

*Bulletin* of the  
**Oregon  
Entomological  
Society**

***Cicindela bellissima* Leng (Pacific Coast Tiger Beetle) in Southern Oregon  
 (Coleoptera: Carabidae) *Ron Lyons***

**Introduction**

Adult tiger beetles (Figures 1–4) are charismatic insects. For a long time tiger beetles were placed in their own family, Cicindelidae, but they are now usually placed in the subfamily Cicindelinae under the Carabidae. Adults are easily recognized as they actively pursue prey in the areas where they are found, often along the edges of ponds or waterways popular with the public. Like dragonflies, damselflies and butterflies, the number of North American species is relatively small and good illustrated guides and web resources exist (e.g. Pearson et al. 2006; Northern Prairie Wildlife Research Center web site <<http://www.npwrc.usgs.gov/resource/distr/insects/tigb/>>) to help one identify the various species with reasonable certainty. As with the other groups there are species that require more careful examination, but for the

most part the interested person can identify a large number of the species with confidence based on appearance and known range.

Pearson et al. (2006; source for all the common names) provided information and distribution maps for the 109 species known from the United States and Canada. Based on their distribution maps, 22 species occur in Oregon: 4 in the genus *Omus* (night-stalking tiger beetles), the rest in the genus *Cicindela* (common tiger beetles divided among 5 subgenera: *Cicindela* [temperate], *Tribonia* [tribon], *Cicindelidia* [American], *Cylindera* [rounded-thorax], and *Ellipsoptera* [ellipsoid-winged]). One of these, *Cicindela columbica* (Columbia River Tiger Beetle), is no longer found in Oregon. Only one species, *Omus cazieri* (Mount Ashland Night-stalking Tiger Beetle), is known solely from Oregon. There are a couple of additional species that may be present. A number of species have



Figure 1: Mating pair of *Cicindela bellissima* (Oregon, Curry County, Pistol River dunes, 2 August 2013).

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Figure 2: *Cicindela hirticollis* (Oregon, Coos County, along New River, 9 May 2009).



Figure 3: *Cicindela oregona* (Oregon, Curry County, Cape Blanco, 1 June 2008).

been divided into named subspecies, and in some cases, more than one subspecies occurs in Oregon.

As adults, our night-stalking tiger beetles are fairly large, heavy bodied flightless black beetles that tend to be found in or along the edges of forested areas west of the Cascades. One is limited to the extreme southwest corner of the state and another is known only from Mount Ashland. As adults, our other tiger beetles vary in color (browns and greens are the most common colors) and generally have prominent white markings on their elytra that are species specific. These tiger beetles can fly. Members of this group can be found in various open habitats throughout the state.

Along the south coast of Oregon, I encounter several species of temperate tiger beetles on a regular basis when I am out along the beaches or in the dunes: *Cicindela (Cicindela) bellissima* (Pacific Coast Tiger Beetle, Figure 1), *C. (C.) hirticollis* (Hairy-necked Tiger Beetle, Figure 2), and *C. (C.) oregona* (Western Tiger Beetle, Figure 3). According to the distribution map shown in Pearson et al. (2006), *C. (C.) depressula* is supposed to be along the coast, but I cannot say that I have ever seen it there. However, *C. depressula* is very similar to *C. oregona*, the latter being quite common along the coast and widespread in Oregon. While Pearson et al. (2006) indicate that *C. (C.) repanda* (Bronzed Tiger Beetle) does not reach our coastal plain, I have occasionally found it near the ocean.

### Identification

The overall color of *Cicindela bellissima* adults ranges from black to blue to green to brown. Brown and green specimens are the most common. When examined closely individuals are much more colorful than this general description would suggest, with vivid metallic overtones. The overall pattern of the whitish features on the elytra is distinctive and consistent among individuals (Figure 4). In some cases these features are much finer than usual, and in

some cases there is a small break where the band in the middle normally joins the marginal line. On teneral adults the overall pattern appears dull brownish instead of whitish. Maser (1973) refers to these adults as having a “greasy appearance”. The pattern of the markings on the elytra is sufficient to distinguish *C. bellissima* from the other species found along the coast.

There are two subspecies: the nominate subspecies *C. b. bellissima* being present over most of the range, and the subspecies *C. b. frechini* confined to the extreme northwestern tip of Washington (Leffler 1979b).

Pearson and Vogler (2001: pp. 158–159) discussed sexual dimorphism between male and female tiger beetles. Besides the fact that the females are generally larger than the males, common differences occur with the mandibles and the labrum (upper lip), particularly in their length and shape. In the case of *C. bellissima*, I have noticed from the pairs that I have photographed that the mandibles and labrum seem to have color differences that can be used to distinguish males from females in the field. The white area on the side of the mandible appears to be longer and whiter on the males than the females. The labrum of the males is all white whereas that of the females is more like a creamy (yellowish) white with a darker yellowish-brown smear centered on the midline.

### Distribution

In material written prior to 1997, the distribution of *Cicindela bellissima* is given as Washington and Oregon, the most southerly location being the dunes at Pistol River in Curry County. At one point Frank Beer searched for it at the mouth of the Smith River in Del Norte County northern California but without success (Maser 1973). Recently I learned that David Brzoska (pers. comm.) had found *C. bellissima* in Del Norte County some time ago in the Crescent City dunes, northeast of Point St. George. This discovery was behind the extension of *C. bellissima*'s known



Figure 4: Elytral pattern of *Cicindela bellissima*. The specimen on the left exhibits wide markings common on most specimens (irregularities in the borders of the markings are specific to the individual specimen shown); the specimen on the right exhibits narrow markings which are much less common. (OSAC specimens from Clatsop County, Oregon).

range into California shown on the distribution map illustrated in Pearson et al. (1997). (This map shows the range extending a bit farther south than it should, perhaps because it was hard to illustrate a point only a few miles south of the border on the scale of the illustration.) There are two additional records from the Crescent City area that I know of. Dana Ross told me that he had seen *C. bellissima* in the Tolowa Dunes State Park area while doing butterfly surveys several years ago. On 21 June 2013, I photographed *C. bellissima* in the south section of Tolowa Dunes State Park.

I have examined the *C. bellissima* specimens held in the collections of the Oregon Department of Agriculture (ODA, Salem) and the Oregon State Arthropod Collection (OSAC, Corvallis). I also looked at the collections of Southern Oregon University (SOU, Ashland) and Humboldt State University (HSU, Arcata, California). There were no *C. bellissima* specimens at SOU or HSU.

Based on all the information available, *C. bellissima* is a coastal species, found mainly in open sparsely vegetated areas of sand dunes along the Pacific coast (i.e. within a couple of km of the ocean) from the Crescent City area of northern California to the northwest tip of Washington (Pearson et al. 2006). In some cases, individuals have been found on the beach and beach area as well (OSAC specimens, personal observation, Brzoska [pers. comm.] and Leffler 1979b). Of all of the specimens examined, the literature accounts, my observations and Brzoska's material, only two reported localities, discussed in the next section, do not fall within the coastal strip. Some of the areas where it has been reported are probably no longer suitable or certainly less suitable due to coastal development and dune stabilization efforts. There are some large

gaps in the distribution, particularly at the northern and southern extremes.

