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Figure 1: A mosquito with pollinia from a blunt-leafed rein orchid attached to its eyes (credit: Bob Armstrong).

Notes on the chokecherry midge: A new insect species record for Alaska and natural enemy of invasive chokecherry

by Alexandria Wenninger[1]

Introduction

Figure 1: Chokecherry midge larva inside of a gall that has been opened. Note the shriveled seed within the center of the gall.

The chokecherry midge *Contarinia virginianiae* (Diptera: Cecidomyiidae) was first recorded in Alaska in 2021. This insect was described by Felt (1906) under the name *Cecidomyia virginianiae* from larvae in fruit galls of the host *Prunus virginiana*. This species is also referred to as the "chokecherry gall midge" or "chokecherry gall fly". I present a summary of this insect's known life history as well as some of my observational notes of this insect in an effort to facilitate recognition and reporting of this insect. I am interested in mapping the chokecherry midge's distribution in Alaska as this insect disrupts normal seed production of *P. virginiana*, an invasive species in Southcentral and Interior Alaska, which may slow the spread of this invasive species into our forests.

Insect life history

The chokecherry midge larva is bright orange in color and ranges from about two to three millimeters in length (Figure 1). It induces fleshy, hollow galls within the fruits of host *Prunus virginiana* (Figure 2).

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Occupied galls contained anywhere from one to upwards of thirty larvae within a single gall. The galls grow up to two centimeters in length and turn from green to red as they mature. A small hole eventually forms near the petiole of the galled fruit through which the larvae can escape the gall. The larvae drop to the soil to pupate and spend the winter in this form. The adults emerge in spring and are thought to lay their eggs on the blossoms of the host plant; there is one generation per year (Cranshaw 2004).

Figure 2: An ornamental *Prunus virginiana* with a substantial amount of galled fruit caused by the chokecherry midge.

From my observations in 2021, these galled fruits began dropping from the tree around early August and had largely all fallen off the trees by September, before the time when the non-galled fruits on these trees had fully ripened. In one case, a homeowner discovered a large mass of larvae and empty galls piled on the pavement beneath their chokecherry tree in mid-August. Presumably the larvae had dropped off the tree to pupate but were caught on the impervious surface. (A similar phenomenon has been observed in Anchorage in prior years, where masses of bright orange larvae have been found on impervious surfaces including pavement, gutters, and decks after rainfall events. This phenomenon is most often associated with birch trees around mid-late July and when found in association with birch is suspected to be a different species of fly larva from the same family, Cecidomyiidae.)

Host

The initial description of the chokecherry midge was from chokecherry host species *Prunus virginiana* (Felt 1906). Known hosts of this species in North America are listed as "*Prunus* sp." by Gagné and Jaschhof (2021), however, I have only been able to find literature reports of this insect on *P. virginiana* specifically. In my limited survey, galls were only found on the 'Canada Red' variety of *P. virginiana*, despite close ornamental plantings of both *P. virginiana* and *P. padus* throughout Anchorage. *P. virginiana* is native throughout much of Canada and the United States but is not native to Interior or Southcentral Alaska. *P. virginiana*, particularly the 'Canada Red' variety, has been planted as a landscape ornamental throughout the state and is naturalized in Anchorage forests, although possibly in fewer numbers than *P. padus*. The habit of the chokecherry midge larvae to fall to the soil to overwinter facilitates the spread of this species in potted nursery plants (Ray Gagné, pers. comm. 2021). This insect is of particular interest for invasive species management as the gall formation results in seed inviability which could potentially reduce the spread of invasive chokecherry via seed (see Figure 1).

Records & Distribution

The galls were first noted on July 29, 2021 in Anchorage, Alaska. Upon subsequent investigation, trees containing the galled fruit with larvae were found at several locations in Northern and Midtown Anchorage (Figure 3). Gagné and Jaschhof (2021) list its distribution as "widespread Nearctic". Given how widespread *P. virginiana* has been planted ornamentally in the state I am interested to monitor for this species in areas outside of Anchorage.

