Carabid beetles (Coleoptera, Carabidae) of the Pacific Northwest, USA:  
Scaphinotus (Pseudonomaretus) mannii Wickham (Cychrini)  
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Introduction

Two of the most exciting tasks for field entomologists are prospecting for new species or attempting to recollect extremely rare or lost species (species incognitus; Bergdahl 2013). The focus of most of my carabid beetle collecting over the last 15 years has primarily been the fauna associated with small streams in the Pacific Northwest, especially documenting the geographic distribution and ecology of the swarm of regionally endemic species in the subgenus Pterostichus (Pseudoferonia Ball). It took me many years to develop this focus. There are now nine described Pseudoferonia species. They are only found in Washington, Idaho or Oregon. They are all hygrophilic, flightless, black beetles, about 10 mm long, and strictly associated with the wet margins of small montane streams, primarily in forested country (Bergdahl & Kavanaugh 2011). There are a number of other endemic carabid beetle species in the Pacific Northwest that are comparatively rare in collections also found exclusively in this type of wetland habitat (Bergdahl 2012). One of these species may be Scaphinotus (Pseudonomaretus) mannii Wickham, 1919, since the few published habitat records suggest it is associated with riparian zones of small streams.

Figure 1. Habitus photos of Scaphinotus mannii, S. regularis, S. relictus, and S. merkelii. The bar on the right hand side represents 1 cm. Ron Lyons photo.

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The adults of *Scaphinotus mannii* are among the largest beetles in the Pacific Northwest (≈23 mm), and arguably one of the rarest carabids in the region. The species is known from only four sites. It may be extinct at its type locality (LaBonte 1995). Only one of the populations has been reasonably well documented, and its conservation status is questionable due to cattle grazing. In an assessment of ten potentially at-risk predaceous beetle species in the Columbia Basin, LaBonte (1995: 25) concluded *S. mannii* is at the greatest risk, and: “Based on the available data, Scaphinotus mannii appears to be imminently threatened or endangered throughout its known range.” Yet no significant change in its formal listing status has been made since then by any state or federal wildlife agency, and the species remains largely helpless in a region heavily impacted by human activity, and by the real possibility of long-term climate warming and drying. The species has recently been upgraded to “candidate” status by Washington State (<http://www1.dnr.wa.gov/nhp/refdesk/lists/animal_ranks.html>), but the State of Oregon has not done similarly (<http://orbic.pdx.edu/documents/2013-inverts.pdf>). Candidate status does not provide any significant protection. Fortunately, the “rank” of *S. mannii* has been reasonably assessed by the NatureServe/National Heritage Network as G1 (critically imperiled globally) and S1 (critically imperiled locally). Clearly there is a huge discrepancy between state and federal listing status and NatureServe’s ranking for this beetle.

Threatened, endangered or sensitive insect species in need of special attention are especially annoying to most farmers, ranchers, foresters, water resource managers, and real estate developers. There appears to be a concerted effort to keep most of them from getting any significant formal conservation listing by state and federal agencies. The excuse is typically there is not enough information to make a status determination. Comparatively rare, localized insect species will always be somewhat elusive and enigmatic, and therefore problematic for wildlife managers. Hence there will be a need for more information about them. If an at-risk species is not listed, there is little chance public agencies or other conservation organizations will devote any of their resources towards research on them, and therefore they remain *species incognitae*.

A conservative approach to biodiversity stewardship employing precautionary principles suggests at some point entomologists should take the big step forward and demand formal listing of those species suspected of being in constant need of at least some special habitat conservation given current trends in human impacts on our landscape. Their listing status should be at a level that assures these species receive some investment in resources for research. Our efforts should not be limited to only the pretty species that the general public my already be in love with, such as butterflies. There is no evidence that butterflies are reliable conservation umbrellas and indicators of biogeographic patterns among the huge quantity of species diversity in other terrestrial invertebrate taxa (Andelman & Fagan 2000). Our focus regarding listings should be on regional endemics in all insect taxa for many reasons, such as their small geographic range. Only their natural history tells us about unique historical events in the evolutionary history of our fauna, if we are willing to be good students and stewards. If we neglect to assume this responsibility, our complacency could eventually lead to the loss of priceless information.

It is impossible to advance our knowledge of very rare species without openly discussing specific details of their known localities, which must make these populations more vulnerable. For very sedentary species with extremely low dispersal power that are known from very few localities, conservation measures should include some restrictions on collecting at known localities, especially if an at-risk species appears to occupy a very well-defined, spatially-restricted habitat. This would help avoid the risk of extirpations caused by over-collecting by entomologists (New 2010). *Scaphinotus mannii* is possibly an excellent example of such an insect from the Pacific Northwest . . . more field research needs to be accomplished.

In June 2014, Glada McIntyre and I had the opportunity to hand-collect carabid beetles in the Wallowa Mountains of northeast Oregon. On this trip we spent a day looking for *Scaphinotus mannii* in the Troy area (Wallowa County, Oregon) along the Grande Ronde River, one of this species’ four known localities (Westcott et al. 2006). This is the only known site of the species in Oregon, although it is probably more widespread in this area. This report is a brief summary of what little is known about this remarkable, apparently rare beetle, including some comments on the other three species in the subgenus *Scaphinotus* (*Pseudonomareus*).

### Systematic Account of Species of *Scaphinotus* Subgenus *Pseudonomareus* and Their Geographic Range

**Class** Insecta  
**Order** Coleoptera  
**Suborder** Geadephaga  
**Family** Carabidae  
**Subfamily** Carabinae  
**Tribe** Cychrini  
**Genus** Scaphinotus Dejean, 1826

**Subgenus Pseudonomareus** Roeschke, 1907

1. *S. (P) relictus* (G.H. Horn, 1881) [AB, BC, ID, MT, WA, (OR3)]
2. *S. (P) regularis* (LeConte, 1884) [BC, ID, WA, (OR?, MT?)]
3. *S. (P) mekelii* (G.H. Horn, 1890) [BC, ID, MT, (WA?)]
4. *S. (P) mannii* Wickham, 1919 [OR, WA, (ID?)]

The above nomenclature follows Bousquet (2012). Gidaspow (1973: 74) provides a key to all four of these species. Hatch (1953) includes these species in his key, but incorrectly decided *S. regularis* was a variety of *S. relictus*. Lindroth (1961: 20) does the same, and does not include *S. mannii*, probably because he never saw any specimens. Hatch (1953), Lindroth (1961, 1969), and Gidaspow (1968, 1973) provide excellent keys that include most of the other Pacific Northwest carabid species in the tribe Cychrini.
Species Notes

I have personally collected many specimens of Pseudonomaretus, except for S. manii, which is in my opinion very enigmatic. The range of Pseudonomaretus species is primarily the west slope of the Rocky Mountains in the Columbia River watershed. The only other cychrines occurring within this region are Cytherus hemphillii G.H. Horn, Scaphinotus (Brennus) marginatus (Fischer), and Scaphinotus (Stenocanththus) angusticollis (Fischer). All of these carabids are large bodied, very distinct, and easily separated from the four Pseudonomaretus species. Within this region, S. marginatus and S. relictus are the most commonly encountered cychrines. In British Columbia’s West Kootenay region, S. angusticollis, a coastal disjunct, is also commonly collected north of Kootenay Lake, which must be the result of an ancient, somewhat localized, successful dispersal opportunity.

With the exception of Scaphinotus relictus, Pseudonomaretus species have fairly small geographic distributions compared to other Pacific Northwest carabids. They are also fairly rare in collections, and are not that easy to find in the field, even when you are in regions where they are known to occur and you are hunting in the right habitat. In my experience S. manii is by far the rarest and least understood Pseudonomaretus. I do not think this is an artifact of insufficient sampling. Although, as with many infrequently collected insect species, once S. manii’s habitat and seasonality are better defined by focused field surveys, its geographic range and representation in collections may become much greater. With the exception of S. manii, which has only been recorded in the steppe region where Oregon, Washington and Idaho meet (ca. the Lewiston–Clarkston area; see habitat photos), all of the species appear to inhabit primarily forested ecoregions.

Within this small subgenus, S. manii and S. regularis adults are the largest in overall body size (up to ~23 mm), although the largest S. manii are a little longer than the biggest S. regularis. This is fairly large for a carabid beetle in the Pacific Northwest; the average body size of the ~710 species in this region is ~7 mm (range=1.5–29 mm; Bergdahl 2012). S. relictus adults are slightly smaller, ~16–20 mm. S. merkeli are significantly smaller than the other three (~10–13 mm). Mature S. relictus and S. regularis are typically black in color, whereas S. manii are usually dark brown, and S. merkeli are piceus. (Note: S. merkeli may have a faint bronze or slight green iridescent sheen.)

Scaphinotus relictus (Figure 1) – Body length=13–20 mm.
Type locality: Spokane, Spokane County, Washington.

This is by far the most widespread and commonly collected Pseudonomaretus species. It can be found on the east slope of the Rockies in Alberta from the southern headwater of the Peace River near Willmore Wilderness Park south into northwest Montana. In British Columbia this species is widespread in the Columbia Mountains (Monashee, Selkirk and Purcell ranges). In British Columbia it ranges at least as far north as the Revelstoke area, and westward to the east slopes of the Cascade Mountains near Princeton. In Washington it can be found in the forested ecoregions in the northeast sector of the state, and in the Blue Mountains in southeast Washington. It is extremely common in forests of northeast Washington. In northern Idaho, it ranges at least as far south as Latah County. Bouquet (2012) includes western Montana in its range. Russell (1968) reported a record from the Clark Fork River 13 miles northeast of St. Regis (Sanders County). It may be more widespread in the northwestern-most sector of Montana, however Edwards (1975) did not record the beetle in his many years of collecting carabids in Glacier National Park (109 species). According to Gidaspow (1973), there are records from near Kerby (Josephine County) in southwest Oregon, and from northern California, but these are probably mistakes. It would not be too surprising if populations of S. relictus were eventually discovered in northeast Oregon.

Scaphinotus relictus is most definitely not a hygrophilic—it is a mesophilic upland species. This may help explain its much larger geographic distribution compared to the other three Pseudonomaretus species, and its superior ability to colonize formerly glaciated terrain in Canada since the close of the Pleistocene.

Scaphinotus regularis (Figure 1) – Body length=12–22 mm.
Bosquet (2012) reviews the questionable status of this species by Roeschke (1907: 163), Lindroth (1961: 20), and Hatch (1953: 45). I agree with Gidaspow (1973: 77) and Bouquet (2012) that it is a valid species.

Type locality: Coeur d’Alene Mountains, Kootenai and Shoshone Counties, north Idaho.

The northern extent of this species in southeast British Columbia is unclear; both Hatch (1953) and Lindroth (1961: 20) unfortunately lumped it as a variety of S. relictus. Gidaspow (1973) mentions records from Kaslo and the Penticton area. In eastern Washington there are records from only Whitman County. In Idaho’s Bitterroot Mountains the species can be found at least as far south as Lemhi County. I have records in my collection for as far south as western Idaho as Banks (Boise County, Idaho). Given the number of records near the crest of the Bitterroot Mountains it would not be too surprising to find this species in Montana on the east slope of the Bitterroots as well. Scaphinotus regularis is common in the Seven Devils Mountains (Idaho) within miles of the Oregon border so it would not be too surprising if the species was eventually found in Oregon in Wallowa County if Hells Canyon is not a terminal dispersal barrier (Figure 2).