At the north end, there is a gap of about 120 km between the population at Moclips, Grays Harbor County and the population (*C. b. frechini*) near Cape Flattery in Clallam County at the extreme northwest corner of Washington. Leffler (1979b) discussed this gap and pointed out that the habitat along this stretch of coast is now "unsuitable" for *C. bellissima*.

At the south end, there are two smaller but significant gaps: Cape Blanco to Pistol River in Curry County (straight-line distance about 50 km), and Pistol River to the Crescent City area in California (straight-line distance about 55 km). (The dunes at Cape Blanco are not very extensive, but apparently are enough to support *C. bellissima*. Two OSAC specimens were collected at Cape Blanco and Brzoska [pers. comm.] also found it there.) In general the coast between these points is not very suitable for *C. bellissima* (Maser 1973).

South of Crescent City the next major dunes are the Lanphere, Ma-le'l and Samoa Dunes in the Arcata-Eureka area of Humboldt County. It would be interesting to know if anyone has ever looked for *C. bellissima* in those dunes. The range of *Trimerotropis helferi* (Helfer's Dune Grasshopper), another coastal dune insect, overlaps that of *C. bellissima* over much of its range. At Pistol River and Tolowa Dunes State Park, it can be found in the same areas as *C. bellissima*. The range of *T. helferi* does not reach quite as far north, but does go much farther south and includes the Arcata-Eureka area dunes (Lyons 2013).

### Distribution Outliers

As I indicated above, *Cicindela bellissima* has been found for the most part in the coastal strip. There are however two collection localities reported by Leffler (1979a: p. 713) which are well away from the coast: Oregon: Coos Co.: Upper Cherry Creek 15 mi SW Powers, and Oregon: Multnomah Co.: Sauvie Island. According to the text, both localities came from specimens in the OSAC but no further information was provided on either of them.

Powers is a small town in the southeast corner of Coos County. Fifteen miles southwest of Powers would place the locality in the Rogue River-Siskiyou National Forest close to the border between Coos and Curry Counties. In this area it would be quite reasonable to use Powers as a reference point when measuring distances. Unfortunately, I have not been able to locate any Cherry Creek in that area on any maps I checked (DeLorme Atlas & Gazetteer for 2008, Coos Forest Protection District Central Unit map from 1991, USGS topographical maps from 1954). There is a Cherry Creek in Coos County but it is near Dora and McKinley, about 20 miles north of Powers. For this spot it would have been more reasonable to use



one of these smaller towns or Coquille rather than Powers as the reference point for the collection locality. Unfortunately, there is no specimen among the *C. bellissima* specimens at OSAC labeled with this collection locality, and I have not come across it (or anything similar to it) among the other tiger beetles held in the collection.

Sauvie Island is on the Columbia River northwest of Portland Oregon. The island is split by the boundary between Columbia and Multnomah counties. There is a single specimen at OSAC from Sauvie's [sic] Island, Or. collected Aug. 20, 1906 by Farrell (OSAC #197566). There is a similar species, *C. columbica* (Columbia River Tiger Beetle), which historically occurred along the Columbia River at least as far west as The Dalles area. Pearson et al. (2006: p. 82) said of *C. bellissima*: "Extremely similar in appearance to the Columbia River Tiger Beetle, they are most easily distinguished by their separate geographical ranges." Chris Marshall (OSAC) and I examined the specimen and compared it with the OSAC material for both species to see whether or not it had been properly identified. It definitely is *C. bellissima*. Any habitat provided along the river, like sand bars or cutoff meanders, would seem somewhat atypical and less permanent than the areas where it is now found. Today, part of Sauvie Island is a wildlife refuge ([http://www.dfw.state.or.us/Resources/visitors/sauvie\\_island/index.asp](http://www.dfw.state.or.us/Resources/visitors/sauvie_island/index.asp)). In their discussion of *C. bellissima* in Washington, Leffler and Pearson (1976) noted "Suitable habitat is not present inland from the mouth of the Columbia River." Assuming they were being fairly general here, it would seem that they regarded the label information on this specimen as erroneous. On the other hand it was collected in 1906. It would be interesting to find out if there are any old specimens from the Columbia River in other collections.

### Life History

Pearson and Vogler (2001: pp. 32–36) discussed the life history of tiger beetles in general terms. The key points are:

- the female lays a single egg in each location
- 9–38 days elapse before the egg hatches
- tiger beetle larvae have 3 instars
- the larval stage generally lasts 1–4 years depending on the species (at least partially dependent on food availability)
- the larva spends less time in instar 1 than instar 2 and less time in instar 2 than instar 3
- the pupal stage usually lasts 18–30 days but in some cases can be much longer
- adult lifespans average around 8–10 weeks.

The only published account of the life history of *Cicindela bellissima* is a preliminary study by Maser (1973) carried out in the



Figure 5: Oregon, Coos County, Oregon Dunes National Recreation Area west of Bluebill Lake, looking north across the open dune habitat. There is a sand road which runs along the tree line on the right. A narrow path curves along the right hand side. I monitored the activity in and around a small plot near the grassy mounds in the middle of the photograph. While the entire area is open to public activity (mainly hiking, jogging and dog-walking), I went in and out the same way to minimize my disturbance.

dunes north of Bandon, Coos County, Oregon to which Leffler (1979b) added some further notes from Washington.

Leffler and Pearson (1976) indicated that *C. bellissima* adults occur from 3 April to 5 September, with most records from May–August. Leffler (1979b) extended the late date to 13 September. Pearson et al. (2006: p. 83) echoed this, saying: "Although apparently a spring–fall species, adults have been observed from early April to early September, with most records from May to August". (Spring–fall refers to the primary seasons when adults are active.)

Since this species appears restricted to a narrow strip along the coast, the earliest and latest dates for the adults in any given year will be dependent primarily on latitude and weather. Among the specimen records and observations, there are a cluster of occurrences from March. Specimens were collected at Waldport, Oregon on 9 March 1984 (OSAC # 197999-198003); I have seen adults as early as 7 March 2013 near North Bend in the Oregon Dunes National Recreation Area on the west side of Bluebill Lake in Coos County, Oregon (hereafter ODBL, Figure 5). In the New River Area of Critical Environmental Concern in Coos County south of Bandon, I have found adults on 10 March 2013 in the Storm Ranch section and on 19 March 2006 in the Lost Lake section. The latest specimen I came across in collections was collected at Pacific City, Tillamook County, Oregon on 26 September 1969 (ODA). I photographed an individual 14 October 2013 at ODBL. The area was hammered by an early winter storm shortly after that and no adults were seen in the same area later in the month (there were still dragonflies and grasshoppers about so I may have missed some). At least at the south end of its range, adults can be active from early March to mid-October. To complicate the determination of the adult activity period, there is one unusually early (or unusually late) specimen at OSAC,



Figure 6: Oregon, Coos County, New River Area of Critical Environmental Concern, Storm Ranch Section, sandy slope just north of New River boat launch, 27 April 2008. Male *Cicindela oregona* attempts to mate with what looks like a male *C. bellissima*.

a specimen collected at Newport in Lincoln County, Oregon on 4 January 1981 by C. Maser (OSAC# 138754).

