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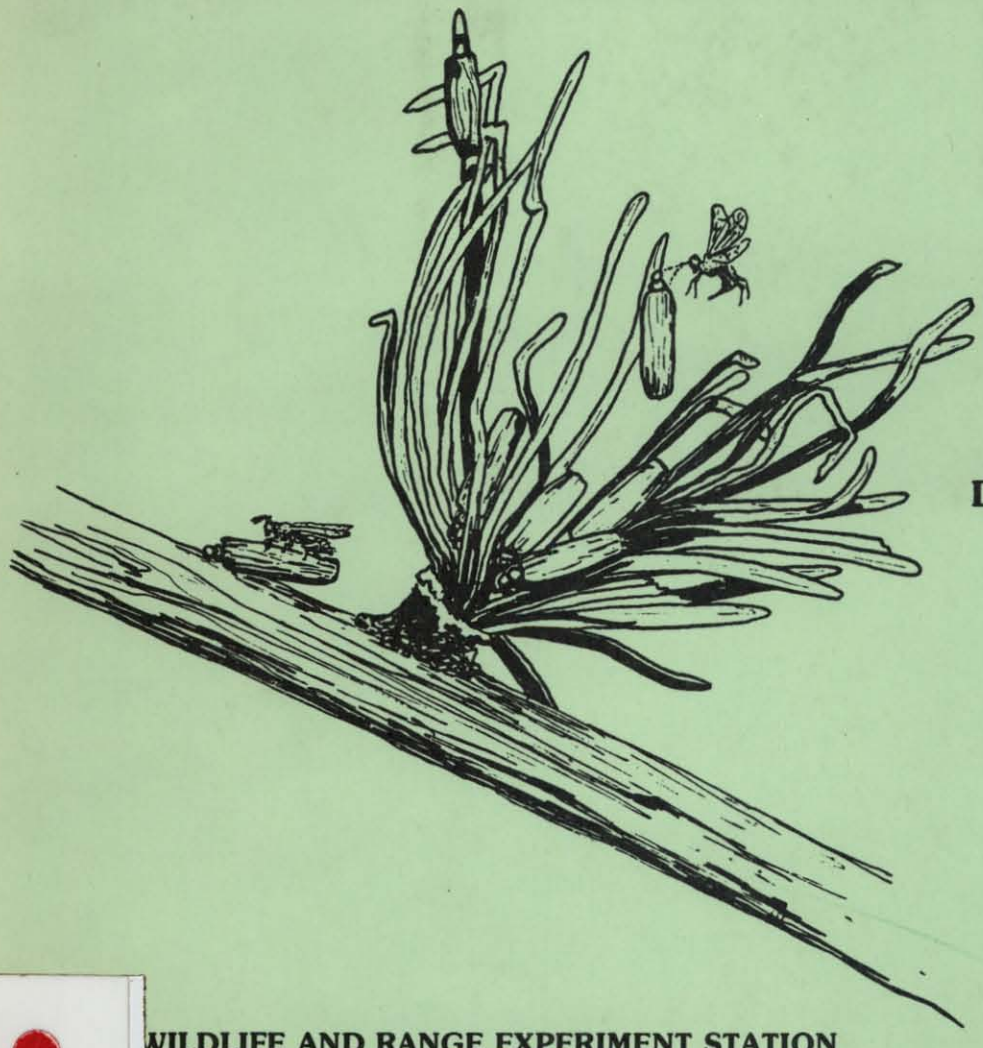
ANNOTATED BIBLIOGRAPHY OF LARCH CASEBEARER PARASITOIDS



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FOREWORD

Over 560 references dealing with parasitoids that attack the larch casebearer, *Coleophora laricella*, (Hubner) are contained in this bibliography. As the larch casebearer is an introduced species in North America, with subsequent releases of its native parasites from Europe and Asia, a worldwide search of the literature was conducted. In addition to citations specifically concerning parasitism of the larch casebearer, papers dealing with alternate hosts of casebearer parasitoids and references related to the significance of understory vegetation to parasitoid survival and effectiveness are included. These subjects are deemed important, considering the extensive effort made in North America to import parasitoids for control of the larch casebearer. This bibliography contains published references and unpublished reports through 1982.

Citations and their abstracts are listed alphabetically and chronologically by senior author, with each citation numbered consecutively. For convenience in locating references a keyword index is provided. Keywords were generated from the entire text of the article; they may or may not occur in the abstract.

Where possible, synonyms and current names are listed in the keyword index. However, current names, old generic names and synonymies, should be used to locate all references concerning a particular species.

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Annotated Bibliography

of

Larch Casebearer Parasitoids

1 Abraham, R. 1970. Okologische Untersuchungen an Pteromaliden (Hym., Chalcidoidea) im Grenzraumland-Meer an der Nordseekuste Schleswig-Holsteins. (Ecological investigations on pteromalids (Hymenoptera, Chalcidoidea) from the tidal region of the western coast of Schleswig-Holstein.) Oecologia 6:15-47.

Fifty species of Pteromalidae were caught in the study area, the most numerous was *Cyrtogaster vulgaris*, a member of the larch casebearer parasite complex. Adaptation of adult pteromalids to specific factors of the tidal region could not be found despite their high abundance.

2 Abu, J. F., and Ellis, C. R. 1975. Biology of *Bathyplectes curculionis* (Thompson) (Hymenoptera: Ichneumonidae) a parasitoid of the alfalfa weevil in Ontario. Proc. Entomol. Soc. Ont. 106:8-12.

Populations of *Bathyplectes curculionis* and the alfalfa weevil, *Hypera postica*, were monitored in order to determine population fluctuations and mortality due to this parasite species. During one year, hyperparasitism accounted for 22 percent mortality in *B. curculionis*. Of the four secondary species responsible, *Eupelmella vesicularis*, is also part of the larch casebearer parasite complex.

3 Aeschlimann, J. P. 1969. Contribution a l'etude de trois especes d'Eulophides (Hym. Chalcidoidea) parasites de la tordeuse grise du meleze, *Zeiraphera diniana*, Guenee (Lep. Tortricidae) en Haute-Engadine. (Contribution to the study of three species of eulophids (Hym. Chalcidoidea) parasites of the larch bud moth, *Zeiraphera diniana*, Guenee, (Lep:Tortricidae), in Engadin.) Entomophaga 14:261-320.

The three eulophid species discussed play a very important role in the dynamics of the larch bud moth; two of them, *Elachertus argissa* and *Dicladocerus westwoodii* are also parasites of the larch casebearer. The life cycles of these species are described and keys to the identification of larval, pupal and adult stages have been developed. A preliminary list of alternate hosts is given.

4 Aeschlimann, J. P. 1974. Elevage, biologie, et complexe parasitaire de *Anchinia laureolella*, (Lep., Oecophorid) en Haute-Engadine (Suisse). (Rearing, biology and entomophagous complex of *Anchinia laureolella*, (Lep., Oecophoridae) in the Upper-Engadine.) Ann. Soc. Entomol. Fr. 10:123-127.

The biology and parasites of *A. laureolella*, were studied from 1969-1972. One of the six species attacking *A. laureolella* is *Elachertus argissa*, which has also been recorded from the larch casebearer. The development of *E. argissa* in *A. laureolella* is discussed.

5 Ahmad, R., and Muzaffar, N. 1976. A note on the biology of *Bracon gelechiae* (Hym.: Braconidae) and augmentation of this parasite against *Pectinophora gossypiella* (Lep.: Gelechiidae). Entomophaga 21:235-238.

B. gelechiae is a common parasite of *P. gossypiella* in the Punjab and Sind, but its incidence has been reported to be very low. Studies on the biology of *B. gelechiae* and augmentation trial releases were conducted. This resulted in an increase in the incidence of the parasite as well as in the amount of seed cotton produced.

6 Allen, D. C., Knight, F. B., Foltz, J. L., and Mattson, W. J. 1969. Influence of parasites on two populations of *Choristoneura pinus* (Lepidoptera: Tortricidae) in Michigan. Ann. Entomol. Soc. Am. 62:1469-1475.

Twenty-six species of primary parasites and four species of hyperparasites were reared from eggs, early instar larvae, late instar larvae and pupae of the budworm. Three of the parasites recovered have also been reared from the larch casebearer. *Scambus hispae* and *Gelis tenellus* are primary parasites of *C. pinus*, attacking either the late larval or pupal stage. *Tetrastichus coerulescens* is a hyperparasite of *C. pinus* pupae.

7 Allen, H. W. 1932. Present status of oriental fruit moth parasite investigations. J. Econ. Entomol. 25:360-367.

Examines the work done to date with indigenous parasites of the oriental fruit moth, *Grapholitha molesta*, (as *Laspeyresia*) and investigates the importation of foreign species to control moth populations. A common native species, *Dibrachys boucheanus* is also a parasite of the larch casebearer. *D. boucheanus* occurs as a primary and secondary parasite of the oriental fruit moth.

8 Allen, H. W. 1962. Parasites of the oriental fruit moth in the eastern United States. USDA Tech. Bull. No. 1265, 139p. Collections of oriental fruit moth,

Grapholitha molesta, parasites from 25 eastern states are reported. Keys and extensive information on distribution, biology and cohosts of parasite species are discussed. Included are six species which also parasitize the larch casebearer, they are: *Agathis cincta*, *Bracon gelechiae*, *Scambus hispae*, *Gelis tenellus*, *Dibrachys cavus*, *Spilochalcis side* and *Haltichella xanticles*. Eupelmella vesicularis *was reared* as a secondary parasite of the oriental fruit moth.

9 Amman, G. D., and Tunnock, S. 1971. Radiographic detection of *Agathis pumila*, a parasite of the larch casebearer. J. Econ. Entomol. 64:1086-1088.

Larvae of *Coleophora laricella* (Hubner) while still in their cases were radiographed on Kodak type M film using an X-ray exposure of 5 kv and 3 ma for 4 minutes. Parasite larvae could not be detected consistently because of density similar to that of the host, hence lack of contrast. However, mature parasite larvae which had left the host's integument to pupate inside the larch needle case were detected with 100 percent accuracy. Contents of all cases were identified with up to 97 percent accuracy. The radiographic method may be useful where a quick check of the

casebearer population is needed to determine if the parasite is established and when subsequent preservation of the parasite is desired. (Author)

10 Andrews, R. J. 1966. First record of larch casebearer on western larch in British Columbia. Can. Dept. For. Rural Dev. Bi-mon. Res. Notes 22(6):3.

The larch casebearer was first collected in British Columbia near Rossland on June 2, 1966. Samples were collected to determine casebearer and parasite populations. To date only a small number of *Spilochalcis albifrons* adults have been reared from the Salmo river area.

11 Andrews, R. J., and Geistlinger. N. J. 1969. Parasites of the larch casebearer, *Coleophora laricella* (Hbn.) in British Columbia (Lepidoptera: Coleophoridae). J. Entomol. Soc. B. C. 66:50-51.

Nine species of parasites and hyperparasites were recovered from rearings of larch casebearer in interior British Columbia from 1966 to 1968. *Agathis pumila* was absent and has apparently not spread into the province from the United States. *Spilochalcis albifrons* was recovered, it is often hyperparasitic. The other species recovered were: *Scambus transgressus*, *Gelis tenellus*, *Dicladocerus westwoodii*, *Tetrastichus xanthostigma*, *Amblymerus* sp., *Sceptrothelys deione* and *Bracon* sp.

12 Angalet, G. W., and Andres, L. A. 1965. Parasites of two weevils, *Microlarinus lareynii* and *M. lypriformis*, that feed on the puncture vine, *Tribulus terrestris* L. J. Econ. Entomol. 58:1167-1168.

Eupelmella vesicularis was recovered from both species of *Microlarinus* collected in France. This parasite also attacks the larch casebearer.

13 Anonymous. 1924. The larch leaf-miner or case bearer. Conn. Agric. Exp. Stn. Bull. 256:288-290.

An early report on the larch casebearer states that three species of parasites have been reared in New York. One belonged to the genus *Pachyneuron* and the other two in the families Pteromalidae and Tetrastichidae. Nine species of casebearer parasites are reported to be known in Europe.

14 Anonymous. 1934. Identify eight additional cherry casebearer parasites. Wisc. Agric. Exp. Stn. Bull. 428:101-102.

Microbracon pygmaeus continued to be the dominant parasite of the cherry casebearer, *Coleophora pruniella*. The degree of parasitism by this species, varied strikingly between widely separated orchards. *M. pygmaeus* and another cherry casebearer parasite, *Eurydinota lividicorpus*, have also been reared from the larch casebearer.

15 Anonymous. 1945. Forest entomology. Rept. Dept. Lands and For. 1944, Nova Scotia, p.35-65.

Attacks by the larch casebearer were scattered and patchy in 1943 and defoliation was usually light to moderate. Over 8,000 *Chrysocharis laricinellae* and over 800 *Bassus pumilis* were liberated against the casebearer this year.

16 Anonymous. 1946. Forest entomology. Rept. Dept. Lands and For. 1945, Nova Scotia, p.35-55.

Infestations by the larch casebearer were lighter than the previous year. Releases of the parasites *Chrysocharis laricinellae* and *Bassus pumilis* against the casebearer continued.

17 Arthur, A. P. 1958. Development, behavior and descriptions of immature stages of *Spilochalcis side* (Walk.) (Hymenoptera: Chalcididae). Can. Entomol. 90:590-595.

Spilochalcis side (Walk.), a common parasite of lepidopterous pupae throughout the United States, was reared in the laboratory in the pupae of *Depressaria heracliana* (L.), *Anagasta kuhniella* (Zell.), *Galleria mellonella* L. and *Pyrausta nubilalis* (Hbn.) (Lepidoptera); in the cocoons of *Apanteles atalantae* (Pack.), *A. congregatus* (Say) and *A. glomeratus* (L.) (Hymenoptera); and in an unidentified coleopterous casebearer. Mating usually took place soon after the females emerged. It was usually preceded by a short courtship period. The pairs remained 'in copula' for 15 seconds to seven minutes. The preoviposition period was six to eight days. Both males and females lived up to five months. A female deposits as many as four eggs in a host pupa. One first-instar larva usually killed the others. Adult parasites emerged 20 to 25 days after the eggs were deposited. The distinguishing characters of the immature stages are described. (Author) *S. side* also parasitizes the larch casebearer.

18 Arthur, A. P. 1963. Life histories and immature stages of four ichneumonid parasites of the European pine shoot moth *Rhyacionia buoliana* (Schiff.) in Ontario. Can. Entomol. 95:1078-1091.

Four indigenous parasites of *R. buoliana* are discussed: *Exeristes comstockii*, *Scambus hispae*, *Scambus tecumseh* and *Itoplectis conquisitor*. The first three are external larval parasites and the fourth an internal pupal parasite. Observations are given on the hosts, life histories and habits under laboratory conditions. The immature stages are described. (Author) The two *Scambus* species also attack the larch casebearer.

19 Arthur, A. P., and Wylie, H. G. 1959. Effects of host size on sex ratio, development time and size of *Pimpla turionellae* (L.) (Hymenoptera: Ichneumonidae). Entomophaga 4:297-301.

Nine species of lepidopterous hosts, two species from laboratory cultures and the remaining from field collections, were used to test the effects of host size on the development of *P. turionellae*. Only male parasites emerged from small host pupae, the percentage of females increased with larger host size. The development time was longer in the largest sized hosts. The weight of the parasites increased with that of the hosts.

20 Ashmead, W. H. 1888. Descriptions of some new North American Chalcididae. Can. Entomol. 20:101-107.

One of the new species described, *Holcopelte microgaster* has been reared from the larch casebearer.

21 Ashmead, W. H. 1889. Descriptions of new Braconidae in the collection of the U. S. national museum. Proc. U. S. Nat. Mus. 11:611-671.

Four of the new species described *Bracon junci*, *B. trifolii*, *B. gelechiae* and *B. notaticeps*, attack the larch casebearer.

22 Ashmead, W. H. 1890. Descriptions of new Ichneumonidae in the collection of the U. S. National Museum. Proc. U. S. Nat. Mus. 12:387-451.

Keys and descriptions are provided for new ichneumonid specimens in the national museum. Included are two species, *Hemiteles melitaeae* and *Pimpla gossypii*, which attack the casebearer. *H. melitaeae* was described from specimens reared from *Melitoea chalcedon* and *P. gossypii* was recovered from a tortricid which feeds in cotton bolls.

23 Ashmead, W. H. 1891. Descriptions of some new Canadian Braconidae. Can. Entomol. 23:1-7.

One of the new species described is *Bracon melanaspis*, a parasite of the larch casebearer.

24 Ashmead, W. H. 1893. A monograph on the North American Proctotrypidae. Bull. U. S. Nat. Mus. 45:104 and 162.

Describes two species, *Phanurus ovivorus* and *Trissolcus euschisti*, which have been collected from the larch casebearer. The type specimens of *T. euschisti* were reared from the eggs of *Euschistus servus*.

25 Ashmead, W. H. 1893. West Virginia Scolytidae and their enemies. W. Va. Agric. Exp. Stn. Bull. 31:144-158.

Among the enemies of Scolytidae listed is *Hemiteles scolyti* Ashm., a species which also attacks the larch casebearer. *H. scolyti* is reported to have parasitized *Scolytus rugulosus* in dead peach twigs.

26 Ashmead, W. H. 1894. Descriptions of new parasitic Hymenoptera. Trans. Am. Entomol. Soc. 21:318-344.

Contains descriptions of many parasites of destructive forest insects. The new species *Arthrolytus pimplae* was described from several specimens bred from *Pimpla inquisitor*. *A. pimplae* has also been recorded from the larch casebearer.

27 Ashmead, W. H. 1896. Descriptions of new parasitic Hymenoptera. Trans. Am. Entomol. Soc. 23:179-234.

Among the Hymenoptera described are two species which have been recovered from the larch casebearer. *Otacustes orgyiae* was described from specimens bred from *Orgyia leucostigma*. *Otacustes periliti* was reared from a species of *Perilitus*.

28 Ashmead, W. H. 1897. Descriptions of five new hymenopterous parasites on *Canarsia hammondi* (Riley). Proc. Entomol. Soc. Wash. 4:124-131.

Descriptions of the morphology of five parasites of *Canarsia hammondi* are given. One of these, *Tetrastichus coerulescens*, also attacks the larch casebearer. *T. coerulescens* was recovered as a primary parasite of *C. hammondi*; and as a secondary through *Habrobracon gelechiae*, also a parasite of the larch casebearer.

29 Ashmead, W. H. 1898. Notes on parasitic Hymenoptera, with descriptions of some new species. Part 2 - Descriptions of new parasitic Hymenoptera. Proc. Entomol. Soc. Wash. 4:155-173.

Of the 70 species discussed in Dimmock (1898) two new species attack the larch casebearer. *Habrocytus phycidis* is described from specimens bred from *Phycis rubrifasciella*. *Apanteles parorgyiae* has been reared from both *Spilosoma* (?) *virginica* and *Parorgyia clintonia*.

30 Ashmead, W. H. 1900. On the genera of the chalcid flies belonging to the subfamily Encyrtinae. Proc. U. S. Nat. Mus. 22:323-412.

Describes and lists hosts of two species, *Berecyntus floridanus* and *Copidosoma truncatellum*, which have been recovered from the larch casebearer.

31 Askew, R. R. 1964. Chalcidoidea (Hymenoptera) in the Manchester museum (Part 3). Entomologist 97:265-271.

Two of the species listed, *Dicladocerus westwoodii* West. and *Necremnus metalarus* (Walk.) are casebearer parasites. Sex, collection date, location and occasionally host information are provided.

32 Askew, R. R. 1965. The holarctic species of *Cytrogaster* Walker and *Polycystus* Westwood (Hym., Pteromalidae) including the description of a new species of *Cyrtogaster* from Britain. Entomophaga 10:179-195.

Notes on hosts, biology, taxonomy and a key to a few species of *Cyrtogaster* and *Polycystus* are given. Included is the larch casebearer parasite, *Cyrtogaster vulgaris*. In the spring adult female *C. vulgaris* can be found in catkins of *Salix* and on other flowers.

33 Askew, R. R. 1968. Hymenoptera Chalcidoidea: Elasmidae and Eulophidae (Elachertinae, Eulophinae, Euderinae). Royal Entomol. Soc. Lond. Hdbk., for the Identification of British Insects. 8(2b), 39p.

Provides keys, morphological notes and host records for British Elasmidae and Eulophidae. Included are seven species of eulophids which attack the larch casebearer. They are: *Elachertus argissa*, *Cirrospilus pictus*, *C. salatis*, *C. vittatus*, *Dicladocerus westwoodii*, *Necremnus metalarus* and *Euderus albitarsis*.

34 Askew, R. R., and Coshan, P. F. 1973. A study of *Chrysocharis nephereus* (Walker) (Hymenoptera: Eulophidae) and allied species with observations on their biology in northern England. J. Nat. Hist. 7:47-63.

Morphological variation in *Chrysocharis nephereus*, *C. nitetis*, *C. pentheus* and *C. laricinellae* is examined. A key to the species is provided and their biology discussed. (Author) *C. laricinellae* and *C. nitetis* are parasites of the larch casebearer.

35 Askew, R. R., and Shaw, M. R. 1979. Mortality factors affecting the leaf-mining stages of *Phyllonorycter* (Lepidoptera: Gracillariidae) on oak and birch. 2. Biology of the parasite species. Zool. J. Linnean Soc. 67:51-64.

Parasitic Hymenoptera attacking *Phyllonorycter* species mining leaves of oak and birch were studied at a Cheshire locality in 1974. The host developmental stages killed and attacked by each parasite species are analyzed. Two of these species, *Cirrospilus pictus* and *C. vittatus* have also been recovered from the larch casebearer. *C. vittatus* is a small species and tends to kill early host instars. *C. pictus* was recovered from *Phyllonorycter* only as a primary parasite, while *C. vittatus* occurred as a primary, secondary and multiparasite in this host.

36 Atkins, E. L. Jr., Frost, M. H. Jr., Anderson, L. D., and Deal, A. S. 1957. The "omnivorous leaf roller," *Platynota stultana* Wlshm., on cotton in California: Nomenclature, life history, and bionomics (Lepidoptera, Tortricidae). Ann. Entomol. Soc. Am. 50:251-259.

Catolaccus aeneoviridis was commonly recovered as a secondary parasite of *P. stultana* through its most abundant parasite, *Goniozus platynotae*. *C. aeneoviridis* is also a part of the larch casebearer parasite complex.

37 Aubert, J. F. 1974. Les Ichneumonides Ouest Palearctiques et leurs hotes. (Western palearctic ichneumonidae and their hosts.) Quatre Feuilles, 22 rue Marcel Bourdarias, Alforville, France, 1:89, 107.

Provides brief notes on the biology, hosts, geographic range and systematics of *Pimpla acquilonia* Cresson. *P. acquilonia* is a parasite of the larch casebearer in Europe and North America. Hosts include at least two coleopterans and several lepidopterans.

38 Baeschlin, R. 1974. Zum Parasitenkomplex der Sacktragermotten an Obstbaumen (Lep., Coleophoridae). (The parasite complex of casebearer moths of fruit trees, (Lep., Coleophoridae).) Mitt. Schweix. Entomol. Ges. 47:73-84.

Parasites were reared from *Coleophora serratella* and *C. anatipennella* in Switzerland during 1970 and 1971. The hyperparasite *Gelis areator* was recovered from both, it also attacks the larch casebearer.

39 Baird, A. B. 1923. Some notes on the natural control of the larch sawfly and larch case bearer in New Brunswick in 1922. Acadian Entomol. Soc. Proc., N. S. 8:158-171.

Predation by birds caused 25 percent mortality of spring larch casebearer larvae. Nonhatch of eggs accounted for an additional 25 percent mortality. No parasites were reared from either spring or autumn stages of the larvae, however four species of pupal parasites were reared. A chalcid "with much swollen femur" was the most effective native parasite, causing 8.5 percent mortality at one location.

40 Baker, W. A., Bradley, W. G., and Clark, C. A. 1949. Biological control of the European corn borer in the United States. USDA Tech. Bull. No. 983, 185p.

Reviews the status of imported and native parasites of the European corn borer, *Pyrausta nubilalis*. Three native species which attack *P. nubilalis* are also parasites of the larch casebearer. *Dibrachys cavus* has been recovered primarily as a hyperparasite, however it also acts as a primary parasite of corn borer pupae. *D. cavus* is prone to superparasitism in this host. *Scambus tecumseh* and *S. hispae* have also been reared from the corn borer in low numbers.

41 Baker, W. L. 1972. Eastern forest insects. USDA Misc. Publ. No. 1175, 642p.

The larch casebearer is attacked by more than 50 species of native parasites in eastern America, but none are particularly effective in control. Two introduced parasites, *Agathis pumila* and *Chrysocharis laricinellae* are now widely distributed and are very helpful in control of the casebearer. *Spilochalcis albifrons* is cited as a parasite of the locust leaf and arborvitae leaf miners, as well as the larch casebearer.

42 Bakkendorf, O. 1955. Notes on Icelandic and Greenlandic chalcidoideous Hymenoptera. Entomol. Meddr. 27:135-162.

Of the 25 Chalcidoidea described from Iceland, *Cyrtogaster vulgaris* and *Cirrospilus vittatus*, are part of the larch casebearer parasite complex. *C. vittatus* has been collected in Europe from the hosts *Elachista argentella*, *Orchestes* sp., *Nepticula* sp. and *Agromyza* sp.

43 Bakkendorf, O. 1965. Notes on six chalcidoid parasites (Hym.) of *Rhynchaenus fagi* L. (Col.). Entomol. Meddr. 34:118-122.

One of the species reared from *R. fagi*, *Cirrospilus diallus*, is also a parasite of the larch casebearer. *C. diallus* has previously been collected from *Lithocolletis* sp.

44 Balduf, W. V. 1926. On the bionomics of some Hymenoptera from a Bur oak cynipid gall. Can. Entomol. 58:135-143.

The larch casebearer parasite, *Epiurus indagator* was recovered from galls caused by *Disholcaspis mamma*. Its presence in the almost mature galls of *D. mamma* in April indicates that the winter is spent there and that it is parasitic upon one or more immature stages of this form of the gall maker. Whether or not another generation develops in *D. flavipes* is unknown. Other alternate hosts recorded for *E. indagator* are discussed.

45 Balduf, W. V. 1926. The bionomics of *Dinocampus coccinellae* Schrank. Ann. Entomol. Soc. Am. 19:465-498.

A detailed discription of the biology, distribution and natural enemies of *D. coccinellae*, a parasite of ladybeetles. *Dibrachys boucheanus* Ratz. a species which attacks the larch casebearer was found to be a hyperparasite of *D. coccinellae*. Though *D. boucheanus* was not found to attack *D. coccinellae* throughout the year, its many other alternate hosts would help to maintain populations at a substantial level. Its hosts include many primary hymenopterous parasites of *Thyridopteryx ephemeraeformis*, *Clisiocampa americana*, *Hemerocampa leucostigma*, *Hyphantria cunea*, *Euproctis chrysorrhoea*, *Porthetria dispar*, *Lespyrezia molesta*, *Carpocapsa pomomella*, *Phytonomus posticus*, and *Sitotroga cerealella*.

46 Balduf, W. V. 1937. Bionomic notes on the common bagworm *Thyridopteryx ephemeraeformis* Haw. (Lepid. Psychidae) and its insect enemies (Hym., Lepid.) Wash. Entomol. Soc. Proc. 39:169-184.

Two species which attack the larch casebearer are reported as parasites of the common bagworm as well. *Habrocytus thyridopterigis* is a superparasitic external hyperparasite of the bagworm, attacking either *Itoplectis conquisitor* or *Hemiteles thyridopterigis*. *Dibrachys cavus* is probably a secondary parasite of the bagworm, as it is in numerous other lepidopteran hosts.

47 Balduf, W. V. 1959. Obligatory and facultative insects in rose hips. Their recognition and bionomics. Ill. Biol. Monog. 26, 194p.

Thirty species of animals are known to comprise a microcommunity which centers in the rose hip. Two solitary ectoparasites attack the cherry fruitworm, *Cydia packardi* in rose hips. Both *Scambus hispae* and *Euderus cushmani* also parasitize the larch casebearer. Alternate hosts and the biologies of these species attacking *C. packardi* are briefly discussed.

48 Balduf, W. V. 1966. Life of *Acrobasis rubrifasciella* (Lepidoptera: Phycitidae), its main parasite, *Agathis calcarata* (Hymenoptera: Braconidae), and three hyperparasites (Chalcidoidea). Ann. Entomol. Soc. Am. 59:1038-1049.

The bionomics of *Acrobasis rubrifasciella* and its primary parasite *Agathis calcarata* are described. *Eupelmella vesicularis* a hyperparasite in this complex, is also a parasite of the larch casebearer.

49 Balduf, W. V. 1968. Bionomic notes on the hexapodous parasites of *Acrobasis rubrifasciella*. Ann. Entomol. Soc. Am. 61:463-476.

The habits of 26 species of parasites associated with the alder casebearer at Eaglenest Lakes are described. Four of these, *Scambus hispae*, *Gelis tenellus*, *Spilochalcis albifrons*, and *Habrocytus phycidis* are also parasites of the larch casebearer. *S. hispae* was found to be a hyperparasite of *A. rubrifasciella* and a primary parasite of numerous other insects, mainly small Lepidoptera.

50 Beacher, J. H. 1947. Studies of pistol case-bearer parasites. Ann. Entomol. Soc. Am. 40:530-544.

Fifteen species of parasites were reared from the mature larvae and pupae of the pistol casebearer, *Coleophora serratella*. These included four larch casebearer parasites, *Habrocytus phycidis*, *Microbracon pygmaeus*, *Spilochalcis albifrons*, and *Eurydinota lividicorpus*. No parasitism was recorded for the egg or the first and second larval instars of the pistol casebearer. Observations on the life history of *Eurydinota lividicorpus*, the most important primary parasite of the pistol casebearer, are detailed.

51 Becker, G. C. Jr., and Benjamin, D. M. 1964. Notes on insect parasites and predators of the Swaine jack-pine sawfly in Wisconsin. J. Econ. Entomol. 57:355-357.

Parasites and predators collected from the Swaine jack-pine sawfly, *Neodiprion swainei*, are listed and general comments on their relative importance are included. *Gelis tenellus* and *Dibrachys cavus* are possible hyperparasites of the Swaine jack-pine sawfly, these species have also been recovered from the larch casebearer.

52 Bedard, W. D. 1938. An annotated list of the insect fauna of Douglas fir (*Pseudotsuga mucronata* Rafinesque) in the northern Rocky mountain region. Can. Entomol. 70:188-197.

In a survey of the insects found in or on Douglas fir in the Rocky mountains, three species of larch casebearer parasites were recovered from alternate hosts. *Itoplectis esuchus* was reared from pupae of the spruce budworm, *Choristoneura occidentalis*. *Epiurus indagator* and *Dibrachys cavus* were collected from cocoons of the Douglas-fir tussock moth, *Orgyia pseudotsugata*.

53 Bendel-Janssen, M. 1962. Ein weiterer Beitrag zur Parasitierung von *Apanteles glomeratus* L. (Hym., Brac.), Parasit in *Pieris brassicae* L. (Lep., Pier.). (A further observation on parasitism by *Apanteles glomeratus* L. (Hym., Brac.), a parasite of *Pieris brassicae* L. (Lep., Pier.).) Zeit. Pflanzenkrank und Pflanzenshutz 69:526-529.

Habitat preference of several hyperparasites of *A. glomeratus*, a parasite of *P. brassicae* included *Dibrachys cavus*, a species which also attacks the larch casebearer. *D. cavus* preferred cocoons in the "house" surroundings but it could be found in the "field" surroundings as well.

54 Benjamin, D. M. 1955. The biology and ecology of the red-headed pine sawfly. USDA Tech. Bull. No. 1118, 57p.

Discusses the bionomics, impact and control of the red-headed pine sawfly, *Neodiprion lecontei*, a defoliator of hard pines in the eastern United States and Canada. Fifty-eight species of parasitic and predatory insects have been recorded from *N. lecontei* in eastern North America. Included are *Bracon pygmaeus* which has been recovered in the United States and *Dibrachys cavus*, a hyperparasite of *N. lecontei* in the United States and Canada. These two species also attack the larch casebearer.

55 Betz, E., and Schwerdtfeger, F. 1970. Lepidopteren-Parasiten aus zwei nordwestdeutschen Eichenwaldern. (Parasites of Lepidoptera from two oak forests of northwest Germany.) Entomophaga 15:347-351.

Larvae and pupae of Lepidoptera from two locations were collected and reared in order to compile host-parasite lists for these areas. Six species of parasites which attack the larch casebearer are recorded from alternate hosts in this study. These parasite species are: *Dibrachys cavus*, *Itoplectis alternans*, *I. maculator*, *Apanteles emarginatus*, *Mesopolobus subfumatus*, and *Gelis areator*.

56 Bissell, T. L. 1938. The host plant relationships and parasites of the cowpea curculio and other legume infesting weevils. J. Econ. Entomol. 31:534-536.

Collections of more than 20 species of wild and cultivated legumes were made in a search for host plant relationships of the cowpea curculio and other weevils. *Horismenus microgaster*, a parasite of the larch casebearer was recovered in this study from the weevil, *Apion decoloratum*. It is possible that *H. microgaster* is a primary and secondary parasite of this host.

57 Blickenstaff, C. C., Arbuthnot, K. D., and Harris, H. M. 1953. Parasites of the European corn borer in Iowa. Iowa State Coll. J. Sci. 27:335-379.

Reports the status of exotic parasites released against the corn borer *Pyrausta nubilalis* in Iowa and comments on its native parasites. One exotic and two of the native parasite species have also been reared from the larch casebearer. Adults of the European species *Microgaster tibialis* were released in 1950 and 1951. No cocoons were found in the fall following the first release. *Scambus hispae* and *Dibrachys cavus* are native parasites of the corn borer. *D. cavus* attacks this host both as a primary and secondary parasite.

58 Bogenschutz, H. 1971. Vergleich der Leistung von zwei Puppenparasiten. (Comparison of the performance of two pupal parasites.) Z. ang. Entomol. 68:250-257.

The effectiveness of *Coccygomimus turionellae*, a parasite of the larch casebearer, and the closely related species *Itoplectis conquisitor* are compared. *C. turionellae* showed greater longevity and fecundity in laboratory tests. The importance of temperature on the performance of parasites is discussed.

59 Bogenschutz, H. 1975. Parasitenstudien als Entscheidungshilfen bei der intergrierten Bekampfung von Forstschadlingen. (Parasite studies as a decision-helper for the integrated control of forest pests.) Z. ang. Entomol. 78:1-4. During an outbreak of *Laspeyresia pactolana* from 1970-1971, pupal parasitism reached 30 percent. The most important parasite of this stage was *Coccygomimus turionellae* (L.), also a parasite of the larch casebearer. This bivoltine (at least) parasite is not synchronized with *L. pactolana*, its population changes are dependent on alternate hosts.

60 Bogenschutz, H. 1978. Fuhler-Bewegungen wirtesuchender Weibchen der Schlupfwespe *Coccygomimus turionellae* (Hymenoptera: Ichneumonidae). (Movements of antennae in host-finding females of the ichneumond species *Coccygomimus turionellae* (Hymenoptera: Ichneumonidae).) Entomol. Ger. 4:122-132.

Three types of movement were distinguished in the antennal drumming of *C. turionellae*, a behavior which apparently is important to

host finding. 1). Antennae are bent actively in a ventral direction, and are curved passively when the tips hit a substratum. 2). The position of the antennae is determined by the angle of elevation and angle of splaying. 3). Irregular up and down movements with antennae not moving in synchrony with each other. *C. turionellae* has been recovered as a parasite of the larch casebearer.

61 Boucek, Z. 1963. Studien uber europaische Eulophidae, III. Euderinae (Hymenoptera: Chalcidoidea). (Studies of European Eulophidae, III. Euderinae (Hymneoptera: Chalcidoidea).) Beitr. Entomol. 13:257-281.

A revision of the European species of Euderinae. Fifteen species are reviewed and several names are synonymized. One of the species included is the larch casebearer parasite, *Euderus albitarsis*.

62 Boucek, Z., and Askew, R. R. 1968. Hym. Chalcidoidea, Palearctic Eulophidae (excl. Tetrastichinae). In: Index of Entomophagous Insects. V. Delucchi and G. Remaudiere (eds.), Le Francois, Paris, Vol. 3, 254p.

This index provides information and references concerning the taxonomy, hosts, biology and geographic distribution of the Palearctic Eulophidae. This listing includes twelve species which attack the larch casebearer, they are: *Elachertus argissa* (Walk.), *Cirrospilus diallus* Walk., *C. pictus* Nees, *C. salatis* Walk., *C. vittatus* Walk., *Dicladocerus westwoodii* West., *Necremnus metalarus* Walk., *Euderus albitarsis* Zett., *Chrysocharis laricinellae* Ratz., *C. nitetis* Walk., *C. novellus* Walk., and *Teleopterus erxias* Walk.

63 Bousfield, W. E., Lood, R. C. 1973. Parasites of the larch casebearer in Montana, Idaho, and Washington. Environ. Entomol. 2:212-213.

Twenty parasitic and hyperparasitic species were reared from *Coleophora laricella* (Hubner) from 95 locations in Montana, Idaho, and Washington. *Spilochalcis albifrons* (Walsh) and *Dicladocerus* sp. near *westwoodii* Westwood were the most abundant native species recovered. *Agathis pumila* (Ratzeburg), an introduced parasite, was recovered from 58 percent of the release sites sampled in 1970. (Author) Other species reared were: *Scambus transgressus*, *Gelis tenellus*, *Gelis* sp., *Itoplectis evetriae*, *Pristomerus* sp., *Campoplex rufipes*, *Bracon pygmaeus*, *Tetrastichus dolosus*, *T. coerulescens*, *T. ecus*, *Hyssopus* sp., *Achrysocharella silvia*, *Zagrammosoma americana*, *Habrocytus phycidis*, *Mesopolobus* sp., *Catolaccus aeneoviridis*, and *Platygaster* sp.

64 Bousfield, W. E., Tunnock, S., Pettinger, L., and Ross, D. 1974. Establishment and distribution of the larch casebearer parasite, *Agathis pumila* (Ratz.), in Idaho, Montana, Washington, Oregon, and British Columbia. USDA For. Serv., Northern Region, For. Ins. and Dis. Mgt., Missoula, Mt., Rep. No. 74-3, 40p.

Effectiveness of *A. pumila* releases from 1960 through 1969 ranged from 20 to 100 percent establishment. Dispersal from release sites has been limited, although *A. pumila* has been recovered from four areas more than a mile from known release sites. An appendix lists release and recovery information.

65 Boyce, H. R. 1941. Biological control of the codling moth in Ontario. Entomol. Soc. Ont. Ann. Rep. 71:40-44.

Discusses native parasitoids, predators, diseases, and parasite liberations for control of the colding moth, *Laspeyresia pomonella* (as *Carpocapsa*). *Dibrachys cavus*, a broadly polyphagous chalcid was recovered as a primary and secondary parasite of the codling moth.

66 Bradley, G. A. 1974. Parasites of forest Lepidoptera in Canada. Part 1. Subfamilies Metopiinae and Pimplinae (Hymenoptera: Ichneumonidae). Can. For. Ser. Publ. No. 1336, 99p.

An annotated parasite catalog which includes information dealing with: distribution, insect hosts, host trees, stage and time hosts collected, time of adult parasite activity and other remarks. Eight of the species mentioned use the larch casebearer as a host, they are: *Scambus brevicornis*, *S. transgressus*, *S. tecumseh*, *S. hispae*, *S. decorus*, *Itoplectis quadricingulata*, *I. evetriae*, and *I. vesca*.

67 Breland, O. P. 1940. Some parasites and hyperparasites of the cecropia moth. J. New York Entomol. Soc. 48:259-264.

Incidence of primary, secondary and multiple parasitism of cecropia moth cocoons was investigated. Among the hyperparasitic species was *Dibrachys cavus* which is also in the in the larch casebearer parasite complex. *D. cavus* attacked *Spilocryptus extrematus*, a primary parasite of cecropia cocoons.

68 Britton, W. E., and Zappe, M. P. 1918. The imported pine sawfly. Conn. Agric. Exp. Stn. Bull. 203:273-290.

Parasitism by eight hymenopterous and one dipterous parasite accounted for nearly 50 percent mortality in the imported pine sawfly, *Diprion simile*. Two of these species, *Dibrachys nigrocyaneus* and *Hemiteles utilis* are also parasites of the larch casebearer. *D. nigrocyaneus* is the most abundant natural enemy of the pine sawfly.

69 Brodie, W. 1909. Lepidopterous galls collected in the vicinity of Toronto. Can. Entomol. 41:7-8.

Discusses the parasites which emerged from lepidopteran galls. The only secondary parasite recovered was *Dibrachys boucheanus*. This species is also found in the larch casebearer parasite complex.

70 Bronskill, J. F. 1959. Embryology of *Pimpla turionellae* (L.) (Hymenoptera: Ichneumonidae). Can. J. Zool. 37:655-688.

A detailed description of the embryology of the larch casebearer parasite *Pimpla turionellae* is given. Similarities between the embryogenesis of *P. turionellae* and other hymenopterous species show being a parasitoid has little influence on its embryogenesis.

71 Brown, N. R., and Clark, R. C. 1956. Studies of predators of the balsam woolly aphid, *Adelges piceae* (Ratz.) (Homoptera: Adelgidae). II. An annotated list of the predators associated with the balsam woolly aphid in eastern Canada. Can. Entomol. 88:678-683.

This paper is a compilation of notations on predators of the balsam woolly aphid from various publications. Two introduced dipteran predators, *Cremifania nigrocellulata* and *Neoleucopis obscura*, are both commonly parasitized by *Pachyneuron altiscutum* How. which also attacks the larch casebearer.

72 Brunson, M. H. 1948. Secondary parasites of the oriental fruit moth through *Macrocentrus ancylivorus*. J. Econ. Entomol. 41:119-120.

Secondary parasitization of *M. ancylivorus* during the first brood of the oriental fruit moth, *Grapholitha molesta*, was significant. Two species of fruit moth hyperparasites, *Dibrachys cavus* and *Gelis tenellus*, also attack the larch casebearer as an alternate host. Both species appear

to have the limited the effectiveness of *M. ancylivorus* releases in peach orchards.

73 Brunson, M. H., and Allen, H. W. 1948. Oriental fruit moth cocoon parasites. J. Econ. Entomol. 41:446-450.

Cocoon parasites of the oriental fruit moth, *Grapholitha molesta*, were determined using trap bands and by exposing insectory reared pupae to parasite attack in orchards. Among the parasites recovered from the oriental fruit moth are four species which use the larch casebearer as an alternate host. *Dibrachys cavus* and *Haltichella xanticles* were reared from cocoons formed in trap bands, while *D. cavus*, *Gelis tenellus* and *Scambus hispae* were recovered from insectory reared cocoons. *D. cavus* and *G. tenellus* were found over half the time as secondary parasites.

74 Burks, B. D. 1940. Revision of the chalcid-flies of the tribe Chalcidini in America north of Mexico. Proc. U. S. Nat. Mus. 88:237-354.

Discusses the synonymy, morphology, and hosts of three species of *Spilochalcis* (S.albifrons, S. side and S. leptis) which parasitize the larch casebearer.

75 Burks, B. D. 1943. The North American parasitic wasps of the genus *Tetrastichus*--a contribution to biological control of insect pests. Proc. U. S. Nat. Mus. 93:505-608.

A key to the species of *Tetrastichus*; synonymy, morphology and host records for each species are provided. Three species, *T. coerulescens*, *T. dolosus* and *T. xanthostigma*, are parasites of the larch casebearer. Primary and secondary hosts are listed for these species.

76 Burks, B. D. 1963. The Provancher species of Chalcidoidea (Hymenoptera). Can. Entomol. 95:1254-1263.

The extant types of chalcids described by Provancher are re-examined. Three of the species discussed are parasites of the larch casebearer. *Euplectrus mellipes* was correctly placed. However *Euplectrus viridaeneus* is recognized as a synonym of *Elachertus proteoteratis* and *Theocolax canadensis* is a synonym of *Eupelmella vesicularis*.