As mentioned above, Hatch (1953) and Lindroth (1961) considered S. regularis a variety of S. relictus, but Gidaspow (1973) determined that the two forms differ distinctly in elytral sculpture.
and male genitalia. The abdomen and elytra of *S. regularis* are also typically noticeably wider than *S. relictus*. Also, unlike *S. relictus*, I usually find them in the riparian zone of small streams. There is the possibility *S. regularis* is primarily a hygrophile.

Teneral adults: I have many specimens in my collection that were collected teneral in late August, from both low and high elevations in central Idaho.

*Scaphinotus merkelii* (Figure 1) – Body length=10–13 mm.
Type locality: Coeur d’Alene, Kootenai County, north Idaho.

This species has been found in southeast British Columbia only in the vicinity of Creston and Wynndel near the south end of Kootenay Lake, very close to the Idaho border. The species is fairly easy to find in the St. Joe River Basin (Shoshone County, Idaho). The species can be found in the front ranges of the Bitterroot Mountains in Idaho (near the Washington border) in Benewah and Latah Counties (e.g. Moscow Mountain near Moscow), but there do not appear to be any records of it occurring in Washington. I have never seen the species on Mica Peak or Mt. Spokane (Spokane County, Washington), yet both massifs seem to provide excellent habitat within miles of the Idaho border and its type locality. I have collected the species as far south in Idaho as the Gospel Hump Wilderness Area (small unnamed creek, 6800 feet elevation, Middle Fork Slate/Salmon River watershed, 20 miles SSE of Grangeville, Idaho County, 06 August 2009). This is the southernmost record of the species that I am aware of. In Montana, Russell (1968) reports records from specimens caught in pitfall traps at 4200 feet near Lookout Pass (Mineral County, Interstate 90 at Idaho border). Its range in Montana is probably restricted to the eastern slopes of the Bitterroot Mountains.

This is the odd species in the subgenus; for instance, it has a significantly smaller body size, the fourth antennal segments are pubescent, the median lobe of the male aedeagus is much thinner than the other species, adults are rarely black, and some individuals have an iridescent sheen. According to Gidaspow (1973: 75) this species bridges the gap between *Pseudonomatetus* and *Scaphinotus* (Maronetus). Roeschke (1907), Hatch (1953), Lindroth (1961), Gidaspow (1973), and Bouquet (2012) all consider *Cyclus idahoensis* Webb, 1901 a synonym of *S. merkelii*.

As with *S. regularis*, I usually find *S. merkelii* in the riparian zone of small streams, and the two species may be found at the same site. There is the possibility *S. merkelii* is primarily a hygrophile.

*Scaphinotus manni* also co-occurs with *S. marginatus*, and the two species look very similar, however they can be easily separated since *S. merkelii* has two sets of setae along the edge of its pronotum, whereas *S. marginatus* has only one set.

*Scaphinotus manni* – see below.

**Species Account of Scaphinotus manni**

*Scaphinotus manni* (Figure 1) – Body length=16–23 mm.
Type locality: Wawai, Whitman County, Washington.
The type specimen is at the National Museum of Natural History (Smithsonian Institution, Washington, DC).
Range=USA: southeast Washington and northeast Oregon.

This species has only been recorded at four localities—three in southeast Washington (Whitman and Asotin Counties), and one in northeast Oregon (Wallowa County) -3 miles south of the Washington border. The species has not been recorded in Idaho, but there is a good probability some populations will eventually be found along the Snake and lower Clearwater Rivers in the Lewiston area in Idaho.

Gidaspow (1973) lists Asotin (Asotin County, Washington), but does not provide any other locality information. Asotin (~765 feet elevation) is on the Snake River ~6 miles south of Clarkston.

The two Whitman County sites are Wawai (Gidaspow 1973: 75) (~765 feet elevation; Figures 3–5) and Steptoe Canyon Creek (Greene 1975) (~930 feet elevation; Figures 6–7). These two localities are ~16 miles apart, and located on the steep, south-facing basalt breaks of the canyon of the lower Snake River, ~23 miles downstream (west of) from Lewiston (Idaho). The upper elevations of these dry breaks abut the great Palouse farmlands. Trees (primarily deciduous species, e.g. *Alnus, Populus*, and *Robinia*) along the lower Snake River are now largely confined to gallery forest in the riparian zone of creeks, most of which are small and temporary. The vegetation of the region is primarily dry, wind-blown steppe/grassland. Scrub thickets occur on some hillsides, especially in areas that escape the full force of wind and sun. Direct and indirect impacts on native habitats in this area by humans are very significant. They include widespread, large-scale farming of
the Palouse grasslands, cattle ranching on the steppe canyon breaks, and recreation. There is also a very long stretch of nearly continuous, run-of-the-river impoundments of the lower Snake River by the four dams between Lewiston (Idaho) and Pasco (Washington). The pattern of seasonal flow (hydrographs) and water quality of the many small streams in the area has been severely impacted by changes in snow melt, soil permeability, silt load (erosion), and pesticide pollution from large-scale agriculture on the Palouse grasslands, and by cattle ranching on the Snake River canyon breaks.

Wickham’s (1919) original description of the species is based on three specimens collected by William M. Mann at Wawawai on 20, 27, and 28 March, and one specimen from Wawawai collected by C.V. Piper on 14 May. He does not mention the year they were collected. Mann [1886–1960] worked for the United States Bureau of Entomology early in his career and then became director of the National Zoological Park in Washington, DC. Mann worked primarily on ants, termites and myrmecophilous insects, such as staphylinids (Bouquet 2012). Wickham does not mention where exactly in the Wawawai area the beetles were collected; presumably they were found in the vicinity of what is now Wawawai County.
Park, or the county road in that area. Early in the 1900s, paddle-wheel ferryboats were a primary means of transportation along the lower Columbia and Snake River. There was a ferryboat landing at Wawawai and an old wagon road to Pullman (Washington) and Moscow (Idaho) (Lever 1901). Consequently, entomologists enroute to and from the old agricultural colleges now known as Washington State University and University of Idaho regularly collected at Wawawai. Albert Greene (pers. comm., 18 December 2014) collected a couple *Scaphinotus marnitii* at Wawawai in ~1975, but I know of no reports of any records after that date. Wawawai is also the type locality for *Pterostichus (Pseudoferonina) lanei* Van Dyke, 1925, an equally rare and enigmatic, flightless carabid endemic to the Pacific Northwest. The Steptoe Canyon site is very well documented by Greene (1975), and *S. marnitii* has been seen there recently.

Hatch (1953) indicates records of *Scaphinotus marnitii* from northeast Oregon, but the only known reliable record from Oregon is apparently a single specimen collected by James R. LaBonte on 05 June 1998, "1 km E Troy T5N R43E Sec 4, elev. 490 m . . . under a log in remnant riparian stand of cottonwood" (Westcott et al. 2006). This site (1607 feet elevation; Figures 8–10) is on the Grande Ronde River ~3 miles south of the Washington border, a little upstream of Highway 3, which runs between Clarkston and Enterprise. The Troy site appears to be in the small, lower Bear Creek parcel of the Wenaha State Wildlife Area.

Wawawai, Steptoe Canyon, Asotin and Troy are in the Canyons and Dissected Uplands ecoregion of the Columbia Plateau region. Annual rainfall of this area ranges from 25–60 mm (~10-23 inches). The canyons of this region typically have very steep relief, whereas the uplands cover great expanses with low relief that are now mostly under cultivation. The four localities all fall within a 50-mile diameter circle.

Discussion

Diversity

The carabid beetle tribe Cychrini is a well-defined and most likely a monophyletic group of ~200 species restricted to the Northern Hemisphere (Bousquet 2012), currently classified in four genera:

*Cychrus* Fabricius, 1794: ~115 species in the Nearctic (2 species) and Palaearctic regions,

*Scaphinotus* Dejean, 1826: 55 species in the boreal and temperate regions of North America and the Sierra Madre Occidental in Mexico,

*Sphaeroderus* Dejean, 1831: 6 species restricted to the boreal and temperate regions of eastern North America,

*Cychropsis* Boileau, 1901: ~25 Asian species.

Many cychrine species have adults with long thin heads and jaws, thin pronota, and wide abdomens and elytra, giving them a distinct habitus profile (Figure 1). They are all apterous or extremely brachypterous and therefore flightless. The elytra are fused, suggesting they have been flightless for perhaps millions of years. [See photos at the website Carabidae of the World, <http://carabidae.org>.] The tribe is no doubt derived from very ancient stock.

Figure 8. Looking south across Grande Ronde River, ca. 1 mile east of Troy at Bear Creek, 14 June 2014. J.C. Bergdahl photo.

Figure 9. Bear Creek gallery forest, ca. 1 mile east of Troy, 14 June 2014. J.C. Bergdahl photo.

Figure 10. Bear Creek, 14 June 2014. A 1 hour sample here included: 5 *Scaphinotus marginatus*, 6 *Platynus bruneomarginatus* (Mannerheim), 1 *Nebria eschscholtzi* Menétriers, 4 *Nebria gouleti* Kavanaugh, and 3 *Agonum decorum* (Say). J.C. Bergdahl photo.
Their long thin jaws and heads, and narrow pronota, are supposedly adaptations for feeding on mollusks, however the feeding habits of very few cyprinid species have been investigated in the field. Regarding cyprinids, Lindroth (1961: 13) states: “This is an unusually clear-cut unit, above all stamped by the narrow, prolonged head, apparently an adaptation to feeding on shell-bearing snails.” Many of the species probably have a much more catholic diet.

While night collecting over many years in the San Juan Islands, I frequently observed adults eating worms, and ripe sand berries and salmonberries. The unique morphology of cyprinid larvae and their habit of eating mollusks is discussed below.

Roeschke (1907) reviewed all of the cyprinid species known at the time. Gidaspow (1968, 1973) reviewed many of the North American cyprinids, including keys to many of the species in many of the subgenera. The relationships between the four cyprinid genera have not been documented, however Erwin (2007) suggests the two North American genera, Scaphirhinchus and Sphaeroderus, are sister groups, although this has yet to be verified with molecular data.

**Habitat**

Allen & Carlton (1988) describe two of the most recently described Scaphirhinchus species. They state: “There are two large cyprinid faunas, one eastern and one western. . . . Many cyprinid species appear to be endemic to specific mountain tops or at least to specific mountain ranges. There is also a lowland fauna consisting of a number of distinct species in several subgenera in Scaphirhinchus.” Regarding Scaphirhinchus Lindroth (1961: 15) states: “Many species, especially in the mountains of the south, have a very limited distribution. There is a strong tendency towards subspecialization in some groups and much difficulty in defining the species . . . .” Gidaspow (1968: 137) states: “Nearly all of the [Scaphirhinchus (Brennum)] inhabit the forests and ravines in California mountains ranges and can be collected under logs and rocks during almost the entire year. . . . (and the two non-Californian species can be found from) May until late in August.”

