EULOPHIDAE

Dicladorcerus westwoodii (Westwood) - 6 specimens from Creston, B.C. emerged 18-VI-68.

Tetrastichus xanthops (Ratzburg) - 2 specimens from Creston, B.C. emerged 18-VI-68.

PTEROMALIDAE

Amblymerus probably new sp. - 4 specimens from Salmo, B.C. emerged 18-VI-68; 6 specimens from Creston, B.C. emerged 14-VI-68 and 18-VI-68.

Sceptrothelys deione (Walker) - 2 specimens from Creston, B.C. emerged 14-VI-68.

CHALCIDIDAE

Spilochalcis albifrons Walsh - 12 specimens from Creston, B.C. emerged 27-VI-68; 7 specimens from Salmo, B.C. emerged 27-VI-68; 5 specimens from Salmo, B.C. emerged 5-VII-66, 6-VII-66, 7-VII-66, 18-VII-66.

All parasites were recovered from ultimate instar larvae or pupae of *C. laricella*.

G. tenellus is a common hyperparasite and *S. albifrons* is often hyperparasitic.

In 1966, 0.69% of 1,004 casebearers reared at Vernon were parasitized; in 1967, 0.22% of 881 casebearers were parasitized and in 1968, 4% of 1,360 casebearers reared were parasitized, with the greatest percentage (14% of 208) occurring near Creston.

LABORATORY REARING OF *NOTONECTA UNDULATA* SAY (HEMIPTERA : NOTONECTIDAE)

R. A. ELLIS AND J. H. BORDEN[1]

ABSTRACT

Four generations of **Notonecta undulata** Say were reared in the laboratory within a year. Adults were kept in 15 gallon oviposition aquaria maintained at a temperature of 25 ± 1°C and a pH of 6.5 - 7.5. Eggs were transferred to an incubation aquarium kept under identical conditions. Nymphs were reared individually in 100 ml glass beakers. Live prey were supplied regularly for food.

Notonecta undulata Say, one of the most common species of backswimmer in North America, is a predaceous water bug found in many fresh - water habitats throughout Canada and the United States. Various aspects of its life-history, ecology and behavior are known (Bueno 1905; Essenburg 1915; Hungerford 1917, 1919; Clark 1928; Clark and Hersh 1939; Ellis and Borden 1969). Adults can be collected throughout the year in southwestern British Columbia, although with considerable difficulty during the winter. Because *N. undulata* is suitable for biological studies, we have, therefore, developed a technique by which this species may be reared in the laboratory.

In southwestern British Columbia there are generally two generations per year. Our colony was started in April, 1967, from field-collected adults and has continued for 23 months.

The rearing conditions were as follows: backswimmers were kept in covered 15-gallon aquaria, filled with tap water that had been aerated for at least 24 hours to remove chlorine. Aquaria were equipped with a filter-aerator, pH was 6.5-7.5 and temperature was maintained at 25 ± 1°C by a standard aquarium heater. The backswimmers were kept under natural daylight. The aquaria were covered with canopies to prevent the escape of adults, two 25-watt light bulbs being used to facilitate periodic inspection. The bottoms of the aquaria were covered with sand, and several pieces of green rubber-mesh

