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On the biology of *Baloghella melis* Mahunka, 1963 (Acari: Acaridida: Glycyphagidae)

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Abstract. *Baloghella melis* (syn. *Melesodectes auricularis*) is a representative of the Glycyphagidae, the deutonymph of which is found in the external auditory meatus of badgers (*Meles meles*). We isolated the hypopi from the conchae of *Meles meles* and reared them up to the adults of the next generation. Besides the already known hypopi (motile hypopi) located in the external auditory meatus we obtained a different immovable type of deutonymph (inert hypopus), which had been unknown so far. In nest material from a badger's hole we found all developing stages of *Baloghella melis* including inert hypopi. In our opinion *B. melis* is not a parasite but a saprophagous nest-inhabitant feeding on shedded and decomposing tissue particles.

Key words. *Baloghella melis*, *Melesodectes auricularis*, *Meles meles*, inert hypopus.

Introduction

Mites of the family Glycyphagidae are in their majority nest-inhabitants of Marsupialia, Insectivora or Rodentia. Only a few species live in a broader range of biotops without contact to mammals (e. g. *Glycyphagus domesticus*, *Lepidoglyphus destructor*). Most of the species produce heteromorphous deutonymphs (hypopi) which serve for dispersion by phoresy or in other cases constitute an immovable permanent stage. *Baloghella melis* is the only representative of the Glycyphagidae, the deutonymph of which is typically found on Carnivora. There is also no corresponding case known so far of deutonymphs occurring in the external auditory meatus.

Previous Knowledge

Baloghella melis was described in 1963 by S. Mahunka. The mites were collected by the aid of a Berlese apparatus from nest material of a badger's hole. Fain & Lukoschus (1968) detected *B. melis* when they examined the external auditory meatus of badgers for *Psorergates* infestations. Not realising that the species was already known Fain & Lukoschus (1968) described it as *Melesodectes auricularis*. In the ears they found heteromorphous deutonymphs (hypopi), some tritonymphs having just developed from deutonymphs, and deutonymphs enclosing complete tritonymphs. The exact site of the mites could not be located, because the auditory meatus had been completely scraped out for examination. The hypopi were considered by the authors to live in deeper tissue layers and to come to the surface only to continue their development. In his work of phoretic deutonymphs on mammals Fain (1969) revised this earlier opinion. The hypopi were now thought to live exclusively in the earwax (cerumen).

Lukoschus, De Cock & Fain (1971) published an extensive work on the life cycle of *Baloghella melis*. Initial stages were again hypopi from the conchae of *Meles meles* (lactating females). The authors succeeded in rearing the mites to the protonymphal

instar of the following generation. A combination of choncha, fatty tissue and muscular tissue was found to be the best rearing medium. Other mixtures which have been proved so far to be successful for rearing mites living in nests of small mammals were less suitable. Moreover hypopi were found in small skin lesions of the abdomen and inner side of the thighs and on thorax of a starved suckling. These findings induced Lukoschus et al. to conclude: "Failure of rearing mites on defined rearing media, fitted for most species of nest-inhabitant mites, suggests that *Melesodectes* is not a free-living nest-inhabitant, hypopi of which are phoretic on hosts for reaching new habitats, like *Xenoryctes krameri*, but a specialized monophagous parasite. Successful rearing only on epidermis and fat tissue of the host suggests that in field conditions free living stages also feed on debris of host tissues present within the nests only during lactation period." Males of *B. melis* have very enlarged legs II with opposable apophyses at femora and tibiae. According to Lukoschus et al. they are used for clasping the legs IV or III of females at copulation.

The aim of our examination was to improve the knowledge of *B. melis*. The main question was whether this species is in fact a parasite as assumed by all authors who expressed their opinion on this case or a saprophagous nest-inhabitant.

Material and Methods

Conchae of *Meles meles* (1 ♀, 7. 4. 1989, Spraitbach near Schwäbisch Gmünd, SW-Germany; 1 ♂, 4. 5. 1989, Welzheim near Schwäbisch Gmünd) with hypopi of *B. melis*. Nest material from a badger's hole (3. 9. 1989, Täferrot near Schwäbisch Gmünd).

The mites were reared in little vessels containing conchae and some yeast at moderate humidity. The behaviour of the mites was observed with a Zeiss stereomicroscope (16x, 40x). Whole mounts in Hoyer's medium were made from all developing stages. Nest material was examined for the evidence of *B. melis*.