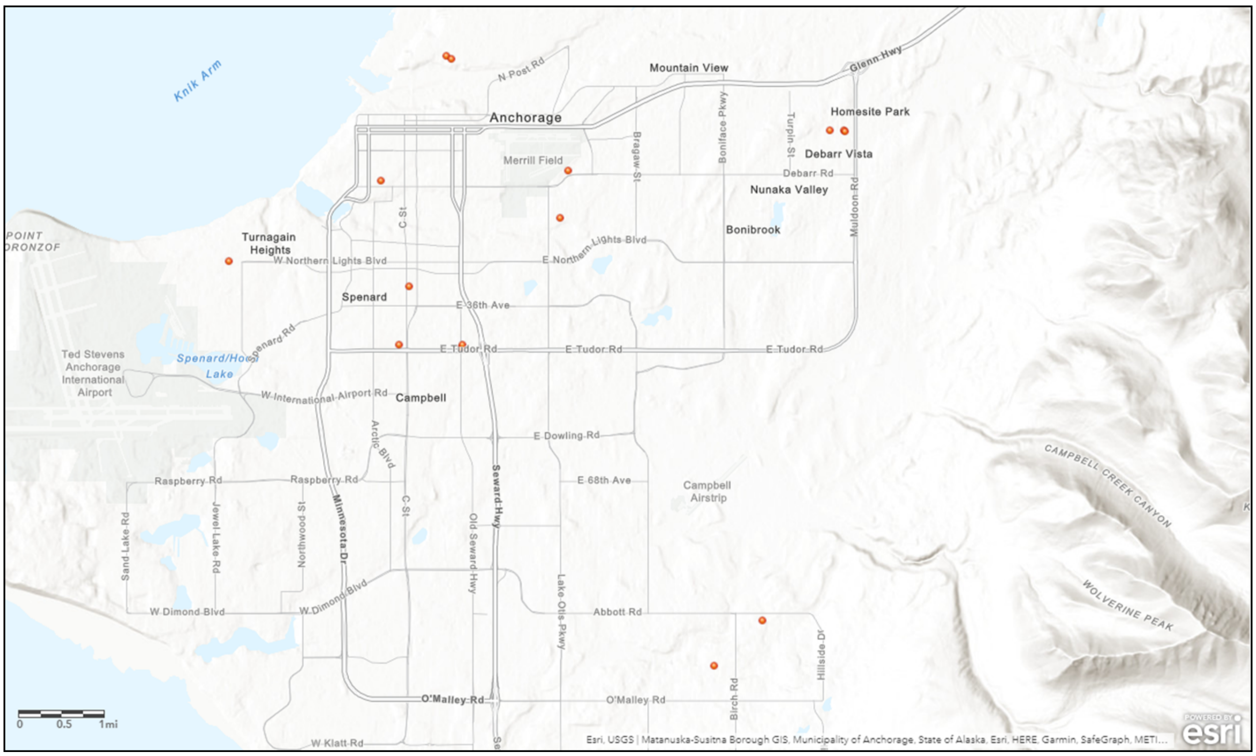

Figure 3: Map of locations where the chokecherry midge was recorded in Anchorage in 2021. Observed locations are indicated by red circles.

Reporting

The University of Alaska Fairbanks Cooperative Extension Service Integrated Pest Management (IPM) program is interested in identifying and monitoring insects and diseases of invasive chokecherries in Alaska, in hopes that these insects may serve as natural biocontrol agents in slowing the spread of invasive chokecherry. If you see this insect, or any other insect or disease of chokecherry fruits and/or seeds, we would love to hear about it. Please send photos of both the host plant and the insect when submitting observations. You can submit your observations to Statewide IPM Technician Alex Wenninger directly via email at akwenninger@alaska.edu or via our monitoring portal at http://alaskapestreporter.org.

Acknowledgements

I am grateful to Dr. Raymond J. Gagné (Smithsonian Museum of Natural History) for confirming the identity of the chokecherry midge larvae. Thank you to Josh Hightower (Alaska DNR Division of Forestry, Community Forestry Program) for keeping an eye out for this species while doing site visits for the *Prunus* 'Remove and Replace' program and for sharing his observations with me. I also thank the citizen scientists that reached out to report their observations.

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Corrections to the literature: Three recently published records for *Nicrophorus* (Coleoptera: Staphylinidae: Silphinae) deemed erroneous

by Derek S. Sikes[2]

Abstract

During the last decade three occurrence records for three species of *Nicrophorus*—*N. guttula*, from Sitka Alaska, USA, *N. hebes* from Alaska, and *N. hybridus* from Whitehorse, Yukon, Canada—were published, which are likely erroneous because no reliable evidence suggests these species occur or occurred in these regions. This short note provides details, comments, and species distribution modeling analyses on these records and concludes all three are erroneous.

Introduction

Species of the genus *Nicrophorus*, commonly called burying beetles in North America, are relatively well known, large-bodied beetles (Anderson and Peck 1985) now in the family Staphylinidae (Cai et al. 2022). Despite peer-reviewed publications being the gold standard for reliable scientific information, errors do make it into print and, when found, are best corrected. Herein, three such records are addressed—while admitting the much greater difficulty of demonstrating the absence, relative to the presence, of a species from a region. One approach to this problem is to attempt to answer the question of whether the climate of a region is suitable for a species based on an understanding of the climate from where it is known to occur. Thus, a niche modeling, aka species distribution modeling, analysis was undertaken to help quantify the likelihood of two of these questionable records.

Methods

Species Distribution Modeling

The basics of the protocols in Oliver (2021) and Waraniak (2018) were followed using the 19 bioclimatic variables available from the WorldClim 2.0 database which contain the averages for the years 1970–2000 at 2.5 minutes resolution (~5 km) (Fick and Hijmans 2017). The bioclim (Nix 1986, Booth et al. 2014) model in the dismo 1.3-5 package (Hijmans et al. 2021) for R v.4.0.2 (R Core Team 2020) was used with the presence-only occurrence data for *N. hybridus* and *N. guttula*. The R script for the *N. guttula* analysis is provided as an appendix. The occurrence data files for the R analyses presented herein are available at https://doi.org/10.6084/m9.figshare.19401131. These data came from the collections and literature sources listed in Table 1. Those with DSS as the source are available in more complete form at http://dx.doi.org/10.5061/dryad.mr221 from Sikes and Venables (2013). Those with GBIF as the source are listed below in the literature cited as GBIF.org (2022c) and GBIF.org (2022a).

Table 1: Collections and literature from which data used herein were derived.

Collection or Publication	Source
Albuquerque [MSBA]	GBIF
Anderson & Peck (1985)	literature
Backlund & Marrone (1997)	literature
Berkeley [EMEC]	DSS, GBIF
Boulder [UCM, UCMC]	GBIF

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Collection or Publication	Source
Budapest [HNHM]	DSS
Cambridge [MCZC]	DSS
Chicago [CHAS]	GBIF
Chicago [FMNH]	DSS, GBIF
Cincinnati [CMC]	GBIF
Cochrane [CEIC]	DSS
College Station [TAMU]	DSS, GBIF
Columbus [OSUC]	DSS
Denver [DMNS]	GBIF
Ebina -Nishikawa private coll [MNC]	DSS
Edinburgh [RSME]	DSS
Fairbanks [DSSC]	DSS
Fairbanks [UAM]	GBIF
Flagstaff [NAUF, CPMAB]	GBIF
Fort Collins [CSUC]	GBIF
Frankfurt [SMFD]	DSS
Hatch (1945)	Literature
iNaturalist	GBIF
Jalisco [CZUG]	GBIF
Las Cruces [NMSU]	GBIF
Los Angeles [LACM, IP]	GBIF
Los Angeles [LACM, RLB]	GBIF
Los Angeles [LACM]	DSS
Logan [EMUS]	DSS
New Haven [PMNH]	DSS
New York [AMNH]	DSS
Norman [OMNH, RINVRT]	GBIF
Ohio [OSUC]	GBIF
Peck & Anderson (1985)	Literature
Peck & Kaulbars (1987)	Literature
Philadelphia [ANSP]	DSS
Provo (BYUC)	DSS
San Diego [SDNHM]	GBIF
Santa Barbara [SBMNH]	GBIF
Santa Barbara [UCSB, IZC]	GBIF
St. Paul [UMSP]	DSS
Tempe [ASU, ASUHIC]	GBIF
Tempe [ASU, NEON-IV]	GBIF
University Park [PSUC]	GBIF
Vancouver [UBCZ]	GBIF
Washington D.C. [USNM]	DSS, GBIF
Wien [Wolfgang Barries Private Coll.]	DSS

