

Olympic Bog Surveys

Funded by the
Interagency Special Status Sensitive Species Program

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Audrey Mechtenberg, Forest Service Biology Intern and Western Washington University student, at a sphagnum bog, Olympic National Forest.

Photographs by Karen Holtrop

INTRODUCTION

The Beller's ground beetle (*Agonum belleri*) and the Makah copper butterfly (formerly *Lycaena mariposa charlottensis*, recently revised) are Forest Service Sensitive and Washington State Candidate species associated with sphagnum bogs. Prior to 2018, little was known about the status and distribution of these two insects on the Olympic National Forest, particularly the ground beetle. Species surveys and habitat assessments were needed to inform forest management. The Interagency Special Status Sensitive Species Program (ISSSSP), a Forest Service and Bureau of Land Management program that manages for rare species conservation to help prevent their federal listing, funded a survey project on the Olympic National Forest (ONF) in 2019. This report documents the ISSSSP project.

The Beller's ground beetle is known to occur on acidic sphagnum bogs in forested areas, with a geographic range of northern Oregon, western Washington, and southwestern British Columbia. Prior to 2018, known Washington records were in Thurston, Snohomish, and King Counties (Bergdahl 1997, C. Sato, pers. comm.). The species was suspected to occur in other counties including on the Olympic peninsula, but there had been no surveys.

Prior to recent taxonomic revision (Pyle and Hammond 2018), the Makah copper butterfly was considered a mariposa copper (*Lycaena mariposa*) subspecies occurring in peat bogs and forest openings in western British Columbia, the Olympic Peninsula, and southwest Washington. It had been documented in the northeast Olympic National Forest (Fleckenstein 2009). The larval foodplants include *Vaccinium* species and other members of the Ericaceae (heath) family, including *V. oxycoccos* in Washington (Pyle and LaBar 2018). Pyle and Hammond (2018) described nine new mariposa copper subspecies, of which three are on the Olympic Peninsula: *L. m. makah*, *L. m. cascadia*, and *L. m. junia*.

BACKGROUND

In 2018, Washington Department of Fish and Wildlife (WDFW) initiated a state survey effort for Beller's ground beetles under the coordination of Conservation Biologist Chris Sato. WDFW District Biologist Anita McMillan and I conducted the first ground beetle surveys on the ONF in spring 2018 at a sphagnum bog in the Dungeness watershed. We noted the need to do copper surveys at this and other sites, as well as ground beetle surveys. There had been copper surveys on ONF, but not since 2009.

In 2019 the ISSSSP provided funding for the ONF to complete surveys and habitat assessments for both bog-associated species, the ground beetle and the copper butterfly. The project objectives were to:

- Expand knowledge of the presence and seasonality of Beller's ground beetle and Makah copper butterfly on the ONF.
- Identify suitable habitat for species associated with bogs on the Olympic National Forest and potential threats to the habitats.
- Train Forest staff in survey methods and identification of bog species.
- Improve coordination between the Forest Service and the WDFW regarding bog species surveys and habitat management.

METHODS

In 2018 and 2019, Anita McMillan and I identified and assessed potentially suitable habitats for bog-associated ground beetles and Makah coppers using aerial photography, Google Earth, prior field knowledge and ONF wetland survey effort (USFS 2015). With the help of Forest Service interns, we visited several wetlands on both ranger districts of ONF and assessed the sites for habitat. Suitable habitats were areas dominated by *Sphagnum* moss and herbaceous vegetation with limited tree cover and shrub cover. We also noted the presence of *Vaccinium* and other plants.

If sphagnum was present, then surveys were conducted for ground beetles following a treading method described in *Sampling and Processing Protocols for Agonum belleri and Eanus hatchi Survey* (WDFW no date). In 2018, surveys were also conducted using pitfall traps, which consisted of plastic cups containing non-toxic antifreeze set in the ground amongst the sphagnum. Collected beetle specimens were given to Chris Sato, WDFW who sent them to James LaBonte, Oregon Department of Agriculture, Salem, Oregon, for identification verification.

