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# Chemical ecology of spruce beetle

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## Introduction

Spruce beetle, *Dendroctonus rufipennis* (Kirby), is a major cause of spruce, *Picea* spp., mortality in North America (Figure 1). All North American species of spruce and known hybrids of spruce are hosts, with large-diameter, mature trees preferred. Preferred host species include Lutz spruce (*P. x lutzii* Little) and white spruce (*P. glauca* (Moench) Voss) in Alaska, white spruce and Engelmann spruce (*P. engelmannii* Parry ex. Engelm.) in western Canada, Engelmann spruce in the Rocky Mountains, and white spruce and red spruce (*P. rubens* Sargent) in eastern North America. Spruce beetle completes its life cycle in 1 to 3 years depending on temperatures.

Figure 1: Faded white spruce killed by spruce beetle along the Nenana River, Alaska. Photo by Christopher J. Fettig, Pacific Southwest Research Station, Forest Service.

## Chemical Ecology of Spruce Beetle

Chemical ecology is the science that seeks to understand the origin, function, and significance of natural chemicals that mediate interactions within, between, and among species. The geographic extent and impacts of spruce beetle outbreaks in the late 20$^{th}$ and early 21$^{st}$ centuries caused a surge in spruce beetle research, including a focus on the chemical ecology of the spruce beetle-host system. In Alaska, studies on *semiochemical* inhibitors conducted by the Forest Service (Research & Development and Forest Health Protection) and Alaska Division of Forestry & Fire Protection contributed to this research. A *semiochemical* is a compound or mixture of compounds that affects the behavior of receiving individuals (here, spruce

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beetle adults). *Pheromones*, semiochemicals that mediate intraspecific interactions, are the most widely recognized class of semiochemicals. Information on other classes of semiochemicals relevant to the study of bark beetles is provided by (Seybold et al. 2018).

Below we highlight a recent synthesis on the chemical ecology of spruce beetle published by (Fettig et al. 2025). We also draw from a related presentation "Spruce beetle: A new synthesis of its chemical ecology, updated Forest Insect & Disease Leaflet, and a 3-methylcyclohex-2-en-1-one (MCH) inhibition assay near Denali National Park" at the 19th Annual Meeting of the Alaska Entomological Society in 2026. Literature on the chemical ecology of spruce beetle focuses on populations in Alaska, western Canada, and the central and southern Rocky Mountains and dates back to the mid-20th century. Early research focused on spruce beetle attractants and shortly thereafter on inhibitors for reducing colonization of downed spruce. Since the early 2000s, research has focused on the use of inhibitors for protecting live standing spruce.

Spruce beetle adults produce *aggregation pheromones*, including frontalin (1,5-dimethyl-6,8-dioxabicyclo[3.2.1] octane), seudenol (3-methyl-2-cyclohexen-1-ol), MCOL (1-methyl-2-cyclohexen-1-ol), and verbenene (4-methylene-6,6-dimethylbicyclo[3.1.1]hept-2-ene), which facilitate mass attacks (a density sufficient to cause host mortality) of spruce. Aggregation pheromones are produced by both sexes of spruce beetle as they bore into spruce trees. Attraction to one aggregation pheromone is enhanced by other aggregation pheromones and host volatiles (e.g., $\alpha$-pinene, a monoterpene found in spruce and other plants). Spruce beetle baits consisting of aggregation pheromones and host volatiles are commercially available and primarily used in traps for monitoring and experimental purposes (Figure 2). Baited traps have also been used in conjunction with other treatments to suppress localized populations of spruce beetle, although this has not been demonstrated effective in Alaska. In general, baited traps should be placed $\geq 15$ m from susceptible spruce to reduce spillover, whereby spruce beetle is attracted to traps but colonizes adjacent host trees.

Figure 2: A 12-unit multiple-funnel trap baited with aggregation pheromones and host volatiles to assess the effects of potential inhibitors on spruce beetle near Soldotna, Alaska. Data from trapping assays are used to select inhibitors for tree protection studies. Photo by Christopher J. Fettig, Pacific Southwest Research Station, Forest Service.

Spruce beetle also produces an *antiaggregation pheromone*, MCH (3-methyl-2-cyclohexen-1-one). Antiaggregation pheromones serve as “no vacancy” signs by regulating attack densities during the latter stages of host colonization. Too many spruce beetle attacking a single host can result in high levels of competition among developing broods, which can negatively affect spruce beetle populations. In addition to MCH, the antennae of spruce beetle are capable of detecting several other compounds including 1-octen-3-ol, *trans*-verbenol, verbenone, nonanal, *exo*-brevicomin, *endo*-brevicomin, and acetophenone. Several of these have been demonstrated to be inhibitory to spruce beetle in trapping assays. 1-octen-3-ol has been detected in female spruce beetle and may be an antiaggregation pheromone.

MCH was first evaluated for reducing colonization of downed spruce by spruce beetle as spruce beetle populations can increase in downed spruce with subsequent generations attacking nearby healthy trees. For example, a study in Montana found MCH reduced spruce beetle attack densities on downed Engelmann spruce by ~85% (Lindgren et al. 1989). MCH was released from bubblecaps stapled along downed stems at ~3-m intervals. Each bubblecap released ~1–3 mg of MCH per day, depending on temperatures.


Figure 3: (A) MCH bubblecaps and (B) an early prototype (a standard 10.1-fl. oz. caulking tube) of SPLAT MCH (ISCA Inc., Riverside, CA). SPLAT MCH is a flowable matrix containing 10.0% MCH by weight with the texture of toothpaste. Photo by Christopher J. Fettig, Pacific Southwest Research Station, Forest Service.

