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SPECIES OF THE FAMILY DOLICHOPODIDAE AS ENEMIES OF MOSQUITO AND BLACKFLY LARVAE AND ADULTS

Terrestrial predacious insects play a certain role in reducing the number of blood-sucking Diptera, primarily their larvae. There exists a number of papers dealing with this problem, pointing out some species of the family Dolichopodidae as natural enemies of blood-sucking Diptera.

Unnamed species of the family Dolichopodidae are indicated as predators of mosquito larvae by Atkinson (J. Trop. Med. Hyg. 12: 255—256, 1909), Howard et al. (Washington Carnegie Inst. 1: 156—179, 1912) and Christophers (Cambridge Univ. Press, pp. 739, 1960). Bishop and Hart (J. N. Y. Ent. Soc. 39: 151—157, 1931) mention 4 species of the genus *Dolichopus* from Colorado, observed while catching mosquito larvae on the water surface both in nature and in laboratory. Likewise Williams in his paper on ecology of Hawaian water-loving Diptera indicates (Proc. Hawaian Ent. Soc. 10: 281—315, 1939) adults and larvae of the family Dolichopodidae as important predators of mosquitoes. Travis (Proc. Entomol. Soc. Wash. 49: 20—21, 1947) describes mosquito larvae hunted by the species *Paraclius germanus* Parent in Quam in the South Pacific and Darrow (Amer. J. Hyg. 50: 207—235, 1949) gives a picture of *Thinophilus* species devouring mosquitoe larvae. Collart (Rev. Zool. Afr. 15: (Suppl.) 31—32, 1927) mentions as predator of mosquito larvae *Pelastoneurus collarti* Curran in Congo (Kinshasa). Laing and Welch (Proc. Entol. Soc. Ontario 93: 89—90, 1963) report from Canada the species *Dolichopus gratus* Lw. hunting mosquito larvae in experimental water reservoirs. The last mentioned authors, as well as Bishop and Hart (1931), also give some data on the number of mosquito larvae liquidated by predacious flies in a concrete period of time. Among papers of European authors noteworthy is the study of Smith and Empson (Brit. J. Anim. Behav. 3: 32—34, 1955) in which the authors briefly mention the current species *Poecilobothrus nobilitatus* (L.) in Central Europe and describe the manner in which its adults hunt larvae of *Culex pipiens* L. The same species was reported as predator of mosquito larvae by Brocher (Ann. Biol. lac. 13: 75—76, 1924). There are several records from the southern part of the European USSR by Negrobov (Ref. dokl. IV. Nauch. konf. molodykh uchenykh-biol., Izd. Moskov. Univ., pp. 75—76, 1966) concerning species of the family Dolichopodidae which play a role in checking the increase of mosquito populations. The species mentioned, are also abundant in Central Europe, or they are species closely related to those occurring here. They are primarily species of the genera *Poecilobothrus*, *Hydrophorus*, *Tachytrechus*, *Dolichopus* and *Campsicnemus*. The remaining group of papers, dealing with predators of mosquitoes from the family Dolichopodidae, contain the up-to-date studies of Service (Bull. Wld. Hlth. Org. 45: 169—180, 1971, Proc. Symp. Univ. Alberta, Edmonton, pp. 125—132, 1973a, Bull. Ent. Res. 62: 359—369, 1973b, J. Med. Ent. 10: 503—510, 1973c) who investigated the predators by precipitin test. This author mentions species of the family Dolichopodidae not only as predators of larvae, but also of mosquito imagoes hatching at the moment. To our conditions most important is Service's paper (1973c)

dealing with predators of *Aedes cantans* (Meig.). The species *Hercostomus* sp., *Campsicnemus scambus* (Fall.) and *C. curvipes* (Fall.) are mentioned here as predators of hatching imagoes, and the last two species of the genus *Campsicnemus* are also common in Czechoslovakia, *C. curvipes* (Fall.) being the most abundant species of the family. Finally, Dolichopodidae are also mentioned as predators of adult mosquitoes by Beyer (Quart. Bull. La Bd Hlth. 14: 54—84, 1923), but particular species are not given.

