

SPECIES FACT SHEET

Common Name: O'Brien Rhyacophilan Caddisfly
Scientific Name: *Rhyacophila colonus* (Schmid 1970)
Phylum: Mandibulata
Class: Insecta
Order: Trichoptera
Family: Rhyacophilidae
Subfamily: Rhyacophilinae

Conservation Status:

Global Status (2008): G1
Rounded Global Status: G1- Critically Imperiled
National Status (United States): N1
State Statuses: California: not ranked, Oregon: SH (Possibly Extirpated: species occurred historically in the state and there is some possibility that it may be rediscovered, but efforts to relocate occurrences have not been successful).
IUCN Red List Category: NE - Not evaluated

Note that the recent California record resulted in a global status change from GH/NH to G1/N1. This change is not yet apparent on the public NatureServe website. (NatureServe 2008, Cordeiro 2008, *pers. comm.*)

Technical Description:

Adult: The adults of this species are small, moth-like insects, 1.2 cm (0.5 in) in length. Species identification is based on the male genitalia (Schmid, 1970).

Immature: Although the larval stage of this species is unknown, all members of the family are free-living (case-less) until the end of the final larval stage when a pupal chamber is made. Pupal enclosures of most *Rhyacophila* species are constructed of rock fragments and fastened to the underside of a stable rock on the benthos surface (Wisseman 2008, *pers. comm.*). In North America, *Rhyacophila* pupal chambers range in length up to 25 mm (1 in.), and may be quite obvious on the undersurface of rocks (Wiggins 2004).

Life History:

The larval behavior and diet of this species are probably similar to others in the genus. *Rhyacophila* larvae are generally predaceous, feeding on simuliid (black fly) larvae, chironomid (midge) larvae and pupae, and the pupae of other caddisflies (Thut 1969, *reviewed in* Wiggins 2004). *Rhyacophila* gut content analysis has also revealed small proportions of mites, oligochaetes (segmented worms), and copepods (microcrustaceans) (Thut 1969). The flight period of this species is unknown, but the known records in both Oregon and California were in June. Little is known about the adult emergence, sexual maturation, mating, oviposition, dispersal, and life span of this species.

Range, Distribution, and Abundance:

This species is known from a collection of nine adults at the Oregon type locality (in the vicinity of O'Brien, Josephine Co., 1965), and from a collection of one adult male in California (Trinity County, Little Bidden Creek @ Highway 299, 1993) (Burdick 1999). Darren Borgias with The Nature Conservancy conducted extensive surveys for this species in 1998 and 1999. (Borgias and Wisseman 1999). Surveys took place between May and August, across twenty-one days in total, and included overnight ultraviolet light trapping, sweep netting, and benthic searches for larvae at thirteen Siskiyou National Forest streams in the vicinity of the type locality. A Nature Conservancy report details the dates and locations of the survey, including maps (Borgias and Wisseman 1999). Although five *Rhacophila* species were collected (identification by Robert Wisseman), this species was not among them, and it is possible that the species is now extirpated from the area.

Forest Service/BLM Lands: The only known documented Oregon occurrence is in the vicinity of the Siskiyou National Forest.

Habitat Associations:

The entire *Rhacophila* genus, whose name is derived from the Greek roots *rhyaco* (stream or torrent) and *philia* (fondness), is confined to running water. Within the genus, larvae of the Sibirica subgroup are typically found in small to mid-size streams in forested, montane areas (Wisseman 2006, *pers. comm.*). The adults of this species were collected along streams and torrents in dense forest. Larvae of the congeneric *R. arnoudi* forage for prey in interstitial spaces between gravels and are found in stream runs with a deep layer of gravel and coarse sand substrates that are not smothered with silt or algae (Wisseman 2008, *pers. comm.*).

Threats:

Housing development and stream-water diversions have been occurring in the vicinity of O'Brien, Oregon (on both private and USFS land) during the forty-three year time-span since this species was originally collected (Borgias and Wisseman 1999). Since subsequent collection effort has not revealed this species, the risk of local extirpation due to these habitat-altering activities appears to be high.

Conservation Considerations:

Inventory: Although this rare species appears to be extirpated from the 1965 type locality in Oregon (Borgias and Wisseman 1999), the recent record (1993) in California (Burdick 1999) suggests the continued existence of this species, and has resulted in a global status change from GH (possible extirpated) to G1 (critically imperiled) (Cordeiro 2008, *pers. comm.*). Conduct follow-up surveys at the California site and adjacent habitat in an effort to collect a voucher series and establish the current status of this species at the site (Wisseman 2008,

pers. comm.). Since the larvae of this species are unknown, collect as many life stages as possible and rear out some individuals in order unambiguously associate immature stages with adults (see Survey Protocol, attached). Further documentation of this rare species' range and habitat is especially critical for advancing our understanding of its needs and taking the appropriate conservation measures.

Management: Protect all new and known sites and their associated watersheds from practices that would adversely affect any aspect of this species' life cycle. Riparian habitat protection, including maintenance of water quality, substrate conditions, and canopy cover, would likely benefit and help maintain this species.