Developing inhibitors for tree protection is a challenge, requiring identification and synthesis of inhibitors; development of release devices to diffuse inhibitors into the forest environment; and numerous lab and field studies conducted over years to decades (Audley et al. 2025a). The situation is further complicated by the need to work in remote areas. Once a promising inhibitor has been identified, there are substantial regulatory hurdles at multiple levels of government that must be addressed before a product can be commercialized. Research in Alaska by (Holsten et al. 2003) was first to demonstrate that MCH could be used to protect live standing spruce from spruce beetle. MCH was released from small medical devices containing a battery-operated pump and storage reservoir. These devices provided timed releases of MCH (2.6 mg of MCH per day, regardless of temperatures) onto a collection pad from which MCH evaporated into the forest environment. MCH reduced the number of Lutz spruce attacked by spruce beetle by ~87%. Since then, several studies have evaluated the effectiveness of MCH and other inhibitors for protecting live standing spruce from spruce beetle (Table 1, Figures 3 and 4). With few exceptions (shaded rows, Table 1), significant reductions in levels of spruce beetle colonization and/or spruce mortality were reported. The efficacy of MCH for spruce protection is highest when spruce beetle populations are low to moderate (e.g., when just a few trees have been attacked within a stand).

Table 1: Studies in peer-reviewed scientific literature on the efficacy of inhibitors for protecting live standing spruce from spruce beetle in the western United States, 2000–2025. Modified from Fettig et al. (2025).

| State | Host | Compounds[1,2] | Effect(s)[3] |
|---|---|---|---|
| AK | Lutz | MCH | Reduction in number of attacked spruce. |
| UT | Engelmann | MCH | NS. |
| UT | Engelmann | MCH + isophorone + sulcatone | Reduction in the probability of mass attacked spruce. |
| NM, UT | Engelmann | MCH | Reductions in the probability of severe attacks. |
| NM, UT | Engelmann | MCH, AKB, and MCH + AKB | Reductions in the probability of mass attack. Spruce treated with MCH or AKB were more likely to be mass-attacked than MCH + AKB. |
| CO, UT | Engelmann | MCH + AKB | Reductions in the probability of severe attack. on treated spruce, and on spruce within 10 m of treated spruce. |
| AK | White | MCH, MCH + AKB, MCH + AKB + sulcatone | NS on treated trees but reductions in the probability of severe attacks on spruce within 10 m of treated spruce. |
| CO, NM, UT, WY | Engelmann | MCH + AKB, MCH + AKB + sulcatone | Reductions in the probability of severe attacks on treated spruce and on spruce within 10 m of treated spruce. |
| CO, UT | Engelmann | MCH + AKB | Reductions in the probability of severe attack. |
| WY | Engelmann | MCH, MCH + AKB, MCH + PLUS | Reductions in mortality of treated spruce and of spruce within 11.3 m of treated spruce. |
| AK | Lutz | MCH + AKB, MCH + PLUS, MCH + octenol, MCH + AKB + PLUS + octenol | Reductions in mortality of treated spruce and of spruce within 11.3 m of treated spruce. |
| UT | Engelmann | MCH + AKB, MCH + PLUS, MCH + octenol, MCH + GLV | Only MCH + AKB and MCH + octenol reduced mortality of treated spruce. |
| AK | Lutz | MCH | Reductions in mortality of treated spruce. |
| AK | Lutz | MCH, MCH + AKB, MCH + PLUS | Reductions in mortality of treated spruce and of spruce within 11.3 m of treated spruce. |
| CO | Engelmann | MCH, MCH + AKB, MCH + PLUS | Reductions in mortality of treated spruce and of spruce within 11.3 m of treated spruce. |

*Note:*
1. See Fettig et al. (2025, Table 2) for references and information on release devices, doses, and release rates.
2. AKB = *Acer* kairomonal blend (linalool + $\beta$-caryophyllene + (*Z*)-3-hexanol; PLUS = acetophenone + (*E*)-2-hexen-1-ol + (*Z*)-2-hexen-1-ol; GLV = (*E*)-2-hexen-1-ol + (*Z*)-2-hexen-1-ol.
3. Significant inhibitory effects compared to the control. NS = not statistically significant (no effect).

Figure 4: An Engelmann spruce baited with a spruce beetle aggregation pheromone (frontalin, black pouch in yellow circle) to assess the efficacy of SPLAT MCH (gray dollop in blue circle; ISCA Inc., Riverside, CA) + AKB (*Acer* kairomonal blend, linalool + $\beta$-caryophyllene + (*Z*)-3-hexanol; white pouch) for protecting spruce from spruce beetle, Utah. Photo by Jackson P. Audley, University of California.

## Conclusions

Our basic understanding of the chemical ecology of the spruce beetle-host system has increased substantially since the mid- to late 20$^{th}$ century. Much progress has been made developing semiochemicals for management of spruce beetle. Baits are highly effective, readily available, and inexpensive. They have furthered understanding of the ecology of spruce beetle by providing a means of attracting and manipulating spruce beetle for experimental study. MCH and other inhibitors have been identified and demonstrated effective for spruce protection (Table 1). To our knowledge, there is only one peer-reviewed study on MCH (or MCH + other inhibitors) that failed to demonstrate efficacy for spruce protection. In that study, Ross et al. (2004) reported the percentage of Engelmann spruce that were mass attacked by spruce beetle was not significantly different between MCH-treated (52.7% mass attacked) and untreated plots (68.3% mass attacked) in Utah. Two other studies showed efficacy for only some of the inhibitors that were evaluated (Table 1). Promising research by Audley et al. (2022, 2024, 2025b) in Alaska, Colorado, and Wyoming reported all inhibitors that were evaluated significantly reduced mortality of treated spruce as well as spruce within 11.3 m of treated spruce. In one study, 4 of 6 inhibitors reduced levels of spruce mortality by 100% while all of the control trees were killed by spruce beetle (Audley et al. 2022).