On 11 May 1972, Maser (1973) observed the only mating adults he found during his study. I have encountered mating adults on 9 May 2013 (Douglas County, Oregon Dunes Overlook Day Use Area), 27 June 2009 (Coos County, New River accessed from Lost Lake), 2 August 2013 (Curry County, Pistol River dunes, Figure 1), and 22 August 2008 (Coos County, Bandon State Natural Area, mouth of New River). On 27 April 2008, I saw three interspecific pairing attempts on a sandy slope just north of the New River boat launch in the Storm Ranch Section of the New River Area of Critical Environmental Concern involving *C. bellissima* and *C. oregona*. One paired a male *C. bellissima* and female *C. oregona*. The other two paired a male *C. oregona* with *C. bellissima*; in one case this appeared to be another male (Figure 6) and in the other case I couldn't tell whether it was a male or female. None of these observations were made as part of any systematic study, so no conclusions should be drawn concerning *C. bellissima*'s seasonality, especially as the summer months were poorly covered.

As I indicated I regularly find *C. bellissima*, *C. hirticollis* and *C. oregona* along the coast. When I have encountered the species in the same area, they are usually spatially separated. *C. oregona* and *C. hirticollis* prefer the wet sand borders of ponds and waterways while *C. bellissima* prefers the dry sand, often far away from any surface water. However, early in the season, I have found *C. oregona* well away from water along paths and in the dune areas with *C. bellissima*. On one occasion, early in the season, I found *C. hirticollis* at a seasonal pond which had developed in a low point in the dunes. Others (Paul Hammond and Jim LaBonte) have told me of similar findings. (In my case there also happened to be a mating pair of *C. bellissima* on the dry sand up from the pond.) Like *C. oregona*, *C. hirticollis* should also be found occasionally in the dunes away from water as it is forced to search for new habitats when these seasonal ponds disappear.

## Larvae

Tiger beetle larvae are sit-and-wait predators that live in burrows. A hunting larva will sit at the entrance hole of its burrows in such a manner that its face appears to be capped by the dorsal surface of the first thoracic segment. The setae seem to act to center the body in the opening, so that the larvae are often nicely centered in their burrows. The mandibles are held like open arms ready to grab any suitable passing prey. In at least some cases, some of the legs are visible at the edge of the hole. Older instar larvae are larger and have more setae than younger instar larvae. Leffler (1979a: p. 63) indicated that the instar number, 1–3, of larval tiger beetles can be “quickly recognized by the number of setae on the mesal edge of the basal segment of the maxillary galea”.

Pearson and Vogler (2001) discuss the process whereby the larval tiger beetle uses its head and first thoracic segment to shovel up material and toss it back during the construction of its burrow. Maser (1973) reported that *C. bellissima* larvae “deposit the sand next to their burrows and the wind blows it away” and showed two examples. Maser (1973) noted that the larvae “appear to be primarily crepuscular and nocturnal feeders”.

Leffler (1979a) collected 2nd instar larvae of *C. b. bellissima* on 5 May 1975 and/or 29 June 1975, and 2nd and 3rd instar larvae of *C. b. frechini* on 10 Sept 1976 and 13 Sept 1977. Leffler (1979a: pp. 75–77 and p. 65 Fig 5E) described the 3rd instar larva of *C. b. frechini*. He included a diagram of one of the pronotal setae. Valenti (1996) only lists Leffler's (1979a) thesis as a source for the larval description of *C. bellissima* and I have not come across any more recent information. Leffler (1979a: p. 302) suggested that the larvae overwinter as both instar 2 and instar 3 or that larvae require two years for development.

*Note: In the discussion that follows, I am assuming the larvae I found are those of C. bellissima based on the fact that the burrows are located in areas of the typical adult habitat, i.e. sparsely vegetated dune areas usually away from water. I have not collected any larva to check its identity, raise it, or determine its stage. I have not found any specific description of the first or second instar or any illustrations or images of any of the instars.*

I found my first larva on 31 March 2013 while hiking along the trail near Lost Lake (Oregon, Coos County, New River Area of Critical Environmental Concern, Lost Lake Section) The larva was on a sparsely vegetated sandy slope on the south side of the trail, and apparently had recently opened its burrow as evidenced by the small pile of drying sand near its burrow (Figure 7). The larva was similar to that shown in Figures 9 and 10.

My next encounters with larvae were in October 2013 in the ODBL (Figure 5). While searching for adults, I noticed a number of small holes in the sand, some of which turned out to be the burrows of larval tiger beetles. Over the course of the winter I visited the area a number of times to check for and photograph evidence of larval activity. Visits were made mainly in the early





Figure 7: A recently excavated burrow with the excavated material forming a pile on the right. (Oregon, Coos County, New River Area of Critical Environmental Concern, Lost Lake Section, 31 March 2013).

to late afternoon when the area was exposed to direct sunlight. While some holes were closed (deliberately plugged, or plugged by drifting sand, storms, or animal activity), I found open holes and evidence of activity in the form of sand disturbance or hunting larvae throughout the winter. Two instars were active. On 7 March 2014, I found my first adult of 2014 a short distance from the plot I was monitoring. Both larval instars were also active on that day.

In some cases recently excavated burrows could be recognized by the small sand piles beside them. Maser (1973) noted that the wind would carry this away during the summer. During the winter, the rain seemed to beat these down so they were not always obvious; in some cases all that remained were a few small sand pellets. The piles that escaped this fate dried a bit faster than the surroundings and so could be identified by their lighter color. Once the burrow had been constructed any further excavations either did not necessarily end up in a pile or were too small to stand out.

Larvae often appeared at the entrance to their burrows with sand grains on their faces. They made no attempt to dislodge them; perhaps they provide some camouflage.

The burrow openings themselves are small, generally <5 mm in diameter. The nature of the entrance area depended on the activity of the larva and the moisture level in the sand. Burrows in damp sand often look just like small holes, the top of the burrow being very close to the level of the surroundings. The hunting activity of the larva can produce a saucer-like depression centered on the opening as the larva reaches out for nearby prey. As the surface sand dries and loses cohesiveness, any significant activity by the larvae can cause a cave-in around the edges of the opening. (If dry enough surface sand can cave in just from the vibration of someone walking nearby.) As a result the entrance area when the sand is, or has been, drier will be more conical and the opening deeper than that found when the sand has remained moist. In some cases, the conical pits resemble those made by antlions, the difference being that the larva maintains an open hole at the bottom of the pit, rather than hiding immersed in the sand. In all cases, the hunting larva rests in the opening at the bottom of any pit. Often at least one of the front legs is also visible. The places where I have found the burrows are in areas that would have been well above the local water table during the winter rainy season, but the subsurface sand was damp and firm. Burrows were present around vegetation and in open areas; burrows were present on slopes and in relatively level areas. Some were in mounds or hummocks stabilized by patches of vegetation.