Butterfly surveys were conducted at the sites by walking carefully and looking for butterflies. If a copper butterfly was seen, the site was surveyed more carefully, estimating the number of butterflies, noting the sex and associated plants, if possible. If necessary, the surveyor captured butterflies using an aerial insect net for photography and identification.

Surveys were done in the late spring and summer (May to August), the active period for beetles and the expected flight period for coppers. The peak activity period for Beller's ground beetles was believed to be late April and early May (WDFW no date), but it was possible to detect them throughout the summer (C. Sato, pers. comm.). During surveys for beetles and butterflies, we noted the presence of other species, such as birds, amphibians, and bees. We did not focus on documenting other species, except at one survey site we looked more carefully for bumblebees.

Locations of sightings and collections were recorded with a GPS device. Weather conditions (air temperature, wind speed and cloud cover) were recorded during each survey. Weather conditions were appropriate for butterfly flight if temperature was at or above 13 °C (55° F), wind speed was below 15 miles per hour, and cloud cover was thin enough for distinct shadows during most of the survey (Pollard and Yates 1993). The preferred weather to do beetle surveys was sunny days (WDFW no date). Some surveys were conducted under conditions that were not appropriate for butterfly flight and not ideal for beetle surveys. During these surveys, it was at least possible to assess the habitat.

RESULTS

We identified and visited several wetlands on both Pacific and Hood Canal Ranger Districts of the ONF but found only two wetlands to have suitable habitat for bog-associated species with *Sphagnum* moss: Pat's Prairie and Cranberry Bog (Figures 1 and 2), both located in the Dungeness watershed (T29N R04W Sec 29 and T29N R03W Sec 19). Both sites had other plant species representative of wetlands, including sedges (*Carex* sp.) Labrador tea (*Ledum groenlandicum*) and hardhack (*Spirea* sp.). Cranberry Bog appeared to be a higher quality bog habitat; we noted small cranberry (*Vaccinium oxycoccos*), cotton sedge (*Eriophorum angustifolium*) and sundew (*Drosera rotundifolia*). Potential threats to the sites were the invasion of non-native plants and recreation (hiker) access. Past threats included nearby timber harvest.

We conducted several visits to these two sites in 2018 and 2019 to survey for both ground beetles and coppers (Table 1). Annabelle Pfeffer and I first surveyed for beetles in May 2018 at Cranberry Bog following the WDFW treading method. Two beetles which fit the size and color of Beller's ground beetle were photographed and measured (7 mm) on May 3, 2018, but were not collected. Anita McMillan, ONF interns, and I returned in June 2018 to set six pitfall traps. Three specimens collected from traps were mailed to Chris Sato WDFW and James LaBonte, Oregon Department of Agriculture, who confirmed the specimens as *Agonum belleri*. These were the first known verified records of *Agonum belleri* for Clallam County and the Olympic peninsula, Washington.

In 2019 we conducted additional beetle surveys at Cranberry Bog using the bog treading survey method. We surveyed throughout the summer - June, July, and August - to obtain more information on the

seasonality and detectability of the species at this site. We took additional photos in 2019 (Figures 3 and 4) but did not collect more specimens at Cranberry Bog. We also surveyed Pat's Prairie, hoping to determine presence, but did not find any ground beetles.

In July and August we surveyed for coppers at both sites, if weather conditions were appropriate. We found a mariposa copper butterfly population on July 26, 2019, at Cranberry Bog. We counted 24 individuals, took photographs (Figures 5, 6, 7), and captured a male which measured 13 mm. Some of the females were near *Vaccinium oxycoccus*, a possible host plant (Figure 8). We did not observe nectaring.

We noted 27 bird species at Cranberry Bog and the surrounding forest. Birds associated with the wetland itself (as opposed to the adjacent forest) included common yellowthroat (*Geothlypis trichas*), red-winged blackbird (*Agelaius phoeniceus*), Canada goose (*Branta canadensis*), willow flycatcher (*Empidonax traillii*), and rufous hummingbird (*Selasphorus rufus*). We noted just three bird species at Pat's Prairie because the surveys were later in the season; one was band-tailed pigeon (*Patagioenas fasciata*). We also noted other species (Table 1), including the rare western bumblebee, *Bombus occidentalis* at Pat's Prairie. Other species noted during surveys were Pacific tree frog (*Pseudacris regilla*), western toad (*Anaxyrus boreas*), garter snake (*Thamnophis sirtalis*), western tiger swallowtail (*Papilio rutulus*), great spangled fritillary (*Speyeria cybele*), bald-faced hornet (*Dolichovespula maculata*), and bumblebees.