We encourage the reader to consult (Fettig et al. 2025) for more information on the chemical ecology of spruce beetle. MCH products that are registered for use in Alaska can be found at https://www.kellysolutions.com/ak/. At this time, other inhibitors (e.g., AKB and PLUS, Table 1) are only available for experimental use. General information on spruce beetle ecology and management can be obtained from Jenkins et al. (2014), Bleiker and Brooks (2021), and Fettig et al. (2026), as well as university cooperative extension service offices, county agricultural commissioner's offices, State natural resources agencies, and the U.S. Forest Service's Forest Health Protection program (https://www.fs.usda.gov/science-technology/forest-health-protection). The Alaska Division of Forestry & Fire Protection, Forest Service, and University of Alaska Fairbanks Cooperative Extension Service maintain a website on spruce beetle at https://www.alaskasprucebeetle.org/.

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# Three new records of gall inducers in Alaska

*by Ramsey Sullivan*[4]

## Introduction

Galls are growths made of plant tissue and induced by another organism. The inducer lives some or most of its lifecycle within the gall. Galls provide shelter and food for the inducer, often at the expense of the host.

Most galls are induced by arthropods, although bacteria, fungi, plants, and other organisms are known to induce them as well. Gall midges and gall wasps, Cecidomyiidae and Cynipidae, encompass the two largest groups of arthropod gall inducers with over 800 and 700 gall inducing species known to occur in North America, respectively (Russo 2021, Gagné and Jaschhof 2025).

Preliminary descriptions and distributions for two gall midges and one gall wasp previously unrecorded in Alaska are provided in the following section organized by associated plant hosts.

## Gall Descriptions by Host

***Arctostaphylos uva-ursi* (L.) Spreng.**

Figure 1: From left to right: Galls observed near Lake Louise State Recreation Area (Aug. 2023); Dissection of the previous gall showing a Cecidomyiid larva of unknown species; Terminal and lateral galls observed on Horseshoe Lake Trail, Denali National Park and Preserve (Aug. 2023); Dissected gall after snowmelt showing a cecidomyiid larva, Lake Louise State Recreation Area (May 2025).

**Description** An unknown gall midge (Cecidomyiidae) induces single chambered rosette galls on the lateral and terminal buds of kinnikinnick or bearberry, *Arctostaphylos uva-ursi* (Figure 1). Galls rarely contain multiple larvae. Orange larvae overwinter in the galls and emerge the following spring. Galls halt development of terminal and lateral shoots. A single partially emerged adult was reared from galls collected on May 17th, 2025, and found deceased June 8th, 2025. Additional rearing attempts will be made in Spring 2026.

A Gallformers.org code, "a-uva-ursi-bud-gall"[5], has been made to track observations of this midge on the community science platform, iNaturalist.org. No record of a midge-induced bud gall on Arctostaphylos uva-ursi could be found in reviewed literature (Felt 1928, Gagné 1989, Skuhravá and Skuhravý 2021, Redfern et al. 2023, Gagné and Jaschhof 2025, Ellis 2026, UAM 2026).

**Distribution** Uncommon occurrences have been noted by the author in Interior and Southcentral Alaska to British Columbia.

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[5]https://www.gallformers.org/gall/5104

***Picea glauca* (Moench) Voss & *Picea mariana* (Mill.) Britton, Sterns & Poggenb.**

Figure 2: From left to right: Gall at the base of the previous year's shoot with shoot basal scales removed, host: *Picea mariana* (May 2024); Gall midge exuvia outside a gall on a shoot with basal scales removed, host: *Picea mariana* (June 2024); Pupa dissected from a gall with strongly sclerotized serrated fused antennal horns, host: *Picea mariana* (reared indoors for one month, January 2024); Adult female post emergence, host: *Picea mariana* (June 2024).

**Description** An undetermined gall midge (Cecidomyiidae) induces enlarged bud galls at the base of new shoots on black spruce, *Picea mariana*, and white spruce, *Picea glauca* (Figure 2). It is not known if it utilizes other *Picea* species. Orange larvae overwinter in galls and pupate and emerge the following spring. Larvae were observed in the dissected galls of *P. mariana* from Port Alsworth, AK on May 23, 2024, pupae on June 9th, 2024, with adults emerging from collected galls on June 11th, 2024. Pupae exhibit strongly sclerotized serrated fused antennal horns that likely assist in exiting the gall. Host damage is not superficially apparent; galled buds are often covered by the remnant scales of the bud from which the affected shoot developed.

A Gallformers.org code, "p-mariana-bud-scale-gall"[6], has been made to track observations of this midge on the community science platform, iNaturalist.org. No record of a midge-induced bud gall at the base of shoots of *Picea* spp. could be found in reviewed literature. (Gagné 1989, Fedotova and Averenskij 2016, Skuhravá and Skuhravý 2021, Redfern et al. 2023, Gagné and Jaschhof 2025, Ellis 2026, UAM 2026).

**Distribution** Common in Matanuska-Susitna and Lake and Peninsula Boroughs, though presence throughout host ranges is unknown.

***Potentilla norvegica* L.**

Figure 3: From left to right: *Diastrophus tumefactus* stem gall on *Potentilla norvegica*, Fairbanks (July 2025); Same plant as previous after nearly 6 weeks, Fairbanks (August 2025); Dissected *D. tumefactus* gall, Fairbanks (July 2025); Wasp larva in early season gall, Palmer (July 2025).