Results

Nicrophorus hebes Kirby

Based on molecular, ecological, breeding trial, and morphological data, Sikes et al. (2016) recognized this species as valid and elevated it to species status from a junior synonym under *Nicrophorus vespilloides* Herbst. *Nicrophorus hebes* is distritibuted widely within eastern and central Canada and, to date, there is no evidence that *Nicrophorus hebes* occurs west of about 120° longitude or north of about 61° latitude in the Nearctic. It is thus absent from northwestern Canada and Alaska. Nevertheless, this species was accidentally reported from Alaska by Meeds (2021) who, while reviewing literature relevant to forensic entomology for Alaska, misunderstood the information presented in Sikes et al. (2016).

Nicrophorus hybridus Hatch & Angell

Bygarski and LeBlanc (2013), presenting on forensic entomological research conducted in Whitehorse, Yukon Territory (60° 43′ N, 135° 03′ W) reported the species *N. hybridus* from their samples. This species has never been confirmed north of 53° latitude and is relatively difficult to distinguish from *Nicrophorus investigator* (magnified lateral and ventral views are needed). *Nicrophorus investigator* is a widespread and common species in northern regions of the Nearctic and Palearctic so any records of *N. hyrbidus* north of 53° latitude are likely misidentifications of *N. investigator,* as suggested for this case by Sampson and Sikes (2020). There are numerous records of *N. investigator* north of 60° latitude in both the Nearctic and Palearctic, with maximum latitude records at 69°N in Norway and 67°N in Yukon Territory (Anderson and Peck 1985, Sikes and Venables 2013).

Climate change is expected to expand many species' ranges polewards (Stafford et al. 2013) so *N. hybridus* records north of 53° latitude may increase in likelihood as the planet warms. Any such records would need confirmation by careful study of voucher specimens and use of appropriate keys (e.g., Anderson and Peck 1985) by someone experienced with identification of *Nicrophorus*.

Backlund and Marrone (1997) reported *N. hybridus* from sandy grasslands and scattered cottonwood stands in South Dakota. Peck and Kaulbars (1987) reported this species from prairie, sage steppe, and montane meadow. Anderson and Peck (1985) indicated it occurs in prairies and dry inland valleys. The ecoregion data of Olson et al. (2001), as mapped in SimpleMappr (Shorthouse 2010) (data not shown), indicate it occurs primarily in grasslands, shrub steppe, montane and foothills forests and parklands east of the Rocky Mountains but some records are known from west of these mountains in coastal forest ecoregions—presumably in drier inland grassland and shrub valleys. All these habitats and climates are quite different from the subarctic boreal habitats of the Whitehorse region.

Using presence-only data for *N. hybridus* a niche model for this species was estimated which shows Whitehorse to have habitat unsuitable for this species (Figure 1), thus making it far more likely that the specimens in question were actually *N. investigator.*

Nicrophorus guttula Motschulsky

Bousquet et al. (2013) in their checklist of the beetles of Canada and Alaska, reported *N. guttula* from Alaska because the type locality of this species is Sitka, Alaska (57° N). Sikes et al. (2002) had addressed this issue and concluded the type locality was likely based on an error. Aside from the type locality description there have been no other records of this species reported from Sitka or anywhere in southeast Alaska, despite relatively extensive beetle collections having been made there, including 408 records of *Nicrophorus* from southeast Alaska—with the only *Nicrophorus* species being *N. investigator* and *N. defodiens* (GBIF.org 2022c). The northernmost, verified record (specimen identified by S. Peck) for *N. guttula* is from Riske Creek in southern British Columbia at 51.9° (GBIF.org 2022b). However, this northernmost record appears to be an outlier, because 97% of records are south of 50°N (Sikes and Venables 2013 (total n = 294), GBIF.org 2022a (total n = 1328)). Note that in Sikes and Venables (2013) there is a record from 55°N that, upon inspection, was revealed to be incorrectly georeferenced—its locality data said only "British Columbia" with no further geoprecision and it had thus been georeferenced to the approximate center of the province. I therefore deleted that record's geocoordinates.

Using presence-only data for *N. guttula* a niche model for this species was estimated which shows southeast Alaska to have unsuitable habitat for this species (Figure 2), making the likelihood very low that the type locality of Sitka is correct. The correct type locality is presumably somewhere along the northwestern coast of California, Oregon, or Washington. Many beetle specimens from this coastline, and Alaska, made their way to Europe via Russian naturalists in the mid 1800s and confusion over collection data is quite plausible.

Finally, how is it that this error was published in a work (Bousquet et al. 2013) on which I, a specialist on both the beetles of Alaska and the genus *Nicrophorus*, was a co-author? The answer is that the Alaskan