Regarding cyprinids in general, Lindroth (1961: 14) states: “Almost all species are confined to forest country. They are nocturnal. Most species seem to hibernate as larvae, at least in part.” Collection records suggest the adults can be found throughout the active season, which is year-round in the coastal regions with mild winters. In the Puget Sound lowlands of Washington, adult Cyprinus appear to be primarily summer active, whereas adult Scaphirhinchus are primarily spring and fall active. I ran pitfall traps continuously over many years in the San Juan Islands, where there are four cyprinid species with “checkerboard” inter-island distributions. On some of the islands typically rare cyprinid species (whose habits are usually difficult to define) are fairly common because widespread common species are absent, especially Scaphirhinchus angusticollis, an extremely common tramp-like species in the Puget Sound lowlands.

Regarding S. manni, LaBonte (1995) states: “These beetles are apparently confined to riparian strips in the canyons lowland (~200 meters elevation) tributaries of the Snake River . . . restricted to forested areas with dense canopies.” LaBonte et al. (2001: 192) conclude Scaphirhinchus manni is “reliant on streamside forests.” Greene’s (1975: Table 3) pitfall trap records show that S. manni was most frequently trapped along Steptoe Creek in areas with a canopy created by the deciduous syringa (Philadelphus lewisii Pursh., Hydrangeaceae), reaching ~3 meters high, and probably best described as a tall-shrub thicket. They were also trapped along creek sections with a taller deciduous canopy created by Alnus rhombifolia Nutt.; however a similar number were trapped along sections of the creek without any canopy at all. They were rarely trapped along waterless sections of the creek bed.

Although there is insufficient field data to make a definitive conclusion at this time, in my experience S. manni, S. regularis, and S. merkelii may be primarily associated with the margins of small streams (0–2 order). That is, regarding habitat preference, they may be best described as ripiculous hygrophiles. For reasons that have not been very well defined, in the Pacific Northwest these wetland habitats tend to have a disproportionate number of endemic invertebrate species (Dietrich & Anderson 2000). This is probably the result of very long-term ecological and evolutionary processes embodied in the so-called “taxon cycle,” whereby populations of once widespread species with high powers of dispersal become isolated in restricted habitats and regions, and eventually evolve into new species with low dispersal power (e.g. Darlington 1943; Wilson 1961; Erwin 1985; Howden 1985; Ricklefs & Bermingham 2002; Liebherr & Short 2006). The history and geographical ecology of small headwater streams may provide unique opportunities for the accumulation of endemic terrestrial invertebrates because:

1. the soil is moist year-round and the communities have high productivity subsidized by aquatic food webs,
2. small, low-order streams represent the vast majority of stream lengths in typical Pacific Northwest watersheds, and are therefore comparatively abundant,
3. due to much lower-level hydrographs their riparian zones are much more stable habitats (less disturbed by flooding) than the riparian zones of large higher-order streams,
4. when major freshets do occur it is easier for soil invertebrates to escape the flood plain because they are narrow; and
5. they are often geographically isolated in headwater basins, thereby restricting gene flow between populations (Arter 1990; Fagan 2002; Matern et al. 2009, 2010), and promoting speciation.

If Scaphirhinchus manni is a hygrophilic primarily associated with the banks of small permanent or intermittent shaded streams, this would severely restrict the amount of suitable habitat in the steppe region since creeks are comparatively rare there. Populations would also be much more isolated geographically, and more vulnerable to factors that may compromise habitat quality and population viability.
Life Cycle Characteristics and Larval Ecology

Although the carabid beetle fauna of the Pacific Northwest is very well documented, characteristics of the life history and larval ecology of the species are very poorly known, primarily because the immature stages are much more cryptic. However, thanks to the field research of Albert Greene (1975) while he was at Washington State University, characteristics of the life cycle and larval ecology of Scaphinotus manni in Steptoe Canyon are fairly well defined.

Like most large-bodied carabid beetle species, Scaphinotus manni is probably univoltine—that is there is one generation per year. In addition to the egg, pupa and adult stages, cychrine life cycles include 3 larval (grub) stages. Most individuals probably take about a year to complete development. Cychrine grubs are very distinctive (Thompson 1979): their nota and tergites are extremely wide, broadly overhanging the sides of the abdomen in all instars, giving the larvae a very flattened appearance. They have anal lobes armed with micro-crochets. The grubs typically occupy the same habitat and niche as the adults, although they are much less mobile. Many cychrine species are considered to be primarily molluscivores (although few comprehensive field studies on the composition of their diets have been published), and the same generalization may apply to their larvae. Among other things, Greene (1975) showed that Scaphinotus manni adults and larvae are slugs and snails both in the field and in his rearing chambers.

Some of the salient features of Scaphinotus manni’s life history at Steptoe Canyon are (Greene 1975):

Adults—

1. Old adults become active on the surface early in the spring during warm periods in March. These old adults appear to die during the upcoming summer; it is unclear if they lay eggs in the spring or summer before they die.
2. Young (teneral) adults begin surface activity later; especially during May and June they were common in his traps.
3. Trap records and hand-collecting indicates that after a brief period of activity following emergence the new adults enter a summer aestivation diapause or parapause. The females are not fully mature when they retreat for the summer.
4. Fully mature adults re-emerge late summer and early fall, although Greene trapped significantly fewer individuals than in May–June. Consequently, mature adults are much less active (trappable) or there was significant mortality during the summer. Presumably, the shortening of day length after summer solstice triggers maturation of oocytes in S. manni.
5. Copulation and egg laying probably occurs soon after late summer-fall emergence.
6. Adults begin retreating to hibernacula by late-October, although some were still found on the surface as late as mid-November. As indicated above, all the adults that survive the winter will presumably eventually die before or during the next summer.

Immature stages—

1. Eggs probably hatch within a few weeks of being laid, although some may wait a year. The 1st instar larvae are probably the least mobile of the 3 grub stages, but may have the shortest tenure before graduation to the next instar.
2. Greene hand-collected second and third (17–22 mm long) instars of S. manni in late winter and early spring.
3. Larvae are often found in small, excavated chambers under stones or logs, and they probably hibernate in similar protected cavities in the soil.
4. Larvae are rarely collected in pitfalls, suggesting they are significantly less mobile than adults.
5. In Greene’s garage laboratory, some larvae became active by early February, whereas some remained torpid until mid-March.
6. The only larva found eating in the field was consuming slug eggs (Derocea laeve [Muller]) on 23 February. Green observed a 3rd instar larva take 10 hours to completely consume a 12 mm long immature slug.
7. Some individuals probably spend more than 2 months as 3rd instars in the field.
8. Several days after excavating a pupal chamber, 3rd instar larvae begin pupating. The two individuals Greene was able to observe in his lab took 16–17 days from onset of pupation until the eclosion of the adult.
9. Greene estimated fresh adults become active on the surface (show up in traps) 3 days after eclosion. Therefore, pupation in the field presumably takes place primarily in April since there was a significant hatch of adults beginning in early May.
10. Adults take ~10 days to turn dark brown, however it may take 6–7 weeks for the elytra and sternites to fully harden; consequently over-wintered adults are easy to distinguish from fresh ones.

Understanding the life cycle characteristics of Scaphinotus manni is key to discovering new populations since they seem to be small, patchily distributed on the landscape, and adult surface activity is somewhat ephemeral. Clearly, any intensive survey work should focus on sampling during May and June, since, as Greene documented, these are the only months of the year when adults are commonly encountered active on the surface.

Phylogeography

One of the interesting attributes of Pseudonamaretus is their geographic range restriction to primarily the Columbia River basin of the Rocky Mountains. This area is clearly the taxa’s center of diversity, and therefore the species’ most likely place of origination/diversification. In this regard Pseudonamaretus probably shares an ancient history with the flightless carabids in the Ptero-stichus subgenus Pseudoferonia. Pseudoferonia’s center of diversity is the Bitterroot Mountains and foothills of central Idaho (6 species). Although, unlike Pseudonamaretus, it has been able to establish an outpost of 3 species in the Cascade and Coast Ranges of Washington and Oregon. The development of a robust hypothesis of how Pseudonamaretus and Pseudoferonia species have been able to diversify on this landscape and to predict the timing of the key events involved in their speciation will require molecular analysis.
Given our knowledge of the evolution of some other taxa in the region, some speculation of a rough estimate of the history of *Pseudonamnetus* in the Pacific Northwest is irresistible. The significant morphological differences among the four *Pseudonamnetus* species suggest their diversification took place as far back as the vast span of time of the Pliocene (~5–1.5 million years ago) when cool temperate coniferous forests similar to those of today first developed in the Pacific Northwest. The Pliocene experienced numerous climatic cycling events and probably major forest expansion-contraction cycles in the region. More recently, the Clearwater River basin, the heart of the geographic range of *Pseudonamnetus* today, supported numerous refugia during the Pleistocene that contributed to regional subspeciation (e.g. Brunsfeld et al. 2001; Brunsfeld & Sullivan 2006). Extreme topographic relief of central Idaho and northeast Oregon no doubt also enhances opportunities for speciation. This region was south of the southern limit of the Cordilleran Ice Sheet, however large ice caps occurred in the Wallowa and Seven Devils Mountains, on Gospel Hump and on many of the massifs in the upper Clearwater River country. The extant *Pseudonamnetus* species must have retreated into multiple glacial refugia in Idaho and Washington during the Pleistocene ice ages. Comparative molecular analysis may eventually suggest how many refugia there were for *Pseudonamnetus* and where they occurred on the regional landscape. Forest expansion and contraction cycles at low elevation in the Columbia Basin during the Pleistocene probably played a role in the distribution of *Scaphinotus maniii* today. During the ice ages forest zones retreated to lower elevations, although it is unclear how much further west Ponderosa pine and Douglas fir extended their range into the steppe region since the climate was probably also significantly drier than it is today. A thorough analysis of genetic variation in *Scaphinotus relicus* across its current range may reveal the location of ice age forest refugia in Canada north of the southern limit of the Cordilleran Ice Sheet. At some point in the ancient history of *Pseudonamnetus*, incipient *S. maniii* populations were probably isolated in drier habitats at the western edge of coniferous forests at lower elevation in the Columbia Basin in the Clearwater/Snake River region (Howden 1985). As already mentioned, I suspect a comparative gene analysis of *Pseudonamnetus* may suggest this event probably unfolded in the Pliocene.

