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In this issue:

A new state record, *Neodiprion nanulus contortae* Ross collected from shore pine in Southeast Alaska

by Elizabeth Graham[1] and Robin Mulvey[2]

Figure 1: *Neodiprion nanulus contortae* feeding on shore pine. The larvae are gregarious feeders, typically on old growth foliage.

Professionals with the USDA Forest Service, Forest Health Protection unit have added a new insect to Alaska's state record of known species. A sawfly species was discovered in 2012 while working to evaluate damage agents of shore pine (*Pinus contorta* var. *contorta*). Shore pine is a subspecies of lodgepole pine that occurs on peatland sites across Southeast Alaska. The Forest Inventory and Analysis Report, Forests of Southeast and South-Central Alaska 2004-2008, documented a decrease in *Pinus contorta* biomass over the study period, despite negligible harvest (Barrett and Christensen, 2011). The causal agent was unknown and there was no apparent geographic trend in mortality, which was more common among large trees ($> 8''$ dbh). This prompted installation of 24 permanent shore pine plots to assess the health status and damage agents of shore pine. Plots were established in the summer of 2012 in Juneau (3), north Chichagof Island (5), Prince of Wales Island (6), Mitkof Island (5) and Wrangell Island (5) (Figure 2). Information collected included: live/dead tree status and decay class, dbh, height, height to live crown, percent crown dieback, wound type and severity, western gall rust severity, years of foliage retention, foliage disease type and severity, and foliage-feeding insect type and severity.

A sawfly species was observed feeding on shore pine foliage in nearly 40% of the established plots on north Chichagof, Mitkof, Wrangell and Prince of Wales Islands, but were not detected in Juneau. Early instar larvae were first observed feeding on shore pine in mid-July. Damage became more noticeable in late July and August when the larvae were late-instar. Small trees and saplings were oc-

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casionally completely defoliated except for tufts of current year foliage, although no mortality associated with feeding was detected. Feeding damage or larvae were not observed on other trees or shrubs growing in association with shore pine.

Sawfly larvae were collected, reared to adulthood, and identified as *Neodiprion nanulus contortae* by David Smith at the Smithsonian Institution. This is the first record *N. n. contortae* collected or observed in Alaska, according to the Arctos Multi-Institution, Multi-Collection Museum database at the University of Alaska, Fairbanks.

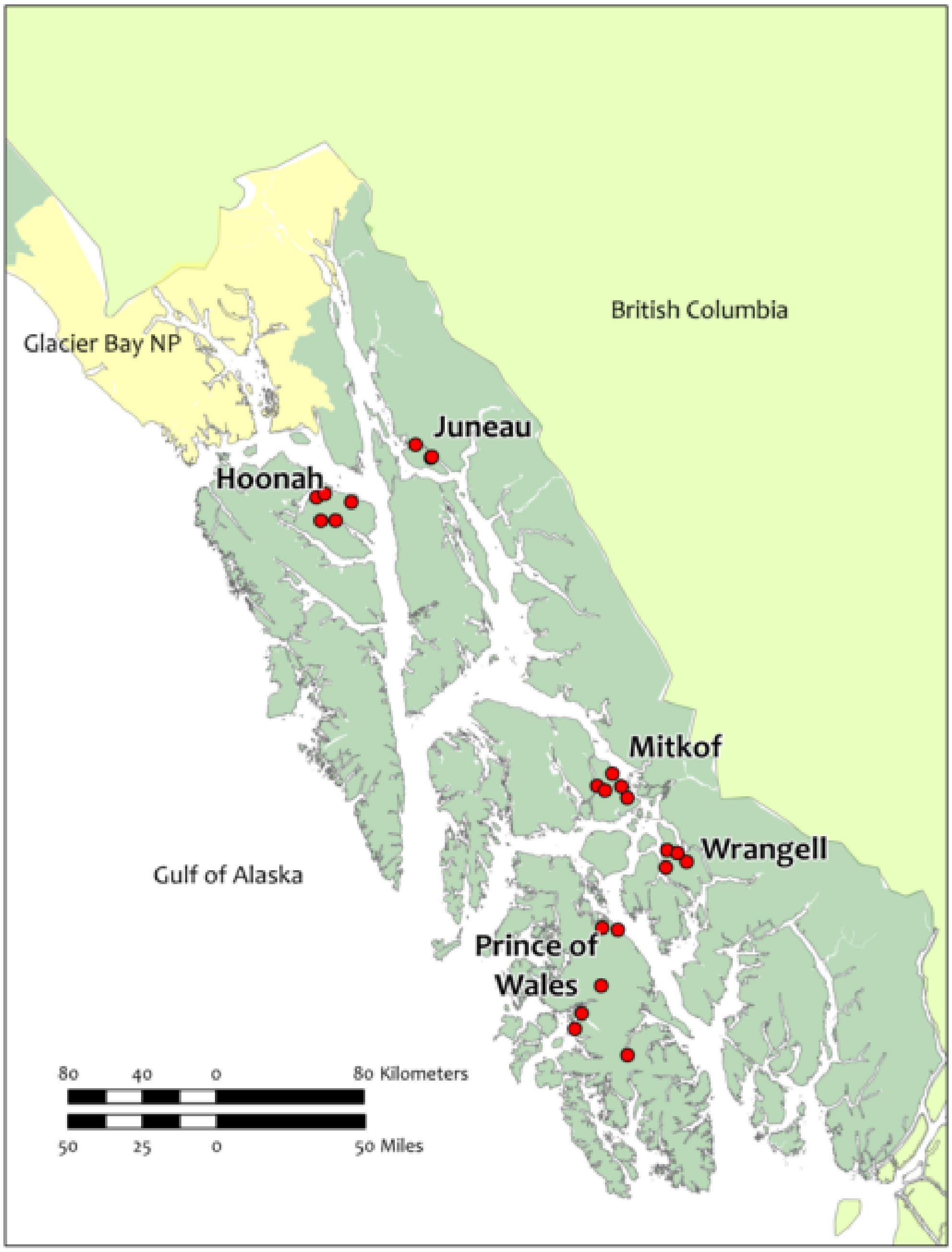

Figure 2: Map of Southeast Alaska. Red dots indicate shore pine study plot locations.

Figure 3: Large populations may also feed on new growth after the needles have elongated.

N. n. contortae is known from Oregon, Idaho, Montana, British Columbia, and Alberta, where it feeds on lodgepole and ponderosa pines and occasionally reaches outbreak levels (Ciesla, 1976). Repeat defoliation can kill trees outright, or subject them to attack by other insects. Generally trees recover from attack but may suffer a reduction in growth. A significant outbreak of *N. n. contortae* occurred across 11,000 acres in Montana in 1959-1961, and then quickly declined due to a nucleopolyhedrosis virus. Scattered pockets of heavy defoliation have been recorded throughout the Pacific Northwest since the 1940s.

To our knowledge, sawflies have never been reported on shore pine in Southeast Alaska, but *Neodiprion* spp. are known to feed on shore pine along the Oregon coast (Reeb and Shaw, 2010). Due to its low commercial value, shore pine and its pests have been understudied in Alaska. Larvae were consistently found across a broad geographic range on the four islands surveyed, indicating that this species is not a recent introduction. Small scale outbreaks have occurred on islands off British Columbia since the 1970s; therefore this may be an example of a range expansion. Interestingly, the sawfly was not found in the northernmost location, Juneau. We will continue to install shore pine plots in 2013, allowing us to collect further information on the extent of the range and activity of *N. n. contortae* in Southeast Alaska.

Figure 4: Adult female *N. n. contortae*.