Less numerous are papers dealing with blackflies as prey of Dolichopodidae. Twin (Can. Ent. 71: 101—105, 1939) reports from Canada *Dolichopus splendidulus* Lw. (= *D. affinis* Walk) and *Chrysotus* sp. as predators of larvae. Peterson (Canad. Ent. 92: 266—274, 1960) gives an account of a female *Hydrophorus algens* Wheeler captured while devouring the *S. aureum* imago and Peterson and Davies (Canad. J. Zool. 38: 9—18, 1960) indicate species *Chrysotus obliqus* Lw., *Chrysotus* sp. and *Rhaphium effilatum* (Wheeler) as predators of *S. venustum* Say.

Between 1976 and 1978 the author of the present communication studied the behaviour of some species of the family Dolichopodidae in nature. In 1976 (October 3) he observed imagoes of the species *Hydrophorus bipunctatus* (Lehm.) and *H. litoreus* Fall. hunting larvae of *Culex pipiens* L. and *Anopheles maculipennis* (Mg.) mosquitoes in overgrown edges of a small shallow water reservoir in the outskirts of the village Popice (South Moravia). Although the two species of the genus *Hydrophorus* were abundant in this locality and in some places the mosquito density reached 2,850 larvae and pupae of *C. pipiens* and 1,220 larvae of *A. maculipennis* per 1 m², only two cases were observed when a fly preyed upon *A. maculipennis* larva. This may be explained by late afternoon hours and inadequate sunshine during the observations.

In 1978 (August 3, 12.30 hours) observations were made of adult *Poecilobothrus nobilitatus* (L.) and *Dolichopus ungulatus* (L.) intensively hunting *C. pipiens* larvae in the still water at the outflow of the fishpond near the Černý Dub village, district of České Budějovice (South Bohemia). *D. ungulatus* belongs to the most abundant species of its genus and family in Central Europe and may be encountered on the shores of all kinds of waters. *P. nobilitatus* is a species with a relatively local occurrence, but in South Bohemia its mass occurrence is quite common, primarily in the environs of periodic standing waters in open terrain. The two mentioned species belong to the biggest European species of the family. Only females were observed preying on the mosquito larvae on the sunny surface of a shallow still water, but only during sunshine. The mosquito larvae sheltered in shade, did not attract their attention. The flies were moving over the water surface and tried by mouth parts to catch mosquito larvae present under it, attacking primarily those which have just emerged. After a successful catch they immediately flew away to the shore where they devoured their prey. Males of the two species made intensive attempts at copulation and performed characteristic ritual dances. So far as I could observe, attempts at copulation were successful only when the female had its prey (a mosquito larva, less frequently a chironomid larva). In one case a *D. ungulatus* female was observed with a small blackfly larva, most likely of the species *Simulium argyreatum* Meig. The manner in which the female hunted the larva, was not observed, but the larva in question was probably attached under the water surface at the edge of the spilway of fishpond.

On 4 August 1978 two females of the species *Hypophyllus obscurellus* Fll., devouring *S. argyreatum* larvae, were observed and caught at the outflow of the Bezdrev fishpond near Hluboká nad Vltavou (South Bohemia). However, neither here the way these females had caught the larvae, was observed. In both cases the larvae were about 3 mm in size. This observation was made during a sunny weather, but the locality was more shaded than the previous one.

Although the species of the family Dolichopodidae cannot be considered to play a decisive role in the liquidation of mosquito and blackfly larvae in nature, it would be incorrect to disregard this role, mainly because high numbers of some species occur primarily in the surroundings of the mosquito breeding sites (e.g. the species *C. curvipes*, mentioned by Service, occurs in some localities, particularly in South Moravia, around water pools in inundated forests throughout the entire vegetation period in immense numbers). It stands to reason that not all water-loving species of this family may be regarded as potential natural enemies of mosquitoes and blackflies. Moreover, it should be taken into consideration that in absence of sunshine the activities of adults are apparently decreasing. Likewise, larvae sheltered in the shade are less attractive prey to the flies. As for adult dolichopodids hunting blackfly larvae, only outflows of fishponds are suitable places for catches because due to the frequent water level fluctuation enormous numbers of blackfly larvae become exposed on the wet stones and can be easily picked up. On the other hand, during their mass occurrence the mosquito and blackfly larvae may constitute the most available food to dolichopodid adults, particularly when these predators are abundant, and this fact may play a certain role in the eradication of blood-sucking Diptera species annoying to man.

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