Conservation

*Scaphinotus maniii* appears to be one of the rarest carabid beetle species in the Pacific Northwest since it is known from only four sites and very few specimens, all taken within a small region. This may not be an artifact of inadequate sampling. Entomologists have now had almost 100 years since its formal description by Wickham (1919) to document its range, yet records still suggest it is extremely localized. The carabid beetle fauna of the Pacific Northwest, including the Washington State University and University of Idaho region, has been fairly well documented over the last 150 years. Both of these universities have entomology departments, teach many undergraduate and graduate entomology classes, and have had many entomology students and professors collect the region over many decades. These campuses are within ~17 miles of *S. maniii*’s type locality at Wawawai. Given this long history of intense entomology in the area, if *S. maniii* was not extremely rare it should be much more common in collections (Allsopp 1997). Also, *S. maniii* is a very large beetle, and, as Gaston (1991: 507) showed: “Larger [beetles] are more likely to have been collected than smaller ones, because they tend to be both more conspicuous and easier to obtain using non-specialist techniques.” Large beetles are also usually much easier to accurately identify.

Regarding *S. maniii*’s status, LaBonte (1995: 25) states: “Based on the available data, *Scaphinotus maniii* appears to be imminently threatened or endangered throughout its known range.” LaBonte et al. (2001: 188) state: “Southeastern Washington populations are threatened by rural development, agriculture, understory vegetation destruction via livestock grazing and trampling, possible rangeland pesticide applications, habitat inundation via dams and other barriers to water flow, increasing pool depth of existing dams, and the possibility of increased frequency and intensity of seasonal flooding due to upstream deforestation...”

Greene (1975) also mentions threats caused by pesticide drift and runoff from the Palouse farmlands, where huge quantities of herbicides and insecticides are applied each year. At Wawawai County Park, *S. maniii*’s type locality, park managers regularly spray herbicides to control non-native blackberry bushes in the riparian zone of Wawawai Creek. Upstream from Wawawai Park, Washington State University owns and operates a central facility for cattle ranching (Wawawai Canyon Ranch). This farm is the source of much pollution in lower Wawawai Creek. A number of collectors have tried to find *S. maniii* at Wawawai, but as far as I know, no one has seen it there since Al Greene (pers. comm. 18 Dec 2014), who collected 2 specimens in ~1975, almost 40 years ago.

LaBonte et al. (2001) state: “Damming and permanent inundation can entirely eliminate populations of riparian species, as appears to be the case with at least one population of *Scaphinotus maniii*.” The population they refer to is probably Wawawai (see LaBonte 1995), and the inundation caused by Lower Granite Dam on the Snake River, beginning in June 1975. Based on Greene’s (1975) research it is unlikely the *S. maniii* population at Wawawai is/was dependent on the floodplain of the mainstem of the Snake River, or that this impoundment may have put it at much increased risk. Very few large-bodied flightless carabid beetle species have populations that successfully occupy the highly disturbed floodplains of large rivers in the Pacific Northwest. Collection records suggest *S. maniii* populations are associated with side creeks in this region.

Direct impacts of deforestation should also be added to the list of threats since over-harvesting can easily eliminate forest groves of conifer trees at the edge of their range in the steppe region (Langston 1995). By 1910, timber harvesting had been so severe in this region it pushed back the boundary of the Ponderosa pine–Douglas fir forest on the Palouse 10–12 miles (Fahey 1986). This distance is a long walk for a flightless insect.
At this time cattle grazing is most likely a serious threat to *S. mannii* populations since cattle are now common in the area and are attracted in large numbers to the few natural water sources in the steppe region. The steppe ecoregion along the breaks of the lower Snake River region is very dry and very few creeks are fully protected from access by cattle. Furthermore, before the development of massive farming operations on the Palouse, its tall-grass prairie was very effective at holding snow and rainwater, and springs and streams provided ample surface water. Many channels that are now dry except during the flood season were occupied by small permanent trout-bearing streams (Rockie 1939). These are the watersheds that feed the creeks descending the breaks of the Snake River Canyon. The widespread cultivation of the Palouse has caused stream hydrographs to be much more flashy, and caused many formerly permanent creeks to be temporary or intermittent, especially during summer and fall months when they are so important to native wildlife species in this region (Thomas 1979).

Given this, in my opinion, *S. mannii* deserves an immediate upgrade to at least sensitive-species status by government wildlife agencies in both Washington and Oregon, and by the United States Forest Service. Since the species probably occurs in Idaho, at least in the Lewiston area, government agencies in Idaho should also seriously consider listing the beetle. The United States Fish & Wildlife Service should also seriously consider the species for threatened or endangered status. Therefore it should be federally listed at least as a candidate for threatened or endangered status. It is debatable whether or not these agencies are actually interested in providing protection to anything more than a small proportion of the potentially at-risk insect species. They seem preoccupied with butterflies, as if that was good enough to meet the objectives defined by laws and regulations designed to protect threatened and endangered insect species. There is no mention of *Scaphinotus mannii* on Xeres Society's website, an international, non-profit insect conservation organization headquartered in Portland, Oregon, although they do have projects focused on some other beetle species from the Pacific Northwest.

This conclusion is consistent with LaBonte (1995). LaBonte et al. (2001) discuss the conservation and listing status of *Scaphinotus mannii* but fail to come to a similar conclusion, apparently because they feel there is insufficient information about the beetle and it will eventually be shown to be more widespread in the region. There is little evidence that any state or federal agencies have invested in any significant field research to improve our knowledge about the status of the species. Given this, it is perhaps not surprising that Whitman County Park sprays herbicides annually at Wawawai County Park on the floodplain of Wawawai Creek, the type locality of *S. mannii* and one of only four sites the species has been found at.

The only other *Scaphinotus* species in the Pacific Northwest that seems to be as rare as *S. mannii* is *S. longiceps* Van Dyke, 1924, which, according to Bousquet (2012), "is known only from a few specimens collected in Humboldt and Mendocino Counties (Weber & Kavannah 1992: 34), northern California." According to the BugGuide website, Kipling Will (University of California, Berkeley) also collected this species on 22 June 2008 in Del Norte County (California) along an un-named stream on the South Fork Smith River Road, in northwestern California (not far from the Oregon border). *Scaphinotus longiceps* is federally listed as a "potential candidate without sufficient data on vulnerability" (US Fish & Wildlife Service 1994). *Scaphinotus inflectus*, a highly restricted species from Arkansas, has the same federal status. The US Army Corps of Engineers (ACE) has jurisdiction over many miles of a linear corridor of property along both sides of the lower Snake River in the vicinity of Wawawai that must include a number of *S. mannii* populations. In some sectors of this corridor ACE jurisdiction extends miles away from the Snake River, such as at Nisqually John Canyon complex near Steptoe Creek. Consequently, some land use activity on federal property in the lower Snake River corridor may have a significant impact on *S. mannii* populations. Federal listing would obviously provide an impetus and some resources to better document the natural history of *S. mannii*.

It should be mentioned that the tiger beetle *Cicindela columbica* Hatch (Carabidae) is endemic to the same region as *S. mannii*, although *C. columbica* appears to have a significantly larger geographic range. This winged species’ habitat is large sandy beaches along the lower Salmon, Snake, and Columbia Rivers, which are very patchy in occurrence (Shook 1981). It is listed as critically imperiled in Idaho, and presumably extirpated in Washington and Oregon. The US Fish & Wildlife Service does not list the species. The US Bureau of Land Management lists it as sensitive. There are more populations of *C. columbica* known, and probably more specimens in collections than *S. mannii*.

Except for the Wenaha State Wildlife Area near Troy, no major protected areas occur within *S. mannii*’s known range. A long stretch of the Grande Ronde River ca. Troy (Figure 8) is designated as "Wild and Scenic." The Wenaha–Tucannon Wilderness Area is near Troy and populations of *S. mannii* may occur there, although, since Troy is significantly higher than the other three known sites, this protected area may be primarily too high in elevation for *S. mannii*.

Over more than 15 years I have extensively collected carabid beetle faunas associated with the margins of small streams in the lower Snake River and tributaries of central Idaho and have not seen any *S. mannii* there. The species appears to be quickly replaced by *S. regularis* east of Lewiston in the Douglas-fir zone in the foothills of the Bitterroot Mountains. *Scaphinotus merkeli* seems to be more common even further to the east at higher elevations in the hemlock-cedar zone in the heart of the Bitterroots. Therefore, it appears *S. mannii* is strictly associated with the steppe region of the lower Snake River watershed. I have collected carabids at Wawawai County Park and in the adjacent Army Corps of Engineers area on many occasions over many years, primarily in search of *Pterostichus lanei*, and have never seen *S.
mannii or any *P. lanei* there. Assuming both of these species were actually once collected at their type locality (Wawawai), hopefully both of them will eventually be re-collected there again. A comprehensive survey of the Canyons and Dissected Uplands ecoregion using intensive hand-collating and pitfall trapping, especially in spring months, would be an excellent project for students in entomology field courses at either Washington State University or the University of Idaho. Assuming *S. mannii* is closely associated with the riparian zones of small creeks descending steep breaks in the lower Snake River country, surveys for the species should focus on sampling these habitats in the lower Snake country in Washington, Oregon and Idaho. North-facing, cooler slopes are much wetter, and support many more small creeks; however these slopes often have very poor road access.

In closing, I would like to point out how ridiculous some of the common names being given to insect species by wildlife managers are, such as “Mann’s mollusk-eating ground beetle” for *Sphagnitrus mannii*. This species recently made its debut in the literature and will presumably forever be attached to this fascinating beetle. Twenty years ago the US Fish & Wildlife Service (1994) concluded: “The flux in common names, the inclusion of vernacular and composite subspecific names, and the fact that a majority of invertebrates still lack a standardized name combine to make common names relatively useless . . .” Surprisingly, for reasons that are unclear, many government agencies and other organizations still promote their use. Presumably they are easier for some people to use, despite their length. Over the last twenty years, thanks to basic invertebrate biodiversity research that depends on state-of-the-art methods for species delineation and classification, the names of valid species and subspecies has improved and stabilized immensely in many taxa. This is certainly the case for most carabid beetle genera in North America (Bousquet 2012). Scientific names should be sufficient for everyone, and all applications. For instance, many children refer to dinosaurs by their scientific names, not common names. Authors who publish new species should therefore strive to designate short and memorable species names. This is the only place in this paper I have felt is necessary to mention “Mann’s mollusk-eating ground beetle.”

Acknowledgements

Many people have supported my work on Pacific Northwest carabid beetles over many years. I would especially like to thank the University of Washington Zoology Department and Friday Harbor Labs. A University of Washington Hall-Ammerer WRF Interdisciplinary Dissertation Fellowship helped support my analysis of the regional carabid fauna when I needed it most, as did John S. Edwards. Albert Greene and Samuel Perry graciously provided information about *S. mannii* at the Steptoe and Wawawai sites. Ron Lyons and Glada McIntyre helped edit this report, although the personal opinions expressed are mine.

References


The Funnybug Chronicles, Episode 4: The Death and Resurrection of my Dissertation  

Loren Russell

“We’re all nutters—all bloody nutter counting things... 2 AM and we’re all here counting things!” I’m going back a couple of years now to the winter of 1974–5 (as near as I can reconstruct it) when Rich Robbins marched through Cordley Hall on one of his hoot-and-holler breaks. Rich was right about “counting” — the repetitive, often tedious and mind-numbing counting that entomologists dress up as “data-acquisition.” Seven or eight entomology students, myself included, were beavering into the night. We were variously hunched over our dissecting scopes, dissecting needle in one hand and clicker in the other to count and measure our fleas, flies, mites, or beetles, filling out data sheets, or transcribing our raw data to IBM punch cards, or (oh joy!) digging through the thick stacks of tractor-feed paper that came back from the mainframe at the OSU Computer Center.

