ABHANDLUNGEN UND BERICHTE
DES NATURKUNDEMUSEUMS GÖRLITZ

Band 67, Nummer 5

Abh. Ber. Naturkundemus. Görlitz 67, 5: 9–12 (1993)

ISSN 0373-7568

Manuskriptannahme am 24. 7. 1993
Erschienen am 31. 12. 1993

Kurze Originalmitteilungen

Taxonomic description of Myrmica microrubra n. sp. – a social parasitic ant so far known as the microgyne of Myrmica rubra (L.)

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With 4 figures

Introduction

Investigating the biology of *Myrmica rubra* (Linnaeus, 1758), ELMES(1976), PEARSON & CHILD (1980), PEARSON(1981) and ELMES & BRIAN(1991) have performed field investigations of the composition of nest populations, an electrophoretic study of esterase polymorphism of natural nest populations and a number of laboratory rearing experiments. They found in this ant that

a) microgynes do not appear to occur independently of the macrogynes,
b) microgynes produce microgynes but no macrogynes,
c) microgynes may produce workers in laboratory cultures but only occasionally do so in the field,
d) macrogynes produce macrogynes but no microgynes and plenty of workers,
e) there is no enzymeelectrophoretic indication for interbreeding between the macrogyne and microgyne population.

The investigations referring to point e) were not fully convincing and would need further confirmation. However, the sum of evidence is strong enough to conclude that the microgynes found in the nests of *Myrmica rubra* much more probably represent a separate social parasitic species than being a component of a genetic polymorphism.

This social parasite is described here as *Myrmica microrubra* n. sp. It is in the process of maximising its production of sexuals and reducing its worker caste, without having completed this evolutionary step. In a similar way as found in other social parasites (e.g. *Strongylognathus testaceus*), the presence of fertilized gynes of *microrubra* suppresses the production of alate host gynes, but has no clear queen effect on the nest population of the inquiline. According to PEARSON, the output of alate *microrubra* gynes per dealate *microrubra* gyne is 37fold higher than the output of alate *rubra* gynes per dealate *rubra* gyne in non-parasitized nests. ELMES & BRIAN (1991) have described a possible regulatory mechanism which ensures that the workerless parasite can not kill the colony by explosive production of sexuals. The reduction of the worker caste in *microrubra* means that gynes are mainly responsible for the production of males which, in contrast, are a worker offspring in *Myrmica rubra*.

To a certain degree the findings of the English scientists have not been appreciated by European myrmecologists - mainly because the alerting act of a taxonomic description of a new species was never done. I became aware of the problem as late as 1990 by a personal meeting with G.W. Elmes. My own samplings in the previous 12 years were not directed at gathering large amounts of material of *Myrmica rubra* and no attention was paid to its inquline. As a consequence, *Myrmica microrubra* is strongly underrecorded and the species is surely much more abundant the 14 known sites in East Germany (former GDR) suggest.

Taxonomic description of Myrmica microrubra n. sp.

Type material

The holotype (a gyne) and 5 paratypes (3 gynes and 2 males) were fixed in a nest series from a peat bog in East Germany labelled »Oberlausitz, 6 km SE Weißwasser, 13.8.1981, Große Jeseritzen«. Additional 8 paratypes (4 males and 4 gynes) were fixed in a nest series from north of Berlin, labelled »Kr. Oranienburg, Glienicke, 14.8.89«. All types are deposited in the collection of the Staatliches Museum für Naturkunde Görlitz. The material studied included a total of 23 gynes and 23 males. 18 of these gynes and 13 of these males originated from 12 sites in Germany. G.W. Elmes kindly provided 5 gynes and 10 males from his study site in Dorset/England.

Description and differential diagnosis

The morphometric characters are given in µm:

HL – maximum head length measured from midpoint of occipital border to midpoint of anterior clypeal border; the head has to be positioned so that the maximum length appears in measuring plane.

HW – maximum head width including the eyes.

ML – mesosoma length as maximum distance from posterior border of the lateral propodeal lobe to anterior border of the promesonotum (i.e. not to anterior border of neck shield). This is most easily measured in lateral view (see fig. 6 in SEIFERT 1988).

SL – maximum scape length excluding the neck of articular bulb.

SP – length of propodeal spines as mean of both spines, taken in dorsal view with full spine length in measuring plane.

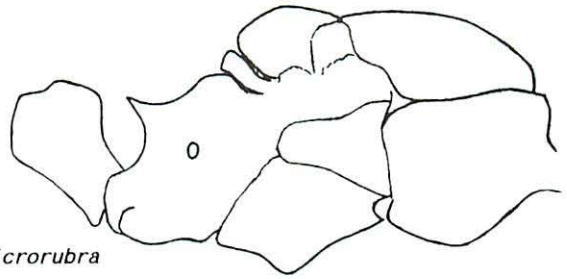
The differences in the morphological structures of *Myrmica microrubra* n. sp. and *Myrmica rubra* are much lower than usually observed between social parasites belonging to the genus *Myrmica* and their *Myrmica* hosts (e.g. *Myrmica hirsuta* Elmes/*Myrmica sabuleti* Meinert and *Myrmica samnitica* Mei/*Myrmica sabuleti*). This should mean that the reproductive separation of *microrubra* n. sp. and *rubra* has occurred very recently in terms of the evolutionary time scale.

