described for control of *H. abietis*, in which a weak insecticide (DTHP) with a suspension of *B. bassiana* spores is used (Samsináková and Novák, Anz. Schadlingsk 40:20-27, 1967). This fungus is a natural mortality factor of *Hylobius rhizophagus* Millers (Goyer and Benjamin, J. Econ. Entomol. 64:562, 1971), and mortality of *Hylobius pales* (Herbst) adults was shown to be related directly to the concentration of *B. bassiana* spores (Walstad and Anderson, J. Econ. Entomol. 64:322-323, 1971).

Two fly larvae found attached to, and which later killed, a mature larva and a pupa of *H. warreni* were identified as belonging to the family Asilidae, subfamily Laphriinae. Little is known about the larval habits of Laphriinae, except that they inhabit soil, wood and leaf mould and are either predacious or scavenging (Imms, A general textbook of entomology, Methuen, London, 9th ed.: 628-629, 1957). Elton *et al.* (Z. angew. Ent. 55:1-54, 1964) provided evidence that, in Holland, certain *Laphria* species are at least partly predacious on larvae of *Hylobius abietis* L. in pine stumps. The effect of this predatory fly on *H. warreni* populations is believed to be insignificant.

The shrew, *Sorex cinereus cinereus* Kerr., was commonly trapped in the weevil study area but examination of stomach contents of 46 individuals failed to reveal sclerital remains of the weevil. This may have been because the weevils were relatively scarce and the shrews may have been conditioned to search for more abundant species such as carabids. Sclerical fragments of carabids were easily recognized. Another possibility is that complete digestion of adult weevils may have occurred as about 8 hours elapsed between the time of emptying the traps and the time of peak adult weevil locomotion on the forest floor, between 2200 and 0100 hours.

I express my thanks to the specialists for the taxonomic identification of the parasites and predators of *H. warreni*: Mr. G. S. Walley (ichneumonid), Dr. J. R. Vockeroth (asilid) and Dr. E. E. Lindquist (mite), all at the Entomology Research Institute, Ottawa, Canada. Dr. Gertrude R. Kloss, Department of Zoology, Secretary of Agriculture, Sao Paulo, Brazil and Dr. W. Rühm, Institute of Parasitology, Hanover, Germany, identified the nemotodes.—H. F. Cerezke, Northern Forest Research Centre, Edmonton, Alta.

PATHOLOGY

Liquid Cultures in Polythene Bags.—An inexpensive method of producing large quantities of mycelium of the insect pathogen, *Cordyceps militaris* (Fr.) Link, is being used at the P.F.R.C. in Victoria. The method was developed primarily to obviate buying large numbers of glass Erlenmyer flasks. It employs sterilized polythene bags and possesses several advantages in storage and processing of the end product.

Polythene bags (10 lb size, 8 x 18 inches — 20 x 46 cm approx.) are shaken with 70% ethanol and rinsed with sterile water. They are then placed upright in a large basin with vertical sides for support. Sterilized medium (500 ml/bag) and inoculum are added and the tops are closed with a large, sterile, foam-plastic plug, held in place by an elastic band. These operations are performed in a laminar flow sterile air bench.

Inoculated bags are placed on a shelf where there is a support for the top (Fig. 1), and the bottom is flattened to give maximum culture area inside the bag.

As only the fungus mat was required, it was possible to draw off the liquid at the end of the culture period by puncturing a small hole in the bottom of the bag. The air was then expelled, the plug removed and the collapsed bag wrapped around the mat. In the case of *C. militaris*, the packaged mats were frozen and stored in this form until needed in field trials, when the ease of transporting the frozen mats becomes an important factor.

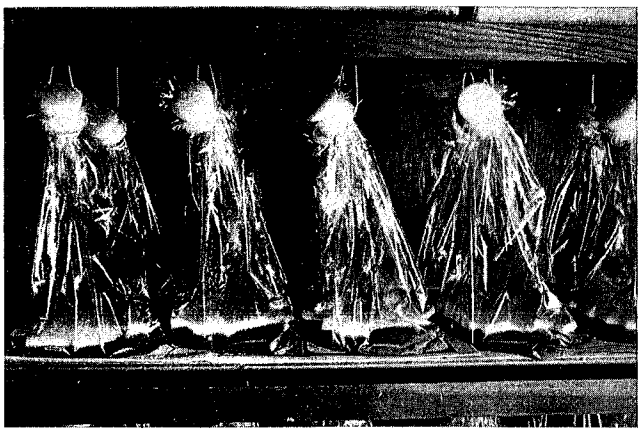

Figure 1. Polythene bag cultures of *Cordyceps militaris* on malt extract broth.

The method, best suited to organisms that do not require agitation during growth, is equally suitable for obtaining either the mat or the growth medium. In the latter case, the unwanted mycelium could be disposed of without removing it from the bag and thus contamination of the air or operator would be avoided. The savings in glassware and storage space are considerable when a large amount of fungus material is produced at one time. Where it is desirable to manipulate a culture during incubation, e.g. wood blocks in a liquid medium, the plastic bag method would be applicable. No changes in morphology or viability of *C. militaris* have been noted after culturing in polythene.

Polythene, though inexpensive, has had only limited use in microbiology (Norris and Ribbons, "Methods in Microbiology" Vol. 1, p. 51. Academic Press, New York. 1969). This new method exploits the advantages of this material and suggests a wider application in the field of liquid culturing. A. Funk, Pacific Forest Research Centre, Victoria, B.C.

Lodgepole Pine Dwarf Mistletoe on Douglas-fir in Alberta.—Lodgepole pine dwarf mistletoe [*Arceuthobium americanum* Nutt. ex Engelm.] was discovered on Douglas-fir [*Pseudotsuga menziesii* (Mirb.) Franco] in 1972 approximately 50 miles (80 km) west of Calgary, Alta. Three typical swellings (Fig. 1) and infection structures of dwarf mistletoe (Fig. 2) were found on one tree, 6 ft (1.8 m) high, which was surrounded by young lodgepole pine [*Pinus contorta* Dougl. var. *latifolia Engelm.*] infested with dwarf mistletoe. Previously, *A. americanum* was recorded once on Douglas-fir at Kamas, Utah (Hawksworth and Wiens, U.S. Agric. Handbook 401, 234 p. 1972). Douglas-fir dwarf mistletoe [*A. douglasii* Engelm.] causes large witches' brooms and occurs in limited areas of southeastern British Columbia (Kuijt, Can. Nat. Mus. Bull. 186:134-148, 1963; Smith, Ecology 53:729-734, 1972) approximately 160 miles (260 km) west of the present location.

During a study of dwarf mistletoe development from seed on lodgepole pine, I noted that numerous seeds were deposited on the Douglas-fir. In May 1966 and 1967 approximately 200 seeds were recorded and re-examined in September and May 1966-68. Most seeds germinated and grew holdfasts as they did on lodgepole pine. In 1972 one swelling was located where a seed dispersed in 1966 was recorded.