Our town-crier, Rich Robbins, was also making good progress and he did complete his dissertation on vole fleas. I did not: my own thesis project, an ecological study of oak-woodland carabids, was on life support. I had started it two years before with great expectations and with support from a pest population ecology grant. The project was modelled on well-regarded European studies of carabid communities, looked to be interesting to do and was (I thought!) pretty much bomb-proof — lots of beetles collected in pitfalls and lots of parameters, so some patterns would surely emerge. But after two full seasons and a few out-and-out disasters (who knew that pitfall traps look like dining halls for various critters?), no amount of data-gathering gave me significant results. I was bummed out and timed out, so a few weeks later, I suspended my graduate program and began clearing out my office in Cordley Hall.

Life would go on—I had my day job, and I knew I could enjoy natural history without being dogged by the null hypothesis demons. I had new freedom to look at odd little communities that interested me—I was already looking at mycophagous insects and insects in soil and litter. The former led to a short publication on the beetle associates (mostly Agathidium, Anisotoma and other leiodids) of slime molds, the latter led to my Belese campaigns and so to my discovery of the funnybug. I expected no more out of Caurinus than my other one-offs. It seemed like another good leisure project—I could describe it and move on. But Ken Cooper (UC-Riverside, for his connection to my study, see Funnybug Chronicles, Episode 2) kept proroding me to dig deeper on Caurinus (“Does it hop?”, “Is that the larva?”, “Does it feed on mosses?”). At some point, at the end of 1976 or perhaps in January 1977, Ken’s tone went from enthusiasm to challenge: “You know, you have enough here for a nice dissertation. Why don’t you talk about it with Jack Lattin?”

I summoned my nerve to talk to Jack the next day, and it was pretty clear that he had already heard from Ken and thought about whether this was a good idea. Setting aside departmental and Graduate School rules (I would be bumping against time limits for my courses), it was possible, Jack said, to do an old-fashioned mono-

graph on a single species of significant phylogenetic interest. After a couple of meetings in which we discussed the possibilities and potential pitfalls, I had outlined what I thought my study would cover and Jack gave me a conditional go-ahead. If I could fill out a new thesis committee, he would chair it. I next approached Gerry Krantz who always had a penchant for the tiny and weird (none more than the sex life of the “signet ring” mite—don’t ask!). He was quite enthusiastic about my study. Finally, within the major department, Norm Anderson, who agreed with some reservations—since I proposed to study seasonal patterns (phenology) I would need to come up with a sampling scheme. I don’t recall much about how I recruited the outside committee members other than mycologist Jack Lyford (General Science), who had been helping me identify mosses in association with Caurinus. (Later, when I found that the actual hosts were liverworts, Lyford introduced me to Dave Wagner, then at the University of Oregon. This was another lucky coincidence for me since Wagner had just completed an excellent picture key to the leafy liverworts of Western Oregon.)

So I had a new beginning. But, as Norm Anderson pressed me in our conference, why should I expect it to go better this time? My only answer then was that the funnybug study was worth doing, it had fallen into my hands, and I was sure I had the knowledge, motivation and skillset to complete it. For once, my enthusiasm was well-placed and the following two years proved almost magical. I had breakthroughs almost every week and very few setbacks. Luck was said to favor the prepared mind, but I also was truly lucky in my material. The funnybug turned out to be a wonderfully cooperative subject—tough and easy to handle. Both adults and larvae could be retrieved undamaged from bulk samples with wet screening that blew up most other insects. I had some misadventures with a borrowed environmental chamber — the blower caused cycles of drying and condensation—before finding that both the insects and the host liverworts could be kept in small Petri dishes on a windowsill in a cool room. Caurinus tolerate warmish conditions better than the related Boreus and Hysporoborus, and flourished for weeks at temperatures near 60 F. (My apartment—living alone again, I could turn the heat off.) I needed only to change their food and “bedding”—moist filter discs—2 or 3 times a week. With live subjects at hand, I proceeded to fill in the blanks—sometimes in surprising ways and sometimes not. I observed egg-laying, and eventually realized that the distinctive eggs, just visible to my unaided eye, would be a valuable survey tool. I found a way to bleach the opaque cement coating the eggs without harming the developing larva, and watched the larvae cut their way out with their box-cutter-like egg-burster (a primitive mecopteroid trait, but unique among Boreidae). I found that the larvae are “stem” miners in the first instar, but rather comically need to paste several liverwort shoots together into a feeding gallery when they get bigger and their “wardrobe” no longer fits. I never quite reared an individual from egg to adult, but I was able to link and follow all stages of the life cycle under my scope. From my rearing data and measurements of head capsules, I
found there were 3 larval instars and a univoltine life history pattern. (All other boreids require 2 years to complete development, all other Mecoptera have 4 larval instars.) I found pupae in the field—in silk cocoons no less, though labial-gland silk, presumably a primitive trait in the mectopteroid complex of orders, is otherwise unknown among the Mecoptera proper.

Another big item on my punch list was working out the funnybug host relations. So less than a year after establishing that they were not predators, and didn’t eat mosses either, I was doing extensive feeding studies with adults and larvae. With tips from David Wagner, I found nearly 50 species of liverworts (the great majority of which were fun- germanniales, also known as leafy liverworts) in habitats occupied by Caurinus, and in feeding studies found that about 2/3 of the leafy liverworts presented (25 species in 15 genera) were “highly acceptable” to adults and usually to larvae as well. And so it went. There were one-offs and incomplete observations as well, like the single preparation of a larval brain that gave me a stub at the karyotype (probably N=9 +XO, which is similar to some other boreids).

I had less luck working out their love life. I found my captives in copu- lino on two occasions, but I never managed to see courtship/pairing, which must be very different from typical boreids. Ken Cooper again was not so surprised that Caurinus were more discreet about sex—the typical boreid approach, all rapine with lunging males and S&M, wasn’t to be seen. “With their round bodies and short appendages, that approach would be like billiard balls mating” he predicted, “any romance would be on the rebound.” I did get to see a decoupling male drop a sausage-shaped spermaphore, and only then realized I’d seen the gelatinous spermaphores in screening samples from the field. Spermaphores which are secreted and retained within the male genitalia must be universal in Boreidae, but I had been narrowly scoped on this—the first observation of a boreid spermaphore had just been published by a German worker. This is significant—all other Mecoptera transfer sperm via a “sperm pump”, and the sperm pump has been held out as a trait linking Mecoptera and Diptera (Aniliophora, the pump-beers).

I could go on, and I did—eventually I compiled 250 pages of these now known-novels, all exciting to me then and even now as I read them. But all good things end. In the spring of 1979, I completed my thesis, and over the next year or so both the species description and the paper describing the larva, pupa, and life cycle pattern came out. I made a few more collecting trips, often long road trips with Bill Fender, Wayne Mathis, and Michael Schwartz. Perhaps the most memorable was an evening in Marin County, California in 1980, when Mike and I stopped off after a productive day on Mt. Tam to visit some friends he knew from high school. They were newbys and a rather odd couple I thought—she was an ex-Hare Krishna, he an ex-Moonee, and both alternated between recriminating Jimmy Carter for the failed Desert One and trying to recruit Mike for Jews for Jesus. To free myself from all the political bar- angues and spiritual journeys, I escaped into their back yard and found it crawling with the odd little hangingfly Apterobittacus apertus. I took a few back to Corvallis as “pets.” Hangingflies are easy to keep and amazing flycatchers—it’s a real shame, by the way, that neither Tolkien nor the Grimm Brothers had ever heard of them.

Another trip, this time with Bill Fender, also went south, and in the pursuit of giant earthworms, we had an overnight visit with Bill’s friends at the commune in Covel, California. Here again, a touch of weird spirituality was combined with a not-so-spiritual entomolog- logical discovery: I woke up from my night on the pounded straw/cowpie floor to discover just how earwigs got their name. (Hint: Anglo-Saxon peasants never bothered to admire the ear- shaped hindwings of Forficula auricularia, as they picked them out of their ears.) It happens that I had been introduced to tofu the night before, and for some reason, I’ve avoided it all my life.

My earwig discovery was near the end of this entomological stage of life. I still expected to publish more of my thesis—especially the sections on host relations, behavior, and my appendix on other by- opagous insects—and to continue studies I’d started in comparative morphology involving other boreids and Mecoptera. But my job responsibilities at EPA were changing, and eventually took me away from any connection with entomology. My attention span is never the best, so my outside interests drifted as well—bicycling, softball, a new girlfriend. I continued to celebrate Funnybug Day (January 22) each year, but that was it. Or so I thought . . .

A teaser for Episode 5 (maybe the last, or maybe two parts):

EPISODE 5: “Ancient and forever”—Caurinus Revisited and its Ancestor’s Tale

“Glancing at your Caurinus . . . . made me question whether the as- signment to the Boreidae is well supported by morphology . . . . Why did you decide to end up placing it there?” — Letter from Michael Whiting, June 3, 1996

“. . . one of the most bizarre and cryptic species of Mecoptera and endopterygote insects” — Beutel et al, 2008

“Among the Tlingit, for example, there are two kinds of stories, daga (of the long ago) and ch’alnik (it really happened).” — J Bierhorst, The Mythology of North America, quoted by Derek Sikes and Jill Stockbridge in their description of Caurinus tagu (ZooKeys 316: 35–53, 2013)

Previous installments in the Funnybug Chronicles:


Contact Dr. Russell at <oren-russell@comcast.net> with any comments/additions/corrections/questions or t-shirt inquiries (see design in Episode 2).
Northwest Lepidopterists’ Workshop 2014

On 18–19 October 2014, over 55 people gathered in Cordley Hall on the campus of Oregon State University for the 36th annual workshop meeting of Lepidopterists of the Pacific Northwest. The meeting was hosted by Drs. Paul Hammond and David McCorkle and sponsored by the Oregon State Zoology Department and the Oregon State Arthropod Collection (OSAC).

Oral presentations were made by David Maddison, Chris Marshall, Paul Hammond, Ann Potter, Dana Ross, Jim Reed, Logan Foix, Mason Knowland, Chad Pyle, Dave Specht, Jayme Lewthwaite, Ron Lyons, David Lee Myers, Bob Pyle, Jeff Miller and Rik Littlefield.

In the pages that follow I (Ron Lyons) have summarized the various presentations, as well as some of the other business discussed. The summaries have been looked over and enhanced and/or corrected as necessary by the various speakers. Resources mentioned at the meeting are included with the relevant material.

The groups of Lepidoptera for emphasis this year were:
▶ Butterflies: Acmenoid Blues and Hairstreaks
▶ Moths: general moths, Pyralidae

Dr. David Maddison—Welcome

David Maddison, director of the Oregon State Arthropod Collection (OSAC), formally welcomed the group on behalf of OSU and the Collection.

