SPECIES FACT SHEET

Common Name: Schuh's Homoplectran Caddisfly
Scientific Name: *Homoplectra schuhi* Denning 1965
Phylum: Mandibulata
Class: Insecta
Order: Trichoptera
Suborder: Annulipalpia
Family: Hydropsychidae
Subfamily: Diplectroninae

Conservation Status

Global Status (2005): G3Q – Vulnerable, but taxonomic questions persist (last reviewed 25 Mar 2005)
National Status (United States): N3 - Vulnerable (23 Feb 2005)
State Status (Oregon): S3 - Vulnerable
(NatureServe 2015)
Oregon Biodiversity Information Center: List 3
IUCN Red List: NE – Not evaluated

Taxonomic Note

This species has been given a global status of G3Q due to the limited number of specimens that have been reviewed to date, and the variability of diagnostic characteristics (NatureServe 2015). This genus is in need of additional collecting and taxonomic review, which may lead to synonymization with older described species (Wisseman 2015, Ruiter 2015). For example, specimens identified as *H. luchia* Denning 1966 may in fact be synonyms of *H. schuhi* (Ruiter 2015).

Technical Description

A microscope is required to identify *Homoplectra schuhi*, as identifications are based on genitalia anatomy. The advice of a Trichoptera expert is suggested. See Denning (1965) for lateral view drawings of the male and female genitalia.

Adult: The adults of this species are small, moth-like insects in the caddisfly family Hydropsychidae. *Homoplectra* males are recognized by the complexity of the phallic apparatus, which can be complicated by very strong development of several sclerotized branches (Schmid 1998).

Holotype male: Length 6 mm. General color of head, thorax and abdomen dark brown, wings tan with no pattern, legs and antennae varying shades of brownish. Pubescence of head, thorax and legs aureous. Fifth sternite with a dorsal filament enlarged distally and curved dorso-caudad. Genitalia: Tenth segment and claspers typical of genus. Distinctive characters apparently confined to the armature of the aedeagus: (1) a short dorsal acuminate prong, curved ventrad, bearing a basal pair of closely appressed spurs which extend caudad for about half its length, from dorsal aspect prong bifid to base; (2) a long, narrow filamentous process, distally only slightly curved dorsad, from dorsal aspect processes laterad of remainder of structure; (3) a short, stout, heavily sclerotized prong, distally acute and curved dorsad, bifid to

base and closely associated with aedeagus; (4) the aedeagus proper, long and slender throughout except for an abruptly narrowed apex, discernible from either a lateral or dorsal aspect; (5) the troughlike ventral process in which the aedeagus rests; this process and the aedeagus extending the same distance caudad; when seen from dorsal or ventral aspect, structure furcate for about two-thirds its length, apices divergent and acute.

Allotype female: Length 7 mm. General structure and size similar to male, wings concolorous, dark brown. Pubescence of head, thorax and legs somewhat heavier than in male. Fifth segment with dorsal filament shorter than width of segment, enlarged distally; shorter than in male. Genitalia: Eighth sternum with dorsocaudal corner developed into an acute triangular projection. Ninth segment annular; tergum extending caudad and distinctly delineated by a quadrangular membranous area, best discernible from dorsal aspect. Tenth tergum slender, bearing three semimembranous tubular processes (Denning 1965).

Immature: Although the larval and pupal stages of this species are unknown, all members of the family are fixed-retreat makers that build tunnel-like retreats of rocks and sediment with silken filter nets spun across the retreat entrance (Wiggins 2004). *Homoplectra* larvae are characterized by a transverse sulcus on the pronotum which constricts the posterior one-third from the anterior two-thirds (Wiggins 1996). Western *Homoplectra* larvae in particular have stout setae subdivided into a cluster of flattened lobes on the mesal face of the middle and hind femora (ibid.).

Life History

Adults: Adults of this species have been collected in the spring and early summer, from late March through July. In general, flight times for *Homoplectra* species extend from February to August, with most records falling in the April to June period, depending somewhat on elevation and climatic factors (Wisseman 2005, pers. comm.).

