and female or of male and worker components. The correctness of my interpretation was doubted by Santschi (1920) and Emery (1924). The latter conjectured that what I had taken to be the soldier half of the head was really a generalized female-worker component, but I gave reasons (1928) for adhering to my original interpretation. Additional considerations might be adduced, but this is no longer necessary, because Vandel (1931) has just published a very careful account of a dinergatandromorph of *Pheidole pallidula*, in which the union of soldier (right-sided) with male (left-sided) characters in the head is even more extraordinary than in my specimen of *Camponotus albocinctus*. The more striking character of Vandel's specimen is due, of course, to the much greater differentiation in the shape of the head of the normal soldier, worker and female castes of *Pheidole*. The body and right side of the head in the specimen are very clearly those of a soldier, and as in the *Camponotus*, there is no median ocellus, which should be present if that region of the head were female. The bearing of the two cases on the opposed blastogenic and trophogenic hypotheses of the origin of castes in ants, is obvious. The anomalies under discussion must have arisen

either in the egg or during the larval stage. On the former supposition, the soldier like the male component would be blastogenic and the anomaly would be due to unusual nuclear (chromosomal) or other conditions in the unsegmented or just segmented egg; according to the blastogenic hypothesis, the soldier component would be due either to special feeding of the undifferentiated female portion of a germinally determined gynandromorphous organism, or to some shock or other injury to certain tissue areas of the larval or prepupal soma, as in the butterfly gynandromorphs produced by van Someren.

II. Anteroposterior Gynandromorphs

Vandel, while discussing the various hypotheses that have been framed by Boveri, Morgan, Doncaster, myself and others to account for gynandromorphs, calls attention to certain ambiguous cases which may be interpreted either as functional ergatomorphic males or as anteroposterior gynandromorphs, that is, as pathological individuals having the anterior part of the body of the worker type and the gaster and genitalia male. The following are cases of this description:—

(1) Santschi (1921) described three specimens of *Cataglyphis albicans* Rogers, taken by Théry in a single locality in Morocco, as having the head and thorax of the worker type, but the gaster and well-developed genitalia male. The head, however, was small and furnished with male ocelli. Santschi was unable to decide whether these specimens were gynandromorphs or normal ergatomorphic males of their species. The fact that some species of *Cataglyphis* have no marriage flight and have males with rather short wings and that there were three of the peculiar specimens seemed to indicate that they were ergatomorphic males. The number of individuals is not important in this connection since in two other cases recorded in the sequel three undoubted gynandromorphs were taken from the same nest.

(2) Mayr, in 1868, described a peculiar hermaphrodite ("Zwitter") specimen of *Iridomyrmex constrictus* Mayr,

a fossil ant from the Baltic amber. I reëxamined and figured this insect in 1914. It has a typically worker head and thorax and a normal male gaster with well-developed genitalia, but the eyes are large and the antennæ are 13-jointed and therefore male. The specimen, therefore, resembles Santschi's specimens of *Cataglyphis* even in having some male cephalic characters.

(3) Lomnicki (1914) found in the same colony three very similar specimens of *Myrmica rugulosa*, with the anterior part of the body as far back as the gaster predominantly female and the gaster male, but with poorly developed genitalia (small in one specimen, retracted and invisible in the others).

Lomnicki's specimens are evidently anteroposterior gynandromorphs, though they exhibit some admixture of maleness in the anterior portion of the body, and perhaps of femaleness in the reduced size of their male genitalia. The *Cataglyphis* and *Iridomyrmex* cases are also, I believe, anteroposterior intersexes or gynandromorphs which may, perhaps, have become the only males of their respective species. My reasons for this opinion, developed in my paper on intercastes (1928, p. 229 et seq.), are derived mainly from a consideration of the peculiar conditions in the genus *Ponera*. Some species of these ants (*P. ergatandria* Forel, *P. punctatissima* Roger, *P. mina* Wheeler) have males exactly like the workers, except for the genitalia, while one Mediterranean species, *P. eduardi* Forel, has, in addition to the usual winged male an ergatomorphic male with worker thorax and abdomen but with the head and genitalia male. The ergatomorphic male of *P. punctatissima* was originally described by Roger as *P. androgyna*. These ergatomorphic males are therefore transverse, or anteroposterior gynandromorphs which function as the regular males of the species. Additional support for this statement is furnished by three extraordinary specimens of *P. coarctata pennsylvanica* Buckley, which Professor Clarence H. Kennedy has generously sent me for examination and which he or Miss H. Sheldon will describe in detail. They were taken from a colony nesting in a white