David thanked the group for their support and their contributions to the OSAC fundraising campaign to purchase new metal cabinets. The cabinets, installed in August, will be used to house OSAC’s collection of Lepidoptera and Hymenoptera. David outlined the changes that were made in the collection and invited participants to come to the open house that would be held in the afternoon.

Dr. Chris Marshall—Collection Update

Chris Marshall, Curator and Collection Manager of the Oregon State Arthropod Collection (OSAC), detailed the changes to the collection since the last meeting and reiterated David Maddison’s invitation to visit the collection in the afternoon.

Chris noted that the collection is being reorganized. Donations and collections which had remained separate, are being integrated into the larger collection and this work is ongoing. New temporary space has been granted to the collection in Cordley Hall. This space will be filled with the replaced cabinets allowing curatorial staff to, at least temporarily, alleviate congestion in the Coleoptera, Lepidoptera and Hymenoptera.

The collection is growing in terms of the number of specimens. OSAC received some significant donations this year including a nice butterfly collection from Roger Sunford of Portland, Oregon. In addition, the collection is becoming more active in terms of the number of people using it on a regular basis.

OSAC is part of a national butterfly consortium consisting of 30 institutions that applied for a large NSF grant this year. The purpose of the grant would be to digitize the label data of North American Lepidoptera housed in the various collections and make them available online. OSAC compared well to other university-owned collections with its Lepidoptera holdings estimated at approximately 200,000 specimens. Of key importance is the geographic coverage (the Pacific Northwest) which is less well represented by other institutions. Taxonomically, OSAC has good representation nationally in terms of having examples of various species from around the country; however, the vast majority of specimens come from the western United States, particularly the Pacific Northwest. Chris was quick to point out the contributions non-professional entomologists (especially butterfly and moth collectors) have made to the collection over its history—the collection represents a considerable investment of time and effort by a number of people over the years involved in collecting, pinning and spreading Lepidoptera. The weakest area of the regional collection is the microlepidoptera, particularly the leaf miners.

People new to the collection who wish to visit or use the collection should contact Chris beforehand—especially now that some taxonomic groups (other than Coleoptera, Lepidoptera and Hymenoptera) will be stored in a separate room that, for the short term, will require staff assistance to access.
Paul Hammond—Overview of the Acmonoid Blue Butterflies

One reason for holding these workshops is to get young people involved in entomology in general and butterflies and moths in particular. Another reason is to bring people together to work on specific groups that are taxonomically difficult to understand. One of these difficult groups of butterflies is the “acmonoid blue” (Icaricia sp).

In 1961 when Paul and Anne Ehrlich wrote “How to know the butterflies,” there were only 2 species of “acmonoid blue” recognized: Icaricia nevadensis, a very distinctive species from Southern California, and everything else, lumped together as the “Acmon Blue.” When Bob Pyle’s book “The Butterflies of Cascadia” in 2002, people were starting to separate the Lupine Blue out from the Acmon Blue but it was still kind of dicey. Even now separating these two is a problem in some areas, particularly in Washington and eastward through the Rocky Mountains. As people began to study the “acmonoid blues” in more detail, they began to realize that there were all kinds of variations present in this species complex; even today these variations aren’t understood very well.

Paul summarized the efforts of a lot of people in a handout titled “Potential Classification of Acmonoid Blue Butterflies.” Paul listed 7 species of “acmonoid blue” (24 spp altogether) on the handout: Icaricia acon (4 spp), I. costell (2 spp), I. spangleus (4 spp), I. lupini (10 spp), I. texana, I. dedeckeri and I. nevadensis each with only the nominate species and 1 undescribed species. His handout included the proposed ranges of the various species and subspecies.

Paul discussed our current understanding of these butterflies as he went through the handout. There were additional significant contributions from Ann Potter, Dave Nunnallee, Jon Shepard, Bob Pyle, Steve Kohler, Dave McNeese and Jim Dillman. Based on the discussion, it appeared that the list needed to include one, possibly two more species/subspecies—one from the northern coast of Washington and possibly another from northeastern Montana and the Dakotas.

It is clear that a lot of work on these particular insects remains to be done.

Ann Potter—Washington Season Summary

Ann Potter works at the Washington State Department of Fish and Wildlife. Her area of specialty is conservation biology for insects.

Ann pointed out that quite a bit of butterfly information is coming in now from non-traditional sources like social media and various websites (e.g. Butterflies and Moths of North America [BAMONA], NW LeP Server, eButterfly) because we can more readily share information/photographs. These resources, Bob Pyle’s book The Butterflies of Cascadia, and David James and David Nunnallee’s book Life Histories of Cascadian Butterflies are also bringing in people who haven’t otherwise participated in the study of Lepidoptera. People such as John Baumann, David James and Bob Pyle are building networks and getting people thinking more about butterflies. Some of these new sets of eyes are seeing things that are new to the various counties and even the state. One problem with these alternate resources is that some of the reports of interest are not completely documented.

All the county and state records from this year are from eastern Washington, primarily from Lincoln and Stevens Counties, both NE counties. The county records were:

- Stevens—Thymelicus lineola (European Skippering), Lycæna editha (Edith’s Copper), Satyrium sylvium (Sylvan Hairstreak), and Strymon melinus (Gray Hairstreak);
- Lincoln—Calliphrys polio (Hoary Elfin), Plebejus saepiolus (Greenish Blue), Apodemia mormo (Mormon Metalmark) and Boloria selene (Silver-bordered Fritillary).

Junonia coenia (Common Buckeye) was found in both Lincoln and Benton Counties this year, a new state record.

Recently, while going through some old material, Bob Pyle found 3 worn specimens that had been misidentified or undetermined at the time of collection. Two of these, specimens of Ochloides yuma (Yuma Skipper) from Asotin County and Polites thermiotodes (Tawny-edged Skipper) from Spokane County, turned out to be county records. The third specimen, Chlosyne hoffmanni (Hoffman’s Checkerspot), represented a westward range extension. He recommended that when you are going through your old material you look more closely than you did the first time—you might find some surprises.
Dave Specht—Powell Butte Lepidoptera 2014

Dave provided an overview of the Powell Butte Nature Park (<http://friendsofpowellbutte.org/>) in Portland where he has been conducting butterfly surveys since 2005. This year Dave conducted his census, a modified free range survey, on a bi-weekly basis. He walked each of the trails once and went off the trails in certain areas.

Dave noted the early appearance of Polygonia satyros (Satyr Anglewing) on May 7 and early disappearance after August 7. Usually he can still find them in early September. He noted that Platyproplia virginalis (Ranchman’s Tiger Moth) and Cernucha rubrosceps (Red-shouldered Ctenucha) also showed a shortened season. For the first time he found Strymon melinus (Gray Hairstreak), taking their photographs on August 7 and 27 in different regions of the park.

The new Powell Butte Visitors Center opened in the park this past June. As part of the opening ceremony activities Dave led a butterfly walk. He also created a checklist of the butterfly species he had found over a 9 year period (24 species to early June), arranged in order by the average date of first appearance. He included the total number of individuals he had seen as a measure of abundance so people would be able to assess the common and uncommon species.

Dave Specht—2014 Butterfly Excursions

David showed images from some of the places he and his wife Carol had visited during 2014. David got a real treat during their visit to the Channel Islands National Park off the coast of California near Santa Barbara. While in-route to Santa Rosa Island, he saw a Blue Whale along the south coast of Santa Cruz Island, the dream of a lifetime.

Jeff Miller—Opinions Please!

Jeff has been working with lepidopterists in Thailand for the past 6 years. The work is drawing to a close and Jeff is interested in writing a coffee table book which uses his extensive library of images of Thailand’s Lepidoptera—caterpillars, adults, and host plants. Jeff showed sample pages and asked for feedback on how much or how little additional information he should put on the page for each species.

Jeff emphasized the size of caterpillars in his plates; there was a question about the size of the adults. Jeff made an interesting point that the length of the full grown caterpillar, on average, is really close to the width of the spread butterfly or moth.

Activity Reports (cont.)

Dana Ross—Oregon Season Summary

Dana found Colias occidentalis chrysoulas (Western Sulphur) at Bigelow Lakes in Josephine County, a western range extension. This was a big year for Junonia coenia (Common Buckeye)—they were very common in southwestern Oregon and Klamath County. David Lee Myers reported the farthest northwest occurrence in Oregon of Pontia occidentalis (Western White), his yard in Astoria.

This year was a low point in the cycle of Nymphalis californica (California Tortoiseshell) which were not seen in any numbers in Oregon or Washington. Paul Hammond indicated they were off in the Great Basin, not here in the northwest. He reported that there was a huge northward migration in the northern Wasatch Range of Utah near Ogden in July.

Linda Kappen reported that a Monarch tagged in Applegate Oregon had been recovered in San Mateo, California 330 miles away 10 days later.


Jon Shepard indicated that the tropical moth, Ascalapha odorata (Black Witch), had again shown up in Tillamook County—the third record for that Oregon county.

Black Witch photographed at Rockaway Beach, Tillamook County, July 2014. Photograph by MJ Murawski / epigrams inc. Used by permission.
Activity Reports (cont.)

Steve Kohler—Montana Activity Reports

Steve indicated that he had several new county records this year, but they were getting harder to come by. He mentioned the second state record for Polygona compta, coincidentally found in the same place where the first record was obtained 10–12 years before. All the species of Polygona have been recorded in Montana as well as at the Question Mark. Steve indicated that there are a couple of records for the Black Witch in Montana too, but none from this year.

Lois Hagen—NABA Eugene–Springfield Chapter Activities

Lois Hagen, president of the Eugene–Springfield Chapter, outlined the activities of chapter members this past year.

This was the 24th year they had conducted a 4th of July count in the Eugene area, identifying 25 species. Unusual species this year were an early Lycaena xanthoides (Great Copper) and Junonia coenia (Common Buckeye). Speeria cybele (Great Spangled Fritillary) was found at Spencer Butte.

The group completed their 12th butterfly count at Brower Ridge documenting 36 species, and their 3rd count in the Cascade–Siskiyou National Monument, documenting 74 species there.

Details of the Eugene and Brower Ridge counts for 2014 and some Eugene area surveys from other years can be found on the chapter’s website, <http://www.naba.org/chapters/nabaes/>.

On Lepidoptera Records

Jeff Miller indicated that as another aspect to our record keeping, we should be mapping where the larvae live, not just where the adults can fly to.

Lepidoptera records and information for Oregon should be sent to Dana Ross. Only butterfly records for Washington should be sent to Ann Potter. Moth records for Washington and all records for British Columbia and Idaho should be sent to Jon Shepard. Records posted to various internet resources should also be sent to these regional coordinators to make sure they get included in the yearly summaries.

Rik Littlefield—High Magnification Macrophotography

Rik showed a high resolution image of Hecatera dysidea (the Small Ranunculaceae Moth), a European import which arrived in Oregon a few years ago and has been working its way north. (See <http://pnwmoths.biol.wsu.edu/browse/family-noctuidae/subfamily-noctuidae/tribe-hadenini/hecatera/hecatera-dysidea/> for more information on this moth in the Pacific Northwest.) His photograph was the first record of this species in Benton County Washington, although it had been found in nearby counties.