Larvae: Larvae not known but possibly present all year since some other *Homoplectra* species require more than one year for complete development. Other species of the genus are classed as collectors-filterers. Larvae of other caddisflies in this family construct fixed retreats of organic and mineral fragments with a silken sieve net placed adjacent to the anterior entrance to filter particles from the current (Merritt et al. 2008). They rely on stream currents to bring food and materials to these retreats. Mesh size of the filter net differs for each genus, and caddisflies in this subfamily have intermediate mesh sizes, which allow these larvae to exploit a wide range of suspended particles in mid-range currents (Wiggins 2004).

Pupae: Pupae not known, but at pupation the larvae of other species in this family abandon their retreats and construct new, dome-like cocoons lined entirely with silk. These cocoons are open at either end to allow free passage of water and oxygen, but reinforced with a silk mesh to deter predators (ibid.).

Range, Distribution, and Abundance

Range: There are 12 species in this genus (Morse 2014) with nine of them found in mountainous areas of Oregon and California. Three additional species occur in the eastern U.S. The range of *Homoplectra schuhi* (based on 34 records) appears restricted to cold seeps,

springs, and creeks in forested areas of the Oregon Coast Range, Willamette Valley, Cascade foothills, and southern Oregon. It is known from Benton, Curry, Jackson, Klamath, Lane, Linn, Tillamook, and Yamhill Counties (Ruiter 2015, pers. comm.; Fallon and Blackburn 2014; Wisseman 2014, pers. comm.).

Distribution: This species has been found in southwest Oregon and throughout the Oregon Coast Range, Willamette Valley, and Cascade foothills. The type locality for this species is from the west side of the Klamath River, between Big Bend Powerhouse (John C. Boyle dam and powerhouse) and the Frain Ranch, Klamath County. A number of other specimens from the Coast Range and Willamette Valley have recently been determined to be *H. schuhi* (Ruiter 2014, pers. comm.). In addition, three specimens (two adult males and one adult female) were recently collected from the suspected type locality (Fallon and Blackburn 2014). Populations may occur, in appropriate habitat, throughout southwest Oregon and perhaps into northern California (Ruiter 2014, pers. comm.).

BLM/Forest Service Land: This species is documented on the Klamath Falls Resource Area, Lakeview BLM (Klamath River, near Keno, Oregon) and near the Siuslaw National Forest (Parker Creek, Marys Peak). This species is suspected on the Rogue River-Siskiyou National Forest (three documented occurrences may be from the RRS or very close by) and the Fremont-Winema National Forest. Other field units between known locations may consider the species suspected as well.

Abundance: Abundance estimates at known population sites have not been conducted, although population sizes are presumed to be small. Recorded collections range from one to six adults.

Habitat Associations

Larvae of this genus are classified as clingers that spin nets or create fixed retreats (Merritt et al 2008). *Homoplectra schuhi* in particular has been collected in seeps, springs, spring channels, and creeks in forested and often montane areas, where subsurface water flows at moderate velocities through loosely consolidated coarse particulate organic matter, moss and gravel substrates (Wisseman 2014).

Most sites where *Homoplectra* have been collected have a mixed deciduous and coniferous canopy. Adults of a related species, *H. luchia*, were found on herbaceous and shrub vegetation in and adjacent to seeps and may have a low dispersal rate away from these isolated habitats (Wisseman 2005, pers. comm.).

The suspected *Homoplectra schuhi* type locality is characterized by heavily vegetated seeps located directly adjacent to a gravel BLM road. Understory plants include abundant monkey flower (*Mimulus*), columbine (*Aquilegia*), mosses, gooseberry (*Ribes*), cow parsnip (*Heracleum*), bracken fern (*Pteridium aquilinum*), stinging nettle (*Urtica dioica*), and grasses. Overstory is composed of oak (*Quercus*), alder (*Alnus*), and Douglas-fir (*Pseudotsuga menziesii*). Shrubs include mock orange (*Philadelphus*) and serviceberry (*Amelanchier*). The vegetation in these very moist seepage areas is noticeably different from the surrounding hillside, which is dominated by Ponderosa pine (*Pinus ponderosa*) and comparatively minimal ground cover. Recent surveys (July 2014) at this location recorded water temperatures of 9-10° C (48-50° F).

