

larvae taken by the writer at Nicola, August 25, 1932, in a pack rat, was allowed to pupate in earth in the out-of-doors insectary at Kamloops, and emerged in mid-August, 1933.

Conclusions: Some of the foregoing observations suggest the following deductions regarding the habits of *C. tenebrosa*.

It is usually assumed that the female fly lays her eggs on the hair of the host animal. The extreme viability of the egg and the longevity and motility of the unfed maggot are specializations which would seem unnecessary were the above assumption true. It seems, therefore, more probable to suppose that the eggs are laid among the rocks, logs, nests, or burrows frequented by pack rats, chipmunks, and ground squirrels, the commonest hosts. In support of this, H. B. Leech has told the writer that he captured in 1929 a female of this species in the mouth of a burrow of a ground squirrel or groundhog at Vernon, B. C.

The growth in the host is amazingly rapid, little over a month being required for larval development. The pupal stage, on the other hand, is extraordinarily long and may last a year, but in order for the life-cycle to be completed in a year, the average duration of this stage cannot be more than 10 or 11

months. A two-year cycle, however, does not seem impossible when the viability of the eggs, even in cold weather, is considered. It may have been because of room temperatures, about 70°F., that so many eggs hatched within three months, although the humidity of the room, about 20 per cent, may have been an adverse factor. According to our records of grubs taken from rodents, flies of this group thrive best in localities such as Nicola, Salmon Arm, and Vernon, which have a relatively heavy snowfall. They are rare at Kamloops.

The mortality of rats in the foregoing experiments suggests that this fly may cause the death of small mammals in nature in certain localities, although a general infection may be induced by the grubs less easily in mountain rats than in those used in the laboratory. If they do constitute a factor in reducing populations of wild rodents, then they become a factor in the control of wood ticks, and deserve further study.

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ADDITIONAL NOTES ON THE LIFE-HISTORY OF CUTEREBRA TENEBROSA COQUILLET¹

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At the 1935 meetings of the Entomological Society of British Columbia, T. K. Moilliet read a paper entitled "Notes on the life-history of *Cuterebra tenebrosa* Coquillet." In that paper, which is being published concurrently with this one, he reported his observations on some 400 eggs laid by a fly captured on August 23, 1934. Larvae commenced hatching from these eggs on September 27, reaching a peak in November. Some

of the remaining unhatched eggs yielded active larvae when mechanically opened in February. Numbers of these larvae were used to infest rats, in which they matured in about a month. Since none of these were followed through their pupal period to emergence of adults, the following notes may prove of value in further studies of this parasite.

The material for these subsequent observations was provided by a batch of 850 eggs deposited by a fly on July 26, 1943. The first of these hatched on

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August 20. Further larvae did not appear normally until the following May. By June 15 all remaining eggs had hatched. Larvae kept in the damp cellar of the insectary lived for about three weeks after hatching. After the appearance of the first larva, it was found that eggs could be readily induced to hatch by pricking open the operculum with a sharp needle, or even by merely dislodging the egg from its attachment.

In September, 1943, 43 white rats were each infested with from one to four larvae which had been obtained by mechanical hatching. Of the 89 cuterebrid larvae planted on these hosts, 23 matured and dropped out after an interval of about five weeks. The mortality of the infested rats was approximately 30 per cent, although it must be admitted that some of these animals were the victims of as many as four grubs at once. Most of the grubs were localized in regions about the head and shoulders.

Upon being placed on loose soil the mature grubs burrowed, pupated, and remained quiescent until August 1,

1944, when the insects of the earlier infestations commenced to emerge as adults. With a pupal period of nearly 11 months, the life-cycle of this cuterebrid is just the opposite of those of the cattle warbles, as the periods spent within the host as a larva and in the ground as a puparium are approximately reversed. The fact that up to nearly a year after oviposition the eggs may remain viable and even hatch with the mechanical aid of a host brushing by suggests that the cycle of the warble fly of this rodent may on occasion last as long as two years.