77 Burks, B. D. 1971. The nearctic species of *Horismenus* Walker (Hymenoptera: Eulophidae). Proc. Entomol. Soc. Wash. 73:68-83.

A redefinition of the genus *Horismenus*, with a key to the nearctic species. Included is *H. microgaster* a common secondary parasite of Lepidoptera, attacking ichneumonoid and chalcidoid primary parasites. It has also been reared, apparently as a primary parasite, from lepidopterous leafminers and other minute Lepidoptera. (Author) *H. micrógaster* is part of the larch casebearer parasite complex.

78 Burks, B. D. 1975. The species of Chalcidoidea described from North America north of Mexico by Francis Walker (Hymenoptera). Bull. Brit. Mus. (Nat. Hist.) Entomol. 32:137-170.

Seventy-two species of Chalcidoidea described by Francis Walker are reviewed and full information is given on their type-material. The species are assigned to their correct genera, and synonymies are given. Two of the species described by Walker are parasites of the larch casebearer, *Spilochalcis side* and *Haltichella xanticles*. *Haltichella xanticles* is a primary parasite of small moths and a secondary parasite, emerging from *Apanteles*.

79 Butcher, G. E. 1953. Biotic factors of control of the European fir budworm, *Choristoneura murinana* Hbn., in Europe. Can. J. Agric. Sci. 33:448-469.

Attack by insect parasites was of secondary importance to a virus disease in reducing both a low and a high population of *C. murinana*. In the *C. murinana* parasite complex, two species also attack the larch casebearer as an alternate host. The polyphagous species *Itoplectis maculator* F. was responsible for about half of all parasitism during the pupal stage. *Pimpla turionellae* (L.) occurred rarely throughout the study.

80 Cameron, E. 1939. The holly leaf-miner (*Phytomyza ilicis*, Curt.) and its parasites. Bull. Entomol. Res. 30:173-208.

The biology, distribution, host records, morphology and development of the holly leaf-miner, *Phytomyza ilicis*, parasites are described. Included is *Cyrtogaster vulgaris* which also parasitizes the larch casebearer. *C. vulgaris* is a primary pupal parasite of *P. ilicis*. Keys to adults, mature larvae and pupae are given.

81 Cameron, P. 1908. A contribution towards the knowledge of the Odyneridae of the southwest of the United States. Trans. Am. Entomol. Soc. 34:195-246.

One of the species described, *Otacustes nigro-ornatus*, has been recovered as a parasite of the casebearer (Odyneridae=Eumenidae).

82 Chamberlain, T. R. 1941. The wheat jointworm in Oregon, with special reference to its dispersion, injury, and parasitization. USDA Tech. Bull. No. 784, 47p.

Eupelmella vesicularis, a parasite of the larch casebearer, plays a minor role in the control of the wheat jointworm, *Harmolita tritici*. In this host, *E. vesicularis* acts as a primary, secondary and tertiary parasite, attacking most of the other jointworm parasites. The author has reared *E. vesicularis* as a primary parasite from several other species of *Harmolita*.

83 Cheng, H. H., and LeRoux, E. J. 1969. Parasites and predators of the birch leaf miner, *Fenusa pusilla* (Hymenoptera: Tenthredinidae), in Quebec. Can. Entomol. 101:839-846.

Twenty-two species of insect parasites of *Fenusa pusilla* are listed. Host-parasite relationships and the level of parasitism are given for the fifteen species reared in Quebec. Three of these, *Chrysocharis laricinellae*, *Tetrastichus xanthostigma*, and *Cirrospilus pictus* are also parasites of the larch casebearer. *C. laricinellae* was the most common and abundant of all parasites reared from *F. pusilla*. It is a primary parasite which is parasitized by *T. xanthostigma* and three other species.

84 Childress, W. H., and Fox, R. C. 1962. Investigation of the biotic control complex of the Nantucket pine moth, *Rhyacionia frustrana* (Comstock), in the Piedmont region of South Carolina. So. For. Dis. and Ins. Res. Council. (unpubl.)

Two parasites, *Bracon gelechiae* and *Habrocytus thyridopterigis*, which attack the Nantucket pine moth have also been recovered from the larch casebearer.

85 Clancy, D. W. 1944. Hyperparasitism of *Clausenia purpurea* Ishii, an important parasite of the Comstock mealy bug. J. Econ. Entomol. 37:450-451.

The presence of numerous hyperparasites has prevented *C. purpurea* from controlling its host, *Pseudococcus comstockii*. One of these hyperparasites is *Pachyneuron altiscuta* which also is part of the larch casebearer parasite complex.

86 Clancy, D. W. 1946. Natural enemies of some Arizona cotton insects. J. Econ. Entomol. 39:326-328.

Two larch casebearer parasites, *Catolaccus aeneoviridis* and *Spilochalcis side*, were reared from cocoons of *Bucculatrix thurberiella*, the cotton leaf perforator. They were the two most abundant parasites found from this host.

87 Clancy, D. W. 1946. The insect parasites of the Chrysopidae. Calif. Univ. Publ., Entomol. 7:403-496.

The bionomics of parasites reared from *Chrysopa californica* and *C. majuscula* are discussed. Included are two species that attack the larch casebearer. Both *Dibrachys cavus* and *Hemiteles tenellus* develop as primary parasites of *Chrysopa*, but are primarily hyperparasites on other hosts.

88 Clancy, D. W. 1969. Parasitization of cabbage and alfalfa loopers in southern California. J. Econ. Entomol. 62:1078-1083.

Copidosoma truncatellum was the major hymenopterous parasite reared from collections of the cabbage looper, (*Trichoplusia ni*), the alfalfa looper, (*Autographa californica*), and the bean leaf skeletonizer, (*Autoplusia egena*), taken from annual weeds, alfalfa and true tobacco. In greenhouse cage studies to investigate their potential for mass-release experiments against the cabbage looper, a tachinid parasite, *Voria ruralis*, was more effective than *C. truncatellum* at comparable host-parasite densities. Periodic releases of *C. truncatellum* in an unsprayed cabbage plot were ineffective. *C. truncatellum* has also been recovered as a parasite of the larch casebearer.

89 Clark, R .C., and Brown, N. R. 1962. Studies of predators of the balsam woolly aphid, *Adelges piceae* (Ratz) (Homoptera: Adelgidae). XI. *Cremifania nigrocellulata* Cz. (Diptera: Chamaemyiidae), an introduced predator in eastern Canada. Can. Entomol. 94:1171-1175.

Though establishment of *C. nigrocellulata* has been successful, it has failed to markedly affect *A. piceae* populations. Poor synchronization and food preferences are the primary reasons for its lack of dispersal. Only one parasite, *Pachyneuron altiscutum*, How, has been reared from *C. nigrocellulata* in Canada. It parasitizes the pupa, but the rate of parasitism is, as yet, unknown. This species also parasitizes the other chamaemyiids in the complex as well as being a parasite of the larch casebearer.

90 Clark, R. C., and Brown, N. R. 1957. Studies of predators of the balsam woolly aphid, *Adelges piceae* (Ratz.) (Homoptera: Adelgidae). III. Field identification and some notes on the biology of *Neoleucopis pinicola* Mall. (Diptera: Chamaemyiidae). Can. Entomol. 89:404-409.

Field identification, seasonal life history, and natural control of *N. pinicola*, an occasional predator of the balsam woolly aphid, are discussed. *Pachyneuron altiscutum*, a parasite of the larch casebearer is a common parasite of *N. pinicola*, *N. obscura*, and *Leucopina americana*. *P. altiscutum* parasitizes mainly the summer host generation of *N. pinicola*, with the peak of the adult parasites' activity for the season occurring during the early part of July.

91 Clausen, C. P. 1956. Biological control of insect pests in the continental United States. USDA Tech. Bull. No. 1139, 151p.

A complete record of importations and establishment of parasites and predators for biological control up to 1950. Two imported parasites of the larch casebearer, *Agathis pumila* and *Chrysocharis laricinellae*, are discussed. Liberations of *C. laricinellae* have been made against the birch leaf-mining sawfly, *Heterarthrus nemoratus*, as well as the larch casebearer. It has also been recovered from the elm leaf miner, *Fenusa ulmi*, which indicates that it may have been present some time prior to these importations.

92 Cody, J. B. 1963. The rate of spread of *Agathis pumila* (Ratz.) and its interaction with *Epilampsis laricinellae* (Ratz.) M.S. Thesis, Univ. Mich., Ann Arbor, 31 p.

Larch casebearer collections in the northern lake states in 1954 and 1963 suggest that *A. pumila* is able to spread at a rate of more than 30 miles per year. *A. pumila* by itself is an effective parasite of the casebearer; however, *E. laricinellae* depends on the presence of *Agathis* to increase its numbers to effective levels. The presence of alternate hosts prevents *E. laricinellae* from being eliminated from a locality when casebearer populations are low.

93 Cody, J. B., Knight, F. B., and Graham, S. A. 1967. The hymenopterous parasites *Agathis pumila* (Braconidae) and *Epilampsis laricinellae* (Eulophidae) on the larch casebearer (Lepidoptera: Coleophoridae) in the northern lake states. Mich. Entomol. 1:159-167.

A published version of Entry 92.

94 Cole, L. R. 1967. A study of the life-cycles and hosts of some Ichneumonidae attacking pupae of the green oak-leaf roller moth, *Tortrix viridana* (L.) (Lepidoptera: Tortricidae) in England. Trans. R. Entomol. Soc. Lond. 119:267-281.

The biologies of four ichneumonids attacking *T. viridana* were studied. One of these species, *Itoplectis maculator* (F.), is also a parasite of the larch casebearer. *I. maculator* passes a single generation a year in *T. viridana*, with only the adult females surviving the winter. It is not believed to be an effective natural control of *T. viridana* due to mortality during aestivation and hibernation. During the summer, *I. maculator* was reared from eight lepidopteran and hymenopteran hosts: *T. viridana*, *Cacoecia lecheana* (L.), *Pandemis cerasana* (Hbn.), *Ditula angustiorana* (How.), *Acrobasis consociella* (Hbn.), *Carcina quercana* (F.), *Phytodietus* sp. and *Phobocampe* sp. *I. maculator* was observed in many types of plant communities during the study. Its presence in deciduous and coniferous woodlands, hedgerows and roadsides indicates that host species from a wide range of habitats may be susceptible to attack by this parasite.

95 Cook, A. J. 1885. Bark lice. Mich. St. Hort. Soc. Ann. Rept. 14:88-93.

Describes *Pachyneuron altiscuta*, a parasite reared from the bark louse, *Pulvinaria innumerabilis*. This parasite species also attacks the larch casebearer. (Ed. note: Bark lice are Psocopterans. *Pulvinaria* is a genus of the family Coccidae, order Homoptera).

96 Coppel, H. C. 1947. The collection of spruce budworm parasites in British Columbia with notes on their overwintering habits. Entomol. Soc. Ont. Ann. Rep. 77:38-40.

Included among the insect parasites of the spruce budworm, *Choristoneura fumiferana*, reared from a 1946 collection is *Scambus hispae* (Harr.), a species which also attacks the larch casebearer. It was observed that *S. hispae* overwintered as a secondary parasite in the cocoon of *Phytodietus fumiferanae*.

97 Coppel, H. C., and Shenefelt, R. D. 1960. Parasites introduced to help control the European larch casebearer--A progress report. Univ. Wisc. For. Res. Note No. 53, 3p.

Very few native larch casebearer parasites were present in Wisconsin before the introduction of *Agathis pumila* and *Chrysocharis laricinellae* in 1953. After five years both species have become established and are spreading within the state.

98 Coppel, H. C., and Sloan, N. F. 1970. Avian predation, an important adjunct in the suppression of larch casebearer and introduced pine sawfly populations in Wisconsin forests. Proc. Tall Timbers Conf. Ecol. Anim. Cont. Habitat Mgt. 2:259-272.

Bird predation is apparently contributing to the stability of casebearer populations in Wisconsin. They are increasing the effectiveness of control by taking more larvae than would normally have been attacked by native and introduced parasites.

99 Corbet, P. S. 1973. Habitat manipulation in the control of insects in Canada. Proc. Tall Timbers Conf. Ecol. Anim. Cont. Habitat Mgt. 5:147-171.

A general review paper on biological control. It cites the release of parasites against the larch casebearer as having achieved complete or widespread control.

100 Coshan, P. F. 1974. The biology of *Coleophora serratella* (Lepidoptera: Coleophoridae). Trans. Royal Entomol. Soc. Lond. 126:169-188.

Details of the life history and behavior of *C. serratella* are given. Of the eight parasites reared from the birch casebearer, two, *Cirrospilus pictus* and *Chrysocharis laricinellae*, also attack the larch casebearer. The latter is a new record from *C. serratella*; it appears to have three generations a year in this host.

101 Crabtree, L .L., Boyd, M. J., and Theroux, L. J. 1978. Recovery information for exotic larch casebearer parasite releases on the Colville Indian reservation in northeastern Washington. Colville Tribal For., Nespelem, Washington. 13p.

In 1960, a biological control program was initiated against the larch casebearer on the Colville Indian reservation. *Agathis pumila*, *Elachertus argissa*, and *Necremnus metalarus* were released. *Agathis* is not increasing its population significantly, perhaps due to poor release site selection or low release numbers. *Chrysocharis laricinellae* has established and spread rapidly, though original release points are uncertain. A native parasite, *Spilochalcis* sp. was abundant in all plots sampled. Other native species recovered were *Habrocytus* sp., *Mesopolobus* sp. and *Dicladocerus nearcticus*. There appears to be a correlation between increased elevation and more substantial exotic parasite populations.

102 Craighead, F. C. 1950. Insect enemies of eastern forests. USDA Misc. Publ. No. 657, 679p.

Although 18 or 20 native parasitic Hymenoptera attack the larch casebearer in the northeastern states, none have ever been recorded as abundant enough to bring about appreciable control. Two of the introduced species, *Chrysocharis laricinellae* and *Bassus pumilis* have been established and an account of their biology and history in the eastern U. S. are discussed. *C. laricinellae* is also an introduced parasite of the birch leaf-mining sawfly, *Phyllotoma nemorata*.

103 Crawford, J. C. 1911. Two new Hymenoptera. Proc. Entomol. Soc. Wash. 13:233-234.

One of the new species described, *Tetrastichus doteni*, is a parasite of the larch casebearer. This species also attacked caged larvae of *Habrobracon hebetor*, *Meraporus*, and *Pteromalus*.

104 Crawford, J. C. 1914. Descriptions of new Hymenoptera, No. 8. Proc. U. S. Nat. Mus. 46:343-352.

Describes new species found in specimens from Trinidad. *Derostenus fullawayi* was reared from *Agromyza diminuta* which also contained *Diaulinus* sp. and *Chrysocharis* sp. *D. fullawayi* has also been recovered from the larch casebearer.

105 Crawford, J. C. 1915. The genus *Secodella* in North America. Proc. Entomol. Soc. Wash. 17:142-144.

Four new species of *Secodella* are described. *S. cushmani* has been recorded as a parasite of the larch casebearer.

106 Cresson, E. T. 1872. Synopsis of North American species belonging to the genera *Leucospis*, *Smicra*, and *Chalcis*. Trans. Am. Entomol. Soc. 4:155-173.

Provides keys and descriptions of three genera of chalcids. Three species in the genus *Smicra*, (*S. albifrons*, *S. torvina* and *S. side*), are parasitoids of the larch casebearer.

107 Cresson, E. T. 1873. Descriptions of North American Hymenoptera, No. 5. Can. Entomol. 5:51-54.

Species from the genera *Microdus* and *Earinus* are described. The new species *M. cincta* has been recovered from the larch casebearer.

108 Cushman, R. A. 1917. Eight new species of reared ichneumon-flies, with notes on some other species. Proc. U. S. Nat. Mus. 53:457-469.

New species are described and notes on previously described species are included in order to add to the definition of the species. The larch casebearer parasite, *Itoplectis obesus*, is described.

109 Cushman, R. A. 1921. The North American ichneumon-flies of the tribe Ephialtini. Proc. U. S. Nat. Mus. 58:327-362.

Descriptions and host records for Ephialtini species are given. The species *Itoplectis obesus*, *Ephialtes latus*, *E. leavitti*, *E. pacificus*, *E. montana* and *E. quadricingulatus* are larch casebearer parasites; alternate hosts are listed.

110 Cushman, R. A. 1924. Change of name (Hymenoptera). Proc. Entomol. Soc. Wash. 26:221.

The author's species *Ephialtes (Itoplectis) pacificus* is preoccupied by *Ephialtes pacificus* Harrington, so he has renamed it *Ephialtes (Itoplectis) esuchus*.

111 Cushman, R. A. 1927. New species and new forms of Ichneumonidae parasitic upon the gypsy-moth parasite, *Apanteles melanoscelus* (Ratzeburg). J. Agric. Res. 34:453-458. Describes the morphology of six hyperparasites of the gypsy moth, *Porthetria dispar*, through *Apanteles melanoscelus*. One species, *Gelis apanteles*, is also part of the larch casebearer parasite complex.

112 Cushman, R. A. 1927. The parasites of the pine tip moth, *Rhyacionia frustrana* (Comstock). J. Agric. Res. 34:615-622.

Twenty-one species of parasitic Hymenoptera and two species of parasitic flies were reared from pine tip moths infesting western yellow pine on the Nebraska National Forest. *Habrocytus thyridopterigis* Howard, a parasite of the larch casebearer, was found to occur as both a primary and secondary parasite of the pine tip moth. Host-parasite interactions and a key for identification of the parasites are included.

113 Cushman, R. A. 1935. New ichneumon-flies. J. Wash. Acad. Sci. 25:547-564.

Descriptions of one new genus and 13 new species, as well as a few generic transfers and notes on synonymy are provided in this paper. Two of the new species described, *Phaeogenes epinotiae* and *Phaedroctonus piceae*, are larch casebearer parasites. Both of these parasites have been recovered from the alternate hosts *Epinotia nanana* and *Recurvaria piceaella*.

114 Cushman, R. A., and Gahan, A. B. 1921. The Thomas Say species of Ichneumonidae. Proc. Entomol. Soc. Wash. 23:153-171.

Synonymies for the 61 species of Ichneumonidae originally described by Say are listed. Among these is *Hemiteles tenellus*, originally named in the genus *Cryptus*; it is a member of the larch casebearer parasite complex.

115 Dahlsten, D. L., Cameron, E. A., and Cooper, W. A. 1970. Distribution and parasitization of cocoons of the Douglas-fir tussock moth, *Hemerocampa pseudotsugata* (Lepidoptera: Lymantriidae), in an isolated infestation. Can. Entomol. 102:175-181.

The larch casebearer parasite, *Itoplectis quadricingulatus* was recovered from collections of the Douglas-fir tussock moth, *Orgyia pseudotsugata* (as *Hemerocampa*), in California.

116 Dahlsten, D. L., Luck, R. F., Schlinger, E. I., Wenz, J. M., and Copper, W. A. 1977. Parasitoids and predators of the Douglas-fir tussock moth, *Orgyia pseudotsugata* (Lepidoptera: Lymantriidae), in low to moderate populations in central California. Can. Entomol. 109:727-746.

Three of the species found parasitizing the Douglas-fir tussock moth in central California also attack the larch casebearer. *Itoplectis quadricingulatus* is a primary parasite, emerging from cocoons of the tussock moth. *Scambus hispae* is possibly a secondary parasite of this host, as is *Gelis tenellus*.

117 Dalla Torre, K. W. 1850-1928. Catalogue Hymenopterorum hucusque descriptorum systematicus et synonymicus. Leipzig, Engelmann, 643p.

The geographic distribution, synonymies and hosts are listed for several larch casebearer parasite species. The following species are included: *Euderus albitarsis*, *E. amphis*, *Tetrastichus ecus*, *T. xanthostigma*, *Entedon laetus*, *E. erxias*, *E. laricinellae*, *E. nitetis*, *E. novellus*, *E. punctatus*, *E. xanthostigma*, *Chrysocharis boops*, *Eulophus battis*, *E. metalarus*, *Euplectrus mellipes*, *E. viridaeneus*, *Elachistus opaculus*, *E. proteoteratis*, *Cirrospilus diallus*, *C. immaculatus*, *C. pictus*, *C. salatis*, *C. vittatus*, *C. subviolaceus*, *C. walkeri*, *C. bifasciatus*, *C. elegantissimus*, *Pteromalus laricinellae*, *P. semiclavatus*, *P. tenuis*, *P. perversus*, *P. chionobae*, *P. gelechiae*, *P. cavus*, *Dibrachys boucheanus*, *Cyrtogaster biglobus*, *C. cingulipes*, *C. rufipes*, *C. tenuis*, *C. thoracia*, *C. scotica*, *C. vulgaris*, *Pachyneuron altiscuta*, *Mira saltator*, *Eupelmus albitarsis*, *E. degeeri*, *Smicra side*, *S. torvina*, *Spilochalcis albifrons*, *Halticella americana*, *Hockeria xanticles*, *Ichneumon cingulator*, *I. lateratorius*, *Earinus tuberculatus*, *Microdus bicolor*, *M. cincta*, *M. pumilus*, *Agathis anglica*, *A. bicolor*, *Microgaster tibialis*, *Apanteles albipennis*, *A. congregatus*, *Sigalphus caudatus*, *Bracon gelechiae*, *B. guttiger*, *B. juncicola*, *B. junci*, *B. melanaspis*, *B. notaticeps*, *B. trifolii*, *Omorgus tumidulus*, *Angitia armillata*, *A. nana*, *A. virginalis*, *Campoplex rufipes*, *Bassus bicolor*, *B. cincta*, *Glypta nigrina*, *G. resinana*, *Pimpla alternans*, *P. brevicornis*, *P. castaneiventris*, *P. cruentata*, *P. balearica*, *P. detrita*, *P. examinator*, *P. examinada*, *P. gossypii*, *P. graminellae*, *P. kolthoffi*, *P. maculator*, *P. minuta*, *P. nigriscaposa*, *P. punctiventris*, *P. sexpunctata*, *P. tricolor*, *P. tricincta*, *P. turionellae*, *P. opacellata*, *Ephialtes pacificus*, *Lampronota parva*, *Cryptus tenellus*, *Pezomachus obscurus*, *Hemiteles albipalpus*, *H. areator*, *H. coleophorae*, *H. depressus*, *H. melitaeae*, *H. nemativorus*, *H. obscuripes*, *H. pulchellus* and *H. utilis*.

118 Daniel, D. M., Cox, J., and Crawford, A. 1933. Biological control of the oriental fruit moth. N. Y. Agric. Exp. Stn. Bull. No. 635, 27p.

The oriental fruit moth, *Grapholitha molesta*, is well established in the entire commercial peach area of western New York. Larval parasites have been able to reduce infestations in peach orchards but have been unable to exert appreciable control in quinces because of the difficulty experienced by the female parasite in reaching a fruit moth larvae with her ovipositor when it is burrowing deep within a fruit. Of the 26 species recorded as parasites of the fruit moth in western New York, *Epiurus indagator* has also been recovered from the larch casebearer. Methods for rearing both the fruit moth and its parasites are described.

119 Daviault, L. 1949. Notes sur la biologie et les parasites du porte-case du meleze (*Coleophora laricella* Hbn.) dans la province de Quebec. (Notes on the biology and the parasites of the larch casebearer, (*Coleophora laricella* Hbn.), in the province of Quebec.) Ann. de l'ACFAS 15:90-92.

Details the bionomics of the larch casebearer in Quebec. Collections at Berthierville, Quebec in 1939 recovered ten species of native parasites, *Eulophus* sp., *Spilochalcis albifrons*, *Dimmockia* sp., *Habrocytus phycidis*, *Sympiesis* sp., *Microbracon pygmaeus*, *Dioctes* sp., *Gelis tenellus*, *Lissonota parva*, and *Horogenes* sp. The rate of parasitism caused by all species observed varied considerably from one year to another, but never exceeded 20 percent. Two exotic species were introduced in 1942 and 1943. Recoveries in 1944 and 1947 found several individuals of the introduced species, *Chrysocharis laricinellae*, in the release area.

120 Daviault, L., and Dusharme, R. 1966. Life history and habits of the green spruce leaf miner, *Epinotia nanana* (Treidschke) (Lepidoptera: Tortricidae). Can. Entomol. 98:693-699.

Of the parasites recovered from *E. nanana*, three, *Agathis bicolor*, *Pimplopterus parvus*, and *Euderus cushmani*, also use the larch casebearer as an alternate host. The amount of control exerted by parasites on the green spruce leaf miner is always low.

121 Dawson, A. F. 1971. Larch casebearer in British Columbia. Can. For. Serv., Pac. For. Res. Cent., For. Ins. and Dis. Survey Pest Leafl. No. 34, 5p.

Reports the biology, damage, and appearance of the larch casebearer in B. C. There are over nine species of native parasites of the casebearer in the province. *Agathis pumila* has been introduced into the province from northern Idaho in hopes of reducing the casebearer population.

122 Delucchi, V. L. 1958. *Lithocolletis messaniella* Zell. (Lep., Gracilariidae): Analysis of some mortality factors with particular references to its parasite complex. Entomophaga 3:203-270.

Included within the parasite complex of *L. messaniella* is one species, *Tetrastichus xanthostigma*, which also attacks the larch casebearer. *T. xanthostigma* often attacks the sap-feeding stage of *L. messaniella*, destroying this host at the beginning of its larval activity. *T. xanthostigma* also occurs as a hyperparasite in this complex. Several other cohosts of *T. xanthostigma* obtained from this study are listed. The bionomics and a key for the identification of the parasites of *L. messaniella* are provided.

123 Denton, R. E. 1964. The larch casebearer in western larch forests, northern Rocky Mountain region. A problem analysis. USDA For. Serv., Intermt. For. and Range Exp. Stn., Ogden, UT. 24p. (unpubl.)

Reviews the distribution, bionomics and control of the larch casebearer in the western United States. Three species of native parasites have been recovered from the casebearer in northern Idaho. *Bracon pygmaeus* and *Pristomerus* sp. were very scarce. *Spilochalcis albifrons* appears unable to build up high enough numbers to be valuable in control, as only males emerge from the casebearer. The exotic parasite *Agathis pumila* has gone through three generations and is apparently becoming established in Idaho.

124 Denton, R. E. 1972. Establishment of *Agathis pumila* (Ratz.) for control of larch casebearer, and notes on native parasitism and predation in Idaho. USDA For. Serv., Intermt. For. and Range Exp. Stn., Ogden, UT. Res. Note INT 164, 6p.

Describes results achieved ten years after the release of 2,360 *A. pumila* near St. Maries, Idaho. A significant build up had occurred in only three of the five release areas. The failure of *A. pumila* to spread throughout the range of larch casebearer is attributed to the excessively large numbers of casebearer that were immediately available. By 1968 aggregate native parasitism had increased to 17 percent and the number of species recovered had reached 16, of which *Spilochalcis albifrons* predominated. Other native parasite species collected were: *Bracon pygmaeus*, *Bracon* Sp., *Bathythrix* sp., *Campoplex* sp., *Gelis tenellus*, *Gelis* sp., *Pristomerus* sp., *Scambus transgressus*, *Scambus* sp., *Dicladocerus* sp., *Tetrastichus coerulescens*, *T. dolosus*, *Amblymerus* sp., *Habrocytus phycidis*, and Pteromalini (genus? species?).

125 Denton, R. E. 1979. Larch casebearer in western larch forests. USDA For. Serv., Intermt. For. and Range Exp. Stn., Ogden, UT. Gen. Tech. Rept. INT. 55, 62p.

A synthesis of work done on the larch casebearer in the western U. S. Casebearer bionomics, distribution and chronology of outbreaks, distribution within trees and stands, and host tree damage are described. Provides information concerning biological control of the casebearer through the introduction of exotic parasites. The following exotic species were released through 1976: *Agathis pumila*, *Chrysocharis laricinellae*, *Dicladocerus westwoodii*, *Necremnus metalarus*, *Elachertus argissa*, *Dicladocerus "A"*, (subsequently described as *D. japonicus*) and *Diadegma laricinellae*. Thirty-nine native parasites are listed, with comments on their interaction with the larch casebearer in the west. These species are: *Scambus decorus*, *S. transgressus*, *S.* sp., *Gelis tenellus*, *G.* sp., *Campoplex rufipes*, *Pristomerus* sp., *Itoplectis evetriae*, *I. vesca*, *Bathythrix* sp., *Acrolyta* sp., *Hyposoter* sp., *Bracon pygmaeus*, *Spilochalcis albifrons*, *Dicladocerus nearcticus*, *D. occidentalis*, *D. pacificus*, *Tetrastichus coerulescens*, *T. dolosus*, *T. ecus*, *Hyssopus* sp., *Achrysocharella silvia*, *A.* sp., *Zagrammosoma americana*, *Eulophus* sp., *Euderus cushmani*, *Elachertus proteoteratis*, *Cirrospilus pictus*, *Melittobia* sp., *Diglyphus* sp., *Habrocytus phycidis*, *Mesopolobus* sp., *Catolaccus aenoviridis*, *Cyrtogaster vulgaris*, Pteromalini (genus? species?), *Telenomus* sp., *Trissolcus* sp., *Platygaster* sp., and *Anaphes* sp.

126 Denton, R. E., and Theroux, L. J. 1979. An annotated bibliography of the larch casebearer (*Coleophora laricella* (Hubner)). USDA For. Serv., Intermt. For. and Range Exp. Stn., Ogden, UT. Gen. Tech. Rep. INT-52, 29p.

Contains annotations of 147 published references on the larch casebearer. Citations are cross-referenced by subject as well as by author. An appendix lists 30 unpublished reports.

127 Denton, R. E., and Tunnock, S. 1971. Larch casebearer in western larch forests. USDA For. Serv., For. Pest Leafl. No. 96, 8p.

Thirteen species of native parasites have been reared in Idaho, Montana, and British Columbia; however, none have been able to hold casebearer populations in check. Beginning in 1960, *Agathis pumila* has been introduced to the west from New England. The effectiveness of the parasite releases has been limited by the inability of *A. pumila* to spread throughout the range of the casebearer. The geographic range of the casebearer in the west, its life history, damage, and natural and applied control are also summarized.

128 Desvignes, T. 1868. Two species of *Pimpla*, new to Britain, reared by C. G. Barrett, Esq. Entomol. Mon. Mag. 4:174.

Describes the new species, *Pimpla opacellata*, a parasite of the larch casebearer.

129 Dickason, E. A., Poonyathawon, P., and Rosenstiel, R. G. 1972. Parasites of the omnivorous leaf-tier in Oregon. Environ. Entomol. 1:419-424.

Nine species of native hymenopterous parasites were recovered from the omnivorous leaf-tier, *Cnephasia longana*, in western Oregon. The larch casebearer is an alternate host for three of these parasites, *Agathis cincta*, *Bracon gelechiae* and *Itoplectis quadricingulata*. The incidence of parasitism was generally low, and larvae were not attacked until late in their activity period. There appears to be a difference between ichneumonids and braconids in their attack of leaf tier larvae depending on the host plant infested.

130 Dimmock, G. 1898. Notes on parasitic Hymenoptera with descriptions of some new species. Part 1. Notes on parasitic Hymenoptera. Proc. Entomol. Soc. Wash. 4:148-155.

Provides fragmentary information on 70 species of parasitic Hymenoptera. Five of these species have been reared from the larch casebearer. *Habrocytus phycidis* Ashm. was bred from larvae of *Phycis rubrifasciella*; *Habrobracon gelechiae* Ashm. emerged from a noctuid larva living among the buds and blossoms of *Solidago*; *Apanteles congregatus* Say was obtained from the sphingid *Thyreus abbotii* and was in turn attacked by four species of hyperparasites; *Apanteles parorgyiae* Ashm. was recovered fom larvae of *Pyrrharctia isabella*; and *Hemiteles utilis* Nort. was reared as a hyperparasite from *Thyreus abbotii*.

131 Dixon, J. C., and Benjamin, D. M. 1963. Natural control factors associated with the jack-pine budworm, *Choristoneura pinus*. J. Econ. Entomol. 56:267.

Forty-six parasites were collected from the jack-pine budworm, *Choristoneura pinus* in Wisconsin during 1954-1957. Five of these species also use the larch casebearer as a host. *Scambus hispae* and *Habrocytus phycidis* are primary pupal parasites of *C. pinus*. *Gelis tenellus*, *Dibrachys cavus* and *Tetrastichus coerulescens* are hyperparasites in this host.

132 Doane, R. W., VanDyke, E. C., Chamberlin, W. J., and Burke, H. E. 1936. Forest insects. McGraw-Hill Book Co., New York, 463p.

Arogalea cristifasciella is listed as an alternate host of the native larch casebearer parasite, *Spilochalcis albifrons*.

133 Domenichini, G. 1966. Hym. Eulophidae, palearctic Tetrastichinae. In: Index of entomophagous insects. V. Delucchi and G. Remaudiere (eds.). Le Francois, Paris, Vol. 1, 101p.

This index provides information and references concerning the taxonomy, hosts, biology and geographic distribution of the palearctic Tetrastichinae. One of the species discussed, *Tetrastichus ecus* Walk. uses the larch casebearer as a host. Twenty-nine alternate hosts are listed for *T. ecus*.

134 Dondale, C. D. 1954. Biology of *Agathis laticincta* (Cress.) (Hymenoptera: Braconidae), a parasite of the eye-spotted bud moth, in Nova Scotia. Can. Entomol. 86:40-44.

A larch casebearer parasite, *Scambus hispae* was recovered as a primary parasite of the eye-spotted bud moth, *Spilonota ocellana*, and as a hyperparasite of this host through *Agathis laticincta*.

135 Doner, M. H. 1934. Observations on the biology of *Microbracon pygmaeus* (Prov.), an important parasite of *Coleophora pruniella* Cl. Ann. Entomol. Soc. Am. 27:435-442.

M. pygmaeus is an ectoparasite of the mature larvae of the cherry casebearer, *Coleophora pruniella*. The cherry casebearer is a native pest, having been first reared from wild cherry. The distribution, hosts, synonymy, biology, habits, development, seasonal history, economic importance, and limiting factors of *M. pygmaeus* are discussed. *M. pygmaeus* fed extensively upon the fluids from the larval host, an activity which in *M. juglandis* greatly lengthened the period of oviposition. A constant supply of sugar water in vials given to the ovipositing females did not lessen the acquisition of food from the host. Due to the small size of the host larvae during the late summer feeding period, it is not possible for *Microbracon* larvae to obtain enough food to complete an overwintering generation in the cherry casebearer. The chief factor limiting the efficacy of *M. pygmaeus* appeared to be the relative scarcity

of late summer and overwintering hosts. Although the larch casebearer is not named as a host, seven identified species and two undetermined species of *Coleophora* serve as hosts to this parasite.

136 Doner, M. H. 1936. Hymenopterous parasites of *Coleophora pruniella* Cl., and parasites recorded from other species of *Coleophora*. Ann. Entomol. Soc. Am. 29:224-244.

Of the 32 species of parasites reared from *C. pruniella*, seven also parasitize the larch casebearer. One of these, *Microbracon pygmaeus* was the most effective parasite of the cherry casebearer. *M. pygmaeus* has been recorded from three additional *Coleophora* species, *C. innotabilis*, *C. leucochrysella*, and *C. malivorella*. The other species which attack both *C. pruniella* and *C. laricella* are: *Spilochalcis torvina*, *Eupelmella vesicularis*, *Habrocytus thyridopterigis*, *H. phycidis*, *Eurydinota lividicorpus* and *Catolaccus aeneoviridis*. Comments on the bionomics and incidence of super- hyper- and multiparasitism by cherry casebearer parasites. The author cites the lack of sufficient numbers of alternate hosts as the greatest single factor that limits the efficacy of the parasites of *C. pruniella*.

137 Doutt, R. L., and Finney, G. L. 1947. Mass-culture technique for *Dibrachys cavus*. J. Econ. Entomol. 40:577.

A method for the mass rearing of *D. cavus* is described. *D. cavus* has a wide host range including the larch casebearer.

138 Dowden, P. B. 1934. Recently introduced parasites of three important forest insects. Ann. Entomol. Soc. Am. 27:599-603.

Only three of seven parasites reared in Austria from the larch casebearer were deemed suitable for liberation in the eastern United States. *Chrysocharis laricinellae* Ratz, overwinters as a mature larva in the case of the late-instar hibernating larva. The adults emerge in the spring and give rise to another generation. *Angitia laricinellae* Stobl. and *Microdus* (*Bassus*) *pumilus* Ratz both hibernate in the case of the immature larvae, resume development and emerge in May. *C. laricinellae* was liberated in New York, Maine and Massachusetts. Adults of the other two species emerged in early June, therefore liberations had to be made while the casebearer was in the egg stage. No suitable host larvae would be available until the end of July. Under laboratory conditions in England, *A. nana* Grav. lived long enough in the laboratory to attack the new generation of larvae developing during July.

139 Dowden, P. B. 1941. Parasites of the birch leaf-mining sawfly (*Phyllotoma nemorata*). USDA Tech. Bull. No. 757 55p.

About 20 species of primary and secondary parasites have been reared from *P. nemorata*. *Chrysocharis laricinellae*, the most important parasite of the leaf-mining sawfly in Europe has been successfully released in the U. S. against *P. nemorata* as well as the larch casebearer. Another exotic and two native parasites are common to both the leaf-mining sawfly and the larch casebearer; they are *Cirrospilus pictus*, *C. vittatus*, and *Tetrastichus xanthostigma*. The biology and cohosts of these and eight other leaf-mining sawfly parasites were studied in detail.

140 Dowden, P. B. 1962. Parasites and predators of forest insects liberated in the United States through 1960. USDA Handb. No. 226, 70p.

Lists details of the releases of four exotic species of casebearer parasites introduced into the eastern U. S. and Idaho: *Agathis pumila*, *Chrysocharis laricinellae*, *Dicladocerus westwoodii*, and *Horogenes nana*.

C. laricinellae is also found as a parasite of the birch leaf-mining sawfly, *Heterarthrus nemoratus* (Fall.). It was established against this host in New England in the early 1930's.

141 Dowden, P. B., and Berry, P. A. 1938. European parasites of *Rhyacionia buoliana* (Schiff.), *Coleophora laricella* Hbn. and *Phyllotoma nemorata* (Fall.). J. Econ. Entomol. 31:459-460.

Five hymenopterous parasites of the larch casebearer have been liberated in the eastern United States. Two of these, *Bassus pumilus* (Ratz.) and *Chrysocharis laricinellae* (Ratz.) have been recovered from release points in Sidney, Maine, Berlin, New Hampshire and Saranac, New York, and the latter from Sharon, Vermont as well. Of the five parasites released against the birch leafmining sawfly, *Phyllotoma nemorata*, two have been recovered. One of these is *C. laricinellae* which was recovered from Eustis, Maine and Stark, New Hampshire.

142 Dowden, P. B., Buchanan, W. D., and Carolin, V. M. 1948. Natural control factors affecting the spruce budworm. J. Econ. Entomol. 41:457-464.

Discusses the importance of natural control factors on the abundance of the spruce budworms, *Choristoneura fumiferana* and *C. occidentalis*, including a compilation of parasite records from North America. Three species which attack the larch casebearer are also recorded from the spruce budworm. *Itoplectis quadricingulatus* and *Scambus hispae* are rare primary parasites, while *Gelis tenellus* is a common hyperparasite of the spruce budworm.

143 Drooz, A. T., and Benjamin, D. M. 1956. Parasites from two jack-pine budworm outbreaks on the Upper Penisula of Michigan. J. Econ. Entomol. 49:412-413.

The relative abundance of three dipterous and eleven hymenopterous parasite species of the jack-pine budworm, *Choristoneura pinus*, are reported. Included are three species that also attack the larch casebearer, *Gelis tenellus*, *Scambus hispae*, and *Habrocytus phycidis*.

144 Dunnam, E. W. 1927. Notes on the life history and control of the strawberry leafroller. J. Agric. Res. 34:149-156.

Among the five natural enemies recovered from strawberry leafroller (*Ancylis comptana*) larvae was *Spilochalcis albifrons*. It is also a parasite of the larch casebearer.

145 Ebel, F., Joseph, P., Kleine, L. N., Pettinger, L. F., Swaby, J., Tarnasky, E., Ryan, R. B. 1982. Recolonization of the larch casebearer parasites, *Agathis pumila* and *Chrysocharis laricinellae*, in Oregon using the branch method, 1977-1981. U. S. Forest Service, USDA, Administrative Report. 6p.

Branches collected from casebearer-infested western larch were used to distribute larch casebearer parasites to 56 sites in Oregon in an attempt to extend the range of the parasites.

146 Ehler, L. E., Eveleens, K. G., and van den Bosch, R. 1973. An evaluation of some natural enemies of cabbage looper on cotton in California. Environ. Entomol. 2:1009-1015.

Parasitization by *Copidosoma truncatellum* is one of the most important regulatory agents acting on *Trichoplusia ni* populations. *C. truncatellum* was not adversely affected by dimethoate sprays. This parasite also attacks the larch casebearer.

147 Eichhorn, O., Pschorn-Walcher, H., and Schroder, D. 1971. Gegenwartige Projekte der biologischen Bekampfung verschleppter Forstschadlinge 3. Bericht uber die Arbeiten der europaischen Station des Commonwealth Institute of Biological control. (Current projects of biological control of forest insects. Third report of the European Station, Commonwealth Institute of Biological control.) Anzeig. F. Schadlingsk und Pflanz. v. m. Schadlingsbekampfung., 44:145-152.

The present status of biological control attempts against nine pests introduced into America or Africa is discussed. Larch casebearer work emphasizes augmenting the introductions of *Diadegma nana* in North America. A thesis (not cited here) is referred to which lists the important parasites of the casebearer in Graz, Austria: *Diadegma nana* Gran., *Agathis pumilus*, *Chrysocharis novellus* Walk., *C. laricinellae*, *Cirrospilus pictus*, and *Dicladocerus westwoodii* Steph. Parasites determined to be of lesser importance were: *Habrocytus semotus* Walk., *Necremnus metalarus* Walk., and *Sceptrothelys deione* Walk. Although *Diadegma nana* is considered a useful candidate for introduction with *A. pumilus*, the authors cite other work where it is detrimental to overall parasitism. By prolonging the late larval feeding stage it increases multi- and hyperparasitism by multivoltine chalcids.

148 Eidmann, H. H. 1958. Larktradsmalen (*Coleophora laricella* Hbn.). (Larch casebearer (*Coleophora laricella* Hbn.).) In: Sven. Skogsvardforen. Tidskr., p.399-418.

Discusses the biomomics and damage caused by the larch casebearer in Sweden. Three eulophid species have been recovered, *Chrysocharis laricinellae*, *C. boops* Thoms., and *Cirrospilus pictus* Nees. Native parasitism has never been greater than seven percent in this area.

149 Eidmann, H. H. 1961. Zur Entwicklung, von *Epilampsis boops* Thoms. und *Cirrospilus pictus* Nees, zwei Parasiten der Larchenminiermotte *Coleophora laricella* Hbn. (The development of *Epilampsis boops* Thoms. and *Cirrospilus pictus* Nees, two parasites of the larch casebearer *Coleophora laricella* Hbn.) Entomol. Tidskr. 82:52-59.

This article describes work done in Sweden searching for parasites of the larch casebearer. Of all the parasites, *E. boops* and *C. pictus* seem to be the most important. It describes the morphological characteristics of these two parasites and their life cycles. The process of collecting and rearing the casebearer in the lab is described. The temperature requirements of the casebearer and of these two parasite species are discussed. *C. pictus* has two generations per year and attacks several host species. It paralyzes the host, and the larvae then live as ectoparasites. *E. boops*, on the other hand, is an endoparasite and does not thus paralyze the host, allowing it to continue feeding for a short while. Several other parasites are also mentioned: *Cirrospilus diallus* Walk., *Dicladocerus westwoodii* Westw., *Derostenus* Westw., *Epilampsis laricinellae* Ratz., *Mesopolobus subfumatus* Ratz. and *Habrocytus*.