Substrate is characterized by loosely packed rocks and gravel (quarter inch to several inches in diameter), duff, downed wood, sediment, mosses, and forbs. Water flow was mostly subsurface during the 2014 surveys.

Exact elevations of known collections are mostly unknown, but the three specimens found in the Lakeview BLM District in 2014 were found at 1027 meters (3371 ft.) elevation. Estimated elevations of known collections could range anywhere from 21-1829 meters (70-6000 ft.) due to location uncertainty.

Threats

Specific threats to this species have not been identified. However, since larvae of this species burrow into porous substrates with subsurface water flow, flow alterations and activities that degrade water quality or increase siltation are likely to have negative effects (Wisseman 2003, Ruiter 2014, pers. comm.). Larvae are intolerant, cool to cold water adapted, and are likely sensitive to reduced dissolved oxygen levels and warm water temperatures (Wisseman 2003). *Homoplectra* species seem to be patchily distributed and isolated, and their spring-seepage habitats are probably very sensitive to logging and road building activities (Wisseman 2005, pers. comm.).

Most Trichopteran species have highly specific preferences with regard to water temperature, velocity, dissolved-oxygen levels, and substrate characteristics, and are therefore sensitive to a wide array of habitat alterations. Increased sedimentation, eutrophication, and chemical and thermal pollution by logging, road construction, and recreation in the watershed could harm this species. The Klamath Falls sites are located directly along a gravel road; dust and sedimentation from this road could negatively impact the fragile seep habitat at this site, althought traffic along this road appears minimal. The loss of trees through timber harvest poses additional threats, since this species occupies forested habitats, and trees provide shade that maintains appropriate water levels and temperatures for larval and pupal development. Continued global climate change further threatens the long-term survival of this species. Projected effects of climate change in this region include increased frequency and severity of seasonal droughts and flooding, reduced snowpack to feed river flow, increased siltation, and increased air and water temperatures (Field et al. 2007), all of which could impact this species and its habitat unfavorably.

Conservation Considerations

Inventory: This rare species appears to be patchily distributed, but that may solely be a result of where surveys have been conducted for this species. Surveys are first recommended at and in the vicinity of known sites throughout the species' range, and then in potential habitats in the large swaths of federal lands located between known sites.

Research: The immature stages of this species are unknown and have not been described. Research is needed to identify characters useful in separating the larvae of all the described *Homoplectra*. DNA analysis of fresh material within the genus may be particularly useful given the relatively subtle differences in morphological characteristics of this genus. At present, minor variations in male genitalia are the basis for species designations; however, variability within species has made taxonomic designations difficult. Wisseman (2015) and Ruiter (2015)

note that the literature and existing figures for this genus need to be updated to ensure positive species identification, and taxonomic review may ultimately lead to synonymization with older described species).

Management: Consider protection of all known and potential sites from practices that would adversely affect any part of this species' life cycle or habitat. In particular, avoid activities that would increase water temperatures or degrade water quality or quantity. Riparian buffers would likely benefit this species. Consider designing road maintenance activities to minimize impacts to populations located along roadsides, and take care to minimize roadside dust addition to seepage areas.

Other pertinent information

Nine species of *Homoplectra* are described from western North America (Weaver 1985, Wiggins 1996, Ruiter 2003). Because a limited number of specimens exist for any member of the genus, and the diagnostic characteristics appear to be quite variable, this genus is in great need of additional collecting and taxonomic review (Wisseman 2005, pers. comm.).

Adult males are required for positive species confirmation. Since adults only appear to respond to ultraviolet lights placed directly adjacent to the habitat, collections should be made by sweep-netting of vegetation near or in seepage areas, by hand-picking of adults, and by emergence trapping (including the use of lights). Larval collections can be made in suitable habitat during the 3-4 month period prior to emergence to determine if the genus is present. Care should be taken to not over-sample for larvae at small isolated habitats and to not trample fragile seep habitats.