Results

In resected conchae we never found deutonymphs burrowing in the tissue. The mites were located on the skin surface or were embedded in the earwax. In contrast to Lukoschus et al. (1971) we succeeded in rearing the hypopi up to the adults of the next generation. But we obtained only a few females and no males. In this case the protonymphs developed directly into tritonymphs (fig. 1). The mites fed predominantly on the surface of the putrifying conchae. At microscopic examination their gut contained besides fungus spores a brownish substance resembling in its colour the decomposing tissue of the conchae. Besides the already known hypopi (motile hypopi) located in the external auditory meatus of *Meles meles* we obtained a different immovable type of deutonymph (inert hypopus) (fig. 2). In this type all extremities are completely reduced. Instead of the first and second pairs of legs there are only four little protuberances each accompanied by a sensory bristle laterally. This inert hypopus remains in the protonymphal exuviae (fig. 3). In the nest material which had been removed from the hole by the badgers themselves we found all developing stages of *B. melis*. Among deutonymphs the immovable type occurred in very high numbers. Gut contents consisted again of a brownish matter mixed with fungus spores and hyphae. In the nest material mites could be kept for weeks. At copulation the male climbs onto the female while the gnathosomata of both sexes



Fig. 1: Developing tritonymph within protonymph. Small arrows: genital suckers of protonymph. Large arrow: genital suckers of tritonymph.

point at the same direction. In contrast to Lukoschus et al. (1971) it was never observed in copulating pairs that a male clasps with its legs II the legs IV or III of a female. This is anatomically not possible because the male is too small for doing this. Males already mount female tritonymphs. Even during torpor and subsequent hatching they do not leave the female tritonymphs.

Discussion

All observations and rearing experiments lead to the conclusion that *Baloghella melis* is not a parasite but a saprophagous nest-inhabitant feeding on shedded and decomposing tissue particles.

The distribution of *B. melis* is guaranteed by the motile hypopus which migrates into the external auditory meatus and in this way gets into other badger's holes. The inert hypopus constitutes a permanent stage which has to bridge bad living conditions. Probably the formation of deutonymphs is provoked by deficiency of nourishment. Perhaps this was the cause for the failure of Lukoschus et al. to exceed the protonymphal stage in their rearing experiments. Some of the protonymphs which they thought to be dead supposedly contained inerthypopi. We have not examined the reasons for the formation of either inert or motile hypopi.

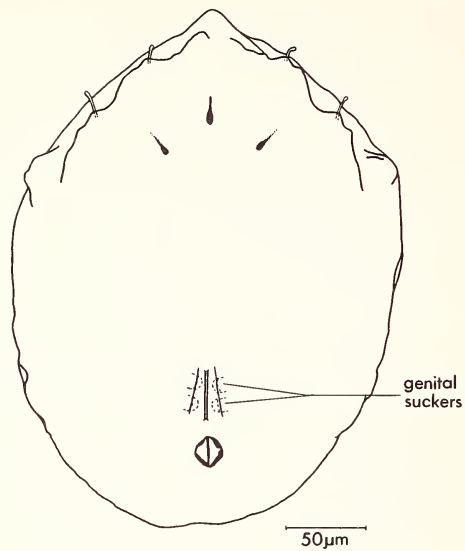


Fig. 2: Deutonymph (inert form) of *Baloghella melis*, ventral view.



Fig. 3: Inert hypopus within protonymphal exuviae. The interior of the hypopus appears dark because of highly condensed reserve substances.