150 Eidmann, H. H. 1961. Untersuchungen uber die Entwicklung von Parasiten bei *Coleophora laricella* Hbn. mit Hilfe von Rontgenphotographie. (Investigations on the development of parasites on *Coleophora laricella* Hbn. by means of x-ray photography.) Z. ang. Entomol. 50:118-125.

The development of *Epilampsis boops* and *Cirrospilus pictus* in the larch casebearer was studied using dissections during rearing and x-ray photography. Differences in development between the two species and sexes are discussed in connection with their importance to biological control practices.

151 Eidmann, H. H. 1965. Okologische und physiologische Studien uber die Larchenminermotte, *Coleophora laricella* Hbn. (Ecological and physiological studies of the larch casebearer, *Coleophora laricella* Hbn.) Stud. For. suec. Skogshogsk, Stockh. No. 32, 226p.

An intensive treatment of the distribution, bionomics, ecology, population density and natural enemies of *C. laricella* in Sweden. The insect parasites observed were all Hymenoptera. The most widespread and common were *Chrysocharis nitetis* Wlk. of which Graham considers *C.* (*Kratochviliana*) *boops* (Thoms.) to be a synonym, (*Kratochviliana* being made a subgenus of *Chrysocharis*) and *Cirrospilus pictus* (Nees). Other parasite species reared were *Cirrospilus immaculatus* Thoms., *C. diallus* Walk., *C.* sp., *Derostenus* sp., *Dicladocerus westwoodii* Westw., *Habrocytus* sp., *Mesopolobus subfumatus* Ratz. and *Sceptrothelys* sp. Total parasitism was less than 10 percent. Birds, especially tits and finches, afforded important control.

152 Eidt, D. C. 1962. Distinguishing the larvae of three pupal parasites of *Argyresthia laricella* Kft. (Lepidoptera: Yponomeutidae). Can. Entomol. 94:32-34.

Descriptions of the mouthparts and adjacent cranial structures facilitated the identification of parasites that had died as larvae within the host pupae. One of the identified species was the casebearer parasite, *Spilochalcis albifrons*. It suffered 2.7 percent mortality, within *A. laricella*. *Euderus cushmani*, another larch casebearer parasite, occurs as both a primary parasite of *A. laricella* and as a secondary parasite attacking *Apanteles laricellae* and *Pimplopterus argyresthiae*. *A. laricellae* also attacks the larch casebearer.

153 Eidt, D. C., and Sippell, W. L. 1961. The life history, parasites and economic status of the larch shoot moth, *Argyresthia laricella* Kft. (Lepidoptera; Yponomeutidae), and comparisons with *A. laevigatella* H-S. Can. Entomol. 93:7-24.

A. laricella has been found in every province in Canada except Saskatchewan, it occurs in three species of larch. Three parasites are common to both the larch shoot moth and the larch casebearer. Specimens of *Agathis pumila* have been reared from the larch shoot moth in New Brunswick and southern Ontario. *Apanteles laricellae* occurs throughout the range of *Argyresthia laricella* and is the most effective parasite in New Brunswick. The single record of its recovery from the larch casebearer is doubtful, probably resulting from contamination. *Spilochalcis albifrons* is a pupal parasite of both species.

154 Eikenbary, R. D. 1963. The parasites and predators of the Nantucket pine tip moth, *Rhyaciona frustrana* (Comstock), in the Piedmont region of South Carolina with special emphasis on the biology of *Campoplex frustranae* Cushman. M.S. Thesis, Clemson Univ., Clemson, South Carolina, 83p.

Two larch casebearer parasites, *Bracon gelechiae* and *Habrocytus thyridopterigis* were recovered from *R. frustrana*.

155 Eikenbary, R. D., and Fox, R. C. 1965. The parasites of the Nantucket pine tip moth in South Carolina. S. C. Agric. Exp. Stn. Tech. Bull. No. 1017, 9p.

Among the parasites recovered from the Nantucket pine tip moth, *Rhyacionia frustrana*, were *Bracon gelechiae*, *Spilochalcis leptis*, and *Habrocytus phycidis*. These three species also attack the larch casebearer. All three were collected in relatively low numbers from this host.

156 Esbjerg, P. 1972. Danish hymenopterous and dipterous parasites from the pine shoot moth *Rhyacionia buoliana*. Entomol. Medd. 40:9-20.

Lists and discusses the effectiveness of parasites of the pine shoot moth reared from Danish plantations of lodgepole pine. *Coccygomimus turionellae* is a pupal parasite of *R. buoliana* and attacks the larch casebearer.

157 Escherich, K. 1931. Die Forstinsekten Mittleuropas. Neuauflage von Judeich-Nitsche, Lehrbuch der mitteleuropaischen Forstinsektenkunde. Bd. III. (The forest insects of central Europe. A new edition of Judeich and Nitsche's textbook of central European forest entomology. Vol. III.) Berlin, Paul Parey, 825p.

A general treatment of the larch casebearer in Europe. States its upper elevational limit as 1600 m. and ascribes considerable influence on populations to weather. Describes extreme variability of defoliation, various natural controls and lists the following parasites: *Angitia nana* Grav., *A. virginalis* Grav., *Bracon guttiger* Wesm., *Cirrospilus arcuatus* Nees, *C. pictus* Nees, *Entedon laetus* Rtzb., *E. laricinellae* Rtzb., *Hemiteles pulchellus* Grav., *Microdus pumilus* Rtzb., *Omorgus tumidulus* Grav., *Pimpla examinator* F., *P. turionellae* L., and *Pteromalus laricinellae* Rtzb.

158 Evans, D. 1960. A revision of the genus *Enypia* (Lepidoptera: Geometridae). Ann. Entomol. Soc. Am. 53:560-574.

The genus *Enypia* includes four species which are restricted to western North America and are of little economic significance. The species are redescribed and information is presented on their morphology, ecology and distribution. Keys to the larvae and adults are given. Among the parasites attacking *E. venata* is *Euplectrus mellipes*, a species which also parasitizes the larch casebearer.

159 Evans, D. 1962. Descriptions and life history of *Melanolophia imitata* (Walker) (Lepidoptera: Geometridae). Can. Entomol. 94:594-605.

The background, life history, and ecological aspects of the green striped forest looper are discussed. Included is a list of parasites of *M. imitata* from western British Columbia. *Euplectrus mellipes* Prov., a larval parasite of the green striped forest looper, is also a parasite of the larch casebearer.

160 Evelleens, K. G., and Evenhuis, H. H. 1968. Investigations on the interaction between the apple leaf miner *Stigmella malella* and its parasite *Cirrospilus vittatus* in the Netherlands. Neth. J. Pl. Path. 74:140-145.

Investigations during 1967 in an experimental orchard where no insecticides were applied, showed that parasitism of larvae of the first generation of *Stigmella malella* by *Cirrospilus vittatus*, which is by far the most numerous parasite of this leafminer in the Netherlands, was low and that parasitism of larvae of the second generation was much higher. It is concluded that the capacity of increase of the parasite is much greater than that of its host and that the parasite is a potentially important factor in the natural control of the leaf miner. The factors that may be responsible for the discrepancy between the high population density of the parasite in autumn and the low density in spring are discussed. (Author) *C. vittatus* also parasitizes the larch casebearer.

161 Evenhuis, H. H. 1965. Over het optreden van de appelbladmineerder *Stigmella* en haar paraset *Cirrospilus vittatus* in 1964. (The appearance of

the apple leaf miner *Stigmella* and its parasite *Cirrospilus vittatus* in 1964.) Entomol. Ber. 25:127-129.

In 1964, *S. malella* appeared in an apple orchard in which integrated control experiments were being conducted. Its main parasite was *Cirrospilus vittatus*, with *Achrysocharella formosa* and *C. pictus* contributing to a lesser degree. At the end of the season, *C. vittatus* was much more numerous in the "modified" sprayed part of the orchard than in the "normal" sprayed area. This is probably a result of the heavy infestation of *S. malella* in the "modified" area during the summer. *C. vittatus* and *C. pictus* also attack the larch casebearer.

162 Evenhuis, H. H., Nikolova, W., and Vlug, H. J. 1971. Ein vergleich zwischen *Achrysocharella chlorogaster* und *Cirrospilus vittatus* (Hymenoptera, Eulophidae) als Parasiten des Apfelblattminierers *Stigmella malella* (Lepidoptera, Stigmellidae) in den Niederlanden. (A comparison between *Achrysocharella chlorogaster* and *Cirrospilus vittatus* (Hymenoptera, Eulophidae) as parasites of the apple leaf miner *Stigmella malella* (Lepidoptera, Stigmellidae) in the Netherlands.) Z. ang. Entomol. 68:32-40.

A comparison of the two parasite species showed *Cirrospilus vittatus* to be more effective in controlling the apple leaf miner. Both parasite species are multivoltine. *Achrysocharella chlorogaster* is an endoparasite, hibernating mainly in the pupal stage, while *C. vittatus* is an ectoparasite, and hibernates exclusively in the last larval instar. In the second half of October, both species may act as hyperparasites, even on their own species. The explanation for this behavior may be that suitable hosts for these broadly polyphagous leaf miner parasites are lacking at that time. *C. vittatus* is also a parasite of the larch casebearer.

163 Evenhuis, H. H., and Soehardjan, M. 1970. Further investigations on the interactions between the apple leaf miner *Stigmella malella* and its parasite *Cirrospilus vittatus* in the Netherlands. Neth. J. Pl. Path. 76:1-7.

Host feeding by *Cirrospilus vittatus* (Hymenoptera, Eulophidae) is shown to be an important factor in the mortality of the apple leaf miner, *Stigmella malella* (Lepidoptera, Stigmellidae). It is also shown that the parasite acts as a density-dependent factor in relation to this host. Both facts emphasize that this parasite may play an important role in the natural control of the apple leaf miner. (Author) *C. vittatus* has also been recovered from the larch casebearer.

164 Ferriere, C. 1933. Systematic notes on the Chalcidoidea. Bull. Entomol. Res. 24:288-291.

This is an appendix to Thorpe (1933; Entry No. 487). It contains a key to seven genera and descriptions of five species of larch casebearer parasites: *Eupelmus* sp., *Habrocytus* sp., *Eurydinota laricinellae*, *Cirrospilus pictus*, *Eulophus metalarus*, *Dicladocerus westwoodii*, and *Chrysocharis laricinellae*.

165 Ferro, D. N., and Rice, R. E. 1970. Parasites of pink bollworm in southern California. Ann. Entomol. Soc. Am. 63:1783-1784.

Three previously unreported parasites of the pink bollworm, *Pectinophora gossypiella* were collected from the Coachella Valley of southern California in 1968. Included is *Dibrachys cavus*, which also parasitizes the larch casebearer. It is possible that *D. cavus* is a hyperparasite in the pink bollworm complex.

166 Finlayson, L. R., and Finlayson, T. 1958. Parasitism of the European pine sawfly, *Neodiprion sertifer* (Geoff.) (Hymenoptera: Diprionidae), in southwestern Ontario. Can. Entomol. 90:223-225.

Eleven species of parasitic Hymenoptera and three species of Diptera were reared from the European pine sawfly. *Eupelmella vesicularis* was recovered in low numbers from *N. sertifer* in southwestern Ontario. *E. vesicularis* also attacks the larch casebearer.

167 Finlayson, T. 1960. Taxonomy of cocoons and puparia, and their contents of Canadian parasites of *Neodiprion sertifer* (Geoff.) (Hymenoptera: Diprionidae). Can. Entomol. 92:21-47.

Twenty-three species of parasites of *Neodiprion sertifer* (Geoff.) are identified using the host cocoons from which they emerged. The characters used in the key are the size and position of the exit hole, the size, color, type of cocoon, and the cephalic structure, spiracles, and skin of the last larval instar. Two of the species described, *Eupelmella vesicularis* and *Dibrachys cavus*, have also been recovered as parasites of the larch casebearer.

168 Finlayson, T. 1962. Taxonomy of cocoons and puparia, and their contents, of Canadian parasites of *Diprion similis* (Htg.) (Hymenoptera: Diprionidae). Can. Entomol. 94: 271-282.

Contains a key and descriptions of parasite remains found in or near the remains of parasitized *Diprion similis*. Three of the species recovered from *D similis*, *Gelis tenellus*, *Eupelmella vesicularis* and *Dibrachys cavus*, are also part of the larch casebearer parasite complex. The larval remains of *G. tenellus* are described in this article, those of *E. vesicularis* and *D. cavus* are described in an earlier paper (Finlayson, 1960).

169 Finlayson, T. 1963. Taxonomy of cocoons and puparia, and their contents, of Canadian parasites of some native Diprionidae (Hymenoptera). Can. Entomol. 95:475-507.

Characteristics of the cast skin of the last larval instar are described and illustrated in this paper; 29 other species were described and illustrated in earlier papers by the author (Entries 166, 167). Three larch casebearer parasites, *Gelis tenellus*, *Eupelmella vesicularis* and *Dibrachys cavus*, are reported as parasites of various sawflies in this paper.

170 Finlayson, T. 1967. Taxonomy of final-instar larvae of the hymenopterous and dipterous parasites of *Acrobasis* spp. (Lepidoptera: Phycitidae) in the Ottawa region. Can. Entomol. 99:1233-1271.

Parasites of *Acrobasis* spp. found in the Ottawa, Ontario area are separated by using characters of the parasite remains left in the host cases from which the parasites emerged. The cephalic structures, spiracles and skins of final instar larvae of 28 species of parasites are described and illustrated in this paper. The larch casebearer parasite *Habrocytus phycidis* was reared from *A. juglandis*. It was recovered from this host as both a primary and secondary parasite, through *Campoletis* sp., *Itoplectis conquisitor*, *Macrocentrus instabilis* and *Orgilus lateralis*.

171 Fiske, W. F. 1903. A study of the hymenopterous parasites of the American tent caterpillar. N. H. Agric. Stn. Tech. Bull. 6:185-230.

Two of the parasites listed for the tent caterpillar, *Malacosoma americana* (as *Clisiocampa*), also attack the larch casebearer. *Bracon gelechiae* larvae feed gregariously on one caterpillar from which they emerge before making cocoons. *Dibrachys boucheanus* has been reared as a secondary parasite of the tent caterpillar.

172 Flanders, S. E. 1954. Fecundity of entomophagous insects under mass culture, an effect of environmental resistance. Ecology 35: 245-249.

Outlines the types of mass culture methods that have been developed. Analyzes the fecundity of propagated species in relation to environmental resistance and the methods used. Propagation of *Dibrachys cavus* for control of the potato tuber worm was achieved by use of the periodic-contact method. In this method, successive populations of the host are briefly exposed to a stable population of parasites. *D. cavus* has also been recovered as a parasite of the larch casebearer.

173 Flanders, S. E. 1965. Competition and cooperation among parasitic Hymenoptera related to biological control. Can. Entomol. 97:409-422.

Studies indicate that the simultaneous occurrence of parasite species has little or no affect on the host population. Sequential parasitism however may play an important role in host regulation as it is highly conducive to continuity in the conservation of the host's food supply. As an example, the author cites the larch casebearer which is attacked by two introduced parasites, *Agathis pumila* and the intrinsically superior species *Chrysocharis laricinellae*.

174 Flavell, T. H. 1979. Reevaluation of larch casebearer parasites in casebearer-infested stands of Region I. USDA For. Serv., No. Reg., For. Ins. and Dis. Mgt. Rep. 79-3, 3p.

In a 1977 survey in Washington and Idaho, *Agathis pumila* parasitized 12.5 percent of the casebearer pupae and *Chrysocharis laricinellae* parasitized 8.3 percent. *A. pumila* was recovered in seven of 25 random plots and 62 of 104 release sites. *C. laricinellae* was the most widespread parasite. It was found in 59 release plots and 19 random plots. Five native species, *Spilochalcis* sp., *Bracon pygmaeus*, *Pristomerus* sp., *Gelis* sp. and *Mesopolobus* sp. were found in smaller numbers.

175 Forbes, R. S., Underwood, G. R., Cuming, F. G., and Eidt, D. C. 1961. Maritime provinces, forest insect survey. Can. Dept. For., Ann. Rept. For. Ins. Dis. Survey, p.19-37.

Reports on parasitism by the introduced larch casebearer parasite species *Epilampsis laricinellae* and *Agathis pumila* since 1958. Percent parasitism was obtained by rearing and dissecting overwintering casebearers from New Brunswick and Nova Scotia. *Itoplectis quadricingulatus*, a species which has been recovered from the casebearer, is recorded for the first time from the fall cankerworm, *Alsophila pometaria* in the Maritimes.

176 Franz, J. M. 1952. Observations on collecting parasites of *Cacoecia histrionana* (Froel.) (Lep: Tortricidae). Bull. Entomol. Res. 43:1-19.

Twenty primary and secondary parasites were reared from *Cacoecia histrionana*. They caused substantial mortality and were an important factor affecting changes in the population density of *C. histrionana*. A proportion of the parasite population overwinters in other microlepidoptera, concentrating on *C. histrionana* in summer. *Hemiteles areator*, a species which attacks the larch casebearer, was recovered as a hyperparasite of *C. histrionana* and *Argyroploce hercyniana*, another host in this habitat.

177 Friend, R. B. 1927. The birch leaf skeletonizer *Bucculatrix canadensisella*, Chambers. Conn. Agric. Exp. Stn. Bull. 288:395-486.

The morphology, bionomics, behavior, population dynamics, distribution, and development of the birch leaf skeletonizer are detailed. Of the ten species of parasites reared from *B. canadensisella* larvae and pupae, one also attacks the larch casebearer; *Haltichella xanticles* Walk. is a fairly common pupal parasitoid of the birch leaf skeletonizer.

178 Friese, G. 1963. Die Parasiten der palaaktischen Yponomeutidae. (The parasites of palearctic Yponomeutidae.) Beitr. Entomol. 13:311-326.

Lists the primary and secondary parasites of *Yponomeuta evonymellus* and *Y. padella(us)*. Included are seven species which also parasitize the larch casebearer: *Itoplectis alternans*, *I. maculator*, *Hemiteles areator*, *Gelis instabilis*, *Pimpla padellae*, *Apanteles emarginatus* and *Dibrachys cavus*.

179 Fulmek, L. 1962. Parasitinsekten der Blattminierer Europas. (Parasites of European needleminers.) Uitgeverij, Dr. W. Junk, Den Haag, 203p.

An extensive list of the parasites attacking European needleminers. Hosts from the orders Coleoptera, Diptera, Hymenoptera, and Lepidoptera are given. Locations of parasite recoveries are provided. Forty-five species of parasites have been reared from the larch casebearer in this area: *Agathis anglica* Marsh., *A. pumilus* Rtzbg., *Apanteles albipennis* Nees., *Bracon* sbg. *Lucobracon guttiger* Wsm., *Earinus tuberculatus* Wsm., *E. variicoxis* Wsm., *Habrobracon* (*Microbracon*) *stabilis* Wsm. var. *concolor* Thn., *Triaspis*, (*Sigalphus*) *caudatus* Nees, *Anaphes* sp., *A.* ? *ratzeburgianus* Rond., *Atoposomoidea* (*Cirrospilus*) *pictus* Nees, *A.* var. *arcuatus* Rtzbg., *A. immaculatus* Thn., *Derostenus* sp., *Dicladocerus* (*Eulophus*) *westwoodii* Steph., *Epilampsis* (*Chrysocharis*, *Eurydinota*) *laricinellae* Rtzbg., *Entedon laetus* Rtzbg., *Eulophus* sp., *Eupelmus* sp., *Eutelus* (*Pteromalus*) *semiclavatus* Rtzbg., *Habrocytus* sp., *Mesopolobus* (*Eutelus*) *mediterraneus* Mayr, *Necremnus leucarthros* Thn., *N.* (*Eulophus*) *metalarus* Wlk., *Gelis* (*Pezomachus*) *laricellae* Fab., *Glypta nigrina* Desv., *G. resinanae* Htg., *Hemiteles albipalpus* Thom. var. *austriacus* Fohrg., *H. cincta* L. (*bicolorinus* Grv.), *H. obscuripes* Thn., *H. pulchellus* Grv., *Horogenes* (*Angitia*) *armillata* Grv., *H.* (*A.*) *laricinellae* Strbl., *H.* (*Campoplex*) *virginalis* Grv., *H.* (*Anigitia*, *Campoplex*) *nana* Grv., *Itoplectis* (*Pimpla*) *alternans* Grv., *I.* (*P.*) *maculator* F., *Leptocryptus* (fals.: *Leptopygus*) *aereus* Grv., *Omorgus* (*Angitia*, *Campoplex*) *tumidulus* Grv., *O. borealis* Zett., *Pimpla examinator* F., *P. turionellae* L., *Scambus* (*Pimpla*) *brevicornis Grv.*, *S.* (*P.*) *detrita* Hgn. and *Bethylus* sp.

180 Gahan, A. B. 1913. A new genus and one new species of Chalcidoidea. Can. Entomol. 45:178-182.

The new genus *Coelopisthoidea* is described and a key to its species is given. *C. nematicida* is part of the larch casebearer parasite complex.

181 Gahan, A. B. 1914. New Hymenoptera from North America. Proc. U. S. Nat. Mus. 46:431-443.

One of the new species described is *Dibrachys meteori*, recovered from *Meteorus* sp. parasitizing *Laphygma frugiperda*. *D. meteori* also participates in the larch casebearer parasite complex.

182 Gahan, A. B. 1915. Descriptions of new genera and species, with notes on parasitic Hymenoptera. Proc. U. S. Nat. Mus. 48:155-168.

Describes three new species of Ichneumonoidea and ten new species of Chalcidoidea. Some synonymical and other notes on described species are also included. The new species *Derostenus fullawayi* was recovered from *Agromyza parvicornis* in South Dakota. This species has also been reared as a parasite of the larch casebearer.

183 Gahan, A. B. 1917. Descriptions of some new parasitic Hymenoptera. Proc. U. S. Nat. Mus. 53:195-217.

Describes new genera and species in the superfamilies Ichneumonoidea, Chalcidoidea, and Proctotrupoidea. Each species is described from reared material and so is connected with a definite host record. The larch casebearer parasite, *Tetrastichus dolosus* is described. The type specimens were reared as hyperparasites from *Euplectrus platyhypenae* parasitizing *Laphygma frugiperda* and from *E. comstockii* parasitizing *Caradrina* sp.

184 Gahan, A. B. 1927. Four new chalcidoid parasites of the pine tip moth, *Rhyacionia frustrana* (Comstock). J. Agric. Res. 34:545-548.

Describes the morphology of four new parasites of the pine tip moth. Included is the species *Secodella subopaca* which also parasitizes the larch casebearer.

185 Gahan, A. B. 1930. Synonymical and descriptive notes on parasitic Hymenoptera. Proc. U. S. Nat. Mus. 77, 12p.

Contains notes and descriptions dealing with species in several families of parasitic Hymenoptera. The synonymy of the larch casebearer parasite, *Habrocytus phycidis* is discussed.

186 Gahan, A. B. 1933. The serphoid and chalcidoid parasites of the hessian fly. USDA Misc. Pub. No. 174, 147p.

A complete bibliography, review of the literature, description, list of synonyms, and a short outline of hosts, life history and distribution for each species attacking the hessian fly, *Mayetiola destructor* are given. The species *Eupelmella vesicularis* is also a parasite of the larch casebearer.

187 Gahan, A. B. 1938. Notes on some genera and species of Chalcidoidea (Hymenoptera). Proc. Entomol. Soc. Wash. 40:209-227.

Notes on generic and specific synonymy, several generic transfers, and new distributional records for several species. The author comments on the synonymy of *Dibrachys cavus*, a parasite of the larch casebearer.

188 Gahan, A. B. 1942. Descriptions of five new species of Chalcidoidea, with notes on a few described species (Hymenoptera). Proc. U. S. Nat. Mus. 92:41-51.

Contains descriptions of five new species and synonymical and distributional notes for a few described species. The synonymy of *Dibrachys cavus*, a parasite of the larch casebearer is discussed.

189 Garman, P. 1934. Large scale breeding of *Dibrachys* parasites. Conn. Agric. Exp. Stn. Bull. 360:476.

Reports an unusual abundance of the primary and secondary parasite, *Dibrachys boucheanus* in 1933. It is believed that if this species ever proves to be of importance in the control of such pests as the codling moth, *Laspeyresia pomonella*, or oriental fruit moth, *Grapholitha molesta*, it could be produced in large quantities.

190 Garman, P. 1938. Oriental fruit moth parasite work. Conn. Agric. Exp. Stn. Bull. 408:222-227.

An extensive program for the recovery of oriental fruit moth, *Grapholitha molesta* parasites was undertaken in the summer of 1936. During this survey, *Dibrachys boucheanus* appeared as a secondary parasite. Its abundance may explain, in part, the general scarcity of larval parasites during that period. *D. boucheanus* is a widespread primary and secondary parasite which attacks the larch casebearer as well.

191 Garman, P., and Brigham, W. T. 1933. Studies on parasites of the oriental fruit moth. II. *Macrocentrus ancylivorus*. Conn. Agric. Exp. Stn. Bull. 356:73-116.

This paper gives a detailed report of the artificial propagation of *M. ancylivorus* for control of the oriental fruit moth, *Grapholitha molesta*. The secondary parasite, *Dibrachys boucheanus* Ratz, caused difficulties during the release program. Although *D. boucheanus* is also a primary parasite of the oriental fruit moth, it appears to prefer hyperparasitizing *M. ancylivorus* larvae. *D. boucheanus* is also part of the larch casebearer parasite complex.

192 Gauss, R. 1960. *Tortrix viburniana* F. erneut als Forstschadling. (*Tortrix viburniana* F. resurges as a forest pest.) Z. ang. Entomol. 47:46-51. The microlepidopteran *Tortrix viburniana* F. is normally rare and feeds on bushes and herbs. In the period 1858 to 1958 three outbreaks on forest trees have been recorded. This article describes the biology on its coniferous hosts in an outbreak which began in 1958. Parasites reared from larvae and pupae included *Itoplectis maculator* F. and *Mesopolobus subfumatus* Ratz, both of which attack the larch casebearer. The former is cited as a pupal parasite, the latter as a hyperparasite.

193 Gepp, J. 1975. Zum Parasitenkomplex von *Coleophora fuscedinella* Z. (Lep., Coleophoridae) in Ostosterreich. (The parasite-complex of *Coleophora fuscedinella* Z. (Lep., Coleophoridae) in East-Austria.) Z. ang. Entomol. 79:76-96.

Provides brief descriptions of the parasites of *C. fuscedinella* and their bionomics. Six of these species also attack the larch casebearer: *Gelis areator*, *Habrocytus semotus*, *Elachertus argissa*, *Cirrospilus pictus*, *Chrysocharis*, sp. and *Tetrastichus ecus*. Compares parasite complexes and densities in various regions, and divides the parasite complex into three groups: 1.) largely specific, univoltine endoparasites which attack and kill older larvae in the mine; 2.) relatively non-specific spring parasites in older larvae and pupae and 3.) Largely non-specific species which attack young larvae in the autumn and older larvae in the spring. Briefly discusses synchronization, super-, multi- and hyperparasitism, the sequence of attack of the parasite complex.

194 Gijswijt, M. J. 1962. Nederlandse chalcididen. (Dutch chalcids.) Entomol. Ber. 22:250-252.

Lists the chalcids reared on galls from *Rosa* spp. and *Salix repens* collected in North Holland. Two of these chalcids, *Eupelmella vesicularis* Ratz. and *Tetrastichus ecus* (Walk.), have also been recovered from the larch casebearer. The parasites of *Lithocolletis blancardella pomifoliella* Zell. in apple leaves are also given. Two of the most abundant parasite species, *Cirrospilus pictus* (Nees) and *C. vittatus* Walk., also attack the larch casebearer.

195 Gijswijt, M. J. 1964. Nederlandse chalcididen. (Dutch chalcids.) Entomol. Ber. 24:30-34.

A host list of leafminer parasites is provided. Alternate hosts for two larch casebearer parasites are given. *Cirrospilus vittatus* attacked *Stigmella oxyacanthella*, and *C. pictus* was reared from *Coleophora fuscedinella*.

196 Girault, A. A. 1911. Miscellaneous notes on the Hymenoptera Chalcidoidea: The genus *Arthrolytus* Thompson; *Horismenus microgaster* Ashmead. Can. Entomol. 43:346-354,370-377 and 401-413.

In describing a new species of *Arthrolytus*, the author compiled literature on the entire group. Morphology and host relations for closely related species are discussed. Among these is a larch casebearer parasite, *Arthrolytus aeneoviridis*. *A. aeneoviridis* was recovered from breeding cages containing the larvae of *Perovea minuta*.

197 Girault, A. A. 1916. Descriptiones Hymenopterorum Chalcidoidicorum variorum cum observationibus. III. (Descriptions of hymenopterous Chalcidoidea from various observations. III.) Entomol. News 27:223-228.

Among the new species described is *Pseudomphale ancylae*, a parasite of the larch casebearer. The type specimens for the description were reared from *Ancylus nubeculana*.

198 Girault, A. A. 1916. Descriptiones Hymenopterorum Chalcidoidicorum variorum cum observations. II. (Descriptions of hymenopterous Chalcidoidea from various observations. II.) Entomol. News 27:401-405.

One of the new species described, *Eulophus magnisulcatus* is a larch casebearer parasite. The type specimen was reared from a cherry "Coleophor" from New Jersey.

199 Girault, A. A. 1916. New miscellaneous chalcidoid Hymenoptera with notes on described species. Ann. Entomol. Soc. Am. 9:291-308.

The larch casebearer parasite, *Eupelminus coleopterophagus*, is described for the first time. The description is based on female specimens reared in connection with the strawberry weevil, *Anthonomus signatus*.

200 Girault, A. A. 1916. The North American species of *Dibrachys* (in the North American sense-Coelopisthoidea Gahan) with a note on *Uriella* Ashmead. Can. Entomol. 48:408-409.

Consists of a key to three species of *Dibrachys* and notes on *Uriella rufipes*. Two of the *Dibrachys* species, *D. apantelae*, and *D. clisiocampae*, parasitize the larch casebearer.

201 Girault, A. A. 1917. New chalcid flies, with notes. Bull. Brooklyn Entomol. Soc. 12:86-89.

Notes on the morphology of ten new species of chalcids are provided. The species *Eurydinota lividicorpus* has been recovered from the larch casebearer.

202 Girault, A. A. 1917. New North America Hymenoptera of the family Eulophidae. Proc. U. S. Nat. Mus. 51:125-133.

Fifteen new species of Eulophidae are described from material in the United States National Museum. A larch casebearer parasite, *Zagrammosoma americana* is described from a specimen from Colorado.

203 Girault, A. A. 1917. The North American species of *Habrocytus* (chalcid-flies). Can. Entomol. 49:178-182.

A key to several species of *Habrocytus* from North American type specimens. Included is *H. dux* which parasitizes the larch casebearer.

204 Girault, A. A. 1920. Various new species of Hymenoptera. Proc. U. S. Nat. Mus. 58:192.

Provides a brief description of a male specimen of the native larch casebearer parasite, *Spilochalcis albifrons*.

205 Girault, A. A. 1921. New serphidoid, cynipoid, and chalcidoid Hymenoptera. Proc. U. S. Nat. Mus. 58:177-216.

Descriptions include three species of larch casebearer parasites, *Spilochalcis albifrons*, *S. torvina*, and *Achrysocharis camilli*.

206 Giron, A. R. 1978. Notes on the biology and diapause inducement of the hyperparasite *Gelis tenellus*. Ann. Entomol. Soc. Am. 71:827-829.

The larch casebearer parasite *Gelis tenellus* is the most important hyperparasite of the gypsy moth, *Porthetria dispar* (as *Lymantria*), through the primary parasite *Apanteles melanoscelus*. Development, oviposition, and diapause of *G. tenellus* in this host were studied. Photoperiod was the main factor affecting diapause; 11-14 hours of daylight were needed to induce diapause.

207 Giron, A. R. 1979. Host discrimination and host acceptance behavior of *Gelis tenellus*, a hyperparasite of *Apanteles melanoscelus*. Environ. Entomol. 8:1029-1031.

Gelis tenellus females do not discriminate between parasitized and unparasitized hosts, a behavior which could lead to super- and multiparasitism. Mock cocoons treated with a hexane extract of the host cocoons were probed by the parasite more than untreated mock cocoons suggesting, the existence of a kairomone that stimulates ovipositional activity. Empty cocoons are less frequently attacked when normal cocoons are present, indicating that *G. tenellus* has some measure of plasticity in its host selection. *G. tenellus* has been recovered as a parasite of the larch casebearer.

208 Gould, E., and Geissler, G. H. 1940. Parasites of the pistol casebearer. J. Econ. Entomol. 33:814-815.

Forty-eight parasites reared from the pistol casebearer, *Coleophora serratella*, are listed. Three of these, *Habrocytus thyridopterigis* How., *Microbracon pygmaeus* (Prov.), and *Spilochalcis albifrons* (Walsh), parasitize in the larch casebearer.

209 Graf, J. E. 1917. The potato tuber moth. USDA Bull. No. 427, 56p.

The history, distribution, injury, bionomics, and control of the potato tuber moth, *Phthorimaea operculella*, are discussed. One of its most important natural enemies is *Sympiesis stigmatipennis*, a parasite which also attacks the larch casebearer.

210 Graham, A. R. 1943. The establishment of some imported parasites of the larch casebearer, *Haploptilia laricella* Hbn., in Ontario. Entomol. Soc. Ont. Ann. Rep. 74:48-52.

Five exotic species were introduced against the casebearer in Ontario between 1931 and 1939: *Angitia nana*, *Microdus pumilus*, *Dicladocerus westwoodii*, *Chrysocharis laricinellae* and *Cirrospilus pictus*. Based on recovery information, it is suspected that *Chrysocharis laricinellae* and *Microdus pumilus* will become better established and of more use in Canada than the other introduced species. Twenty-five native parasites have been reared in Ontario but never in sufficient numbers to indicate them as being of benefit in controlling the casebearer. These species are: *Gelis* sp., *Itoplectis* sp., *Lissonota parva*, *Syrphoctonus agilis*, *Hemiteles tenellus*, *Phaeogenes* sp. near *epinotiae*, *Inareolata* sp., *Exochus* sp., *Angitia* sp., *Microbracon pygmaeus*, *Clinocentrus* sp., *Hormius* sp., *Bracon* sp., *Euderus amphis*, *Habrocytus phycidis*, *Spilochalcis albifrons*, *S. zanthostigmata*, *Calliceras* sp., *Euplectrus mellipes*, *Pachyneuron altiscutum*, *Tetrastichus* sp., *Achrysocharis* sp., *Phanurus ovivorus*, *Trissolcus euschisti*, and *Polynema* sp.

211 Graham, A. R. 1948. Developments in the control of the larch casebearer, *Coleophora laricella* (Hbn.). Rept. Entomol. Soc. Ont. 79:45-50.

Following releases of *Agathis pumila* and *Chrysocharis laricinellae* in Ontario, the casebearer infestation was controlled each year in progressively larger areas radiating outward from the liberation point. This progressive movement however, did not begin until the degree of parasitism by *A. pumila* became very high, thereby supplying *C. laricinellae* with ample host stock in June to maintain it during the following summer generation.

212 Graham, A. R. 1957. Effectiveness of two introduced parasites of the larch casebearer, *Coleophora laricella* (Hbn.) (Lepidoptera: Coleophoridae), in Ontario. Entomol. Soc. Ont. Ann. Rept. 88:37-41.

Collections made in 1957 confirmed that *Agathis pumila* was the most effective biological control agent of the casebearer in Ontario. It spread over a large area with light discontinuous infestations of casebearer and parasitized rather large percentages of the populations. *Chrysocharis laricinellae* is not an effective control as it has spread only about 42 miles since its release in 1934 and its dispersal is dependent on high populations.

213 Graham, M. W. 1961. The genus *Aprostocetus* Westwood, sensu lato (Hym., Eulophidae); notes on the synonymy of European species. Entomol. Monthly Mag. 97:34-64.

Among the species discussed is *Aprostocetus ecus*, a larch casebearer parasite. Its synonymy is described in detail.

214 Graham, S. A. 1918. An interesting habit of a wax moth parasite. Ann. Entomol. Soc. Am. 11:175-182.

The bee moth, *Galleria mellonella*, is reported as a new host for the parasite *Dibrachys clisiocampae*. Its life cycle varies from 31 to 59 days in this host. *D. clisiocampae* females sting and kill the host before ovipositing. The forest tent caterpillar, *Malacosoma disstria*, and the larch casebearer, have also been reported as alternate as hosts of this species.

215 Greenblatt, J. A., and Barbosa, P. 1980. Interpopulation quality in gypsy moths with implications for success of two pupal parasitoids: *Brachymeria intermedia* (Nees) and *Coccygomimus turionellae* (L.). Ecol. Entomol. 5:31-38.

Gypsy moth, *Porthetria dispar*, (as *Lymantria*), pupae collected from innocuous, release, and outbreak populations, were exposed to attack by the two parasite species. *Brachymeria intermedia*, is a common gypsy moth parasite during outbreak conditions. The larch casebearer parasite, *Coccygomimus turionellae*, attacks the gypsy moth infrequently. While *B. intermedia* was most numerous when reared from outbreak gypsy moths; *C. turionellae* were most abundant when reared from innocuous or release populations.

216 Griffiths, K. J. 1960. Parasites of *Neodiprion pratti banksianae* Rohwer in northern Ontario. Can. Entomol. 92:653-658.

Eupelmella vesicularis, a parasite of the larch casebearer, was recovered from *N. pratti banksianae*, cocoons found on vegetation. It is not yet known whether this *E. vesicularis*, is primary or secondary in *N. pratti banksianae*.

217 Griffiths, K. J. 1976. A preliminary report on the gypsy moth and its parasites in southeastern Ontario. Proc. Entomol. Soc. Ont. 107:79-84.

Parasites reared from the gypsy moth, *Porthetria dispar* (as *Lymantria*), in southeastern Ontario included three exotic species, one native, and the hyperparasite *Gelis tenellus*. In the United States hyperparasitism greatly reduces the effect of the introduced species *Apanteles melanoscelus* in controlling the gypsy moth. *G. tenellus* is also a parasite of the larch casebearer.

218 Grover, T. 1878. Report of the entomologist and curator of the museum: Hymenoptera. Ann. Rept. USDA (1877):99.

Records *Spilochalcis albifrons*, a native parasite of the larch casebearer, as a hyperparasite of *Gelis minimus*.

219 Guevremont, H., and Juillet, A. 1974. Recherches sur la dynamique des populations naturelles de *Coleophora fuscedinella* Zeller (Lepidopteres: Coleophoridae) dans la region de Sherbrooke, Quebec. (Research on the population dynamics of *Coleophora fuscedinella* Zeller (Lepidoptera: Coleophoridae) in the region of Sherbrooke, Quebec.) Phytoprotection 55:121-134.

Factors affecting the abundance of *C. fuscedinella* were studied. Of the parasites attacking *C. fuscedinella*, eight parasitize the larch casebearer. *Chrysocharis laricinellae* is the most abundant parasite of third and fourth instar *C. fuscedinella* larvae; it is recovered sporadically in fifth instars and pupae. *Orgilus coleophorae* is the most frequent parasite of *C. fuscedinella* pupae; it also attacks fourth and fifth instar larvae. Other parasites of *C. fuscedinella* found in lower numbers are: *Bracon juncicola*, *Gelis tenellus*, *Scambus decorus*, *Habrocytus phycidis*, *Agathis cincta*, and *Tetrastichus xanthostigma*.

220 Guevremont, H., and Juillet, J. 1975. Parasites du porte-case du bouleau, *Coleophora fuscedinella* Zeller (Lepidopteres: Coleophoridae), dans la region de Sherbrooke, Quebec. (Parasites of the birch casebearer, *Coleophora fuscedinella* Zeller (Lepidoptera: Coleophoridae), in the region of Sherbrooke, Quebec.) Phytoprotection 56:1-17.

About 40 species of parasites of *Coleophora fuscedinella* Zeller are recorded in North America. Nineteen were reared in this study, from larvae of fourth and fifth instars and chrysalids of casebearers living on grey and white birches in the region of Sherbrooke. The abundance of species in the parasite fauna and the degree of parasitism in host plants from 1971 to 1973 are described. A description of parasite remains and a

key to the Sherbrooke species are provided. Fifteen of the North American and nine of the Sherbrooke species listed are also parasitoids of the larch casebearer. *Agathis cincta*, *Orgilus coleophorae*, *Bracon juncicola*, *B. pygmaeus*, *Gelis obscurus*, *G. tenellus*, *Scambus decorus*, *S. hispae*, *Spilochalcis albifrons*, *S. side*, *Cirrospilus pictus*, *Chrysocharis laricinellae*, *Tetrastichus xanthostigma*, *Habrocytus phycidis* and *H. thyridopterigis*.

221 Guppy, J. C. 1959. Four Hymenoptera newly recorded as parasites of the armyworm *Pseudaletia unipuncta* (Haw.) (Lepidoptera: Noctuidae). Can. Entomol. 91:426-427.

Euplectrus mellipes is one of four newly recorded primary parasites of the armyworm. It is an ectoparasite of the third, fourth and fifth instar stages; superparasitism always occurs. The average number of parasite larvae per host is eight. In North America, this species has only been recorded from Ontario and Quebec, where it is known to parasitize *Feralia jocosa* (Guen.) and the larch casebearer.

222 Gyorfi, J. 1941. Beitrage zur geographischen Verbreitung der Schlupfwespen in Finnland und zur Kenntnis deren Wirte. (Notes on the geographic distribution of hymenopterous parasites in Finland and their hosts.) Ann. Entomol. Fenn. 7:86-91.

Lists the Ichneumonidae, Braconidae, Chalcididae and Proctotrupidae of Finland. In Finland, the chalcid *Dibrachys cavus* Walk. has been reared from *Lophyrus sertifer* Geoffr. *D. cavus* has also been recorded as a parasite of the larch casebearer in other areas.

223 Gyorfi, J. 1951. Die Schlupfwespen und der Unterwuchs des Waldes. (Ichneumonids and the understory vegetation of forests.) Z. ang. Entomol. 33:32-47.

From personal observations, rearings, and review of literature the author arrived at four important conclusions concerning parasites and their habitat: 1) in forest stands on mature sites, pests of tree species and insects inhabiting ground vegetation have many common parasites; 2) the presence of a variety of shrubs, herbaceous plants, and ground vegetation encourages increases in parasite populations more than the mixture of tree species; 3) insects feeding on ground vegetation act as a critical reservoir for parasites of tree-dwelling herbivores as well as providing nourishment for their activities; and 4) where forest management constraints permit, every effort should be made to enrich the forest plant community. Maintenance of forest meadows and artificial clearings are the most obvious means. The author provides extensive lists of alternate hosts and food plants for parasites of forest pests and lists the important plants for parasites in a "typical" Oak, Beech, Pine, and Spruce forest in Hungary. Two larch casebearer parasites, *Pimpla maculator* and *P. alternans*, are included.

224 Gyorfi, J. 1962. Beitrage zur Kenntnis der Lebensweise der Chalcididen-Arten in Ungarn. (Contribution to the knowledge of the life cycles of chalcidoids in Ungaren). Z. ang. Entomol. 49:207-223.

Two hundred and eight chalcidoid parasites and their hosts in the Ungarn area of Hungary and their hosts are listed. *Habrocytus laricella* Ratz. and *Cirrospilus pictus* have been reared from the larch casebearer. *Chrysocharis* (*Epilampsis*) *boops*, an important larch casebearer parasite in Sweden is listed as a parasite of *Lithocolletis platani* Stgr.

225 Gyorfi, J. 1963. Beitrage zur Biologie und Okologie der Schlupfwespen (Ichneumonidae). (Investigation of the biology and ecology of ichneumonids (Ichneumonidae).) Z. ang. Entomol. 51:142-147.