[6] https://www.gallformers.org/gall/5487

**Description** The rough cinquefoil gall wasp, *Diastrophus tumefactus* Kinsey 1920, was observed in Matanuska-Susitna and Fairbanks North Star Boroughs in July 2025 (Figure 3). *D. tumefactus* induces polythalamous or agglomerate stem swellings on Norwegian or rough cinquefoil, *Potentilla norvegica*. Galls were collected from Palmer and Fairbanks in August 2025 and sent to Charles Davis, a Ph.D. candidate at Penn State University studying the biodiversity and natural history of gall wasps utilizing hosts within Rosaceae, for rearing and incorporating into his ongoing research.

**Distribution** These occurrences represent the northernmost detection of *D. tumefactus*. "Research grade" identifications on iNaturalist ranging south to Pennsylvania and east to Nova Scotia suggest that it could occur more broadly throughout the host range. The only previously published records of *D. tumefactus* were from Ontario and Quebec from samples collected in the late 1800s (Kinsey 1920, Nastasi and Deans 2021, Nastasi and Davis 2022, Bennett et al. 2024).

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# Larch casebearer confirmed in Southcentral Alaska

*by Grace Graham*[7]

Figure 1: A larch casebearer larva (circled) feeds on recently flushed ornamental larch needles in Anchorage. Photographed 29 April 2025.

## Introduction

In April 2025, larch casebearer, *Coleophora laricella* Hübner (Lepidoptera: Coleophoridae), larvae were found infesting ornamental Siberian larch (*Larix sibirica* Ledeb.) in Anchorage, Alaska (Figure 1). This is the first confirmed detection of this invasive moth in Alaska, though tree damage consistent with infestation by larch casebearer was initially noted in June 2023. In summer 2025, the Alaska Division of Forestry & Fire Protection (AKDFFP) Forest Health team conducted a survey of larch trees in urban areas across the state in collaboration with US Forest Service Region 10 Forest Health Protection. Staff conducted these surveys to determine the distribution of larch casebearer in Alaska, with a focus on the Anchorage Bowl, and the potential threat to native larch stands in the Interior. Additionally, staff maintained two moth traps baited with larch casebearer pheromone lures to obtain specimens and establish the primary flight period for larch casebearer in Alaska. Moth collection was successful and species identification was confirmed by Coleophora specialist Dr. Jean-Francois Landry, research scientist with the Canadian National Collection of Insects, Arachnids, and Nematodes.

## Description & Life History

Larch casebearers are univoltine and complete their life cycles entirely on the branches and foliage of larch trees. In Alaska, native eastern larch (*Larix laricina* (Du Roi) K. Koch) and non-native ornamental larches, predominantly Siberian larch (*Larix sibirica*), are susceptible species. Female moths lay tiny (< 0.5 mm) yellow eggs singly on larch needles in summer. First instar larvae bore directly into and feed from within the needle during their first stage of development (Figure 2B). Several weeks later, second instar larvae emerge and hollow out a larch needle to wear as their namesake protective case (Figure 2B). They continue

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to feed on larch needle tips from within this case through the autumn. Larch trees are deciduous conifers and undergo an annual foliar senescence in the fall. As larch needles yellow and prepare to drop, third instar larvae line their cases with silk threads and move from the needles to the twigs. Overwintering larvae resemble old brown needles and are often found, singly or in groups, firmly attached to branch and twig crotches or needle fascicles (Figure 2C).


Figure 2: Three different stages of larch casebearer larvae in Anchorage, Alaska: A) first instar needleminer, photo taken 22 July 2025; B) second instar feeding casebearer, photo taken 29 July 2025; C) third instar overwintering casebearer, photo taken 10 October 2025.

Larvae activate in the spring soon after new larch needles begin to flush. During this time, larvae molt into their fourth and final instar and immediately start feeding on extending needle bundles. Although small (~5 mm in length), larvae stand out during this phase as they look like brown cylinders sticking out at odd angles from the new, bright green needles (Figure 1). After about six weeks of feeding, most larch casebearers will pupate, widening their case with silk and attaching to needle bundles. Delicate-looking, silver moths (8 mm wingspan) emerge two to three weeks later, taking flight during warm, dry weather to find mates and lay eggs (Figure 3).

Figure 3: An adult larch casebearer sits on a larch needle in Anchorage, Alaska. A larch casebearer egg and damaged needle tips can be seen in the background. Photo taken 1 July 2025.

The specific timing of life events for invasive populations of larch casebearer in the lower 48 varies geographically. Most notably, western North American populations activate more than a week earlier and require less than half as many cumulative degree-days above 5 °C (DD) to begin foraging as those from the

Great Lakes Region under equivalent experimental conditions (66 DD for Oregon vs 172 DD for Minnesota (Ward et al. 2020)). The influence of phenological, genetic, or host factors on these observed discrepancies has not been conclusively established (S.F. Ward, Ohio State University, personal communication). In Alaska, active casebearers were observed on April 29 (54.7 DD) shortly after host bud break, and most insects were pupating by May 29. The first adult moth was captured in traps on June 10, and the highest moth trap catch occurred in the week leading up to July 1. Second instar case-bearing larvae were first noted July 29. Even after most larch needles had turned yellow, active third instar casebearers could be found on lingering green needles as late as October 7.

## Records & Distribution

Larch casebearer is native to the southern mountainous regions of Central Europe where its primary host is European larch (*Larix decidua* Mill.). As early as the 1700s, larch casebearer populations expanded into Northern Europe, the British Isles, and Scandinavia as infested host trees were planted in new areas (Da Ronch et al. 2016). Initially introduced to Eastern North America in the 1880s via the importation of nursery stock, larch casebearer quickly spread to native eastern larch stands in the US and Canada as far west as the Great Lakes Region. In 1957, larch casebearer of unknown origin was discovered on native western larch (*Larix occidentalis* Nutt.) in Idaho. By the mid-1960s, larch casebearer had established in natural larch stands throughout Montana, Idaho, Washington, and southern British Columbia (Ryan et al. 1987).

