

existing mosquito control commissions, or that new commissions must be provided to deal in a similar but appropriate manner with such added public requirements.

It seems probable that, since all such new pest control activities must, like present mosquito control work, be organized in response to local initiative, administered by local agencies, and financed with local funds, considerations of simplicity and economy in the organization and operation of this new work might be best served by the assignment of these new responsibilities to existing agencies where such exist.

Among the many pest control problems that might be best met by community action, the control of blackflies, for example, would be an especially appropriate addition to the responsibilities of a mosquito control commission.

Accomplished by use of a pyrethrum larvicide, and thus with materials and equipment normal to the suppression of mosquitoes, the economies resulting from such an extension of responsibilities could doubtless be multiplied many times as other insect pests might be added to a community pest-control program.

New Jersey Mosquito Larvicide
For
Control of Blackflies (Simuliidae).

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The blood sucking blackflies (Simuliidae) may be a nuisance anywhere, especially in mountainous or hilly regions where the streams are rapid; but in many parts of the world these insect pests constitute a major economic problem.

In the lower Mississippi Valley, more especially before installation of modern flood control, blackflies have caused huge losses of livestock, and much physical suffering and inconvenience to the human population of affected regions. Staggering losses have been reported of which the following are cited as examples (Webster, F. M., U. S. Bur. Ent. Bull. No. 1, 1887, pp. 29-39): 1. In 1866, within a few days of their appearance, huge swarms of blackflies are reported to have killed more than 4,000 mules and horses in the three Louisiana parishes of Tensas, Madison, and Concordia; many plantations having lost every mule owned: 2. In 1874, a single county of southwestern Tennessee reported more than \$500,000.00 worth of livestock killed by blackflies: and 3. In 1884, blackflies are said to have killed more than 3,200 head of livestock in Franklin Parish, Louisiana, within a week.

In Eastern Europe, losses of livestock killed by blackflies have likewise been tragic (Riley, C. V., U. S. D. A. Ann. Rep. for 1884, pp. 340-345): 1. In 1783 Schoenbauer reports the loss on a tract of land belonging to the Imperial Austrian Mining Institution in Hungary, of 20 horses, 32 foals, 60 cows and oxen, 71 calves, 130 hogs, and 310 sheep killed by blackflies. In 1880, the American Legation at Vienna reported the loss that spring in the single county of Hungad, of 158 buffaloes, 186 oxen, 175 cows, 56 calves, 49 sheep, 118 horses, and 1137 hogs all killed by blackflies.

During the first world war blackfly outbreaks in northern Europe resulted in disastrous losses of livestock, both of food and work animals, with the result that after the Armistice the German Government proceeded for a very comprehensive study of the blackfly problem, which was continued until the present war began. (Wilhelmi, Prof. Dr. J., Die Kriebelmückenplage, Gustav Fischer, Jena, 1920, 245 pp.).

In the mountain resort areas of northern New York and New England, there is one particularly troublesome brood of blackflies which emerges in late June, and may persist until after the Fourth of July.

As a result, the season for summer hotels and resort camps in these areas does not really open until near the middle of July; and since the season closes on Labor Day because schools start immediately after, the loss of two or three weeks' business at the beginning of the season, due to blackflies, is a major economic handicap to the region.

At present, the "overhead" expense for the entire twelve months must be carried from the profits of a six weeks' season. Any possible extension of this season by control of blackflies from the middle of July toward the time when schools close in June would, as one summer resort operator expressed it, "be almost pure velvet".

Mosquito larvae develop in quiet water, swim actively about, browse actively on algae and other organisms growing on submerged objects, and for most species breathe atmospheric air taken through the surface film.

Blackfly larvae, in strong contrast, develop in running water, are sedentary, usually remaining attached to the surface of rocks and other submerged

objects where the water is flowing swiftly, feed on floating organisms brought to their highly special strainers by the current, and for respiration depend upon dissolved oxygen from the highly aerated water of their rapid-stream habitat.

Control of blackflies directed at the larvae has been complicated by the fact that blackfly breeding streams are likely to be trout streams, and these highly prized game fish must not be harmed.

Earlier experimental work with oil emulsions at a concentration sufficient to kill the blackfly larvae proved harmful to the fish population of the treated streams.

In my own field tests, the pyrethrum-oil larvicides (including by actual test, the N. J. Mosquito Larvicide), however, appear to give an effectual kill of the blackfly larvae without harm to the fish.

In this procedure, advantage is taken of the ecological segregation of the blackfly larvae in the rapids, from the fish in the intervening pools.

The film of pyrethrum larvicide which forms on the quiet surface of the pools in a treated stream is broken and re-mixed with the water as it passes over a rapid, only to reappear quickly as a film on the surface of the next pool below.

In the agitated water of the rapids, the blackfly larvae are exposed to contact with the pyrethrum-oil insecticide. On the quiet surface of the pools, neither the fish nor the pool-inhabiting fish-food insects are so exposed.

Even the brown trout appears experimentally to tolerate without harm exposure to the pyrethrum-oil larvicide in concentrations greater than should ever be encountered in practical control work; and, unlike the mosquito control which may require repetition of the necessary treatment at intervals throughout the active season, with only one economically significant brood of blackflies, at least in Northern New York, it appears that effectual control of these insects may be accomplished by a single properly timed application of the larvicide.

Observations On The
Over-Wintering Of Mosquitoes
Near Fort DuPont, Delaware

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The literature of the over-wintering of Anopheles trimaclulatus (and of other American anopheline mosquitoes as well) is very limited. The observations of Hinman (1934) occasioned considerable surprise and discussion regarding the "hibernation" of this species. An unusual number of over-wintering females had been noted previously. The idea had been prevalent that there is no prolonged period of inactivity, but rather that greatly-reduced, breeding activity occurs intermittently throughout the winter months.

Since this early work by Hinman, there have been subsequent accounts of enormous, or even large, numbers of over-wintering females of this mosquito. However, Hinman and Hurlbut (1940) reported other occurrences of small numbers of over-wintering females. Published data on the depletion of the fat body during the dormant season.