

Three species of dwarf mistletoe have been found parasitic on spruce in the United States: *Arceuthobium pusillum* Peck, *A. douglasii* Engelm. (artificially), and *A. campylopodum* f. *microcarpum* (Engelm.) Gill. Only *A. pusillum* has been found on spruce in Canada to date, its most western location known being near Hudson Bay, Saskatchewan.

The following facts indicate that the mistletoe species involved is *Arceuthobium americanum* rather than any of the three others mentioned above:

1. The fruit of this mistletoe matures in the second season after pollination.
2. The time of flowering coincides with that of *A. americanum* on lodgepole pine locally (late April till early June).
3. Branching, if present, is collateral rather than superposed.
4. Some male flowers are supported by pedicel-like joints.
5. The size of the shoots ranges from 0.5 cm. to more than 5 cm.
6. When plants are sufficiently large, pistillate flowers often occur in whorls.
7. Most shoots seem to produce more than one crop of flowers.
8. The original lodgepole-pine stand surrounding the area is heavily infected with *Arceuthobium americanum*. No other species of *Arceuthobium* has been reported to date in Alberta.

The above facts seem sufficient to identify the dwarf mistletoe with *A. americanum* Nutt. For confirmation, however, specimens were sent to Dr. L. S. Gill, who concurred with our identification.

Since *Arceuthobium americanum* had not previously been reported on white spruce, some description of the disease seems warranted. One of the most striking features of spruce infections is the compactness of the mistletoe brooms, often resulting in a solid ball of dead needles and small branches, from which larger branches radiate out. These characteristics, as well as the swelling produced on the main branch, serve to distinguish the mistletoe brooms from the yellow witches' broom caused by the rust, *Peridermium coloradense* (Diet.) A. & K., which is also common on spruce in the area. However, as on lodgepole pine, infections are sometimes found without any evidence of broom formation.

The mistletoe plants on spruce are usually quite small, rarely attaining the size of the plants on pine. Curiously enough, the majority of the brooms have no external evidence of mistletoe plants whatsoever. If plants are present at all, they are minute and scarce.

The question of susceptibility of white spruce to *Arceuthobium americanum* seems somewhat puzzling, since many infected pine stands in this Province have an understory of apparently healthy white spruce. From observations at the original Kananaskis location it seems that variation in susceptibility of spruce may occur. Here, a heavily infected spruce is frequently found in close contact with a completely healthy one. It is also possible that opening up of the stand increases the chances of mistletoe transfer from pine to spruce. A quick count at the Kananaskis location showed at least 43 infected spruce within an area of approximately ten acres where all pine had been removed, but only two infected spruce were found within the surrounding, severely infected, undisturbed pine stand. It is hoped that inoculation tests can be made this fall to determine the degree of susceptibility of local spruce to the lodgepole pine mistletoe.

Two more cases of attack of *Arceuthobium americanum* on white spruce have since been found in the Province, one at Mal'igne Canyon, the other at Athabasca Viewpoint, both in Jasper National Park. In both cases, only one infected spruce was found among heavily infected lodgepole pine and apparently healthy spruce. Since the locations of the three infections are quite separate, it seems likely that *A. americanum* is parasitic on spruce more commonly than is known.—R. J. Bourchier and J. Kuijt.

Larch Mistletoe on Lodgepole and Western White Pine.

—Two more unusual hosts of larch dwarf mistletoe have been found. The larch mistletoe, *Arceuthobium campylopodum* Engelm. f. *laricis* (Piper) Gill, common on western larch (*Larix occidentalis* Nutt.), was found on lodgepole pine (*Pinus contorta* Dougl. var. *latifolia* Engelm.) at the three following British Columbia localities: Cascade, west of Grand Forks, and Needles. Infections were fairly common, though not abundant.

