

Short Communications

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PHORESIA OF *DAMALINIA (C.) MEYERI*
(MALLOPHAGA) AND *LAMPROCHERNES*
NODOSUS (PSEUDOSCORPIONIDEA) ON MOSQUITOES
AÈDES STICTICUS (CULICIDAE)

J. MINÁŘ

Institute of Parasitology, Czechoslovak Academy of Sciences, Prague

Abstract. 12 cases of phoresia of biting lice *Damalinia (Cervicola) meyeri* (Taschenberg) on the mosquitoes *Aedes sticticus* (Meig.) were observed in southern Moravia. Mosquitoes with lice attached to their legs represented 0.048% of population sample of this species. In 3 cases phoresia of pseudoscorpions *Laprochernes nodosus* (Schrank) on mosquitoes *Aë. sticticus* was also observed. The phoresia of some lice species on blood-sucking *Diptera* is under favourable conditions, probably a frequent mode of distribution and evidence of certain adaptation to parasitic life. The phenomenon observed proves that mosquitoes *Aë. sticticus* frequently attack roe deer and search for food in the vicinity of their breeding places.

Cases of phoresia of biting lice on mosquitoes have been rarely observed until now. PEUS (1933) described two cases from the region of Dolní Lužice (now in territory of G.D.R.), where he found biting lice of the species *Damalia (Cervicola) tibialis* Piag. (in his paper recorded as *Trichodectes tibialis* Piag.), the parasites of fallow-deer (*Dama dama* L.), attached to the proboscis of female mosquitoes *Aedes intrudens* Dyar and *Aë. rusticus* Rossi by means of their mandibles and anterior pair of legs. EICHLER (1963) recorded a case of phoresia of biting louse *Damalinia (C.) meyeri* (Taschenberg) on the mosquito *Aë. punctor* Kirby and another case of phoresia of the same biting louse species on the fly *Hematobia stimulans* (Meigen). A case of two specimens of biting lice *Linognathus* sp., the parasites of antelopes, attached to the legs of the female mosquito *Aë. circumluteolus* Theob. was reported from Natal (BROOKE—WORTH, PATERSON 1960).

12 cases of phoresia of biting lice *Damalinia (Cervicola) meyeri* (Taschenberg) 1882 on the mosquitoes *Aë. sticticus* were observed in South Moravia. The relatively high number of cases and some ecologically interesting circumstances of this phenomenon are specially remarkable.

Mosquitoes with attached biting lice were collected in the inundated forest near Drnholec in four localities, 300—1300 metres distant from one another in periods between 18—21 May and 7—10 June 1965. In May a total of 25 954 female mosquitoes were collected, out of which 11 specimens, i.e. 0.040% had biting lice attached to their bodies. The most abundant species *Aë. sticticus* represented 85.64% of the total number of mosquitoes collected. The biting lice were found in 0.048% of captured mosquitoes of this species. In June one case of phoresia was discovered in 29917 specimens of *Aë. sticticus*.

The biting lice were attached by means of their mandibles and first pair of legs to the lower part of tibia or to the segments of the mosquito's tarsus. (Two cases of attachment to tibia of the 1st pair of legs, two cases of attachment to the 4th segment of tarsus of 3rd pair of legs, one case of attachment

each to the 3rd segment of tarsus of 1st pair of legs, to the 3rd segment of tarsus of 2nd pair of legs and to the 2nd segment of tarsus of the 3rd pair of legs were observed. In five cases the exact spot of attachment could not be specified because the lice became detached during identification). PEUS (1933) recorded the mosquito's proboscis as the spot of attachment. All specimens of lice collected from mosquitoes were females, some of them were immature.

In our territory this species of biting lice was found on roe deer in Slovakia (BALÁT 1956).*) It was one of few species of lice which proved to have harmful effects on the hosts—the falling out of hairs, damaged skin and general weakening of heavily infested individuals (EICHLER 1957, 1963).

The finding reported in this paper comes from isolated inundated forest covering the area of 170 ha at the lower reaches of the river Dyje. If the water level in the river is high, the forest is regularly flooded at various degrees. According to the data of the Forestry Management 25 heads of roe deer lived in the area of inundated forest at the time when the mosquitoes were collected.

Some other species of arthropods were also found on the mosquitoes collected in this locality. On three mosquitoes *Aë. sticticus* captured in June pseudoscorpions (*Pseudoscorpionidea*) of the species *Lamprochernes nodosus* (Schrank) 1761 (det. Dr. P. Verner) were found in one of the four places where the collecting was done. The pseudoscorpions were attached to the legs of the mosquitoes. Normally these pseudoscorpions live in the soil of gardens, in piles of compost etc. Phoresia of these pseudoscorpions on various species of flies is well known (BEIER 1963, 1953).