Figure 8 shows the two larval instars that I photographed in the ODBL. As evidenced by the difference in the number of setae on the face and first thoracic segment, at least two instars were present. (I assume these are the 2nd and 3rd instars noted by Leffler [1979a].)

There are similar structural features on the dorsal area of the first thoracic segment on both instars as evident from the color and shadow pattern. There is a central suture that splits the segment



Figure 8: **(left)** *Cicindela bellissima* larvae in its burrow (instar 2). Note the ridge-like features and shading of the first thoracic segment and the number and distribution of the setae. The mandibles are outstretched. (Oregon, Coos County, Oregon Dunes National Recreation Area west of Bluebill Lake, 17 November 2013). **(middle and right)** *Cicindela bellissima* larva in its burrow (instar 3). The change in appearance is due to the use of the on-camera flash in the right image. Although the color pattern is different from the larva shown at left, the features and shading on the first thoracic segment are similar. However, the setae are more numerous and distributed differently. The relative lengths of the various setae are in part at least a function of their orientation relative to the camera. On the left hand side, you can make out one leg against the sand grains. (Oregon, Coos County, Oregon Dunes National Recreation Area west of Bluebill Lake, 17 November 2013).

from front to back, more pronounced towards the rear. There is also a prominent C-shaped feature on each side of the midline. There is another less prominent open C-shaped feature that runs part way across the leading edge of the segment, on each side of the midline, and up to intersect the more prominent feature. The shadow pattern near the outside edge is also similar. The leading edge of the thoracic segment on the older larvae is more wavy. The main difference between the two has to do with the number and placement of the setae. Some of the features on the older larva are obscured by the presence of the additional setae. Differences in the color and color pattern are present, but no conclusions should be drawn as different larvae show different colors, a variation similar to that found in the adults. In addition, different lighting conditions can affect the colors seen. There are no drawings or photographs in the literature for this species with which to compare my photographs.

### Conclusions

A number of questions remain concerning the life history of this interesting insect.

It is possible that in some years, under the right conditions, adults may be active most of the year. At least in the southern part of its range, adult activity can extend from March through October. The few collecting records early and late in the season probably reflect more on the activity of collectors and other investigators than tiger beetle inactivity.

Early in the season, adult and larval activity can overlap. At least in the southern part of its range, some larval activity occurs during the daytime throughout the winter. Two instars can be found during this period.

### A Comment on the Photographs

The larval tiger beetle images were made with a Sigma 180 mm macro lens mounted on a Canon T5i digital camera. The camera was mounted on a tripod and a remote cable release was used to minimize any vibration/movement that would be caused by manually pressing the shutter button. When the picture was taken, there was a short delay introduced between the time the viewing mirror was locked up and the exposure was made, in a further effort to minimize any vibration caused by the mirror lock up. For the most part images were taken in natural light, sometimes supplemented with the on-camera flash.

At the distance the larvae were from the camera, the depth of field of the lens is small and it is difficult to get a really good focus. Since the larvae are very sensitive to movement, they would seldom wait around while I set up the camera and focused the lens. So after positioning the camera, I focused on the sand grains at the rim of the opening of the burrow and waited for the larva to reappear (not right away and sometimes not at all!). If it did appear, the larva would take up a position near where I had focused the lens, sometimes a bit above, sometimes a bit below and I could take its picture. Sometimes the larva would notice the change when the mirror locked up and drop down into its burrow before I could take its picture.

The oblique illumination angle of the winter sun often cast strong shadows across the resting larvae, and the ones whose burrows had distinctive conical depressions tended to be mainly shaded. Since the sand was bright and the larvae dark, I usually overexposed the image to bring up the detail in the larvae.

If a larva was illuminated directly with strong sunlight or the on-camera flash, there tended to be a lot of distracting specular reflections from different parts of the thorax and face (Figure 8, rightmost image). Other regions tended to be dark so there was little contrast between the areas. The white setae could dominate the final image, but the angles of the various setae relative to the camera affected their visibility, making it hard to compare photographs of different individuals or photographs from different angles. In addition grains of sand (sometimes lots of sand) tended to get stuck between the setae, particularly on the older larvae.

### Acknowledgements

I would like to thank Chris Marshall (OSAC), Jim LaBonte (ODA), Mike Camann (HSU) and Peter Schroeder (SOU) for providing access to, and help with, the collections at their respective institutions. I would like to thank David Brzoska for providing me with a list of his collecting sites. I would like to thank Chris Maser for calling me up to discuss some questions I had about the specimens he had deposited at OSAC, I would also like to thank Rick Westcott for taking the time to read the article and make helpful comments and suggestions.

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# Butterfly Enthusiast's Guide to the Buckwheats of Oregon and Washington

Eleanor Ryan

This booklet of 54 pages, generously illustrated with 180 photos, has been produced as an aid to butterfly collectors, citizen scientists, and enthusiasts to understand the important role buckwheats (*Eriogonums*) play as host plants to butterflies, and to identify the *Eriogonum* species in the field.

The idea for this booklet originated with David Nunnallee who produced the Buckwheats of Washington to help butterflyers in the Washington Butterfly Association learn these plants of importance for butterfly identification. Initially David considered expanding to Oregon but he was busy on other projects. His Washington pages are incorporated into this booklet including all of his text and beautiful photos. (David Nunnallee is a cofounder of the Washington Butterfly Association and the coauthor, with David James, of Life Histories of Cascadia Butterflies.) The photos for Oregon *Eriogonums* were donated by a host of generous botanists. Eleanor Ryan, former president of the North American Butterfly Association (NABA) Eugene–Springfield Chapter and now Conservation Chair, has compiled this material for both states.

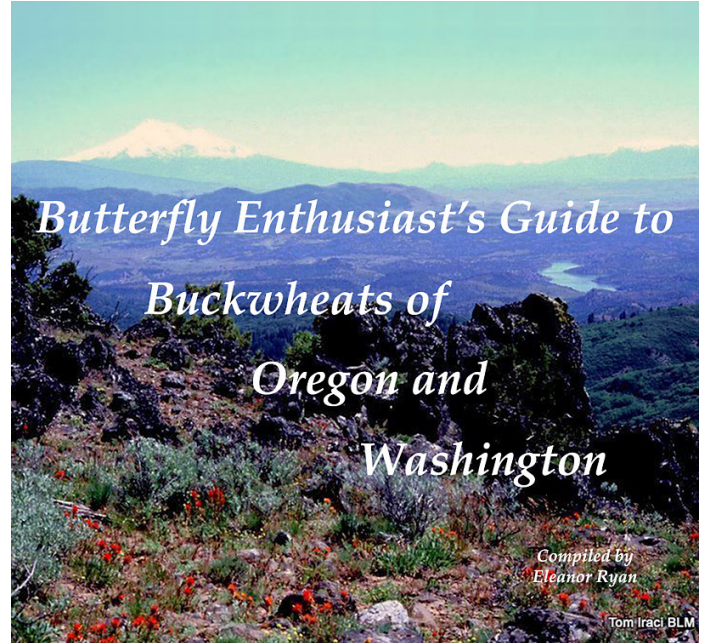
## Why Buckwheats are Important

Buckwheats of the genus *Eriogonum* are widely distributed throughout the American West; from the Mississippi to the Pacific coast, and from northern Mexico to southern Canada, there are some 250 species. In this expansion *Eriogonums* have adapted to extreme climates, from deserts like Death Valley to high mountains. They have adapted to difficult growing conditions like the expandable clay of badlands, serpentine soil, and volcanic tuff. One third of *Eriogonum* species are uncommon to rare; many are endemic in their states. New species are discovered every few years. These rare buckwheats once established in their difficult territory open up habitat for butterflies who can make the adaptive jump to using that specific plant.