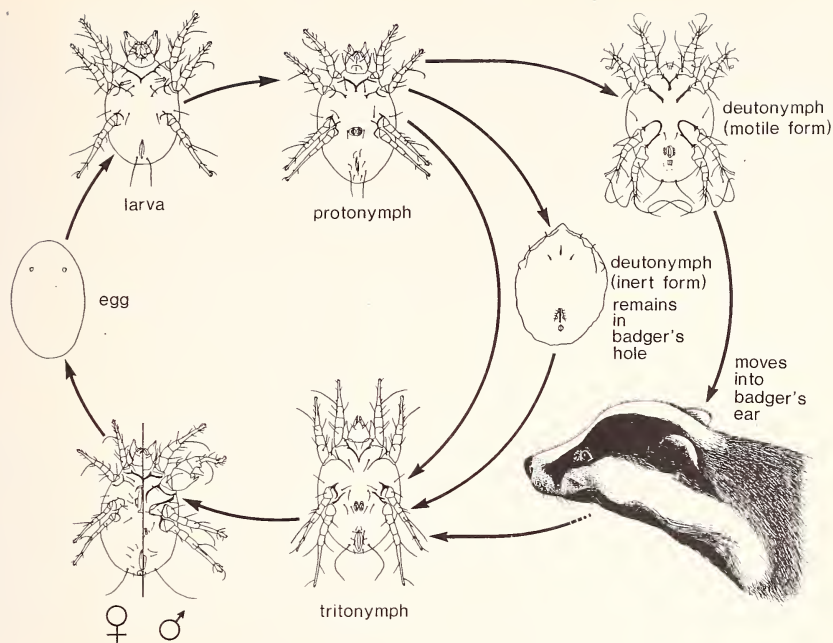


Fig. 4: The life cycle of *Baloghella melis*.

According to our findings it is very unlikely that motile hypopi in the conchae are feeding through the body surface. Newly hatched motile hypopi were of the same size as the motile hypopi from badger's ears. We never found "shrunken" motile hypopi which are typical of species feeding during the deutonymphal phase which is an obligatory stage in these cases (e. g. *Hypodectes propus*, *Apodemopus apodemi*).

At copulation with a female or a female tritonymph the male is secured against slipping off by the strong broadening of the membranous part of the pretarsi. The pretarsi of females are formed normally. Analogous formations also occur in males of other proconiugati (sensu Samsinak 1971), e. g. in *Dermacarus sciurinus* (Glycyphagidae) or *Sennertia cerambycina* (Chaetodactylidae). We are not able to explain the function of the strongly enlarged legs II with apophyses in males of *B. melis* but it has to be considered that there are a lot of free-living Astigmata (e. g. *Acarus*, *Rhizoglyphus*, *Caloglyphus*, *Schwiebea*) of which the males also have hypertrophic legs with unknown function.

The formation of two types of heteromorphous deutonymphs was only known in some *Chaetodactylus* spp. so far (Krombein 1962, Baker 1962). *Chaetodactylus* spp. live in nests of megachilid bees (mainly *Osmia* spp.) and feed on pollen and nectar stored as food for the bee larvae. The motile hypopi of *Chaetodactylus* spp. attach to the hatching bees and leave the nest. The inert hypopi remain in the nest. As the nests are repeatedly used by the same species the inert hypopi constitute a second possibility for guaranteeing propagation.

Among the Glycyphagidae inert hypopi were recorded only from *Lepidoglyphus destructor* and *Glycyphagus domesticus* so far. In these species a motile hypopus was never found. The inert hypopus of *B. melis* is very similar to that of *Glycyphagus domesticus* which is also lacking the legs completely. In the inert hypopus of *Lepidoglyphus destructor* legs are still present but strongly simplified.

The so-called genital suckers are permanent even in the most advanced forms of reduction of hypopi. This fact supports the assumption of Alberti (1979) that the genital suckers are in fact an organ for water balance. The development of every hypopus to the tritonymph is accompanied by a strong enlargement of body volume only explicable by water intake. Probably the water is transported through the "genital suckers".

Zusammenfassung

Baloghella melis (syn. *Melesodectes auricularis*) ist ein Vertreter der Familie Glycyphagidae, dessen Deutonymphe (Hypopus) in den Gehörgängen des Dachses (*Meles meles*) vorkommt. Ausgehend von den Hypopi aus Gehörgängen von Dachsen, gelang es, die Milben bis zu Adulti der nächsten Generation zu züchten. Neben den bereits bekannten Hypopi (Wandernymphen) lieferten die Zuchten noch eine zweite, unbewegliche Hypopus-Form (Dauernymphen), die bisher unbekannt war. Bei der Untersuchung von Nestmaterial aus einem Dachsbau konnten alle Entwicklungsstadien von *B. melis* gefunden werden, einschließlich der Dauernymphen. Aus diesen Befunden wird gefolgert, daß *B. melis* nicht, wie bisher angenommen, ein Parasit, sondern ein saprophager Nestmitbewohner ist.

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