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ON SOME OESTRIDAE, HYPODERMATIDAE AND HIPPOBOSCIDAE (DIPTERA) FROM AFGHANISTAN

Staff members of the Institute of Parasitology, Czechoslovak Academy of Sciences, in collaboration with Afghan specialists studied parasites of domestic animals in Afghanistan in the spring (April—May) and autumn (September—October) seasons of 1974. The study was carried out at the abattoir in Kabul where animals from various regions of Afghanistan, partly of Pakistan arrived to be sloughtered.

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Family Oestridae

Cephalopina titillator (Clark, 1816)

Material: 10 larvae of 3rd instar, Kabul 7. 5. 1974; 3 larvae of 3rd instar, Pakistan 28. 9. 1974. Host: Bactrian camel (*Camellus bactrianus* L.).

This species was reported from Afghanistan earlier (Minář J., Povolný D., Acta Univ. Agric. Brno, ser. A, 19: 349—351, 1971), where 3rd instar larvae were found in February and March. In southern Kazakhstan 3rd instar larvae were found from mid-March to beginning of September (Blagoveshchensky D. Yu., Orlov N. P., Krasnousov G. N., Tr. Kazakhst. fil. AN SSSR 2: 101—121, 1937). The occurrence of 3rd instar larvae in Afghanistan from February to end of September indicates a development of two generations of this species during the year in warm regions of its range, as stated by K. Ya. Grunin. (Nosoglotochnye ovoda (Oestridae). Fauna SSSR, Nasekomye dvukrylye, 3, 145 pp., Moskva—Leningrad, 1957) etc.

Family Hypodermatidae

Crivellia silenus Brauer 1858

Material: 21 larvae of 2nd instar, Ghazni 23. 9. 1974; 117 larvae of 2nd instar, Jalalabad 22. and 26. 9. 1974. Host: goat (*Capra hircus* L.).

The occurrence of *C. silenus* in Afghanistan was recorded by G. Madel (Angew. Parasit. 10: 204—211, 1969; Folia parasit. (Praha) 18: 85 to 91, 1971). The period of occurrence (September) of 2nd instar larvae agrees with the period of this instar indicated by him.

The goats examined were infested with 1 to 39, on the average with 6.9 larvae per infested animal. A similar degree of infestation, on the average 6, maximally 40 larvae per host, was reported by E. Gauzer (Kozhnyi ovod koz v Azerbaijane, Baku, pp. 44, 1940) from Azerbaijan. E. I. Gan (Entomol. sb. Tashkent, pp. 143—174, 1960) reported from Uzbekistan a higher infestation, maximally 97 larvae per host.

Family Hippoboscidae

Hippobosca equina Linné, 1758

Material: 35 ♀♀, 20 ♂♂, Kunduz 23—30. 9. 1974, from cows. 3 ♀♀, Pakistan 30. 9. 1974, from zebu. 1 ♂, Pakistan 28. 9. 1974, from camel. 1 ♀, North Salang, 11. 10. 1974, from man. Hosts: *Bos taurus* L., *Camellus bactrianus* L., *Homo sapiens*.

This species was found in the Kunduz region in the north-eastern Afghanistan by M. Daniel and D. Povolný (Folia parasit. (Praha), 13: 370—378, 1966) on dog. Main hosts of *H. equina*, according to published data (Theodor O., Oldroyd H., Hippoboscidae. In: Lindner E., Fliegen der Palaearktischen Region, VIII, 70 pp., Stuttgart, 1964 etc.) and to the collections of the first author in the Balkans (Bulgaria, Yugoslavia) are cows and horses.

Melophagus ovinus Linné, 1758

Material: 1 ♀, Ghazni 24. 9. 1974. Host: goat (*Capra hircus* L.).

From Afghanistan this species was reported by Daniel and Povolný (1966). According to their observations it is very numerous on sheep in the region of Jalalabad. From Kazakhstan it was reported by T. N. Doszhanov and K. Kozhakhmetov (Tr. Inst. zool. AN Kaz. SSR 33: 113—114, 1972).

Lipoptena caprcoli Rondani, 1878

Material: 47 ♀♀, 25 ♂♂, Jalalabad 22., 23., 26., 28. 9. 1974; 4 ♀♀, 1 ♂ Nuristan 29. 9. 1974; 1 ♀ Badakshan 30. 9. 1974; 2 ♀♀, 1 ♂ Ghazni 23. to 24. 9. 1974; 5 ♀♀, 4 ♂♂ Kunduz 24. 9. 1974, all from goats. 3 ♀♀, 4 ♂♂ Kunduz 22. 9. 1974, from sheep. Hosts: *Capra hircus* L., *Ovis aries* L.