Buckwheats provide exceptional habitat for many butterfly species including: *Apodemia* sp. (Metalmarks), *Lycaena heteronea* (Blue Copper), *Callophrys* sp. (Green Hairstreaks), *Plebejus lupinilacmon* (Lupine Blues), and *Euphilotes* sp. (Buckwheat Blues).

The lives of the *Euphilotes* butterflies revolve around their specific buckwheat host plants. Mating takes place on the plants as males hover to find females. The female lays eggs on the flowers; caterpillars eat the flowers and seeds; butterflies nectar. Normally in the soil beneath the plant, pupation occurs. Emergence of the adult is linked to the bloom time of the specific buckwheat host plant (for more on this see David Nunnallee's note "*Euphilotes* Butterflies on Buckwheats" which follows).

The close association of *Eriogonum* host and *Euphilotes* species has (at least in some species) been known to favor ant-butterfly associations. Chemicals from the *Eriogonum* allow the production in the



caterpillar of a nutritional substance that ants desire. Ants are seen tending and protecting the caterpillars on *Eriogonums* in return for this substance, secreted from the caterpillar's "honey gland". (Electron microscopy reveals in the caterpillar a complex gland to store and dispense this "honey" [Gordon Pratt ])

In some *Euphilotes* species the caterpillar has other well developed glands, that, using buckwheat chemicals, produce a mimic of the brood pheromone of ants. Thus when the ants take small caterpillars into their nests, the caterpillars are protected. It is thought the caterpillars eat the ant larvae, but continue to provide the nutritional substance to the ants. Eventually the caterpillar pupates in the ant nest. Still protected by pheromones, it emerges with folded wings from the ant nest. These are amazing evolutionary adaptations that link a buckwheat host species to a specific *Euphilotes* species. Consequently if ants are seen on *Eriogonums* watch for caterpillars. Although this particular relationship has been studied, we do not know how many buckwheat–butterfly pairs have these relationships.

## Research Highlights: Importance of Host Plants in Identification.

This booklet provides a summary of our current knowledge of possible new species identifications for our butterflies based on the isolation of unique *Eriogonums* as well as the flight time of the butterfly. Andy Warren's five new designations are quoted for the *Euphilotes battoides* group (the Square-spotted Group). For the *Euphilotes enoptes* group (the Dotted Blues), use of the host plant *Eriogonum compositum* and later *E. elatum* helps to distinguish the "Columbia Blue".



Included as well is a discussion of the *acmonilupini* group where there are changes to realizing that *Plebejus lupini* is the most wide-spread and common of the two species. We also have new designations based on the isolation of the *Plebejus* feeding on *Eriogonum pyrolifolium* at high elevations. Another *Plebejus lupini* is given the variety designation *lutzi* based on its feeding on *Eriogonum heracleoides*.

Background material is summarized in the first nine pages. The remaining pages are given over to full page species descriptions for 42 *Eriogonum* species or varieties. Each is given a habitat description or habitat photo if available, and close up of the leaves and flowers. County maps or specific designations like "Steens Mt." are given. The Butterfly Use category lists recent information about which butterfly uses that specific *Eriogonum* or variety.

The first goal of this booklet is to aid butterfly enthusiasts to identify the *Eriogonums* for help in identifying correctly the butterflies they find. The second goal is to encourage active participants to search for new buckwheat–butterfly pairs on *Eriogonums* not yet surveyed. It is highly likely that in this process new butterfly species or varieties may be found. I have told briefly the stories of finding Leona's Little Blue and finding a new buckwheat species, *Eriogonum villosissimum*, in 2009. There are more discoveries to be made.

Donald Gudehus, the web master for the NABA Eugene–Springfield Chapter, has made the pages of this booklet available at

### *Eriogonum flavum* var. *piperi* Piper's Wild Buckwheat

Piper's Wild Buckwheat either has no caudex, or has a spreading caudex. Basal leaves 2.5-4cm. are dark green, moderately hairy above, but densely hairy below. Leaves are crowded, erect, and 6-12 per flo. stem. Leaf blades are slender ovals with petioles of ~equal length. Flo. stems are solid, densely hairy, 10-20cm. tall. Stems are leafless except for a whorl of leafy bracts below the flower heads. Flower stems branch to a ball-shape or umbellate inflorescence. Each inflor. has 7 involucre (flo. cup) each bearing 15 flowers. Flowers are either pale or bright yellow : blooms June to Sept. Piper's Wild Buckwheat is a common plant west of the continental divide. It lives on clayey, sandy, or gravelly slopes in mixed grass, sagebrush communities, in mt. conifer woodlands at 800-2800m. In the Blue Mts. grows at 5600'. Nectar use by Fritillaries but no butterfly host use yet.

Plants are spaced evenly in open rocky meadows. Slichter's photo from Logan Valley, Malheur N.F. OR. Photos by Gerald D. Carr: leaf structure hairy. Flower head involucre evident.



<<http://www.parfaitimage.com/temp/>> (the booklet can also be accessed through a link on the Chapter's web site, <<http://www.naba.org/chapters/nabaes/>>). We expect to add new material as more buckwheat–butterfly pairs are discovered. We can also add new or updated information about the buckwehats, for example, new varieties for *E. umbellatum* where clearly many new designations could be recognized. We would be glad to add your discoveries to these online pages. However if you want to sit in a flowery meadow to enjoy the identification of *Eriogonums* in the field, I can provide this booklet for \$20 plus a \$2 donation to the NABA Eugene–Springfield Chapter. The mailing cost is about \$3.00 in the US. I will always have updated copies available. To order a hardcopy please contact me at (541) 556-6119 or email <[woodnymph3000@gmail.com](mailto:woodnymph3000@gmail.com)>.

## **Euphilotes Butterflies on Buckwehats**

David Nunnallee

The total picture is complex. First, a few basics.

1. All *Euphilotes* are single-brooded, i.e. they fly only once per year.
2. As far as I know all *Euphilotes* overwinter as pupae.
3. All *Euphilotes* use buckwehats (*Eriogonum*) as their larval hosts, and in fact most of our perennial buckwehats host at least one species of *Euphilotes*. But of course the various buckwehats do not all bloom at the same time.
4. With all *Euphilotes* species, because their life cycle is uniquely tied to a specific buckwheat blooming cycle, their flight period

must occur right at the beginning of their host plant's bloom cycle. In most buckwehats the bloom cycle is fairly short, and the larvae need the full bloom cycle to complete development.