It is unknown how larch casebearer originally entered Alaska. Given its previous invasion history and presence on trees throughout its lifecycle, infested nursery stock is the most plausible source of introduction for larch casebearers in Alaska. During our survey, larch casebearer was found throughout the Anchorage Bowl and as far north as Wasilla (Figure 4). There are no native larch trees in Southcentral Alaska and larch casebearer was not detected in the Interior during inspections of ornamental and natural larch in Fairbanks. Almost all surveyed trees (97%) in Anchorage exhibited damage from larch casebearer, indicating the insect is well established and has likely been present in Anchorage for several years. At most survey locations (71%) this damage was categorized as trace or light, but three geographically disparate hotspots of heavier damage (Figure 5) suggest there was not a single point source introduction for larch casebearer in Anchorage. This population of larch casebearer may have originated from multiple infested shipments or a single infested import outplanted in multiple locations.

## Host Damage & Integrated Pest Management

Foliar damage from larch casebearer is distinct and presents as hollowed out needle tips that turn brown and droop or curl (Figure 5). This injury is most apparent in early summer after feeding by fourth instar larvae. In Southcentral Alaska, larch casebearer will likely remain a cosmetic nuisance rather than a tree mortality agent as larch are deciduous and generally more resilient to defoliation compared to other conifers. Trees can withstand many years of minor defoliation. Chemical control options may be available for individual, high-value trees.

Historically, successful introductions of insect parasites of larch casebearer, namely *Agathis pumila* Ratzeburg (Hymenoptera: Braconidae) and *Chrysocharis laricinellae* Ratzeburg (Hymenoptera: Eulophidae), have occurred in the eastern US and Canada, the Lake States Region, and the Intermountain West. After the establishment of these biological control agents, the rate and severity of larch casebearer outbreaks declined rapidly (Ryan et al. 1987). Recently, however, larger outbreaks of larch casebearer have been observed in Minnesota and western states despite continued parasitism from both introduced wasps (Ward and Aukema 2019). While these wasps are not known to exist in Alaska, it is possible they may have entered Alaska with their host.

Of greatest concern is the spread of larch casebearer into native larch stands in the Interior. There, multi-year outbreaks or concurrent infestations with larch sawfly, *Pristiphora erichsonii* Hartig (Hymenoptera: Tenthredinidae), could result in severe growth losses or predisposal of trees to mortality from the native eastern larch beetle, *Dendroctonus simplex* LeConte (Coleoptera: Curculionidae). Larch casebearer is extremely cold hardy and can survive temperatures as low as -40 °C (Ward et al. 2020). As such, winter temperatures cannot be relied upon to hamper establishment of larch casebearer in Interior Alaska. Given the patchy distribution of ornamental larch in urban areas and the insect's low dispersal rate, the chance of larch casebearer naturally spreading beyond Southcentral Alaska is small. However, should the insect be introduced via nursery stock to Fairbanks or other Interior towns within the range of native larch, there is a higher risk of spread into natural forests given the proximity to more abundant hosts. As such, we suggest that transport of larch trees or foliage to the Interior from Southcentral be avoided when possible.

