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Times of Log Attack by the Ambrosia Beetle *Trypodendron lineatum* in Coastal British Columbia

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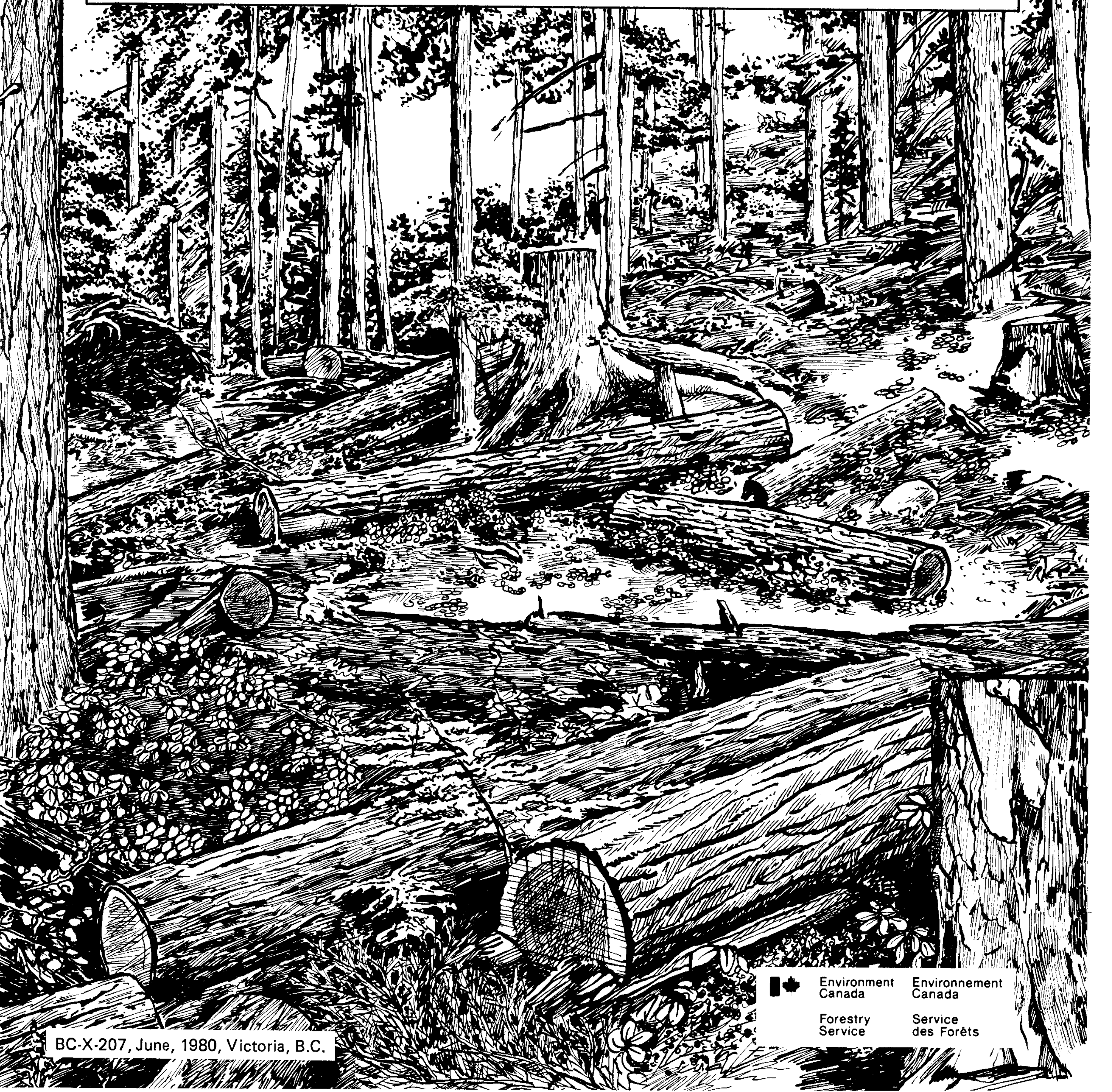

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ABSTRACT

Guidelines developed to aid in forecasting attack flight activity of ***Trypodendron lineatum*** (Oliv.) (Coleoptera: Scolytidae) in coastal British Columbia are presented. Further details may be found in BC-R-5.

