fir (*Abies balsamea* (L.) Mill.), the major conifer components of the forest in the area and the preferred hosts of the black-headed budworm.

The emergence dates of the black-headed budworm from the club tops were from August 4 to September 3, July 27 to September 6, and August 1 to September 9 in 1962, 1963 and 1964 respectively. These are somewhat later than corresponding dates for material reared from white spruce and balsam fir, namely July 20 to August 26, 1962; July 19 to August 16, 1963; and July 7 to August 15, 1964. Further study will be necessary to determine if different strains of the black-headed budworm inhabit each of the three conifer species, although individuals reared from the black spruce club tops readily laid eggs on a shoot of balsam fir when confined in a small cage.—R. E. Fye.

ROCKY MOUNTAIN REGION

The Occurrence of Tuberculina maxima Rost. on Cronartium Rust Infected Trees in Alberta.—During the summer of 1964 surveys were carried out in southwestern Alberta to establish the distribution of *Cronartium comandrae* Peck on lodgepole pine. During these surveys a hyperparasite, the purple mold, *Tuberculina maxima* Rost. was collected in a number of locations. These were the first collections of this fungus on any tree species in Alberta, though it has long been known as a parasite of the white pine blister rust, *Cronartium ribicola* J. C. Fischer, on western white pine in British Columbia and adjacent areas of the United States. (Mielke, J. L., Phytopath. 23: 299-305. 1933.) (Hubert, E. E., Phytopath. 25: 253-261. 1935.)

Special attention was given to *Tuberculina maxima* because of its value as a biological agent in reducing the number of aeciospores available for infecting the alternate hosts, and for killing portions of the cankered bark. *T. maxima* was collected at 13 locations in Alberta between Robb on the timber reserve of North Western Pulp and Power Limited, Hinton, and near Beaver Mines in the Crowsnest Forest, and included a collection from the Porcupine Hills. *T. maxima* was found parasitic on *Cronartium comandrae* on lodgepole pine in eleven areas, but was notably absent from other locations of this rust. One collection of *T. maxima* on *C. comandrae* was made from a plantation of Scots pine near Beaver Mines. This was the first report of *C. comandrae* on Scots pine in Alberta. *T. maxima* was also found parasitic on *Peridermium stalactiforme* Arth. & Kern on lodgepole pine in three locations. So far *T. maxima* has not been found on *Cronartium ribicola* on limber pine nor on *Peridermium harknessii* Moore on lodgepole pine or Scots pine.

To obtain more information on the incidence of *Tuberculina maxima* on *Cronartium* rust infected trees some data were collected at two locations. At Altrude Creek in Banff National Park, *T. maxima* was found on 12 out of 112 *Peridermium stalactiforme* infected trees, and on three out of five *Cronartium comandrae* infected trees. In this stand, there was also a white aeciospore form, presumably a race of *P. stalactiforme*, though the spores differ in some characteristics from the normal orange aeciospores of *P. stalactiforme*. Two of the 22 trees having cankers with white aeciospores were infected by *T. maxima*. The other location was on the north slopes of The Wedge, south of Evans-Thomas Creek in the Bow River Forest. In a 25-year-old stand of lodgepole pine heavily infected by *P. stalactiforme* and *C. comandrae*, of 12 trees infected by *C. comandrae*, three had *T. maxima*. Further work is planned to establish the incidence and role of *T. maxima* on Cronartium rust infected trees. —J. M. Powell and W. Morf.

BRITISH COLUMBIA

Laboratory Observations of Oviposition by the Golden Buprestid, Buprestis aurulenta L.—Apparently normal adults of this species emerge from structures after spending many years in larval development (Smith: Can. Entomol. 94; 586-593. 1962). When confined in tubes with Douglas-fir foliage they survive for weeks. A series emerging during the winter 1960-61 inside a log house built in 1947 and fed foliage has been reported (Smith: Can. Entomol. 94: 672. 1962). In 1961-62 and again during 1962-63, series similarly derived and handled were obtained. Amongst the second and third series, having 14 and 15 years of prior larval development respectively, 11 females laid unfertilized eggs following varying periods of foliage feeding. Several of the females oviposited more than once, one laying a total of 178 eggs in six masses at intervals during a ten week period (Table 1). All egg masses were invested with a cream-colored translucent viscid secretion.

A minimum of 41 days (mean: 77.4 days) elapsed before the first oviposition. These long pre-oviposition periods suggest some inherent need, but probably of shorter duration in nature, for post-emergent gonadal maturation. The literature is without reference to examples.