A single western white pine (*Pinus monticola* Dougl.) at Sloean Lake, B.C., was found heavily infected with a dwarf mistletoe, also believed to be *Arceuthobium campylopodum* f. *laricis*. The plants on both species of pine appear identical

to the larch mistletoe in all characters that are at present considered to have taxonomic value. In every case, the infected pine were surrounded by severely infected western larch, and no other mistletoe was found locally.

The fact that lodgepole pine is susceptible to larch mistletoe has been known for some time. Weir successfully inoculated this mistletoe on lodgepole pine, and found also cases of this transfer in nature. Susceptibility of western white pine to larch mistletoe has, to the writer's knowledge, not been reported. Both records are believed to be new for Canada.—J. Kuijt.

BRITISH COLUMBIA

Report on Ambrosia Beetle Control in the Nimpkish Valley, B.C.—Field trials in various parts of the world have shown that gamma benzene hexachloride (BHC) confers considerable protection on logs exposed to attack by ambrosia beetles. For this purpose it has been almost unique among insecticides, far surpassing in effectiveness any other chemical or combination of chemicals yet tested. During 1953 our attention was called to a failure of BHC to protect logs in a commercial operation. We wished to determine, if possible, the circumstances which might account for any failures.

Following procedures which have given highly encouraging results elsewhere on Vancouver Island, foresters of Canadian Forest Products Ltd. made several large-scale trials in their operations in the Nimpkish Valley. Benzene hexachloride was applied in a water emulsion containing 0.4 per cent of the gamma isomer, at a dosage of 1 gallon per 100 square feet of log surface. The emulsion was made up from a grade of BHC containing 36 per cent gamma isomer, dissolved in Velsicol AR 50 and rendered emulsifiable in water with Antarox A-400. Applications were made in three separate areas of logging in the region. Western-hemlock and Douglas-fir logs under the following conditions were treated: clear-cut felled-and-bucked, right-of-way logs, and cold-decked logs. Some treatment on nondecked logs consisted of close-range applications on selected logs; others consisted of broadcast spraying over logs along a right of way. The one cold-deck given treatment was subjected to a searching spray from all possible angles. In all applications the logs were drenched with the BHC emulsion. The treatments began April 15 and ended May 12.

Trypodendron sp. adults appeared in flight May 4 and 5. In most areas they were in such unprecedented abundance as to draw comment from loggers in the woods. It appears likely that the tremendous beetle population in one area may have originated from great volumes of hemlock blow-down resulting from a windstorm early in 1951. Much of this timber produced large numbers of *Trypodendron* during 1951 and 1952. In contrast, another area has had but very light beetle populations in recent years despite extensive logging for the past decade. Even the slash and stumps have had few attacks. It is also noteworthy that *Gnathotrichus* is very scarce generally throughout the valley. This is in contrast to other areas of Vancouver Island.

One series of treated logs received no attacks, notwithstanding the fact that they were not treated until a whole week after the beginning of the mass beetle flights. These logs were in the area of extremely low population. All the treatments in the other areas failed to give any practical protection despite the killing of large numbers of attacking beetles by the residual action of the BHC. Some Douglas-fir logs, though drenched with spray, received as many as 200 attacks per square foot of log surface, and the beetles produced successful broods which eventually emerged during July.

Among untreated logs, company foresters observed, only those felled before March 1st were attacked during the current season. Our own records from other areas over a period of years show that while *Trypodendron* attacks on fresher logs are less severe they nevertheless may occur during the same season, in logs felled several weeks later than the date indicated above.

Failure of the spray to give protection for even 2 or 3 weeks could not be accounted for by leaching away with rain, because the period concerned was dry. Even as late as August 11 the logs had a strong odour of BHC. There is good reason to believe that the materials were used and applied in a manner which has given protection elsewhere. No satisfactory reason can yet be advanced for the failure on this occasion while other tests have been highly encouraging.

It is evident that the attractiveness of the logs was not appreciably affected by the chemicals used. It is possible that the solvent is actually attractive to the beetles. It is increasingly evident that there is much need for studies on the behaviour of the beetles and of the factors which attract them to logs but not to living trees. Incidental observations