Version 2:
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Date: April 21, 2015

Version 1:
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Date Completed: December 14, 2005

Edited by: Rob Huff
Date: June 26, 2007

ATTACHMENTS:

(1) References
(2) List of pertinent or knowledgeable contacts
(3) Map of known records in Oregon
(4) Photographs of this species and the type habitat
(5) Trichoptera Survey Protocol, including specifics for this species

ATTACHMENT 1: References

Denning, D.G. 1965. New Hydropsychidae (Trichoptera). Journal of the Kansas Entomological Society 38:75-81.

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Wisseman, R.W. 2005. Personal communication with Eric Scheuering.

Wisseman, R.W. 2014. Personal communication with Candace Fallon, The Xerces Society.

Wisseman, R.W. 2015. Personal communication with Candace Fallon, The Xerces Society.

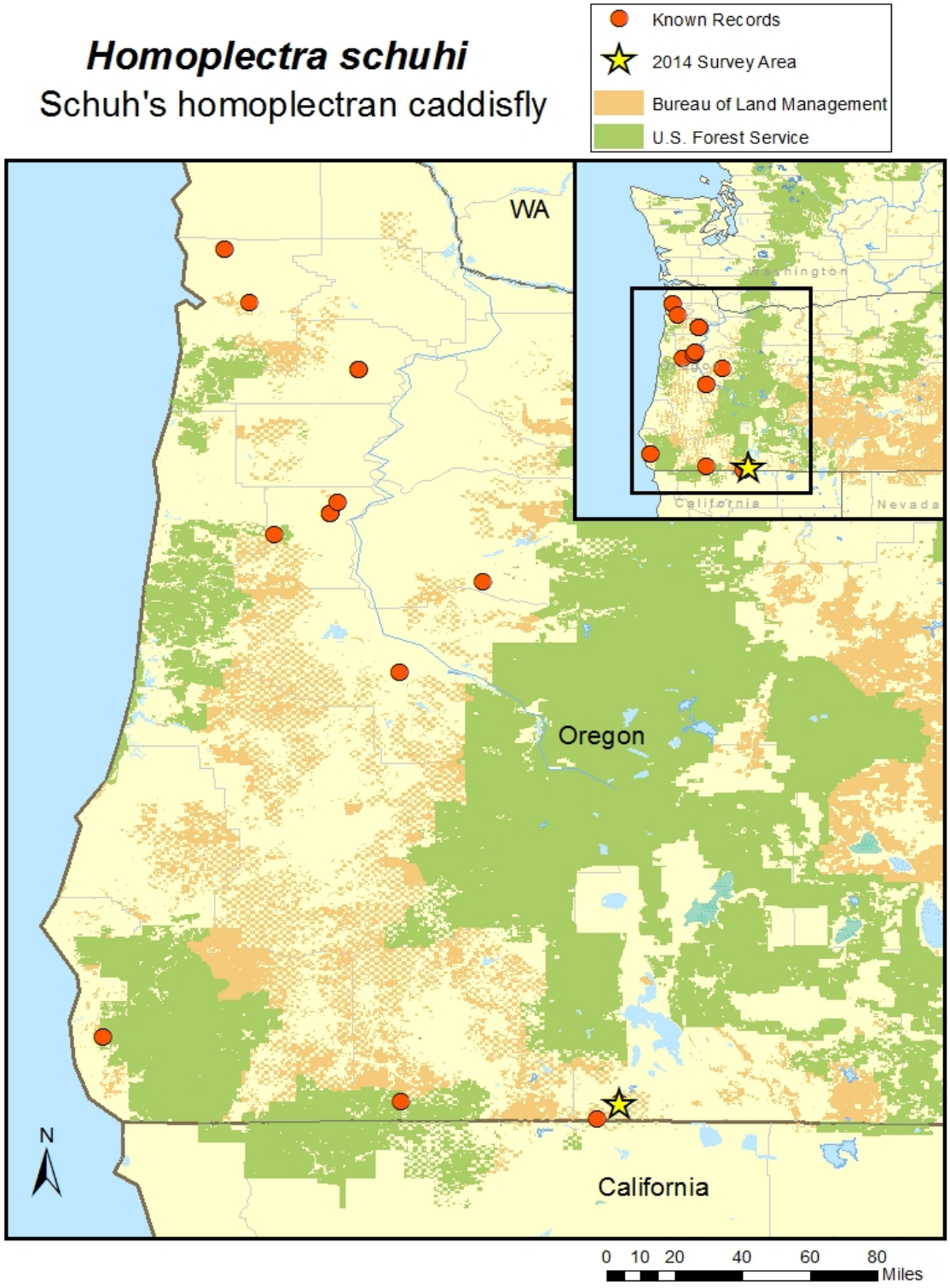
ATTACHMENT 2: List of pertinent, knowledgeable contacts

