

**R<sup>m</sup>** nests – otherwise a shift from monogyny to polygyny would be impossible. The adoption behaviour of **pht I<sup>m</sup>** is unknown to me.

As for acceptance behaviour in polygynous nests, it seems reasonable to conclude from different average population numbers (see section 8.) on a declining readiness to adopt queens from **pht P** across **pht I** to **pht R**.

At this point, I want to present a hypothesis on a possible correlation between external morphology of queens and queen/colony behaviour which could be more or less valid for all phenotypes considered here. The most critical point of this hypothesis is that the distinction of the two queen morphs is not free of subjectivity and I have no statistical evidence for a bimodality. These morphs are defined as opposite extremes to express more clearly what I want to say which does not mean intermediates are lacking:

	queen morph P	queen morph M
<b>morphology:</b>		
head width	< 2050 $\mu$ m	> 2150 $\mu$ m
center of scutellum	longitudinally striate	shining
dorsal gaster surface	less shining	brilliantly shining
gaster size	less voluminous	voluminous
<b>found ratio of queens</b>		
in <b>pht P</b>	96 $\frac{0}{0}$ (n = 49)	4 $\frac{0}{0}$ (n = 2)
in <b>pht I</b>	76 $\frac{0}{0}$ (n = 37)	24 $\frac{0}{0}$ (n = 12)
in <b>pht R</b>	46 $\frac{0}{0}$ (n = 21)	54 $\frac{0}{0}$ (n = 25)
<b>ascribed functional characters</b>		
dispersal flight:	absent or short-ranged	long-ranged
ability for socialparasitic colony foundation in <i>Serviformica</i> :	low	high
egg laying capacity:	low	high
queen effect on workers:	low	high

The queen effect means here the probable influence of queen secretions on worker aggressivity towards alien queens. The ratios of queen morph P correlate with the observed polygyny frequencies. This is an argument to put forward the hypothesis that the statistic differences of the phenotypes in dispersal capacity, colony foundation and structure (see sections 5.2 and 6) could be the result of statistic differences in morpho-ethological queen types.

Of particular interest is the mixed nest No 454 from Deutsch-Paulsdorf near Görlitz. On 19 March 1989 it contained worker phenotypes with such extreme pilosity differences that each individual was easy to allocate either to **pht I** or **pht R**. The sample contained

83 workers with  $H_{cor} = 19.7 \pm 6.48$  [ 5.2, 32.0] and  
109 workers with  $H_{cor} = 42.6 \pm 2.99$  [35.5, 50.5].

The head width distribution indicated for each phenotype a highly significant monogyny; the OTTO discriminant was  $L = 194.8$  for the **pht I** fraction and  $L = 207.8$  for the **pht R** fraction. A sample taken in March 1990 contained 94 **pht I** and 107 **pht R** workers which is an almost unchanged ratio. This unexpected result contradicts the interpretation that an adoption of a **pht R** queen by an orphaned **pht I** colony (or vice versa) has taken place and suggests both fractions to be the offspring of the same queen. A long-term observation of this colony will possibly bring more clarity.

A representative statement on the real frequencies of phenotype shifts is not possible from my data since only 38 nests out of 432 were reinvestigated a few years after the first study. In these 38 nests, I have only one clear example for a phenotype shift from the site Spitzberg near Deutsch-Paulsdorf: This mound, a good-sized polygynous colony, contained **pht P** workers with  $H_{cor} = 10.4$  (sample No 64) in the year 1984 but it had definitely shifted to **pht I** with  $H_{cor} = 21.4$  (sample No 441) in the year 1988. I found 5 **pht P**, 6 **pht I** and 3 **pht R** nests in this site in 1988 and most likely the shift was performed through repeated acceptance of **pht I** (or **pht R**) queens from neighboured colonies and gradual displacement of resident **pht P** queens. In this context a sentence of GÖSSWALD (1981) is interesting. He wrote that queens of his intermediate "Form II" will displace queens of „*Formica polyctena*“ because "Form II" queens were "duftlich dominant" and