Table 1. Surveys visits to Cranberry Bog and Pats Prairie, Olympic National Forest in 2018-2019.

Date	# ground beetles	# coppers	Sky; temp (F)	Survey method	Other species noted
<i>Cranberry Bog</i>					
3 May 2018	2	0	75% clouds; 69	Treading method, 5 person-hours	10 bird species. Pacific tree frog
11 May 2018	0	0	Clear; 55	Treading, 3 person-hours	17 bird sp. 3 tree frogs, 2 western toads
14 June 2018	1	0	Cloudy; 60	6 Pitfall traps. Collected 1 beetle, ID verified	12 bird sp. 1 garter snake, 4 tree frogs, 1 W toad. <i>Bombus mixtus</i> , bald-faced hornet
27 June 2018	2	0	Cloudy; 66	6 Pitfall traps. Collected 2 beetles, ID verified	12 bird species
20 June 2019	2	0	Clear; 61	Treading, 4 person-hours.	W tiger swallowtail. 11 bird species
26 July 2019	5	24	Clear; 70	Treading, 4 person-hours	<i>Bombus flavifrons</i> on Spirea. 7 bird species
19 Aug. 2019	36	0	Cloudy; 61	Treading, 4.5 person-hours	5 Pacific tree frogs. 3 bird species
<i>Pat's Prairie</i>					
8 Aug. 2019	0	0	Clear; 70	5 person-hours.	Great spangled fritillary, 3 bird species
22 Aug. 2019	0	0	75% clouds; 66	3 person hours treading and searching	<i>Bombus occidentalis</i> , <i>vosnesenskii</i> , <i>flavifrons</i> , and <i>flavidus</i> .



Figure 1. Photo of Pat's Prairie, Olympic National Forest, 8 August 2019.



Figure 2. Photo of Cranberry Bog, Olympic National Forest, 20 June 2018.



Figure 3. Beller's ground beetle from Cranberry Bog, Olympic National Forest, the first known site on the Olympic Peninsula and Clallam County, Washington.



Figure 4. Beller's ground beetle on sphagnum moss, Cranberry Bog, Olympic National Forest.



Figure 5. Male mariposa copper butterfly, dorsal side, at Cranberry Bog, Olympic National Forest.



Figure 6. Male mariposa copper butterfly, ventral side, at Cranberry Bog, Olympic National Forest.



Figure 7. Female mariposa copper butterfly at Cranberry Bog, Olympic National Forest.



Figure 8. Small cranberry (*Vaccinium oxycoccus*) flowering at Cranberry Bog, Olympic National Forest.

DISCUSSION

Between the two years, we detected Beller's ground beetles in May, June, July, and August. According to the survey protocol (WDFW no date), the peak period to detect this species is late April and early May. We found only a few individuals (0 to 2 per visit) in May 2018. We found the highest number of beetles during our August 19th visit – 36 individuals. This indicates the species can be easily detected later in the summer. In addition, we detected this high number on an overcast day, indicating that sunny days are not necessarily preferred, as the survey protocol suggested. The temperature was 61° F (Table 1). Perhaps temperature is more important than sun for detecting beetles. Most of the 36 beetles detected on August 19th were within a three-meter area; indicating the species can be very concentrated.

The mariposa copper population at Cranberry Bog had been deemed the subspecies “Makah copper” *Lycaena mariposa charlottensis* until Pyle and Hammond (2018) revised the taxonomy of the species, describing nine new subspecies. Prior to revision there was only one subspecies on the Olympic Peninsula: the Makah copper, *L. m. charlottensis*. Now there are three described subspecies on the Olympic Peninsula: *L. m. makah*, *L. m. cascadia*, and *L. m. junia*. According to Pyle and Hammond (2018), the population at Cranberry Bog is the new subspecies *L. m. cascadia*, which is distributed in the Cascade Range of Oregon and Washington, and westward very spottily through the Puget Sound trough, around Hood Canal, and into the Olympic Mountains of Washington.