Spencer (Proc. Ent. Soc. B.C. 60: 45-47. 1963) reports that he secured a number of adults from the interior of another log house. These were preserved shortly after their emergence. He dissected "nine of these and found that none had mature reproductive organs; in fact, both ovaries and testes were so small as to be barely discernible". He concluded that egg laying required a post-emergence maturation period.

Taken jointly, the above observations strongly support each other and lead to a view that field-emerged adults of both sexes probably require a period of feeding on foliage for maturation.

While the mass-oviposition noted may have been induced by confinement, the accompanying investing secretion was nevertheless abundant. Mass oviposition may therefore occur, at least occasionally, under natural conditions. Concentrated populations are not rare in infested wood. For example, a post section bore 18 emergence holes on 49 sq. in. of surface, 16 of them in an area of 35 sq. in. The initiating eggs may therefore have been laid en masse, or singly in a concentrated manner.

The foregoing further suggest the impossibility of reinfestation inside structures, because of the absence of tree foliage for feeding to promote egg maturation.—D. N. Smith.

TABLE I

The relation between developmental time and fecundity, pre- and post-oviposition life and adult longevity in *Buprestis aurulenta* L.

Developmental time	Number of ovipositions	Total eggs laid	Time from emergence to first oviposition (days)	Time from last oviposition to death (days)	Total adult life (days)
14 years	1	2	72	0	72
	2	3	66	54	127
	2	2	106	69	178
	1	1	75	43	118
	1	1	92	82	174
	1	40	61	62	123
	1	9	41	16	57
15 years	1	26	48	33	88
	1	30	129	0	129
	2	11	116	28	152
	6	178	46	17	133

Proportion of Old and Young Adults in an Overwintering Population of the Ambrosia Beetle, Trypodendron lineatum (Oliv.).—"Old" and "young" adults of the ambrosia beetle, *Trypodendron lineatum* (Oliv.), can be distinguished by the appearance of their internal organs (Proc. 10th Internat. Cong. Ent., 4: 375, 1956 (1958); Can. Dept. Agr., For. Biol. Div., Bi-Mon. Prog. Rpt. 11(6): 3, 1955). Old adults have gone through at least one brood establishment period; young adults have not yet made galleries in logs. The distinction between the two age groups is clearer in females which, therefore, are used for this purpose.

The proportion of old adults in samples of overwintering or spring-flying *Trypodendron* taken in different years has varied from 1% to more than 30%. This wide range suggests that the proportion might provide important information about a population, if the factors that determine age ratio were known.

One obvious factor that may influence the young/old adult ratio is the productivity of beetles—the average size of brood produced from a certain breeding site. If only a few offspring are produced per pair of adults, a higher proportion of old beetles might be expected in an over-wintering population than if many offspring per pair were produced. Possibly, then, by determining the age ratio in these populations one could learn something about brood success in adjacent breeding areas that year (Can. Entomol. 93: 746, 1961).

The first step in examining this possibility was to determine whether all samples of beetles from one margin showed essentially the same ratio; i.e., whether the overwintering population was homogeneous in this respect.

On two dates during the overwintering period of the beetles, a series of bark and litter samples were taken, near Lake Cowichan, B.C., at the base of each of several trees. All trees were within a zone of standing timber approximately 50 by 150 meters, adjacent to a recently logged area. Many or all females in the samples were examined and the resulting data on their age subjected to the Chi-square test for homogeneity. Several samples with smaller numbers of beetles were combined in pairs to secure an expected number of five or more old adults for each sample. The data are given in the table.

TABLE 1

Number of old females in samples of bark or litter collected on two dates within a single timber margin.

Type of sample	Number of females	Number old	Type of sample	Number of females	Number old
Bark I (Jan. 7)	100	7	Litter I (Jan. 7)	37	2
	90	3		56	7
	76	6		79	9
	89	12		77	15
	101	7		67	11
	80	1			
	100	8		316	44
	636	44	Litter II (Apr. 24)	42	3
				38	3
Bark II (Apr. 24)	81	5		55	16
	75	9		42	5
	97	6		55	9
	65	5		42	8
	105	10		37	10
	78	6		36	3
				43	12
	501	41		47	5
				46	5
				45	7
				56	2
				584	88

Chi-squares, calculated for each of the four groups of samples, using the summed figures for each category to determine expected values within that category, indicated that Bark II and Litter I samples were homogeneous, Bark I doubtful and Litter II heterogeneous with respect to young/old adult ratio. However, because both collection dates fell within the period of beetle quiescence, we concluded that the two bark and two litter samples, respectively, could be pooled. This was done and yielded a Chi-square of 14.725 (19.68 for $P = 0.05$) for bark, and 36.144 (26.30) for litter. From these figures we may conclude that the bark samples were homogeneous for age ratio but the litter samples were not ($P < 0.003$). When combined bark samples were compared with combined litter samples, a Chi-square was obtained (24.533 $DF = 2$) for which the probability was less than 0.00003, so the bark samples clearly differed from the litter samples in proportion of old adults.