5. In my experience, all *Euphilotes* larvae develop at roughly the same rate; that is, all species exist in their pre-pupal stages for roughly the same length of time. From oviposition to pupation that time is approximately in the range of five weeks, although stresses of weather or food limitations might alter that number. The adult flight period is about one week before oviposition. That means that the pupal diapause has to be what's left of the year, roughly 46 weeks, or about 10.5 months. I think we can say this is roughly true for all *Euphilotes* in our region.

6. Some *Euphilotes* pupae eclose (hatch) in early spring because their host plant develops in early spring; some eclose later because their host plant develops later. But that does not mean that one species has a shorter diapause than another species, or that some species have delayed or extended diapauses, it means simply that the *Euphilotes* are closely tied to their host plants, and those host plants develop at different stages of the year.

Okay, now that I have made this all look simple, we need to recognize that there are some exceptions. We have a few *Euphilotes* which appear to use more than one species of buckwheat. As best we can tell, *Euphilotes columbiae* (Columbia Blue) uses three different buckwheats, *Eriogonum compositum*, *E. strictum* and *E. elatum*. These three buckwheats develop sequentially, although with some overlap, with *compositum* first, *strictum* second and

*elatum* last. Furthermore these three buckwheats belong to two different subgenera, i.e. they are not closely related. Switching host plants allows the Columbia Blue to have a much more extended flight period than other *Euphilotes*. However some experts such as Gordon Pratt contend that this is not possible, that no *Euphilotes* can switch between relatively unrelated buckwheats (i.e. from different subgenera). Yet, that is what our research is showing. A similar story may apply to our widespread but undescribed "*Euphilotes* on *heracleoides*"—it apparently uses more than one buckwheat too. So these buckwheat blues might appear to have shorter diapause periods than other species, but that may be simply because different populations are using different buckwheats.

Confused? Join the crowd. There is still much we do not know about these fascinating little blues.

## Systematic account and bibliography of the Notoptera (Insecta) *James C. Bergdahl*

### Introduction

This report is a sequel to Bergdahl (2013a) and commemorates the 100th anniversary of the first description of a notopteran, the grylloblattid (Insecta, Notoptera, Grylloblattidae) *Grylloblatta campodeiformis* E. M. Walker, 1914, from the alpine zone near Banff (Alberta), Canada. This bibliography provides the most comprehensive list of references relating directly to Notoptera since Yamasaki (1982b). It includes references to published papers on grylloblattids (rock and ice crawlers) and the closely related species in the family Mantophasmatidae (gladiators and heelwalkers), an equally enigmatic group of flightless insects primarily from the winter rainfall regions of southern Africa that were first described in 2002 (see Predel et al. [2012] for a review). These two families form a well-documented monophyletic clade, Xenonomia, within Notoptera. There is also such a bewildering variety of winged "grylloblattodean" fossil taxa (many described only from wing venation patterns) that authors have erected many other families in Notoptera, but their evolutionary relationships are unclear, as are Notoptera's relationship with other Polyneoptera (Blattodea, Dermaptera, Embiodea, Isoptera, Mantodea, Orthoptera, Phasmatodea, Plecoptera and Zoraptera). Grylloblattids get their name from their morphological similarity to crickets (gryllids) and cockroaches (blattids), whereas mantophasmatids resemble both mantises (mantids) and stick insects (phasmatids). A systematic account of the extant genera of Notoptera is provided below. Extant grylloblattids and mantophasmatids are unique among other closely related taxa in being apterous (flightless), and in having no ocelli (simple eyes; Grimaldi & Engel 2005). Grylloblattids are best described as omnivores, whereas mantophasmatids are predators.

Given the widespread (yet regionalized) occurrence of notopterans in southern Africa, eastern Asia and western North America, this bibliography is not totally complete since the literature is also widespread, and from many provinces and languages. For instance, it does not include all of the references listed by Yamasaki (1982b), many of which are published in Japanese. There must be many

articles on notopterans published in obscure places I have not discovered. Also, no attempt was made to include all the literature on the many fossil taxa; more of this literature may be accessed via Aristov & Storozhenko (2011), Aristov et al. (2013), Wipfler et al. (2012) and Wipfler et al. (2014a). A more complete account of the Asian and Russian grylloblattid literature may be accessed via Schoville & Kim (2011) and Schoville et al. (2013). Both Schoville (2014) and Wipfler et al. (2014a) provide an excellent summary of the fairly intensive search to better define the early history of the phylogeny of Polyneoptera and the role Notoptera has played in this quest. Many papers have now been published on this topic. Many of the old hypotheses are now obsolete given the many new techniques for more accurately defining evolutionary trees (phylograms), although it should be mentioned that there are still many unanswered questions and unresolved nodes given the deep history of time involved (>300 millions years?) since the apparent origination of proto-notopterans in the Late Carboniferous Period. The debate among phylogeneticists about such ancient evolutionary events will no doubt continue for many years since the many different morphological and molecular techniques for reconstructing phylograms may suggest conflicting relationships.

My academic training is primarily as an animal ecologist. As an undergraduate I was greatly influenced by Stephen F. MacLean (University of Alaska, Fairbanks) and John S. Edwards (University of Washington, Seattle) to focus on insects. Over the years I have worked on many fish and wildlife projects, but I have primarily focused on exploring factors influencing local species diversity in carabid beetles (Coleoptera, Carabidae) in the Pacific Northwest, including in cold arctic and alpine regions. Ecological adaptations of insects and their power of dispersal play a huge role in local diversity; this is especially apparent in grylloblattids. However the deeper paleo-biogeographic history of any group has greatly influenced the occurrence (e.g. speciation and extinction) of species on any landscape today due to its influence on the species pool from which local faunas are assembled. There is a rich and fascinating, widely scattered literature on paleo-biogeography and climatology





them in the tribe are monospecific.

\*\* Apparently known from a single museum specimen (Predel et al., 2012). This species is considered a *Mantophasma* by Zompro (2005: 101) and Zompro & Adis (2006: 22).

The notopteran lineages that eventually evolved into grylloblattids and mantophasmatids probably became isolated (split) when Pangaea began to break up forming Gondwana and Laurasia, during the Triassic Period of the early Mesozoic Era, when the first dinosaurs and mammals enter the fossil record (Predel et al. 2012). The region of maximum diversity of a taxon is probably the single best indicator of its province of origin; therefore grylloblattids may have originated in the eastern Asia region, and subsequently migrated overland via Beringia to the Pacific Northwest, perhaps in the Tertiary Period during one of the many long periods of time the continent Asiamerica was intact (Sampson 2009). Transoceanic rafting (e.g. in log debris) across the North Pacific is another

option. Although the probability of a successful colonization by trans-Pacific rafting may be very small, an enormous amount of time has lapsed for such an unlikely event to have occurred. No similar long distance, intercontinental dispersal event is required to explain the known distribution of extant mantophasmatids since they are all found in southern Africa.

### Acknowledgements

Glada McIntyre, Sean Schoville and Ron Lyons helped edit this report. John S. Edwards, my Ph.D. advisor, sparked my interest in grylloblattids many years ago.