The copper butterflies I observed at Cranberry Bog largely matched the description and photos of *L. mariposa cascadia* in Pyle and Hammond (2018), except for the size. The newly described *L. m. cascadia* is a medium-sized copper with a forewing length of 14-16 mm. In contrast, a specimen we captured at Cranberry Bog had a forewing length of 13 mm, which matches the size of *L. m. charlottensis* or *L. m. makah* in Pyle and Hammond (2018). Anecdotally, I have seen other mariposa coppers in the Olympics, and the ones observed at Cranberry Bog appeared to be smaller than other Olympic mariposa coppers. However, there are variations within populations, and more specimens at Cranberry Bog should be examined to state any differences.

The habitat of the Cranberry Bog mariposa copper population matches that of *L. m. makah*, which occurs strictly in coastal sphagnum bogs and feeds on *Vaccinium oxycoccus*. We observed females near this plant species, but more studies would be needed to determine the host plant of this population. According to Pyle and Hammond (2018), the subspecies *L. m. cascadia* is not restricted to bogs and is more widely distributed. I believe Cranberry Bog is an important site for mariposa coppers, even if it is home to the more widely-distributed subspecies.

The flight season for the Cranberry Bog mariposa copper population appears to be late July to early September. Forest Service botanist Cheryl Bartlett incidentally observed the species at Cranberry Bog on August 13, 2013. Fleckenstein (2009) detected the species at this site on August 30, 2009. He noted that the recorded flight period (for new nomenclature *L. m. makah* and *L. m. junia*) was between 23 July and 5 September. We did not observe coppers on June 20th under good weather conditions; but detected them on July 26th. However additional surveys are needed to document the flight season.

We did not detect ground beetles nor coppers at Pat's Prairie, but further surveys should be completed before assuming absence. We completed only one survey at Pat's Prairie under appropriate weather conditions for butterfly flight. Fleckenstein (2009) detected mariposa coppers at this site; so, more surveys should be done to determine if coppers still occupy the site. Although we did not detect ground beetles or coppers at Pat's Prairie, we did find another rare species: the western bumblebee (*Bombus occidentalis*), a Forest Service Region 6 sensitive species. We recommend subsequent surveys for ground

beetles, butterflies and bumblebees. Both Pat's Prairie and Cranberry Bog are unique sites and are important ecosystems to maintain and manage for coopers, ground beetles and other species.

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REFERENCES

- Bergdahl, J.C. 1997. Endemic sphagnum bog beetles from the Puget Sound region: Kings Lake and Snoqualmie Bogs, King County, Washington. Northwest Biodiversity Center, Seattle, WA.
- Fleckenstein, J. 2009. Makah Copper (*Lycaena mariposa charlottensis*) Survey Project Final Report, Washington Natural Heritage Program. Olympia, WA.
- Pollard, E. and T. J. Yates. 1993. Monitoring butterflies for ecology and conservation: the British butterfly monitoring scheme. Chapman & Hall. London. 274 pp
- Pyle, R.M. and P.C. Hammond. 2018. A review of the mariposa copper (*Lycaena (epidemia) mariposa*, Lycaenidae) with description of nine new subspecies and a model for their biogeographical origins. Journal of Lepidopterists' Society 72 (1).
- Sato, Christina, Washington Department of Fish and Wildlife Biologist. 2018. Personal communication.
- USFS (U.S. Forest Service). 2015. Wetland Surveys, Olympic National Forest. Unpublished report, Olympic National Forest, Olympia, WA.
- WDFW (Washington Department of Fish and Wildlife). No date. Sampling and Processing Protocols for *Agonum belleri* and *Eanus hatchi* Survey. Unpublished document, Washington Department of Fish and Wildlife, Olympia, WA.