

non-nestmate pupae of their own genetic type in a behavioural choice test (ROSENGREN et al., 1994). Unfortunately, in all these studies cited, no comparative investigations on external morphology of the ants were performed.

The geographic distribution of genetically 'type A like *F. lugubris*' is similar to the distribution of KUTTER's pilosity 'form I' and that of 'type B like *F. lugubris*' is similar to KUTTER's 'form II'. Genetical, behavioural and morphological studies all indicate that these 'types' or 'forms' are in fact different species and it is obvious that only 'type A/form I' can belong to *Formica lugubris* ZETTERSTEDT the locus typicus of which is in Norway. In contrast 'type B/form II' are absent from Fennoscandia and the British Isles and are clearly distinct from *Formica aquilonia*. This close relative of *Formica lugubris* and *F. aquilonia* YARROW, 1955 is described here as the new species *Formica paralugubris* nov. spec. since there is no valid taxonomic name available that refers to this species. This paper will demonstrate that the morphological separation of *F. lugubris* and *paralugubris* nov. spec. is possible even in the more similar workers – a fact which is highly desired in the context of comparative studies of these sibling species.

## 2. Materials and Methods

### 2.1. Material

The external morphology was numerically described on the basis of the following material:

*Formica lugubris*: A total of 197 workers from 42 nest samples; thereof 2 nest samples from the Alps of Central Austria, 7 from Bulgaria (Pirin mountains, Rhodopes), 1 from England (N Yorkshire), 4 from the French Jura, 2 from Germany (Schwarzwald), 1 from Sweden, 1 from N Italy, and 23 nest samples from Switzerland. The latter included 8 genetically typed (type A) nest samples from the study sites of PAMILO et al. (1992) and ROSENGREN et al. (1994) in the Swiss Jura mountains.

A total of 53 queens; 1 from Austria, 3 from Bulgaria, 3 from France and 46 from Switzerland (22 of which were collected in the study sites in the Jura mountains).

*Formica paralugubris* nov. spec.: A total of 184 workers from 38 nest samples; among them 4 nest samples from the Alps of W Austria, 2 from the French Jura and 32 from Switzerland. The latter included 11 genetically typed (type B) nest samples from the above mentioned study sites in the Swiss Jura mountains.

A total of 49 queens from Switzerland (27 of which were collected in study sites in the Jura mountains).

*Formica aquilonia*: A total of 116 workers from 23 nest samples; thereof 16 nest samples from the central and W Austrian Alps and 7 nest samples from E Switzerland.

A total of 13 queens; 7 from Finland and 6 from Switzerland.

### 2.2. Terminology and methods of morphological investigation

All measurements were taken in mounted and dried specimens using a pin-holding device freely turnable into each spatial position. A Wild M10 stereomicroscope equipped with a 1.6× planapochromatic objective was used at magnifications of 80–320×. The maximum possible magnification to keep a structure within the range of the ocular micrometer was used. A mean measuring error of ± 1 µm is given for small and well-defined structures, such as hair length, but may reach 5 µm for large measures with difficult positioning and high dependency from air humidity such as CW. To avoid rounding errors, all measurements have been recorded in µm even for characters where a precision of ± 1 µm is impossible. In order to reduce irritating reflexions of the cuticular surfaces and to get an improved visualization of the microsculpture, a plastic diffusor was positioned as close as possible to the specimen.

If not otherwise stated, statistic tests testing the equality of mean values are: a t test when an F test proved the equality of the variances; otherwise a modified t test with corrected degrees of freedom according to WELCH (1947).

Setae are differentiated from pubescence hairs in having a much larger basal diameter (4–8 µm in setae and 1–2 µm in pubescence). Seta counts (nOCC, nPE, nMET, nMES, nSC) are restricted to standing setae projecting > 10 µm from cuticular surface.