The author summarizes two decades of research on the ecology of parasites in Hungary. For 48 species of parasites he lists the adult food preferences, alternate hosts where known, and other general information from rearings. One of these, *Itoplectis maculator*, is a parasite of the larch casebearer. From this and other observational work, he concludes that forest weeds, herbs, and shrubs, particularly in forest meadows, clearcuts, and borders of forest stands, are critical elements for parasite guilds. He also speculates that the higher incidence of pest outbreaks in conifer monocultures is due in part to the lack of food plant relationships for alternate hosts of parasites. The often higher sex ratio of females to males in field sampling is explained by the greater dependency of females on food plant relationships; i.e., the males are more apt to disperse.

226 Haden, W. R. 1935. Parasitism of the oriental fruit moth with special reference to the importance of certain alternate hosts. Delaware Agric. Exp. Stn. Bull. No. 194, 42p.

A study was conducted to determine which parasites attack the larvae and pupae of the oriental fruit moth, *Grapholitha molesta* and two alternate hosts, the ragweed borer, *Epiblema strenuana(um)*, and the strawberry leaf-roller, *Ancylis comptana*. The importance of the parasites separately and collectively are discussed. Of the species recovered, three have also been recorded as parasites of the larch casebearer. *Secodella cushmani* was reared as a parasite of the ragweed borer, while *Spilochalcis torvina* and *Catolaccus aeneoviridis* attacked the strawberry leaf-roller.

227 Haeussler, G. J. 1930. Parasites of the oriental peach moth, *Laspeyresia molesta* Busck, in North America. J. Agric. Res. 41:365-377.

Fifty-seven species of primary and eight species of secondary parasites of the oriental peach moth, *Grapholitha molesta* (as *Laspeyresia*), are listed. Among the hyperparasites of *G. molesta* is *Dibrachys boucheanus*, a species which also attacks the larch casebearer.

228 Haeussler, G. J. 1940. Parasites of the oriental fruit moth in Japan and Chosen and their introduction into the United States. USDA Tech. Bull. No. 728, 62p.

Sixty-one species of parasites were reared from the oriental fruit moth, *Grapholitha molesta*, in a survey of the important peach-, pear-, quince-producing regions of Japan and Chosen. Secondary parasites were found to be important in biological control of the oriental fruit moth, particularly in the summer generations and in Chosen where the proportion of hyperparasitism was the greatest. Two species, *Hemiteles pulchellus* and *Dibrachys cavus*, which have been reported from the larch casebearer, were recovered from the oriental fruit moth as both primary and secondary parasites.

229 Hamel, D. R. 1977. The effects of *Bacillus thuringiensis* on parasitoids of the western spruce budworm, *Choristoneura occidentalis* (Lepidoptera: Tortricidae), and the spruce cone worm, *Dioryctria reniculelloides* (Lepidoptera: Pyralidae), in Montana. Can. Entomol. 109:1409-1416.

Twenty-one species of parasitoids were recovered in rearings of the western spruce budworm and an associated defoliator, the spruce cone worm. Parasitoid population changes occurred following application of *Bacillus thuringiensis*. The number of parasitoids attacking prediapausing first-instar budworm was higher following application of *B. thuringiensis*, while populations of parasitoids of late instars and pupae were significantly lower following treatment. Two larch casebearer parasites were among the parasite complexes examined in this study. *Gelis tenellus*

was recovered as a hyperparasite of the spruce budworm and *Itoplectis quadricingulata* was recovered from the spruce cone worm.

230 Hansen, J. D. 1977. The biology and behavior of *Spilochalcis albifrons* (Hymenoptera: Chalcididae), a parasite of the larch casebearer, *Coleophora laricella* (Lepidoptera: Coleophoridae). Ph.D. Diss., Wash. State Univ., Pullman, 124p.

A detailed study of the biology, distribution, artificial propagation and development, morphology, and behavior of *S. albifrons*, a native parasite of larch casebearer. *S. albifrons* attacks the pupal stage of a wide variety of hosts. A list of cohosts, food plant relationships of these hosts and time of host pupation is provided. Interactions between *S. albifrons*, the larch casebearer and its other native and introduced parasites are discussed. Keys to major casebearer parasites based on emergence holes in host pupal cases and x-ray images of pupae were developed. *S. albifrons* was the dominant parasite of the casebearer in all study plots except in areas of high infestations of the Douglas fir tussock moth. *S. albifrons* was inversely density-dependent with casebearer populations, suggesting a lack of sychronization between *S. albifrons* and this host. Only male *S. albifrons* emerged from parasitized casebearers. This was attributed to the host pupae being too small to initiate the proper behaviorial response to stimulate the spermatheca of the parasite to release sperm, resulting in all male progeny.

231 Hansen, J. D. 1980. The life history and behavior of *Spilochalcis albifrons* (Hymenoptera: Chalcididae), a parasite of the larch casebearer, *Coleophora laricella* (Lepidoptera: Coleophoridae). J. Kansas Entomol. Soc. 53:553-566.

Spilochalcis albifrons (Walsh), a native parasite of the larch casebearer, *Coleophora laricella* (Hbn.), was studied in the laboratory and the natural habitat in Idaho and Washington state. Data from northern Idaho indicate at least two generations yearly with maximum populations in July. Parasite activity is most prominent from late morning through mid-afternoon. Courtship, mating, and oviposition behavior were observed in the laboratory. Females sometimes fed on host fluids originating from oviposition wounds. Pupae of the larch casebearer, the Indian meal moth, and the uglynest caterpillar served as hosts and were radiographed in studying parasite development. *S. albifrons* has at least three instars, a larval development time of ca. 15 days at 26 degrees C, and a pupal stadium of ca. 12 days at 26 degrees C. (Author)

232 Harcourt, D. G. 1960. Biology of the diamondback moth, *Plutella maculipennis* (Curt.) (Lepidoptera: Plutellidae), in eastern Ontario. III. Natural enemies. Can. Entomol. 92:419-428.

Reports the principal parasites and predators of the diamondback moth recovered during a five year study. Among the larval parasites of *P. maculipennis* are four species, *Habrocytus phycidis*, *Dibrachys cavus*, *Spilochalcis albifrons*, and *Gelis tenellus*, which also attack the larch casebearer. As parasites of the diamondback moth, *D. cavus* is a superparasite and *G. tenellus* is a hyperparasite through *Horogenes insularis*.

233 Hard, J. S. 1976. Natural control of hemlock sawfly *Neodiprion tsugae* (Hymenoptera: Diprionidae) populations in southeast Alaska. Can. Entomol. 108:485-498.

Biotic factors that limit sawfly populations are a fungus, *Entomophthora sphaerosperma*, food quality, and three ichneumonid parasitoid species which attack prepupal larvae in cocoons. One of these

parasites, *Itoplectis quadricingulatus*, has also been recovered from the larch casebearer. The parasites attack after the fungus has decimated larval populations and were most abundant during two dry summers.

234 Hard, J. S., Meso, S., and Haskett, M. 1979. Testing aerially applied orthene for control of larch casebearer. USDA For. Serv., Pac. Northwest For. and Range Exp. Stn., Portland OR., Res. Pap. PNW 138, 6p.

A fall application of Orthene (0.5 lb a.i./gal water/acre) near La Grande, Oregon provided adequate population reduction of larch casebearer in young western larch stands and prevented heavy defoliation of trees the following spring. Percent parasitism of casebearer larvae by native parasites was higher in treated plots than in check plots. The effect of orthene spraying on introduced parasites is not known and it is recommended that no operational spraying of Orthene be done in areas where these species have been released until further research is conducted.

235 Hardy, J. E. 1938. *Plutella maculipennis* Curt., its natural and biological control in England. Bull. Entomol. Res. 29:343-372.

The biologies and interactions between *P. maculipennis* parasites are discussed and a key to the adults is included. Three species which attack the larch casebearer are also part of the *P. maculipennis* parasite complex. *Itoplectis maculator* is a primary pupal parasite of *P. maculipennis*. *I. alternans* and *Hemiteles areator*, are both hyperparasites of *Angitia cerophaga* and *A. fenestralis*, and are the major larval parasites attacking *P. maculipennis*.

236 Harman, D. M. 1972. Parasites of the Nantucket pine tip moth, *Rhyacionia frustrana*, on three pine species in Maryland. Chesapeake Sci. 13:223-226.

Parasites of the Nantucket pine tip moth were collected from specimens on loblolly, Scotch, and Virginia pines. Twenty-five parasites and associated species were reared. Two species, *Habrocytus thyridopterigis* and *Scambus tecumseh* also attack the larch casebearer. *H. thyridopterigis* was one of the most common parasites encountered from *R. frustrana* from all tree species.

237 Harman, D. M., and Kulman, H. M. 1962. Parasites of the European pine shoot moth, *Rhyacionia buoliana*. J. Econ. Entomol. 55:1007-1008.

Of the parasites recovered from *R. buoliana* in West Virginia and Maryland, three also parasitize the larch casebearer. *Habrocytus thyridopterigis* has been recorded from *R. frustrana* and *R. rigidana*; however, *Scambus tecumseh* and *Sympiesis guttatipennis* only attack *R. buoliana*. All three species parasitize *R. buoliana* in small numbers.

238 Harrington, W. H. 1894. Canadian Hymenoptera-No. 6. Can. Entomol. 26:245-250.

Contains descriptions of new species of Ichneumonidae from Vancouver Island. One of the species described is *Ephialtes pacificus*, a parasite of the larch casebearer.

239 Harris, P. 1960. Natural mortality of the pine shoot moth, *Rhyacionia buoliana* (Schiff.) (Lepidoptera: Olethreutidae), in England. Can. J. Zool. 38:755-768.

A population of *R. buoliana* infesting a young Scots pine plantation was followed through three generations. The most important causes of mortality in the population were an egg parasite, the failure of the third instar larvae to establish themselves in the buds, and two

external parasites. *Pimpla turionellae* is a minor parasite of *R. buoliana*, attacking pupae in early summer. *P. turionellae* has also been recovered from the larch casebearer.

240 Harville, J. P. 1955. Ecology and population dynamics of the California oak moth *Phryganidia californica* Packard (Lepidoptera: Dioptidae). Microentomology 20:83-166.

The parasite complex of *P. californica* has two species in common with the larch casebearer. Both *Gelis tenellus* and *Dibrachys cavus* are hyperparasites of *Itoplectis behrensii*, a pupal parasite of *P. californica*.

241 Hassan, E. 1967. Untersuchungen uber die Bedeutung der Kraut-und Strauclischicht als Nahrunsquelle fur Imagines entomophager Hymenopteren. (Investigations of the importance of herbaceous and shrub vegetation as a source of nourishment for internal parasites (Hymenoptera).) Z. ang. Entomol. 60:238-265.

Discusses the hymenopterous parasites visiting herbs and bushes in forests of North Germany. Many parasites were observed and individuals were collected. There are descriptions of plant species with notes on the value of nectar and pollen. Also given are collection dates, parts of the plants visited, and host species for the parasites. Seven of the parasite species observed attack the larch casebearer: *Pimpla detrita*, *P. examinator*, *P. turionellae*, *Cyrtogaster vulgaris*, *Mesopolobus subfumatus*, *Euderus albitarsis*, and *Necremnus leucarthros*.

242 Hawboldt, L. S. 1947. Forest entomology. Rept. Dept. Lands and For. 1946, Nova Scotia, p. 35-50.

Larch casebearer populations dropped for the third year in a row. Biological control efforts against the casebearer continued with additional releases of *Chrysocharis laricinellae* and *Bassus pumilis*.

243 Hedqvist, K. J. 1972. Notes on the parasites of green spruce leaf miner *Epinotia nanana* (Hymenoptera: Ichneumonidae and Braconidae). Entomol. Tidskr. 93:60-64.

Describes three parasites of *E. nanana* in northern Sweden. Also listed are parasites of the green spruce leaf miner in Quebec, Canada. Among these are three species, *Agathis bicolor*, *Euderus cushmani*, and *Pimplopterus parvus*, which parasitize the larch casebearer.

244 Hellen, W. 1939. Zur Ichneumoniden fauna Finnlands (Hym.) (On the ichneumonids of Finland (Hym.).) Not. Entomol. 19:52-63.

Among the ichneumonids listed from museum collections in Finland is one species which attacks the larch casebearer. *Itoplectis alternans* Grav. was recovered from the host *Orgyia ericae*.

245 Helson, G. A. H. 1939. The oriental peach moth, (*Cydia molesta* Busck), investigations in the Goulburn valley, Victoria. Austral. Council Sci. and Indus. Res., Pamph. No. 88, 23p.

Reports on the bionomics and control of the oriental peach moth, *Grapholitha molesta* (as *Cydia*). *Dibrachys boucheanus* is the most important peach moth parasite in this area; attack is confined to the autumn and winter months. Parasitism of the overwintering larvae on the butts of trees may be as high as 90 percent. *D. boucheanus* is also a hyperparasite, attacking the primary parasites *Chromocryptus antipodialus* and *Macrocentrus ancylivorus*. *D. boucheanus* is also of the larch casebearer parasite complex.

246 Herrick, G. W. 1912. The larch casebearer. Cornell Univ. Agric. Exp. Stn. Bull. No. 322, 54p.

An early report on the introduction of the larch casebearer to the United States, its life history, habits, and control in eastern larch forests. Only two or three parasites had been reared from casebearer larvae at the time of this report. Determination of species was not yet possible. Nine species of European parasites of the casebearer are listed: *Bracon quttiger Wesm.*, *Microdus pumilus Ratz.*, *Campoplexnana Gr.*, *C. tumidulus Gr.*, *C. virginalis Gr.*, *Entedon arcuatus Frst.*, *E. laricinellae Ratz.*, *Pteromalus laricinellae Ratz.*, and *Anaphes sp.*

247 Herrick, G. W. 1935. The larch case-bearer *Coleophora laricella* Hbn. In: Insect Enemies of Shade Trees, Comstock Publ. Co., Ithaca, New York, p.138-140.

Describes the morphology, life history, and injury caused by the casebearer. Three parasites have been reared from the casebearer in New York; however, no parasite species are listed in the report.

248 Hill, C. C., and Pinckney, J. S. 1940. Keys to the parasites of the Hessian fly based on remains in the host puparium. USDA Tech. Bull. No. 715, 23p.

A key to 17 species of Hessian fly, *Mayetiola destructor* (as *Phytophaga*), parasites based on their remains in the host puparium. Among these is *Eupelmella vesicularis*, a species which has also been obtained from the larch casebearer.

249 Hill, C. C., Pinckney, J. S., and Udine, E. J. 1939. Status and relative importance of the parasites of the Hessian fly in the Atlantic states. USDA Tech. Bull. No. 689, 15p.

Eighteen species of hymenopterous parasites have been found parasitizing the Hessian fly, *Mayetiola destructor* (as *Phytophaga*), in the wheat growing areas of the eastern coastal states. Included is *Eupelmella vesicularis*, a species which also attacks the larch casebearer.

250 Hoffmann, C. H. 1936. A population study of *Cacoecia cerasvorana* Fitch with special reference to its insect parasites (Tortricidae- Lepidoptera). Bull. Brooklyn Entomol. Soc. 31:209-211.

One of the most common parasites reared from ugly-nest caterpillar, *C. cerasvorana*, was *Dibrachys cavus*, a species which also attacks the larch casebearer. *D. cavus* acts as a primary and secondary parasite of the ugly-nest caterpillar. As a hyperparasite it attacks *Phorocera tortricis*, *Nemorilla maculosa*, and *Itoplectis conquisitor*, all of which are primary parasites of the ugly-nest caterpillar.

251 Holmes, N. D. 1953. Note on *Scambus detrita* (Holmg.) (Hymenoptera: Ichneumonidae), a new parasite of the wheat stem sawfly, *Cephus cincta* Nort. Can. Entomol. 85:339.

Scambus detrita, a parasite of the larch casebearer, has been recovered from *Cephus cincta* and *C. pygmaeus*, both pests of wheat.

252 Horning, D. S., and Barr, W. F. 1974. Insects of Craters of the Moon National Monument, Idaho. Univ. Idaho, College of Agric. Misc. Ser. 8, 117p.

An inventory of the insect species found in Craters of the Moon, with special attention given to the associations of insects and plant

relationships. The order Hymenoptera was the most abundant in the study. Six larch casebearer parasites were recovered by sweeping plant foliage. These species were recovered: *Bracon gelechiae*, *B. pygmaeus*, *Gelis tenellus*, *Sympiesis stigmatipennis*, *Spilochalcis albifrons*, and *S. leptis*.

253 Horstmann, K. 1969. Typenrevision der Europaischen Arten der Gattung *Diadegma* Foerster (syn. *Angitia* Holmgren). (Revision of the types of European species of the genus *Diadegma* Foerster (syn. *Angitia* Holmgren).) Beitr. Entomol. 19:413-472.

A key and brief descriptions of the 82 revised species of European *Diadegma* are given. Included is *D. laricinellum*, a parasite of the larch casebearer.

254 Horstmann, K. 1973. Nachtrag zur Revision der Europaeischen *Diadegma* - arten (Hymenoptera: Ichneumonidae). (Supplement to the revision of European *Diadegma* species (Hymenoptera: Ichneumonidae).) Beitr. Entomol. 23:131-150.

This article lists *Diadegma laricinellae* as a parasite of the larch casebearer.

255 Howard, L. O. 1888. A commencement of a study of the parasites of cosmopolitan insects. Proc. Entomol. Soc. Wash. 1:118-135.

Lists the hymenopterous parasites which have been recorded from hosts that occur in both Europe and North America. *Hemiteles areator*, a parasite of *Anthrenus* sp. in Europe, and *Copidosoma truncatellum*, recorded from *Plusia brassicae* in North America, are also larch casebearer parasites.

256 Howard, L. O. 1925. Parasitic Hymenoptera feeding by indirect suction. Entomol. News 36:129-133.

Reports instances in which parasites have been observed host feeding through a tube formed by the hardening of a whitish mucus secreted from between the stylets. The larch casebearer parasite, *Dibrachys boucheanus*, has displayed this behavior in other host species.

257 Hudon, M. 1956. *Dibrachys cavus* (Wlkr.) (Hymenoptera: Pteromalidae), a new parasite of the European corn borer, *Pyrausta nubilalis* (Hbn.) (Lepidoptera: Pyralidae), in Canada. Can. Entomol. 88:25.

This is the first record that lists *D. cavus* as a parasite of European corn borer larvae in Canada. *D. cavus* also attacks the larch casebearer.

258 Hunter, K. W. Jr., and Bartlett, A. C. 1975. Chromosome number of the parasitic encyrtid *Copidosoma truncatellum* (Dalman). Ann. Entomol. Soc. Am. 68:61-62.

The haploid chromosome number of 10 (n=10) and a diploid chromosome number of 20 (2n=20) were found in preparations of the neuroganglial cells of prepupal parasites of *Copidosoma truncatellum* (Dalman). *C. truncatellum* is an internal parasite of several lepidopterous species including the larch casebearer.

259 Ismail, A. B. 1981. Interactions of *Agathis pumila* (Ratz.) (Hymenoptera: Braconidae), and *Chrysocharis laricinellae* (Ratz.) (Hymenoptera: Eulophidae), on larch casebearer, *Coleophora laricella* (Hbn.), (Lepidoptera: Coleophoridae) in northern Idaho. M.S. Thesis Wash. State Univ., Pullman, Wa., 98p.

Describes the interactions of *Agathis pumila* and *Chrysocharis laricinellae* with the larch casebearer, and includes notes on other introduced and native parasites. Two introduced and 17 native parasites were recovered during 1979 and 1980. The introduced species, *Agathis pumila* and *Chrysocharis laricinellae*, dominated the parasite complex in 1979, but in only one of three plots in 1980. Although native parasites were abundant, parasitism by any one species was not significant. The most abundant native species were: *Mesopolobus verditer* (Norton), *Spilochalcis albifrons* (Walsh), and *Tetrastichus coerulescens* Ashm. *M. verditer* and *T. coerulescens* were frequently hyperparasitic. The other species found were: *Bracon pygmaeus Prov.*, *Dicladocerus nearcticus Yosh.*, *Elachertus proteoteratis (How.)*, *Sympiesis* sp., *Scambus transgressus (Holmg.)*, *Pimpla* sp., *Campoplex* sp., *Gelis tenellus (Say)*, *Gelis* sp., *Phaeogenes laricellae Mason, and Habrocytus phycidis Ashm.* Three species reared, *Pausia sp.*, *Trissolcus sp.*, and *Praon pequedorum* are likely from other hosts accidently included in the samples. *Agathis pumila* parasitism was affected by competitive interactions with other parasites. There was a reduction of approximately 45 percent of initial parasitism by *A. pumila* in the spring attributed to competitive effects, although competitive displacement was not observed. *A. pumila* and *C. laricinellae* were complementary and well-established in northern Idaho. *C. laricinellae* was abundant at both high and low densities of the casebearer. Multiple introductions of parasites is discussed and a list of known casebearer parasites in western North America is provided.

260 Ismail, A. B., and Long, G.E. 1982. Interactions among parasites of the larch casebearer (Lepidoptera: Coleophoridae) in Northern Idaho. Environ. Entomol. 11:1242-1247.

A published version of Entry 259. Only 16 confirmed parasites of the casebearer are included. Two, *Agathis pumila* and *Chrysocharis laricinellae*, were introduced, the rest were native. The most abundant native species were *Mesopolobus verditer*, *Spilochalcis albifrons* and *Tetrastichus coerulescens*. Observations were made of parasitic behavior and suggested competitive interactions between the five parasite species. However, overall parasitism of the larch casebearer seemed higher when both introduced parasite species were present.

261 Jackson, D. J. 1937. Host-selection in *Pimpla examinator* F. (Hymenoptera). Proc. R. Entomol. Soc. Lond. 12:81-91.

The life history, oviposition behavior, and recorded hosts of *P. examinator*, are summarized. Breeding experiments were carried out in order to test the individual preferences of different females for the same host.

262 Jagsch, A. 1973. Populationsdynamik und Parasitenkomplex der Larchenminiermotte, *Coleophora laricella* Hbn., im naturlichen Verbreitungsgebiet der Europaeischen Larche, *Larix decidua* Mill. (Population dynamics and parasite complex of the larch casebearer moth, *Coleophora laricella*, in the natural area of distribution of the European larch, *Larix decidua* Mill.) Z. ang. Entomol. 73:1-42.

Life tables were used for an investigation of larch casebearer population dynamics in Austria. The investigations were based on three locations at different elevations and population densities of casebearer. It was determined that in the alpine area, the most important mortality factors for *C. laricella* were: predatory activity of birds during the winter; intraspecific competition of young mining larvae; poor synchronization of the larvae emerging from diapause with the budding of the larch trees; unfavorable influences of the weather, and desiccation. Parasitic Hymenoptera played a minor role as mortality factors. The

parasite complex was composed of six abundant species, *Dicladocerus westwoodii*, *Chrysocharis novellus*, *Cirrospilus pictus*, *Diadegma nana*, *Agathis pumila*, and *Habrocytus semotus*; and 14 relatively rare species, *Gelis tenellus*, *G. areator*, *G. albipalpus*, *Itoplectis alternans*, *I. maculator*, *Cirrospilus vittatus*, *C. salatis*, *Necremnus metalarus*, *Teleopterus erxias*, *Elachertus argissa*, *Tetrastichus* sp., *Mesopolobus subfumatus*, *Sceptrothelys deione*, and *Thysiotorus thomsoni*. A comparison of alpine, northern European, and North American casebearer parasites showed that several nearctic species have switched over to the casebearer in North America since its introduction. The parasitization of *C. laricella* decreases with increasing host population density, an indication that most of the parasites are poorly or not at all synchronized with their host. The parasites are therefore inversely density-dependent, and thus have no regulatory effect. Biologies of the various reared parasites are described.

263 Jahn, E. 1952. Parasiten des grauen Larchenwicklers (*Grapholitha diniana*) und der mit ihm vergesellschafteten Insekten in Tirol im Jahre 1948. (Parasites of the grey larch tortrix (*Grapholitha diniana*) and its associated insects in Tirol in the year 1948.) Mitt. Forstl. Bundes-Versuchsanst Mariabrunn 48:147-152.

A study was conducted of three pests of larch in the Austrian Tirol, one of which was the larch casebearer. Only five parasite species, *Angitia armillata*, *Habrobracon stabilis* var. *concolor*, *Cirrospilus pictus*, *Entedon laricinellae*, and *Necremnus leucarthros*, were listed for the larch casebearer. No parasites were common to all three pests. Two parasites of the grey larch tortrix, *Pimpla examinator* and *Habrobracon stabilis*, are also recorded as parasites of the larch casebearer, but were not recovered in this study.

264 Janssen, M. 1960. Beitrag zur Kenntnis der Parasiten von *Apanteles glomeratus* L. (On the parasites of *Apanteles glomeratus* L.) Zeit. Pflanzenkrank. und Pflanzenshutz 67:19-24.

Fourteen hyperparasites of *A. glomeratus*, a primary parasite of *Pieris brassicae* L., were recovered from collections in Germany and Denmark. Parasitism rates were significantly higher in Germany than in Denmark, with *Haplaspisnana* Grav. being the most common species in both areas. Three of the species reared, *Dibrachys cavus* Walk., *Hemiteles areator* Grav., and *Gelis instabilis* Forst., are also part of the larch casebearer parasite association. The question of whether certain parasite species prefer to attack hosts in certain habitats is discussed.

265 Jaques, R. P., LeRoux, E. J., and Paradis, R. O. 1971. *Spilonota ocellana* (D. and S.), eye-spotted bud moth (Lepidoptera: Olethreutidae). In: Biological Control Programmes Against Insects and Weeds in Canada 1959-1968, Commonw. Inst. Biol. Control Tech. Commun. No. 4:47-48.

During the years 1957-1962, *Chrysocharis laricinellae* parasitized an average of 20 percent of the summer and 17 percent of the winter eye-spotted bud moth larvae. Although initially introduced in Berthierville, Quebec in 1943 to control the larch casebearer, *C. laricinellae* has spread to apple districts and is now closely associated with eyespotted bud moth and pistol casebearer, *Coleophora malivorella*, populations in these areas.

266 Jones, M. G. 1976. Arthropods from fallow land in a winter wheat-fallow sequence. J. Appl. Ecol. 13:87-101.

Hymenopterous parasites were most numerous in emergence traps immediately after harvest. *Cyrtogaster vulgaris*, a larch casebearer parasite, was common in the autumn collection of 1971.

267 Judd, W. W. 1950. Emergence of the lacewing, *Chrysopa harrisii* Fitch (Neuroptera), and three hymenopterous parasites from the cocoon. Ann. Entomol. Soc. Am. 42:461-464.

Two of the three parasites discussed *Gelis tenellus* and *Pachyneuron altiscuta*, also attack the larch casebearer. Both emerge from the lacewing during August. Specimens of *P. altiscuta* were the last to emerge; it is believed to be a hyperparasite in *C. harrisii*. *G. tenellus* and *P. altiscuta* accounted for 17.6 and 1.2 percent parasitism respectively. Over 90 percent of *G. tenellus* emerging from the lacewing were females.

268 Judd, W. W. 1954. Four species of leaf-tying moths and their dipterous and hymenopterous parasites reared from mayapple, *Podophyllum peltatum* L. Trans. Am. Micros. Soc. 73:401-404.

Scambus hispae, a parasite of the larch casebearer, was recovered from rearings of *Macrobotys aeglealis* collected from mayapple.

269 Jung, W. 1942. Beitrage zur Kenntnis der Larchenminiermotte (*Coleophora laricella* Hbn). (Contribution to the knowledge of the larch casebearer (*Coleophora laricella*).) Z. ang. Entomol. 29:476-517.

An extensive treatment of the morphology, biology, distribution, population spread, and natural control of the casebearer in Germany. No egg parasitism was noted. Parasitism by ichneumonids was extremely variable by location and year. No species are named.

270 Kamenova, K. V. 1967. Entomophages of the cut-worm (*Agrotis segetum* Schiff.) in Tajikistan. Zool. Zhur. 46:1799-1809.

An investigation of the species composition, phenology, and populations of parasites and predators of *A. segetum* showed that natural enemies are able to reduce pest populations substantially. However, chemical treatments against the first generation of *A. segetum* kills many of these beneficial species, lowering their influence in the later generations of the cut-worm. The larch casebearer parasite, *Dibrachys cavus* is part of the cut-worm parasite complex.

271 Kamijo, K. 1965. Descriptions of five new species of Eulophinae from Japan and other notes (Hymenoptera: Chalcidoidea). Insecta matsum 28:69-78. Synonymies and a description of *Dicladocerus westwoodii* are given. The type specimens were recovered from the larch casebearer in Japan.

272 Kanamitsu, K. 1961. Some hymenopterous parasites of caterpillars on oak twigs in winter. Entomol. Monthly Mag. 97:11-14.

The larch casebearer parasite *Dicladocerus westwoodii* was reared from the overwintering larvae of *Gypsonoma sociana*.

273 Keifer, H. H., and Jones, L. S. 1933. Some parasites of *Anarsia lineatella* Zell. in California. Calif. State Dept. Agric., Mo. Bull. 22:387-388.

Ten parasite species emerged from various stages of *A. lineatella* collected from Sutter County, California. Of these, four are also part of the larch casebearer parasite complex: *Itoplectis obesus* Cush., *Secodella cushmani* Crawf., *Dibrachys boucheanus* (Ratz.), and *Spilochalcis torvina* (Cress.)

274 Kerrich, G. J. 1961. A new Australian species of *Elachertus* Spinola (Hym., Chalcidoidea, Eulophidae) and notes on two European species. Bull. Entomol. Res. 52:769-772.

The new species, *E. agonoxenae* is compared to two British species, *E. argissa* and *E. artaeus*. *E. argissa* has been recorded as a parasite of the larch casebearer.

275 Kirkland, R. C., and Paramonov, A. 1962. Egg parasites of larch sawflies in Great Britain. Entomol. Monthly Mag. 98:3.

The larch casebearer parasite *Cirrospilus vittatus* was recorded as an egg parasite of *Anoplonyx destructor* and *Pristiphora laricis* in Great Britain.

276 Knowlton, G. A. 1937. Strawberry leaf roller parasites. J. Econ. Entomol. 30:379-380.

During 1935, a study was made of the parasites attacking two species of strawberry leaf rollers in northern Utah. Among the parasites reared from *Ancylis comptana fragariae* was *Catolaccus aeneoviridis*, a species which attacks the larch casebearer also.

277 Knowlton, G. F., and Allen, M. W. 1937. Oblique-banded leaf roller, a dewberry pest in Utah. J. Econ. Entomol. 30:780-785.

The biology and control of the leaf roller, *Cacoecia rosaceana*, are discussed. *Catolaccus aeneoviridis* is a hyperparasite of the leaf roller. It also attacks the larch casebearer.

278 Knowlton, G. F., and Harmstron, F. C. 1939. Some entomophagus Utah Hymenoptera. Proc. Utah Acad. Sci. Arts Lett. 16:59-63.

Locations and hosts of several hymenopterous parasites in Utah are listed. Five of the species listed are parasites of the larch casebearer. *Epiurus bicoloripes* Ashm. and *Spilochalcis albifrons* Walsh were reared from the strawberry leafroller, *Ancylis comptana*. *Catolaccus aeneoviridis* Gir. was recovered from both the strawberry leafroller and oblique banded leafroller. *Hemiteles tenellus* (Say) is a secondary parasite of many important primary parasites in this area. No host was listed for *Microbracon melanaspis* (Ashm.).

279 Koot, H. P., and Garbutt, R. 1983. Forest insect and disease conditions Nelson forest region 1982. Can. For. Serv., Pac. For. Res. Con., Victoria, B. C., V821M5, p.20.

Discusses defoliation by larch casebearer in Canadian Nelson Forest Regions. Parasitism by *Chrysocharis laricinellae* declined but that by *Dicladocerus* sp. seemed to increase in 1981.

280 Kraemer, M. E., and Coppel, H. C. 1979. The parasitoids of the European pine sawfly *Neodiprion sertifer* (Hymenoptera: Diprionidae) in Wisconsin, with keys to adults and larval remains. Trans. Wisc. Acad. Sci. Arts Lett. 66:91-112.

Thirteen species of hymenopterous parasitoids have been reared from *N. sertifer* in Wisconsin. Two illustrated keys based on the adults and remains left in the host cocoon have been prepared to aid in the separation of these parasitoids. Brief notes on the biology of each species are also presented. The larch casebearer is a cohost for three of these. *Eupelmella vesicularis* is primary on *N. sertifer* and is a hyperparasite through *Dahlbominus fuscipennis* and *Habrocytus thyridopterigis*. *Dibrachys cavus* is a gregarious cocoon parasite as well as being a hyperparasite. *H. thyridopterigis* is also a gregarious cocoon parasite, but may occur as a primary, hyper- or multi- parasitoid.

281 Krombein, K. V. 1958. Hymenoptera of America north of Mexico synoptic catalogue. USDA Agric. Monog. 2, First Suppl., 305p.

This first supplement to Muesbeck and Krombein (1951) contains information concerning errors and ommissions, extensions of geographic range, new hosts, prey or flower-feeding records, changes in synonymy and additional citations. Changes in synonymy or new hosts are recorded for 15 species which parasitize the larch casebearer: *Agathis binominata* Mues., *A. cincta* (Cresson), *A. pumila* Ratz., *Bracon gelechiae* Ash., *B. juncicola* Ash., *B. pygmaeus* Prov., *Scambus brevicornis* (Grv.), *S. hispae* (Harris), *Pimpla turionellae* (L.), *Itoplectis maculator* (Fab.), *I. 4-cingulatus* (Prov.), *Campoplex mellipes* (Prov.), *Sympiesis guttatipennis* Gir., *Pachyneuron altiscutum* How. and *Catolaccus aeneoviridis* (Gir.).

282 Krombein, K. V., Hurd, P. D., Smith, D. R., and Burks, B. D. 1979. Catalog of Hymenoptera in America North of Mexico. Volume 1, Symphyta and Apocrita (Parasitica). Smithsonian Inst. Press, Washington, D. C., 1198p.

The catalog contains host lists as well as references to synonyms, revisions, taxonomy, biology, and morphology. Included are 63 species of parasites that attack the larch casebearer: *Achrysocharella fullawayi* (Crawford), *A. silvia* Girault, *Agathis binominata* Mues., *A. cincta* (Cresson), *A. coleophorae* (Rohwer), *A. pumila* (Ratz.), *Apanteles laricellae* Mason, *A. scitulus* Riley, *Bracon gelechiae* Ash., *B. juncicola* Ash., *B. pygmaeus*, Prov., *Campoplex mellipes* (Prov.), *Catolaccus aeneoviridis* Girault, *Chrysocharis laricinellae* (Ratz.), *Cirrospilus pictus* (Nees), *Coccygomimus turionellae turionellae* (L.), *Closterocerus trifasciatus* West., *Copidosoma truncatellum* (Dalman), *Cyrtogaster vulgaris* Walk., *Diadegma laricinellum* (Strobl.), *Dibrachys cavus* (Walk.), *Dicladocerus westwoodii* West., *Elachertus aeneoniger* Girault, *Elachertus proteoteratis* How., *Euderus albitarsis* (Zett.), *E. cushmani* (Crawford), *E. subopacus* (Gahan), *Eulophus magnisulcatus* Gir., *Eupelmella vesicularis* (Ratz.), *Euplectrus mellipes* Prov., *Gelis cushmani* Carlson, *G. obscurus* (Cresson), *G. tenellus* (Say), *Habrocytus phycidis* Ash., *H. thyridopterigis* How., *Haltichella xanticles* Walk., *Horismenus microgaster* (Ash.), *Itoplectis evetriae* Vier., *I. maculator* (Fab.), *I. quadricingulata* (Prov.), *I. vesca* Townes, *Lissonota parva* (Cresson), *Mesopolobus subfumatus* (Ratz.), *Microgaster tibialis* Nees, *Orgilus coleophorae* Mues., *Pachyneuron altiscutum* Cook, *Phaeogenes epinotiae* Cush., *Scambus brevicornis* Grv., *S. decorus* Walley, *S. detrita* Hgn., *S. hispae* (Harris), *S. transgressus* (Holmgreen), *Sceptrothelys deione* (Walker), *Spilochalcis albifrons* (Walsh), *S. leptis* Burks, *S. side* (Walker), *Sympiesis stigmatipennis* Girault, *Telenomus ovivorus* (Ash.), *Tetrastichus coerulescens* Ash., *T. dolosus* Gahan, *T. ecus* (Walk.), *Trissolcus euschisti* Ash., and *Zagrammosoma americana* Girault.

283 Kulman, H. M. 1965. Natural control of the eastern tent caterpillar and notes on its status as a forest pest. J. Econ. Entomol. 58:66-70.

Four species of larch casebearer parasites were recovered from the eastern tent caterpillar, *Malacosoma americana*. *Scambus hispae* is a primary pupal parasite of *M. americana*, while *Gelis tenellus*, *Dibrachys cavus*, and *Habrocytus thyridopterigis* were recovered as hyperparasites. *G. tenellus* was acknowledged as an important hyperparasite, attacking the larval parasites *Hyposoter fugitivus* and *Phobocampe clisiocampae*.

284 Kusevska, M. 1977. Morphological characteristics of *Dibrachys fuscicornis* Walk. (Hym., Pteromalidae) and its activity in relation to *Euproctis chrysorrhoea* L. (Lep., Lymantriidae). Fragm. Balc. Mus. Macedonici Sci. Nat. 10:45-56.

The brown tail moth, *E. chrysorrhoea*, is an economic pest causing defoliation in Yugoslavia. *Dibrachys boucheanus* Ratz., confirmed to be a synonym for *D. cavus* is the only parasite and hyperparasite of *E. chrysorrhoea* from this genus. An extensive comparison of the morphology of *D. fuscicornis* and *D. cavus* is presented. *D. cavus* is also a parasite in the larch casebearer complex.

285 Lange, W. H., Sciaroni, R. H., and Greathead, A. S. 1954. Artichoke plume moth damage. Calif. Agric. 8:7, 8 and 12.

Dibrachys cavus and a *Gelis* sp. are secondary parasites of the artichoke plume moth, *Platyptilia carduidactyla*. They attack the ichneumonid, *Angitia platyptiliae*, thus reducing its' effectiveness against the artichoke moth. *D. cavus* is also a member of the larch casebearer parasite complex.

286 Langford, G. S. 1937. Biology and control of the juniper webworm in Maryland. J. Econ. Entomol. 30:320-323.

A brief summary of the biology, natural enemies, and use of insecticides, against the juniper webworm, *Dichomeris marginella(us)*, is given. Among the parasites attacking the webworm are two species which have been recovered from the larch casebearer. *Horismenus microgaster* emerged from webworm larvae while *Dibrachys cavus* was reared from pupae. It was not determined whether these species are primary or secondary parasites of the juniper webworm.

287 Langston, R. L. 1957. A synopsis of hymenopterous parasites of *Malacosoma* in California. Calif. Univ. Publs. Entomol. 14:1-49.

The biologies and cohosts of primary and secondary parasites of various *Malacosoma* species are discussed. Four species which parasitize the larch casebearer were recorded as secondary parasites of *Malacosoma* spp. The most important hyperparasite was *Dibrachys cavus*, reared from most of the primary parasites of *Malacosoma*. It is gregarious, has several generations annually, and has so many alternate hosts that it can be present in extensive areas without depending upon the parasites of tent caterpillars to complete its yearly cycle. *Gelis tenellus*, *Habrocytus phycidis*, and *H. thyridopterigis* were also recovered as secondary parasites of *Malacosoma*.

288 Laplante, J. P. 1967. Clef des parasites Hymenopteres adultes de *Pulicalvaria piceaella* (Kearfott), (Lepidoptera: Gelechiidae) du Quebec. (Key of the adult parasites of *Pulicalvaria piceaella* (Kearfott), (Lepidoptera: Gelechiidae) in Quebec.) Ann. Soc. Entomol. Quebec. 12:137-165.

A key for the identification of 37 species of parasites recovered during the years 1943 to 1960 from *Pulicalvaria piceaella* (Kft.), a spruce defoliator in Quebec. Included are at least 11 species which attack the larch casebearer as an alternate host: *Spilochalcis albifrons*, *Dicladocerus westwoodii*, *Euderus cushmani*, *Sympiesis guttatipennis*, *Bracon gelechiae*, *Agathis binominata*, *Itoplectis vesca*, *Phaeogenes epinotiae*, *Campoplex rufipes*, *Scambus decorus* and *Pimplopterus parvus*.

289 Lashomb, J., Steinhauer, A. L., and Dively, G. 1980. Comparison of parasitism and infestation of Nantucket pine tip moth in different aged stands of loblolly pine. Environ. Entomol. 9:397-402.

Parasite communities in stands of different ages were classified as colonizing, intermediate (in age of establishment), and older. Percent parasitism in the three communities was similar for all stands. Percent

parasitism roughly corresponded to population reduction in the following generation of the Nantucket pine tip moth, *Rhyacionia frustrana*. Three of the parasites reared from the tip moth also attack the larch casebearer. *Bracon gelechiae* and *Euderus subopacus* are primary parasites of the tip moth while *Habrocytus phycidis* is a hyperparasite.

290 Legner, E. F. 1962. Some biotic control factors affecting the eye-spotted bud moth, and red-banded and fruit-tree leaf rollers in Wisconsin. Proc. Entomol. Soc. Am., North Cent. Br. 17:115-117.

The biotic control factors affecting three economically important insect pests were studied as an initial step to an integrated control program in Wisconsin. Of the parasites recovered, three species have also been recorded from the larch casebearer. *Habrocytus phycidis* was an abundant parasite of the eye-spotted bud moth, *Spilonota ocellana*. *Gelis* sp. (probably near *tenellus*) and *Dibrachys cavus* attacked this pest in lower numbers.

291 Legner, E. F., and Medved, R. A. 1979. Influence of parasitic Hymenoptera on the regulation of pink bollworm, *Pectinophora gossypiella*, on cotton in the lower Colorado desert. Environ. Entomol. 8:922-930.

Bracon gelechiae, a parasite of the larch casebearer, was one of 14 imported parasitic Hymenoptera introduced against the pink bollworm, *Pectinophora gossypiella*. The importation of *B. gelechiae* failed, reportedly due to intensive pesticide treatment and low winter temperatures.

292 Legner, E. F., and Oatman, E. R. 1963. Natural biotic control factors of the eye-spotted bud moth, *Spilonota ocellana*, on apple in Wisconsin. J. Econ. Entomol. 56:730-732.

Nine parasites, three predators, and four pathogens were involved in the natural control of *S. ocellana*. Two of the parasite species attacking the eye-spotted bud moth have also been recovered from rearings of the larch casebearer. *Habrocytus phycidis* was the second most numerous species parasitizing *S. ocellana*. *Dibrachys cavus* was only recovered from dead eye-spotted bud moth pupae.

293 Leius, K. 1967. Influence of wild flowers on parasitism of tent caterpillar and codling moth. Can. Entomol. 99:444-446.

Surveys in unsprayed orchards showed that the wild flowers that are food sources for adult parasites influence the extent to which host Lepidoptera are parasitized. Proportionately about 18 times as many tent caterpillar pupae were parasitized in orchards with rich undergrowths of wild flowers as in orchards with poor floral undergrowths. The corresponding figures for tent caterpillar egg parasitism were about 4 to 1 and for codling moth larvae about 5 to 1. Orchards with average undergrowths of wild flowers produced intermediate figures. (Author) One of the parasites of tent caterpillar larvae, *Malacosoma americana*, was *Scambus hispae*, a species which also attacks the larch casebearer.

294 LeRoux, E. J. 1971. Biological control attempts on pome fruit (apple and pear) in North America, 1860-1970. Can. Entomol. 103:963-974.

Biological control attempts on pome fruit are summarized and reviewed. In only two cases could claims of success be supported; one of these is the control of the pistol casebearer, *Coleophora serratella*. *Epilampsis laricinellae* was originally introduced in Quebec against the larch casebearer but migrated to *C. serratella* on apple trees and is now exerting effective control over this orchard pest.

