PINE SISKIN PREYS ON EGG MASSES OF THE SPRUCE BUDWORM, *CHORISTONEURA FUMIFERANA* (LEPIDOPTERA: TORTRICIDAE)[1]

DANIEL T. JENNINGS and HEWLETTE S. CRAWFORD
Northeastern Forest Experiment Station, University of Maine, Orono, Maine 04469

During preoutbreak periods before spruce budworm, *Choristoneura fumiferana* (Clemens), populations reach epidemic levels, birds can play an important role in regulating budworm abundance (Gage and Miller 1978). All life stages of the spruce budworm are subject to predation by birds, but documentation of predation on budworm eggs is sparse (Hope 1945).

We collected 142 birds of 33 species from 5 locations in Maine (1976); 75 birds of 19 species from 2 locations in New Hampshire (1977); and, 12 birds of 9 species from the Penobscot Experimental Forest, Maine (1978) to determine bird predation on spruce budworm populations. Most were collected during late-larval and pupal periods; only a few were taken when moths and egg masses were present. Stomach-content analyses showed that only one bird had fed on egg masses of the spruce budworm. However, many birds had fed on spruce budworm larvae, pupae, or adults.

The bird containing budworm egg masses was an adult male pine siskin, *Carduelis pinus* (Wilson), (wt. 13 g), shot 28 June 1976 in Penobscot County, Maine. The forest was predominantly (79%) softwood with basal area of ca. 36 m^2/ha. Most birds collected at this site had fed on spruce budworm.

The pine siskin's proventriculus had expanded to form a crop where most of the egg masses were found; 5 fragments of egg masses were in the bird's gizzard. We measured the length of each egg mass (to 0.01 mm) with an ocular micrometer. To facilitate counting eggs per egg mass, we modified the staining procedure of Jennings and Addy (1968) by submerging egg masses from the siskin's stomach in Leoffler's methylene blue stain for 45–60 sec, then rinsing in 70% ethanol for 10–20 sec to destain. Egg masses were examined while submerged in 70% ethanol and egg rows and eggs/mass counted.

More egg masses were found intact (63) than fragmented (41) in the siskin's digestive tract. Our attempts to assemble the 41 fragments into entire egg masses were futile. Only new, unhatched egg masses were eaten by the pine siskin. Individual eggs totaled 2162, including 18 devoid of yolk or embryonic material. Chorions of empty eggs were usually collapsed and had no larval emergence holes. Larval head capsules were visible in only 2 egg masses, indicating that predominantly fresh, "green" egg masses were consumed.

Six of the egg masses consumed by the pine siskin had black chorions, a sign of parasitism by *Trichogramma* sp. Five of the six masses were partially parasitized; one was totally parasitized. Five more egg masses probably contained parasitized eggs, but these were difficult to distinguish from nonviable eggs.

Rows of eggs/mass ranged from 1 to 5; 57 of 63 intact masses and 38 of 41 fragmented masses had only 2 or 3 rows of eggs. The preponderance of 2- and 3-row egg masses does not necessarily indicate a selective feeding preference for egg masses of this size because spruce budworm generally deposits eggs in 2- and 3-row masses (Miller 1957; Otvos 1977). We surmise that the bird "stripped" the egg masses from host tree needles, because there were no needles or fragments of needles in the crop or gizzard.

In addition to egg masses, the siskin also consumed 16 larvae and 3 pupae of the spruce budworm, 514 chalcid larvae (det. Chalcidoidea), and 1 female spider (*Philodromus exilis* Banks). Other insects and spiders were eaten but species could not be determined.

[1]A contribution to the Canada/United States (CANUSA) Spruce Budworms Program.