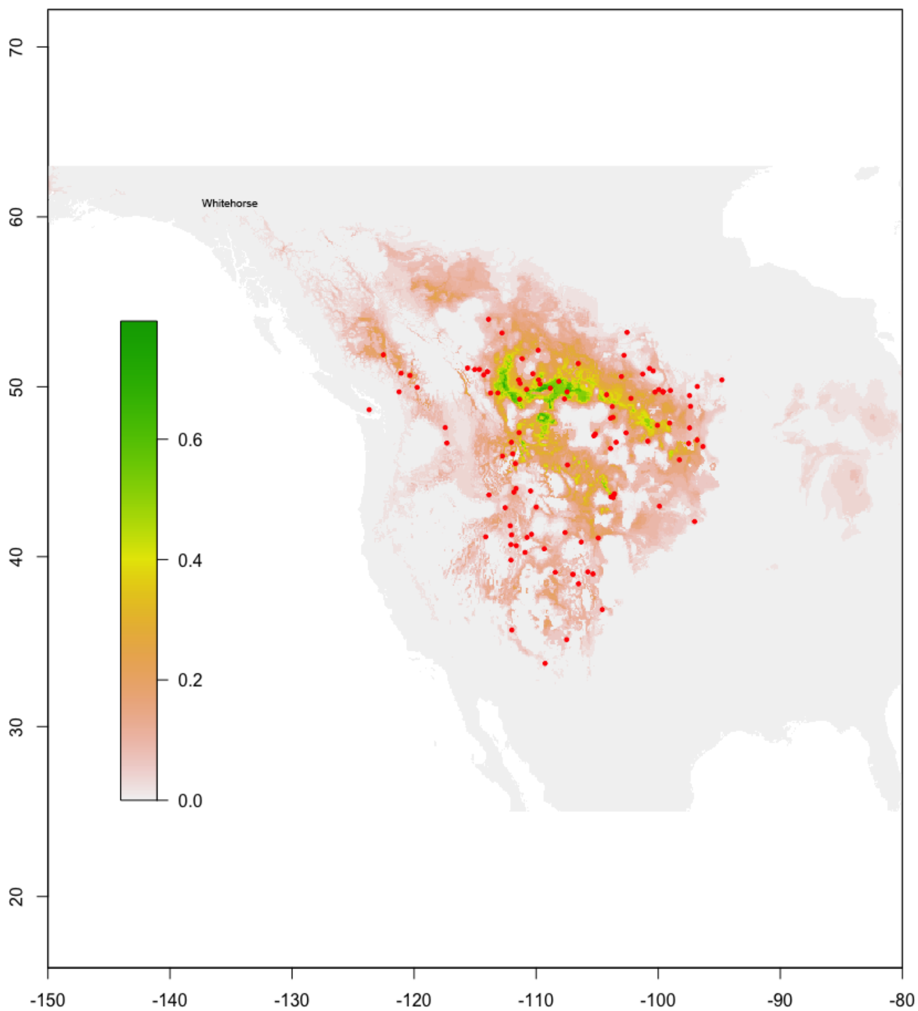

Figure 1: Map of records for *Nicrophorus hybridus* Hatch & Angell showing observations (red dots) and habitat suitability probability (colors, see key) based on presence-only niche modeling using the bioclim algorithm in the dismo package in R.

record for this species was added to the draft, without consulting me, after I had finished and submitted my edits. Nevertheless, I was curious how likely such a record was and these analyses helped lay this question to rest.

Acknowledgments

I thank the curators and collections staff who helped arrange loans of specimens for study from the collections listed in Table 1 and those who helped digitize data shared with GBIF.org, including those who submitted relevant iNaturalist observations.

Appendix: R script for Niche Modeling

```
# Species distribution modeling for Nicrophorus guttula
# Derek Sikes, dssikes@alaska.edu
# 2022-01-17
```