295 LeRoux, E. J., Paradis, R. O., and Hudon, M. 1963. Major mortality factors in the population dynamics of the eye-spotted bud moth, the pistol casebearer, the fruit-tree leaf roller, and the European corn borer in Quebec. Mem. Entomol. Soc. Can. 32:67-82.

Life table analysis revealed that fluctuations in the winter larval stage of the pistol casebearer, *Coleophora serratella*, has the greatest effect on population increases and decreases. The primary factors responsible for mortality of winter larvae were the parasite *Epilampsis laricinellae* and birds. *E. laricinellae* can successfully attack and develop on all larval stages of the pistol casebearer. Since its introduction against the larch casebearer in 1943, *E. laricinellae* has been recovered from eight species of apple pests other than the pistol casebearer.

296 Lewis, K. R., Kulman, H. M., and Heikkenen, H. J. 1970. Parasites of the Nantucket pine tip moth in Virginia with notes on ecological relationships. J. Econ. Entomol. 63:1135-1139.

The abundance and vertical distribution of parasites in plantations of loblolly and shortleaf pine were studied. Five of the parasites reared from the Nantucket pine tip moth, *Rhyacionia frustrana*, are also in the larch casebearer parasite complex. Of these, *Bracon gelechiae* was one of the most abundant parasite species reared from moth-infested loblolly pine. It was markedly more abundant during the first tip moth generation. *Habrocytus thyridopterigis* was more abundant in the lower crown levels. The other parasite species which attack both the casebearer and tip moth are, *Agathis binominata*, *Tetrastichus coerulescens*, and *Scambus hispae*.

297 Lingren, P. D. 1977. *Campoletis sonorensis*: Maintenance of a population on tobacco budworms in a field cage. Environ. Entomol. 6:72-76.

A large drop in the population of *Campoletis sonorensis*, a parasite of the tobacco budworm, *Heliothis virescens*, was caused by the hyperparasites *Catolaccus aeneoviridis* and *Ceratosmicra immaculata*, and the predator, *Collops vittatus*. *Catolaccus aeneoviridis* is also part of the larch casebearer parasite complex.

298 Linnaeus, C. 1758. Systema Naturae. Holmiae, Impensis Direct, Laurentii Salvii, 10th edition, 824p.

Provides a description of *Ichneumon turionellae*, a parasite of the larch casebearer.

299 Lintner, J. A. 1898. The report of the entomologist. Rept. New York State Mus. 50:210-211.

Records *Ceucania unipuncta* and *Gelis minimus* as hosts of *Spilochalcis albifrons*, a native parasite of the larch casebearer.

300 Lloyd, D. C. 1944. A study of the codling moth and its parasites in California. Sci. Agric. 24:456-473.

The larch casebearer parasite, *Dibrachys cavus*, attacked a small percentage of codling moth, *Laspeyresia pomonella*, larvae in California. It has also been recovered from the codling moth in Colorado and New Mexico.

301 Long, G. E. 1977. Spatial dispersion in a biological control model for larch casebearer (*Coleophora laricella*). Environ. Entomol. 6:843-852.

Discusses the use of interaction, random dispersal and parasite-host models for the larch casebearer and its parasite *Agathis pumila*. The use of random-walk models allows a comparison of net reproductive and dispersal rates for the larch casebearer and *A. pumila*. The model shows that in some areas, *A. pumila* has a faster rate of reproduction than the larch casebearer. The larch casebearer has a higher dispersal rate so multiple-site releases of *A. pumila* are necessary to gain more effective control over large areas.

302 Loos, C. 1892. Einige Beobachtungen uber *Coleophora laricella* Hbn. auf dem Schluckenauer Domanengebiete. (Some observations on *Coleophora laricella* in the Schluckenauer Domanen region.) Centralbl. ges. Forstwes. 18:423-431.

A general treatment of the biology of the larch casebearer. Parasites were recognized by a round hole in the case. Describes the spread of the infestation from observations made in 1891-1892.

303 Luck, R. F. 1976. Bionomics and parasites of a needle miner *Coleotechnites* sp. infesting Jeffrey pine in southern California. Environ. Entomol. 5:937-942.

Biology of the needleminer and seven hymenopterous parasites associated with it in California are discussed. *Spilochalcis side*, a parasite of the larch casebearer, was recovered as a primary parasite of *Coleotechnites*.

304 Lyle, G. T. 1920. Contributions to our knowledge of the British Braconidae - No. 5, Sigalphidae. Entomologist 53:56-60.

The casebearer parasite *Tetrastichus ecus* Wlk. is recorded as a primary parasite of *Rhynchaenus alni* L. in England.

305 Lyons, L. A. 1957. Insects affecting seed production in red pine. II. *Dioryctria disclusa* Heinrich, *D. abietella* (D. and S.), and *D. cambiicola* (Dyar) (Lepidoptera: Phycitidae). Can. Entomol. 89:70-79.

Describes the seasonal history and habits of three borers of the genus *Dioryctria* that destroy red pine cones in Ontario. *Dibrachys cavus* (Wlkr.), a parasite of the larch casebearer, commonly parasitizes the pupal stage of *Dioryctria disclusa*. Superparasitism occurs frequently, with the adults emerging from *D. disclusa* pupae in late summer.

306 Marlatt, C. L. 1933. Report of the Chief of the Bureau of Entomology, 1933. USDA Ann. Rep. Dept. Agric., 47p.

Three species of parasites from Austria were released against the larch casebearer. A small number of two unnamed species were liberated. A substantial number of the parasite, *Chrysocharis laricinellae*, were introduced in Maine, New York, and Massachusetts.

307 Marose, G. A. 1967. Biological control of the larch casebearer. USDA For. Serv., Div. State and Priv. For., Northern Region, 6p. (unpubl.)

Describes the establishment of a biological control program against the larch casebearer in Montana and Idaho. Importation of the parasite *Agathis pumila* from the eastern United States began in 1960. Beginning in 1967, replanting stock of *A. pumila* was released in other areas of casebearer infestation.

308 Marsh, F. L. 1936. Egg placing by *Dibrachys boucheanus* Ratzburg. Can. Entomol. 68:215-216.

Dibrachys boucheanus commonly occurred as a secondary parasite of *Samia cecropia* through the ichneumon *Spilocryptus extrematus*. The placing of eggs by *D. boucheanus* was observed and described in detail. The female *D. boucheanus* is not specific in her choice of host which explains the cosmopolitan nature of this chalcid. In addition, the reproductive capability of this parasite is high, due both to the number of eggs a female can lay and to the short time needed for a generation to develop. The only natural food that *D. boucheanus* was observed to take was the sap of boxelder trees. *D. boucheanus* has been recovered as a parasite of the larch casebearer.

309 Marsh, F. L. 1937. Ecological observations upon the enemies of cecropia with particular reference to its hymenopterous parasites. Ecology 18:106-112.

Studies the feeding relationships existing between *Samia cecropia* larvae, and its parasite complex on host trees. Two hymenopterous species, *Hemiteles tenellus* and *Dibrachys boucheanus* are members of both the *S. cecropia* and larch casebearer parasite communities. Both parasites are secondary in *S. cecropia* through *Spilocryptus extrematis*. *D. boucheanus* also occurs as an accidental tertiary parasite, attacking *S. extrematis* through *Aenoplex smithii*.

310 Martin, J. L. 1959. The bionomics of the pine bud moth *Exoteleia dodecella* L. (Lepidoptera: Gelechiidae), in Ontario. Can. Entomol. 91:5-14.

The distribution, life history and host relationships of *E. dodecella* are discussed. Parasitism by hymenopterous insects was found to destroy about 50 percent of the larval population in some areas. Of the seven identified pine bud moth parasites, four also attack the larch casebearer: *Scambus hispae*, *Campoplex rufipes*, *Habrocytus phycidis*, and *Pimplopterus parvus*.

311 Mason, W. R. M. 1959. Some new Braconidae (Hymenoptera). Can. Entomol. 91:42-50.

Five new species of Braconidae are described to make names available for publications by economic entomologists. Among them is *Apanteles laricellae* which has been reared from the larch casebearer and the terminal twig borer, *Argyresthia laricella*.

312 Mason, W. R. M. 1978. Ichneumonoid parasites: Hymenoptera accidentally introduced into Canada. Can. Entomol. 110:603-608.

Gelis areator (Panzer), a parasite of the larch casebearer, is recognized as an unreported introduced species. It is parthenogenetic and widespread. It is believed to have been introduced into North America in the 18th or early 19th century. *G. areator* is adaptable to an exceptionally wide range of hosts making establishment comparatively easy.

313 Mathers, W. G. 1932. The spruce budworm in British Columbia. For. Chron. 8:154-157.

Parasites have undoubtedly played an important part in the suppression of various outbreaks of the western spruce budworm, *Choristoneura occidentalis*. Their effectiveness has been through the combined activities of a number of different species rather than the work of one or two parasites. Three hymenopterous parasites, *Phytodietus fumiferanae*, *Ephialtes obesus*, and *Epiurus innominatus*, unknown in the east, have been recovered in British Columbia. *E. obesus* was widespread but not numerous. *Epiurus innominatus* is of doubtful status; observations indicate that it may possibly be a hyperparasite. *E. obesus* and *E. innominatus* have been found as parasites of the larch casebearer.

314 McConnell, H. S. 1928. The oriental fruit moth. In: Insect Investigations. Md. Agric. Exp. Stn. Bull. 298, p.179-180.

Epiurus indagator was recovered in large numbers from the oriental fruit moth, *Grapholitha molesta* (as *Laspeyresia*), in western Maryland. It has been reared from overwintering larvae of the fruit moth. *E. indagator* is also a member of the larch casebearer parasite complex.

315 McConnell, H. S. 1932. Oriental fruit moth parasites in Maryland. J. Econ. Entomol. 25:367-370.

Lists the oriental fruit moth, *Grapholitha molesta* (as *Laspeyresia*), parasites recorded by Maryland experiment station workers, with notes on their relative importance and distribution in the state. *Microbracon gelechiae* is a larval parasite and *Dibrachys boucheanus* a hyperparasite of the fruit moth. Both of these species have been recovered from the larch casebearer.

316 McConnell, W. R. 1918. *Eupelminus saltator* Lindm. as a parasite of the Hessian fly. J. Econ. Entomol. 11:168-175.

The distribution, host list, morphology, and bionomics of *Eupelminus saltator* as a parasite of the Hessian fly, *Mayetiola destructor* are discussed. Besides being a parasite of the larch casebearer and the Hessian fly, *E. saltator* has also been reared from eight species of *Harmolita*.

317 McGough, J. M., and Noble, L. W. 1957. Summary of work at Brownsville, Texas, with imported pink bollworm parasites and an aphid predation. J. Econ. Entomol. 50:514.

None of five species of parasites imported from India from 1953-1955 against the pink bollworm, *Pectinophora gossypiella*, have become established. The failure of these parasites to maintain themselves was due to the extensive use of insecticides and the cultural-control program directed against the pink bollworm. *Bracon gelechiae* one of the imported bollworm parasites, has been recovered from the larch casebearer.

318 McGugan, B. M., and Coppel, H. C. 1962. Larch casebearer, *Coleophora laricella* (Hbn) (Coleophoridae). In: A Review of the Biological Control Attempts Against Insects and Weeds in Canada, Part II-Biological control of forest insects 1910-1958. Commonw. Inst. Biol. Control Tech. Commun. 2:79-83.

Reports the European origins of five introduced casebearer parasites and their release and establishment in eastern Canada between 1931 and 1939. The species liberated were: *Dicladocerus westwoodii*, *Horogenes nana*, *Agathis pumila*, *Epilampsis laricinellae*, and *Cirrospilus pictus*.

319 McKnight M. E. 1974. Parasitoids of the western spruce budworm in Colorado. Environ. Entomol. 3:186-187.

Four of the parasitoids reared from the western spruce budworm, *Choristoneura occidentalis*, have also been recovered from the larch casebearer. *Itoplectis quadricingulatus*, *I. vesca* and *Scambus hispae* are primary parasites of the budworm, while *Gelis tenellus* is a secondary species.

320 McLeod, J. H. 1951. Notes on the lodgepole needle miner, *Recurvaria milleri* Busck (Lepidoptera: Gelechiidae), and its parasites in western North America. Can. Entomol. 83:295-301.

There are numerous species of parasites present throughout the distribution of the lodgepole needle miner in the western U. S. One of the most important is *Zagrammosoma americana*, a parasite which also attacks the larch casebearer. *Z. americana* was recovered from the needle miner in California, Idaho, and Alberta. It emerged from host larvae and was a hyperparasite of *Copidosoma nanellae*. All adults recovered as secondary parasites were males.

321 McLeod, J. H. 1954. Status of some introduced parasites and their hosts in British Columbia. Proc. Entomol. Soc. B. C. 50:19-27.

An evaluation of 11 biological control projects reports that introduced parasites have achieved commercial control of five pest species. Two species in the larch casebearer parasite complex, *Dibrachys cavus* and *Gelis tenellus* were secondary parasites on introduced parasites of the satin moth, *Stilpnotia salicis*. These secondary parasites were not abundant enough to affect the success of the control project.

322 McNeil, J. N., and Brooks, W. M. 1974. Interactions of the hyperparasitoids *Catolaccus aeneoviridis* (Hym.: Pteromalidae) and *Spilochalcis side* (Hym.: Chalcididae) with the microsporidians *Nosema heliothidis* and *N. campoletidis*. Entomophaga 19:195-204.

Infection of the hyperparasites by the two microsporidians was not detrimental to their development or adult longevity. The hyperparasites are part of the larch casebearer complex.

323 McNeil, J. N., and Rabb, R. L. 1973. Life histories and seasonal biology of four hyperparasites of the tobacco hornworm, *Manduca sexta* (Lepidoptera: Sphingidae). Can. Entomol. 105:1041-1052.

Hypopteromalus tobacum, *Catolaccus aeneoviridis*, *Spilochalcis side*, and *Tetrastichus coerulescens* were reared as hyperparasites of the tobacco hornworm, attacking the primary parasite, *Apanteles congregatus*. All but *H. tobacum* are also part of the larch casebearer parasite complex. The life history of each species was studied and the distinctive features of egg, last larval instar, and pupal stage were described. In 1969 through 1972 parasitization by *A. congregatus* started at low levels in June or July but increased to nearly 100% by the end of September. A corresponding increase in the incidence of hyperparasitism was observed but never exceeded 85%. A number of possible alternate hosts for the hyperparasites were investigated.

324 McNeil, J. N., and Rabb, R. L. 1973. Physical and physiological factors in diapause initiation of two hyperparasites of the tobacco hornworm, *Manduca sexta*. J. Insect Physiol. 19:2107-2118.

Catolaccus aeneoviridis diapauses as a non-pharate pupa within cocoons of the primary hornworm parasite, *Apanteles congregatus*. *C. aeneoviridis* entered diapause more frequently when *A. congregatus* was also in diapause. The effect of photoperiod, temperature, maternal age, and physiological state of the host on the initiation of diapause was tested. *C. aeneoviridis* is also a parasite of the larch casebearer.

325 Mertins, J. W., and Coppel, H. C. 1971. The insect parasites of the introduced pine sawfly *Diprion similis* (Hartig) (Hymenoptera: Diprionidae) in Wisconsin, with keys to the adults and mature larval remains. Trans. Wisc. Acad. Sci. Arts Lett. 59:127-168.

Keys, descriptions, and biological notes on 21 hymenopterous pine sawfly parasites are provided. Seven of these species also attack the larch casebearer: *Scambus hispae*, *Gelis tenellus*, *Tetrastichus*

coerulescens, *Eupelmella vesicularis*, *Dibrachys cavus*, *Habrocytus thyridopterigis* and *Spilochalcis albifrons*. Instances of hyper-, super- and multiparasitism are discussed.

326 Metcalf, C. L., Flint, W. P., and Metcalf, R. L. 1962. Destructive and Useful Insects. McGraw-Hill Book Co., New York., 1087p.

Records *Coleophora malivorella*, the pistol casebearer, as a host of *Spilochalcis albifrons*, a native parasite of the larch casebearer.

327 Miller, G. E., and Finlayson, T. 1974. Native parasites of the larch casebearer, *Coleophora laricella* (Lepidoptera: Coleophoridae), in the west Kootenay area of British Columbia. J. Entomol. Soc. B. C. 71:14-21.

Thirty-two species of parasites and hyperparasites were reared in 1973 from eight locations. The most abundant and wide spread species in the collection were the *Dicladocerus* spp. complex, *Spilochalcis albifrons*, and *Bracon pygmaeus*. Other species collected were: *Acrolyta* sp., *Hyposoter* sp., *Melittobia* sp., *Diglyphus* sp., *Cyrtogaster vulgaris*, *Anaphes* sp., *Itoplectis vesca*, *Eulophus* sp., *Euderus cushmani*, *Elachertus proteoteratis*, *Cirrospilus pictus*, *Chrysocharis laricinellae*, *Telenomus* spp., *Trissolcus* sp., *Pristomerus* sp., *Tetrastichus dolosus*, *T. ecus*, *Achrysocharella* sp., *Zagramosoma americana*, *Habrocytus phycidis*, *Catolaccus aeneoviridis*, *Gelis tenellus*, *Mesopolobus* sp., and *Scambus decorus*. Variations in parasitism between the different plots could not be explained on the basis of host density. Since the parasites must have transferred to the larch casebearer from other hosts in the area, the most likely cause of variation in species numbers and densities is the extent of occurrence of alternate hosts at each site.

328 Miller, G. E., and Finlayson, T. 1977. Distribution of *Coleophora laricella* (Lepidoptera: Coleophoridae) and its major parasites in the crowns of western larch in British Columbia. J. Entomol. Soc. B. C. 74:10-15.

The distribution of *Coleophora laricella* (Hbn.) and its parasites *Dicladocerus* spp. (*D. nearcticus* Yosh. and *D. pacificus* Yosh. (Yoshimoto 1976)) and *Spilochalcis albifrons* (Walsh) in the crowns of western larch were determined for five classes of trees. In open-grown trees more than 7.6 m high, *C. laricella* densities were greater at 1.5-3.1 m than at 6.1-7.6 m above the ground, on the sunny side of a tree than on the shaded side, and on the outer half than on the inner half of a branch. In open-grown trees 3.0-4.6 m high and in trees forming a closed canopy, only the outer branch halves had significantly greater densities. The only significant variation in parasitism by *Dicladocerus* spp. occurred between branch halves in open-grown, non-roadside trees more than 7.6 m high, with more parasitism on the inner halves than the outer. Parasitism by *S. albifrons* was significantly greater at the lower crown level than at the higher in open-grown, closed-canopy, non-roadside trees that were more than 7.6 m high, and on the outer branch half than on the inner half in the same category of tree. (Author) The distribution of *Dicladocerus* spp. and *S. albifrons* within trees probably reduces competition for casebearers between these species in open grown trees. The differences in distribution of both *C. laricella* and its parasites between crown classes must be considered when measuring casebearer populations or parasitism.

329 Miller, G. E., and Finlayson, T. 1977. Parasites of the larch casebearer, *Coleophora laricella* (Lepidoptera: Coleophoridae) in the west Kootenay area, British Columbia. J. Entomol. Soc. B.C. 74: 16-22.

An investigation of the parasite complex of the larch casebearer produced 29 confirmed species of hymenopterous parasites from collections

in 1973 and 1974. No parasites were obtained from eggs, needlemining larvae or third instar casebearing larvae. The highest total percentage parasitism was 17.7 percent in 1973 and 24.5 percent in 1974. *Dicladocerus* spp. and *Spilochalcis albifrons* were by far the most abundant and widespread species collected. *Agathis pumila* was conspicuous by its absence in the survey, as it was released in British Columbia in 1969 and has since become established. *Spilochalcis albifrons* must be dependent on alternate hosts as very few females emerged from casebearer pupae in the study. The other parasites recovered were: *Bracon pygmaeus*, *Campoplex rufipes*, *Diadegma* sp., *Gelis tenellus*, *G.* sp., *Itoplectis vesca*, *Pristomerus* sp., *Scambus decorus*, *Achrysocharella* sp., *Chrysocharis laricinellae*, *Cirrospilus pictus*, *Elachertus proteoteratis*, *Euderus cushmani*, *Eulophus* sp., *Tetrastichus dolosus*, *T. ecus*, *Zagrammosoma americana*, *Copidosoma* sp., *Catolaccus aeneoviridis*, *Habrocytus phycidis*, *Mesopolobus* sp., *Eurytoma* sp., *Telenomus* sp., and *Trissolcus* sp.

330 Miller, P. F. 1973. The biology of some *Phyllonorycter* species (Lepidoptera: Gracillaridae) mining leaves of oak and beech. J. Nat. Hist. 7:391-409.

Fifteen species of hymenopterous parasites were reared from *Phyllonorycter* on oak and eight on beech. Among these, two species also use the larch casebearer as a host. *Tetrastichus ecus* was the most common first generation parasite of *Phyllonorycter*, while *Cirrospilus vittatus* figured prominently in the second generation parasite complex. Both of these species occasionally were superparasitic.

331 Miller, W. E., and Neiswander, R. B. 1955. Biology and control of the European pine shoot moth. Ohio Agric. Exp. Stn. Res. Bull. No. 760, 31p.

The bionomics and chemical control of European pine shoot moth, *Rhyacionia buoliana*, are discussed. Two parasite associations were distinguished, a summer complex, attacking young larvae and a spring group which parasitized older larvae and pupae. Four of the species in the spring complex are also parasites of the larch casebearer. These species, *Bracon gelechiae*, *Dibrachys cavus*, *Scambus hispae*, and *Habrocytus thyridopterigis* have not been directly observed to have developed from the shoot moth.

332 Mook, J. H., and Haeck, J. 1965. Dispersal of *Pieris brassicae* L. (Lepidoptera, Pieridae) and of its primary and secondary hymenopterous parasites in a newly reclaimed polder of the former Zunderzee. Arch. Neerl. Zool. 16:293-312.

Two larch casebearer parasites, *Hemiteles areator* and *Dibrachys cavus* also attack *P. brassicae* in the Netherlands. *D. cavus* was always much more numerous in the greenhouse than in the field environment.

333 Morley, C. 1936. Notes on Braconidae: XV. Microgasterinae. Entomologist 69:209-215.

The larch casebearer parasite, *Microgaster tibialis* Nees., is one of the species discussed. It is abundant in Europe during June and July. The author has collected *M. tibialis* from oak boughs and has seen it on *Angelica* flowers.

334 Morris, E., and Monts, J. 1972. Larch casebearer infestations, Nelson forest district 1972. Can. For. Serv., Pac. For. Res. Cent., For. Ins. and Dis. Survey, Pest Rept., 1p.

One hundred casebearer pupae were collected at each of two 1969 *Agathis pumila* release sites in British Columbia. Three specimens of *A. pumila* were recovered from one site and seven from the other.

335 Morris, K. R. S. 1938. *Eupelmella vesicularis* Ratz. (Chalcididae) as a predator of another chalcid, *Microplectron fuscipennis* Zett. Parasitology 30:20-32.

Eupelmella vesicularis, a parasite of the larch casebearer, was reared from cocoons of *Diprion sertifer* which were already parasitized by the primary parasite *Microplectron fuscipennis*. Several biological factors make *E. vesicularis* a serious threat to the efficiency of *M. fuscipennis* as a control agent.

336 Morris, K. R. S., Cameron, E., and Jepson, W. F. 1937. The insect parasites of the spruce sawfly (*Diprion polytomum*, Htg.) in Europe. Bull. Entomol. Res. 28:341-393.

Contains a key to the adults and larvae as well as information on the cohosts, morphology, and biology of 13 species of spruce sawfly parasites. Three of these species have also been recovered from the larch casebearer. While *Itoplectis alternans* is exclusively a primary parasite of *D. polytomum*, *Hemiteles areator* and *Dibrachys cavus* attack this host as both primary and secondary parasites.

337 Morris, R. F. 1976. Hyperparasitism in populations of *Hyphantria cunea*. Can. Entomol. 108:685-688.

Four of the parasite species attacking *Hyphantria cunea* were exposed to attack by five species of hyperparasites. These hyperparasites have features in common: they are general rather than specific in their host selection; all attack the cocoon stage of the webworm parasites; develop rapidly; produce adults in August and September; and probably attack alternate hosts before winter. Since no webworm parasite cocoons are available until August, it is also probable that these hyperparasites have earlier generations in other species. One of these secondary parasites, *Gelis tenellus*, is found as a part of the larch casebearer parasite complex.

338 Mumma, R. O., and Zettle, A. S. 1977. Larval and pupal parasites of the oak leaf-roller, *Archips semiferanus*. Environ. Entomol. 6:601-605.

Parasitism of *Archips semiferanus* larvae was mainly due to dipteran parasites; attack by hymenopterans was low during this stage. Pupal parasitism is the reverse, with hymenopterous parasitism playing the major role. Twenty-two parasites were recovered from larval and pupal samples. *Scambus hispae*, a parasite of the larch casebearer, was recovered as a larval parasite of the oak leaf roller.

339 Munroe, E. G. 1971. Status and potential of biological control in Canada. In: Biological Control Progammes Against Insects and Weeds in Canada 1959-1968. Commonw. Inst. Biol. Control Tech. Commun. 4:213-255.

Provides an intensive evaluation of biological control technology and examines 11 theses or 'principles' of biological control which have been proposed by various authors. Describes in considerable detail biological control attempts in Canada and concludes that biological control is a practical and desireable approach to control of many pest species. Ten recommendations to further the use of, and improve methodologies, are given. In the synopsis of the biological control programs in Canada, the release of parasites against the larch casebearer is rated as a success.

340 Muesebeck, C. F. W. and Dohanian, S. M. 1927. A study in hyperparasitism, with particular reference to the parasites of *Apanteles melanoscelus* (Ratzeburg). USDA Dept. Bull. No. 1487, 35p.

Hyperparasitism is a common occurrence which can greatly retard the increase of primary parasites and may seriously interfere with their successful establishment in a new country. Host selection, habits and biologies of hyperparasites of *Apanteles melanoscelus* were studied in detail. Included are six parasite species which also attack the larch casebearer: *Hemiteles tenellus*, *Gelis apanteles*, *Haltichella xanticles*, *Dibrachys boucheanus*, *Habrocytus dux* and *Spilochalcis torvina*.

341 Muesebeck, C. F. W., Krombein, K. V., and Townes, H. K. 1951. Hymenoptera of America north of Mexico synoptic catalogue. USDA Monog. No. 2, 1420p.

This monograph presents a comprehensive catalogue of North American Hymenoptera. The taxonomy, geographic distribution, hosts, and bibliographic information are included. Over 50 species of parasites listed in the catalogue attack the larch casebearer: *Agathis bicolor*, *A. coleophorae*, *A. cincta*, *A. pumilus*, *Apanteles scitulus*, *Bracon gelechiae*, *B. juncicola*, *B. pygmaeus*, *Ephialtes pacificus*, *Scambus detrita*, *S. hispae*, *S. tecumseh*, *S. transgressus*, *Itoplectis quadricingulata*, *I. evetriae*, *I. 4-cingulatus*, *Gelis obscurus*, *G. tenellus*, *Phaeogenes epinotiae*, *Pimplopterus parvus*, *Sympiesis guttatipennis*, *Tetrastichus dolosus*, *T. coerulescens*, *Catolaccus aeneoviridis*, *Dibrachys cavus*, *Euplectrus mellipes*, *Elachertus aeneoniger*, *Cirrospilus pictus*, *Zagrammosoma americana*, *Euderus amphis*, *E. cushmani*, *Chrysocharis laricinellae*, *Achrysocharella silvia*, *A. fullawayi*, *Horismenus ancylae*, *H. microgaster*, *Copidosoma truncatellum*, *Eupelmella vesicularis*, *Pachyneuron altiscutum*, *Eurydinota lividicorpus*, *Sceptrothelys deione*, *Habrocytus phycidis*, *H. thyridopterigis*, *Haltichella americana*, *H. xanticles*, *Spilochalcis albifrons*, *S. leptis*, *S. side*, *S. xanthostigma*, and *Lissonota parvus*.

342 Nelson, W. A. 1953. Observations on hyperparasitism of the wheat stem sawfly *Cephus cincta* Nort. (Hymenoptera: Cephidae). Can. Entomol. 85:249-251.

The life histories of two parasites of *Cephus cincta* are outlined. *Eupelmella vesicularis*, a parasite of the larch casebearer, is a primary and secondary parasite of the wheat stem sawfly. It is often a hyperparasite of *Bracon cephi* during its first and third generations in this host.

343 Neunzig, H. H., and Gyrisco, G. G. 1959. Parasites associated with seed chalcids infesting alfalfa, red clover, and birdsfoot trefoil seed in New York. J. Econ. Entomol. 52:898-901.

The larch casebearer parasite, *Eupelmella vesicularis*, occurred in association with seed chalcids infesting alfalfa, *Medicago sativa* and birdsfoot trefoil, *Lotus corniculatus*.

344 Nikol'skaya, M. 1934. List of chalcid flies (Hym.) reared in U.S.S.R. Bull. Entomol. Res. 25:129-147.

Records a number of parasitic and phytophagous species of Chalcididae that have been reared in the U.S.S.R. Host records for these species are given. Two larch casebearer parasites, *Dibrachys boucheanus* and *Chrysocharis boops* have been reared from other hosts in the U.S.S.R.

345 Nilsson, L. A. 1979. The pollination ecology of *Herminium monorchis* (Orchidaceae). Bot. Notiser 132:537-549.

Parasitic Hymenoptera, Chloropidae and Scatopsidae accounted for 94 percent of all insectan flower visitors. The genus *Tetrastichus* represented 32 percent of the visitors and carried 65 percent of the

pollinaria. *Tetrastichus* females were observed seven times as frequently as males on *H. monorchis*. The genus *Tetrastichus* has been reared from the larch casebearer. The parasite *Euderus albitarsis* Zett. which attacks the larch casebearer was also recorded as a flower visitor.

346 Niwa, C. G., and Hard, J. S. 1981. Parasite complex of the larch casebearer in Idaho and Montana, progress report. USDA For. Serv., State and Priv. For., For. Pest Mgt., Missoula, Mt. Rep. No. 81-15, 8p.

A survey of parasite release and nonrelease areas showed a range in parasitism rates from 8 to 61 percent. *Chrysocharis laricinellae* was the most abundant parasite recovered, accounting for almost 90 percent of total parasitization. *Agathis pumila* was second in abundance but accounted for only two percent of total parasitism in release areas. Both of these introduced parasites were recovered considerable distances from their original release sites. Though present in low numbers, *Spilochalcis albifrons* was the most widespread native parasite. Other parasite species recovered were: *Mesopolobus* sp., *Dicladocerus* spp., and *Gelis tenellus*.

347 Norton, E. 1869. Catalogue of the described Tenthredinidae and Uroceridae of North America. Trans. Am. Entomol. Soc. 2:321-368.

Two of the species described, *Cheiropachus nigro-cyaneus* and *Hemiteles utilis* are parasites of the larch casebearer.

348 Oatman, E. R., Wyman, J. A., and Platner, G. R. 1979. Seasonal occurrence and parasitization of the tomato pinworm, *Keiferia lycopersicella* on fresh market tomatoes in southern California. Environ. Entomol. 8:661-664.

One of the most abundant tomato pinworm parasites, *Sympiesis stigmatipennis*, also attacks the larch casebearer. *S. stigmatipennis* is an external larval parasite of the pinworm.

349 Oehlke, J. 1967. Westpalaarktische Ichneumonidae 1. Ephialtinae. (Western Ichneumonidae 1: Ephialtinae.) In: Hymenopterorum Catalogus (nova editio), C. Ferriere and J. Vecht (eds.), Uitgeverij, Dr. W. Junk, 49p.

Synonymies, a host list, and bibliography are given for species in the subfamily Ephialtinae. Four of these species attack the larch casebearer: *Scambus brevicornis*, *Itoplectis alternans*, *I. maculator*, and *Coccygomimus turionellae*.

350 Ohmart, C. P., and Dahlsten, D. L. 1979. Biological studies of bud-mining sawflies, *Pleroneura* spp. (Hymenoptera: Xyelidae), on white fir in the central Sierra Nevada of California. III. Mortality factors of egg, larval, and adult stages and a partial life table. Can. Entomol. 111:883-888.

Two ichneumonids, *Allophroides* n. sp. and *Scambus transgressus*, were observed parasitizing the larval stages of *Pleroneura* spp. Parasitism of *Pleroneura* by *S. transgressus* was extremely low and there are indications that *Pleroneura* is not its primary host. *S. transgressus* has also been recovered from the larch casebearer.

351 Oldham, J. N. 1928. The metamorphosis and biology of *Rhynchaenus alni* L. (Coleoptera). Ann. Appl. Biol. 15:679-698.

The biology and morphology of the leaf miner *R. alni* are discussed. Eight species of hymenopterous parasites were reared from *R. alni*. *Cirrospilus pictus* Nees, a secondary parasite of the leaf miner, also attacks the larch casebearer.

352 Packard, A. S. 1875. Insects specially injurious to wheat, oats, barley, etc. Ann. Rept. U. S. Geol. Geogr. Survey 9:699-709.

Records *Ceucania unipuncta* and *Gelis minimus* as hosts of *Spilochalcis albifrons*, a larch casebearer parasite.

353 Page, M., Ryan, R. B., Rappaport, N., and Schmidt, F. 1982. Comparative toxicity of acephate, diflubenzuron, and malathion to larvae of the larch casebearer, *Coleophora laricella* (Lepidoptera: Coleophoridae), and adults of its parasites, *Chrysocharis laricinellae* and *Dicladocerus nearcticus*. Environ. Entomol. 11:730-732.

Discusses the effects of the different insecticides on the larch casebearer and some of its parasites. *Chrysocharis laricinellae* and *Dicladocerus nearcticus* were more susceptible to acephate and malathion than the host. When diflubenzuron was used, the casebearers were more susceptible than the parasites. Of the two parasites, *D. nearcticus* seemed to be more tolerant to acephate and diflubenzuron.

354 Paradis, R. O., and LeRoux, E. J. 1971. *Coleophora malivorella* Riley, pistol casebearer (Lepidoptera: Coleophoridae). In: Biological Control Programmes Against Insects and Weeds in Canada 1959-1968, Commonw. Inst. Biol. Control Tech. Commun. 4:15-16.

Chrysocharis laricinellae and birds were key factors in reducing epidemic pistol casebearer populations. *C. laricinellae* has three generations a year, attacks all larval stages of *C. malivorella*, and overwinters as a larvae within the host body or shelter. It can survive the low temperatures experienced in apple orchard areas. *C. laricinellae* is considered to be an effective control against *C. malivorella* as well as the larch casebearer.

355 Parker, F. D. 1970. Seasonal mortality and survival of *Pieris rapae* (Lepidoptera: Pieridae) in Missouri and the effect of introducing an egg parasite, *Trichogramma evanescens*. Ann. Entomol. Soc. Am. 63:985-994.

Four larch casebearer parasites, *Gelis tenellus*, *Catolaccus aeneoviridis*, *Spilochalcis side*, and *Dibrachys cavus*, are among the hyperparasites of *Pieris rapae* through the larval parasite, *Apanteles glomeratus*. Hyperparasitism was one factor causing the ineffectiveness of *A. glomeratus* in regulating *P. rapae*.

356 Peck, O. 1963. A catalogue of the nearctic Chalcidoidea (Insecta: Hymenoptera). Can. Entomol. Suppl. 30, 1092p.

This catalogue contains synonymies, host lists, and a full bibliography. Thirty-one of the chalcid species listed are parasites of the larch casebearer: *Sympiesis guttatipennis* Girault, *S. stigmatipennis* Girault, *Eulophus magnisulcatus* Girault, *Dicladocerus westwoodii* Westwood, *Tetrastichus coerulescens* Ash., *T. dolosus* Gahan, *T. xanthostigma* (Ratz.), *Euplectrus mellipes* Prov., *Elachertus aeneogniger* (Girault), *E. proteoteratis* (How.), *Cirrospilus pictus* (Nees), *Zagrammosoma americana* Girault, *Euderus amphis* (Walker), *E. cushmani* (Craw.), *Epilampsis laricinellae* (Ratz.), *Derostenus fullawayi* Craw., *D. silvia* (Girault), *Horismenus ancylae* (Girault), *H. microgaster* (Ash.), *Copidosoma truncatellum* (Dalman), *Pachyneuron altiscuta* Cook, *Cyrtogaster vulgaris* Walk., *Capellia lividicorpus* (Girault), *Dibrachys cavus* (Walk.), *Habrocytus phycidis* Ash., *Haltichella americana* How., *H. xanticles* (Walk.), *Spilochalcis albifrons* (Walsh), *S. leptis* Burks, *S. side* (Walk.), and *S. xanthostigma* (Dalman).

357 Peck, O., Boucek, Z., and Hoffer, A. 1964. Keys to the Chalcidoidea of Czechoslovakia (Insecta: Hymenoptera). Mem. Entomol. Soc. Can. 34:7-120.

Contains keys, and brief descriptions of the morphology, biology and cohosts of the chalcids of Czechoslovakia. At least three species of chalcids which attack the larch casebearer have been reported from the fauna of Czechoslovakia. *Cyrtogaster vulgaris* is a common parasite of leaf-mining Diptera. *Dibrachys cavus* is polyphagous in pupae of Lepidoptera and their parasites. *Eupelmella vesicularis* is also a polyphagous parasite in this region.

358 Perkins, J. F. 1941. A synopsis of the British Pimplini, with notes on the synonymy of the European species (Hymenoptera: Ichneumonidae). Trans. R. Entomol. Soc. Lond. 91:637-659.

Keys to the genera and species of the British Pimplini are given. The synonymies of these species are also listed. Included are the larch casebearer parasites, *Itoplectis alternans* and *I. maculator*.

359 Peterson, L. O. T. 1962. Insect enemies of *Lecanium coryli* L. (Homoptera: Coccoidea) in Saskatchewan. Can. Entomol. 94:739-742.

Adults of 11 species of hymenopterous parasites and one dipteran predator were reared from *L. coryli* infesting white elm. *Pachyneuron altiscutum* How., also a parasite of the larch casebearer, is a primary and secondary parasite of *L. coryli*. Superparasitism has been observed in this species. Adults emerge from the late nymphal stage of the scale.

360 Pettinger, L. F., and Johnsey, R. L. 1979. Results of surveys in northeast Washington during 1977 and 1978 for introduced exotic and native parasites of the larch casebearer. USDA For. Serv., For. Ins. and Dis. Mgt., Pac. Northwest For. and Range Exp. Stn., Portland, Or., 13p.

Pupal sampling at 16 locations revealed that *Agathis pumila* is established, but has been slow to increase in number and spread to new areas. *Chrysocharis laricinellae* is now well established and is invading new areas. Two other introduced exotic species, *Elachertus argissa* and *Necremnus metalarus*, were not recovered in significant numbers. The native parasitism rate was less than ten percent. However, early sampling may have prevented the full effects of *Spilochalcis albifrons* on the host population to appear in the results. Other native parasite species recovered were: *Scambus transgressus*, *Gelis tenellus*, *Dicladocerus nearcticus*, *Mesopolobus verditer*, *Itoplectis evetriae*, *Pristomerus* sp., *Bracon pygmaeus*, *Habrocytus phycidis*, *Spilochalcis leptis*, and *Tetrastichus* sp.

361 Phillips, W. J., and Poos, F. W. 1927. Two hymenopterous parasites of American jointworms. J. Agric. Res. 34:473-488.

Describes the morphology and development of two important parasites of the genus *Harmolita*. One of these parasites, *Eupelminus saltator*, has been recovered from the larch casebearer.

362 Pike, K. S., and Burkhardt, C. C. 1974. Hyperparasites of *Bathyplectes curculionis* in Wyoming. Environ. Entomol. 3:953-956.

Seven species of hymenopterous hyperparasites were reared from *Bathyplectes curculionis* cocoons in 1972. The larch casebearer parasite, *Spilochalcis albifrons* was limited in its distribution and abundance as a hyperparasite of *B. curculionis*. Citations from other literature list *Spilochalcis side*, *Catolaccus aeneoviridis*, and *Dibrachys cavus*, also larch casebearer parasites, as secondary parasites of *B. curculionis*.

363 Pilley, P. G., and Trieselmann, R. A. 1967. A note on the occurrence of *Coleophora frischella* (Lepidoptera: Coleophoridae) in North America. Can. Entomol. 99:1229.

The first record of the occurrence of the clover case-moth, *Coleophora frischella*, in North America, was made in June 1966 on Picton Island, New York. Seven species of parasites were obtained from rearings of the case-moth. Of these, four species attack the larch casebearer as an alternate host, *Bracon gelechiae*, *B. pygmaeus*, *Scambus tecumseh*, and *Gelis tenellus*.

364 Poinar, G. O. Jr., and Gyrisco, G. G. 1963. Hymenopterous parasites of the alfalfa weevil, *Hypera postica*, in New York. J. Econ. Entomol. 56:533-534.

Discusses the egg and pupal parasites of *H. postica* recovered in Dutchess county, New York. *Spilochalcis albifrons* was recovered from a single pupal specimen; it was considered to be a primary parasite of *H. postica*. *S. albifrons* is also part of the larch casebearer parasite complex.

365 Poos, F. W. 1928. An annotated list of some parasitic insects. Wash. Entomol. Soc. Proc. 30:145-150.

Lists parasites and their respective hosts from a collection made in eastern Virginia during 1926 and 1927. Included are alternate hosts for five larch casebearer parasites: *Trissolcus euschisti*, *Epiurus indagator*, *Sympiesis stigmatipennis*, *Copidosoma truncatellum*, and *Habrocytus thyridopterigis*.

366 Poos, F. W. 1940. The locust leafminer as a pest of soybean. J. Econ. Entomol. 33:742-745.

Records *Xenochalepus dorsalis*, as a host of *Spilochalcis albifrons*, a native parasite of the larch casebearer.

367 Porter, B. A., and Garman, P. 1923. The apple and thorn skeletonizer. Conn. Agric. Exp. Stn. Bull. 246:247-264.

The bionomics and control of the apple and thorn skeletonizer, *Hemerophila pariana* (Clerck), are discussed. Among the natural enemies of the skeletonizer are three parasites which also attack the larch casebearer. *Habrobracon gelechiae* and *Epiurus indagator* are larval parasites while *Dibrachys boucheanus* acts as a secondary parasite in this host.

368 Prentice, R. M. 1955. The life history and some aspects of the ecology of the large aspen tortrix, *Choristoneura conflictana* (Wlkr.) (N. Comb.) (Lepidoptera: Tortricidae). Can. Entomol. 87:461-473.

A study of the life history and ecology of the large aspen tortrix was conducted in northern Manitoba and Saskatchewan. Of the parasites reared from *C. conflictana* both within and outside of the study areas, three species also attack the larch casebearer. *Catolaccus aeneoviridis* is a hyperparasite of the large aspen tortrix in Manitoba and Saskatchewan, while *Scambus hispae* and *Habrocytus phycidis* attack the tortrix in New Brunswick.

369 Prentice, R. M. 1962. Forest lepidoptera of Canada, Vol. 2. Forest Entomol., Path. Br., Can. Dept. Forestry. 281p.

Records *Bomolocha deceptalis* as a host of *Spilochalcis albifrons*, a native parasite of the larch casebearer.

370 Proper, A. B. 1934. Hyperparasitism in the case of some introduced lepidopterous tree defoliators. J. Agric. Res. 48:359-376.

Three species in the larch casebearer parasite complex were recorded as low level hyperparasites of other hosts. *Habrocytus phycidis* attacked *Apanteles melanoscelus*, a parasite of the gypsy moth, *Porthetria dispar*, and *Meteorus versicolor*, a parasite of the brown-tail moth, *Nygmia phaeorrhoea*. Both *Gelis apantelis* and *Horismenus microgaster* hyperparasitize *Apanteles solitarius* which attacks the satin moth, *Stilpnotia salicis*.

371 Pschorn-Walcher, H. 1964. On the parasites of some injurious Lepidoptera from northern Japan. Commonw. Inst. Biol. Control, Delemont, Switz. Bull. 4:27-28.