The high resolution image, along with the relevant photographic and image processing details, can be found at <http://www.photomacrophotography.net/forum/> (search for species). The image was produced using an extended depth of field imaging technique. A series of images, taken with slightly different focus points (the focus stack), was processed with software Rik had developed to pull out the best focused areas of each separate image and combine these to produce a close-up image, in focus over a much wider range than available to traditional macrophotographers.

Rik is the administrator of www.photomacrophotography.net, a website that is devoted to the photography of small things. Other images of interest to lepidopterists can be found on this site, including high resolution pictures of butterfly eggs.

The focus stacking software developed by Rik, as well as tutorials on its use, are available from his site, <http://www.zerenesystems.com>. This software produces excellent results for subjects which don’t move. It can be used to produce stereo pairs as well. The icon for Rik’s company uses the wing pattern of Zere ne eurydice (California Dogface).

David Lee Myers—Images of Butterflies

David showed images of butterflies from various places he had visited in 2014 including Bob Pyle’s garden, localities near Camp Sherman (Green Ridge and the Metolius Preserve), and the Chisos Basin of Big Bend National Park. He indicated that the NABA garden in Mission Texas is well worth visiting.

At the 2013 Workshop, David expressed an interest in getting pictures of lepidopterists at work in the field. This year he was able to photograph Mike Patterson on the transect project on Oregon Silver-spots at Mt. Hebo and Paul Hammond on a second transect project in the same area.

Some of David’s work can be found on his website, <http://www.davidleemyersphoto.com>. 
Jim Reed with contributions from Logan Foix, Mason Knowland and Chad Pyle—Klickidoptera: the Rewards and Challenges of Teaching High School Entomology

Jim Reed teaches science and other subjects at the high school in Klickitat, Washington. (Klickitat is a small rural community on Highway 142 about 15 miles north of The Dalles, Oregon.)

At the National Lepidopterists’ Society meeting in Park City, Utah this past summer, he made a presentation, based on his work with high school students, on education and getting the next generation involved in entomology. Since then, his presentation has been shown in Denver, Indianapolis and New York, where his curriculum has subsequently been adopted. Jim’s curriculum is divided into two parts. The first part in the fall is field studies; the second part in the spring is the entomology class.

The biggest challenge Jim faces is time. During school hours, the students only have one hour per day for instruction, collecting and specimen preparation. This restricts the area that collection activities can occur in pretty much to a short section of highway near the school—they just can’t get very far away. Some of the students sign out collection equipment and so can get a bit farther afield. The main safety concern during collection outings is traffic. However, rattlesnakes, ticks and poison oak are a concern throughout this rural area.

Other challenges involve specimen preparation. They use the Versaboard from Bioquip to pin specimens. It takes a while for the students pinning butterflies and moths to get the wings far enough forward. When things go wrong, the students learn how to fix things. Jim keeps a supply of pins available, and indicated that as the students become more proficient at pinning, they tend to use more pins. Sometimes, it is a struggle to get students to label their specimens. He suggested part of the reason is because the students don’t realize that some specimen they collect may be of interest to someone else at some point in the future.

Another challenge is to get the students to broaden their arthropod-related interests. Most of them pick up his bias towards the Lepidoptera.

The high level of interest for most of the students, their excitement about learning, is very rewarding. The students decide whether they want to catch and release or catch and pin. At the end of the term, the students with collected specimens can keep their material or donate some or all of it for incorporation into the school collection. (Sometimes they donate specimens to Jim for his collection.) Jim prefers that the students keep their collections, in the hopes that it will keep their interest going. The class provides the opportunity for students to teach and work with other students.

The class has access to aerial nets of various sizes, nets for beating and sweeping, aquatic nets and mothing sheets.

In the future Jim would like to do more than just net work. He indicated that he would like to provide a good mothing experience as well. He also wants the students to be exposed to rearing and so has picked up a number of rearing cages. He wants to get the students farther afield and would like to implement an extended summer field trip.

So far the students have 2 county records for Lepidoptera—Thorybes pylades (Northern Cloudywing) and Adalphi bredowii (California Sister). In the last few years, they have started to put together a school collection. This collection now occupies 14 California Academy insect drawers. All but 7 of their specimens have been collected locally, either in the spring or the fall.

Jim is grateful to the administration and the community for the support they have shown to him and his students.

Last year Jim brought a number of students to this workshop where the students got to interact and exchange information with the participants. Following that visit, workshop participant Terry Stoddard went over the school as a guest speaker.

Jim brought several students down again this year. Three of them, Logan Foix, Mason Knowland and Chad Pyle made short presentations after Jim’s talk.

Logan Foix and Mason Knowland talked about their senior culminating projects, a requirement for graduation in Washington. Logan taught classes to the Grades 3 and 4 students, helping them pin out some specimens and learn about Lepidoptera. Mason organized the school’s collection into a website <http://www.klickitathighschoolinsectcollection.com>. They discussed some of the things they had learned in the class (e.g. rehydrating dry specimens) and expressed their appreciation to Jim for his efforts. Chad Pyle has only been in the class for a few months. He gave an overview of his collection with photographs of various specimens.
Dana Ross—Project Activity of a Contract Lepidopterist

Dana, an entomologist who works mainly on Lepidoptera projects, gave a brief summary of some of the projects he has worked on in the past with an emphasis on the past year.

Since 2003, Dana has been monitoring the local populations of Euphydryas editha taylori (Taylor’s Checkerspot) making transect counts in two areas near Corvallis. This has provided a rough estimate of the population size and its variation from year to year. Taylor’s Checkerspot was placed on the endangered species list in late 2013. He has also been involved in monitoring Icaricia icarioides fenderi (Fender’s Blue) as well.

Several years ago, Dana studied the sensitive species Plebejus saepiolus littoralis (Coastal Greenish Blue) and Calliphrya polios mari- tima (Seaside Hoary Elfin) along the coast. Now he is involved with surveys for the Coastal Greenish Blue in the Oregon Dunes National Recreation Area because restoration work is planned. Historically this species was found at Rock Creek on the coast in Lane County. Dana failed to find it there in surveys in previous years or the ones he conducted this past year, even at times when the weather was good and the food plant abundant. He felt that it had been extirpated from the site. Ann Potter pointed out that it took a lot of effort to determine that a species was no longer present. Several others pointed out species that people thought were extirpated that had shown up years later and encouraged him to keep checking the site. (See Zonneveld, C., T. Longcore, & C. Mulder. 2003. Optimal Schemes to Detect the Presence of Insect Species. Conservation Biology, 17(2): 476–487 [available at <http://www.urbanwildlands.org/Resources/2003ZonneveldConBio.pdf> for some information on the problems involved.)

Dana continues his work on moths at the Klamath Marsh National Wildlife Refuge for refuge biologist Faye Weekly. This year they included a pilot inventory project on odonates. It looks like this work will continue in 2015 with the addition of butterflies.

Last year he began a 2 year project to inventory the butterflies and moths of the Oak Basin in Coburg Hills (BLM site). He selected 10 sites in the area to cover the diversity of plant communities and habitats and sampled these areas every month. Paul Hammond is helping with the specimen identification effort. Two moths, extremely rare in the Pacific Northwest, were found this past year: a bagworm moth (Family Psychidae) and a noctuid moth, Papui- pema sauzalitae. Depending on where you go, the local abundance of moths and the attractiveness of the traps, Dana indicated that over the course of a season each moth trap might pull in 15–20 species of moths per night. Jeff Miller indicated that the record for Oregon for one trap in one night was 104 species.

At the end of August, Dana began to do some inventory work at Conboy Lake National Wildlife Refuge in Washington just north of Hood River, Oregon. He did moth trapping at 15 sites representative of the various plant communities in the refuge.

Dana also taught a weekend course on butterflies at the Siskiyou Institute in Selma, Oregon (Josephine County).

Calliphrya polios maritima (Seaside Hoary Elfin) Pistol River area, Curry County, Oregon, April 11, 2008. Photo by Dana Ross.

Plebejus saepiolus littoralis (Coastal Greenish Blue) Tolowa Dunes State Park, Del Norte County, California, May 11, 2013. Photo by Ron Lyons.
Jayme Lewthwaite—Prioritization through Phylogenetics

Jayme is a graduate student at Simon Fraser University in Vancouver British Columbia.

The United Nations Convention of Biological Diversity (1993; as yet unratified by the United States) is an international agreement to protect biodiversity on 3 levels—ecosystems, species and genes. In dealing with the second and third levels, many people have argued that if you save lots of species you will save lots of genetic diversity, by default. A study of plants in South Africa showed that this is not necessarily the case (Forest et al. 2007). If your criterion was species richness (i.e. numbers of species) you would preserve one area; if genetic richness (i.e. phylogenetic diversity) you would preserve an entirely different, completely unrelated, area. In this case, saving a lot of species preserved a lot of redundant information because many of the species were closely related, whereas, preserving the genetic richness saved a lot of unique species. So the question arises: what is the best measure, or combination of measures, to use to preserve as much biodiversity as possible?

Jayme is studying this problem using phylogenetics as it relates to Canadian butterflies (over 300 species). The idea here is to use whatever kind of genetic data you want—hopefully mitochondrial-based because that has a predictable rate of evolution—to build phylogenetic trees. There will be species on long branches—these have been around for a long time, implying that they have gone through lots of evolution and change; species on short branches are fairly recent—they have just broken off. We are interested in saving as much of the tree as possible but also giving priority to the really old species that are really unique at the genetic level.

There are many reasons why one might want to consider genetic diversity when making conservation decisions as to which species should and should not be protected but the 2 big ones in her mind are:

1) Genetically unique species are really interesting; people like them because they are different. They also contain a lot of unique evolutionary history and if they are lost, that’s a lot of genetic information that is lost forever. A good example is the Monarch. Recent work at the University of Chicago shows that the genetics that underline the Monarch’s migration muscles, migration patterns and coloration are completely distinct from their closest relatives (Zhan et al. 2014).

2) There is a very pragmatic reason—areas with more phylogenetic diversity generally function better (e.g. Cadotte et al. 2008). Not only does phylogenetic diversity predict ecosystem function (usually measured as biomass production), but it actually explains significantly more variation in the data than other measures of diversity, such as number of species or functional groups. Communities with more phylogenetic diversity tend to be more stable than less diverse plots.

Jayme is using the phylogenetic data on butterflies found in Canada to determine the distribution of phylogenetic diversity across the landscape. She is building a distribution model to predict where a species can go based on its requirements and constrained by environmental data (climate, precipitation, land cover, etc.). She is testing the model using the historical data, predicting where species can go and then seeing if they actually went there as changes occurred. The model can then be used to predict how species distributions and the resulting distribution of phylogenetic diversity across the landscape are likely to change under future climatic conditions.