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Alaska DNR and USDA Forest Service complete studies on Northern Spruce Engraver in the Interior

by Christopher J. Fettig[3], *Roger E. Burnside*[4], *James J. Kruse*[5], *and Mark E. Schultz*[6]

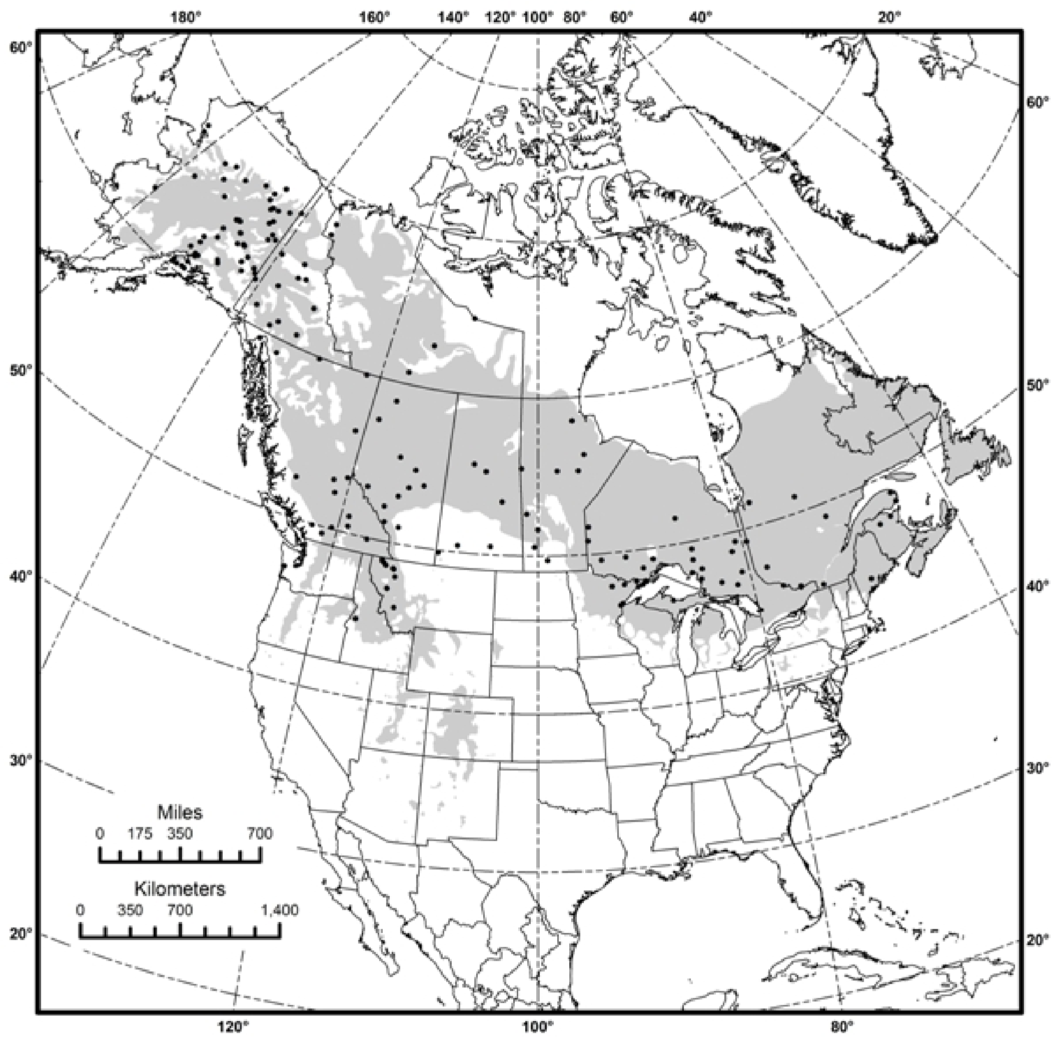

Figure 1: North American distribution of northern spruce engraver (shown as black circles) assembled from historical collection records and pest surveys across the range of its major hosts, white spruce and Engelmann spruce (shown in gray). Adapted from Burnside et al. (2011).

The northern spruce engraver, *Ips perturbatus* (Eichhoff), is a notable bark beetle whose distribution generally coincides with that of white spruce (Figure 1). Other hosts include Engelmann spruce, Lutz spruce, and in rare cases, black spruce and Sitka spruce. Depending on location and year, flight activity usually begins in mid- to late-May and ends in August with peak flight occurring sometime in June. Adult northern spruce engraver usually overwinters in forest litter beneath brood trees and disperses short distances in search of fresh host materials soon after emergence

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in spring. Males produce an aggregation pheromone that attracts both males and females. Galleries are initiated in the phloem by males, which are later joined by and mate with up to four females in a central nuptial chamber. Feeding activity damages and kills the phloem and outer xylem tissues of live hosts, which may result in tree mortality depending on its distribution and extent.

Figure 2: Experimental logs in white spruce stands presented in one of four piles (decks) in a decked, unscored plot (top), and randomly distributed in four groups in a dispersed, scored plot (bottom). Photos: R.E. Burnside.

In most years, endemic populations of northern spruce engraver infest forest debris, widely scattered individual trees or small groups of trees. However, natural (e.g., flooding, wildfire and wind storms) and anthropogenic (e.g., road building, construction of utility rights-of-way and logging) disturbances may produce large quantities of damaged, dead, or dying spruce that serve as ideal hosts. If favorable climatic conditions coincide with large quantities of suitable host material, northern spruce engraver populations may erupt and result in mortality of apparently-healthy trees over extensive areas. For example, in the 1950s an outbreak impacted >375,000 ha near Fort Yukon, while spring drought conditions led to recent outbreaks of northern spruce engraver on the Kenai. Outbreaks are typically associated with small-diameter trees (<15 cm diameter at 1.37 m in height, dbh), and may impact timber and fiber production, water quality and quantity, fish and wildlife populations, recreation, real estate values, biodiversity, carbon storage, cultural resources and other resources. Stand structure and composition may be altered in substantial ways.

In Alaska, increased use of mechanical fuel reduction treatments to reduce the risk of wildfire to rural communities; increased interest in the use of low-cost wood energy systems as alternatives to fossil fuels; and elevated levels of tree mortality attributed to northern spruce engraver have raised concerns regarding the impact of this bark beetle to forest resources. Furthermore, mean temperature in interior Alaska is projected to increase by an additional 3 to 7 °C by the end of this century with only modest increases in precipitation likely insufficient to offset increases in evapotranspiration (Wolken et al., 2011). Drought-stressed trees are likely to become more common, enhancing conditions favorable to northern spruce engraver, particularly along the northern limit of its distribution in the Interior. As a result, we expect outbreaks of northern spruce engraver to become more severe and widespread in the future.

In 2012, a four-year cooperative study was completed by the Alaska DNR and USDA Forest Service to determine factors influencing northern spruce engraver colonization of white spruce slash and to develop practical guidelines for management in the Interior. Results were recently published in Forest Ecology and Management (Fettig et al., 2013). This work was sponsored by a USDA Forest Service grant from the Special Technology and Development Program (STDP) and the scientists' home institutions. Field work was executed near Delta Junction, Fairbanks and Tok in 2009-2011. Higher levels of northern spruce engraver attack and emergence occurred on dispersed logs compared to decked logs (Figures 2, 3). Attack densities were highest in the dispersed, unscored treatment, and ∼70% higher than observed in the decked, scored treatment. The scoring of dispersed logs significantly reduced attack densities by ∼28%, but had no effect in decked treatments or on levels of emergence in either treatment. Higher levels of attack and emergence were observed on the tops of logs as compared to the bottoms of logs. Brood production was also greater on the tops of logs compared to the bottoms of logs, suggesting the tops of logs are not only more attractive to northern spruce engraver, but confer some advantage to brood development. Lower levels of attack and emergence occurred on small diameter logs (Figure 4), while higher levels were observed on logs in a shaded fuelbreak (i.e., a more open condition of lower tree density) compared to the adjacent forest.