The main parasite recovered in collections of the larch casebearer made on the islands of Hokkaido and Honshu was the eulophid, *Dicladocerus westwoodii* Westw., with 14 and 2 percent parasitism respectively. Parasitism in general was much lower on Hokkaido, perhaps due to the fact that larch trees are a recent introduction to the island and a balance between host insects and parasites may not yet have been reached. Another Eulophidae, *Closterocerus trifasciatus* and four Ichneumonidae, *Hemiteles areator*, two unidentified species of *Hemiteles* and *Itoplectis alternans* were also recovered from the casebearer.

372 Pschorn-Walcher, H. 1977. Biological control of forest insects. Annu. Rev. Entomol. 22:1-22.

In this review of classical biological control strategy, the author points out the importance of distinguishing between primary (autochthonous) and secondary (allochthonous) distribution areas of the host plant and target insect when selecting areas for parasite releases. He uses European larch, *Larix decidua* and *Coleophora laricella* as an example. The original distribution of European larch was confined to the central Alps of Europe with outposts in the Carpathian Mountains and Poland. Over the past few centuries it has been planted all over Europe. The natural enemies of pests invading these new areas have lagged behind. The casebearer has some 20 parasite species in the Alps, but only about ten in north Germany and nine in Sweden.

373 Pschorn-Walcher, V. H. 1980. Populationfluktuation und Parasitierung der Birken-Erlenminiermotte (*Coleophora serratella* L.) in Abhangigkeit von der Habitat-Diversitat. (Population fluctuations and parasitism of the birch-alder casebearer (*Coleophora serratella* L.) in relation to habitat diversity.) Z. ang. Entomol. 89:63-81.

Population fluctuations and parasitism of the birch-alder casebearer were investigated at three sites with different habitat diversity in the Swiss Rhone Valley over a period of nine generations. The biology of the host, abundance, and constancy of the 25 species of larval and pupal parasites, their synchronization with the host, and host specificity are briefly reviewed. The larch casebearer is an alternate host for five of these parasitoids: *Gelis areator*, *Chrysocharis laricinellae*, *Cirrospilus pictus*, *C. vittatus*, and *Elachertus argissa*.

374 Puri, S. N., and Sangwan, H. S. 1972. Economics of mass rearing of *Bracon gelechiae* Ashmead. Indian J. Entomol. 34:232-239.

An analysis of the economics of rearing *B. gelechiae* for introduction against the potatoe tuber moth, *Gnorimoschema operculella*.

375 Puttler, B. 1961. Biology of *Hyposoter exiguae* (Hymenoptera: Ichneumonidae), a parasite of lepidopterous larvae. Ann. Entomol. Soc. Am. 54:25-30.

Spilochalcis albifrons, a larch casebearer parasite, was the most frequent hyperparasite of *Hyposoter exiguae* and was reared most often from *H. exiguae* cocoons collected on tomatoes. *S. albifrons* attacks the cocoon of *H. exiguae* while the parasite is in the prepupal stage. Its life cycle takes 23 days at 72 to 76 degrees F. Virgin females produced only male progeny but mated females produced equal numbers of both sexes.

376 Puttler, B. 1966. Biological notes on some hyperparasites of *Bathyplectes curculionis* (Thomson). J. Econ. Entomol. 59:483-484.

The attack behavior and life cycles of four hyperparasites of the alfalfa weevil, *Hypera postica*, through the introduced parasite *Bathyplectes curculionis*, are described. Two of these species, *Catolaccus aeneoviridis* and *Spilochalcis albifrons*, also participate in the larch casebearer parasite complex. Multivoltism and the absence of diapause were found in both of these species, indicating that hyperparasites may be significant in the host-parasite relationship since they are available all year to attack *B. curculionis* or other hosts.

377 Puttler, B., Thewke, S. E., and Warner, R. E. 1973. Bionomics of three nearctic species one new, of *Hypera* (Coleoptera: Curculionidae) and their parasites. Ann. Entomol. Soc. Am. 66:1299-1306.

The distribution, habitat preference, host-plant specificity and seasonal cycle of three species of *Hypera* are discussed. *Spilochalcis albifrons* was reared as a primary parasite of pupae of *H. eximia* and *H. paludicola* and as a hyperparasite of *Bathyplectes* sp.

378 Pyornila, M. 1976. Parasitism in *Aglais urticae* (Lepidoptera: Nymphalidae) Part 3. Parasitism of larval stages by ichneumonids. Ann. Entomol. Fenn. 42:156-161.

Hyposoter horticola was found to be the most important ichneumonid parasite of *Aglais urticae* larvae in eastern Finland. *H. horticola* was in turn occasionally hyperparasitized by *Gelis instabilis*. *G. instabilis* is part of the larch casebearer parasite complex.

379 Pyornila, M., and Pyornila, A. 1979. Role of parasitoids in termination of a mass occurrence of *Yponomeuta evonymellus* (Lepidoptera: Yponomeutidae) in northern Finland. Not. Entomol. 59:133-137.

The role of parasitoids in reducing the number of *Y. evonymellus* and terminating its mass occurrence was greater than that of other unknown lethal factors. *Dibrachys cavus*, a parasite of the larch casebearer was part of the *Y. evonymellus* parasite complex.

380 Quednau, F. W. 1966. Notes on the life history and morphology of *Chrysocharis laricinellae* (Ratzeburg) (Hymenoptera, Eulophidae), a parasite of the larch casebearer (Hubner). Ann. Entomol. Soc. Quebec 11:200-205.

Describes the life history of *Chrysocharis laricinellae* in *Coleophora laricella* and discusses the effect of temperature on coloration of *C. laricinellae* legs.

381 Quednau, F. W. 1967. Ecological observations on *Chrysocharis laricinellae* (Hymenoptera: Eulophidae), a parasite of the larch casebearer (*Coleophora laricella*). Can. Entomol. 99:631-641.

An account is given of host acceptance, the influence of temperature on fecundity and longevity, and searching capacity of *Chrysocharis laricinellae* (Ratzeburg), a parasite of the larch casebearer, *Coleophora laricella* (Hubner). Fourth-instar casebearing larvae were the preferred stages for attack. The size of the parasite progeny varied directly with the size of the host. Fecundity of progeny reared from small hosts was significantly less than that of progeny reared from large hosts. Not all parasite adults could successfully oviposit through the tough skin of the host pupa. *C. laricinellae* showed poor searching capacity. Superparasitism was common at low host densities of the casebearer and resulted in either one parasite emerging or in total parasite mortality. A sex ratio where females predominated resulted when sufficient numbers of preferred stages of the host were presented to mated *C. laricinellae*. The temperature threshold for attacking hosts was 55 degrees F and for development of the parasite 40 degrees F. At 50 degrees F, the adults lived four months on the average. Therefore *C. laricinellae* is able to survive in the field without alternate hosts and at very low host densities. The parasite seems to depend on a continuing supply of suitable instars of host species in sufficient numbers to be effective. If *C. laricella* is the only available host species in the ecosystem the biological control value of this chalcid must be rated as poor. (Author)

382 Quednau, F. W. 1967. Notes on mating behavior and oviposition of *Chrysocharis laricinellae* (Hymenoptera: Eulophidae), a parasite of the larch casebearer (*Coleophora laricella*) Can. Entomol. 99:326-331.

Chrysocharis laricinellae (Ratz.) mated readily in the laboratory when several individuals of both sexes were held together in a vial. The courtship dance performed by the male is described. Parasite females develop mature eggs 3 days after emergence and are apparently capable of resorbing the eggs if hosts are not available, and to produce new ones after host-feeding. Storage of eggs in the ovary for 5 months at 55 degrees F and sterility (phasic castration) of certain individuals is reported. Longevity of egg-laying females at 75 degrees F was about 1 month less than that of parasites that had been denied contact with hosts. Odor apparently plays little or no role in the location of the larch casebearer larvae by *C. laricinellae*, but chemical surface stimuli seem to exist on the surface of a mine or case of *Coleophora laricella* (Hbn.). The parasite is also stimulated by vibrations of the host in its case. The oviposition and host-feeding pattern of *C. laricinellae* is described. Host-feeding on fourth-instar larvae of the larch casebearer contributed little to host mortality. (Author)

383 Quednau, F. W. 1968. Distribution and effectiveness of larch casebearer parasites in southwestern Quebec. Can. Dept. For. and Rural Dev. Bi-Mon. Res. Note 24:22-23.

Results of a sample of the overwintering stage of the casebearer revealed that activity by *Chrysocharis laricinellae* was low in all areas investigated and that it can only be considered of secondary value in the biological control of the casebearer in this part of Canada. *Agathis pumila*, however, is now a well established and effective parasite of the larch casebearer in southwest Quebec.

384 Quednau, F. W. 1969. Laboratory propagation of the parasite *Chrysocharis laricinellae* (Hymenoptera: Eulophidae) and notes on interaction with its host, *Coleophora laricella*. Can. Entomol. 101:100-106.

A method is described for mass-rearing *Chrysocharis laricinellae* (Ratzeburg) on larch casebearer larvae, employing a water culture system for tamarack. The rearing unit accommodates a well-defined episode (limited contact) in the interaction with its host. The yield is about 100

healthy parasites obtained from 300 cases, when the initial inoculum was 15 parasite females. (Author)

385 Quednau, F. W. 1970. Competition and co-operation between *Chrysocharis laricinellae* and *Agathis pumila* on larch casebearer in Quebec. Can. Entomol. 102:602-612.

Agathis pumila (Ratzeburg) and *Chrysocharis laricinellae* (Ratzeburg) compete for their common host, the larch casebearer (*Coleophora laricella* (Hubner)). An analysis of the mechanism of this competition, based on a 2-year study at Joliette, Quebec, is presented. *A. pumila*, in sacrificing part of its own population, prevents a "one stage condition" and helps *C. laricinellae* build up to a point where the latter becomes host-regulative by massive attack. Competitive displacement of *A. pumila* by *C. laricinellae* is less frequent than expected because of the basically different ways in which the two parasite species spread, search for, select, and attack hosts. *A. pumila* may suffer about 50 percent loss from multiple parasitism, but apparently this does not affect its survival potential, its reproductive rate, and its ability to provide significant partial control of the larch casebearer. (Author)

386 Quednau, F. W. 1970. Notes on life-history, fecundity, longevity and attack pattern of *Agathis pumila* (Hymenoptera: Braconidae), a parasite of the larch casebearer. Can. Entomol. 102:736-745.

Agathis pumila is a host specific, univoltine, solitary, internal parasite attacking first and second instar larvae of the larch casebearer. Descriptions and illustrations of all developmental stages are given. The female reproductive system, fecundity rates, longevity, and attack behavior are discussed. *A. pumila* is well synchronized with its host but a low searching capacity may prevent it from achieving a reciprocal balance with casebearer populations.

387 Raigorodskaga, I. A. 1966. Order Lepidoptera. In: Pests of Siberian Larch. A. S. Rozhkov (ed). Acad. Sci. U.S.S.R. Sib. Dept. East Sib. Biol. Inst.(Trans. from Russian). USDA TT70-50043, Washington D. C., p.228, 252-253, and 351.

Reports on the distribution, biology, economic importance and parasites of the larch casebearer in Siberian larch. Five species of parasites have been reared from larvae and pupae with *Microdus pumilus* being the most abundant. The other species recovered were *Cremastus* sp., *Angitia* sp., *Microgaster tibialis*, and *Apanteles emarginatus*.

388 Raizene, H. 1957. Forest sawflies of southern Ontario and their parasites. Can. Dept. Agric. Publ. 1009, 45p.

Of the 90 species of sawflies collected in southern Ontario, two have parasites in common with the larch casebearer. *Neodiprion abietis* is attacked by both *Gelis tenellus* and *Eupelmella vesicularis*, while *N. sertifer* is parasitized by *Dibrachys cavus*.

389 Raske, A. G. 1978. Parasites of birch casebearer larvae in Newfoundland (Lepidoptera: Coleophoridae). Entomophaga 23:103-108.

The birch casebearer, *Coleophora fuscedinella* Zeller, is the most important pest of white birch, *Betula papyrifera* Marsh, in Newfoundland. A total of 31 species of parasites and hyperparasites were reared from birch casebearer pupae in this study. An additional seven species are known to parasitize this casebearer in Newfoundland. Only three species were numerous: *Itoplectis quadricingulata* (Provancher), *Cirrospilus cinctithorax* (Girault) and *Habrocytus semotus* (Walker). (Author) Ten of

the parasitoid species attacking the birch casebearer also attack the larch casebearer: *Bracon juncicola*, *Gelis tenellus*, *Orgilus coleophorae*, *Itoplectis quadricingulata*, *I. vesca*, *Scambus decorus*, *Chrysocharis laricinellae*, *Eupelmella vesicularis*, *Habrocytus phycidis*, and *Spilochalcis albifrons*.

390 Raske, A. G., and Schooley, H. O. 1979. Parasites of *Coleophora laricella* larvae in Newfoundland (Lepidoptera: Coleophoridae). Entomophaga 24:57-64.

A total of 15 species of parasites have been reared from the larch casebearer, *Coleophora laricella* (Hubner), in Newfoundland, but only two species, *Agathis pumila* (Ratzeburg) and *Chrysocharis laricinellae* (Ratzeburg), are common. Both of these species had been introduced in the late 1940's for the biological control of the casebearer. The chalcid, *C. laricinellae*, was the more common parasite till the early 1970's, but since then the braconid, *A. pumila*, has become the most dominant, parasitizing up to 80 percent of the host larvae. It appears that *A. pumila* is the most promising biological control agent present in Newfoundland. (Author) Native parasites reared in Newfoundland were: *Bracon gelechiae*, *Campoplex* sp., *C. mellipes*, *Gelis tenellus*, *G. apantelis*, *G.* sp., *Scambus decorus*, *S. hispae*, *Dicladocerus* sp., *Spilochalcis albifrons*, *Habrocytus phycidis*, *Mesopolobus* sp., and *Mymarid* sp.

391 Reeks, W. A., and Smith C. C. 1956. The satin moth, *Stilpnotia salicis* (L.), in the maritime provinces and observations on its control by parasites and spraying. Can. Entomol. 88:565-579.

Distribution, damage, life history, and control of the satin moth are discussed. *Apanteles solitarius*, an introduced parasite of the satin moth, is sometimes adversely affected by the action of secondary parasites, including *Habrocytus phycidis* and *Dibrachys cavus* (Wlkr.). Both of these hyperparasites are also part of the larch casebearer parasite complex.

392 Reinhard, H. 1858. Beitrage zur Geschichte und synonymie der Pteromalinen. (Contribution to the synonymy of pteromalids.) Berl. Entomol. Z. 2:10-23.

Among the species described is *Cirrospilus vittatus* Wlkr., a parasite of the larch casebearer.

393 Richards, O. W. 1940. The biology of the small white butterfly (*Pieris rapae*), with special reference to the factors controlling its abundance. J. Anim. Ecol. 9:243-288.

The effects of weather, predators, and parasites on the abundance of *P. rapae* were studied. Twelve species of primary and secondary parasites were collected. *Hemiteles areator* (Pz.) was recovered as a polyphagous hyperparasite of the primary parasite *Apanteles glomeratus* (L.). *H. areator* is also part of the larch casebearer parasite complex.

394 Roaf, J. R., Dimick, R. E., and Mote, D. C. 1937. The cotoneaster worm, *Cremona contoneaster* Busk. J. Eco. Entomol. 30:134-136.

Records *Cremona contoneaster* as a host of *Spilochalcis albifrons*, a native parasite of the larch casebearer.

395 Roberts, D. W. 1966. Life history and parasites of *Evora hemidesma* (Zeller) (Lepidoptera: Olethreutidae). Boyce Thomson Inst., Contrib. 23:165-170.

Thirteen hymenopterous and three dipterous parasites of *E. hemidesma* were recovered. Three of these species, *Spilochalcis side*, *Tetrastichus dolosus* and *Catolaccus aeneoviridis*, also attack the casebearer. *C. aeneoviridis* was probably a hyperparasite of *E. hemidesma*.

396 Rohwer, S. A. 1913. Descriptions of new parasitic Hymenoptera. Proc. Entomol. Soc. Wash. 15:180-188.

One of the new species described, *Itoplectis plesia*, is a parasite of the larch casebearer.

397 Rohwer, S. A. 1916. Descriptions of new species of Hymenoptera. Proc. U. S. Nat. Mus. 49:205-249.

Descriptions of 47 new species of Hymenoptera and notes on certain other species and genera are given. Many of the species are of economic importance in regard to forest trees; some of them important parasites, others defoliators. *Bassus coleophorae* and *Microbracon coleophorae* were reared from *Coleophora leucochrysella* feeding on chestnut. Both of these parasite species have also been recovered from the larch casebearer.

398 Roman, A. 1932. The Linnean types of ichneumon flies. Entomol. Tidskr. 53:1-16.

A taxonomic evaluation of the ichneumonid collection of Linnea. Two of the species examined, *Hemiteles cinctus* and *Pimpla turionellae*, are parasitoids of the larch casebearer.

399 Rosen, H. 1961. Zur Kenntnis des Pteromaliden-genus *Mesopolobus* VII. (Information on the Pteromalid genus *Mesopolobus. VII.*) Entomol. Tidskr. 82:1-48.

Contains general descriptions of taxonomy, distribution, and hosts of two casebearer parasite guild members, *Mesopolobus mediterraneus* and *M. subfumatus*. The former attacks several hosts, mostly microlepidopterans, such as *Choristoneura murinana*, and is hyperparasitic on species in several parasite genera. *M. subfumatus* has a much wider host range. It is found in diprionids, particularly *Gilpinia hercyniae* in Europe and North America and various lepidopterans, such as *C. murinana*, *Grapholitha diniana* and the casebearer. It is best known for its hyperparasitic behavior. Among its many parasite hosts is *Itoplectis maculator*, a casebearer parasite.

400 Ross, D. A. 1976. Larch casebearer foliage feeder. Can. For. Serv. Pac. For. Res. Cent. For. Pest Leafl., 8p.

The life history, spread, damage, population fluctuations and biological control of the larch casebearer in British Columbia are discussed. *Agathis* sp. and *Diadegma* sp. have been the two main species of parasites released against the casebearer in the Nelson Forest District.

401 Ruschka, F. 1924. Kleine Beitrage zur Kenntnis der forstlichen Chalcididen und Proctrotrupiden von Schweden. (Small contributions to the knowledge of forest chalcids and proctrotrupids from Sweden.) Entomol. Tidskr. 45:6-16.

Cirrospilus pictus Nees is recorded as a parasite of the larch casebearer in Sweden. *Chrysocharis boops* Thoms., which has been reared from the casebearer in other studies, was collected here from specimens of *Orchestes fagi* L.

402 Ruschka, F., and Fulmek, L. 1915. Verzeichnis der an der K. K. Pflanzenschutz-Station in Wien erzogenen parasitischen Hymenopteren. (List of parasitic Hymenoptera produced in the K. K. plant protection station in Vienna.) Z. ang. Entomol. 2:390-412.

Seven of the parasite species listed attack the larch casebearer: *Angitia armillata*, *Pimpla alternans*, *P. examinator*, *P. turionellae*, *Apanteles albipennis*, *Cirrospilus pictus*, and *Dibrachys cavus*. The alternate hosts are also listed for these parasites.

403 Rush, P. A. 1972. The larch casebearer (*Coleophora laricella*) population (Lepidoptera: Coleophoridae) and its associated parasite complex on the Newcomb tract. M.S. Thesis, Univ. Mich., Ann Arbor, 61p.

A study conducted along the international larch provenance trail reported a loss in the casebearer population of 42 percent due to parasitism. The parasite complex consisted of eight identified species, of which *Agathis pumila* and *Habrocytus phycidis* accounted for 80 percent of total parasitism. *Spilochalcis albifrons* was the third most important parasite species in the study followed by *Kratochviliana laricinellae*, parasitizing 5.4 and 3.8 percent of the total respectively. Other native species recovered were: *Bracon pygmaeus*, *Gelis tenellus*, *Tetrastichus coerulescens*, and *Macroneura vesicularis*.

404 Ryan, R. B. 1971. Interaction between two parasites, *Apechthis ontario* and *Itoplectis quadricingulatus*. 1. Survival in singly attacked, super-, and multiparasitized greater wax moth pupae. Ann. Entomol. Soc. Am. 64:205-208.

Individual pupae of the greater wax moth, *Galleria mellonella* (L.), received either single attacks or were super- or multiparasitized by *Apechthis ontario* (Cresson) and *Itoplectis quadricingulatus* (Provancher). Parasite progeny emerged from approximately 75 percent of the pupae attacked either once or twice by either species. *A. ontario* emerged from the majority of multiparasitized pupae where successive attacks occurred less than 10 minutes apart, regardless of which species attacked first. When the second attack of multiparasitized hosts was delayed until three days after the first atack, the species which attacked first was successful in the majority of the cases. Observations of parasite attack behavior showed that *A. ontario* but not *I. quadricingulatus* tend to reject hosts containing a developing parasite. It is concluded that *A. ontario* is intrinsically superior and tends to avoid multiparasitism. (Author) *I. quadricingulatus* is a parasite of the larch casebearer.

405 Ryan, R. B. 1974. Attainment of the overwintering instar and the casebearing habit by larch casebearer larvae at different elevations in the Blue mountains. USDA For. Serv., Pac. Northwest For. and Range Exp. Stn., Portland, Or., Res. Note PNW-228, 6p.

Transformation of larch casebearer larvae to the third or overwintering instar was generally slower with increasing elevation, beginning from September 11 to September 27. Rate of development increased after September 27 so that at all elevations the overwintering instar was reached by the same date, October 10. Based on this study, parasites of casebearing larvae should not be released until mid-September, at which time suitable hosts would be available at all elevations.

406 Ryan, R. B. 1974. Reduced oviposition by *Ephialtes ontario* and *Itoplectis quadricingulatus* in a humid environment. Ann. Entomol. Soc. Am. 67:928-930.

Oviposition by both *E. ontario* and *I. quadricingulatus* was significantly lower at 100 percent than at 62 percent relative humidity. *E. ontario* was the more affected of the two species. Its lowered rate of oviposition at the higher humidity is partially due to delayed oogenesis. *I. quadricingulatus* is part of the larch casebearer parasite complex.

407 Ryan, R. B. 1975. Photoperiod effects on development of the larch casebearer, *Coleophora laricella* (Lepidoptera: Coleophoridae). Can. Entomol. 107:1305-1310.

Long day (LD = 18 light : 6 dark) and short day (SD = 12 light : 12 dark) photoperiodic treatments of various sequences and durations were applied to *C. laricinellae* larvae at 20 degrees C. Continuous development did not occur at either constant LD or SD. A long photoperiod was shown to be repressive at the young larval stage of development and stimulating at late larval stages. For the casebearer to complete a generation, both a short and a long photoperiod must be experienced. Photoperiod has an important indirect affect on the relationship between the casebearer and its parasites. Since spring feeding by the casebearer is highly dependent on altitude (because of temperature differences), active larvae may be present up to a month later at high altitudes than at lower altitudes. Fall feeding though, does not vary considerably with altitude as it is governed by day length. As a result, higher elevation sites have a shorter casebearer-free period than lower areas. Therefore adult parasite longevity is less limiting, possibly explaining the variation in parasite effectiveness and species composition between different elevational strata. Knowledge of photo-period effects permits year-round laboratory rearing of the casebearer and so makes possible laboratory rearing of univoltine parasites such as *Diadegma laricinellae*, (Strobl) and *Agathis pumila*.

408 Ryan, R. B. 1979. Illustrated key to introduced and common native parasites of larch casebearer. USDA For. Serv., Pac. Northwest For. and Range Exp. Stn., Portland, Or., Res. Pap. PNW-262, 12p.

This key includes line drawings to help in the identification of the following introduced casebearer parasite species: *Agathis pumila* (Ratz.), *Diadegma laricinellum* (Strobl.), *Chrysocharis laricinellae* (Ratz.), *Dicladocerus westwoodii* Westw., *D. japonicus* Yshm., *Necremnus metalarus* (Walk.), *Elachertus argissa* (Walk.), and *Cirrospilus pictus* (Nees). Several genera and species of native parasites are also included, they are: *Gelis* sp., *Bracon* sp., *Scambus* sp., *Itoplectis* sp., *Pristomerus* sp., *Campoplex* sp., *Spilochalcis albifrons*, *S. leptis*, *Mesopolobus* sp., *Habrocytus* sp., *Tetrastichus* sp., *Elachertus* sp., *Dicladocerus nearcticus*, *D. pacificus*, *Euderus* sp. and *Derostenus* sp.

409 Ryan, R. B. 1979. The larch casebearer (Lepidoptera: Coleophoridae) and its parasites. I. Maintaining year-round availability of larch foliage and the casebearer for parasite rearing. Can. Entomol. 111:471-475.

Foliage on potted trees or cut branches of western larch, *Larix occidentalis* Nutt., served as food for rearing *Coleophora laricella* (Hbn.) during winter and spring. Potted trees were induced to flush by laboratory simulation of fall, winter, and spring to provide foliage the year round. The treatment was 2 months at a short-day photoperiod (SD=12-h light: 12-h dark), followed by 2 months of darkness at 2 degrees centigrade, then growth in a greenhouse at long day (LD=18-h light: 6-h dark). *C. laricella* could be collected from the field for further rearing during much of the year. Year-round availability of all stages, however, was realized by rearings starting laboratory-mated moths and eggs laid on potted trees. To promote continued development to the adult stage, a SD-LD-SD sequence of 6 weeks - 2 weeks weeks duration, then LD was imposed. (Author)

410 Ryan, R. B. 1979. The larch casebearer (Lepidoptera: Coleophoridae) and its parasites. II. The influence of growth stages of *Larix occidentalis* foliage on casebearer development and survival. Can. Entomol. 111:477-480.

Last-stage larvae of *Coleophora laricella* (Hbn.) were transferred to foliated *Larix occidentalis* Nutt. trees in four stages of growth for feeding. Based on insect survival, development rate, and size, trees with newly flushing foliage were best for rearing; trees which had completed shoot elongation were nearly as favorable. Both were distinctly superior to trees with elongating shoots and to trees with foliage so old that the current year's buds were breaking. It is important to recognize the effects of tree growth stage when rearing *C. laricella* parasites in the laboratory, because parasite survival and sex ratio can be significantly influenced. (Author)

411 Ryan, R. B. 1980. Rearing methods and biological notes for seven species of European and Japanese parasites of the larch casebearer. Can. Entomol. 112:1239-1248.

Types of cages and methods for rearing, collecting, holding, and scheduling adult emergence are described for hymenopterous parasites of *Coleophora laricella* (Hubner). Methods differ depending on whether the parasite attacks needlemining larvae, e.g., *Agathis pumila* (Ratz.) and *Diadegma laricinellum* (Strobl), or casebearing larvae, e.g., *Chrysocharis laricinellae* (Ratz.), *Elachertus argissa* (Walk.), *Necremnus metalarus* (Walk.), *Dicladocerus westwoodii* Westw., and *Dicladocerus japonicus* Yshm. Biological details of the parasites pertinent to laboratory rearing include stage attacked, developmental times, adult longevity, diapause, mode of reproduction, progeny sex ratios, and suggested parasite/host ratios. (Author)

412 Ryan, R. B. 1981. Larch casebearer parasites assuming control in the Northwest. Internat. Org. for Biol. Control of Noxious Anim. and Plants, Western Hemis. Reg. Sec., Newslett. 6, 1p.

Reports that parasites have assumed control of the casebearer in three of 13 research plots in the Blue Mountains of Oregon and Washington. The survival of casebearers to the adult stage has been reduced from 1/10 to 1/100 of former levels in these plots.

413 Ryan, R. B. 1981. Recent (1977-1980) releases of imported larch casebearer parasites for biological control. USDA For. Serv., Pac. Northwest For. and Range Exp. Stn., Portland, Or., Res. Note PNW 377, 6p.

Releases of *Diadegma laricinellum* (Hymenoptera: Ichneumonidae), *Dicladocerus westwoodii*, *Dicladocerus japonicus*, *Chrysocharis laricinellae*, *Elachertus argissa*, *Necremnus metalarus* (Hymenoptera: *Eulophidae*), and *Agathis pumila* (Hymenoptera: Braconidae) for biological control of the larch casebearer in Oregon, Idaho, and Pennsylvania included some newly imported stocks, and additional release locations. More than 14,000 parasites were released at eight sites. (Author)

414 Ryan, R. B., Bousfield W. E., Denton R. E., Johnsey R. L., Pettinger, L. F., and Schmitz, R. F. 1975. Additional releases of larch casebearer parasites for biological control in the western United States. USDA For. Serv., Pac. Northwest For. and Range Exp. Stn., Portland, Or., Res. Note PNW 242, 7p.

Additional *Chrysocharis laricinellae* and four new parasites, *Necremnus metalarus*, *Elachertus argissa*, *Dicladocerus* "A", and *Diadegma laricinellae*, were released for biological control of the larch casebearer in Washington, Idaho, and Montana. Sources of the new populations, locations, timing, and sizes of these new releases are recorded. (Author)

415 Ryan, R. B., Bousfield, W. E., Johanningmeier, C. W., Parsons, G. B., Schmitz, R. F., and Theroux, L. J. 1977. Releases of recently imported larch casebearer parasites for biological control in the western United States, including relocations of *Agathis pumila*. USDA For. Serv., Pac. Northwest For. and Range Exp. Stn., Portland, Or., Res. Note PNW 290, 8p.

Releases of *Chrysocharis laricinellae*, *Dicladocerus westwoodii*, *Dicladocerus japonicus*, *Elachertus argissa*, *Necremnus metalarus*, (all, Hymenoptera: Eulophidae), and *Agathis pumila* (Hymenoptera: Braconidae), for biological control of the larch casebearer in Washington, Oregon, Idaho, and Montana included some newly imported stocks and additional release locations. (Author)

416 Ryan, R. B., Bousfield, W. E., Miller, G. E., and Finlayson, T. 1974. Presence of *Chrysocharis laricinellae*, a parasite of the larch casebearer, in the Pacific Northwest. J. Econ. Entomol. 67:805.

Reports the presence of *Chrysocharis laricinellae* in Idaho and British Columbia before its planned release against the larch casebearer. Some possible reasons that *C. laricinellae* was present in western larch stands are: it may have dispersed in alternate hosts, following its introduction in eastern North America; it may have moved west with the larch casebearer and spread with it; it could have been accidently introduced with *Agathis pumila*.

417 Ryan, R. B., and Denton R. E. 1973. Initial releases of *Chrysocharis laricinellae* and *Dicladocerus westwoodii* for biological control of the larch casebearer in the western United States. USDA For. Serv., Pac. Northwest For. and Range Exp. Stn., Portland, Or., Res. Note PNW 200. 4p.

A total of 240 *Chrysocharis laricinellae* and 513 *Dicladocerus westwoodii* (Hymenoptera: Eulophidae) from Austria and England were released in Washington and Idaho in 1972. This is the first attempted establishment of these parasites in western North America for biological control of the larch casebearer. (Author)

418 Ryan, R. B., and Medley, R. D. 1970. Test release of *Itoplectis quadricingulatus* against European pine shoot moth in an isolated infestation. J. Econ. Entomol. 63:1390-1392.

A total of 5,365 female *Itoplectis quadricingulatus* (Provancher) was released on a 40-acre site over a 7-week period when pupae of the European pine shoot moth, *Rhyacionia buoliana* (Schiffermuller), were present. Activity and parasitizing ability of the parasites were estimated from weekly parasitization of wax moth pupae hung from tree branches. Effectiveness of the release against shoot moth was evaluated by comparing parasitization of shoot moth pupae in exposed and caged branches. About 50 percent of the wax moth pupae, but only 30 percent of the shoot moth pupae were killed by *I. quadricingulatus*. (Author) *I. quadricingulatus* is a parasite of the larch casebearer.

419 Ryan, R. B., and Medley, R. D. 1971. Rearing insect parasitoids: a technique for counting, spacing and holding lepidopterous pupae for parasitization. J. Econ. Entomol. 64:1558.

Describes techniques for preparing wax moth, *Galleria mellonella* (L.), pupae for parasitization by two ichneumonids, one of which, *Itoplectis quadricingulatus*, is a parasite of the larch casebearer.

420 Ryan, R. B., and Medley, R. D. 1972. Interaction between two parasites, *Apechthis ontario* and *Itoplectis quadricingulatus*. 2. F1 progeny production in light-stratified population cages. Ann. Entomol. Soc. Am. 65:172-177.

Parasitism by the two species together was as good or better than either species by itself. *I. quadricingulatus* predominated in the beginning because of its more rapid maturation. Later in the experiment, *A. ontario* was more successful due to its greater longevity. Of the two species, *I. quadricingulatus* responded more to light intensity. *I. quadricingulatus* is part of the larch casebearer parasite complex.

421 Ryan, R. B., and Theroux, L. J. 1981. Establishment and distribution in 1977 of *Chrysocharis laricinellae* (Hymenoptera; Eulophidae), a parasite of the larch casebearer, *Coleophora laricella* (Lepidoptera: Coleophoridae) in western forests. Can. Entomol. 113:1129-1130.

Describes the establishment and distribution of *C. laricinellae*, throughout Oregon, Washington, Idaho, Montana and southern British Columbia. This parasite was introduced in western North America beginning in 1972. Its presence in Idaho in areas relatively remote from release sites suggested an earlier introduction. The authors speculate that *C. laricinellae* escaped from rearing cages for *Agathis pumila*, introduced in 1964. Small *C. laricinellae* adults are able to pass through the 32 mesh screen used.

422 Ryan, R. B., and Yoshimoto, C. M. 1975. Laboratory crossings with different sources of the larch casebearer parasite *Chrysocharis laricinellae* (Hymenoptera: Eulophidae). Can. Entomol. 107:1301-1304.

Chrysocharis laricinellae (Ratz.) from Austria, Sweden, England, and Wisconsin, some of which were thought possibly different species, were crossed. Hybrid sex ratios in this arrhenotokous species were similar to parental types, indicating conspecificity. English and Wisconsin strains tended toward darker legs and female scapes. (Author)

423 Sadava, A. D., and Miller, C. D. 1967. Taxonomy of last-instar larval remains of parasites reared from *Spilonota ocellana*. Can. Entomol. 99:436-442.

Provides an illustrated key to the last-instar larval cephalic structures of parasites reared from larvae of the eye-spotted bud moth, *Spilonota ocellana*. Notes on habits of the parasites and a description of their cocoons and pupae are given. Rearing techniques are described. Among the parasites reared are two species which also attack the larch casebearer, *Euderus cushmani* and *Gelis tenellus*. The latter is a hyperparasite of *Agathis dimidiator* in the bud moth complex.

424 Salt, G. 1931. Parasites of the wheat-stem sawfly, *Cephus pygmaeus* Linnaeus, in England. Bull. Entomol. Res. 22:479-545.

Among the nine species of wheat-stem sawfly parasites described is *Pimpla detrita*, a species which also attacks the larch casebearer. Adult *P. detrita* begin emerging from the sawfly in May but do not oviposit in this host until mid-July. It is possible that a second generation develops in an alternate host since *C. pygmaeus* larvae are not far enough advanced during the early summer. The host list for *P. detrita* includes: Lepidoptera - *Chilo phragmitellus*, *Tortrix viridana*, *Evetria buoliana*, *Polychrosis botrana*, *Argyroploce variegana* and *Aegeria formiciformis*; Coleoptera-*Anthonomus pomorum*; Diptera - *Lipara lucens*; Hymenoptera - *Cephus infuscator*.

425 Sandlan, K. 1979. Sex ratio regulation in *Coccygomimus turionellae* (Hymenoptera, Ichneumonidae) and its ecological implications. Ecol. Entomol. 4:365-378.

Sex regulation and its relevance to the ecology of a k-selected pupal parasitoid was investigated in *C. turionellae*. The sex ratio varied with host size, females predominating in large hosts. Host size was highly correlated to parasitoid fecundity via influences on size and longevity but not on the number of ovarioles per female or daily egg production. Host encounters are more limiting than egg production and host size had no effect on host acceptance. *C. turionellae* has been recorded as a parasite of the larch casebearer.

426 Sandlan, K. P. 1979. Host-feeding and its effects on the physiology and behavior of the ichneumonid parasitoid, *Coccygomimus turionellae*. Physiol. Entomol. 4:383-392.

The physiological and behavioral aspects of host feeding by the larch casebearer parasite, *Coccygomimus turionellae*, are investigated. Females began host feeding with the onset of oviposition. Wasps that were deprived of hosts showed a greater tendency to feed once hosts were provided.

427 Say, T. 1836. Descriptions of new species of North American Hymenoptera, and observations on some already described. Boston J. Nat. Hist. 1:209-305.

Two of the new species described, *Cryptus tenellus* and *Microgaster congregata*, have been recorded as parasites of the larch casebearer.

428 Schaffner, J. V. Jr. 1937. The larch case-bearer (*Coleophora laricella* Hbn.). Mass. For. and Park Assoc. Tree Pest Leafl. 12, 3p.

Importation of European parasites to control the larch casebearer began in 1932. By 1950, two of the introduced species, *Chrysocharis laricinellae* and *Bassus pumilis* had been recovered in New England and New York. Studies showed that 18 to 20 species of native parasitic hymenoptera attack the casebearer in the northeast U. S., but none has ever been abundant enough to cause any considerable degree of control.

429 Schaffner, J. V. Jr. 1952. Larch case-bearer (*Coleophora laricella*). Mass. For. and Park Assoc. Tree Pest Leafl. 12. In: Important Tree Pests of the Northeast, H. I. Baldwin (ed.), 2nd. Ed., Evans Printing Co., Concord, New Hampshire, p.17-20.

This is new reprinting of Schaffner, J. V. Jr. 1937. No new information provided.

430 Schaffner, J. V. Jr. 1959. Microlepidoptera and their parasites reared from field collections in the northeastern United States. USDA For. Serv. Misc. Publ. No. 767, 97p.

Provides a listing of the bionomics, distribution, and cohosts of 29 larch casebearer parasites reared in the eastern United States. The parasite species discussed are: *Agathis bicolor*, *A. pumilus*, *A.* sp., *Apanteles* n. sp., *Bracon juncicola*, *B. pygmaeus*, *Campoplex rufipes*, *Chrysocharis laricinellae*, *Derostenus silvia*, *Dibrachys* sp., *Dimmockia* sp., *Elachertus* sp., *Euderus cushmani*, *Eulophus magnisulcatus*, *Eurydinota lividicorpus*, *Eurytoma* sp., *Gelis obscurus*, *G. tenellus*, *Habrocytus thyridopterigis*, *Haltichella xanticles*, *Horismenus microgaster*, *Horogenes* sp., *Itoplectis 4-cingulata*, *Pimplopterus* sp., *Rogas* sp., *Scambus hispae*, *Spilochalcis side*, *Tetrastichus xanthostigma* and *T.* sp.

431 Schimitschek, E. 1936. Ergebnisse von Parasitenzuchten. (Results of parasite rearings.) Z. ang. Entomol. 22:558-564.

Lists the parasites reared from forest insect collections for the years 1926-1934. Four species were reared from the larch casebearer, *Pezomachus laricellae* Fohr., *Microdus pumilus* Ratz., *Entedon laricinella* Ratz., and *Pteromalus semiclavatus* Ratz. Two species which have been recovered from the casebearer in other studies were reared from alternate hosts. *Pimpla examinator* F. parasitized *Cacoecia murinana* Hb. and *Angitia armillata* Grav. attacked *Hyponomeuta evonymella* L.

432 Schimitschek, E. 1964. Liste der 1934-1936 und 1940-1953 gezogenen Parasiten und ihrer Wirte. (List of 1934-1936 and 1940-1953 extracted parasites and their hosts.) Z. ang. Entomol. 53:320-341.

Parasites reared from forest pests between the years 1934 to 1936 and 1940 to 1953 in Austria and Czechoslovakia are listed. Notes on habitat, biology, and taxonomy of the species are also provided. Alternate hosts for species in the larch casebearer parasite complex are given. The parasite species are: *Pimpla examinator*, *P. maculator*, *P. brevicornis*, *P. alternans*, *Glypta resinana*, *Apanteles albipennis*, *Angitia armillata*, *Habrobracon stabilis*, *Cirrospilus pictus*, *Hemiteles areator*, and *Dibrachys cavus*. *Both A. albipennis* and *D. cavus* were recovered as primary and as hyperparasites.

433 Schindler, U. 1966. Zum Massenwechsel des Buchensprigrusslers *Rhynchaenus fagi*. (On the growth and variation of the beech leaf miner *Rhynchaenus fagi*.) Z. ang. Entomol. 58:182-186.

Five parasite species were recovered from the beech leaf miner during surveys conducted in 1963 and 1964. Two of these parasites, *Cirrospilus vittatus* and *C. diallus*, have also been recorded attacking the larch casebearer.

434 Schindler, U. 1968. Massenwechsel eines typischen forstlichen Dauerschadlings, der Larchenminiermotte *Coleophora laricella*. (Population change in a typical perennial forest pest, the larch casebearer (*Coleophora laricella*).) Z. ang. Entomol. 61:380-386.

Larch casebearer outbreaks in larch plantations in northwest Germany were studied during the years 1952-1957 and 1964-1967. Parasitism was measured only in the later outbreak. The author concludes that parasitism is regulated by density. A drop in parasitism in the last year of the outbreak was attributed to a cold summer the previous year.

435 Schindler, U. 1972. Einfluss der Meisen (Paridae) auf die Populationsdichte der Larchenminiermotte (*Coleophora laricella* Hbn.) im Kalamitatsgebiet des Emslandes. (Influence of tits on the population density of the larch casebearer (*Coleophora laricella* Hbn.) in the outbreak area of the Ems region.) Allg. Forst. und Jagdzeitung 1:17-20.

In northwestern Germany, periods of high densities of larch casebearer last six to seven years and alternate with periods of low density of the same duration. Control with systemic insecticides was reasonably successful but of short duration. Tits (Paridae) were successful enough to reduce the density of the casebearer below the threshold of economic damage. Artificial nesting boxes were used. Predation is exceptionally intensive during the long winter period and has little effect on parasitism.

436 Schmidt, W. C., Shearer, R. C., and Roe, A. L. 1976. Ecology and silviculture of western larch forests. USDA For. Serv. Tech. Bull. No. 1520, 96p.

The larch casebearer is cited as currently the most serious pest in western larch. A brief discussion of its introduction in the west, effect on the growth of larch, and control measures are given. Biological control attempts have centered around introduction of the parasite, *Agathis pumila*. Two other exotic species, *Chrysocharis laricinellae* and *Dicladocerus westwoodii* were released in Idaho and Washington in 1972. The two most common native parasites are *Spilochalcis albifrons* and *Dicladocerus* sp.

437 Schmitz, R. F. 1975. Status of larch casebearer research in the northern Rocky mountains. Proc. West. For. Conf., Vancouver, B. C., 5p.

A review of the present programs and recent accomplishments in western larch casebearer research; particularly those studies dealing with the use of exotic parasites to suppress casebearer populations. The state of the *Agathis pumila* release program, developments in laboratory rearing of introduced casebearer parasites, and a random dispersal model of the population dynamics of the casebearer and *Agathis pumila* are discussed.

438 Schoenweise, F. 1937. Einige Beobachtungen uber das Auftreten und den Parasiten-Befall der Larchenminiermotte. (Some observations on the occurrence and attack by parasites of the larch casebearer.) Zentralbl. Gesamte. Forstwes. 63:312-316.

Observations of a larch casebearer outbreak in Austria in 1933-1934 indicated a relationship between the parasite species composition and elevation. At higher elevations only *Entedon laricinellae* was well established. *E. laricinellae* was the most important parasite species at all locations, followed by *Microdus pumilus* and *Pteromalus semiclavatus*, respectively. Total parasitism of mature larvae reached 74 percent. An examination of young larvae earlier in the spring showed substantially higher parasitism, over 90 percent. Biological and morphological descriptions are given for *Pezomachus laricellae* Fohringer n. sp., *Hemiteles albipalpus* Thoms. var. *austracus* Fohringer n. var. and *Entedon laricinellae*, with minor notes on *Hemiteles pulchellus*, *Microdus pumilus*, *Entedon arcuatus*, *Pteromalus semiclavatus*, and *Necremnus leucarthros*.