RESUME

Des directives élaborées en vue de faciliter la prévision de l'activité du vol d'attaque de ***Trypodendron lineatum*** (Oliv.) (Coléoptère: Scolytidés) dans la région côtière de la Colombie-Britannique, sont présentées. De plus amples détails peuvent être trouvés dans la publication BC-R-5.

INTRODUCTION

Trypodendron lineatum (Oliv.) is the most common of the five species of ambrosia beetles that attack conifer logs in British Columbia. It attacks logs cut during fall and winter and mines darkly stained tunnels throughout the sapwood. Forestry trends for more storage and sorting of logs on dry land and for increasing cut of second growth timber, with its relatively greater proportion of sapwood, indicate that the potential for ambrosia beetle damage will grow in the future.

A few beetle attacks can cause substantial economic loss and can also attract many more beetles, thus it is important to avoid even light attacks.

Knowledge of the time when beetles fly to attack logs is important for optimal scheduling of logging activity and for log protection procedures.

This report, based on research in the Cowichan Lake area of Vancouver Island, outlines the role that weather plays in determining when logs are attacked by *T. lineatum* in coastal British Columbia. It gives the probability of attack occuring at half-month intervals and is a guide for the scheduling of log protection methods against the insect.

ATTACK FLIGHT

Much of the log damage in a given year results from relatively few hours of flight and attack during favorable warm periods in spring. The numbers of flying beetles depend upon such factors as temperatures and local populations. During a "heavy" flight, "clouds" of flying beetles swarm around and alight on attractive logs. After a heavy flight there may be 30 to *50* dust piles per $0.1 m^2$, each representing a tunnel through the bark and into the wood.

The beetles overwinter as adults in forest litter (duff), bark of standing trees, and rotten stumps or logs. They become active in spring during periods of warm weather. However, wide variation occurs from year-to-year in the time, temperature level and length of these periods, The occurrence of these warm periods is difficult to predict, because of the variability of coastal weather patterns. Ambrosia beetle flight is also affected by wind and rain but, for practical purposes, temperature is the dominant factor and 15.5°C represents the attack flight threshold.

In spring, some flight may be expected whenever maximum daily temperature exceeds 15.5°C. Heavy flight always begins when the air temperature climbs to 21°C. Significant flights are usually over for the year by mid-June. A few parent beetles may leave their first galleries after rearing their brood and attack a second log in July or early August, but these re-attack flights are light. Young beetles go directly into hibernation and do not attack until the following spring.

BEETLE FLIGHT IN RELATION TO WEATHER

Times of ambrosia beetle flight were recorded for most years between 1954 and 1971, at Cowichan Lake or Parksville. This information along with respective weather records allows estimation of flight times in other years. Daily maximum temperatures above 15.5°C for the British Columbia Forest Service Research Station at Lake Cowichan are plotted on Figures I a and b for the years 1948-1962.

The beetle flight data for 1954 show that peak flight occurred between May 6 and 9 and is indicated on the graph (Fig. 1b) with an asterisk. On May 5, the maximum temperature was 15.5°C, the threshold temperature for flight, then rose to and stayed above 20°C for the next 4 days before dropping below the flight threshold temperature on May 10. The peak flight intensity for that year occurred during the first strong warming. Two other periods of flight corresponded with the second and third warm periods in May, but the numbers of beetles were less. A few beetles flew during each of the ensuing warm spells until mid-July.