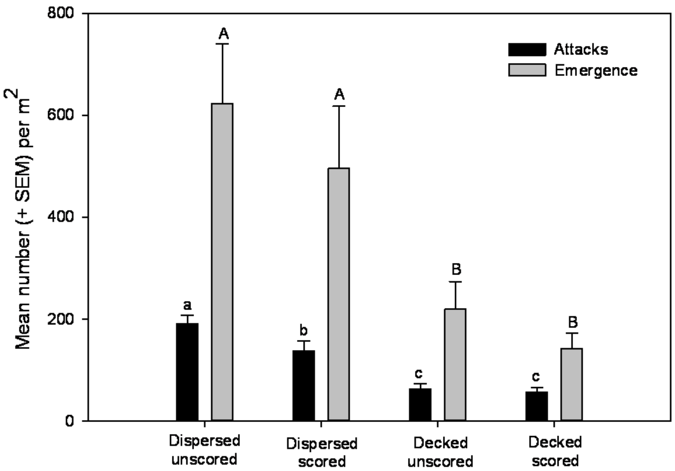

Figure 3: Comparisons of attack and emergence hole densities on white spruce logs among treatments. Means (+SEM) followed by the same letter within columns of the same color are not significantly different (Tukey's HSD, P > 0.05).

Unlike other works on *Ips* spp. in the western United States that promote the desiccation of slash to minimize colonization and brood production, northern spruce engraver appears regulated by the apparency and accessibility of host material highlighting the importance of local study to inform management. To that end, we offer the following management guidelines to minimize northern spruce engraver colonization and brood production in white spruce: (1) logs <12.7 cm in dbh are less attractive and produce less brood, and therefore represent less of a concern to the residual stand than larger diameter material, (2) scoring of logs is ineffective for reducing brood production, and is likely not justified despite previous reports, (3) logs should be stored in areas of forest condition with limited sunlight, but not against residual host trees, and (4) logs should be stored in a manner similar to the decked, unscored treatment (Figure 2, top) (Fettig et al., 2013). Finally, the semiochemicals Trans-conophthorin + (−)-verbenone were effective for inhibiting northern spruce engraver attacks on decked, unscored logs (Fettig et al., 2013) and standing trees (Graves et al., 2008), and may be useful for reducing host colonization. However, the efficacy of these compounds has not been examined for larger-scale applications, but warrants further study.

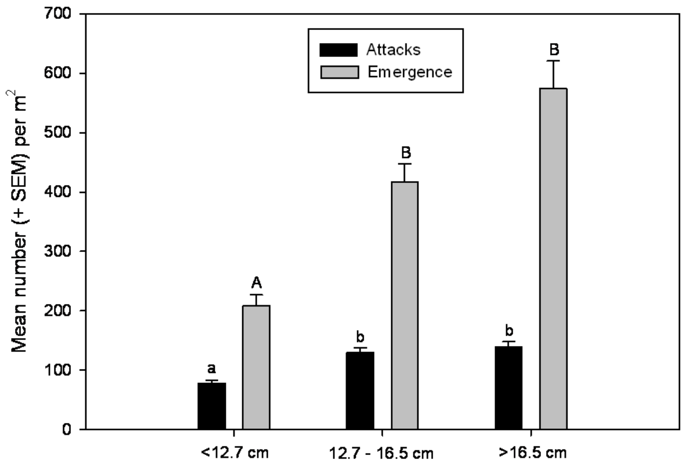

Figure 4: Comparisons of attack and emergence hole densities on white spruce logs among diameter classes (measured at log center). Means (+SEM) followed by the same letter within columns of the same color are not significantly different (Tukey's HSD, P > 0.05).

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Color guide to Alaskan bumble bees

by Rehanon Pampell[7]

Figure 1: *B. occidentalis* on fireweed. Photo by Rehanon Pampell.

Bumblebees are a group of native pollinators that are free and take little maintenance. They are characterized by black and yellow body hairs, often in bands. However, some species have orange or red on their bodies, or may be entirely black. There are approximately 246 bumblebee species worldwide (Williams, 1998). They are an annual species. The mated queen overwinters in the soil and in the early spring will emerge from hibernation. She forages for food, establishes a new nest and rears the first worker brood. These workers are sterile females that forage and tend to the next generation of workers. Later in the season, unfertilized eggs (which will turn into males) are laid by the queen and worker larva develop into new queens. The males and new queens mate; the old queen, workers and males die; the colony disintegrates and the new queens hibernate.

Bumble bee pollination is critical to the maintenance of subarctic ecosystems (Washburn, 1963; Kevan, 1972). They have been observed foraging during snowfall, under a full moon (Kearns and Thomson, 2001), during the night, above the tree line (Richards, 1973; Lundberg, 1980), and temperatures as cold as -3.6°C (Heinrich, 1979). Many of the berries, nuts, and seeds consumed by birds, mammals, and other insects are the result of bumble bee pollination of native woody and herbaceous plants. However, Over the past few decades research has identified declines in bumblebee populations in Europe and North America (Allen-Wardell et al., 1998; Thorp and Shepherd, 2005; Koiser et al., 2007; Goulson et al., 2008; Grixti et al., 2009). Potential causes include loss of nesting and forage sites, invasive species, pesticide use, parasitic spillover, and habitat loss, disturbance, and fragmentation (Cane and Tepedino, 2001; Roubik, 2001; Goulson et al., 2008).

There is very little information on Alaskan bumble bee species (Pampell, 2010). Furthermore, there is no consensus on the total number of bumble bee species present in Alaska. Based on literature reviews, personal communications, and the University of Alaska Museum's (UAM) bumble bee collection, my research suggests there could be 27 species of bumble bees in Alaska belonging to 8 Subgenera (Pampell et al., 2012).

Figure 2: *B. bifarius* on Columbine. Photo by Rehanon Pampell.

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Table 1: *Bombus* subgenera and species reported from Alaska.

Subgenus	Species
Alpinobombus	*B. balteatus* Dahlbom, *B. hyperboreus* Schonherr, *B. neoboreus* Sladen, *B. polaris* Curtis
Bombias	*B. nevadensis* Cresson
Bombus	*B. moderatus* Cresson, *B. occidentalis* Greene
Cullumanobombus	*B. rufocinctus* Cresson
Pyrobombus	*B. bifarius* Cresson, *B. centralis* Cresson, *B. flavifrons* Cresson, *B. frigidus* Smith, *B. jonellus* Kirby, *B. melanopygus* Nylander, *B. mixtus* Cresson, *B. perplexus* Cresson, *B. sitkensis* Nylander, *B. sylvicola* Kirby, *B. vagans* Smith
Psithyrus	*B. ashtoni* (Cresson), *B. fernaldae* Franklin, *B. insularis* (Smith), *B. suckleyi* (Greene)
Subterraneobombus	*B. appositus* Cresson, *B. borealis* Kirby, *B. distinguendus* Morawitz
Thoracobombus	*B. californicus* Smith

Figure 3: Bumble bee nest site at the edge of a UAF field. The nest entrance is circled. Photos by Rehanon Pampell.