Download the full article (including the text above) from [http://odonata.bogfoot.net/oes/OES\\_Spring2014\\_Bergdah1.pdf](http://odonata.bogfoot.net/oes/OES_Spring2014_Bergdah1.pdf).

## CalOdes Dragonfly Blitz/Butterfly Count

When: 27–30 June 2014

Where: Warner Mountains, Modoc County, California and nearby areas in Washoe County, Nevada and Lake County, Oregon

This year's CalOdes Dragonfly Blitz is being planned as a combination Butterfly Count/Dragonfly Blitz in the far northeastern corner of California in the Warner Mountains. The Warner Mountains are a very special area with lots of species possible that don't appear in other areas of California, both ode- and lep-wise. The butterfly count circle in the northern Warners will encompass most of the northeastern corner of the state. Ode forays may also be planned to go into the northwest corner of Nevada (Washoe County) and southcentral Oregon (Lake County).

The count circle center coordinate is 41.8903° N, 120.1329° W. The butterfly count has a 15 mile diameter—this circle includes such potential hotspots as Fandango Pass, Mt. Bidwell, Dismal Swamp, Surprise Valley, Fee Reservoir, Lake Annie and areas of the foothill approach to Mt. Bidwell, and eastern alkali flats as yet unexplored. The Dragonfly Blitz will include not only these areas but also lesser explored areas of adjacent Nevada and Oregon.

A base camp will be established at Cave Lake (elevation 6,600 ft) on Fandango Pass Rd. where we have camped twice before on Blitzes (first come, first served basis). There is no fee. For those wishing to stay in a motel, there are some available in Cedarville and Alturas, California, and Lakeview, Oregon, each approximately a 30–45 minute drive from Cave Lake.

The butterfly count will be held on Saturday, 28 June. This is a brand new count being coordinated by Joe Smith. The day preceding the count and two days after the count will be dragonfly oriented, and of course, our eyes won't be closed to odes on the 28th, nor to butterflies on the other days!

If you are interested, please get in touch. Joe will try to create teams for all the butterfly count areas and assign those out at the base camp. Joe asks that those having butterfly counting skills to please let him know that you plan to attend. Those of us without that skill can still be useful on Saturday as field recorders and learn more about leps, or spend the time concentrating on odes if preferred.

We hope you join us!

Joe Smith, butterfly count coordinator (and originator!),  
<foxglove1785@yahoo.com>

Ray Bruun, dragonfly blitz coordinator, <brun@frontier.net>

Kathy Biggs, dragonfly blitz contact, <bigsnest@sonic.net>

### National Moth Week: 19–27 July 2014

If you have an interest in moths, you can participate in National Moth Week 19-27 July 2014. For more information or to register please visit their web site <<http://nationalmothweek.org/>>. This year's event will include participants from all over the world.

Some of the partners in this event are:

BAMONA (Butterflies and Moths of North America)

<<http://www.butterfliesandmoths.org/>>

BugGuide.net <<http://www.bugguide.net/>>

Moth Photographers Group <<http://mothphotographersgroup.msstate.edu/>>

What's That Bug? <<http://www.whatsthatbug.com/>>

The Lepidopterists' Society <<http://www.lepsoc.org/>>

Pollinator Partnership <<http://www.pollinator.org/>>



## 6th Annual Student Research in Entomology Symposium

The Symposium for students, both graduate and undergraduate, conducting entomology-related projects in different departments at Oregon State University was held on Saturday, 1 March 2014. This symposium gives the students a chance to present their research, or proposed research, and solicit feedback in an informal setting. In some cases they are practicing the talks that they will give at the upcoming ESA Pacific Division meeting. The following papers were presented orally (the presenter's name is in italics):

**Understanding colony level prevalence and intensity of honey bee gut parasite, *Nosema ceranae***, *Cameron J. Jack* and Ramesh R. Sagili

**Tracking bumble bee (Hymenoptera: Apoidea) movement and behavior using wireless microchip sensors**, *Alex Hazelhurst*, Sujaya Rao, Arun Natarajan and Jian Kang

**Genetic consequences of climate change in aquatic, arid-land populations**, *Emily E. Hartfield Kirk*, Ivan C. Phillipsen and David A. Lytle

**Evaluating the Quality of Pollen Resources in Urban and Rural Environments: Impacts on Honeybee Colony Health**, *Stephanie Parreira* and Ramesh Sagili

**Efficacy of entomopathogenic fungi and nematodes against the clover root borer (Coleoptera: Curculionidae: Scolytinae)**, *Anis S. Lestari* and Sujaya Rao

**What's the plan of attack? Responding to new invasive species**, *Jimmy Klick*

**Mortality of bumble bees (Hymenoptera: Apoidea: Apiformes) associated with foraging behavior on linden (*Tilia* species)**, *Adriana Argoti* and Sujaya Rao

**Trap design and Bait Preferences for *Drosophila suzukii***, *Monica Marcus* and Amy J. Dreves

**Crop diversity and landscape effects on the distribution of potato psyllids and aphids in the Pacific Northwest**, *Matthew Klein* and Silvia Rondon

**Some rare and interesting lepturines from Oregon (Coleoptera: Cerambycidae: Lepturinae)**, *Phil Schapker*

**Discovering the overwintering habits of *Drosophila suzukii***, *Alex Hughan*, Amy Dreves and Amanda Ohrn

One oral paper was scheduled but not presented:

**Assessing relationships of stand structure to defoliation by the pine butterfly in the Malheur National Forest, Oregon**, Ari DeMarco, Dave Shaw, Rob Flowers and Lia Spiegel

There were four poster papers:

**Explorations in impacts of fumagillin and tylosin treatments on the honey bee (*Apis mellifera* L.) midgut microbiome in vivo**, Ann C. Bernert and Ramesh Sagili

**Exploring anti-fungal properties of spotted-wing *Drosophila* larvae**, Ann C. Bernert and Ken Johnson

**Horizontal transfer of entomopathogenic fungus, *Beauveria bassiana*, between clover root borer beetles**, Leeandra Rickard, Sujaya Rao and Anis Lestari

**Robber Flies of Oregon (Diptera: Asilidae)**, Chris Cohen and Christopher J. Marshall

By way of clarification *Drosophila suzukii* is also called the spotted-wing *Drosophila* (SWD). More information on this insect and other invasive, non-native insects can be found in the Insect Pest Prevention and Management (IPPM) Section of the Oregon Department of Agriculture's web site, <<http://www.oregon.gov/ODA/plant/ippm/pages/index.aspx>>.

To learn more about the entomology program at Oregon State University and the people involved please visit <<http://entomology.oregonstate.edu/>>. If you are interested in learning more about some of the graduate research being carried out at OSU, look through the theses on the library's web site, <<http://oasis.oregonstate.edu/>>. Recent theses are available as PDF files which can be downloaded from the web site.