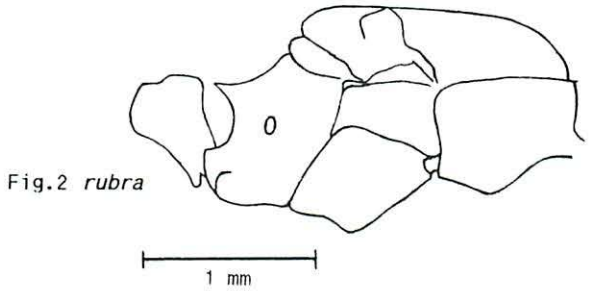
The most simple and clearest separation is possible by the non-overlapping body size data of the gynes. The mesosoma length ML is < 1800 µm in gynes of *microrubra* and > 1900 µm in gynes of *rubra* .

It is not fully justified to call *microrubra* as a simple isometric reduction of *rubra* (ELMES 1976, SEIFERT 1988). The males of *microrubra* have significantly lower SL/HL and SL/HW ratios than those of *rubra* and the reduction of the comb of hind tibial spurs and of ocelli size in *microrubra* gynes is not isometric.

Gynes (figs. 1-4)

The gynes of *microrubra* have inconspicuous structural differences from its host species *rubra*. The cuticular sculpture as a whole is weaker and the number of longitudinal wrinkles on the vaulted part of clypeal surface is lower (*rubra*: 15.38 ± 2.18 [12-20], n=21; *microrubra*: 11.50 ± 1.44 [10-





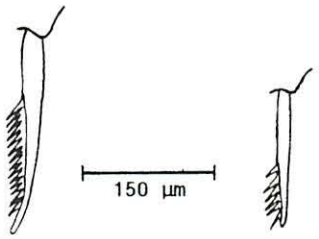


Fig. 3 *rubra*

Fig. 4 *microrubra*

figs. 1-4 Lateral view of petiole and mesosoma and hind tibial spurs of *Myrmica microrubra* n. sp. and *Myrmica rubra* (Linnaeus). The figures of hind tibial spurs show average conditions - the spurs can sometimes be fully reduced in *M. microrubra*.

15], n= 23). Further, the number of comb denticles of the hind tibial spur is reduced (*rubra*: 12.19 ± 1.78 [8-15], n=21; *microrubra*: 7.04 ± 3.48 [0-11], n=23). The hind tibial spur was in 2 specimens of *microrubra* fully absent. Figs. 3 and 4 show average *rubra* and *microrubra* situations. *M. microrubra* has relatively smaller ocelli: the percent ratio width of midocellus / HW is 6.54 ± 0.76 (n=23) in *microrubra* and 7.73 ± 0.38 (n=21) in *rubra*. The following table gives a comparison of further morphometric data of 22 *rubra* and 23 *microrubra* gynes.

	rubra (n=22)	*microrubra* (n=23)
ML	2127 ± 76 [1961-2271]	1620 ± 88 [1507-1775]
HW	1329 ± 48 [1221-1418]	1041 ± 48 [974-1160]
SP/HW	0.192 ± 0.023 [0.156-0.228]	0.185 ± 0.022 [0.146-0.250]

Except of SP/HW, all mean values including the number of clypeal wrinkles, the ocelli size and the hind tibial spur data are significantly different for $p < 0.001$ if subjected to a t test.

Males

There are not detectable obvious differences in cuticular structures. However, the males of *microrubra* show significant differences in their scape length ratios. The absolute body size data of *microrubra* are clearly smaller than in *rubra* but, in contrast to the situation in the gynes, there is a considerable overlap. There are observations that host workers can occasionaly produce males in the presence of parasite gynes and one may ask if the big size overlap may be due to erroneous allocations of *rubra* males to *microrubra*. However, there is a general rule in *Myrmica* that the coefficient of variation of body size data is 1.6-1.7fold larger in males than in gynes. For 12 investigated *Myrmica* species with sufficiently large samples (SEIFERT 1988), the mean coefficient of variation is 5.93 ± 1.39 for ML of males, only 3.44 ± 0.83 for ML of gynes, 4.83 ± 0.83 for HL of males and only 2.97 ± 0.64 for HW of gynes. From this point of view the *microrubra* data presented below are not suspected to be invalidated by a lot of false allocations. The following table gives a comparison of the morphometric data of 23 *microrubra* and 23 *rubra* males. SIZE is the geometric mean of HL,HW and ML and SL/HL_{cor} and SL/HW_{cor} are body-size-independent scape ratios. The body-size-dependent variation was removed by division with a linear regression function of the type **y = ax + b** which describes the ratios SL/HL and SL/HW as function of SIZE. The parameters **a** and **b** are the arithmetic means of the parameters of the species-specific functions. All ratios and size data of *microrubra* presented in the table are significantly smaller than those of *rubra* for $p < 0.001$.

	rubra (n=23)	*microrubra* (n=23)
ML	1919 ± 112 [1735-2103]	1742 ± 143 [1488-2048]
SIZE	1229 ± 62 [1097-1326]	1128 ± 72 [1014-1294]
SL/HL	0.827 ± 0.023 [0.791-0.890]	0.742 ± 0.036 [0.686-0.809]
SL/HW	0.772 ± 0.024 [0.737-0.823]	0.695 ± 0.040 [0.589-0.765]
SL/HL_{cor}	1.065 ± 0.030 [1.013-1.147]	0.941 ± 0.043 [0.864-1.012]
SL/HW_{cor}	1.055 ± 0.033 [1.009-1.127]	0.946 ± 0.054 [0.802-1.040]

A linear discriminant function

$$D = 0.467\ SL/HL_{cor} + 0.337\ SL/HW_{cor} + 1.721 \cdot 10^{-4}\ SIZE$$

offers a perfect separation of both species' males with

D = 0.946 ± 0.039 [0.865-1.008] for the 23 males of *microrubra* and
D = 1.057 ± 0.026 [1.017-1.118] for the 23 males of *rubra*.

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