I created a guide (Figure 5) for queens and workers (both female). It can also be used for male identification, but males can show a higher degree of variability than their female counterparts. Females have six visible abdominal segments called tergites (T); stinger present; antennae with 10 flagellomeres; mandibles are wide and scoop-like. Males have seven visible tergites with the tip of their abdomen blunt; stinger absent; antennae with 11 flagellomeres; mandibles are narrow and bearded. The guide is based on the coloration or patterns of the vertex (resembling a widow's peak), frons (the hair at the antennal bases), thorax, and each abdominal segment called "tergites" indicated by "T" (Figure 4).

Distinguishing features of all recorded species from Alaska were based on personal observations, personal communication with bee experts and other descriptions by Stephen (1957), Thorp et al. (1983), and Williams (1998), as well as the updated web pages of Williams' (1998) checklist at the Natural History Museum Bombus database (`http://www.nhm.ac.uk/research-curation/research/projects/bombus/index.html`) and Ascher and Pickering (2010) with updated pages at DiscoverLife.org (`http://www.discoverlife.org/mp/20q?guide=Bumblebees`) — this information can be found in Pampell et al. (2012).

Based on these observations and descriptions, I created the following guide for the species of Alaska. It has not been through a validation process like the "Color Key to the Most Common Interior Alaska Bumble Bees" as appeared in Pampell et al. (2012). I also have not included *B. appositus*, *B. californicus*, or *B. nevadensis* because their status in Alaska requires further investigation. When reviewing UAM specimens, there was no noticeable difference between *B. suckleyi* and *B. ashtoni*. *B. polaris* and *B. balteatus* were also quite indistinguishable; however, with a microscope you can observe that *B. balteatus* has punctures on the clypeus (low margin of the "face" just above the mandibles) whereas the clypeus of *B. polaris* is smooth or with very few punctures.

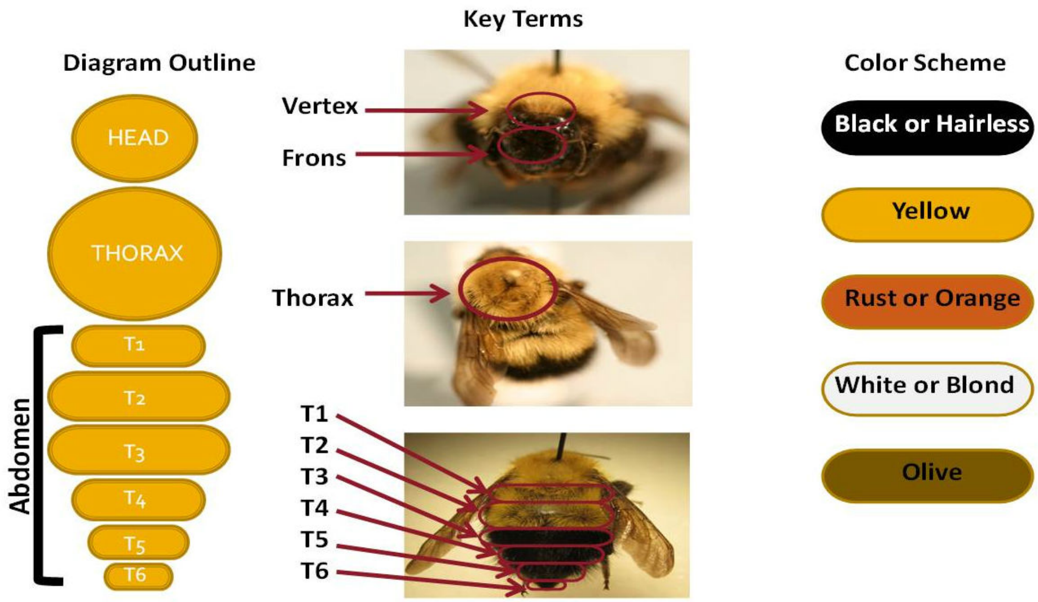

Figure 4: Diagram on how to use the Color Guide.

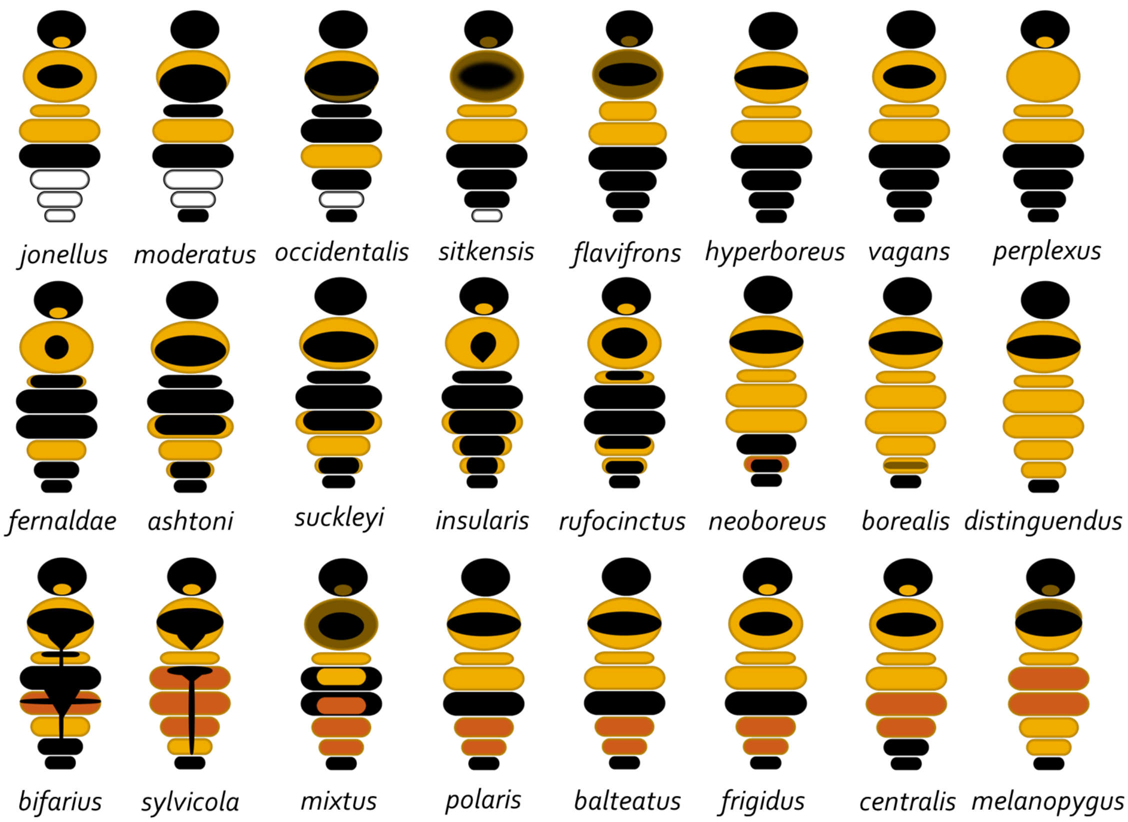

Figure 5: Color Guide to Alaskan Bumble Bees.

There is a real need to assess bumble bee populations in Alaska. A photo with date and location is a simple way to record bumble bee distributions. Anyone interested in contributing to the above key or sending me pictures of Alaskan bumble bees, please write me at rehanon.pampell@live.com. I am no longer in Alaska, but am greatly interested in continuing to learn more about the bumble bees of Alaska.

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Denali Bug Camp 2012

by Sayde Ridling[8]

Figure 1: Denali Bug Camp 2012 participants after deploying a flight intercept trap on the Denali Education Center campus.