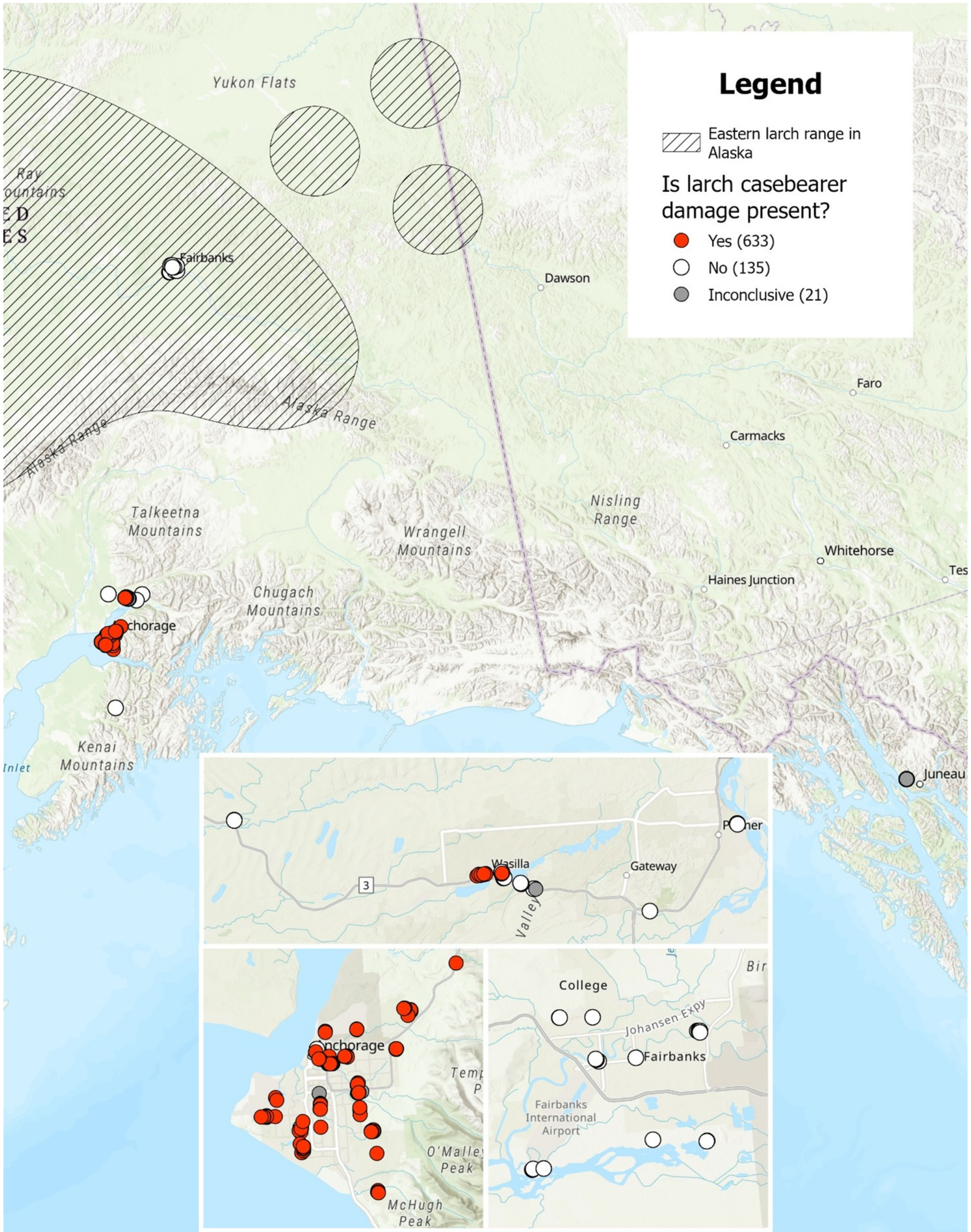


Figure 4: Larch casebearer damage survey locations in Southcentral and Interior regions with the range of native eastern larch (*Larix laricina*) in Alaska overlaid. Numbers in parentheses represent the number of surveyed trees with each value. Points labelled "inconclusive" had larch trees with damage, but the damage was not definitively attributable to larch casebearer.

## Continued Monitoring

The continuation and improvement of survey efforts will allow AKDFFP staff to monitor shifts in the distribution or severity of larch casebearer in Southcentral Alaska and evaluate potential changes to the known range of larch casebearer statewide. Future tree damage surveys will be completed within a narrower temporal window. New surveys will investigate the effects of the northern climate and photoperiod on the phenology of larch casebearer. Additional work determining if the biocontrol parasitoids established for this invasive moth in the lower 48 are present in Alaska is also a priority.

Figure 5: Heavy larch casebearer feeding damage on ornamental Siberian larch in Anchorage. Photo taken 22 July 2025.

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# First detection of small hive beetle, *Aethina tumida* (Coleoptera: Nitidulidae), in Alaska

*by Ramsey Sullivan*[8]

## Background

Since 2018, the Alaska Division of Agriculture (DoAg) has participated in the annual National Honey Bee Disease Survey (NHBS)[9]. This effort is managed by the Honey Bee Lab at University of Maryland, College Park, and has been funded by the United States Department of Agriculture Animal Plant Health Inspection Service (USDA-APHIS) since its inception in 2009. During the 2025 NHBS, small hive beetle (SHB), *Aethina tumida* Murray, was detected at an apiary in the Copper River Census Area. The identification was made by DoAg staff, confirmed by USDA-AHIS identifiers, and constitutes the first recorded detection of SHB in Alaska[10].


Figure 1: Small hive beetle adults in comb. Image credit: Jessica Loque, Smithers Viscient, Bugwood.org.

Small hive beetle (Figures 1 & 2), an economically significant pest of honey bees, *Apis mellifera* Linnaeus, was first introduced into the United States from its native range of sub-Saharan Africa in 1996 (Torgerson et al. 2016, Sheridan 2020). Since then, it has spread across the contiguous United States, Canada, Mexico, Australia, Italy, and South Korea (Noor-ul-Ane and Jung 2020). A review of life history, steps if detected, and prevention and control can be found on the pest alert released by DoAg in collaboration with the University of Alaska Fairbanks Cooperative Extension Service (UAF CES) (Sullivan and Wenninger 2025). SHB negatively impacts honey bee colonies by consuming brood and fouling honey stores, which can result in financial losses for the beekeeper through colony loss and reduced honey production.

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[9]https://ushoneybeehealthsurvey.info/
[10]https://arctos.database.museum/guid/UAMObs:Ento:247837

Figure 2: Adult SHB dorsal view (left), right lateral view (middle), and ventral view (right). Image credit: Chris Hedstrom, Oregon Department of Agriculture.

## Response

The DoAg investigated the apiary where the detection occurred and found that the beekeeper had not registered their hives within the required 72 hour window of acquiring their bees nor had the importer submitted health certificates as required by Alaska state statutes. After requesting and receiving the registration and health certificate, it was determined that the health certificate did not come from an apiary certified free from pests at the time of inspection, and stated that SHB was endemic to the source state, which would have led to corrective action by DoAg had the health certificate been submitted within the required 72 hour window after the importer received their bees. DoAg requested the beekeeper not move their hives until a follow up inspection could be conducted which occurred in May 2026 and yielded a negative detection for SHB.

Additionally, DoAg, in collaboration with the UAF CES, initiated a public outreach campaign, developing and distributing a pest alert and presenting at the Alaska Invasive Species Partnership's 2025 Invasive Species Workshop and at local and regional bee keeping meetings and events.

## Discussion

Preventing the introduction of honey bee pests and diseases begins before bees arrive in Alaska. A person importing bees into the state shall, within 72 hours after the bees arrive, send the Division a copy of the health certificate required by AS 03.47.020[11] (11 AAC 35.020[12]). Additionally, Alaska state statutes require that a person keeping bees shall notify the DoAg of the existence and whereabouts of the bees within 72 hours after acquiring them, and annually after that, on forms available from the Division (11 AAC 35.020). The importance of beekeepers registering their bees cannot be understated. Registrations are used to perform tracebacks, identify areas of risk for pest and disease spread, conduct robust survey efforts, and provide data for the beekeeping industry in Alaska. While bee registration data across the state is likely incomplete, registrations the DoAg has received show the interconnectedness of Alaska apiaries and the far-reaching potential for apiaries to spread disease and pests to one another (Figure 3).