In 1955, the early April warming was slight, short, and followed a cold period; no beetles were seen. A few appeared at lake level on May 4. Flights

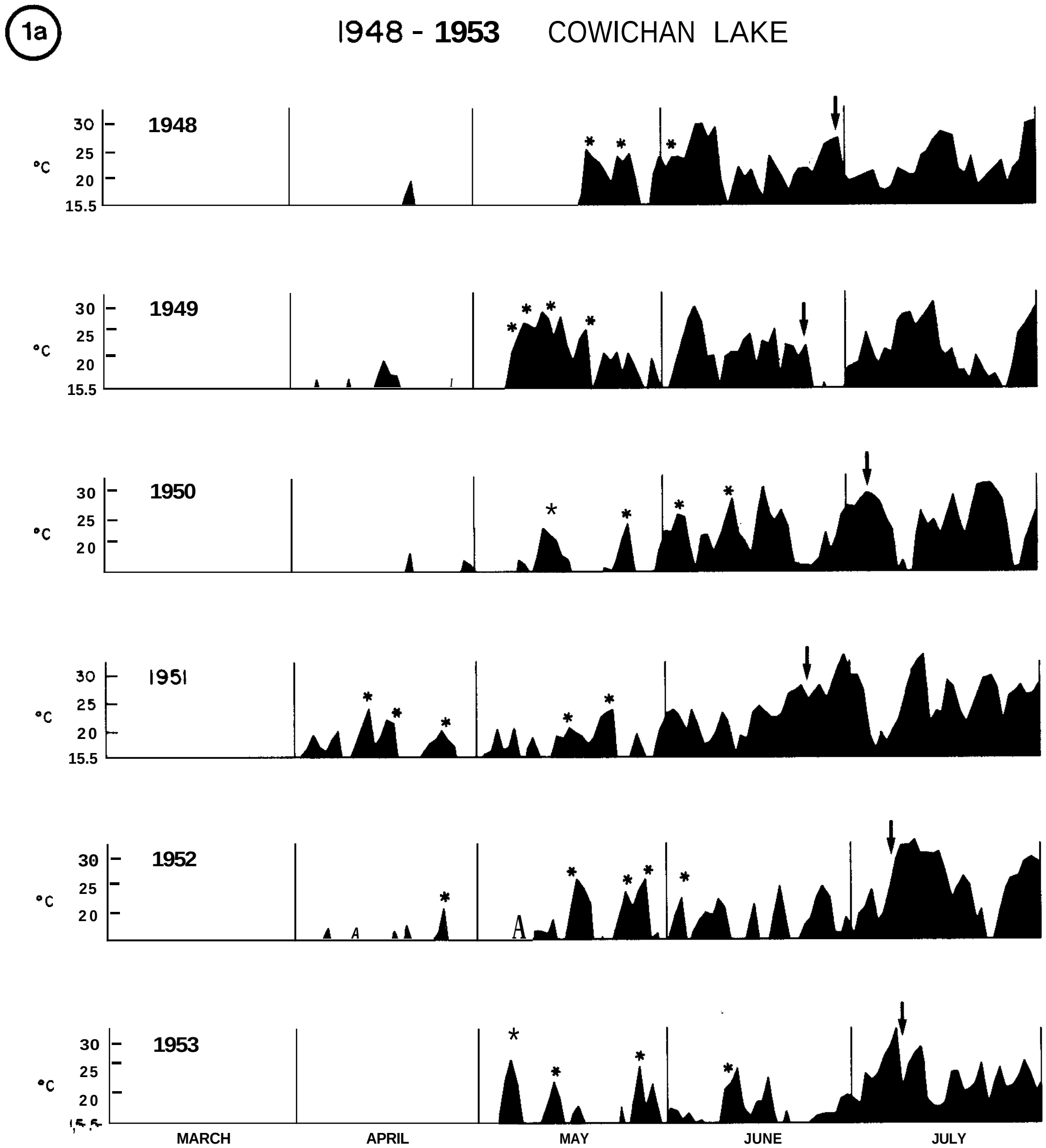
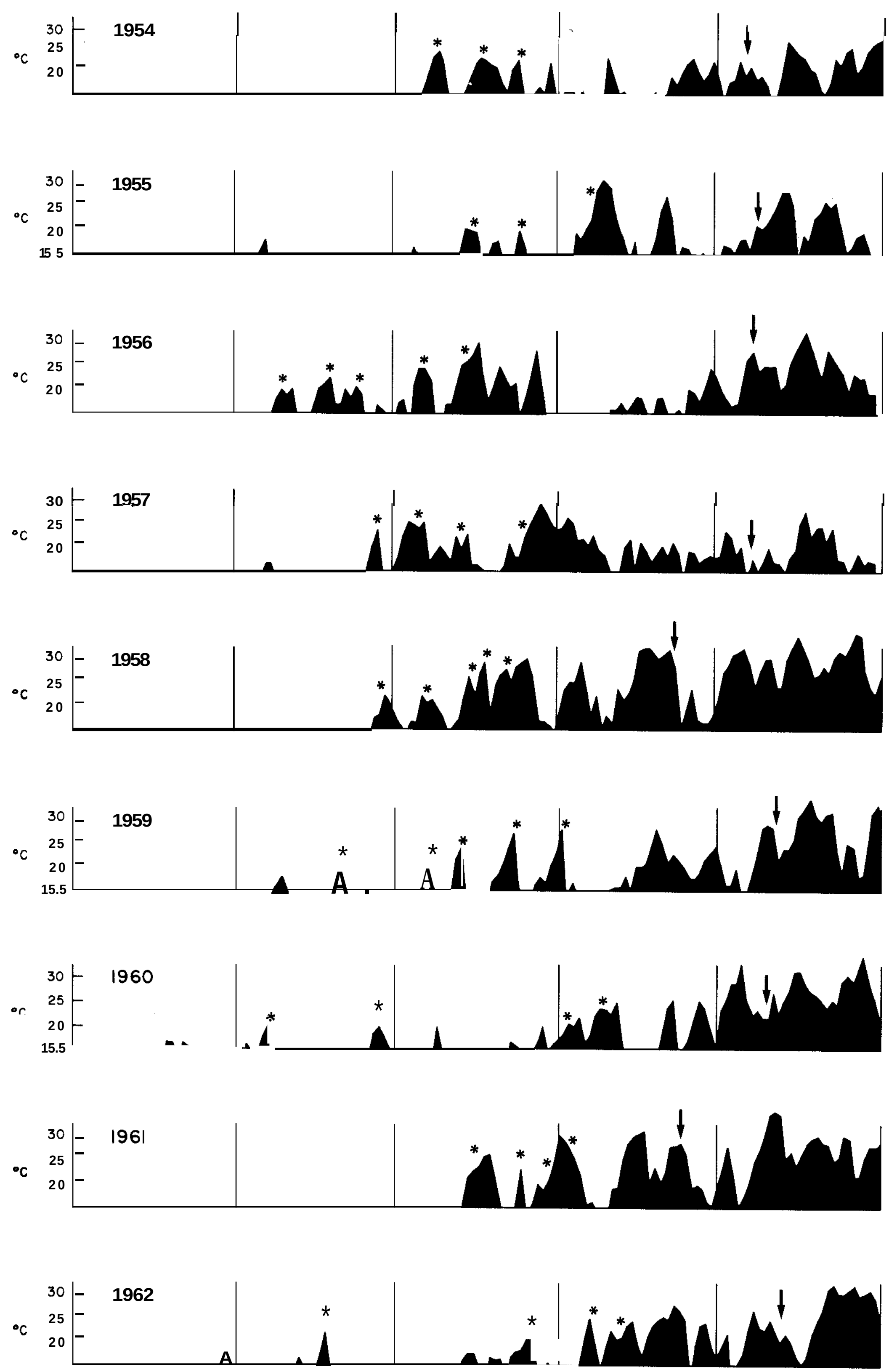


Fig. l a and 1b. Maximum temperatures recorded at Cowichan Lake for each day when the temperature was above 15.5ºC from March through July, 1948-1962. An asterisk indicates a heavy ambrosia beetle flight and an arrow, the end of the seasonal flight.