History

The Denali Bug camp program was initiated in 2010 by Kenai Peninsula naturalist Dominique Collet and the former Denali Education Center youth programs director, Blair Shoenborn. The goal of the program was to introduce interested youth to the science of entomology and teach them proper collection, preservation, and specimen identification techniques. After the program was initiated, both the Alaska Entomology Society and the University of Alaska Museum of the North provided additional support enabling the first camp to be held in July of 2011.

Denali Bug camp 2011 was a five day residential (overnight) program for children in the fifth and sixth grades. Instructors in 2011 were Blair shoenborn, Julie Pearson and Dominique Collet. This first camp was a huge success, leading to the launch of a second Denali Bug camp on June 26^{th}-30^{th}, 2012. This camp restricted participant ages to eleven and twelve year-olds and the program was shortened by one day. These changes were made to maximize time spent with the children and ensure an adequate maturity level in all participants. 2012 instructors again included Blair Shoenborn and Julie Pearson. With Dominique's encouragement, I replaced him as the new lead content facilitator. Denali Bug Camp 2012 was again enthusiastically met with great success, allowing for the continuation of the program. I am pleased to report that Denali Bug Camp 2013 will be held this July.

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My Participation

My position in Denali Bug Camp 2012 as lead content facilitator required that I provide entomological expertise to both the participants and other instructors as well as ensure that pertinent topics were covered and properly understood. My position also required me to lead camp activities, such as making sure traps were deployed correctly, teaching the participants about some of the different insects and their habitats, relating the importance of recording and associating complete label data for each habitat, and introducing and demonstrating proper mounting and preservation techniques. My final duty was caring for our camp mascots: two small firebrats (*Thermobia domestica*) which had traveled with me from Fairbanks.

2012 Program Highlights

Each day at Denali Bug camp 2012 was filled with exciting entomological activities. Listed below are a few of the highlights from the program. In the true nature of science, some of these highlights were planned and some were completely unexpected.

Wednesday (Day 1)

Oxbow hike Participants and instructors completed the nearby Oxbow hike. The goal of this hike was to introduce participants to each other, the instructors, and some of the habitats we would be encountering. Toward the end of the hike is a riparian habitat with many rocks for invertebrates to thrive under. It was under one of these rocks that a participant, Molly Forrest, uncovered a pseudoscorpion. This specimen was the first record of a pseudoscorpion from the Denali area and showed the participants how exciting the science of entomology can be. The specimen (UAM:Ento:228486) was readily donated to the University of Alaska Museum Insect collection and later added to the online database so the record is available to scientists everywhere.

Intro to entomology with Dr. Derek Sikes Back at the Denali Education Center campus, Dr. Derek Sikes, curator for the University of Alaska Museum insect collection, introduced participants to the science of entomology with an enthusiastic talk captivating everyone for two hours.

Build your own funnel trap Participants had the opportunity to get creative and challenge their knowledge of the insect mind by creating their own funnel traps from plastic water bottles.

Thursday (Day 2)

Deploy traps Participants and instructors toured the Denali Education Cener campus in search of the best insect habitats. After discussing the target organisms each trap was designed to capture, participants chose locations and deployed professional entomology traps. These traps included a lingren funnel, a flight intercept trap, a malaise trap, and yellow pan traps. Lastly, handmade funnel traps were "baited" and deployed by the individuals who made them. Some creative bait included sugar and scat.

Figure 2: A successfully deployed malaise trap on the Denali Education Center campus.

Aquatic module with Andrea Blakesley Participants were introduced to aquatic entomology and clean sampling techniques by Denali National Park biologist Andrea Blakesley, who needed their participation to complete a nationwide citizen scientist study. In order to complete this study, participants used their newly mastered clean sampling techniques to collect macro-invertebrate specimens (Odonata larvae) from ponds within the national park. Ten specimens were collected from three sites within Denali National Park to assess the mercury contamination level within the park and compare it to that of other national parks.

Figure 3: Looking for aquatic invertebrates during Denali Bug Camp 2012's aquatic entomology module.

Figure 4: Denali Bug Camp 2012 participants using clean sampling techniques to collect odonata larvae for a national citizen scientist study.

Friday (Day 3)

Preserving and pinning Participants were given instructions and a demonstration on how to properly preserve and/or pin their specimens while keeping them associated with their data. Once participants felt confident in what they needed to do, they were given Schmitt boxes and mounting materials to begin working on creating their own collections. Throughout this process, all of the participants donated several specimens of interest to the University of Alaska Museum insect collection.

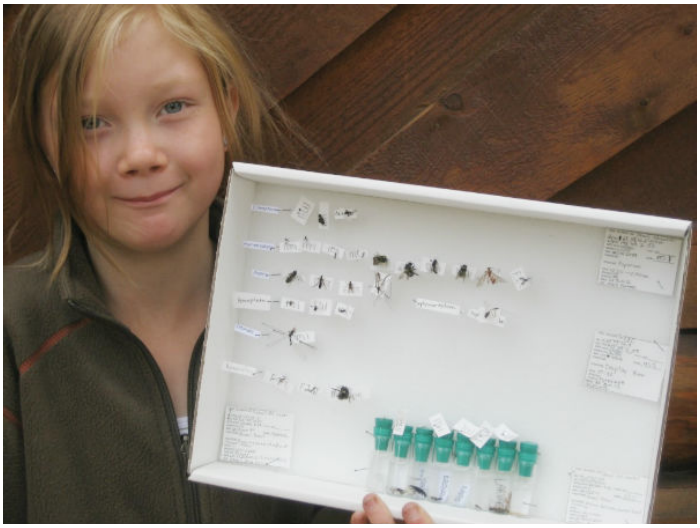

Figure 5: A finished collection ready to show off to parents.

Figure 6: Denali Bug Camp 2012 participant and instructor Julie Pearson working to identify freshly collected specimens.

Presentation to Road Scholars Participants used the knowledge and skills they learned to put together and present a 15 minute talk to participants of the Denali Education Center's Road Scholars program. Road Scholar participants were older individuals with an interest in science. This event has been most memorable to me because the Denali Bug Camp participants greatly impressed me with how clearly and confidently they discussed what they had learned so far.

Saturday (Day 4)

Finish collections Participants used our final day together to satisfactorily complete their collections and prepare them for the parent presentation. Before leaving, each participant received a certificate of completion and a home collection kit so that they could continue collecting insect specimens in a scientific manner.

Final Words

Prior to my role at Denali Bug Camp 2012, I had a variety of experiences doing youth outreach for entomology. Due to the brief nature of these experiences, I was concerned about my ability to remain patient and educational for the duration of the four day, three night camp. More important than any of my concerns was the outreach program itself and the chance to motivate and inspire young people.

When I first became interested in Alaskan entomology as a sixth grader, I experienced few opportunities to learn and participate in outdoor science, let alone with children my age. Fortunately, I met a number of individuals who had the patience and enthusiasm to teach and inspire me and continue to do so to this day. Now that I am older, I can appreciate how vital those individuals were in their willingness to share knowledge and experience with me. I hope that through outreach programs like Denali Bug camp, entomologists and other scientists can continue to inspire our youth, as they did me, and instill the enthusiasm and love they themselves have for the sciences.

For more on Denali Bug Camp, visit `http://www.denali.org/denali-bug-camp`.

I Just “Retired” From the Best Job I Ever Had

by Roger E. Burnside[4]

Figure 1: Aerial detection flight, 1991. Left to right: Robert Wolf, USFS/FHP biotech from Wasilla, now retired; Mike Bowers, our pilot, Ketchum Air Service, Anchorage (Ketchum Air Service has since gone out of business and Mike moved on to permanent work with a major airline); yours truly; and Malcolm Furniss, USFS (Moscow, ID), along on the flight to evaluate and work out the life history of the willow bark beetle.