When the territory of the inundated forest was flooded to the level of 50 cm or more in the first decade of June, the pseudoscorpions left their original habitats in the surface soil layer and crawled on the dry plants and trees where they came into contact with mosquitoes seeking shelter in the vegetation during the day. 5 nymphs of *Hydracarina* were also found on the mosquitoes *Aë. sticticus* and *Aë. cantans* at this period.

Discussion

A relatively high number of phoresia cases of lice is connected with certain natural conditions in the area investigated. The water level in the river Dyje in spring 1965 was unusually high and the floods in southern Moravia practically persisted from the end of March to the beginning of July. In the inundated forest near Drnholec smaller animals and game disappeared or decreased in number. Roe deer which could run over to less flooded places survived the floods best of all and became the nearest source of blood for mosquitoes of the genus *Aëdes* hatched in shallow waters in the forest during the first decade of May. Because of lack of other food sources such as hares the mosquitoes attacked the roe deer more intensively and thus promoted the frequent phoresia of biting lice.

During previous years (1962—1954), when the floods were not so big, mosquitoes of the genus *Aëdes* were collected in the inundated forest near Drnholec in summer months. (Table 1). No biting lice were detected on these mosquitoes probably due to dispersion of mosquitoes on a larger number of host species and to the possible seasonal occurrence of biting lice.

Lice found on the mosquitoes were mostly alive. The mosquitoes apparently could not finish feeding on one roe deer for some reason (for example when disturbed) and searched for another source of blood (feeding of masses of mosquitoes of the genus *Aëdes* on roe deer was recorded by KRAMÁŘ, WEISER 1951). The biting lice

*) The author wishes to thank Dr. Fr. Balát for the revision of lice dealt with in this report.

Table I. Survey of mosquitoes of the genus *Aedes* collected in the studied locality in relation to phoresia

Year	Month	Number of mosquitoes of the genus <i>Aedes</i>	Number of biting lice	Number of pseudoscorpions
1962	8.	13.963	—	—
1963	8.	11.470	—	—
1964	7.	3.835	—	—
1965	5.	25.954	11	—
	6.	30.612	1	3

managed to attach themselves to the mosquitoes during the short interval when the latter were settling down and crawling over the fur of the animal. The lice apparently have an instinct for attachment to other insects. Their mouth-parts—mandibles are adapted for firm attachment to thin cylindrical objects (hairs, setae on the body of some avian parasitic flies, legs of mosquitoes). There are no particular insect species to which the lice try to attach themselves as proved by findings of lice on non-parasitic insects (for example bumble bee, dragonfly — CUMMINGS 1913, MANN 1920 etc.), which cannot possibly carry them to another host. Their capability of firm attachment to the body of insects is most likely the decisive factor here.

After engorgement the mosquito does not seek for a host during blood digestion and maturing of eggs and the survival of the attached louse is doubtful due to the fact that without its specific host the louse can live only several hours or days (BLAGOVESHCHENSKY 1959).

The number of phoresia cases in 1965 is remarkable if we take into account the fact that only some lice manage to attach themselves to the mosquitoes attacking the host and that there is little opportunity of capturing the mosquitoes which carry lice at the moment when they are trying to feed on another host, due to general large numbers of mosquitoes. It is interesting to note that mosquitoes with attached lice were encountered in various localities of the inundated forest and were quite regularly represented in the population sample of mosquitoes. On the other hand, the phoresia of pseudoscorpions was determined only in collections carried out in one locality only. These phoresia cases are closely connected with the mass occurrence of mosquitoes which are not specifically important for their distribution and are mostly their accidental carriers.

EICHLER (1936) regards phoresia of lice (which he calls spatial parasitism) as accidental phenomenon. MARKOV (1938) on the other hand, on the basis of his studies on phoresia of lice parasitic on starlings, states that "natural small mobility of some *Ischnocera* is compensated by phoresia". BLAGOVESHCHENSKY (1959) is of the opinion that it would be premature to draw any conclusions on the general importance of phoresia of lice at present time.

The numerous cases of phoresia of lice on mosquitoes observed in southern Moravia shows that with some species of biting lice this mode of distribution in nature under suitable conditions is more frequent than indicated by the recorded number of observations.

The phoresia of biting lice *Damalinia (C.) mayeri* on mosquitoes is an indirect evidence that mosquitoes *Aë. sticticus* frequently attack roe deer. When recording the observations on mosquitoes feeding on game it is often difficult to identify exactly the respective mosquito species. The presented observations also prove that large numbers of mosquitoes *Aë. sticticus* seek food in the biotope of inundated forest in the vicinity of their breeding places.

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