

bably explains the patchy distribution of the parasite within larger host species populations. More data on frequencies and circumstances of penetration vs. eviction are desirable, though.

As far as is known, sexuals in independent *Temnothorax* species develop from hibernated larvae, i.e. as "slow brood" in the sense of Brian (cf. HÖLLEBLER & WILSON 1990: 352, A.B. unpubl. data). In the parasitic *T. minutissimus*, on the contrary, we found evidence of a rapid brood development of the sexuals (Appendix, col. # 251, # 519, # 521). However, colony # 251, after a second hibernation in absence of a queen of *T. minutissimus*, produced numerous females of *T. minutissimus* from hibernated slow brood. In several European species of *Myrmoxenus* also, in particular the workerless "degenerate slavemakers" preferably produce rapid brood sexuals (BUSCHINGER 1986a). In three colonies (Appendix, col. # 251, # 519, # 883) the sexuals of *T. minutissimus* appeared after the colonies had reared host species females earlier in the same season. This feature deserves more attention since it apparently has never been observed in other parasitic ants as yet. Usually either the sexuals of host and parasite are reared simultaneously, or exclusively parasite sexuals are produced.

Apparently only very few males of *T. minutissimus* are reared in the parasite colonies. The numerical sex ratio was estimated to be close to 0.1 ♂/♀. It may well be that *T. minutissimus* colonies under natural conditions produce more males or less females, respectively, than colonies in laboratory culture. The sex ratio of the colonies from August 2004 (13 ♂♂ and 57 ♀♀) thus may be more representative of conditions in nature. More field data will be necessary. In any case, the strongly female-biased sex ratio again corresponds quite well to the low male frequencies of European species of *Myrmoxenus* with intranidal mating and inbreeding (BUSCHINGER 1986a).

In three colonies comprising *T. minutissimus*, specimens of the slavemaker, *Protomognathus americanus*, were found in addition (col. # 900, # 1038, # 3540), together with workers of *T. curvispinosus*. In all three colonies a host species queen was lacking. In # 900 only one worker of *P. americanus* was found, whereas # 1038 and # 3540 contained a queen and several workers of the slavemaker species. It may be suspected that the latter two were *P. americanus* colonies that had raided *T. curvispinosus* colonies parasitized by *T. minutissimus*, and that the *T. minutissimus* specimens had developed from the pillaged brood. A similar explanation had been suggested by BUSCHINGER (1971) for colonies of the European slavemaker, *Harpagoxenus sublaevis* (NYLANDER, 1849), where a few colonies also contained *Leptothorax* (= *Doronomyrmex*) *kutteri*. *Leptothorax kutteri* is a workerless inquiline of *Leptothorax acervorum* which is the main host species of *H. sublaevis* as well. Co-

existence of two parasitic species in one colony of their common host species has been recorded also for *Plagiolepis pygmaea* and its two inquilines, *P. xene* and *P. grassei* (LE MASNE 1956). It had been termed "double parasitism". The instance of *T. minutissimus* and *P. americanus*, however, probably does not deserve this term: Other than perhaps is the case with the *Plagiolepis* parasites, it may be questioned that *T. minutissimus* has a chance to reproduce within a colony of the slavemaker *P. americanus*.

As had been reported by ALLOWAY (undated), we also saw females of *T. minutissimus* sometimes riding on top of a host species queen. Usually these were parasite queens with a swollen gaster, hence reproductive. So this behavior probably is not a sign of "dominance" as had been suggested by ALLOWAY (undated), but rather may be necessary for the parasite queen to obtain some special food, be it from the host queen's surface, or from workers of *T. curvispinosus* feeding their own queen, or even regurgitated by the host queen herself.

In "guest ants" of the genus *Formicoxenus* a similar "riding" on the body of their hosts, *Formica* and *Myrmica* spp., respectively, has been recorded. This behavior evidently is a kind of appeasement that helps the guests in soliciting food from the hosts. This has been directly observed both in North American *Formicoxenus quebecensis* FRANCOEUR, 1985 with *Myrmica* spp. (FRANCOEUR & al. 1985) and in European *F. nitidulus* (NYLANDER, 1846) and its *Formica* hosts (BUSCHINGER 1986b). According to an alternative or probably additional suggestion of LENOIR & al. (1997) such "riding" may help the parasites of genus *Formicoxenus* to acquire the host species' colony odor. For *T. minutissimus* an experimental study will be necessary to support one or the other explanation, or perhaps both.

The male of *T. minutissimus* which is described here for the first time, exhibits characters that fit well to intranidal mating: The compound eyes are markedly smaller than in the swarming host species, and the thorax is smaller and narrower, indicating a smaller mass of flight muscles. Nevertheless, the useless wings have been retained in both, males and gynes. This, however, is also true for the nest-mating species of *Myrmoxenus* mentioned above.

An intriguing feature of the males of *T. minutissimus* is their morphological similarity to the females: Propodeal spines, small compound eyes, rounded head, reduced number of antennomeres, short and stout petioles. According to KUSNEZOV (1956) this "feminization" of males seems to be a more common feature in parasitic ant species, though it does not always occur in inquiline species, and it seems to be absent in temporary parasitic as well as in dulotic groups. We rather suspect some relation to intranidal mating and inbreeding. "Feminization" in this context means a reduction of morphological attri-