My personal and work-related experiences in Alaska have certainly been numerous and varied, as well as exciting, breath-taking, scary, and challenging, but certainly never boring! When I first set foot here in May 1979, I was on a short visit from North Dakota as a lowly graduate student at NDSU in Fargo. I came for a 3-week vacation with my wife to visit her sister who then lived on the Kenai Peninsula (known as the land of monster Chinook salmon). The lure was that she would get me set up to catch a “King” and would then take us on a road trip in her Volkswagen camper bus for our entire stay, first to Denali National Park, then Fairbanks, Valdez, with a boat trip to see the glaciers and then more salmon fishing. Both her and my wife, being elementary teachers with the whole summer off, eventually wore me, the overworked and underpaid graduate student, down noting, “you just need a break from your leafhopper rearing or whatever it is that you do with those bugs.”

The path to my career as a forest entomologist seemed like a long and circuitous one once I finally got there (or here, should I say?). My original college work was in biology and chemistry, although I spent several summers during the undergrad years in Bemidji, MN honing my skills as a forester and entomologist, working seasonal jobs as a plant health specialist with MNDNR, then later, temp jobs for DNR in forest inventory and field forest cover type mapping in central and northern Minnesota until the “visit” to Alaska. They were all temporary jobs along the way, but I never lost sight of where I wanted to be or eventually what I really wanted to do and that was to work with insects in the northern forest environment.

Forestry jobs in the Midwest in the 1970s were few and far between, but the universities kept pumping out foresters, most of whom eventually couldn't find jobs. I found myself with the dilemma of having a variety of forestry experiences but not quite enough experience and education to qualify for career-level employment in my desired field of entomology, where an advanced degree wasn't absolutely required but "highly desirable" to have. So, in 1977, I decided that I loved the temp work in forestry, loved the outdoors, but did not even have a forestry degree and that I would never achieve what I really wanted unless I made an effort to persevere, get the advanced degree, and then see what would develop. Along the way, I got married, finished graduate school, moved to Alaska, started a family, worked for Alaska DNR for a decade and then landed my dream job as the State of Alaska's first forest entomologist.

Figure 2: Examining bark beetle damage.

That "once in a lifetime" vacation trip to Alaska in 1979 and my wife's degree in Elementary Education ended up being the ticket that landed us in Tyonek (50 air miles across Cook Inlet from Anchorage) at the Bob Bartlett School. My wife obtained her first regular teaching job and I was, it seemed, just along for the ride. After two years in Tyonek working as a reading and math tutor (they knew that I would be bored otherwise) and a number of light plane rides to Anchorage to interview with the Alaska Department of Natural Resources, I landed my first career-track position with the Division of Forest Land and Water Management in February 1981 as a Natural Resource Officer. I bided my time enjoying the good life for the first ten years with DNR in the land management area working land conveyances, contracts, leases, land exchanges and researching land title for the conveyances and various land rights transactions until in December of 1990. Due to a large spruce beetle epidemic that was building steam in south-central Alaska (and other areas including the Copper River region to the east and localized spots across the white spruce forests of Alaska), I literally walked across the hall to the Alaska Division of Forestry to become Alaska's first professionally trained entomologist. It seemed like a long way from graduating high school over 20 years prior but I knew that I had finally arrived.

I've had many rewarding experiences over the past 22 years with the Alaska Division of Forestry, working with my entomological colleagues across the country, and in Alaska with other forestry and natural resources professionals, private non-industrial forest landowners, Alaska Native corporations, elected representatives and the public to assist with forest pest management issues and control of injurious forest pests. Along the way there has been ample opportunity to conduct focused research and publish what we learned about the behavioral attractants of the northern spruce engraver (*Ips perturbatus*) and characterization of its colonization and attack dynamics in white spruce slash in Alaska's interior boreal forest.

I've had several opportunities to work and explore a number of the more remote areas of Alaska conducting biological field evaluations as well as conducting aerial forest damage (pest) surveys with Alaska's U.S. Forest Service Forest Health Protection staff. Highlights of that work, besides the obvious scientific ones, have been a few hair-raising experiences with unscheduled landings in light aircraft and being charged by at least two species of "charismatic megafauna" while on the job.

It seems ages ago now that we were dealing with a major spruce beetle (*Dendroctonus rufipennis*) epidemic which occupied much of our ground work and professional time during the 1990s evaluating, surveying and mapping the widespread damage caused by this ¼ in. long bark beetle. The spruce beetle is now a minor component in terms of the total acres of damage caused by forest insects in Alaska that is mapped by aerial surveys annually. Yet, the past decade's increases in mapped damage and localized outbreaks of both native forest defoliators (e.g., spruce budworm, aspen leaf miner, larch sawfly, Geometrid moths) and invasive non-native immigrant defoliators (e.g., amber-marked birch leaf miner, green alder sawfly, woolly alder sawfly, and related non-native leaf miners and sawflies) are evidence that disturbance from insects will continue to dominate the boreal forest landscape in the years to come.

Figure 3: *Ips* study, 2010.

In the late 1990s, I found that the experience gained from my early years with AKDNR researching title, land status plats, and the various mapping and conveyance actions across Alaska also helped us in the Forest Health Protection program at DOF as Geographic Information System mapping technology was developing to locate, describe and display various types of forest health data on the landscape more reliably and accurately. The development of the Internet, Geographic Positioning Systems and personal computer technology turned out to be a critical tool to display and describe data via GIS-generated maps from our pest damage survey work (including aerial survey mapping data), most notably over the past 15 years in Alaska. Professional web networks established with the U.S. Forest Service and entomology and forest health professional groups across North America, along with advances in Internet messaging and storage systems have made overall communication, database management and information gathering and reporting on project work much more effective and powerful. This has been good, especially for Alaska, which, as it's turned out, had been utilizing the technology well ahead of our counterparts in the lower 48 states.

An immensely rewarding experience for me was serving as Alaska's representative on the U.S. Forest Service Forest Health Monitoring Management Team in Washington, D.C. from 2006-2008. Connected to that responsibility, I was able to get involved with assisting with activities of the U.S. Forest Service Forest Health Monitoring Working Group in meeting planning and working collaboratively with several state and federal forest health professionals over a period of 10+ years to refine a risk-based probability model for estimating and projecting basal area loss from insects and diseases in the Nation's forests.

I'll have to admit that I had a very steep learning curve in the early years of my forest entomology career in Alaska. I relied heavily on my early work experiences before coming to Alaska to forge ahead with our fledgling forest health protection program in the Division of Forestry. I was very fortunate to receive a lot of help and sage advice from a number of forest health professionals over the years to develop the State of Alaska's forest health protection program to the level that it's attained thus far. Were it not for the early prodding, guidance and mentoring received from Ed Holsten, Richard "Skeeter" Werner, Ken Zogas, Malcolm Furniss and others, I might have floundered aimlessly for years.

I have always believed strongly in not attempting to reinvent the wheel for every new project or endeavor and have relied on cooperator networks established through professional meetings and gatherings outside Alaska, as well as expanding on past field and research projects with my colleagues in Alaska. I'm forever indebted to Ed Holsten, Mark Schultz, Ken Zogas, Jim Kruse, Chris Fettig, Malcolm Furniss, John Hard, Roy Mask, Steve Seybold, and other fellow entomologists too numerous to mention who helped me develop or work on various entomology field projects over the years, including presentations of important research results at scientific meetings and in peer-reviewed manuscripts published from the Alaska fieldwork.