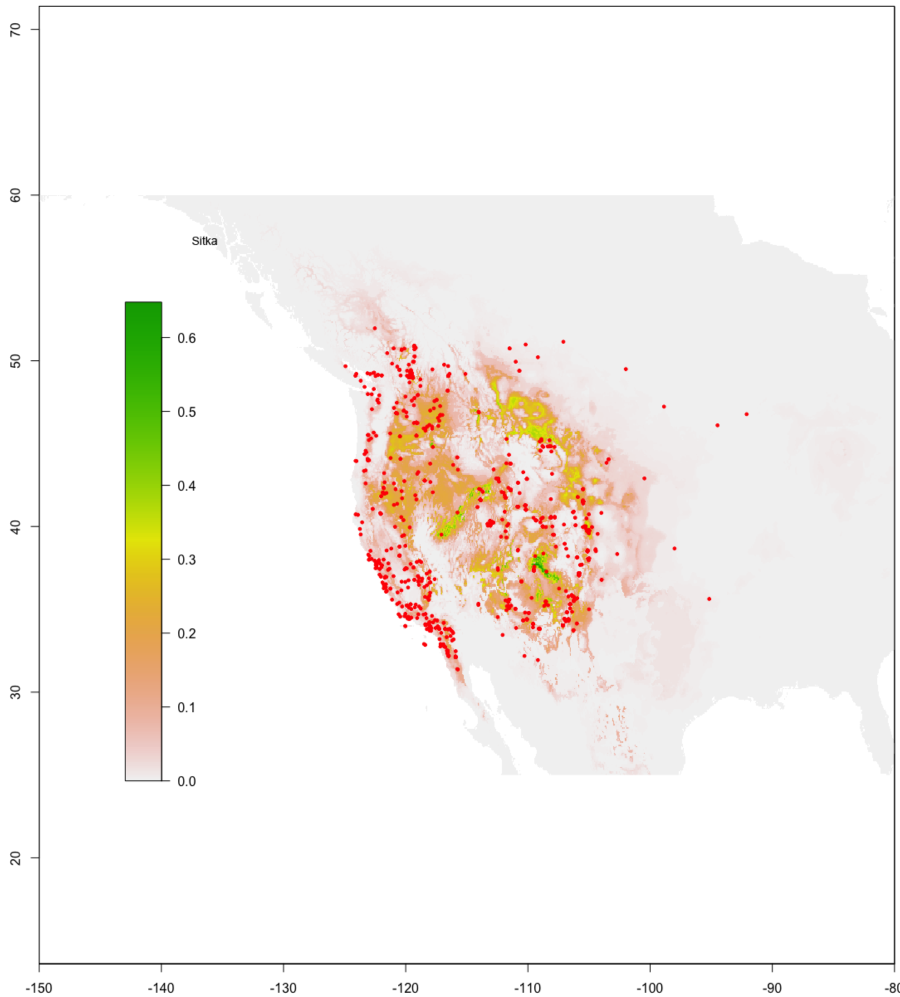

Figure 2: Map of records for *Nicrophorus guttula* Motschulsky showing observations (red dots) and habitat suitability probability (colors, see key) based on presence-only niche modeling using the bioclim algorithm in the dismo package in R.

```
install.packages("dismo")
install.packages("maptools")
install.packages("rgdal")
install.packages("raster")
install.packages("sp")

library("sp")
library("raster")
library("maptools")
library("rgdal")
library("dismo")

# getData did not work to download the bioclimatic data from Worldclim so
   these were downloaded manually from https://www.worldclim.org/data/
   worldclim21.html they appeared in the following directory Users/dssikes
   /Downloads/wc2.1_2.5m_bio
```

```
> path <- file.path("/Users/dssikes/Downloads/wc2.1_2.5m_bio")
> files <- list.files(path, pattern='tif$', full.names=TRUE )
> files
 [1] "/Users/dssikes/Downloads/wc2.1_2.5m_bio/wc2.1_2.5m_bio_1.tif"
 [2] "/Users/dssikes/Downloads/wc2.1_2.5m_bio/wc2.1_2.5m_bio_10.tif"
 [3] "/Users/dssikes/Downloads/wc2.1_2.5m_bio/wc2.1_2.5m_bio_11.tif"
 [4] "/Users/dssikes/Downloads/wc2.1_2.5m_bio/wc2.1_2.5m_bio_12.tif"
 [5] "/Users/dssikes/Downloads/wc2.1_2.5m_bio/wc2.1_2.5m_bio_13.tif"
 [6] "/Users/dssikes/Downloads/wc2.1_2.5m_bio/wc2.1_2.5m_bio_14.tif"
 [7] "/Users/dssikes/Downloads/wc2.1_2.5m_bio/wc2.1_2.5m_bio_15.tif"
 [8] "/Users/dssikes/Downloads/wc2.1_2.5m_bio/wc2.1_2.5m_bio_16.tif"
 [9] "/Users/dssikes/Downloads/wc2.1_2.5m_bio/wc2.1_2.5m_bio_17.tif"
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[11] "/Users/dssikes/Downloads/wc2.1_2.5m_bio/wc2.1_2.5m_bio_19.tif"
[12] "/Users/dssikes/Downloads/wc2.1_2.5m_bio/wc2.1_2.5m_bio_2.tif"
[13] "/Users/dssikes/Downloads/wc2.1_2.5m_bio/wc2.1_2.5m_bio_3.tif"
[14] "/Users/dssikes/Downloads/wc2.1_2.5m_bio/wc2.1_2.5m_bio_4.tif"
[15] "/Users/dssikes/Downloads/wc2.1_2.5m_bio/wc2.1_2.5m_bio_5.tif"
[16] "/Users/dssikes/Downloads/wc2.1_2.5m_bio/wc2.1_2.5m_bio_6.tif"
[17] "/Users/dssikes/Downloads/wc2.1_2.5m_bio/wc2.1_2.5m_bio_7.tif"
[18] "/Users/dssikes/Downloads/wc2.1_2.5m_bio/wc2.1_2.5m_bio_8.tif"
[19] "/Users/dssikes/Downloads/wc2.1_2.5m_bio/wc2.1_2.5m_bio_9.tif"

> predictors <- stack(files)
> predictors
class      : RasterStack
dimensions : 4320, 8640, 37324800, 19  (nrow, ncol, ncell, nlayers)
resolution : 0.04166667, 0.04166667  (x, y)
extent     : -180, 180, -90, 90  (xmin, xmax, ymin, ymax)
crs        : +proj=longlat +datum=WGS84 +no_defs
names      : wc2.1_2.5m_bio_1, wc2.1_2.5m_bio_10, wc2.1_2.5m_bio_11, wc2.1
   _2.5m_bio_12, wc2.1_2.5m_bio_13, wc2.1_2.5m_bio_14, wc2.1_2.5m_bio_15,
   wc2.1_2.5m_bio_16, wc2.1_2.5m_bio_17, wc2.1_2.5m_bio_18, wc2.1_2.5m_bio
   _19, wc2.1_2.5m_bio_2, wc2.1_2.5m_bio_3, wc2.1_2.5m_bio_4, wc2.1_2.5m_
   bio_5, ...
min values :       -54.759167,        -38.162666,        -66.380669,
            0.000000,          0.000000,          0.000000,
   0.000000,          0.000000,          0.000000,          0.000000,
            0.000000,          1.000000,          9.063088,
   0.000000,       -30.760000, ...
max values :         31.16667,          38.50467,          29.29167,
         11246.00000,        2768.00000,         507.00000,
   230.69151,        6174.00000,        1560.00000,        5608.00000,
          5230.00000,          21.97300,         100.00000,
   2377.62402,          48.46000, ...

# the Nicrophorus guttula data were taken from the data prepared for Sikes
    and Venables (2013) and GBIF.org (2022c). These were prepared as a .
   csv file with two columns of data separated by a comma (
   decimalLongitude, decimalLatitude). Note that R will throw an error if
   the first column is latitude and the second is longitude - these must
   be reversed. The following loads the observed data.
```

```
> guttula <- read.csv("~/Documents/␣ALASKA/␣PROJECTS/2022-AKES-Nicro␣
    corrections/niche␣modeling␣attempts/GBIFandDSS␣guttula␣data/guttula.csv
    ")
>   View(guttula)

# the following builds the model by using climate data from the observed
    records

> obspred <- extract(predictors, guttula)  # extracts bioclim data for
    each of our data points
> bioclim.model <- bioclim(obspred)
> predictions <- predict(predictors, bioclim.model)

# the following makes the map of the modeled expected distribution

> plot(predictions, xlim=c(-150, -80), ylim=c(25, 60))

# the following adds the observed data to the expected on the map
> points(guttula, col = "red", pch = 20, cex = 0.75)
```

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Willow weevils in Juneau, Alaska

by Bob Armstrong and John Hudson

What we have seen and learned about willow weevils in Juneau

Figure 1: A willow weevil on snow.

Figure 2: A willow area at the end of Industrial Boulevard in Juneau.

We often see adult willow weevils crawling on the snow in March and early April (Figure 1). Derek Sikes of the University of Alaska Museum of the North identified photographs of specimens as *Dorytomus*. Of the 252 records of Dorytomus in Alaska, *D. leucophyllus* is the only species that has been found in Juneau.