[11] https://www.akleg.gov/basis/statutes.asp#03.47.020
[12] https://www.akleg.gov/basis/aac.asp#11.35

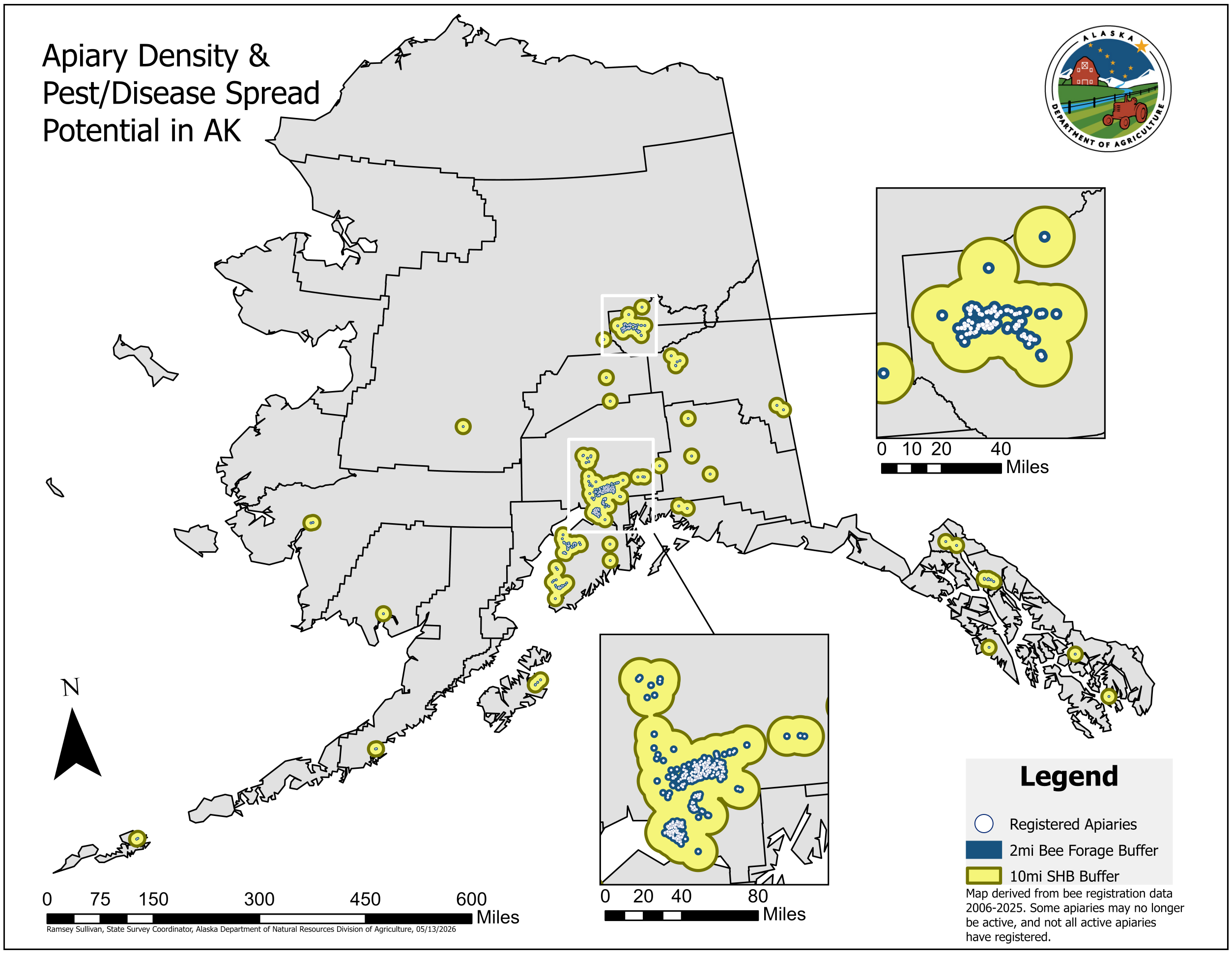


Figure 3: Apiary density and disease spread potential in Alaska. Buffers were rendered around each apiary with overlapping boundaries merged. The 10 mi SHB Buffer is based on the distance within which SHBs can detect honey bee hives. Map derived from 2006-2025 bee registration data. Some apiaries may no longer be active, and not all active apiaries have registered. Produced by Ramsey Sullivan, State Survey Coordinator, AK Department of Natural Resources, Division of Agriculture.

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# Review of the nineteenth annual meeting

*by Sayde Ridling*[13] and *Derek S. Sikes*[14]

Figure 1: Members present at post-meeting social event. From left to right: Roger Burnside, Joey Slowik, Alex Wenninger, and Derek Sikes.

The nineteenth annual meeting of the Alaska Entomological Society was held in the Rasmuson Hall at the University of Alaska Anchorage campus on the traditional lands of the Upper Inlet Dena'ina peoples and virtually via Zoom on February 13, 2026. We are grateful to the University of Alaska Anchorage for offering us the use of this space.

## Presentations

**Taylor Kane** started off the meeting with her talk "Outcomes and takeaways from a week-long entomology summer camp." Taylor designed and co-taught this camp as part of her Scientific Teaching and Outreach Certificate Program. The camp was intended to garner and maintain the interest of older students and was inspired by UAF's Bug Camp for younger children. Taylor discussed some activities, such as nature journaling, and showcased the results of her surveys which assessed how students felt, acted toward, and understood insects both before and after the camp was held. Her surveys show she helped many students increase their curiosity and knowledge of insects while decreasing their fear and opposition towards them.