Figure 4: My license plate.

Also, special thanks go to Doug Warner with the AKDNR Division of Agriculture, who assisted me with securing significant funding for our "Alaska Pinewood Nematode Survey" in 2003 and who has collaborated on several cooperative pest survey projects in Alaska with the Division of Forestry in recent years. The professional foresters from the Kenai Peninsula Borough and also the Tanana Chiefs Conference in Fairbanks as well as several professional foresters with the Alaska Division of Forestry from across Alaska were also instrumental in helping me complete key forest pest survey, pest monitoring and management projects over the years. Several of these individuals remain as key contacts for early detection rapid response (EDRR) monitoring for non-native bark beetles which is now an ongoing cooperative program between DOF and the U.S. Forest Service forest health protection staff in Alaska, and also Nationally.

After 32 years with the State of Alaska I decided to retire from the job in January and join my wife in the retirement lifestyle. My ultimate decision to "retire" felt exciting to me at the time, but also a bit discouraging in some ways since it seemed like I was just beginning to get on a roll with my projects and program. But don't worry. I won't be fading off into the sunset any time soon. I still have a few collaborative efforts in the works so please stay in touch (reburnsi@gci.net). As I begin the next phase of my life, I'll continue to reflect fondly on The Best Job I Ever Had!

A method of culturing *Badonnelia titei*

by Matthew L. Bowser[9]

Badonnelia titei Pearman, 1953 (Psocoptera: Sphaeropsocidae) is one of few arthropods known only from human habitations. It was first described from the Natural History Museum at Tring, England (Pearman, 1953, 1958) from specimens collected from the binding of an atlas, in cupboards, boxes, tables, and in a tub of dried leaves. Since then, this species has been reported from other parts of Europe (Mockford, 2006) and Iceland (Lienhard, 2011).

In the Western Hemisphere, *B. titei* had been found only on the Kenai Peninsula, Alaska (Mockford, 2006, 2009): in the headquarters building of the Kenai National Wildlife Refuge in Soldotna and among locally grown potatoes stored in the garage of a house in Kenai.

Specimens of what appears to be *B. titei* were found on a sticky card trap used for pest monitoring in the University of Alaska Museum in Fairbanks (UAM:Ento:13103) with data as follows: USA: ALASKA. Fairbanks, Univ. of AK Museum. 64.8585°N, 147.8427°W. In collection range. Sticky trap run from July 1, 2006 - March 6, 2007. K. C. May, D. S. Sikes. Label: UAM100001765.

Little is known of the biology or life history of this animal. Other species of *Badonnelia* live in soil in Chile (Badonnel, 1963).

Although Pearman (1958) reared *B. titei* from eggs to adulthood, he did not indicate what he had fed them. He did mention that fungal hyphae were included. Günther (1974), by examining gut contents, found that *B. titei* fed upon fungal spores and insects.

Pearman's *B. titei* females laid eggs, but these were often eaten by the adults and those that did hatch declined food and died (Pearman, 1958).

Live specimens of *B. titei* from the Kenai National Wildlife Refuge headquarters building readily consumed dead, dried insects, a type of food available where they have been collected in floor drains and dusty corners. However, they became noticeably dehydrated and lethargic after one day at the low relative humidity (about 20%) of the lab.

In May 2012, I collected a handful of *B. titei* specimens from the floor drain of the laboratory and placed these in a BD Falcon™15 cm diameter × 25 mm deep, polystyrene, lidded petri dish (Figure 1). The bottom of the dish had been lined with sand by first applying a coat of Elmer's® Glue-All™, then adding sand, then pouring off excess sand. Water was supplied by laying a 10 mm × 45 mm, polystyrene cuvette filled with water and stopped with cotton on its side. Lichens, mostly *Lobaria pulmonaria* (L.) Hoffm., were also added as cover. The temperature in the lab was nearly constant at 21°C.

Figure 1: *Badonnelia* lab culture in a petri dish.

It appears that *B. titei* can flourish solely on dried insect remains. I provided fresh-caught insects killed by placing them in a freezer. The psocids seemed to have no interest in fresh carcasses, ignoring them for a day or two until they had begun drying. In winter, when fresh insects became scarce, I supplemented the insect carcasses with crushed,

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dry dog food, which the psocids readily ate. I posted a brief video of a *Badonnelia* chewing on a dried maggot at `http://youtu.be/2Kt1tDFZmqc`.

The lichens were not eaten, but served as a substrate for oviposition.

I have not kept rigorous track of population growth, the number and duration of instars, etc. The population size of the culture has grown from less than ten individuals in May to probably 80-100 at present. As appears to be the case with the wild population in the building, there are overlapping generations, with all stages present at all times. This population may have a biased sex ratio because there are noticeably more adult females than adult males in the culture.

I think it is the requirement for access to moisture that prevents *B. titei* from becoming a pest in insect collections.

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St. Matthew Arthropods 2012: Preliminary Report

by Derek S. Sikes[10] and Casey Bickford[11]

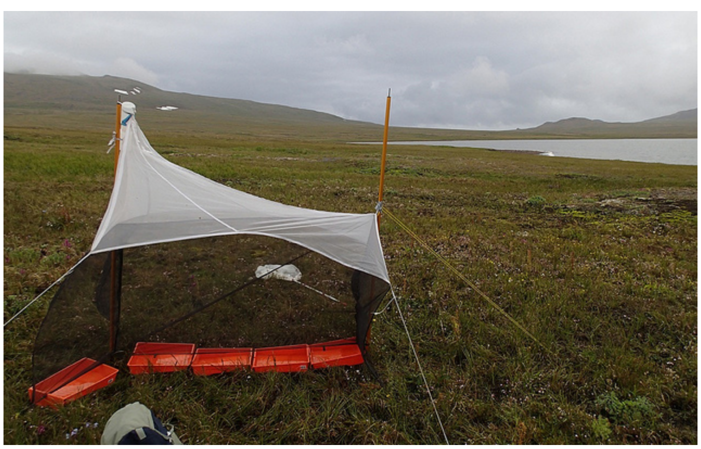

Figure 1: Malaise / FIT trap on St. Matthew Island.

[10]University of Alaska Museum, Fairbanks, Alaska

[11]University of Alaska Fairbanks, Fairbanks, Alaska

The following is an adaptation of a report to the Alaska Martime National Wildlife Refuge dated 29 November 2012.

Goal: to sample macroinvertebrates on St. Matthew and Hall Islands between 31 July – 6 Aug 2012. Freshwater aquatic invertebrate samples were taken by Anthony DeGange (USGS) and Steve Delehanty (USFWS) and will be processed by Dan Bogan at the University of Alaska Anchorage so are not included in this project. Although focused on non-marine arthropods, terrestrial mollusks and annelids were also targeted. Additionally, all known prior records based on publications or specimens will also be summarized.

Methods: sweep net, aspirator, forceps, pitfall traps, flight intercept trap (FIT) - Malaise trap hybrids, colored (pollinator) traps, and Winkler extractors were used. A transect of 33 pitfall traps with 2 pollinator traps at each was set, spacing traps 100m apart through the interior sedge-marsh lowland from the northest coast to the northwest coast. A Malaise / FIT trap was set at either end of the transect with a third Malaise / FIT trap set in the middle. A grid of 15 large yellow pollinator bowls was set around the northwest coast Malaise / FIT trap.

Figure 2: *Nebria nivalis*.

Figure 3: Female *Leptobunus borealis*.