### Taylor's Checkerspot (Lepidoptera: Nymphalidae) Listed

Effective 4 November 2013, *Euphydryas editha taylori* (Taylor's Checkerspot) has been given endangered species status by the US Fish and Wildlife Service under the Endangered Species Act of 1973. Its current range is listed as:

- Oregon: Benton County
- Washington: Clallam, Pierce, Thurston counties
- Canada: British Columbia

The full ruling is included in the online document at <<http://www.regulations.gov/#!documentDetail;D=FW5-R1-ES-2012-0080-0091>>.

### Entomological Society of America (ESA)

#### Entomology 2014—Grand Challenges Beyond Our Horizons

The next annual meeting of the ESA will be held in Oregon Convention Center, Portland, Oregon on 16–19 November 2014.

Visit the ESA's web site, <<http://www.entsoc.org/entomology2014>>, for details as they become available.

## Call For Journal Donations *Jon Shepard*

The call for donations to the OSAC library of missing journal issues of entomological journals has been very successful for Canadian journals.

Many thanks to Norm Anderson (OSU, faculty emeritus), Peter Wood (Selkirk College, Castlegar, B.C., faculty emeritus) and Dean Morewood of Ottawa, Ontario (Toronto Entomological Society, treasurer).

Current holding in the OSAC library are detailed below:

Boreus: 1-, 1981-

OSAC: 1(2), 8(1)–9(1), 10(1)–21(1), 22(1)–29(1) (2009).

Bulletin of the Entomological Society of Canada: 1–, 1969–

OSAC: 1–9, 10(2), 11(2–3), 12(1), 15(4), 20(3)–25, 26(3)–27(2), 27(4), 28(2)–31(2), 31(4)–41(3), 42(1)–44 (2012).

Canadian Entomologist: 1–, 1869–

OSAC: 75(5), 79–81, 82(6–9), 84(12), 85, 86(6, 10–12), 87(8), 88(1–6, 8–11), 89(1–7, 9–12), 90–125, 126(1–4,6), 127–128, 129(2–6), 130–140 (2008).

Memoirs of the Entomological Society of Canada (formerly Supplement): 1–171, 1955–1997.

OSAC: lacks 11, 16, 19, 32, 45, 95, 115, 117–120, 125, 127, 129–133, 135–137, 139–140, 160.

Proceedings/Journal of the Entomological Society of British Columbia: 1–, 1911–

OSAC: 1–108 (2011).

Proceedings of the Entomological Society of Ontario (formerly Annual Report of the Entomological Society of Ontario): 1–, 1870–

OSAC: 83–107, 119–143 (2012).

Any help filling in the remaining gaps would be greatly appreciated. For more information or to inquire about other possible donations please contact Jon Shepard, <shep.1ep@netidea.com> or (250) 352-3028.

## Invertebrate Classes at Siskiyou Field Institute

The Siskiyou Field Institute located in Selma, Oregon offers field courses in the natural sciences. This year's invertebrate subjects include "Terrestrial Mollusks" on 17–18 April, "Insects of the Evening" on 31 May, "Butterflies of the Siskiyou Region" on 21–22 June, "Introduction to" and "Intermediate Dragonflies of the State of Jefferson" on 19–20 July, and "Solitary Wasps and Bees" on 1–2 August. For more information on these courses and other offerings please visit <<http://www.thesfi.org/>>.

## Custom Vintage Insect Cabinet for Sale

Beautiful, 40-drawer, vintage insect cabinet for sale. Custom hardwood (cherry?) cabinet and drawers. Quality craftsmanship. Drawers with wood bottoms, no pinning foam. Cabinet dimensions 29.5"L × 19"W × 62.5"H. Drawer dimensions 12"L × 17"W × 2.5"H. Can deliver in Willamette Valley, or Portland/Vancouver area. \$300 OBO. Contact: Alan Mudge, (541) 327-1939, <[alandm@peak.org](mailto:alandm@peak.org)>, for more info and photos.



## North American Butterfly Association (NABA)

### Eugene–Springfield Chapter Meeting

Dr. Kathleen Prudic will speak at the next meeting of the Eugene–Springfield Chapter of NABA on Monday, 14 April 2014. Her presentation is titled "Flying Circus: The How and Why of Butterfly Wing Patterns".

Time: 7:00 p.m. Friends and Food  
7:30 p.m. Presentation

Location: Eugene Garden Club, 1645 High St., Eugene  
Cost: FREE

For information about the group and its activities visit their web site, <<http://www.naba.org/chapters/nabaes/>>.



## Cross-breeding Experiments with *Speyeria* and other Greater Fritillaries (Lepidoptera: Nymphalidae)

If you have been having trouble identifying the greater fritillary butterflies, and even if you haven't, you might want to read the recent paper by local lepidopterists Paul Hammond and Dave McCorkle with William Bergman from Michigan.

The authors note in the abstract that all but two species of the North American genus *Speyeria* "appear to be inter-fertile in hybrid crosses". They postulate that "inter-species gene flow through hybridization accidents in nature has been important in the evolutionary history of this genus". The reference is:

Hammond, P.C., D.V. McCorkle and W. Bergman. 2013. Hybridization Studies of Genomic Compatibility and Phenotypic Expression in the Greater Fritillary Butterflies (Nymphalidae: Argynniini). *Journal of the Lepidopterists' Society* 67(4): 263–273.

(If you are unfamiliar with the different species of *Speyeria*, you might want to find a book that will allow you to compare the various species representatives with the results of the hybridization experiments shown in the very nice color plates.)

### 2014 Aeshna Blitz

This year's annual gathering of those who are insane for Oregon's Odonata is scheduled for the weekend of 22 August at Cottonwood Meadows Lake campground (not Cottonwood Res.) northwest of Lakeview off Hwy 140. We'll also look at any other lakes and streams in the area and plan to get over to the Chewaucan River. All are welcome.

Contact Jim Johnson at <jt\_johnson@comcast.net> or Steve Valley <svalley2@comcast.net> if you plan to attend.

### 36th Northwest Lepidopterists' Workshop

This year's Northwest Lepidopterists' Workshop will take place at Oregon State University on the weekend of 18-19 October 2014.

The groups of emphasis will be:

- Butterflies: Acmonoid Blues and Hairstreaks
- Moths: general moths, Pyralidae

The latest information available can be found at <<http://osac.science.oregonstate.edu/2014PNWLEPWorkshop>>. The full schedule will be included in the Fall Bulletin.

### Correction for Winter 2013 Bulletin

Rick Westcott pointed out an error in the Winter 2013 issue of the Bulletin. In the Washington State Summary, on page 19, I wrote: Ray Stanford saw *Asterocampus* sp. (Emperor) in the Snake River Canyon in Whitcome County near the Idaho border last year. The text should read: Ray Stanford saw *Asterocampa* sp. (Emperor) in the Snake River Canyon in Whitman County near the Idaho border last year. My apologies to Ray for the error and any confusion it may have caused, and thanks to Rick for pointing it out. — Ron Lyons



*Brepheos infans* (left) and *Annaphila danistica*. Two early spring day-flying moths collected by Dana Ross and his son, Zane, along the Metolius River (Jefferson County, Oregon) in early March 2013. Photographs by Dana Ross.