(Taxonomic experts experienced with collecting and identifying this species and/or interested in working out adult-larval associations of this species):

David (Dave) Ruiter. Grants Pass, OR.

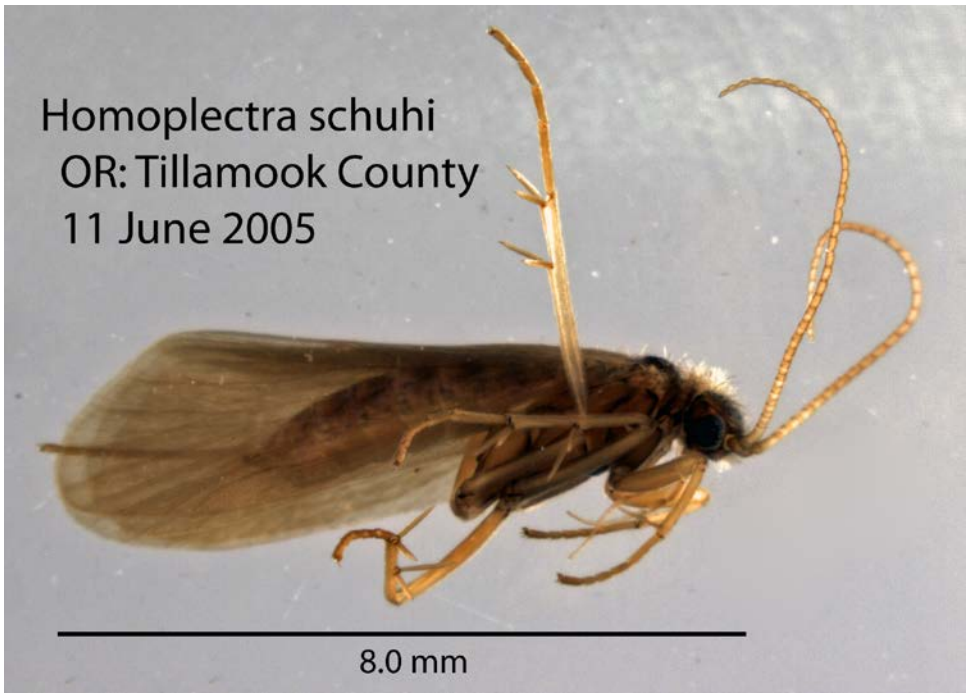
Robert (Bob) Wisseman, Aquatic Biology Associates, Inc. Corvallis, OR.

ATTACHMENT 3: Map of known *Homoplectra schuhi* distribution



Known records of *Homoplectra schuhi* in Oregon, relative to Forest Service and BLM land.

ATTACHMENT 4: Photographs of this species and the type habitat



Homoplectra schuhi adult (male). Photograph by David Ruiter. Used with permission.

Roadside seep habitat at suspected type locality in Lakeview BLM District. Photograph by Candace Fallon / The Xerces Society.