As surmised by Moilliet, it appears probable that this fly does not oviposit on the hairs of its host but deposits its eggs upon debris about the entrance of its burrow. From evidence gained at this laboratory that mice readily eat puparia of cattle warbles, and the fact that gnawed shells of cuterebrid puparia are frequently seen about pack rat nests, it seems likely that this stage of the fly is particularly vulnerable to this means of natural control.

SOME RECORDS OF PARASITIC DIPTERA FROM WELLINGTON, B. C.

BOMBYLIIDAE

Villa alternata, Say Aug. 10, 1946. Bred from a large phalaenid larva, species unknown.

TACHINIDAE

Bombyliopsis abrupta (Wied.), June 8, 1945. Bred from larva of *Diacrisia virginica* (Lepidoptera, Arctiidae). 14.VI.45. Taken on woodland path.

Rileymyia n. sp., Mar. 3, 1945. Bred from larva of *Halisidota argentata* (Arctiidae). The adult form of *H. argentata* appears in the summer, after a very short period as a pupa. Thus the parasite in this case does not follow the life cycle of its host, but must attack the partly grown larvae in spring. Mr. A. R. Brooks advises me that the same species has been bred from *Malacosoma* sp., which passes the winter in the egg stage.

Peleteria obsoleta Cn., Aug. 18, 1946. Taken on flowers of *Anaphalis margaritacea*, Aug. 5, 1947. Bred from the larva of an unknown phalaenid moth on grassy foreshore.

Peleteria campestre, Cn., Aug. 18, 1946. Taken on flowers of *Anaphalis margaritacea*.

Bonellimyia tessellata, Brooks, Sept. 26, 1946. This specimen taken in the house during early autumn, was probably seeking a place for hibernation. I am indebted to Mr. Brooks for the following information on the taxonomy of *B. tessellata*:—"Bonellimyia is a segregate of the old genus *Linnaemyia* Des. and *tessellata* is one of three species which were formerly known as *Linnaemyia haemorrhoidis* Fall."

Uromacquartia halisidotae (Tns.), two specimens, June 6, 1946. Bred from larvae of *H. argentata*. The caterpillars were taken the previous August while very small and kept in a cotton sleeve over winter. In this

case infestation must take place soon after the host larvae are hatched, the parasite following nearly the same life cycle. The emergence date is somewhat earlier than is common for the moths.

Lydella nigrita Tns., June 24, 1946, also two specimens, May 28, 1947. Both bred from larvae of *Arzama obliqua* (Phalaenidae). The caterpillars infested with this parasite die in the autumn without pupating, and the maggots leave the body of the host to pupate. Emergence dates in spring coincided with the appearance of the host adults.

Tachinomyia variata Cn., April 24, 1947. Bred from pupa of *Malacosoma pluviale* (tent caterpillar). This species also over-winters as a pupa.

Argentoepalpus significus (Wlk.), April 27, 1947.

All the above determinations were kindly made by Mr. A. R. Brooks, Ottawa.—Richard Guppy, Wellington, B. C.

A WINTER CRANE-FLY, TRICHCOCERA ANNULATA, AT VERNON, B. C. (Diptera: Trichoceridae)—In Volume 44 of this journal, G. J. Spencer listed two species of *Trichocera* as occurring in the province. In the late fall of 1944 my wife and I took a series of a third species, dancing in a swarm about four feet above our lawn at Vernon, B. C.

Examples were sent to C. P. Alexander, who replied in a letter dated February 23, 1945: "Your species is *Trichocera annulata* Meigen, which has been known to me in North America only from Bergroth's record from Sitka, Alaska. Strange to say, since receiving your specimens, it has turned up in California. The species has been carried by commerce to many parts of the world . . ."—Hugh B. Leech, Calif. Acad. Sci., San Francisco, Calif.