439 Schread, J. C., Brigham, W. T., and Smith, G. R. 1932. Alternate host study of the parasites of the oriental fruit moth. Conn. Exp. Stn. Bull. 461:490-502.

Of the 16 distinct parasites reared from sumac fruit clusters, only one is important as a primary larval parasite of the oriental fruit moth, *Grapholitha molesta*, in Connecticut. Two larch casebearer parasites were reared from sumac during the study. *Horismenus microgaster* showed a tendency toward hyperparasitism and *Elachertus proteoteratis*, although abundant in the sumac samples, has not been reported as a parasite of the fruit moth.

440 Schremmer, F. 1960. Beobachtungen und Untersuchungen uber die Insektenfauna der Larche (*Larix decidua*) im ostlichen Randgebiet ihrer naturlichen Verbreitung mit besonderes Berucksichigung einer Grosstadtlarche. (Observations and investigations on the insect fauna of larch (*Larix decidua*) in the eastern border region in their natural range with special consideration of large city trees.) Z. ang. Entomol. 45:1-48, 113-153.

A general treatment of the pests of *L. decidua*. Parasites recorded from a single city tree and several forest sites in Austria are recorded. Parasites listed from the larch casebearer are *Diglyphus rugifrons*, *Cirrospilus pictus*, *Epilampsis boops*, and *Dicladocerus*

westwoodii. *C. pictus* was also recovered from an alternate host, *Fenusa pusilla*.

441 Schultz, P. B., and Kok, L. T. 1979. Biological influences affecting laboratory rearing of the pupal parasite *Coccygomimus turionellae*. Environ. Entomol. 8:437-440.

Biological factors affecting rearing of the parasite *Coccygomimus turionellae* from pupae of the wax moth, *Galleria mellonella* were examined to determine conditions optimal for mass propagation. Parasite/host ratio and duration of parasite contact with the host were major influences on productivity. *C. turionellae* is a native parasite of the larch casebearer.

442 Schwenke, W. 1978. Die Forstchadlinge Europas. (Forest insects of Europe.) Vol. 3 Lepidoptera. Paul Parey, Hamburg and Berlin p.21-30.

A general treatment of the parasite complex of the larch casebearer (see Jagsch, 1973 for species treated) in Europe. The author notes variations in the species complex and in the dominant species in different regions of Europe and comments on the success of North American introductions of *Agathis pumila*, *Chrysocharis laricinellae* and *Dicladocerus westwoodii*.

443 Shenefelt, R. D. 1970. Braconidae 3: Agathidinae. In: Hymenopterorum Catalogus (nova editio). C. Ferriere and J. Vecht (eds.), Viteverij, Dr. W. Junk N. V. p.307-428.

Synonymies, a host list and bibliography are given for the subfamily Agathidinae. Six of these species attack the casebearer, the alternate hosts are given form each parasites. The parasites are: *Agathis anglica*, *A. binominata*, *A. cincta*, *A. coleophorae*, *A. pumila*, and *Earinus tuberculatus*.

444 Shenefelt, R. D. 1972. Braconidae 4: Microgasterinae and *Apanteles*. In: Hymenopterorum Catalogus (nova editio). J. Vecht and R. D. Shenefelt (eds.), Viteverij, Dr. W. Junk N. V. p.429-668.

Synonymies, a host list and bibliography are given for the subfamily Microgasterinae and the genus *Apanteles*. The parasite, *A. laricellae*, has been recorded from two hosts in North America, *Argyresthia laricella* Kft. and the larch casebearer.

445 Shenefelt, R. D. 1973. Braconidae 5: Microgasterinae and Ichneutinae. In: Hymenopterorum Catalogue (nova edito). J. Vecht and R. D. Shenefelt (eds.), Vitgeverij, Dr. W. Junk N. V. p.669-812.

Synonymies, a host list, and bibliography are given for the subfamilies Microgasterinae and Ichneutinae. Included is the species *Microgaster tibialis* Nees, which attacks the larch casebearer. Forty-seven other hosts of *M. tibialis* are listed.

446 Shenefelt, R. D. 1978. Braconidae 10: Braconinae, Gnathobraconinae, Mesostoinae, Pseudodicrogeniinae, Telengainae, Ypsistocerinae, plus Braconidae in general, major groups, unplaced genera and species. In: Hymenopterorum Calalogus (nova editio), C. Achterberg and R. D. Shenefelt (eds.), Dr. W. Junk B. V. Publ., The Hague, Holland p.1425-1872.

Synonymies, a host record, and bibliography are given for the subfamily Braconinae. Four of the species listed are parasites of the casebearer: *Bracon juncicola* Ash., *B. pygmaeus* Prov., *B. gelechiae* (Ash.), and *Habrobracon stabilis* Wesm.

447 Silver, G. T. 1957. Separation of the species of arbovitae leafminers in New Brunswick. (Lepidoptera: Yponomeutidae). Can. Entomol. 89:97-107.

Records two arbovitae leafminers, *Argyresthia aureoargentalla* and *A. thuiella*, as hosts of *Spilochalcis albifrons*, a native parasite of the larch casebearer.

448 Simmonds, F. J. 1944. Observations on the parasites of *Cydia pomonella* L. in southern France. Sci. Agric. 25:1-30.

Investigates the bionomics of parasites and predators of *C. pomonella*. The larch casebearer parasite, *Dibrachys cavus*, was reared as both a primary and secondary parasite of *C. pomonella*. It develops as an endoparasite in *C. pomonella* pupae, and as an ectoparasite in *C. pomonella* larvae. Tests indicated that *D. cavus* attacked host pupae only when no other hosts were available. *D. cavus* also attacked the *Cydia* parasites *Ascogaster quadridentata(us)*, *Pristomerus vulnerator*, *Ephialtes caudatus*, *E. crassiseta*, *E. cydiae*, and *Cryptus sexannulatus*.

449 Simmonds, F. J. 1944. The propagation of insect parasites on unnatural hosts. Bull. Entomol. Res. 35:219-226.

It is possible to alter host preferences of insect species in the laboratory, but usually a very heavy initial mortality occurs. During mass rearing of *Dibrachys cavus*, their preference for larvae over pupae did not change even after breeding a strain on pupae for several generations. *D. cavus* has been reared as a parasite of the casebearer.

450 Skuhravy, V. 1973. Field control of the larch case-bearer moth, *Coleophora laricella*, with a juvenoid. Acta Entomol. Bohemoslov. 70:313-322.

A juvenoid was applied to fourth instar casebearer larvae under field conditions in Czechoslovakia. A 0.1 percent concentration produced intermediate forms of which did not develop into adults, and mortality reached 96 percent. A concentration of 0.01 produced 35 percent intermediates. The feeding of treated fourth instar larvae took 5-15 days more than in the control. The effects of the juvenoid on the development of parasites of the casebearer was inconclusive. Laboratory rearings resulted in parasites developing in an average of seven percent of the pupae in control rearings, four percent after a 0.1 percent treatment of the juvenoid and ten percent after a 0.01 percent concentration. The high mortality of the casebearer in the areas sprayed with the juvenoid at a 0.1 percent concentration indicates that some of the parasites must have developed from the intermediate forms of the casebearer. Emergence of treated casebearer adults was delayed at both concentration levels, but parasite emergence remained the same as in control plots.

451 Sloan, N. 1965. Biotic factors affecting populations of the larch casebearer, *Coleophora laricella* Hbn. in Wisconsin. Ph.D. Diss., Univ. Wisc., Madison, 193p.

This study includes a survey of the world literature on *C. laricella*, the biotic agents affecting control, and the bionomics of the insect in Wisconsin. From nine authors works, a world list of 93 parasitoids of the larch casebearer was compiled: *Agathis bicolor*, *A. cincta*, *A. pumila*, *A.* sp., *Apanteles laricellae*, *A.* sp., *Bracon gelechiae*, *B. guttiger*, *B. juncicola*, *B. pygmaeus*, *B.* sp., *Chelonus* sp., *Clinocentrus* sp., *Hormius* sp., *Rogas* sp., *Sigalphus caudatus*, *Angitia laricinella*, *A. nana*, *A.* sp., *A. virginalis*, *Campoplex rufipes*, *C.* sp., *C. tumidulus*, *Exochus* sp., *Gelis laricellae*, *G. obscurus*, *G. tenellus*, *G.* sp., *Hemiteles pulchellus*, *Horogenes* sp., *Itoplectis 4-cingulata*, *I. evetriae*, *I. vesca*, *I.* sp., *Lissonota parva*, *Omorgus tumidulus*, *Phaeogenes*

near *epinotiae*, *Pimpla examinator*, *P. turionellae*, *Pimplopterus parvus*, *P.* sp., *Scambus hispae*, *Syrphoctonus agilis*, *Polynema* sp., *Achrysocharis* sp., *Cirrospilus pictus*, *Derostenus fullawayi*, *Dicladocerus westwoodii*, *Dimmockia* sp., *Elachertus* near *aeneoniger*, *E. proteoteratis*, *E.* sp., *Entedon laetus*, *Entedontinae* sp., *Euderus amphis*, *E. cushmani*, *E. subopacus*, *E.* sp., *Eulophinae* sp., *Eulophus magnisulcatus*, *E. metalarus*, *E.* sp., *Euplectrus mellipes*, *Horismenus microgaster*, *Kratochviliana laricinellae*, *K.* sp., *Pnigalio* sp., *Sympiesis guttatipennis*, *S.* sp., *Tetrastichus coerulescens*, *T. xanthostigma*, *T.* sp., *Copidosoma truncatellum*, *Catolaccus aeneoviridis*, *Capellia lividicorpus*, *Dibrachys cavus*, *D.* sp., *Eurydinota laricinellae*, *Habrocytus phycidis*, *H. thyridopterigis*, *H.* sp., *Pteromalus semiclavatus*, *Eurytoma* sp., *Ceraphron* sp., *Chalcid* sp., *Haltichella xanticles*, *Spilochalcis albifrons*, *S. side*, *S. xanthostigma*, *S.* sp., *Telenomus ovivorus*, *Trissolcus euschisti*. Thirteen species of parasites have been recovered in Wisconsin of which *Agathis pumila* is the most effective. *Kratochviliana laricinellae* is of minor importance in the Lake States. It appears unlikely that *K. laricinellae* acts as a secondary parasite on *C. laricella* previously parasitized by *A. pumila*. Except for *Bracon pygmaeus*, *Gelis tenellus*, and *Habrocytus phycidis* the native species exert only a localized influence on the population levels of the casebearer. Other parasite species which have been reared in Wisconsin are: *Agathis cincta*, *Apanteles laricellae*, *Bracon juncicola*, *B.* sp., *Isdromas* sp., *Campoplex* sp., *Sympiesis* sp., *Tetrastichus coerulescens*, *Capellia lividicorpus*, and *Spilochalcis albifrons*. Egg predators eliminate about 25 to 35 percent of the population over and above that already doomed by other natural control agents. Several factors regulate the population level of *A. pumila* including hyperparasitism, bird predation, and climate. Included are keys to the identification of immature parasites from the host and parasite remains found in cases as well as adult specimens.

452 Sloan, N. F. and Coppel, H. C. 1965. Seasonal history and parasite complex of the larch casebearer, *Coleophora laricella* Hbn. in Wisconsin. Univ. Wisc. For. Res. Note No. 123, 6p.

The species of parasites reared from collections of the larch casebearer in three counties in Wisconsin varied from year to year and between areas. Of the 15 parasites native to the state, only *Bracon pygmaeus*, *Gelis tenellus*, and *Habrocytus phycidis*, exhibit more than a localized influence on the population levels of the casebearer. The most important casebearer parasite was *Agathis pumila* which has showed a remarkable ability to spread. It has traveled southward about 294 miles from its 1953 release site. Examination of many *C. laricella* cases from which *Kratochviliana laricinellae* had emerged as a second generation did not reveal the remains of both *A. pumila* and *K. laricinellae*. So it appears unlikely that *K. laricinellae* acts as a secondary parasite on casebearers previously parasitized by *A. pumila*. Other parasite species which have been reared in Wisconsin are: *Agathis cincta*, *Apanteles laricellae*, *Bracon juncicola*, *B.* sp., *Isdromas* sp., *Campoplex* sp., *Sympiesis* sp., *Tetrastichus coerulescens*, *Capellia lividicorpus*, and *Spilochalcis albifrons*.

453 Sloan, N. F., and Coppel, H.C. 1965. The insect parasites of the larch casebearer, *Coleophora laricella* Hubner (Lepidoptera: Coleophoridae), in Wisconsin with keys to the adults and mature larval remains. Wisc. Acad. of Sci., Arts Lett. 54:125-146.

Contains keys for 15 insect parasites collected from the larch casebearer in Wisconsin from 1961-1964 and one additional species collected prior to the study. Keys for the separation of the parasites based on the remains left in the case after the parasite has emerged, and for separation of the adults are given. The final instar cephalic

structures, spiracles, and adults are illustrated and described. Notes on the biology of the parasites are also given. The species discussed are: *Agathis cincta*, *Apanteles laricellae*, *Bracon juncicola*, *B. pygmaeus*, *B.* sp., *Isdromas* sp., *Gelis tenellus*, *Campoplex* sp., *Sympiesis* sp., *Tetrastichus coerulescens*, *Kratochviliana laricinellae*, *Capellia lividicorpus*, *Habrocytus phycidis*, and *Spilochalcis albifrons*.

454 Sloan, N. F., and Coppel, H. C. 1965. Oviposition pattern and egg predation of the larch casebearer *Coleophora laricella* Hbn. in Wisconsin. Univ. Wisc. For. Res. Note No. 124, 4p.

During three years of investigation in Wisconsin no egg parasites have been recovered from the larch casebearer.

455 Sloan, N. F., and Coppel, H. C. 1968. Ecological implications of bird predators on the larch casebearer in Wisconsin. J. Econ. Entomol. 61:1067-1070.

Discusses the importance of birds, as predators of the larch casebearer. Birds did not differentiate between parasitized and nonparasitized larch casebearer. Some of the birds observed eating larch casebearer were: Black-capped chickadees, Yellow warblers, Ruby-crowned kinglets and the Magnolias. Black-capped chickadees were observed more frequently than other species, and were the only bird observed to remove larch casebearer from their case in the spring. During the winter, there was about 23.5 percent decline of larch casebearer probably due to bird predation, with 30-40 percent consisting of nonparasitized larvae.

456 Slosson, A. T. 1898. Additional list of insects taken in alpine region of Mt. Washington. Entomol. News 9:251-253.

One-hundred and seventy-five insect species which are new recoveries for Mt. Washington, New Hampshire are listed. Among these is the larch casebearer parasite, *Smicra albifrons* Walsh.

457 Smith, H. S. 1916. An attempt to redefine the host relationships exhibited by entomophagous insects. J. Econ. Entomol. 9:477-486.

The hyperparasitic nature of the larch casebearer parasite *Dibrachys boucheanus* is discussed. *D. boucheanus* is believed to be a secondary parasite which becomes tertiary only through accident and its omnivorous food habit.

458 Smith, L. M., and Kido, G. S. 1949. The raspberry leaf sawfly. Hilgardia 19:45-54.

Discusses the life history, hosts and control of the rasberry leaf sawfly, *Priophorus rubivorus*. *P. rubivorus* is attacked by two internal parasites, a dipteran, *Bessa selecta* and *Dibrachys boucheanus*, a species which parasitizes the larch casebearer as well. The biology of *D. boucheanus* in *P. rubivorus* is described. *D. boucheanus* is a superparasite and passes the winter as a mature larva within the sawfly. Field evidence indicates that *D. boucheanus* is seldom, if ever, hyperparasitic in this host.

459 Smith, R. C. 1922. The biology of the Chrysopidae. Mem. N. Y. Exp. Stn. 58:1291-1372.

A study of the bionomics of 15 Chrysopidae species is discussed. Parasites of *Chrysopa* include three species, *Hemiteles areator*, *H. tenellus*, and *Dibrachys boucheanus*, which have also been recovered from the larch casebearer.

460 Smith, R. C. 1938. A preliminary report of the insects attacking bindweed, with special reference to Kansas. Trans. Kansas Acad. Sci. 41:183-192.

Two larch casebearer parasites, *Spilochalcis albifrons* and *Catolaccus aeneoviridis*, were recovered from collections in hedge bindweed, *Convolvulus americanus*, and field bindweed, *C. arvensis*. *S. albifrons* was reared in large numbers, especially in August and September, possibly from the morning glory leafminer. *C. aeneoviridis* may be a secondary parasite in this habitat.

461 Sorenson, C. J. 1934. Chalcis-fly infestation of alfalfa-seed and parasitism of the chalcis-fly in Utah, 1930 to 1933, inclusive. Proc. Utah Acad. Sci. Arts Lett. 11:241-244.

The larch casebearer parasite, *Eupelmella vesicularis*, has been reared occasionally from the chalcis-fly, *Bruchophagus funebris* How.

462 Sorenson, C. J. 1934. Some hyperparasites of the alfalfa weevil parasite *Bathyplectes curculionis* (Thoms.) occurring in the Uintah Basin of Utah. Proc. Utah Acad. Sci. Arts Lett. 11:249-251.

Three of the eight hyperparasites of *B. curculionis* are also part of the larch casebearer parasite complex: *Dibrachys boucheanus* (Ratz.), *Catolaccus aeneoviridis* (Girault), and *Eupelmella vesicularis* (Ratz.). As well as acting as a hyperparasite, *D. boucheanus* was also a primary parasite on pupae of the alfalfa weevil, *Phytonomus posticus* (Gyll.).

463 Stark, R. W. 1961. Notes on the parasite complex of *Evagora* (Recurvaria) *starki* Freeman in Canadian Rocky Mountain parks. Can. J. Zool. 39:893-904.

The known parasites of the lodgepole needle miner, 27 in all, are listed and notes on the biologies of the most common species are presented. The larch casebearer is an alternate host for eight of these species. One of these, *Zagrammosoma americana* is a primary and secondary parasite, attacking *Copidosoma deceptor*, a common parasite of the needle miner. The other parasite species which are common to both the casebearer and needle miner are: *Sympiesis stigmatipennis*, *Dicladocerus westwoodii*, *Phaeogenes epinotiae*, *Itoplectis quadricingulata*, *Gelis tenellus*, *Bracon gelechiae* and *Spilochalcis albifrons*.

464 Stearns, L. A. 1919. Some recently recorded parasites of the oriental peach moth. J. Econ. Entomol. 12:347-348.

Eleven species of parasites were reared from the oriental peach moth, *Grapholitha molesta* (as *Laspeyresia*), two of which are also larch casebearer parasites. *Dibrachys boucheanus* was the only secondary parasite reared emerging from cocoons of the primary peach moth parasite, *Macrocentrus* sp. *Habrobracon gelechiae* attacks the peach moth in the larval stage.

465 Stearns, L. A. 1928. The larval parasites of the oriental peach moth (*Laspeyresia molesta* Busck) with special reference to the biology of *Macrocentrus ancylivorus* Rohwer. N. J. Agric. Exp. Stn. Bull. No. 460, 24p.

During the decade subsequent to its introduction, the oriental peach moth, *Grapholitha molesta* (as *Laspeyresia*), has become subject to attack by as many as 47 hymenopterous and dipterous larval parasites. The biology, development and effectiveness of *Macrocentrus ancylivorus*, its most common parasite is discussed in detail. Two peach moth parasite species, *Epiurus indagator* and *Dibrachys boucheanus* have been recovered from fruit pests as well as the larch casebearer.

466 Steiner, H. M., and Worthley, H. N. 1941. The pistol case-bearer and its control in Pennsylvania orchards. Pa. State Coll. Agric. Exp. Stn. Bull. No. 406, 26p.

The pistol casebearer, *Coleophora malivorella*, is a native pest in North America. Though primarily a pest of apples, the establishment of larvae has been observed on quince, pear, plum, cherry, and wild cherry. Among the natural enemies attacking the pistol casebearer are at least four and possibly five species that also parasitize the larch casebearer. All species attack the larval stage of the pistol casebearer. Included is *Spilochalcis albifrons*, a pupal parasite of larch casebearer. *Habrocytus phycidis*, a widespread parasite of the larch casebearer in the eastern U.S. and Canada, is one of the most numerous parasites of the pistol casebearer in Pennsylvania. Other parasite species common to both casebearers are *Microbracon pygmaeus* and *Dibrachys cavus*.

467 Stoner, A., and Weeks, R. E. 1974. *Copidosoma truncatellum*: Effect of temperature on the developmental rate, duration of emergence and longevity. Environ. Entomol. 3:957-960.

The developmental time of *Copidosoma truncatellum* (Dalman) in the host, *Trichoplusia ni* (Hubner), was studied at seven constant temperatures; 14.8, 20.2, 23.5, 25.0, 28.9, 32.3, and 35.6 degrees centigrade. At temperatures of 14.8 and 28.9 degrees centigrade the times from egg to first adult emergence were 122.9 and 22.4 days; the durations of adult emergence from host were 10.8 and 2.9 days; and the durations of a generation were 162.7 and 31.2 days, respectively. At 32.3 degrees centigrade, the parasitized host and parasites died during the late instars of the host. At 35.6 degrees centigrade, the host eggs did not hatch. Longevity of adult female *C. truncatellum* fed on a diet of 20 percent levulose solution was 30.3 days at 14.8 degrees centigrade and 2.8 days at 35.6 degrees centigrade. At 25 degrees centigrade synchronization of the parasite to host was nearly perfect. *C. truncatellum* is also a parasite of the casebearer.

468 Stoner, A., and Weeks, R. E. 1976. *Copidosoma truncatellum*, a polyembryonic parasite of *Trichoplusia ni*: Age of host eggs parasitized, searching, fecundity and effectiveness. Environ. Entomol. 5:323-328.

In laboratory studies, *C. truncatellum* was found to parasitize any age of egg. It was not an effective searcher, even in a confined area. Temperature affects the rate of parasitization, the time taken for oviposition, and the percentage of brood that will oviposit. It is felt that *C. truncatellum* is not a good candidate for mass rearing and release as a biological control agent. *C. truncatellum* has also been reared from the casebearer.

469 Struble, G. R. 1972. Biology, ecology and control of the lodgepole needle miner. USDA Tech. Bull. No. 1458, 38p.

A summary of findings conducted in Yosemite National Park on the biology and ecology of *Coleotechnites milleri*, its natural enemies and pathogens, climatic and physiographic influences, and field tests of insecticides. Five of the primary and hyperparasites of the lodgepole needle miner also parasitize the larch casebearer. *Spilochalcis albifrons*, *S. side*, and *Scambus hispae*, are primary parasites of the needle miner. *Zagrammosoma americana* was a secondary parasite through *Copidosoma deceptor* and *Apanteles californicus*, while *Tetrastichus coerulescens* hyperparasitized only *C. deceptor*.

470 Struble, G. R., and Bedard, W. D. 1958. Arthropod enemies of the lodgepole needle miner, *Recurvaria milleri* Busck. Pan-Pac. Entomol. 34:181-186.

Lists parasites and predators that attack *R. milleri*. It has two tables, one listing the parasites that were reared from *R. milleri* larvae and pupae; the next two groups of parasites have a more remote association with the host. The second table lists parasites taken most often in two years of outbreaks.

471 Summerland, S. A. 1937. The biology and synonymy of the parasites of the strawberry leafroller, *Ancylis comptana* Froel. (Lepidoptera, Tortricidae), found in Kansas. Trans. Kans. Acad. Sci. 40:161-178.

Bomolocha deceptalis and *Ancylis comptana* are recorded as hosts of *Spilochalcis albifrons*, a native parasite of the larch casebearer. *S. albifrons* is also reported as hyperparasitic on the braconid *Apanteles militaris*.

472 Sundby, R. 1957. The parasites of *Phyllocnistis labyrinthella* Bjerk, and their relation to the population dynamics of the leaf miner. Norsk. Entomol. Tidsskr. 2(Suppl.):1-153.

The biology, behavior, incidence of multi- and superparasitism, and morphology of *P. labyrinthella* parasites are discussed. Four of these species also parasitize the larch casebearer: *Cirrospilus vittatus*, *C. pictus*, *Epilampsis boops*, and *Tetrastichus xanthostigma*. Parasites have been unable to control leaf miner populations due to the initial abundance of the host, scarcity of hosts during the second generation of parasites, and the short oviposition period of the host species.

473 Syme, P. D. 1968. *Agathis binominata* (Hymenoptera: Braconidae) parasitizing *Rhyacionia buoliana* (Lepidoptera: Oleothreutidae) in central Ontario red pine. Can. Entomol. 100:893.

The first record of *A. binominata* as a parasite of the European pine shoot moth, *Rhyaciona buoliana*. A list of alternate hosts is provided. This parasite also attacks the larch casebearer.

474 Talhouk, A. S., and Soehardjan, M. 1970. Some notes on the bionomics of *Cirrospilus vittatus* (Hym., Chalcidoidea), an important parasite of the apple-leaf miner, *Stigmella malella* (Lep., Stigmellidae). Entomol. Ber. 30:76-77.

Describes the search and attack behavior of *C. vittatus*. A female *C. vittatus* was once found feeding on the flowers of wild carrot, *Daucus carota*, near an apple orchard. *C. vittatus* will attack both mature and younger smaller leaf miner larvae, which may account for the great variability in the size of adults. *C. vittatus* has also been reared from the larch casebearer.

475 Telford, A. D. 1961. Features of the lodgepole needle miner parasite complex in California. Can. Entomol. 93:394-402.

Of the more common *Coleotechnites milleri* (as *Evagora*) parasites in the Tuolumne meadows in Yosemite National Park, three species use the larch casebearer as an alternate host. *Sympiesis stigmatipennis* and *Zagrammosoma americana* are external larval parasites, attacking the needle miner during the second year of the host's life cycle. These species are apparently dependent upon the availability of cohosts during the period when *E. milleri* is an unsuitable host. *S. stigmatipennis* is only a primary parasite. *Z. americana* is both primary and secondary, and *Tetrastichus coerulescens* is an obligatory hyperparasite. The role of hyperparasitism in the needle miner complex and its influence on the effectiveness of primary parasites are discussed.

476 Telford, A. D. 1961. Lodgepole needle miner parasites: biological control and insecticides. J. Econ. Entomol. 54:347-355.

A malathion-oil spray program against the lodgepole needle miner, *Coleotechnites milleri* (as *Evagora*), at Yosemite National Park in 1959 was detrimental to the defoliator's principal primary parasites. Two of the parasite species suffering mortality during the spray program, *Sympiesis stigmatipennis* and *Zagrammosoma americana*, have also been reared as parasites of the larch casebearer.

477 Terrell, T. T. 1966. Distributing parasites of the larch casebearer - 1966. USDA For. Serv., Div. State and Priv. For., No. Region, Missoula, MT., 6p. (unpubl.)

Describes the propagation of *Agathis pumila* in northern Idaho for distribution in other parts of the western United States.

478 Terrell, T. T., and Denton, R. E. 1964. Introducing parasites to control larch casebearer in the Northern region. USDA For. Serv., No. Region, Missoula, MT. (unpubl.)

Dormant *Agathis pumila* were shipped from the eastern U. S. to be reared and released in the Northwest. Parasitized larch casebearer were reared on small caged casebearer free larch trees. Due to early emergence, males were stored for up to ten days in humid, roomy cages and provided with a diluted honey:water solution until they could be synchronized with females for release. Parasites were released in light to moderate casebearer infestations as it was believed that if released in high populations *A. pumila* might suffer the same mortality as their host larvae.

479 Terrell, T. T., and Denton, R. E. 1966. Biological control of the larch casebearer in the Northern Region - 1965. USDA For. Serv., Div. State and Priv. For., No. Region, Missoula, MT., 10p. (unpubl.)

Discusses the methods used for importing, rearing and caging *Agathis pumila* for biological control of the larch casebearer.

480 Terrell, T. T., and Denton, R. E. 1966. Biological control of larch casebearer by parasites in the Northern Region - 1966. USDA For. Serv., Div. State and Priv. For., No. Region, Missoula, MT. 3p. (unpubl.)

A 1966 overwintering sample was collected in order to determine if any previous release sites contained enough progeny to serve as a source of parasites for distribution the following year. Parasitism of overwintering larvae by *Agathis pumila* ranged from 0 to 48 percent.

481 Theroux, L. 1977. Summary report of 1977 bio-control work. USDA For. Serv., Intermt. For. and Range Exp. Stn., Ogden, Ut., 14p. (unpubl.)

Reports the results of overwintering and pupal samples taken at larch casebearer parasite release sites in northern Idaho. Nonemergence of laboratory reared *Agathis pumila* is believed to be due to the effects of photoperiod. Other parasites reared were: *Scambus decorus*, *Gelis tenellus*, *Pristomerus* sp., *Bracon pygmaeus*, *Spilochalcis albifrons*, *Dicladocerus nearcticus*, *Chrysocharis laricinellae*, *Elachertus argissa*, *Necremnus metalarus*, *Habrocytus phycidis*, *Mesopolobus* sp., and Pteromalini.

482 Thompson, W. R. 1953. A catalogue of the parasites and predators of insect pests. Section 2. Host parasite catalogue. Part 2. Hosts of the Hymenoptera (Agaonidae to Braconidae). Commonw. Inst. Biol. Control, p.1-190.

Parasites in the families Agaonidae, Aphelinidae, Aphidiidae, Apidae, Belytidae, Bethylidae, and Braconidae are listed, with their hosts, including the geographic area where the record was made. Several of these species are members of the larch casebearer parasite complex: *Apanteles albipennis* Nees, *A. congregatus* Say, *A. emarginatus* Nees, *Bassus coleophorae* Rohw., *B. pumilus* Ratz., *Microbracon coleophorae* Rohw., *Microbracon pygmaeus* Prov., *Microgaster tibialis* Nees, and *Triaspis caudatus* Nees.

483 Thompson, W. R. 1955. A catalogue of the parasites and predators of insect pests. Section 2. Host parasite catalogue. Part 3. Hosts of the Hymenoptera (Calliceratid to Evaniid). Commonw. Inst. Biol. Control, p.191-332.

Parasites in the families Calliceratidae, Chalcidae, Chrysididae, Cleonymidae, Cleptidae, Cynipidae, Diapriidae, Dryinidae, Elasmidae, Encyrtidae, Eucharidae, Eulophidae, Eupelmidae, Eurytomidae, and Evaniidae are listed with their hosts, including the geographic area where the record was made. Several of these species are members of the larch casebearer parasite complex: *Haltichella xanticles* Walk., *Spilochalcis albifrons* Walsh, *S. side* Walk., *Litomastix truncatella* Dalm., *Achrysocharis camilli* Gir., *Chrysocharis boops* Thoms., *C. laricinellae* Ratz., *Cirrospilus pictus* Nees, *C. vittatus* Walk., *Derostenus fullawayi* Crawf., *Elachertus aeneoniger* Gir., *E. proteoteratis* How., *Entedon laetus* Ratz., *Euderus albitarsis* Zett., *E. cushmani* Crwf., *E. subopacus* Gahan, *Eulophus magnisulcatus* Gir., *E. metalarus* Walk., *Horismenus microgaster* Ashm., *Sympiesis stigmatipennis* Gir., *Tetrastichus dolosus* Gahan., *T. xanthostigma* Nees, *Eupelmella vesicularis* Ratz., *Eupelminus coleopterophagus* Gir., *E. saltator* Lind., *Eupelmus coleopterophagus* Marc., *E. degeeri* Dalm., and *E. vesicularis* Ratz.

484 Thompson, W. R. 1957. A catalogue of the parasites and predators of insect pests. Section 2. Host parasite catalogue. Part 4. Hosts of the Hymenoptera (Ichneumonidae). Commonw. Inst. Biol. Control, p.333-561.

Parasites in the family Ichneumonidae, and their hosts are listed, including the geographic area where the record was made. Several of these species are members of the larch casebearer parasite complex: *Angitia armillata* Grav., *A. laricinella* Strobl., *A. nana* Grav., *A. virginalis*, Grav., *Gelis instabilis* Forst., *G. laricellae* F., *G. tenellus* Say, *Glypta nigrina* Desv., *Hemiteles areator* Panz., *H. pulchellus* Grav., *H. apantelis* Cush., *H. tenellus* Say, *Phaeogenes epinotiae* Cush., *Pimpla brevicornis* Grav., *P. detrita* Hlgr., *P. examinator* F., *P. indagatrix* Cress., *P. nigricamposa* Thoms., *P. turionellae* L., and *P. alternans* Grav.

485 Thompson, W. R. 1958. A catalogue of the parasites and predators of insect pests. Section 2. Host parasite catalogue. Part 5. Hosts of the Hymenoptera (Miscogasteridae to Trigonalidae), Lepidoptera and Strepsiptera. Commonw. Inst. Biol. Control, p.562-698.

Parasites in the families, Miscogasteridae, Mutillidae, Mymarid(ae), Pelecinidae, Perilampidae, Platygasteridae, Proctotrupidae, Pteromalidae, Scelionidae, Scoliidae, Serphidae, Stephanidae, Tenthredinidae, Torymidae, Trichogrammidae, and Trigonalidae, and their hosts are listed, including the geographic area where the record was made. Several of these species are members of the larch casebearer parasite complex: *Catolaccus aeneoviridis* Gir., *Cyrtogaster vulgaris* Walk., *Dibrachys cavus* Walk., *Eurydinota laricinellae* Ratz., *E. lividicorpus* Gir., *Habrocytus phycidis* Ashm., *H. thyridopterigis* How., *Pachyneuron altiscuta* How., *Amblymerus subfumatus* Ratz., *Pteromalus semiclavatus* Ratz., and *Trissolcus euschisti* Ashm.

486 Thorpe, W. H. 1933. Notes on the natural control of *Coleophora laricella*, the larch case-bearer. Bull. Entomol. Res. 24:271-291

Discusses the morphology, biology, distribution, and cohosts of 11 larch casebearer parasites reared at Farnham House laboratory, England. *Angitia nana* was the most abundant and widespread parasite obtained and it has been shipped to Canada for release against the casebearer. *Microdus pumilus* was very rare in England, but abundant in the south of France, where parasitism reached 12 percent. The other parasites reared at Farnham House are: *Sigalphus caudatus*, *Eupelmus* sp., *Habrocytus* sp., *Eurydinota* (*Pteromalus*) *laricinellae*, *Cirrospilus* (*Eulophus*, *Entedon*) *pictus*, *Eulophus metalarus*, *Dicladocerus westwoodii*, *Chrysocharis* (*Entedon*) *laricinellae*, and *C.* sp.

487 Tilden, J. W. 1959. Microlepidoptera associated with *Baccharis pilularis*. IV. Gracillariidae, Lymetridae, Oinophilidae. Nasman J. Biol. 17:43-54.

Records *Bucculatrix variabilis* as a host of *Spilochalcis albifrons*, a native parasite of the larch casebearer.

488 Torgersen, T. R. 1969. Two eulophid parasites associated with the black-headed budworm in Alaska. Can. Entomol. 101:180.

Reports *Elachertus aeneoniger* and *Tetrastichus coerulescens* as parasites of the black-headed budworm, *Acleris gloverana*. *T. coerulescens* is a secondary, parasitizing *E. aeneoniger*. Both are in the larch casebearer parasite complex.

489 Torgersen, T. R. 1970. Parasites of the black-headed budworm *Acleris gloverana* (Lepidoptera: Tortricidae) in Alaska. Can. Entomol. 102:1294-1299.

Sixteen parasite species are known to attack the black-headed budworm in Alaska. A key for the identification of parasite adults and notes on the bionomics of each species are given. Three of these, *Itoplectis quadricingulatus*, *Elachertus aeneoniger* and *Tetrastichus coerulescens* have also been recovered as parasites of the larch casebearer. *Itoplectis* was the most common pupal parasite of *A. gloverana*. *E. aeneoniger* is a primary solitary or gregarious internal parasite that emerges from fourth- or fifth-instar larvae. *E. aeneoniger* is heavily hyperparasitized by *T. coerulescens*.

490 Torgersen, T. R. 1977. Identification of parasites of the Douglas-fir tussock moth based on adults, cocoons, and puparia. USDA For. Serv., Pac. Northwest For. Range Expt. Stn., Portland, Or. Res. Pap. PNW 215, 28p.

A key for the identification of parasites of the tussock moth, *Orgyia pseudotsugata*, includes the larch casebearer parasite, *Gelis tenullus*.

491 Torgersen, T. R. 1981. Parasite records for the Douglas-fir tussock moth. USDA For. Serv., Pac. Northwest For. and Range Exp. Stn., Portland, Or., Gen. Tech. Rept. PNW 123, 38p.

Hyperparasitic and parasitic species in more than 50 genera in the orders Hymenoptera and Diptera are listed. Among the Hymenoptera, six identified species attack both the larch casebearer and tussock moth, *Orgyia pseudotsugata*. *Scambus hispae* was tentatively identified as a facultative secondary parasite of the tussock moth. *Itoplectis quadricingulata* is known from a wide range of hosts throughout the west and although usually a primary parasite, the author records two instances of hyperparasitism. *Gelis tenellus* appears sporadically and is usually

secondary, rarely primary. *Catolaccus aeneoviridis* was reared as an apparent hyperparasite from material collected near Colville, Washington. *Dibrachys cavus* is a primary parasite. *Tetrastichus coerulescens* is probably hyperparasitic on five parasite genera, which are: *Apanteles* sp., *Bracon* sp., *Dibrachys* sp., *Hyposoter* sp., and *Meteorus* sp.

492 Torgersen, T. R., and Coppel. H. C. 1965. The insect parasites of the European pine shoot moth, *Rhyacionia buoliana* (Schiffermuller) (Lepidoptera: Tortricidae) in Wisconsin with keys to the adults and mature larval remains. Trans. Wisc. Acad. Sci. Art Lett. 54:93-123.

The larch casebearer has three and possibly four parasites in common with *R. buoliana*. *Bracon gelechiae* Ash. develops as a gregarious external parasite of *R. buoliana* larvae. *Scambus tecumseh* Vier. was always reared as a solitary, external larval parasite. A tentative identification of *Itoplectis evetriae* was given to a solitary, internal parasite emerging from the pupae of *R. buoliana*. *Habrocytus thyridopterigis* How. is a gregarious primary and secondary parasite of the shoot moth. It hyperparasitized the primary parasites *Exeristes comstockii* (Cresson), *Eurytoma pini* Bugbee, *Hyssopus thymus* Girault, and *Bracon n.* sp. Keys and notes on the morphology and biology of *R. buoliana* parasites are provided.

493 Torgersen, T. R., and Coppel, H. C. 1969. Parasites of *Rhyacionia buoliana* and their occurrence at different crown levels of red pine in Wisconsin. Ann. Entomol. Soc. Am. 62:163-169.

Two larch casebearer parasites, *Habrocytus thyridopterigis* and *Bracon gelechiae* were recovered from the European pine shoot moth, *Rhyacionia buoliana*. *H. thyridopterigis* was recovered as a primary and secondary parasite. As a hyperparasite it limited the effectiveness of *Exeristes comstockii* in controlling the shoot moth. Despite higher concentrations of *E. comstockii* in the mid-crown position of trees, *H. thyridopterigis* still preferred to operate in the lower crown area. This limited searching behavior has decreased the importance of *H. thyridopterigis* as a secondary parasite.

494 Townes, H. K. 1940. A revision of the Pimplini of eastern North America (Hymenoptera, Ichneumonidae). Ann. Entomol. Soc. Am. 33:283-323.

A description, synonymy, and host-list for each species in the tribe Pimplini is given. Two species, *Itoplectis obesus* and *I. quadricingulatus*, are parasites of the larch casebearer.

495 Townes, H. K. Jr. 1944. A catalogue and reclassification of the nearctic Ichneumonidae. Part 1. The subfamilies Ichneumoninae, Tryphoninae, Cryptinae, Phaeogeninae and Lissonotinae. Ann. Entomol. Soc. Mem. 11:1-477.

This catalogue gives a bibliography, synonymies, and host lists, for the described species of ichneumonids occurring in America north of Mexico. Eleven of these species parasitize the larch casebearer: *Scambus detrita* (Hgn.), *S. tecumseh* Vier., *S. transgressus* (Hgn.), *Ephialtes pacificus* (Cush.), *Itoplectis evetriae* Vier., *I. obesus* Cush., *Gelis obscurus* (Cresson), *G. tenellus* Say, *Phaeogenes epinotiae* Cush., *Pimplopterus parvus*, and *Campoplex rufipes* (Prov.).

496 Townes, H. K. 1945. A catalogue and reclassification of the nearctic Ichneumonidae. Mem. Amer. Entomol. Soc. 11:197, 800.

Gelis minimus is recorded as a host of *Spilochalcis albifrons*, a parasite of the larch casebearer.

497 Townes, H., Townes, M., Walley, G. S., Walkley, L., Habeck, D., and Townes, G. 1960. Ichneumon-flies of America north of Mexico: 2. Subfamilies Ephialtinae, Xoridinae, Acaenitinae. U. S. Nat. Mus. Bull. 216(2), 676p.

This catalogue provides descriptions, synonymies, keys, and host lists for species in the subfamilies: Ephialtinae, Xoridinae and Acaenitinae occurring in America and Mexico. Included are ten species which have been recorded as parasites of the larch casebearer: *Scambus detrita* (Hgn.), *S. brevicornis* (Grv.), *S. transgressus* (Hbn.), *S. tecumseh* Vier., *S. hispae* (Harris), *S. decorus* Walley, *Itoplectis quadricingulata* (Prov.), *I. evetriae* Vier., *I. vesca* Townes, and *Ephialtes pacificus* (Cush.).

498 Tragardh, I. 1910. Larktradsmalen (*Coleophora laricella* Hubn.). (The larch casebearer (*Coleophora laricella* Hubn.).) Entomol. Tidskr. 31:258-264.

Bionomics, distribution, and damage by the the larch casebearer in Sweden are discussed. Parasites, particularly small Chalcididae, caused mortality in 20-25 percent of casebearer pupae.

499 Tsai, Y. H., and Mote, D. C. 1939. The cherry casebearer, *Coleophora pruniella* Clem., in Oregon. J. Econ. Entomol. 32:363-365.

Outlines the seasonal history and habits of the cherry casebearer in Oregon. Two species of hymenopterous parasites, *Eurydinota lividicorpus* and *Microbracon pygmaeus*, were reared. Both of these species have been recovered from the larch casebearer.

500 Tunnock, S. 1965. The larch casebearer epidemic in northern Idaho and Montana. USDA For. Serv., Div. State and Priv. For., Northern Region, Missoula, MT., 3p. (unpubl.)

During 1964, efforts to increase *Agathis pumila* populations were undertaken in Idaho and Montana. Parasitized casebearer larvae from Vermont were released in six new areas.

501 Tunnock, S. 1968. The establishment and natural spread of the larch casebearer parasite, *Agathis pumila*, in the Northern Region. USDA For. Serv., Div. State and Priv. For., Northern Region, 6p. (Missoula, Mt)

The larch casebearer parasite, *Agathis pumila*, has been successfully colonized by three methods since it was introduced into the Northern Region in 1960. Parasites have been recovered at 40, 60 and 400 chains from release trees on 1966, 1964 and 1960 plots, respectively. (Author)

502 Tunnock, S. 1968. The larch casebearer problem in the Northern Region during 1967. USDA For. Serv., Div. State and Priv. For., Northern Region, Missoula, MT., 5p. (unpubl.)

Agathis pumila was recovered from all four-year-old release sites. It was collected as far as 60 chains from the spot it was liberated in one area. Only seven, of fifteen two-year-old plots contained *A. pumila*. The maximum distance of spread was 40 chains, in the two-year-old plots.

503 Tunnock, S., and Bousfield, W. 1969. The spread of the larch casebearer in the northern region and attempts at biological control with *Agathis pumila* USDA For. Serv., Div. State and Priv. For., No. Reg., 13p. (unpubl.)