ATTACHMENT 5: Trichoptera Survey Protocol

Survey Protocol

Taxonomic group:
Trichoptera

Species:
Homoplectra schuhi Denning 1965

Where:

Trichopterans utilize a diversity of fresh water aquatic habitats, including headwater springs, streams, rivers, lakes, marshes, seepage areas, ponds, hot springs, and temporary pools. Most species have highly specific preferences with regard to water temperature, velocity, dissolved-oxygen levels, and substrate characteristics. Since the case-making larvae generally specialize in certain types of building material, the size and composition of available organic and inorganic materials can largely limit species' distributions. Construction materials include sand, pebbles, small rocks, mollusk shells, algae, duck-weed, plant stems, pine-needles, bark, grasses, and dead leaves. Some species are more selective than others and a few even exhibit life-stage-specific specialization, changing the case material and design partway through their aquatic life. Additionally, trichopteran larvae are often highly specialized in their dietary preferences and in the manner and location in which food is obtained. For species-specific construction material, habitat information, and feeding behavior, see the section at the end of this protocol.

When:

Adults are surveyed year-round, within the window of the species' documented flight period. In temperate climates, adults of various species can be collected from ice-break until the first days of heavy frost (Canton and Ward 1980). However, adults of some species may be found only in the winter or very early spring (Ruiter 2014, pers. comm.). Larvae and pupae are most conveniently surveyed at the same time as adults, although immature stages may not always be present during this time due to seasonal variation and each species' particular life cycle.

Adults:

Adult trichopterans are predominantly encountered in the vicinity of water, close to their emergence or oviposition site. Dispersal from the emergence site appears to be negatively correlated with vegetation density along the dispersal corridor; adults disperse farther (up to around 200 m (656 ft.) in sparsely vegetated areas (Collier and Smith 1998). In general, searches will be most productive within 30 m (98 ft.) of the water edge (Collier and Smith 2004). Adults are frequently collected from riparian vegetation with an aerial sweep net; they can also be hand-picked from the undersides of bridges and culverts, and from the sides and upper-surfaces of partly-submerged logs. Additionally, adults can often be collected in large numbers in soapy-water pan traps placed under a light (e.g. a vehicle headlight) and left overnight. Specimens can also be collected at night directly from lights or an illuminated sheet using an aspirator or finger dipped in alcohol. An aspirator is especially useful for capturing small species. Some species are attracted to ultraviolet light. Emergence traps placed over

habitat where the larvae are known or suspected to occur are another good method for obtaining adults (Wisseman 2005, pers. comm.). For emergence trap designs and sampling information, see Davies (1984). Additionally, sticky traps constructed from 5-gallon buckets lined with non-drying glue are effective at capturing adults of some species (Applegarth 1995).

Adults can be killed and preserved in 80% alcohol, or killed in cyanide and transferred to alcohol. However, preservation in 95% ethanol is preferred for future DNA analysis (Wisseman 2014, pers. comm.). Cyanide-killed adults may also be pinned, particularly to preserve color patterns, but pinning often damages critical aspects of the thorax and dried specimens are very difficult to identify to species (Triplehorn and Johnson 2005).

Since trichopteran identification often involves close investigation of adult male genitalia, photographs and sight records will not provide sufficient evidence of species occurrences. However, such observations may be valuable in directing further study to an area.

Larvae and pupae:

The aquatic larvae and pupae are found underwater, often creeping slowly along the substrate, or attached to stable rocks and sticks/logs. In streams and springs, it is best to search for larvae and pupae on the undersurface of large rocks and in the smaller substrate underneath the rocks. Since some species pupate in clusters, it may be necessary to turn over many rocks before finding a cluster. Grazing larvae frequently occur in mosses and liverworts growing on the tops of rocks, and in the thin layers of water running over rocks. In seepage areas at the head of springs, particular attention should be given to washing and searching samples of water-saturated organic muck (Wiggins 1996). In the heavily vegetated areas of lake shores, ponds, and marshes, larvae can be found in the substrate and crawling on aquatic plants. In deeper parts of lakes, larvae occur in surface mat plants, such as Ceratophyllum, and in soft bottom materials (Wiggins 1996).