On April 11, 2021 we visited a willow area at the end of Industrial Boulevard in Juneau (Figure 2). We shook one of the trees and several adult weevils fell on the snow beneath the tree. A few of these adults were placed in a terrarium and kept indoors. Within a few hours we observed four couples mating (3). It appeared that the weevils were on the tree for the purpose of mating.

Figure 3: Willow weevils mating in a terrarium.

Figure 4: A female willow weevil on a willow catkin.

Figure 5: A weevil larva inside a dissected catkin.

After mating the female lays an egg on the catkin (Figure 4). We never found more than one larva inside the catkins that were examined (Figure 5). This indicates the weevil may only lay one egg per catkin.

Catkins containing willow larvae are usually bent (Figure 6). A cavity with brown edges inside the catkin indicates where the larva has been feeding.

Figure 6: A willow catkin dissected to show the cavity in which a weevil has been feeding.

Figure 7: Front view of the weevil larva showing the head.

With the amount of frass produced as the larvae eat the catkins we wondered if it is beneficial to the willows (Figures 8–9).

Of the catkins that we monitored, the larvae pupated within the catkin and adults emerged in early June (Figure 10). To understand if the weevils are overwintering as larvae or adults, we examined the fallen catkins, leaf litter and soil below willows that were used by weevils. So far we have not found any weevils.

After captive adults emerged we examined several catkins on trees in mid-June and found no evidence of the adult weevils mating, laying eggs, or producing any more larvae.

Figure 8: The rear end of the larva and clumps of fecal pellets called frass.

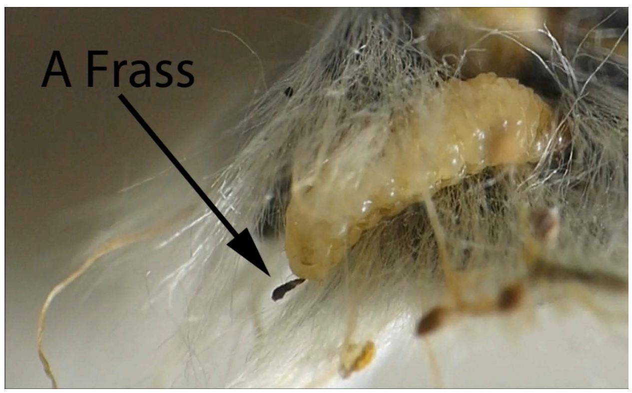

Figure 9: Willow weevil frass on a willow catkin.

On March 14 and 15, 2022 we found weevils on top of the snow near to where we had observed them on willow trees last summer (Figure 11) and we found one adult on a newly emerged catkin on this willow tree (Figures 12–13).

On April 27, 2022 we saw some willow catkins with the willow weevil larva in them (Figure 14). Our conclusion, so far, is that the larva pupate within the catkins and the adults emerge in the summer. They overwinter as adults and mate and lay their eggs on the catkins in spring.

According to the literature some birds have learned to target catkins with weevil larva in them (Figures 15–16).

A couple of useful reports about willow weevils

Fjellberg and Bøcher (2006) worked on *Dorytomus imbecillus* whereas the species we observed was probably *D. leucophyllus*. However there appeared to be significant differences that could alter our conclusions:

1. They found more than one larvae inside individual catkins whereas we only observed one per catkin.
2. They observed pupation taking place in the soil and litter underneath the low bushes. Despite several days of scraping the soil and looking for pupae we never found any. We also observed the weevils pupating inside the catkins and emerging as adults before the catkins fell to the ground. Also we never saw any indication of the adults mating or laying eggs on any catkins after the early June emergence of the adults. This indicated they overwintered as adults rather than pupae.

Figure 10: An adult weevil after emergence from a catkin.

Figure 11: A weevil on the snow.

Leatherman (2011) observed warblers, vireos, kinglets, orioles, Red-winged Blackbirds, House Finches, grosbeaks, and tanagers all vigorously seeking the catkins with weevil larvae in them. And he thought the complete list of weevil seekers is probably much longer. In east-central England, Morris (1998) strongly suspected several bird species (Blue, Marsh, Willow, Long-tailed, and Coal Tits) of preying on *Dorytomus* larvae in aspen catkins. So far we have observed Bohemian Waxwings and Song Sparrows eating the willow catkins. We suspect they may be targeting the ones with weevil larvae in them. To our knowledge there has been very little work or information about the birds in Alaska eating willow catkins.

We have observed several insects feeding on the willow catkins when they emerge in the spring. We have also observed several birds feeding on these insects. We conclude that the catkins are extremely important food for early emerging insects, especially queen bumblebees, at a time when other flowers have not bloomed. The insects are probably an important food for several species of birds. To see what we have observed feeding on willows look at https://www.naturebob.com/sites/default/files/Willows.pdf.

See also

- https://www.naturebob.com/sites/default/files/Su2011_Article_DeclineInTheDiversityOfWillowT.pdf
- https://doi.org/10.1016/j.landurbplan.2010.03.004
- Morris (1969)
- O'Brien (1970)
- Robbins (1997)

Figure 12: A willow tree on which we found an adult weevil.

Figure 13: An adult on a willow catkin.

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Figure 14: A willow weevil larva in a willow catkin.

Figure 15: This Bohemian Waxwing is eating a willow catkin in Juneau.

Figure 16: A Song Sparrow eats a willow catkin in Juneau (Photo by Doug Jones).

Using the Sony RX10 iv for photographing insects

by Bob Armstrong

Figure 1: Sony RX10 iv, front view.

Figure 2: Sony RX10 iv, back view.

I have been testing a Sony RX10 iv (Figures 1–2) for insect photography and so far:

1. This may be the best camera for photographing insects both in the wild and in the lab.
2. It focuses very quickly on insects in nature from a few feet away. This allows you to photograph them without any disturbance.
3. With the addition of a Raynox Super Macro snap on lens you can photograph very tiny insects.
4. The built in flash works very well. This allows you to use a high f-stop, up to f/16, and a high shutter speed (1/1,000 of a second). This gives you a high depth of field and best of all you can hand hold the camera and not have to use a tripod or external flash.
5. In the lab the viewing screen moves for perfect viewing. The camera has a high depth of field, the built in flash works well, and there is no need to use a camera attached to a microscope.