The Alaska Division of Forestry & Fire Protection's **Grace Graham** discussed detection of a non-native species of phyllophagous moth in her talk "First detection of larch casebearer (*Coleophora laricella*) in Alaska." Grace followed up on photo evidence showing there could be an established population of larch casebearer in Anchorage. Grace had worked with these 8 mm microlepidoptera and searched for their minute cases on larch needles in the past. Through her familiarity she was able to return to the location of the photo at the right time to locate larvae and confirm larch casebearer as the likely cause of the larch damage. Following initial confirmation, a survey discovered populations across the Anchorage Municipality and in

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limited other locations in Southcentral Alaska, all on ornamental larch trees. Though not tree mortality agents, this species can negatively impact a tree's growth and resilience. The discovery of overwintering populations in Alaska has expanded the known northern limit of larch casebearers and has implications in their control elsewhere. Because larch has discontinuous populations in Alaska and there are no native larch in Southcentral, it is believed they established here via human dispersal. Continued monitoring will seek to determine the infested areas throughout Alaska, phenology of the insect in the state, and identify possible control measures.

**Jackson Audley** discussed deliverables from his work on spruce beetle chemical ecology and other recent projects in his talk entitled "Spruce beetle: A new synthesis of its chemical ecology, updated Forest Insect & Disease Leaflet, and a 3-methylcyclohex-2-en-1-one (MCH) inhibition assay near Denali National Park." Jackson was especially happy to have conducted field work in a part of Alaska new to him, the Denali area, even given the challenges presented by animals and the environment. Work there helped elucidate spruce beetle chemical synthesis and inhibition. Further details are included in published papers reviewing spruce beetle chemical ecology and pheromone-based tree protection trials. Additionally, Jackson highlighted the Spruce Beetle – Forest Insect & Disease Leaflet (FIDL-127), which he and several colleagues recently updated, an endeavor which will surely have lasting implications to Alaskan entomology. Several AKES members were involved in these projects.

After lunch, **Jozef Slowik** presented two back-to-back talks, the first of which was titled "Rapid maggot update." This brief talk discussed preliminary results garnered from the first year of a five-year study on the influence of root maggots (Diptera: Anthomyiidae: *Delia*) on cover crop mixes in Alaska.

**Jozef Slowik**'s second talk, "Opiliones in Alaska," discussed these charismatic arthropods and his collaborative efforts to develop a key which can be used for Alaskan taxa. This key covers six families and approximately 16 species found or likely to be found within our state. Because he prioritized readily accessible characteristics and those that don't require extensive dissection or knowledge of arachnid traits this key will be useful for a broad audience. The hope is that it will ease some of the neglect currently experienced by Opiliones in Alaska and combat erroneous misidentifications found in online photos by allowing for accurate identifications, collections, and documentation of their diversity.

The final talk of the day was given by **Derek Sikes** who presented on his nearly complete work with "The Ants of Alaska (Hymenoptera: Formicidae)." Work on this project began in 2017 with Renee Nowicki, an undergraduate at UAF, and was initially slated for quick completion based on the small number of ant species in Alaska. Initial efforts to identify what those species were and thus include them in the key quickly became complicated as new species were added and misidentifications or identification disagreements among experts happened. The eventual species count is now settled at 24 species for Alaska, 72% of which overlap with species found in Yukon, Canada. Renee has gone on to complete a MS degree working with ants and the key she started as an undergraduate is currently under review by the Canadian Journal of Arthropod Identification.

**Taylor Kane** was our sole student presenter this year, as such she was awarded the student award. There were no posters. Congratulations, Taylor!

Two whimsically designed insect napkins were donated by Julie Riley and randomly awarded to Susan Wise-Eagle as this year's door prize. Thank you, Julie, and congratulations, Susan!

Thanks to Luke for his student presentation this year which earned him the 2024 Student Presentation Award. Congratulations, Luke!

## Business items - highlights

- The Kenelm W. Philip Entomology Research Award had no applicants again this year. Further efforts will be made on the part of the society to better inform students of this potential research funding via social media, listserv emails, and the University of Alaska system. The creation of youth awards or Bug Camp scholarships were discussed and will be looked into.

- Robin Andrews (Vice President) reported on how the society could meet the UAF library's requirements to archive the AKES newsletters physically, what steps can be taken to meet these, and their associated costs. Julie Riley will contact the UAA library about their requirements so a physical copy can be archived there as well.

- Members discussed options for archiving the newsletters electronically via Fig Share. Options for creating individual newsletters or a single DOI were discussed and consensus was for a single DOI of the whole newsletter to be created.
- Logo discussion continued. Funds are still set aside and efforts will be made by Sayde Ridling and Taylor Kane to have some options for our twentieth meeting.
- Some website updates were reported and discussed including an updated version of the butterflies of Alaska Field Guide and a now working online dues payment link. If you've been putting off your dues payment now is the time! https://akentsoc.org/membership/
- Derek Sikes (President) requested a committee be formed to update our bylaws. Motions were made and accepted to add several exciting new membership categories including lifetime and honorary memberships to our bylaws during the update. A committee consisting of Derek Sikes, Jessie Moan, and Julie Riley was formed.
- Election results: Derek Sikes remains president, Robin Andrews stepped down from her role as vice president to focus on research. She remains active in the society and is leading the efforts to archive our newsletter. The Society appreciates Robin's ongoing commitment to Alaskan entomology! Sayde Ridling was elected the new vice president, Joey Slowik remains secretary, and Roger Burnside remains treasurer with Ramsey Sullivan continuing as apprentice treasurer. All votes were unanimously in favor.

After the meeting, in person attendees enjoyed a social outing at the Onsite Brewing Company in Anchorage. We look forward to discussing another year of Alaskan Entomology at our 2027 meeting to be held in Fairbanks.

Minutes from our business meeting are available on the website.