The larch casebearer infests about 34,500 square miles of larch type from Okanogan, Washington, to the Continental Divide at Glacier

National Park, and north of Riggins, Idaho, into British Columbia. The parasite *Agathis pumila* has been introduced in 270 infested larch stands since 1960. Colonies were established in 75 percent of the plots when adult *A. pumila* were liberated, but only in an average of 42 percent of the plots when branches containing parasitized casebearer larvae were attached to infested host trees. Percent parasitism in areas where adults were released ranged from 0 to 66 on 1960 plots, and 0 to 90 on 1964 plots. By using parasitized casebearer larvae, parasite establishment ranged from 0 to 38 percent on 1966 plots, and 0 to 14 percent on 1967 plots. At one 1960 plot, two parasites were recovered one mile from plot center. Parasitism decreased abruptly one-half mile from plot center on 1960 and 1964 plots. Results from a new distribution method indicated parasites could be harvested for distribution while inside casebearer prepupae. (Author)

504 Tunnock, S., McGregor, M., and Bousfield, W. 1972. Distribution of larch casebearer parasites in the crowns of western larch trees in the northern region. USDA For. Serv., For. Ins. and Dis. Mgt., Rep. 12-4., 7p.

Parasitism by *Agathis pumila* was significantly higher in the outer limbs of the upper one-third of the crown. *Dicladocerus* sp. near *westwoodii* was highest on the inner branch portions regardless of crown level. *Spilochalcis albifrons* parasitized more casebearers on the outer portion of the lower crown. Parasitism by *Mesopolobus* sp. was uniform throughout the crown. These were the most common species recovered; other species of parasites reared were responsible for one percent or less parasitism.

505 Turnbull, A. L., and Chant, D. A. 1961. The practice and theory of biological control of insects in Canada. Can. J. Zool. 39: 697-753.

The release of five exotic parasites against the larch casebearer in eastern Canada resulted in the establishment of *Agathis pumila* and *Epilampsis laricinellae*. *A. pumila* is effective even at very low host densities, while *E. laricinellae* is effective only where host densities are high. In general, the casebearer population has fallen to a very low level and damage to host trees is no longer considered serious. The project is rated a success.

506 Underhill, G. W. 1943. Some insect pests of ornamental plant relationships. Va. Exp. Stn. Bull. No. 349, 36p.

Reports alternate hosts for three larch casebearer parasites. *Catolaccus aeneoviridis* parasitized the juniper webworm, *Dichomeris marginella(us)*. The arborvitae leaf miner, *Argyresthia thuiella*, was attacked by both *Achrysocharella fullawayi* and *Spilochalcis albifrons*.

507 Valcarce, A. C. 1978. Biological evaluation, larch casebearer, Payette and Boise National Forests - 1977. USDA For. Serv., Div. Ogden, UT State and Priv. For., Intermt. Region, 7p. (unpubl.)

Native parasites have shown low levels of natural control of larch casebearer in most areas south of the Salmon river, Idaho. Introduction of the exotic parasites *Agathis pumila* and *Chrysocharis laricinellae* into this area is suggested.

508 Valcarce, A. C., and Lowe, C. A. 1980. Biological control-larch casebearer. Release of *Chrysocharis laricinellae* in the Intermountain Region, 1980. USDA For. Serv., For. Ins. and Dis. Mgt., State and Private For., Ogden UT., 4p. (unpubl.)

During the spring of 1980, the casebearer parasite *C. laricinellae* was released in the Payette and Boise National Forests. Liberations were made by placing larch branches containing parasitized overwintering casebearer larvae on branches of infested larch or nearby non-host trees. Parasitism of the released casebearers by *C. laricinellae* was approximately 22 percent, resulting in an estimated 105,726 parasites liberated.

509 Valley, K., and Wheeler, A. G. 1976. Biology and immature stages of *Stomopteryx palpilineella* (Lepidoptera: Gelechiidae), a leaf miner and leaftier of crown vetch. Ann. Entomol. Soc. Am. 69:317-324.

The life cycle, distribution, damage, and natural enemies of *S. palpilineella* are discussed. Five species of parasitic Hymenoptera were recovered from larval samples. *Sympiesis stigmatipennis*, which also parasitizes the larch casebearer, was reared from larvae of *S. palpilineella* collected during mid- to late August.

510 Van Steenburgh, W. E. 1935. Parasites of the oriental fruit moth (*Laspeyresia molesta* Busck) in Ontario. A summary 1932-1933-1934. Ann. Rep. Entomol. Soc. Ont. 65:68-72.

During the period in which parasite investigations were conducted in Ontario, 39 species of parasites have been found attacking the oriental fruit moth, *Grapholitha molesta* (as *Laspeyresia*). The larch casebearer is an alternate host for two of these parasite species. *Dibrachys boucheanus* is a primary and secondary parasite while *Epiurus indagator* is exclusively a primary parasite of the fruit moth.

511 Van Steenburgh, W. E., and Boyce, H. R. 1938. Biological control of the oriental fruit moth *Laspeyresia molesta* Busck in Ontario: A review of ten years' work. Ann. Rep. Entomol. Soc. Ont. 69:65-74.

Summarizes the control of the oriental fruit moth, *Grapholitha molesta* (as *Laspeyresia*), by parasite introductions. The effectiveness of *Macrocentrus* and *Trichogramma* are analyzed. A list of native parasites attacking the oriental fruit moth includes three larch casebearer parasites, *Dibrachys cavus*, *Epiurus indagator*, and *Hemiteles tenellus*.

512 Vickery, R. A. 1929. Studies on the fall army worm in the gulf coast district of Texas. USDA Tech. Bull. No. 138, 63p.

A summary of the bionomics, seasonal history, parasites, and impact of the fall army worm, *Spodoptera frugiperda*, (as *Laphygma*) on corn. A total of 19 Hymenopteras and two dipterans parasitize this pest. *Tetrastichus dolosus* and *Spilochalcis side* are parasites of the larch casebearer and were recovered as secondary parasites of the army worm.

513 Viereck, H. L. 1905. Notes and descriptions of Hymenoptera from the western United States, in the collection of the University of Kansas. Trans. Kans. Acad. Sci. 19:264-326.

Two of the new species described have been collected as larch casebearer parasites, *Bracon kansensis* and *Microdus pimploides*.

514 Viereck, H. L. 1909. Hymenoptera for the New Jersey list of insects, and other Hymenoptera. Proc. Entomol. Soc. Wash. 11:208-211 211.

The new name *Cryptapanteles rileganus* replaces *Apanteles emarginatus* Riley. A short description of this larch casebearer parasite accompanies the name change.

515 Viereck, H. L. 1912. Contributions to our knowledge of bees and ichneumon-flies, including the descriptions of twenty-one new genera and fifty-seven new species of ichneumon-flies. Proc. U. S. Nat. Mus. 42:613-648.

Two new species described, *Habrobracon johannseni* and *H. tetralophae*, have been recovered as parasites of the larch casebearer.

516 Viereck, H. L. 1912. Description of five new genera and 26 new species of Ichneumon-flies. Proc. U. S. Nat. Mus. 42:139-153.

Descriptions, type, and type locality for twenty-six new species of ichneumons are given. One of these, *Epiurus innominatus*, is a parasite of the larch casebearer.

517 Viereck, H. L. 1913. Descriptions of ten new genera and twenty-three new species of ichneumon-flies. Proc. U. S. Nat. Mus. 44:555-568.

Present the first description of *Itoplectis evetriae*, a parasite of the larch casebearer.

518 Viereck, H. L. 1916. Guide to the insects of Connecticut. Part III. The Hymenoptera, or wasp-like insects, of Connecticut. Conn. State Geol. and Nat. Hist. Survey Bull. No.22, 824p.

A comprehensive list of the Hymenoptera of Connecticut, including descriptions and hosts. Thirteen species have been recovered as parasitoids of the larch casebearer: *Apanteles parorgyiae*, *A. scitulus*, *A. congregatus*, *Microbracon sebequanash*, *M. massasoit*, *Habrobracon gelechiae*, *Bassus pyrifolii*, *B. winkleyi*, *Hemiteles areator tenellus*, *Tetrastichus coerulescens*, *Elachertus proteoteratis*, *Pteromalus gelechiae*, and *P. boucheanus*. Recorded cohosts for these species are also given.

519 Viereck, H. L. 1921. A new species of *Habrobracon*. Entomol. News 32:174.

Describes *Habrobracon diversicolor*, a larch casebearer parasite.

520 Viereck, H. L. 1924. Descriptions of new reared Hymenoptera from Nova Scotia and British Columbia. Can. Entomol. 56:64-69.

Nine new species of Hymenoptera are described. Included are two species, *Ephialtes cacoeciae* and *E. montana*, which have been recorded from the larch casebearer.

521 Viereck, H. L. 1925. A preliminary revision of the Campopleginae in the Canadian national collection, Ottawa. Can. Entomol. 57:178.

Contains keys to the genera and species of the Campopleginae. Three species of the genus *Nemeritis* have been recovered as larch casebearer parasites, *N. melanomerus*, *N. decoratus*, and *N. laeris*.

522 Viereck, H. L. 1926. A preliminary revision of the Campoplegiinae in the Canadian national collection, Ottawa. Can. Entomol. 58:176-182.

Three of the new species described are larch casebearer parasites, *Campoplex* (*Nemeritis*) *melanomerus*, *C.* (*N.*) *decoratus* and *C.* (*N.*) *laeris*.

523 Vikberg, V., and Valkeila, E. 1977. Chalcid flies reared from the cones of *Larix* spp. in Hameenlinna, southern Finland, with notes on Finnish species of *Euneura* (Hym., Eurytomidae, Eupelmidae, Pteromalidae, Eulophidae). Ann. Entomol. Fenn. 43:36-39.

Six species of chalcids emerged from the cones of larch in Finland. *Coleophora laricella* was numerous in the area, with some larvae overwintering in cones. *Sceptrothelys deione*, *Cirrospilus pictus*, and *Chrysocharis nitetis* were reared from cones containing larvae of the larch casebearer. The first two species are new to the fauna of Finland.

524 Vite, J. P. 1954. Die Larchenminiermotte. (The larch casebearer.) Holz-Zentralblatt 80:1065-1067.

Evaluates larch casebearer damage in Japanese and European larch. Parasites are unknown for the egg phase and early larvae but a high degree of parasitism by hymenopterans occurs in later instars. Hyperparasitism has often been observed on the oldest instars. Due to the lack of intermediate hosts, it is believed that even at high densities, introduced parasites would not be able to keep the moth at low numbers. Bird control and the importation of red ants are the only two effective biological countermeasures believed to be effective in this region.

525 Waddell, D. B. 1952. Biology and control of the cherry casebearer, *Coleophora pruniella* Clemens, in British Columbia. Proc. Entomol. B. C. 48:85-89.

Discusses the biology and parasites attacking the cherry casebearer, including 14 species that also parasitize the larch casebearer. *Bracon pygmaeus* and *Spilochalcis albifrons* were responsible for substantial mortality in the cherry casebearer population. *Gelis tenellus* is a possible hyperparasite in this complex. The other larch casebearer parasites recovered from the cherry casebearer were: *Habrocytus thyridopterigis*, *Elachertus proteoteratis*, *Tetrastichus xanthostigma*, *Copidosoma truncatellum*, *Closterocerus* sp. near *tricincta*, *Catolaccus aeneoviridis*, *Eurydinota lividicorpus*, *Habrocytus phycidis*, *H. thyridopterigis*, *Itoplectis obesus*, *I. quadricingulatus*, and *Scambus hispae*.

526 Waddill, V. H. 1978. Contact toxicity of four synthetic pyrethroids and methomyl to some adult insect parasites. Fla. Entomol. 61:27-30.

Four synthetic pyrethroids, fenvalerate, permethrin, buthrenin, and NRDC 149, as well as the carbamate, methomyl, were evaluated at 2 rates for contact toxicity to adults of five parasites of tomato pests. One of these species, *Copidosoma truncatellum* is a parasite of the larch casebearer. *C. truncatellum* was the most susceptible species, with only fenvalerate killing less than 100 percent. Fenvalerate was generally the least toxic to the parasites and thus the most promising candidate for use in pest management programs for control of the tomato pinworm, *Keiferia lycopersicella*, and the vegetable leaf miner, *Liriomyza sativae*.

527 Wadley, F. M. 1940. *Telenomus ovivorus* (Ashmead), an egg parasite of the false chinch bug. J. Kans. Entomol. 13:6-7.

Discusses the seasonal variability of *T. ovivorus* in relation to its host, the false chinch bug, *Nysius ericae*. *T. ovivorus* has been recovered from the larch casebearer, but not from the eggs.

528 Walker, F. 1833. Monographia chalcidum. Entomol. Mag. 1:367-384.

Among the chalcids described from the British Isles are six species from the genus *Cyrtogaster* which parasitize the larch casebearer: *C. vulgaris*, *C. scotica*, *C. thoracia*, *C. rufipes*, *C. tenuis*, and *C. cingulipes*.

529 Walley, G. S. 1932. Host records and new species of Canadian Hymenoptera. Can. Entomol. 64:181-189.

Documents the recovery of *Microbracon pygmaeus* (Prov.), a native parasite of the larch casebearer, in specimens of *Coleophora pruniella* (as *Haploptila*) Clem. and *C. innotabilis* Br.

530 Walley, G. S. 1953. Hymenopterous parasites of *Choristoneura pinus* Free. (Lepid., Tortricidae) in Canada. Can. Entomol. 85:152.

Three larch casebearer parasites, *Scambus hispae*, *Gelis tenellus*, and *Habrocytus phycidis* are among the 13 species of, parasites reared from collections of *C. pinus*.

531 Walsh, B. D. 1861. Insects injurious to vegetation in Illinois. Trans. Ill. St. Agric. Soc. 1861:335-378.

The first known description of *Spilochalcis albifrons*, a native parasite of the larch casebearer.

532 Walsh, B. D. 1869. On a species of *Hemiteles* (Ichneumonidae). Can. Entomol. 2:9-12.

The new species *Hemiteles nemativorus* is described. This species has been recovered as a parasite of the larch casebearer.

533 Ward, R. H., and Pienkowski, R. L. 1978. Mortality and parasitism of *Cassida rubiginosa*, a thistle-feeding shield beetle accidentally introduced to North America. Environ. Entomol. 7:536-540.

Of the five species reared from larval, pupal and adult stages of *Cassida rubiginosa* collected from northern Virginia during 1973 and 1974, two also attack the larch casebearer. *Spilochalcis albifrons* is a pupal parasite of *C. rubiginosa*, usually emerging as a solitary parasite but with a few instances of superparasitism. Females always outnumbered males, with adult emergence occurring between mid-July and mid-August. *Eupelmella vesicularis* was a solitary parasite; only females emerged.

534 Watson, W. Y., and Arthur, A. P. 1959. Parasites of the European pine shoot moth, *Rhyacionia buoliana* (Schiff.), in Ontario. Can. Entomol. 91:478-484.

Of the parasites obtained from *R. buoliana* in Ontario, six attack the larch casebearer as an alternate host: *Bracon gelechiae* Ashm., *Eupelmella vesicularis* (Ratz.), *Itoplectis evetriae* Vier., *Pimpla turionellae* (L.), *Scambus hispae* (Harr.), and *S. tecumseh* Vier. Additional cohosts are listed for two of these species. *B. gelechiae* has been recorded from *Exoteleia dodecella* L., *Phigalia titea* Cram., and *Rhyacionia frustrana* (Comst.). *E. vesicularis* has been obtained from *Coleophora* sp., *Neodiprion abietis* (Harr.), *N. lecontei* (Fitch), *Rogas* sp., *Malacosoma disstria* Hbn., *M. pluviale* (Dyar), *Ceutorhynchus assimilis* (Payk.), and *Hylemya* sp.

535 Webb, F. E. 1950. The biology of the larch casebearer, *Coleophora laricella* Hubner, in New Brunswick. M.S. Thesis, Univ. Mich., Ann Arbor, 59p.

The bionomics, damage, and natural control of the larch casebearer in New Brunswick are detailed. In general, native parasites are considered to exert only slight control over *C. laricella*, despite the large number of species involved. The successful establishment of *Chrysocharis laricinellae* contrasts with the apparent failure of *Microdus pumilus* to

colonize in the Maritime Provinces. The effects of predators, pathological agents, weather, and leaf-fall, on casebearer populations are also discussed. Other native parasite species recovered are: *Scambus hispae*, *Gelis tenellus*, *G.* sp., *Campoplex* sp., *Itoplectis evetriae*, *I.* sp., *Pimplopterus* (*Lissonota*) *parva*, *Syrphoctonus agilis*, *Phaeogenes* sp. near *epinotiae*, *Horogenes* (*Inareolata*, *Angitia*) sp., *Bracon* (*Microbracon*) *pygmaeus*, *B. gelechiae*, *B.* sp., *Hormius* sp., *Clinocentrus* sp., *Euderus amphis*, *E.* sp., *Habrocytus phycidis*, *H.* sp., *Spilochalcis albifrons*, *S. xanthostigma*, *Calliceras* sp., *Euplectrus mellipes*, *Pachyneuron altiscuta*, *Tetrastichus* sp., *Phanurus ovivorus*, *Trissolcus euschisti*, *Achrysocharis* sp., *Polynema* sp., *Dibrachys cavus*, *Mymarid*(*ae*) sp., *Entedontinae* sp.

536 Webb, F. E. 1952. The larch casebearer in the Maritime provinces and Great Lakes region. Can. Dep. Agric. Bi-Mon. Prog. Rep. 8:1.

Larch casebearer outbreaks in the Great Lakes region and Maritime Provinces have occurred at about eight-year intervals. Outbreaks are controlled by a combination of starvation and biotic factors which include native and introduced parasites and native predators. A large number of native parasites have been reared, some of which are economically effective. Of several introduced species, *Chrysocharis laricinellae* and *Agathis pumila* have been successfully colonized.

537 Webb, F. E. 1953. An ecological study of the larch casebearer, *Coleophora laricella* Hbn. (Lepidoptera: Coleophoridae). Ph.D. Diss., Univ. Mich., Ann Arbor, 210p.

The ecology of *Coleophora laricella* and its role as an introduced defoliator of *Larix* spp. is described from studies conducted in New Brunswick and the Lake States. At least 50 native parasite species are known to attack the larch casebearer in North America. The geographic distributions and brief notes on the biologies of a few of these natives are included. Of five introduced parasites, *Chrysocharis laricinellae* and *Agathis pumila* are now widely established and exerting important control of outbreaks. Biologies, cohosts, effectiveness, and competition between these two exotic species are discussed. Other factors, regulating casebearer populations include predation of eggs by the nymphs of a *Mirid* and predation by insectivorous birds.

538 Webb, F. E., and Denton, R. E. 1963. Larch casebearer, *Coleophora laricella* (Hbn.). In: Important Forest Insects of Mutual Concern to Member Countries of the North American Forestry Commission. Working Group on For. Ins. Dis., North American For. Commission, FAO, p.15-17.

A brief summary of the distribution, hosts, life history, damage, impact, control measures, and needs for future research on the larch casebearer. Although apparently effective in the East, the regulation of casebearer populations by introduced parasites is insufficiently understood.

539 Webb, F. E., and Denton, R. E. 1967. Larch casebearer, *Coleophora laricella* (Hbn.). In: Important Forest Insects and Diseases of Mutual Concern to Canada, the United States and Mexico. Can. Dept. For. and Rural Dev., p.85-88.

The distribution, impact, life history, and control measures for the larch casebearer are summarized. Two imported parasites, *Agathis pumila* and *Chrysocharis laricinellae* have become widely established in the eastern United States and Canada, Wisconsin and Idaho.

540 Webb, F. E., and Quednau, F. W. 1971. *Coleophora laricella* (Hubner), larch casebearer (Lepidoptera: Coleophoridae) In: Biological Control

Programmes Against Insect and Weeds in Canada, 1959-1968. Commonw. Inst. Biol. Control Tech. Commun. 4:131-136.

A review and evaluation of releases of *Chrysocharis laricinellae*, *Agathis pumila*, and *Diadegma nana* against the larch casebearer in Canada. See (Munroe, E. G., 1971)

541 Weber, B. C. 1977. Parasitoids of the introduced pine sawfly *Diprion similis* (Hymenoptera: Diprionidae) in Minnesota. Can. Entomol. 109:359-364.

Parasitoids of the overwintering generation of the pine sawfly were surveyed in Minnesota. Two species found rarely in this study, *Gelis tenellus* and *Eupelmella vesicularis*, are also parasites of the larch casebearer.

542 Wellenstein, G., and Fabritius, K. 1973. Beobachtungen am Schlehenspinner (*Orgyia antiqua* L.) und seinen Parasiten. (Observations of *Orgyia antiqua* L. and its parasites.) Anz. Schaedlingskd. Pflanzenschutz 46:24-30.

The bionomics of *O. antiqua* in southern Germany are discussed. One of its most important parasitoids, *Coccygomimus turionellae*, also attacks the larch casebearer. The population dynamics of the *O. antiqua* parasite complex were studied in heavily infested and in endemic situations.

543 Wellington, W. G. 1945. Gelatin capsules used in studies of insect parasites. J. Econ. Entomol. 38:396.

Describes a new method used to obtain information on certain phases of the biology of cocoon parasites and internal parasites. This method was used to better observe the oviposition behavior of *Dibrachys boucheanus*, a species which has been reared from the larch casebearer.

544 Weseloh, R. M. 1979. Comparative behavioral responses of three *Brachymeria* species and other gypsy moth *Lymantria dispar* parasitoids to humidity and temperature. Environ. Entomol. 8:670-675.

The three *Brachymeria* species preferred lower humidities and higher temperatures than other common gypsy moth, *Porthetria dispar* (as *Lymantria*), parasitoids and hyperparasitoids including *Gelis tenellus*. Implications concerning microhabitat as well as geographic areas where these parasites might be successful are discussed. *G. tenellus* also attacks the larch casebearer.

545 Weseloh, R. M. 1979. Competition among gypsy moth hyperparasites attacking *Apanteles melanoscelus* and influence of temperature on their field activity. Environ. Entomol. 8:86-90.

In laboratory studies, *Eurytoma verticillata* consistently destroyed larvae of another hyperparasite, *Gelis tenellus*, when both were associated with the same host. However, since ichneumonid hyperparasites were observed in the field to have a wider temperature range than chalcidoids; it is speculated that they could avoid competition by attacking early, developing rapidly, and emerging before other species are active. *G. tenellus* is part of the larch casebearer parasite complex.

546 Wester, C. 1956. Notes on the bionomics of the natural enemies of the insects on *Mirabilis*. Proc. Entomol. Soc. Wash. 58:283-286.

The bionomics of the natural enemies of three species of insects associated with the wild four-o'clock plant, *Mirabilis nyctaginea*, are

described. Two of the parasite species recovered, *Bracon gelechiae* and *Tetrastichus coerulescens*, are part of the larch casebearer parasite complex. *B. gelechiae* is a solitary, external parasite of the larvae of *Heliodines nyctaginella*. *T. coerulescens*, is an internal, gregarious parasite of the pupae of *H. ionis* in the stems of the wild four-o'clock plant.

547 Wiackowski, S., Chlodny, J., Tomkow, M., Witrylak, M., and Kolk, A. 1976. Studies on entomofauna of larch, alder and birch in different environmental conditions and its ecological relationships with insect pests of more important forest tree species. For. Res. Inst. and Educ. Univ., Kielce. Warsaw, Krakow, Kielce. 142p.

A study of the parasites attacking first- and second-instar larch casebearer larvae was conducted at nine localities in Poland. Only two parasite species, *Diadegma nana* and *Agathis pumila*, were locally effective, Chalcidoidea were not important in any of the study areas. There was no difference in percent parasitism between upper and lower crown levels, although casebearer densities were significantly higher in the upper zone. Parasitism decreased with increasing casebearer population density. None of the parasites studied showed a tendency toward multi-parasitism. *A. pumila* attacked more females than males, thus altering the casebearer sex ratio.

548 Wilkes, A., and Anderson, M. 1947. Notes on recovery of the introduced spruce budworm parasite, *Phytodietus fumiferanae* Rohw. in eastern Canada. Ann. Rep. Entomol. Soc. Ont. 77:40-44.

Collections at two localities in eastern Canada were made to determine if parasite species introduced against the spruce budworm, *Choristoneura fumiferana*, had become established. Thirteen species of parasites were recovered. Five species accounted for the majority of budworm mortality; the other species were represented by only single specimens. None of the introduced parasites liberated in the area were recovered. Two native species recovered, *Gelis tenellus* and *Scambus indagator*, are also found as parasites of the larch casebearer.

549 Wilkes, A., Coppel, H. C., and Mathers, W. G. 1948. Notes on the insect parasites of the spruce budworm, *Choristoneura fumiferana* (Clem.), in British Columbia. Can. Entomol. 80:138-155.

Extensive collections of the spruce budworm were made in the Lillooet area of British Columbia from 1943 to 1947 for the purpose of securing parasites for transfer to infested areas in eastern Canada and for a study of the general parasite complex of *C. fumiferana* in this area. Of the 45 species of primary and secondary parasites recovered, two are also larch casebearer parasites, *Itoplectis obesus* and *Habrocytus phycidis*. Parasite species reared from the budworm in previous work and common to the casebearer are *Itoplectis quadricingulatus*, *Scambus hispae*, and *Gelis tenellus*. *I. obesus* is occasionally hyperparasitic on *Phytodietus fumiferanae*.

550 Williams, P. 1969. Some hymenopterous parasites of weevils of the genus, *Apion* (Col., Curculionidae). Entomol. Monthly Mag. 105:124-143.

The biology and morphology of the immature stages of some parasites of *Apion* spp. are described. The larch casebearer parasite, *Eupelmella vesicularis* was reared as a secondary parasite of *Apion* through *Chlorocytus*, *Tetrastichus*, *Trichomalus*, and *Entedon* species.

551 Wilson, J. W. 1932. Notes on the biology of *Laphygma exigua* Huebner. Fla. Entomol. 16:33-39.

The sugar beet armyworm, *Laphygma exigua*, is recorded as a host of *Spilochalcis albifrons*, a native parasite of the larch casebearer.

552 Wilson, J. W. 1933. The biology of parasites and predators of *Laphygma exigua* Huebner reared during the season of 1932. Fla. Entomol. 17:1-15.

Among the parasites reared from *L. exigua* were two species which also attack the larch casebearer. *Spilochalcis albifrons* and *Catolaccus aeneoviridis* are both secondary parasites of *L. exigua* through *Apanteles marginiventris*. All of the secondary parasites were collected in such small numbers that they do not appear to reduce the effectiveness of the primary parasites to any appreciable extent.

553 Wolff, M., and Kraube, A. 1922. Die forstlichen Lepidopteren. (Forest Lepidoptera.) Jena, Verlag von Gustav Fisher, 337p.

The bionomics, parasites and plant hosts of forest Lepidoptera from Germany are discussed. Nine species of parasites are listed from the larch casebearer: *Bracon guttiger* Wsm., *Microdus pumilus* Ratz., *Entedon arcuatus* Frst., *E. laricinellae* Ratz., *Pteromalus laricinellae* Ratz., *Cirrospilus pictus* Nees, *Angitia nana* Grav., *Omorgus tumidulus* Grav., and *Campoplex virginalis*. Alternate forest hosts of parasite species that attack the casebearer are also given.

554 Wong, H. R. 1972. *Dioryctria banksiella* (Lepidoptera: Pyralidae) in the western gall rust *Ednocronartium harknessii* (Basidiomycedes: Uredinales). Can. Entomol. 104:251-255.

The seasonal occurrence and larval habits of *D. banksiella* in western gall rust of jack pine were studied in Manitoba and Saskatchewan. Six species of parasites were recovered from *D. banksiella*. *One*, *Agathis binominata*, is also found as a parasite of the larch casebearer.

555 Wood, C. S., and Van Sickle, G. A. 1983. Forest insect and disease conditions in British Columbia and Yukon 1982. Can. For. Ser., BC-X-239, 31p.

Defoliation by the larch casebearer continued to decline from the low levels recorded in 1981. In 1981, a *Dicladocerus* species was the most common larval parasite sampled, accounting for about 35 percent parasitism. During 1982, parasitism decreased to 12 percent, with *Chrysocharis laricinellae* being the most abundant species collected.

556 Wood, W. B., and Selkregy, E. R. 1918. Further notes on *Laspeyresia molesta*. J. Agric. Res. 13:59-72.

New information concerning the life history, origin, distribution, food plants, and control of the oriental peach moth, *Grapholitha molesta* (as *Laspeyresia*), are presented. Of the eight species of hymenopterous parasites which have been reared, two are secondary parasites of the peach moth. *Dibrachys boucheanus* was reared from cocoons already parasitized by *Macrocentrus* sp. *D. boucheanus* has also been found as a parasite of the larch casebearer.

557 Wylie, H. G. 1960. Insect parasites of the winter moth, *Operophtera brumata* (L.) (Lepidoptera: Geometridae) in western Europe. Entomophaga 5:111-129.

Dibrachys cavus, a parasite of the larch casebearer, was recovered as a secondary parasite of *O. brumata*. It was reared from the larval parasite *Phobocampe crassiuscula*.

558 Yeargan, K. V. 1979. Parasitism and predation of silk bug eggs in soybean (*Glycine max*) and alfalfa (*Medicago sativa*) fields. Environ. Entomol. 8:715-719.

The larch casebearer parasite, *Trissolcus euschisti*, was reared from naturally oviposited *Euschistus* sp. and *Acrosternum hilare* eggs collected from soybean and iron weed plants, respectively. *T. euschisti* was also recovered in collections of *Podisus maculiventris* eggs from a variety of plants. *T. euschisti* is a parasite of the larch casebearer.

559 Yoshimoto, C. M. 1973. Review of North American *Chrysocharis* (Kratochviliana) (Eulophidae: Chalcidoidea) north of Mexico, especially species attacking birch casebearer (Lepidoptera: Coleophoridae) and birch leafminer (Hymenoptera: Tenthredinidae). Can. Entomol. 105:1309-1340.

This study provides information on the species of *Chrysocharis* found in North America with special emphasis on the Canadian species attacking the birch casebearer and the birch leaf miner. *C. laricinellae* has been recovered from both of these hosts; it is also an important introduced parasite of the larch casebearer. Three alternate hosts of *C. laricinellae* from Europe are cited. Relationships and distribution of species-groups in North America and Europe are discussed. Keys to subgenera and species and host records are included.

560 Yoshimoto, C. M. 1976. Revision of the genus *Dicladocerus* (Eulophidae: Chalcidoidea) of America north of Mexico, with particular reference to species attacking larch casebearer (Lepidoptera: Coleophoridae). Can. Entomol. 108:1173-1206

The North American species of *Dicladocerus* are revised. Twelve new species from North America and one from Japan are described and illustrated: *alaskensis*, *australis*, *prealatus*, *occidentalis*, *exoteliae*, *epinotiae*, *betulae*, *vulgaris*, *nearcticus*, *pacificus*, *japonicus*, and *terraenovae*. The species attacking larch casebearer are *nearcticus*, *pacificus*, *terraenovae*, all Nearctic, *japonicus*, and *westwoodii*, Palaearctic. Relationships of species-groups in North America are discussed. A key to species, and host records are included. (Author)

561 Zwolfer, H. 1956. Zur Kenntnis der Parasiten des Tannentriebwicklers *Choristoneura* (*Cacoecia*) *murinana* Hb. Teil 1. (Investigations on the parasites of *Choristoneura* (*Cacoecia*) *murinana* Hb. Part 1.) Z. ang. Entomol. 39:387-409.

A synoptic list of the parasites reared from *C. murinana* is given. Collections in the Vosges area produced 23 parasite species, seven of which are new records. The parasite complexes of various climatic regions are compared. Among the pupal parasites, *Itoplectis maculator* was common and often the dominant species recovered. *I. maculator* has also been recorded as a parasite of the larch casebearer.

562 Zwolfer, H. 1967. Wechselseitige Beeinflussung des Entwicklung sablaufs bei Entomophagen Parasiten und deren wirten, Eroertert am beispiel von *Coleophora* - arten (Lep., Coleophoridae) und *Urophora* - arten (Dipt., Trypetidae). (Reciprocal influences of entomophagous parasites and their hosts on development as exemplified by *Coleophora* (Lep: Coleophoridae) and *Urophora* (Dipt: Trypetidae) species.) Anz. Schadlngsk. 40:113-120.

This study compares the development of host and parasites in two host-parasite systems. In the *Coleophora-Agathis* system, the larval development of the parasitoid is apparently controlled by the endocrine system of the host, resulting in optimal synchronization of their life cycles. Rearing of adult parasites was not possible until diapause of the

host could be ended experimentally. In the *Urophora-Eurytoma* system the parasite interferes with the hormonal system controlling host development. The parasite induces premature onset of pupation. In both systems, hormonal changes in full grown host larvae result in a change of position of the larvae in the case or gall before changes to pupae take place. This reversal of position, before killing by the parasite, facilitates emergence of the parasite.

563 Zwolfer, H. 1968. Die parasitenkomplexe der Europaischen und nordamerikanischen Tannenwickler (*Choristoneura* ssp., Lep. Tortricidae) in biographischer Sicht. (The parasite complex of European and North American budworms (*Choristoneura* ssp., Lep., Tortricidae) from a biographical view.) Z. ang. Entomol. 61:448-452.

The parasite complex of nearctic and palearctic *Choristoneura* and their larval parasites are described. One species, *Scambus hispae*, Harr. described as a non-specialized pupal parasite, is also a parasite of the casebearer. Its cohost in Europe is *Choristoneura murinana*.

564 Zwolfer, H. 1968. Untersuchungen uber die Struktur von ParasitenKomplexen bei einigen Lepidopteren. (Investigations on the structure of the parasite complexes of some Lepidoptera.) Z. ang. Entomol. 61:346-357.

The interrelationships of host and the parasite complexes were examined for six defoliators. For each host species, one or two, seldom three, specialized and well-synchronized parasites predominate. Where the parasite complex is rich in species they are less effective in regulating host populations than where there are fewer species. Of the parasites examined, *Itoplectis maculator* (F.), *Gelis* sp., *Agathis* sp., and *Habrocytus* sp. are parasites of the larch casebearer.

565 Zwolfer, H., and Kraus, M. 1957. Biocoenotic studies on the parasites of two fir- and two oak-tortricids. Entomophaga 2:173-196.

The parasite complexes of *Choristoneura murinana* and *Eucosma rufimitrana*, both of which infest silver fir, and *Archips xylosteana* and *Tortrix viridana*, which inhabit oak were investigated. Six of the species that attacked *C. murinana* also parasitize the larch casebearer. *Pimpla turionellae* was highly polyphagous, especially on non-forest host species and therefore parasitized a small proportion of *C. murinana*. *Itoplectis maculator* was found to be the most important pupal parasite of *C. murinana*. It acted as a primary and a secondary parasite, attacking *Cephaloglypta murinanae*, *Tranosema arenicola* and several tachinid species, therefore limiting its ability to control *C. murinana*. Although *T. viridana* has been cited as a frequent host for *I. maculator*, only a single specimen was recovered from the oak tortricids. Host preference by *I. maculator* in this case is explained by the hypothesis of a gradually developed preference for the most abundant host species. The remaining parasite species, *Hemiteles areator*, *H. albipalpus*, *Gelis instabilis*, and *Dibrachys cavus* were always secondary in nature.

KEYWORDS

ADDENDUM

The following references were submitted after the Bibliography was formatted; they are not key-word indexed.

566 Flanagan, P.T. 1982. Sampling problems associated with low populations of the larch casebearer, *Coleophora laricella* Hübner (Lepidoptera:Coleophoridae), and its parasitoids. M.Sc. Thesis, Univ. of Idaho, Moscow, ID. 43 p.

Intensive sampling (approximately 25% of total crown) demonstrated that the sampling method most often used for larch casebearer investigations (see Entry 571) was inadequate for precise sampling of parasites. At low populations of casebearer, even this intensive a sampling was imprecise. Parasitism (83%) was due almost entirely (98%) to *Chrysocaris laricinellae*. The distribution of the parasite throughout the tree was similar to that of the casebearer.

567 Hagley, E.A.C. 1985. Parasites recovered from the over-wintering generation of the spotted tentiform leafminer, *Phyllonorycter blancardella* (Lepidoptera:Gracillaridae), in pest-management apple orchards in southern Ontario. Can. Entomol. 117:371-374.

Two larch casebearer parasites, *Scambus decorus* Walley and *S. tecumseh* Viereck were primary parasites of this leafminer.

568 Harris, J.W.E. and A.F. Dawson. 1979. Parasitoids of the western spruce budworm, *Choristoneura occidentalis* (Lepidoptera:Tortricidae), in British Columbia. J. Ent. Soc. B.C. 76:30-38.

At least two of the parasite species reared from western spruce budworm are involved in the larch casebearer guild. *Itoplectis quadricingulata* Prov. is a primary parasite, and *I. conquisitor* Say is a host for several casebearer parasites.

569 Hotchkin, P.G. and H.K. Kaya. 1983. Interaction between two baculoviruses and several insect parasites. Can. Entomol. 115841-846.

Parasites were surveyed for the ability to develop to pupation in virus-infected hosts. At least three of the species are involved in some way in parasitization of the larch casebearer, probably as hosts of larch casebearer parasites. *Campoletis sonorensis* (Cameron), *Hoposoter exiquae* Viereck, and *Compsilura concinnata* (Meigen), all developed to pupation in the armyworm, *Pseudoletia unipuncta* (Haworth), infected with either a granulosis or nuclear polyhedrosis virus.

(Lepidoptera:Coleophoridae). M.Sc. Thesis, Univ. of Idaho, Moscow, ID. 88 p.

An evaluation of seven *Agathis pumila* release sites in northern Idaho and western Montana showed that a combination of environmental factors influence the effectiveness of the parasite. Mesic sites, with adequate moisture, but without temperature extremes, appear to be advantageous to *A. pumila*. Sites that are too dry or too cold are not conducive to its survival. Various factors were examined for their use as predictors of favorable release sites. From this study, the author concludes that habitat typing can be useful in assessing the suitability of release sites.

576 Ryan, R.B. 1983. Population density and dynamics of larch casebearer (Lepidoptera:Coleophoridae) in the Blue Mountains of Oregon and Washington before the build-up of exotic parasites. Can. Entomol. 115:1095-1102.

Population density and parasitism of larch casebearer were monitored for 10 years before introduced parasites became abundant. An unknown factor, not introduced parasites, was most closely correlated with population change and tended to be inversely density-dependent. These data serve as the "before" period in an evaluation of the biological control program.

577 Stark, R.W., D.G. Burnell, and R.N. Nathanson. 1984. Pest management on Colville Tribal Forests with particular reference to the larch casebearer. Final Report to Colville Tribal Forestry, Nespelem, Washington. Unpubl. 33 p. + Appendix.

Larch casebearer population dynamics were studied from 1980 to 1983. Fourteen species of parasites, 12 native and two introduced, were reared from casebearer pupae: *Gelis* sp., *Scambus* sp., *Itoplectis* sp., *Spilochalcis albifrons* Walsh, *S. leptis* Burks, *Dicladocerus* sp., *Tetrastichus* sp., *Elachertus* sp., *Derostenus* sp., *Cirrospilus pictus* (Nees), *Habrocytus* sp., *Mesopolobus* sp., (native), *Agathis pumila* Ratz., and *Chrysocaris larincinellae* (Ratz.). Observations on variations in parasitism by habitat and elevation are presented.

578 Stark, R.W., D.G. Burnell, L.F. Burnell, L.F. Neuenschwander, M.W. Stock, and R.A. Nathanson. 1985. Dynamics of parasite guilds and insect herbivores in forest successional stages. Pp. 1102-123 *in* Proc. IUFRO Conf., Dornoch, Scotland, 1-7 Sept., 1980. D. Bevan and J.T. Stoakley eds., Site Characteristics and Population Dynamics of Lepidopteran and Hymenopteran Forest Pests. U.K. Forestry Commission, Research and Development Paper 135.

A largely theoretical paper based on casebearer investigations in the western United States which speculates on the importance of understory vegetation to parasite success, how pests and their parasites are affected by forest succession, and the role of genetic diversity in host-parasitoid relationships. The authors present a conceptual diagram for three parasite species at three trophic levels. They suggest that the plant community seral stages of forest succession

570 Maier, C.T. 1984. Abundance and phenology of parasitoids of the spotted tentiform leafminer, *Phyllonorycter blancardella* (Lepidoptera:Gracillaridae) in Connecticut. Can. Entomol. 116:443-449.

At least one casebearer parasite, *Eupelmella vesicularis* (Ratz.) was recovered from this leafminer.

571 Moody, B.H. 1973. Design of a sampling system for the larch casebearer, (*Coleophora laricella* Hbn.). Ph.D. Diss., University of British Columbia, Vancouver, B.C., Canada. 186 p.

Although dealing almost exclusively with problems associated with sampling for the different casebearer stages, the author makes some observations on mortality caused by parasites. No egg or early larval parasitism was found. Parasites played a minor role during the development of casebearer from the fourth instar to pupal stage but a major role from pupal to adult stage. Parasites are generally unevenly distributed and frequently aggregated within the tree crown, but parasitism was greatest in the lower crown and on the outer section of branches.

572 Nathanson, R.A. 1983. The influence of understory vegetation on the parasite complex of the larch casebearer, *Coleophora laricella* Hübner (Lepidoptera:Coleophoridae). M.Sc. Thesis, Univ. of Idaho, Moscow, ID. 43 p.

The effects of understory vegetation on the parasite complex of the larch casebearer were examined by comparing plots in which the vegetation was removed by chemical and mechanical means, with untreated plots. Vegetation removal was only partially successful, but plant species and stand vegetation structure appeared to have a strong effect on parasite species composition and degree of parasitism.

573 Nathanson, R.A., R.W. Stark, and D.G. Burnell. 1984. Observations on the influence of site characteristics on parasites of the larch casebearer, *Coleophora laricella* Hbn. (Lepidoptera:Coleophoridae). P. 52-64 *in* L. Safranyk ed., The Role of the Host in the Population Dynamics of Forest Insects. Proc. IUFRO Conf., Banff, Alberta, Canada, Sept. 4-7, 1983. Pacific Forest Research Centre, Canadian Forestry Service, Victoria, British Columbia.

A published version of Nathanson, 1983.

574 Nealis, V.G. 1983. *Tetrastichus galactapus* (Hym:Eulophidae), a hyperparasite of *Apanteles rubecula* and *A. glomeratus* (Hym:Braconidae) in North America. J. Ent. Soc. B.C. 80:25-28.

The braconid parasite, *Apanteles glomeratus* is also a host for several larch casebearer parasites.

575 Niwa, C.G. 1982. Environmental factors influencing the effectiveness of *Agathis pumila* Ratz. (Hymenoptera:Braconidae), an introduced parasite of the larch casebearer, *Coleophora laricellae* Hbn.

are determinants of the population dynamics of herbivorous insects and the success of parasite guilds in regulating herbivore populations. Further, genetic variation of insect trophic levels reflects seral development.

579 Trumble, J.T. and N.C. Toscano. 1983. Impact of methamidophos and methamyl on populations of *Liriomyza* species (Diptera:Agromyzidae) and associated parasites in celery. Can. Entomol. 115:1415-1420.

The use of methomyl in control of celery leaf miner increased adult parasite mortality and reduced the rate of parasitism by 50%. Results with methamidophos were variable; significantly greater parasite mortality occurred on only three of six sampling dates. The authors conclude that methamidophos application did not reduce the potential for biological control. The effects of these two chemicals on two *Diglyphus* species and two *Chrysocaris* species was examined. Although the species studied are not casebearer parasites, these two genera are well represented in the casebearer parasite guild.

A synoptic list of the parasites reared from *C. murinana* is given. Collections in the Vosges area produced 23 parasite species, seven of which are new records. The parasite complexes of various climatic regions are compared. Among the pupal parasites, *Itoplectis maculator* was common and often the dominant species recovered. *I. maculator* has also been recorded as a parasite of the larch casebearer.