These long-legged flies (Figures 3–4) dart about on the water surface. The camera focused on them very quickly. The camera was hand held from about four feet away.

Figure 3: A long-legged fly.

Figure 4: Long-legged flies.

Figure 5: A queen bumblebee.

The camera focused quickly on flying insects such as the queen bumblebee (Figure 5) and moth (Figure 6). It should be great for dragonflies and butterflies.

For very tiny insects you can quickly snap on the Raynox super macro lens and use the built in flash and a high f-stop. Figure 7 is a Willow Weevil adult on a willow catkin. Figure 8 shows a pseudoscorpion hiding under a rock in the intertidal area. They are only about 3–5 mm long. The Sony was able to full frame them.

In the lab you can attach the camera to a fine adjustment stand and actually use it as a microscope. With the Raynox super micro attached you can easily focus on very tiny subjects such as tardigrades (water bears, Figure 9) and tiny springtails (Figure 10). With the high depth of field there is no need for stacking images.

Figure 6: A moth.

Figure 7: A willow weevil.

How much does this equipment Cost? The camera costs $1,698.00 from B&H photo. And also from B&H photo, the Raynox Super Macro lens costs $70.25. It appears that the Raynox Super Micro lens might have to be purchased from the Raynox lens company.

In order to attach these lenses to the Sony camera you will need a 72–62 mm step down ring. A Sensei 72–62mm step-down ring from B & H photo costs $5.95.

I am glad to answer any questions at bob@discoverysoutheast.org.

Figure 8: A pseudoscorpion.

Figure 9: A tardigrade about 0.5 mm long.

Figure 10: A beach springtail about 4 mm long.

Review of the fifteenth annual meeting

by Dana Brennan[3] and Alexandria Wenninger[4]

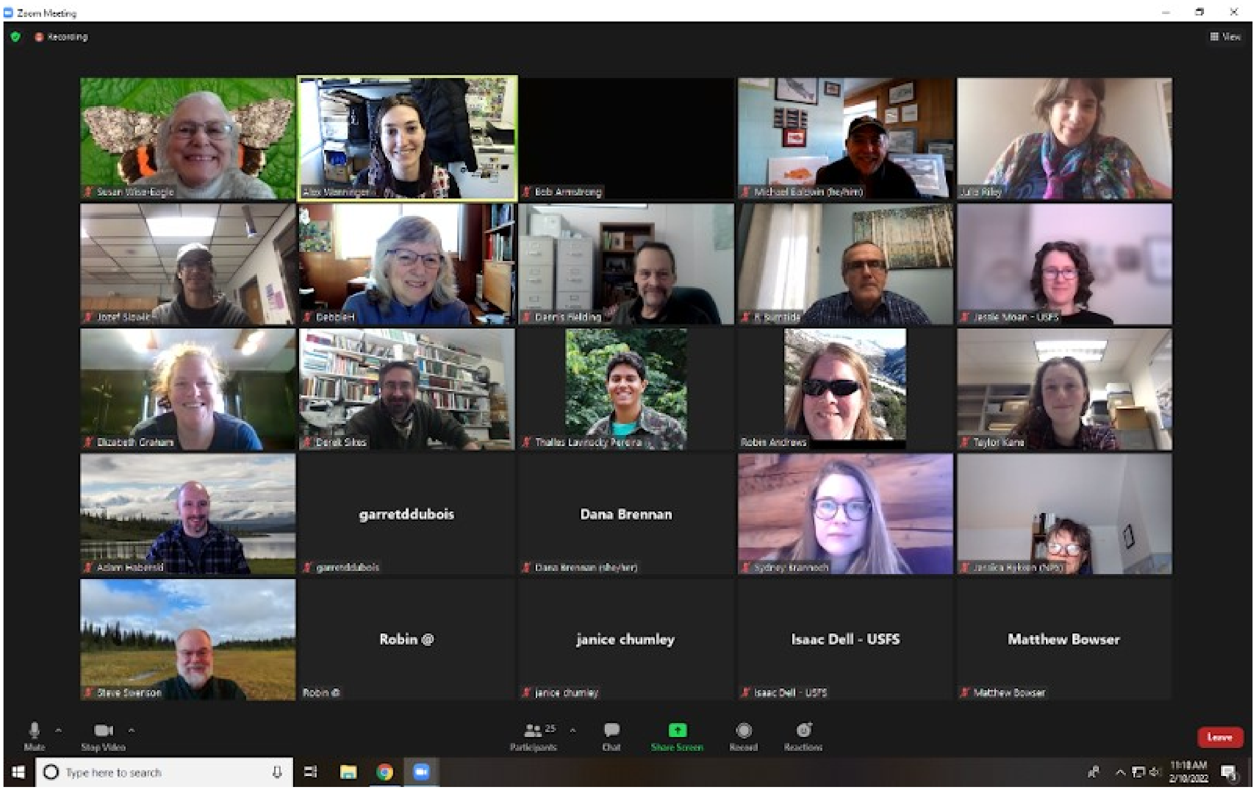

Figure 1: Zoom gallery view of the faces of 24 society members that were in attendance of the 15th annual meeting: From left to right top row: Susan Wise-Eagle, Alex Wenninger, Bob Armstrong, Mike Baldwin, Julie Riley. Second row: Joey Slowik, Debbie H, Dennis Fielding, Roger Burnside, Jessie Moan. Third row: Elizabeth Graham, Derek Sikes, Thalles Lavinscky Pereira, Robin Andrews, Taylor Kane. Fourth row: Adam Haberski, Garret Dubois, Dana Brennan, Sydney Brannoch, Jessica Rykken. Fifth row: Steve Swenson, Janice Chumley, Isaac Dell, Matt Bowser.