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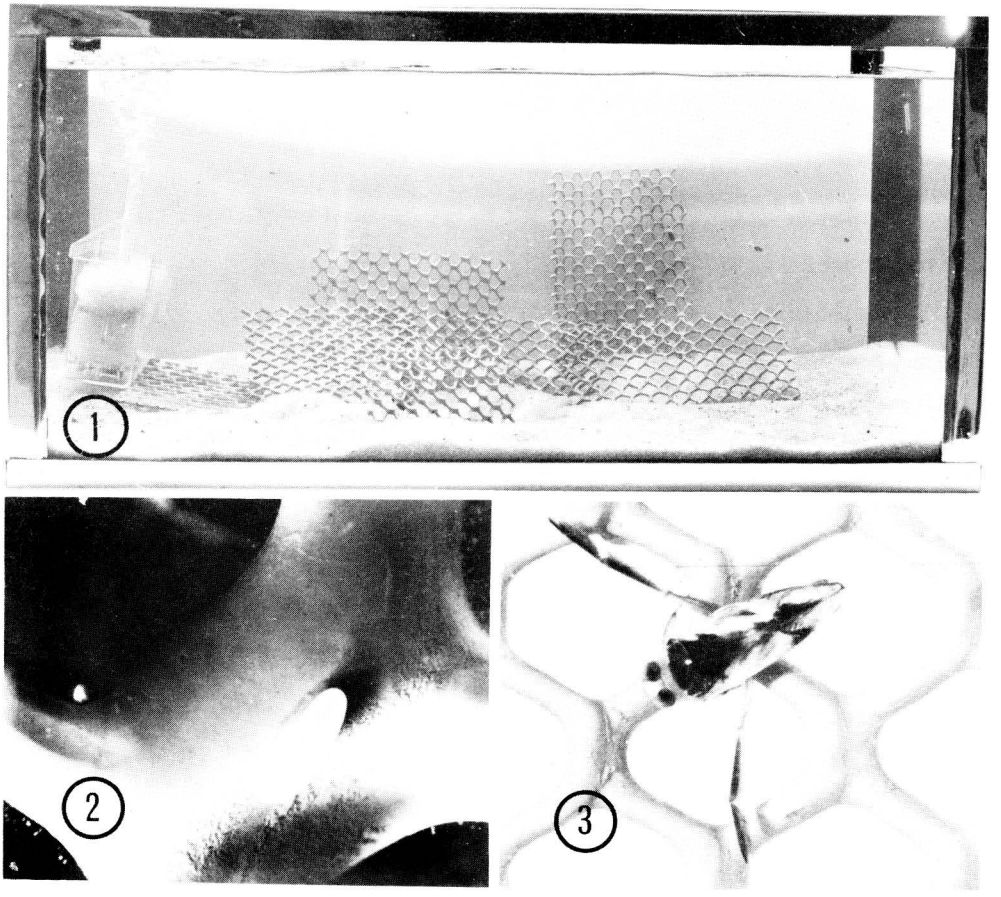

Fig. 1. Oviposition aquarium for **N. undulata.**
Fig. 2. Newly laid egg on rubber-mesh sink matting
Fig. 3. Adult backswimmer using mesh for anchorage.

were provided for cover, anchorage and oviposition (Figs. 1, 2 and 3). Food supplied daily, consisted of small- to medium-sized insects dropped onto the surface. When daily feeding was not possible other aquatic insects, such as mosquito and midge larvae, left in the aquaria, provided a convenient source of food. Under these conditions, up to 15 adults were kept in an aquarium without significant cannibalism and eggs were obtained.

Plants, such as *Anacharis canadensis* Michx. (McPherson 1966, Ellis and Borden 1969), or even sodden leaves (Clark and Hersh 1939) can be used with some success, but due to water temperature and necessary handling they soon deteriorate. This may occur before all the eggs have hatched. The sink matting, however, lasts indefinitely.

Matting on which eggs were laid was transferred to aquaria away from the adults. At 25°C the eggs hatched in 1-2 weeks. On hatching, first instar nymphs were placed individually in 100 ml glass beakers half filled with water and kept at 25°C. Nymphs were fed on a similar diet to that of the adults.

Under these conditions we have produced seven generations in 23 months.

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HYMENOPTEROUS PARASITES OF THE HEMLOCK SAWFLY, *NEODIPRION TSUGAE* MIDDLETON, IN SOUTHEAST ALASKA, WITH A KEY TO LARVAL REMAINS

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ABSTRACT

A key is supplied to identify parasitic Hymenoptera reared from hemlock sawfly cocoons in southeast Alaska. The key is based on the size of the exit hole in the host cocoon, and characters visible on the final-instar larval skin. Brief biological and descriptive notes are given for each species appearing in the key.

Introduction

The hemlock sawfly, *Neodiprion tsugae* Middleton, is an important defoliator of western hemlock, *Tsuga heterophylla* (Raf.) Sarg., in southeast Alaska. Heavy defoliation occurred during the early 1950's (Downing, 1957) and 1960's (Crosby, 1965). Usually epidemics are severe for only a year or two, but noticeable defoliation may continue for several years. Although outbreaks may subside with little immediate effect, top-killing and whole-tree mortality sometimes occur. This is especially true when the sawfly is found in association with or following infestations of the black-headed budworm, *Acleris variana* (Fernald) (Downing, 1959).

The parasite species reared from hemlock sawfly cocoons in Alaska were listed by Torgersen (1968). The paper includes a key to the parasite adults and notes on the abundance of each species. No dipterous parasites have been reared from the sawfly.

The following key, based on the appearance of mature larval remains and host cocoon, includes all but three of the parasite species reared from the sawfly in Alaska to date. The species were omitted because final-instar larval remains were not

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