There are some problems with this approach that needed to be addressed. For example, not all of the butterflies have been sequenced, so some of the data used to construct the trees was constrained using taxonomy. For the distribution models one problem concerned sampling. In some time periods and/or some areas there were no records or few records, at least partly because of lack of collector activity. Additionally, she possesses only Canadian records, and thus lacks information on the southern end of the distribution of many species that straddle the U.S.–Canada border. Jayme is interested in expanding this study to include all of North America (or at least the USA).

Interesting feedback and suggestions came from Chris Marshall, Bob Pyle, Jon Shepard, and Paul Hammond.

References


Ron Lyons—Preliminary Work on South Coast Blues

At last year’s meeting, Paul Hammond mentioned that the Acmon Blues along the South Coast of Oregon, including the offshore islands, were a little peculiar. The larval food plant is thought to be *Eriogonum latifolium*, the seaside buckwheat.

OSAC has 7 specimens from coastal Curry County—2 from Wilson Creek, 1 each from Pistol River and Hooskanaden Beach and 3 from Port Orford. Since Wilson Creek is over 10 miles from the ocean in a well forested area east of Brookings, these 2 specimens should probably be considered separately. This leaves 5 coastal specimens. Dana Ross said that blues were also present at Lone Ranch Beach State Park north of Brookings, and Ron had one photo record from a nearby area. The initial information gave this acmonoid blue’s range as Curry County from Port Orford south to the Brookings area with dates from May 3 to June 16.

The first coastal acmonoid blue Ron encountered in 2014 was actually at Gold Bluffs Beach (west of Orick) in Humboldt County, California. One butterfly was found on May 14 on the beach, nectaring on knotweed. No buckwheats were seen on the beach.

Later that same day, acmonoid blues were found at Lone Ranch and Hooskanaden Point. Clumps of buckwheat were present but not in bloom at both locations. A number of trips were made along the coastal area between Port Orford and Brookings and these butterflies were eventually found near Pistol River as well (Figure 1). Ron concentrated on Hooskanaden Point—a female was seen ovipositing on buckwheat flowers on July 16; individuals could still be seen on the cliff face on his last visit, July 24.

The areas where Ron found these butterflies tended to be somewhat difficult to work in. One of the areas at Lone Ranch is a rock outcrop on a steep well-vegetated hillside. The area at Hooskanaden Point is narrow and bordered by a steep cliff on the ocean side (Figure 2). The drainage ditch along the road cut at Pistol River is only a few feet from the traffic on Highway 101. The marine layer/coastal fog and wind affected butterfly activity.

During the course of this work, Ron ran across another blue along the coast in the Humbug Mountain State Park area. Dana Ross and Dave McCorkle had been mentioned briefly concerning this in Andrew Warren’s 2005 book *Lepidoptera of North America 6: Butterflies of Oregon Their Taxonomy, Distribution and Biology*. Contributions of the C.P. Gillette Museum of Arthropod Diversity, Colorado State University, Fort Collins, Colorado. pg 181.) Warren put this blue in with *Euphilotes enoptes bayensis* and indicated it fed on *Eriogonum nudum*. No other information was published and Ron didn’t find any specimens at OSAC. Ron found these butterflies between June 18 and July 17. A female was seen ovipositing in the flower heads on June 22. A possible dead larva was seen on July 16 being fed on by an unidentified hemipteran below one of the flower heads.

When in bloom, patches of buckwheat are easy to see as one drives along Highway 101 in Curry County. Based on the purported food plants, 2 species of *Eriogonum* are of interest. However the situation is not straightforward. On his *Eriogonum nudum* page (<http://www.plantystematics.org/reveal/pbio/erio/erioeucy/nudum.html> [see item 94b]), James Reveal says: “*Eriogonum nudum* var. *paralinum* occurs along the immediate coast in Curry Co., Oregon, and Del Norte Co., California. It is this variant that bridges the morphological gap between *E. nudum* and *E. latifolium*. Ms. Stokes (1936) combined the two in her revision of the genus, and her action can be justified. The resulting taxonomy, however, would result in recognition of two subspecies, one each for what is here maintained as species. As little would be gained by such an action, the two species are retained as separate entities.” (The variety *paralinum* has the common names Port Orford wild buckwheat and Del Norte wild buckwheat.) The ranges of the 2 host plants overlap along the South Coast. It is not clear how easy it is to separate the two, given the difference in expression that might be expected depending on the actual location. In fact there are two herbarium entries online that appear to reference the same specimen—one is attributed to *Eriogonum latifolium* and the other to *Eriogonum nudum* var. *paralinum*. If these two species are really valid, then it is an open question whether they occur in pure stands or not.

More work is planned for 2015.

Figure 1: Acmonoid blue butterfly photographed in the drainage ditch along the east side of Highway 101 just north of the bridge over the Pistol River in Curry County, Oregon June 24, 2014. Photo by Ron Lyons.
Bob Pyle—The Butterflies of Billy Meadows

Bob read a poem titled the “Butterflies of Billy Meadows.” Billy Meadows is a beautiful area in the Blue Mountains of Oregon (north of Enterprise, northwest of the Zumwalt Prairie and east of the Joseph Gorge). Some years ago Bob had spent time there as a writer-in-residence and later taught a writing workshop there for the Fishtrap Writers’ Conference. He took advantage of both visits to collect and study the local butterflies.

This poem can be found in Bob’s new book of verse, Evolution of the Genus Iris (Lost Horse Press). While several of the poems in the book concern invertebrates, this is the only outright butterfly poem, and uses the scientific names for the butterflies for their beauty and precision. For more about this collection visit the publisher’s webpage at <http://www.losthorsepress.org/catalog/evolution-of-the-genus-iris/>.

Cascade–Siskiyou National Monument Butterfly Bioblitz Announced

Peter Schroeder, a member of the Board of the Friends of the Cascade–Siskiyou National Monument, announced that a butterfly bioblitz will be held on June 6, 2015. He encouraged people to help with the planning and invited audience members to participate. See note on page 25.

Buckwheat Publication

Eleanor Ryan reminded people about the book she had compiled on the species of Eriogonum (buckwheat) found in Oregon and Washington. Over half of these species are documented butterfly hosts, many by the acmonoid blues discussed by Paul Hammond. Digital copies of the book can be downloaded from <http://www.naba.org/chapters/nabaes/> (look in the Highlights section). Email Eleanor (<woodnymph3000@gmail.com>) to order a hardcopy for $22 ($2 of which goes to the NABA Eugene–Springfield Chapter). Eleanor plans to update the material as new information becomes available. A brief write-up on this book can be found in the Spring 2014 issue of the Bulletin.

Butterflies of Cascadia

Bob Pyle reported that The Butterflies of Cascadia, first published by the Seattle Audubon Society in 2002, is going to be revised and re-published by Timber Press. He indicated some of the problems in this effort (e.g., there are no digital files for the original [note: these were later found, thanks to Idie Ulsh and Dave Nunnallel]), the maps have to be redone, the taxonomy of the species like the acmonoid blues and Euphilotes is in flux). While still mostly useful, since the text requires substantial revision it is not worth reprinting as it is. Several new subspecies will be described in time to include them in the new book.

Paper on Chinese Butterflies

Bob Pyle mentioned a paper on Chinese butterflies he and others had recently published:


Figure 2. Hooskanaden Point, Curry County, Oregon (looking south). Acmonoid blues were found along the narrow ridge (foreground) nectaring on strawberry and on the cliff face visiting the plants, including buckwheat. Photo by Ron Lyons.
Northwest Lepidopterists’ Workshop 2014 (cont.)

Next Year: Northwest Lepidopterists’ Workshop 2015

In 2015 the groups of emphasis will be:

- Butterflies: *Callophrys sensu lato* (Green Hairstreaks, Elfin, Cedar and Mistletoe Hairstreaks), *Limenitis* (Admirals)
- Moths: *Catocala*, Saturniidae, overview of micromoths

Acknowledgements

I would like to extend my many thanks to all the presenters for their comments, corrections, and changes to the various summaries I prepared from the meeting record. I know all the feedback improved the accuracy and usefulness of the material. Thank you all very much.

Ron Lyons
The Pacific Northwest Lepidopterists’ Fund in Honor of Harold E. Rice: Call for Proposals for 2015 Season

“In honor of Mr. Rice, we [the Oregon State Arthropod Collection (OSAC)] have allocated funds to support the community of Pacific Northwest lepidopterists to which Harold belonged. In particular, we hope the fund will encourage and facilitate the valuable research, work and contributions made each year by individuals, who like Mr. Rice, were not employed full time as lepidopterists, yet spend much of their personal time and resources collecting and studying these amazing creatures.” (excerpted from the Fund’s write-up)

This fund, which provides one or two awards for up to $500 each, is given annually to encourage activities directly related to PNW Lepidoptera and/or activities related to the improvement of OSAC’s Lepidoptera collection. More information, as well as directions for how to apply, can be found at <http://osac.oregonstate.edu/PNWlepidopteristsFund>.

If you have any questions (e.g. am I eligible? would this project qualify?) or need some advice on writing your proposal (e.g. how specific do I need to be?), please contact Chris Marshall at OSAC, <Christopher.Marshall@oregonstate.edu>.

For full consideration, applications must be received by January 31; late applications will be considered if funds are still available.

Butterfly Bioblitz at Cascade–Siskiyou National Monument

The Friends of the Cascade–Siskiyou National Monument (FCSNM) is pleased to announce the 1st Annual Cascade–Siskiyou National Monument Bioblitz: Butterflies!

Join one of several teams of butterfly experts who will be leading surveys to observe and catalog butterflies in the Cascade–Siskiyou National Monument on June 6, 2015. Butterfly enthusiasts and the general public are encouraged to register as citizen-scientists in this event on June 6, 2015.

The Cascade–Siskiyou National Monument encompasses 62,000 acres of interconnected mountains and valleys in southern Oregon that join the relatively younger but higher elevation Cascades to the east with the relatively older but lower elevation Klamath Mountains to the west. CSNM’s unique geophysical history gave rise to a landscape unique in botanical and faunal diversity. To date, over 130 species of butterflies have been recorded in CSNM, and this bioblitz is an opportunity for citizen-scientists to join and interact with butterfly experts as they attempt to expand our knowledge of butterflies in CSNM.

Please join us on June 6! Registration for this event begins on January 15. To register, please visit the FCSNM website, <http://www.cascadesiskiyou.org>.

For more information, contact:
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Two Recent Spider Papers of Interest

McKeown et al. (2014) examined the reports of 33 spider bites, in which the spider itself had also been identified at least to genus, reported to the Oregon Poison Control Center. The reports were received over a 3 year period. The purpose was to determine whether or not the Hobo Spider (Eratigena agrestis) had toxic venom and was responsible for dermonecrosis, since the evidence for this is suspect. Unfortunately, as far as the study went, there was only one verified Hobo Spider bite and it did not cause any significant problems.

The authors provide a table of results indicating the area of the bite, extent of reaction, duration of symptoms and identification of the spider involved. At least 15 species in 10 genera were involved.


In an interesting ad hoc study, Vetter et al. (2014) analyzed the records of spiders found on international cargo brought into North America. The authors list the species found as well as number of specimens and country of origin of the cargo. There are some nice images and a key to the most common cargo spiders they found.