L. capreoli is distributed over the eastern part of the Mediterranean region, from Dalmacia to western Pakistan and northern India. Goat is reported to be the only host (Theodor, Oldroyd 1964, Maa T. C., Pacif. Ins. Monogr. 20: 205—236, 1969a, ibid.: 261—300, 1969b). The occurrence of this species on sheep in Afghanistan may be explained by the close contact of animals kept in this area together in large herds (as in the case of the occurrence of *Hypoderma bovis* de Geer on goats in Afghanistan—Minář, Povolný 1971). All specimens in the material studied were without wings, in appearance strongly resembling the genus *Melophagus*. Autumn is probably the season of occurrence of this species which was not found by previous expeditions organized

in spring and summer, although in our collections from various regions of Afghanistan it was relatively abundant.

According to the information of the Afghan veterinary service, warble flies (Hypodermatidae), bot flies (Oestridae) and louse flies (Hippoboscidae) cause grave damages in animal husbandry in Afghanistan.

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ENTOMOPHAGOUS FUNGUS BEAUVERIA TENELLA (DEUTEROMYCETES), PARASITE OF PUPAE OF WARBLE FLY HYPODERMA BOVIS (DIPTERA, HYPODERMATIDAE)

Warble flies of the family Hypodermatidae, similarly as bot flies, have very few natural enemies and parasites. The larvae living in the body of their host are well protected against the enemies and the adult specimens, which live only for a short period, and pupae dispersed in the field are only occasionally eaten by predatory insects and insectivorous birds.

Only three species of parasitic hymenopterans of superfamilies Ichneumonoidea, Chalcidoidea and Proctotrupoidea (Grunin K. Ya., Podkozhnye ovoda (Warble flies), Fauna SSSR, XIX, 4, 237 pp., Moscow—Leningrad, 1970; Blagoveshchensky D. I., Parazitologiya 4: 265—266, 1970) have been found in the pupae of *H. bovis* (De Geer, 1776). Therefore any further report of a hyperparasite infecting the pupae of this economically very important warble fly is of great significance.

During our experiments carried out in spring 1975, when mature living larvae of warble flies were placed in free nature where they pupated, the pupae were found to be infected with a fungus. The experiments were aimed at the study of the ecology of pupae under natural conditions and were performed in pasture areas of the Šumava Mountains in Southern Bohemia. The pupae from which no adults emerged were dissected and the stage of development and reason of death were studied. Some of the pupae were filled with the mycelium of fungi which were isolated and cultivated in the laboratory. Of a pupa completely filled with white filaments, the entomophagous fungus, *Beauveria tenella* (Delacr.) Siem. was isolated and determined.

The larva seemed to be infected with the fungus in the surface layer of soil at the stage of its transformation into the puparium. Of the 13 dead pupae only one was infected with this primarily pathogenic fungus, five pupae were secondarily infected with saprophytic fungi of the genera *Aspergillus*, *Penicillium* and *Scopulariopsis*.

Beauveria, one of earlier known genera of entomophagous fungi, is the causative agent of mycoses known under the general name "white muscardine". In its general significance this term is used for infections in which the body of the infected insect hardens and without any deformation is filled with a dense network of fibres of the fungus, as it was in the reported case.

Mac Leod (Can. J. Bot. 32: 818—890, 1954) united all described species of the genus *Beauveria* into two species, *B. bassiana* and *B. tenella*, which differ from one another in the shape of conidia. *Beauveria tenella* occurs very frequently as a parasite of most various insect groups, but its main hosts are beetles, especially grubs of cock chafer *Melolontha melolontha*. The fungus forms in the culture at first white cover of tufty mycelium and later yellowish powdered layer of spores. Microscopic examination reveals characteristic oval conidia, measuring 2—6 × 1.5—3 μm, on short, cup-shaped hyphae-phialides, often arranged in rich whorls. The conidia are formed gradually from the base of a zigzag neck of the phialide to its top.

It is known that at suitable concentration of conidia in the soil, *B. tenella* is capable of infecting live hosts in which it can further develop. This fungus might be therefore utilized for biological control in experimental dissemination of spores at places where the larvae of warble fly fall down and pupate, especially in moisture areas.

The reported case shows that entomophagous fungi may serve as natural enemies of warble flies and reduce their number. The fungus *B. tenella* may be ranged with the not numerous natural enemies infecting warble flies at the pupal stage.

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