Presentations

Contrary to what many would think, over time Alaska butterfly species appear to be moving south! Or are they? In "Testing for Shifts in Distribution of Alaskan Butterflies: Dealing with Non-independence and Sampling Bias," **Walker Brinkman** and **Derek Sikes** discussed this surprising result when examining the range of butterfly species in Kenelm Philip's collection. Derek's first suspicion was that Ken's early career in Alaska was very active in northern part of the state and moved into the Interior in his later years which could explain this range shift by sampling bias. When examining the data, Ken's butterfly data is highly variable in sampling effort per unit time and region, with more collection events occurring in the 1970s and the number of site visits varying by latitude. Ideally, sampling efforts would be the same per unit of time and region and collections independent of each other. Despite initially statistically significant, yet misleading, answers, the data cannot be used to conclude Alaska butterflies are shifting range southerly.

In "Alaska Forest Health Update," **Liz Graham** described the ongoing outbreak of hemlock sawfly and western blackheaded budworm in Southeast Alaska, species that prefer Western Hemlock hosts. There have

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not been much other forest disturbances in Southeast like fire, bark beetle, etc. **Jessie Moan** gave an update for Southcentral Alaska, where spruce beetle outbreak continues to be the largest cause of tree mortality in the area. **Garret Dubois** gave an update on leafminers in birch, which are responsible for 20,000 acres of damage between Talkeetna and Little Coal Creek as well as continued heavy damage in the Fairbanks area. Interestingly, Garret found *Heterarthrus nemoratus* in birch in Bethel at US Fish and Wildlife Service Yukon Delta National Wildlife Refuge staff housing, raising questions as to how, and when, it got there. **Sydney Brannoch** shared an update on the continued rusty tussock moth outbreak, which is heaviest in the Denali State Park area. Egg masses sent to Stephen Cook at the University of Idaho were found to have a frequent parasitism by *Telenomus* sp.

In "Phenology of the Root Maggot, *Delia floralis*, in Alaska," **Dennis Fielding** described experiments done to determine emergence patterns of Turnip Root Maggot, *Delia floralis*, a long-time pest across northern climates. Indoors, *D. floralis* had a bi-modal emergence pattern. Outdoors, emergence was extended over several weeks from May to July in both Fairbanks and Palmer, which makes control methods difficult. While degree-days from 1921 to 2020 in Fairbanks have increased from 1200 to 1380 and in Palmer have increased from 1175 to 1325, it still remains too cold in Fairbanks in late September for *D. floralis* to complete a second generation.

Joey Slowik and **Alex Wenninger** presented "Interesting Insect Finds in the Cooperative Extension Unit Office in 2021," where they shared the first confirmed brown recluse report in AK! Additionally, some new-to-Alaska species of spiders were identified: *Pellenes ignifrons*, *Tetragnatha dearmata*, *Emblyna mitis*, and *Philodromus praelustris*. *Scrobipalpa atriplicella*, is a new-to-Alaska lepidopteran that was found on lamb's quarters. Alex has been investigating chokecherry gall midge, a fly that galls the fruit of chokecherry trees, and is looking for records outside of Anchorage: anyone who has any questions or possible samples should contact Alex with CES.

Phorid flies, parasitoids of spiders, beetles, millipedes, cockroaches, ants, and crickets, may be more diverse in Alaska than originally thought. There are 29 species of phorid flies recorded in Alaska, only four of which have voucher specimens in the Museum of the North collection. In "More than meets the eye: using Next Generation Sequencing – MinION – to study the diversity of Alaskan Phoridae (Diptera)," **Thalles Lavinscky Pereira** used MinION sequencing to determine lower classification identifications for specimens and make more data available. 1,110 phorid barcodes were cleaned, resulting in 13 new species records in Alaska and four species specimens newly vouchered into the Museum collection. The MinION found 144 species clusters, which may represent a lot of new species of phorids.

Robin Andrews showed us her current work in "A comparison of High and Low Vacuum SEM images of Microarthropods." The wonderful photos show an array of ways to image mites. There are pros and cons to each method, but the best contrast and crispness resulted from high vacuum SEM. Unfortunately, much of this imaging is destructive to specimens imaged, but if the imaging turns out well, is a good alternative to physical specimens that allows visualization of many identifying characteristics.

In "Searching for *Boreus* in Wrangell-St. Elias," **Taylor Kane** gave an update on her work with *Boreus* snow scorpionflies. *Boreus* are small, flightless moss-dwelling insects with four species found in Alaska. Taylor sought to confirm presence of *B. nix* and *B. intermedius* in Alaska, identify habitat and collections methods, and get fresh specimens for genetic and morphological study. Through sampling efforts, both male and gravid female *B. intermedius* were collected in Kennecott in May. Taylor returned in September to check for *B. nix/gracilis*, and collected more males and females of *B. intermedius* as well as some *B. nix/gracilis*. Morphological comparison of *B. nix/gracilis* found in Alaska to *B. nix* collected in Washington supported *B. gracilis* as a valid species found in Alaska, further supported by DNA analysis.

Thanks to our student presenters this year: Walker, Taylor, and Robin. Taylor's presentation earned her the 2022 Student Presentation Award and we are excited to hear more about her work with Boreus in the future. Congratulations to Taylor! We also thank the judges this year: Julie Riley, Garret Dubois, Dana Brennan, and Alex Wenninger.

Business items – highlights

The society discussed the idea of having the meeting over two days, which would allow for a shorter time commitment for each day to accommodate for those who must take time off work to attend. Ideas for a split day meeting included having a keynote or social event or student presentations the evening before and the main meeting the following day.

- This year the meeting was held on a weekday after polling members and the society discussed their thoughts on this compared to normal weekend meetings. There are still mixed opinions on the matter as many do not want to commit to a weekend event and others cannot make a weekday event work with their normal schedule.
- With Bioquip closing, new prizes will need to determined for science fair project winners.
- Creating AKES t-shirts was discussed again, including where to get shirts from and what kind of logo or artwork to print on the shirts.

In a fun new addition to the annual meeting, Julie Riley selected a random participant as a winner of a door prize, Bug Bingo! Congrats Garret!

Minutes from our business meeting are available on the website.