1b

1954 - 1962 COWICHAN LAKE



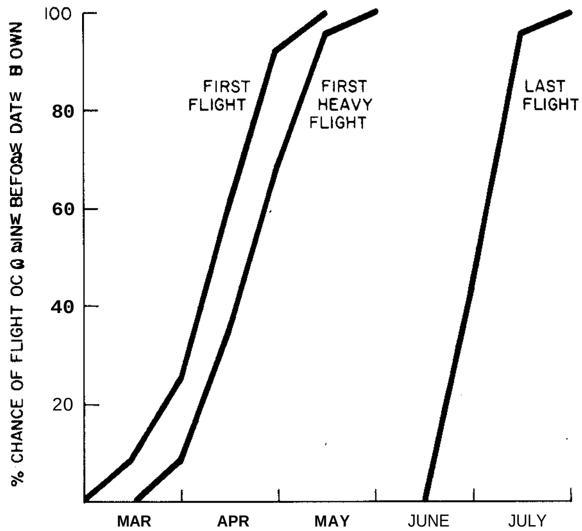


Fig. 2. Probable time of first seasonal flight of T. lineatum, the first heavy flight and the last flight of the season for southern Vancouver Island.

were heavy from May 15-17 and beetles flew during the two other May warm periods. However, peak flight activity did not take place until June 8 and 9, during the early part of an intense warming period.

In 1959, flight was recorded near Parksville. Here, beetle flight corresponded with the Cowichan Lake data (Fig. 1b) for this year. A small flight was recorded from April 7-9, and a heavy one from April 18-20 and each separate May warming brought another wave of flight.

In 1961, at Cowichan Lake, April and early May were cool (Fig. 1b). When warming began on May 14, it was abrupt, intense and lasted several days. Most ***T. lineatum*** attacks that year were made within the first few of those days.

PROBABILITY OF ATTACK

For several years official weather forecasts were used because of the apparent correlation between temperatures and flight activity, in attempts to predict beetle flights. Often there were differences of 3 or more degrees C between forecast and actual maximum temperatures. As a result, beetles appeared when they were not expected or did not appear when they were. In April and May, a change of only a few degrees when temperatures are near 15.5°C can greatly affect flight. It was conluded that weather forecasts are not yet accurate enough for this purpose. However, past weather and flight records do provide a basis for estimating when flight occurred. Accordingly, weather records for 48 years (1924-71) were examined and the known or estimated time of first flight, first heavy flight and end of flight were recorded for each half month period, March through July. These flight data were then graphed (Fig. 2), to provide an estimate of the probability that flight, and consequently damage, can occur in any of these periods. Earliest recorded flights occurred occasionally in March and often began in April; the last flight of the season usually occurred before mid-July. Estimates for the end of the seasonal flight are not as reliable as those for heavy flights because they taper off gradually.

CONCLUSIONS

1. Log protection measures against *T. lineatum* for southern Vancouver Island must be ready by early April, are **most** needed in May and should not be discontinued until mid-June. Occasionally, however, flights may occur in March or early July, depending on the weather for that year.

2. Past weather patterns provide an index *of* the probability *of* attack occurring during any given period and could be used in other regions.

Details on development of guidelines for the scheduling of procedures for log protection against *T. lineatum* are outlined in BC-R-5.

Note:

The final stages of this publication were completed by the junior author, incorporating reviewer's comments and suggestions, while maintaining the spirit and intent of the original author, the late Dr. J. A. Chapman.

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