

3. Results of morphological investigations on workers

3.1. The initial hypothesis on phenotypes P, I and R with a simple pilosity index

We have a clear demonstration of at least three phenotypes computing a simple index of hairiness H from nest means as geometric mean of the five most discriminative characters. How these characters were sorted out is explained below. This crude index H is given by

$$H = (\text{uh} \times \text{pn} \times \text{pp} \times \text{uhl} \times \text{pnl})^{1/5}$$

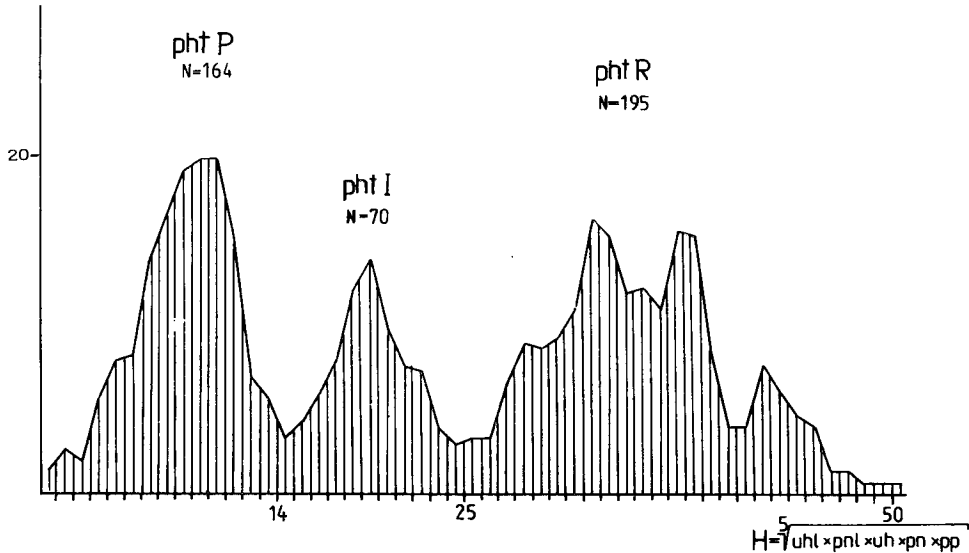


Fig. 1 Demonstration of pilosity phenotypes of the *Formica rufa* complex workers by a simple pilosity index H computed as geometric mean of the five most discriminative characters uhl , pnl , uh , pn , and pp which went into calculation as arithmetic nest means

Fig. 1 shows three well-separated peaks from which an initial hypothesis on phenotypes is derived with some confidence. 164 samples ($= 38.2\%$) belong to the first peak with H values of ≤ 14.5 . These are designated as phenotype P (**pht P**). 16.3% of all samples belong to the second peak within the interval $H = (14.5, 25.0)$ and are designated as phenotype I (**pht I**). The remaining 45.5% of samples with $H > 25.0$ form together a broad third peak and are named phenotype R (**pht R**).

This third peak could possibly consist of three subentities but these are not clear enough to exclude possible artefacts. However, the putative existence of 5 instead of 3 entities is suggested and, remembering the biochemical investigations of GÖSSWALD & SCHMIDT (1959) who demonstrated in German material 5 different biochemical phenotypes for the wood ant group considered here, I am convinced that a separate analysis of the third entity would reveal a heterogeneous structure.

Let us consider now the characters one by one. The figures 2–9 show distributions of sample means for the characters uh , bh , pn , mn , pp , pe , uhl and pnl both in a non-discriminative pooled histogram of all samples as well as in a discriminating presentation of relative frequencies p ($\sum p_i = 1.0$) for each phenotype. These relative phenotype frequencies were derived from the initial hypothesis. We observe a very different discriminatory power of characters. The discriminatory power d means the nonoverlap of frequency distributions between the three stated phenotypes with

$$d = \frac{1}{2} \sum_{K=1}^L |P_{\Delta K} - P_{B K}|$$

where L is the number of intervals a character was subdivided in and $p_{\Delta K}$ and $p_{B K}$ are