oak log on a sand-dune on Point Pelee Island, Ontario, in Lake Erie, and are remarkably alike, having black heads of the male type, though the antennæ are 12-jointed, except in one specimen which has the left antenna 13-jointed. The thorax and abdomen in all of them is pale brownish-yellow, like the color of callow workers. In two the genitalia are purely female, with small though normally developed sting; in the other a similar sting is combined with male genitalia appendages! Since the only known males of *P. pennsylvanica* are of the usual winged type with the body black throughout, we must regard Professor Kennedy's specimens as anteroposterior gynandromorphs. The specimen with hermaphrodite external genitalia is obviously intermediate between such a form as the normal ergatomorphic male of *P. eduardi*, which has a head of the male type with 13-jointed antennæ, and the two other specimens with exclusively worker abdomen and developed sting. The suppression of the sting in the former specimen would convert it into an ergatomorphic male, and if its testes were sufficiently developed it would be essentially like the normal ergatomorphic male of *P. eduardi*.

III. Additions to the List of Known Ant Gynandromorphs

In 1929 Donisthorpe listed the known ant-gynandromorphs and gave their number as 49. Vandel has eliminated from this list Santschi's *Cataglyphis* as a doubtful case (Donisthorpe included only one of the three cases mentioned in Santschi's paper), and has added the two peculiar *Myrmica ruginodis* Nyl. gynandromorphs described by Emery in 1924 (overlooked by Donisthorpe) and his *Pheidole dinergatandromorph*, thus making the total number of known ant gynandromorphs 51. Donisthorpe, however, omitted a *Cardiocondyla* gynandromorph described by Swezey in 1926. I have examined this insect in the collection of the Hawaiian Sugar Planters' Experiment Station and have found it to belong to *C. wroughtoni* Forel var. *hawaiiensis* Forel, and not to *C. nuda minutior* Forel, as Swezey supposed. The specimen, which was taken in a compost heap in the garden of the Experiment Station at Honolulu, is a normal female, except that the left eye is decidedly larger and the left antenna of the male type

and 13-jointed. In the same collection I discovered a second very similar gynandromorph of the same variety, taken on a window pane in Honolulu. This individual, too, has a larger left eye but the left antenna, though decidedly of the male type, has only 12 joints. Probably the normal male of *C. minutior* has 13-jointed antennæ, but a specimen in the same collection was found to have both antennæ 12-jointed. Adding these two Cardiocondyla gynandromorphs and Professor Kennedy's three Poneræ gynandromorphs, the list of these anomalies now totals 56, or if we regard Santschi's three specimens of Cataglyphis and Mayr's Iridomyrmex as anteroposterior gynandromorphs rather than ergatomorphic males, we have 60.

LITERATURE

- Donisthorpe, H. 1929, Gynandromorphism in Ants. Zool. Anzeig. p. 92-96.
- Emery, C. 1924, Casi di anomalia e di parasitismo nelle formiche. Rendic. Accad. Sc. Ist. Bologna, pp. 82-89, 4 figs.
- Lomnicki, J. 1924, On three gynandromorphs of the ant *Myrmica rugulosa* Nyl. (in Polish). Kosmos, Lwow. 49, pp. 817-830, 5 figs.
- Mayr, G. 1868, Die Ameisen des baltischen Bernsteins, Beiträge zur Naturkunde Preussens, Physik. ökonom. Gesell. Königsberg, 1, 102 pp., 5 pls.
- Roger, J. 1859, Beiträge zur Kenntniss der Ameisenfauna der Mittelmeerländer, Berlin. Ent. Zeitschr 3, pp. 225-259, 1 pl.
- Santschi, F. 1920, Cinq nouvelles notes sur les fourmis. 4. La 39e fourmi hermaphrodite. Bull. Soc. Vaud. Sc. Nat. 53, pp. 175-178.
- Santschi, F. 1921, Formicides nouveaux de l'Afrique du Nord. Bull. Soc. d'Hist. Nat. Afr. Nord. 12, pp. 68-77.

- Swezey, H. O. 1926, Gynandromorph Ant. Proc. Hawaii. Ent. Soc. 6, p. 229.
- Vandel, A. 1931, Etude d'un gynandromorphe (diner-gatandromorphe) de *Pheidole pallidula* Nyl. Bull. Biol. France Belg. 65, pp. 114-129, 2 figs.
- Wheeler, W. M. 1914, The Ants of the Baltic Amber. Schrift. physik. ökonom. Gesell. Königsberg 55, 142 pp. 66 figs.
- Wheeler, W. M. 1919, Two Gynandromorphic Ants. Psyche 26, pp. 1-8, 2 figs.
- Wheeler, W. M. 1928 *a*, The Social Insects, Their Origin and Evolution. London, Kegan Paul.
- Wheeler, W. M. 1928 *b*, Mermis Parasitism and Inter-castes Among Ants. Journ. Exper. Zool. 50, pp. 165-237, 17 figs.