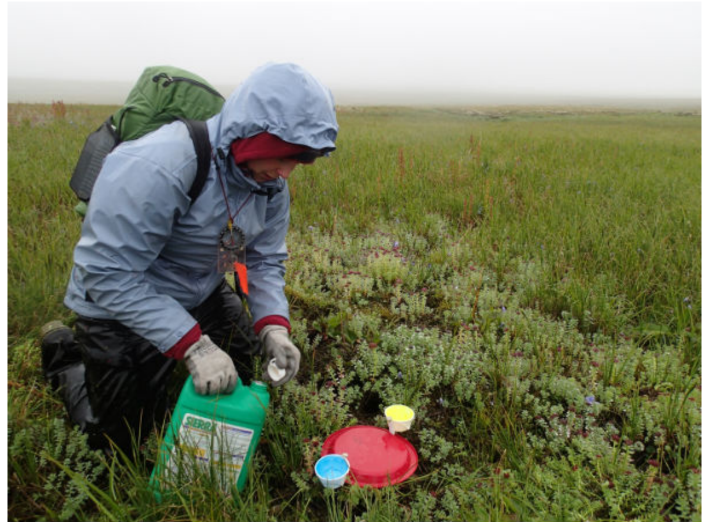

Figure 4: Casey Bickford preparing one of 33 pitfall traps with two pollinator cups attached.

Figure 5: The first author.

Habitats: (1) Littoral - beach drift and vegetation, rock outcrops (0-15 m elevation) (2) interior sedge-marsh lowland (10-60 m elevation) with willow hummocks, (3) interior upland (60-150 m elevation) meadows and streams.

Sites: Collection effort was concentrated on the north end of the island between Bull Seal Point on the northest coast and a small lake on the northwest coast. The island is approximately 3 miles wide between these sites (e.g. 60.56504°N, 172.95976°W ± 2 km). Additional collection areas included two on the S end of the island (60.38036°N, 172.50139°W; 60.37816°N, 172.38133°W) and one on Hall Island (60.67879°N, 173.06880°W).

Results – Field Work: 58 collection events were made (an 'event' being 1 collection method used at 1 place on

1 date or date range). The littoral habitats were the most thoroughly sampled, the interior lowlands were the second most thoroughly sampled, and the interior upland meadows were the least well sampled.

Figure 6: Female *Xestia alaskae* (Grote), determined by Clifford D. Ferris.

Figure 7: *Sthereus* sp., probably *S. ptinoides*.

Figure 8: *Bombus* sp., probably *B. balteatus*.

Results – Preliminary Faunal Assessment: Impressions of the fauna, based on experience with the Pribilofs and Aleutians, follow. A number of littoral, beach-drift taxa were not found on St. Matthew that are relatively common on the Pribilofs and the Aleutians. These include cybaeid spiders, bristletails, pseudoscorpions, *Nebria metallica*, *Aegialites*, *Hypolithus littoralis*, and centipedes. Strikingly absent from the island were pardosid (wolf) spiders, which are particularly common on both mainland Alaska from the Arctic to the southeast, and among the Aleutian archipelago. A large bumblebee, *Bombus balteatus*, was active on the warmest day. This species is known from mainland Alaska in alpine zones and the Arctic.

Higher Taxa: Arachnida: Acari, Araneae, Opiliones, Insecta: Collembola, Plecoptera, Hemiptera, Trichoptera, Coleoptera, Lepidoptera, Hymenoptera, Diptera, Annelida: Lumbricidae?, Enchytraeidae, Mollusca: Gastropoda.

Samples are being processed now in the Entomology Preparation Lab at the University of Alaska Museum. A detailed report will follow once they have all been processed.

Current data from prior samples and literature are available through the University of Alaska Museum online database, Arctos, at `http://arctos.database.museum/saved/St_Matthew_Island_Arthropods`. This URL will also find all databased samples from the 2012 project once they have been fully processed (June 2013).

More photos are available online at `http://www.flickr.com/photos/alaskaent/sets/72157631509207664/`.

Review of the sixth annual meeting

by Matthew L. Bowser[9]

Figure 1: Members present at the end of the meeting. Back row, from left: Roger Burnside, Dan Bogan, Matt Bowser, Elizabeth Graham, Ken Philip, Nick Lisuzzo, and Curtis Knight. Front row, from left: Casey Bickford, Steve Swenson, Sayde Ridling, Jim Kruse, and Derek Sikes.

The sixth annual meeting of the Alaska Entomological Society took place at the DNR office in Fairbanks on January 26, 2013. We are grateful to the Fairbanks Forest Service staff for making this space available.

Presentations

Derek Sikes reviewed his experience so far with moving data management of UAM's entomology collection onto Arctos. I shared some preliminary work attempting to examine defoliation events on the Kenai Peninsula using MODIS imagery.

Elizabeth Graham described her recent work on designing traps for Cerambycid beetles, which led to interesting findings on the varied aggregation behaviors of the targeted species. **Christa Mulder** gave a presentation on the Melibee Project, investigating how proximity of invasive white sweet clover affects pollination and fruit production of native berries.

Casey Bickford presented on her thesis work, a systematics conundrum in Alaskan *Aegialites* beetles. **Sayde Ridling** gave a slideshow on her work in entomology education at Denali Bug Camp.

Ken Philip shared noteworthy happenings among Alaskan Lepidoptera this year. In particular, the Red Admiral may be establishing in Southeast Alaska. **Jim Kruse** gave us his annual highlights of forest entomology in Alaska: Geometrids have continued to cause extensive defoliation in Southcentral Alaska, aspen leaf miner damage in the Interior has declined, spruce beetles were at a 30 year minimum in 2012, and a wind storm in the upper Tanana drainage may lead to high numbers of bark beetles there. Newsworthy exotics were an interception of the Asian Gypsy Moth on a ship at Ketchikan and two Brown Marmorated Stink Bugs found in Southcentral (Anchorage and Kasilof).

The student award committee gave the **Student Presentation Award** to **Casey Bickford** for her presentation, "Systematics of Alaskan *Aegialites* beetles: extremely endemic or oversplit?".

Business Items

- We will be offering awards for entomology-related projects at the three regional science fairs (Anchorage, Fairbanks, and Juneau). Last year we had decided to do so, but we only presented an award at the Fairbanks science fair.
- We again resolved to start offering AKES T-shirts. These are now available from cafe press at `http://www.cafepress.com/akes`. The reviews so far are that the T-shirt and cap have been of good quality, but the logo on the cap was not very legible. We will improve on this.
- The previous slate of officers was re-elected except that **Elizabeth Graham** replaced **Casey Bickford** as vice president.

The minutes from the business meeting are available on our website.

Upcoming Events

Denali Bug Camp, July 9-12

Denali Education Center will again be offering Denali Bug Camp, a 4 day program for students ages 11 and 12. Details are posted at http://www.denali.org/denali-bug-camp.

National Moth Week, July 20-28

Registration is open for the 2013 National Moth Week. During Moth Week people are encouraged to promote education, interest and awareness about moths by organizing events.

Last year there were two registered events in Alaska—one of which was well chronicled in several postings on the National Moth Week blog (http://nationalmothweek.org/2012/10/14/data-from-nmw-event-in-alaska/)

It's not too early to sign up and to start planning and event! For more information or to register, visit http://nationalmothweek.org/2013-registration/.

Seventh Annual Meeting, January 24-25, 2014

The seventh annual meeting of the Alaska Entomological Society will take place in Anchorage on January 24-25, 2014. Check for updates on our website as the meeting date approaches.

Hall Island, 6 August 2012. Photo by Derek Sikes.