Our original expectation was that the proportion of old adults would be the same throughout the timber zone sampled, regardless of whether beetles were taken from bark or litter. This was based on the assumptions, (1) that old and young adults would behave alike as they entered the margin and selected overwintering locations, and (2) that they would all come from a breeding site that had a characteristic average beetle productivity. The fact that the samples studied were not homogeneous with respect to adult age means that at least one of our assumptions was wrong. It means, moreover, that more intensive sampling will be needed before trying to compare different margins or different years with respect to adult age ratio.

We thank Dr. E. C. Pielou, Statistical Research Service, Dept. of Forestry, for assistance.—J. A. Chapman and W. W. Nijholt.

RECENT PUBLICATIONS

Blais, J. R. and G. H. Parks. Interaction of evening grosbeak (*Hesperiphona vespertina*) and spruce budworm (*Choristoneura fumiferana* (Clem.)) in a localized budworm outbreak treated with DDT in Quebec. Can. J. Zool. 42: 1017-1024. 1964.

Bloomberg, W. J. Some factors in the development of callus in poplar cuttings. Forestry Chron. 40: 509-511. 1964.

Brown, C. E. A machine method for mapping insect survey records. Forestry Chron. 40: 445-449. 1964.

Edwards, D. K. Activity rhythms of lepidopterous defoliators. I. Techniques for recording activity, eclosion, and emergence. Can. J. Zool. 42: 923-937. 1964.

Edwards, D. K. Activity rhythms of lepidopterous defoliators. II. *Halisidata argentata* Pack. (Arctidae), and *Neputia phantasmaria* Stkr. (Geometridae). Can. J. Zool. 42: 937-958. 1964.

Gardiner, L. M. and D. O. Prielipp. Aerial survey of dying balsam fir in northern Ontario using an operation recorder. Forestry Chron. 40: 519-533. 1964.

Green, G. W. The control of spontaneous locomotor activity in *Phormia regina* Meigen—I. Locomotor activity patterns of intact flies. J. Ins. Physiol. 10: 711-726. 1964.

Green, G. W. The control of spontaneous locomotor activity in *Phormia regina* Meigen—II. Experiments to determine the mechanism involved. J. Ins. Physiol. 10: 727-752. 1964.

Hubbes, Martin. New facts on host-parasite relationships in the Hypoxylon canker of aspen. Can. J. Botany 42: 1489-1494. 1964.

Ives, W. G. and G. L. Warren. Tree planter attachments for chemical treatment of coniferous seedlings. Forestry Chron. 40: 503-508. 1964.

Lavallée, André. A larch canker caused by *Leucostoma kunzei* (Fr.) Munk ex Kern. Can. J. Botany 42: 1495-1502. 1964.

Lyons, L. A. The spatial distribution of two pine sawflies and methods of sampling for the study of population dynamics. Can. Entomol. 96: 1373-1407. 1964.

Martin, J. L. The insect ecology of red pine plantations in central Ontario. II. Life history and control of Curculionidae. Can. Entomol. 96: 1417-1420. 1964.

Pilon, J. G., H. A. Tripp, J. M. McLeod, and S. L. Ilnitzky. Influence of temperature on prespinning eonymphs of the Swaine jack-pine sawfly, *Neodiprion swainei* Midd. (Hymenoptera: Diprionidae). Can. Entomol. 96: 1450-1457. 1964.

Smirnoff, W. A. La lutte aux insectes nuisibles a l'aide de virose. Ann. Soc. Entomol. du Quebec. 9: 43-53. 1964.

Smirnoff, W. A. and C. F. MacLeod. Apparent lack of effects of orally-introduced polyhedrosis virus on mice and of pathogenicity of rodent-passed virus for insects. J. Insect Path. 6: 537. 1964.

Stillwell, M. A. and D. J. Kelly. Fungus deterioration of balsam fir killed by spruce budworm in northwestern New Brunswick. Forestry Chron. 40: 482-487. 1964.

Thomas, J. B. A key to the larvae and pupae of three weevils (Coleoptera: Curculionidae). Can. Entomol. 96: 1417-1420. 1964.

Watt, K. E. F. Comments on fluctuations of animal populations and measures of community stability. Can. Entomol. 96: 1434-1442. 1964.

ROGER DUHAMEL, F.R.S.C., Queen's Printer and Controller of Stationery, Ottawa, 1965