6. Chorological arguments for hybrid nature of phenotype I

I have performed a realistic large-area census of wood ant nest densities for very few sites only which makes impossible a reliable statistical test of the hypothesis on a close correlation between the occurrence of **pht I** and the syntopic occurrence of both putative parent phenotypes **pht P** and **pht R.** However, a rather simple consideration may show us that there seems to be in fact such a clear chorological correlation. For the same geographic region considered here, OTTO (1968) reported a mean density of 5.8 wood ant nests 100 ha woodland area calculated from 15.500 test squares of 2500 m^2. This test-square method is surely a representative census though underrecording of very small nests by the foresters seems possible. Subtracting the *F. pratensis* complex members, I calculated from OTTO's data an approximate spacious density of 4.7 nests 100 ha for the *F. rufa* complex phenotypes. Since we have indications for a decline of wood ant populations in East Germany during the last 20 years, it is surely no underestimation to speak for the present time of a spacious density of 5.0 nests 100 ha woodland area. If we assumed a mean abundance of 2.5 **pht P** nests and 2.0 **pht R** nests 100 ha and an ideally homogeneous distribution, an area of 50 ha were necessary to hold both putative parent phenotypes with at least one nest each. 15 sites with **pht I** nests were searched for **pht P** and **pht R** nests within a radius of 200 m (or an area of 12.6 ha). In 11 of these **pht I** sites *both* putative parent phenotypes were present within the search area of 12.6 ha and in 4 sites they could not be found together. For conditions of a homogenous distribution, we would predict 3.78 of these search plots to hold both **pht P** and **pht R.** The observed and predicted frequencies 11 : 3.78 and 4 : 11.22 are significantly different with $p < 0.001$ in a χ^2 test after FISHER & YATES which is in my opinion a clear indication for a dependency of occurrence of **pht I** from enlarged densities and syntopic occurrence of parent phenotypes as it must be demanded to facilitate crossbreeding.

Another argument for putative hybrid identity provides the interesting geographical distribution of **pht I** in East Germany. In the Oberlausitz, south of the line Bischofswerda–Bautzen–Niesky, as much as 27.4 % from a total of 212 nests were **pht I** but I found only 6.6 % **pht I** within a total of 218 nests in the remaining part of East Germany. The latter ratio is probably typical for most parts of Central Europe meaning a rather good reproductive isolation between **pht P** and **pht R.** This is probably the main reason why the problem was not recognized by wood ant taxonomists of the past; the few intermediate samples did not bother them very much and the traditional *polyctena rufa* thought pattern was not attacked.

What could be the reason for the outstanding abundance of **pht I** in the mentioned part of the Oberlausitz? The map of this region shows characteristically a very chaotic, "coarse-grained" woodland distribution. Large and compact woodland systems as in the northern Oberlausitz, in Mecklenburg, the Mark Brandenburg, the Thüringer Wald, the Erzgebirge or the Harz are rare in this interesting area but in general we have no lack of woodland. There are many forests but the majority of them has an area between 0.5 and 10 km^2 and locally we have dense wood ant populations. If we assumed **pht P** and **pht R** were species in the making, they should have developed certain isolating factors and they should tend to a niche segregation reducing the probability of encounters. Exactly this isolating niche segregation is more likely in landscapes with a more compact woodland structure. Here, **pht P** will preferentially perform its "large-scale conquest" strategy and **pht R** will preferentially follow a "long-range-dispersal" and "quick colonizing" strategy. The first strategy tends to make dispersal allover the *area* of a forest by colony splitting while the latter will perform a linear dispersal *along margin lines* of the forest where host nests for socialparasitic colony foundation are abundant. This refers to external and internal margin lines but in compact forests internal margins are rare. These differing distributional strategies will produce a certain degree of sympatric spatial segregation and will decrease together with other isolating factors the probability for hybridisation in landscapes with compact woodland. This sympatric spatial segregation should be weakened the more a region has a torn, chaotic woodland structure in which we have a much higher ratio of margin line length against area. Such a condition plus sufficiently dense populations of **pht P** and **pht R** will increase the probability for hybridisation and this was most likely the process responsible for extraordinary high abundance of **pht I** in a special part of the Oberlausitz (for a more detailed discussion see section 10).