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ATTACHMENTS:

- (1) References**
- (2) List of pertinent or knowledgeable contacts**
- (3) Trichoptera Survey Protocol, including specifics for this species**

ATTACHMENT 1: References:

Borgias, D. and Wisseman R.W. 1999. Report on the 1998 and 1999 survey for *Rhyacophila colonus*, in forested torrents near O'Brien, Oregon. The Nature Conservancy of Oregon. Prepared for Diane Perez, Siskiyou National Forest.

Burdick, D.J. 1999. Trichoptera of California. Listing of records in the Donald G. Denning collection of Trichoptera at the California Academy of Sciences, San Francisco, California. Posted at a web site in 1999. Department of Biology, California State University, Fresno, California. *Reference obtained via personal communication with R. Wisseman, 2008.*

Cordeiro, Jay. 2008. Personal communication with Sarah Foltz.

NatureServe. 2008. "*Rhyacophila colonus*." *NatureServe Explorer: An online encyclopedia of life [web application]*. Feb. 2008. Version 7.0. NatureServe, Arlington, Virginia. 6 Oct. 2008 <<http://www.natureserve.org/explorer/>>.

Schmid, F. 1970. Le genre *Rhyacophila* et la famille *Rhyacophilidae* (Trichoptera). *Memoirs of the Society of Entomology of Canada*. 66:1-230.

Thut, R.N. 1969. Feeding habits of larvae of seven *Rhyacophila* (Trichoptera: *Rhyacophilidae*) species with notes on other life history features. *Annals of the Entomological Society of America* 62: 894–898.

Wiggins, G.B. 2004. *Caddisflies: the underwater architects*. University of Toronto Press, Toronto. 292pp.

Wisseman, Robert W. 2006. Personal communication with Eric Scheuering.

Wisseman, Robert W. 2008. Personal communication with Sarah Foltz.

ATTACHMENT 2: List of pertinent, knowledgeable contacts:

Robert Wisseman, Aquatic Biology Associates, Inc. Corvallis, OR.

ATTACHMENT 3: Trichoptera Survey Protocol, including specifics for this species:

Survey Protocol

Taxonomic group:

Trichoptera

Species:

Agapetus denningi

Farula constricta

Farula davisii

Namamyia plutonis

Rhyacophila colonus

Where:

Trichopteran larvae 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, feeding behavior, and habitat information, see the section at the end of this protocol.

When:

Adults are surveyed in the spring, summer, and fall, 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). Larvae and pupae are most conveniently surveyed at the same time as adults.

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 (such as members of the *Rhyacophila*) 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 should be killed and preserved in 80% alcohol, or killed in cyanide and transferred to alcohol. 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 rocks. 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 rearing is an objective. 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 19 November 2008).

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:

Rhyacophila colonus

This species is known in Oregon from a single collection of nine adults at the type locality (in the vicinity of O'Brien, Josephine Co., 1965), and in California from a collection of one adult male (Trinity County, Little Bidden Creek @ Highway 299, 1993) (Burdick 1999). In 1998 and 1999, survey efforts by Darren Borgias with The Nature Conservancy targeted this species; extensive collecting was done at thirteen Siskiyou National Forest streams, in the vicinity of where the type collection was made (Borgias and Wisseman 1999). Surveys took place between May and August (twenty-one days, in total), and included overnight ultraviolet light trapping, sweep netting, and benthic searches for larvae. A Nature Conservancy report details the dates and locations (including maps) of this two-year survey (Borgias and Wisseman 1999). Although five *Rhyacophila* species were collected (identification by Robert Wisseman), this species was not among them, and it is possible that the species is now extirpated from the area. Wisseman (2008, *pers. comm.*) states that the California locale is exact enough that it should be revisited in the hopes of collecting a complete series.

Surveys for this species would probably be most productive during May and June; the type series was collected on June 5th, along streams and torrents in dense forest. Small to mid-size, rapidly flowing streams of the Siskiyou National Forest are the most promising sites for Oregon surveys, but see Borgias and Wisseman (1999). The larvae of congeneric *R. arnoudi* are found in stream runs with a deep layer of gravel and coarse sand substrates that are not smothered with silt or algae (Wisseman, 2008, *pers. comm.*). Since most *Rhyacophila* species are attracted to ultraviolet light-traps, these would likely be useful in conducting field surveys.

The adults of this species are 1.2 cm (0.5 in) in length, and identified based on male genitalia (Schmid, 1970.). Although the larval stage of this species is unknown, all members of the family are free-living (case-less), and the behavior/diet of this species is probably similar to others in the genus. *Rhyacophila* larvae are generally predaceous, feeding on Simuliidae (black fly) larvae, Chironomidae (midge) larvae and pupae, and the pupae of other caddisflies (Thut 1969, *reviewed in* Wiggins 2004). Pupal enclosures of most *Rhyacophila* species are constructed of rock fragments and fastened to the underside of a stable rock on the benthos surface (Wisseman 2008). In North America, *Rhyacophila* pupal chambers range in length up to 25 mm (1 in.), and may be quite obvious on the undersurface of rocks (Wiggins 2004).

Since the immature stages of this species are undescribed, species identification of these stages will require rearing to adulthood. Males, in particular, are needed for positive species confirmation.

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References (survey protocol only):

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