When surveying for larvae, care must be used to avoid disrupting stream banks, shorelines, vegetation, and habitat. Depending on the habitat, a variety of nets can be useful. D-frame nets with mesh size fine enough to retain small larvae (0.5 mm, 0.02 in.) are the most versatile, as they can be used in both lotic and lentic habitats. In stream systems, the standard kick-net technique can be applied. The net is held vertically with the opening facing upstream and the flat side pressed tightly against the bottom substrate, so that water flows neither under nor over the net. Large rocks and wood immediately upstream of the net are gently scrubbed by hand or with a soft brush and the bottom substrate is disturbed with the hands, feet, or a stick while the current carries the uncovered and dislodged insects and material into the net. The stream bottom is disturbed to a depth of 4 – 6 cm (1.2 – 2 in.) for about three minutes, following which the net is removed from the water for specimen retrieval. When lifting the net, the bottom of the frame is swept forward in a scooping motion to prevent insects from escaping. Net contents are then flipped or rinsed into shallow white trays to search for larvae more easily, as they are often quite cryptic and can be difficult to see if they are not moving. In addition to nets and shallow trays, the following equipment is also useful: fine-mesh strainers/sieves for washing mud and silt from samples, squirt bottles for rinsing the net, five-gallon buckets for holding rinsing water, and white ice-cube trays, forceps, and a hand lens for sorting insects.

Larvae and pupae should be preserved on-site in 80% alcohol, unless collection for DNA analysis or rearing is an objective. Specimens collected for DNA analysis should be preserved in 95% ethanol. Since most trichopteran species have not been described in their larval stage, rearing can be critical in both (1) enabling species identification and (2) providing novel associations of larvae with adults. Wiggins (1996, pages 37-38) provides a summary of the accepted methods for immature-adult associations in caddisflies. Generally, in order to maximize the amount of information that can be gained from collected specimens, as many life stages as possible should be collected and a portion of both the larval and pupal series reared to adulthood. While pupae can be reared in small, refrigerated containers containing damp moss, larvae require an aerated aquarium with isolated cages for individuals. An oxygen bubbler generally provides sufficient oxygen and current, although some species (e.g. members of the Hydropsychidae) may require unidirectional current. Detailed techniques for rearing stream-dwelling organisms in the laboratory, including transportation, aeration, current production, temperature control, food, and toxic substances, are provided by Craig (1966), and available online at http://www.nzetc.org/tm/scholarly/tei-Bio14Tuat02-t1-body-d1.html (last accessed 12 September 2014).

Although quantitative collecting of trichopterans is difficult, population-size data is important in evaluating a species' stability at a given locality and in assessing its conservation needs. Relative abundances of immature trichopterans can be estimated by using a uniform collecting effort over a given sample period at comparable habitats (Wiggins 1996). The area or volume of substrate samples can also be standardized, although the aggregated spatial distributions of many species (e.g. Schmera 2004) can complicate this approach.

While researchers are visiting sites and collecting specimens, detailed habitat data should also be acquired, including substrate type(s), water temperature, water source, water velocity, water depth, stream width, canopy cover, streamside vegetation density, and degree of human impact. Algal or cyanobacterial blooms and other signs of eutrophication should be watched for and noted.

Species Specific Survey Details

Homoplectra schuhi

This poorly-understood species is now known from at least eleven locations throughout Oregon, where it has been collected since 1942.

The presumed type locality for this species was rediscovered in 2014, and subsequent survey efforts should focus first on this area on the Klamath BLM District. Additional surveys in appropriate habitat on the Siuslaw National Forest (along Parker Creek near Marys Peak), Rogue River-Siskiyou National Forest, Fremont-Winema National Forest, and Eugene District BLM are also recommended. In general, flight times for *Homoplectra* species extend from February to August, with most records falling in the April to June period, depending somewhat on elevation and climatic factors (Wisseman 2005, pers. comm.). Surveys are recommended during this time period. The adults are dark brown or black with length ranging from 5-10 mm (0.2-0.4 in.). Adults will be found on seep-side vegetation and only appear to be attracted to ultraviolet light if it is located directly adjacent to the habitat. Beating sheets, sweep nets, and aspirators are the best techniques for collecting adults (Wisseman 2014).

Species level identification is based on adult male genitalia. If only immature individuals are encountered, late-stage pupae can be collected and reared to adulthood for identification. Larvae cannot be identified to species but may be useful in determining if the genus is present. Basic research of the habitat, range, life history, and abundance of this species is needed.

References (survey protocol only)

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