

SPECIES FACT SHEET

Common Name: Denning's Agapetus Caddisfly

Scientific Name: *Agapetus denningi* (Ross 1951)

Phylum: Mandibulata

Class: Insecta

Order: Trichoptera

Family: Glossosomatidae

Subfamily: Agapetinae

Conservation Status:

Global Status (2005): GH

Rounded Global Status: GH - Possibly Extinct

National Status (United States): NH

State Status (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

(NatureServe 2008)

Technical Description:

Adult: The adults of this species are dark brown in color, with slightly lighter legs and abdomen. Male length is 5 mm (0.2 in.). For an illustration of the genitalia, see Ross (1951). The following traits distinguish this species: Ninth segment nearly annular, with anterior margin evenly bowed. Tenth tergite with lobes blade-like and thin, each with lateral aspect fairly shallow, triangular, elongate, and ending in a sclerotized portion which is curved ventrad and beak-like. Cercus moderately long and slender, with an irregular row of long setae. Clasper with base massive, apex tapering to a point curved sharply mesad; at the dorsal apex of the basal portion is a short sharp projection pointed mesad. Aedeagus with simple rods. Female: Size, color, and general structure similar to male. Female characters typical for *ophionis* complex, for which means of specific separation in this sex are not yet known (Ross 1951). This species is apparently closely related to *A. taho*, but differs in that *A. denningi* has a more triangular lateral aspect of the clasper and an almost even dorsal outline of the tenth tergite, which ends in a simple downcurved point (Ross 1951). Wisseman (2008, *pers. comm.*) suggests re-examining the original material for confirmation of the identification.

Immature: Although the immature stages of this species are unknown, the larvae of this family build distinctive, tortoise shell-shaped cases out of rock fragments. The case is flat on the bottom and the underside is open except for a small "strap" of rocks or sand, which holds the larva or pupa in place.

Life History:

Most trichopterans in temperate latitudes are univoltine (Wiggins 1996), developing from the egg through five larval instars, pupating and emerging as adults within a single year. The adult flight period is unknown for this species, but adult records of *A. taho* occur from July to November (Wisseman 2005, *pers. comm.*). The tentative record of a pupa of this species is from October 7th (Wisseman 2008, *pers. comm.*).

Range, Distribution, and Abundance:

Endemic to Oregon. Known definitively only from the type locality; Rogue River National Forest, Oregon. The type collection was made prior to 1951, and most of the collection data for this record is unknown (e.g., date, county, location, habitat, collector, determiner, life-stages). Wisseman (2008, *pers. comm.*) maintains an additional record for one male pupae of this species from Douglas County, Umpqua National Forest, Castle Rock Creek, 1999. Due to differences between the male genitalia and the original diagrams, however, this record should be considered tentative until an additional series is collected from the site, and/or comparisons are made with the type specimen (Wisseman 2008, *pers. comm.*).

Habitat Associations:

Habitat information from the type locality is not known, but the closely related *A. taho* is common in mid-order streams of moderate gradient in forested areas over a wide elevation range. These streams often have an open mixed deciduous-coniferous canopy, with substrates dominated by cobble-boulder-bedrock that are free of fine sediment (Wisseman 2005, *pers. comm.*). Glossosomatidae larvae are often conspicuous and abundant on the exposed upper surfaces of rocks (Wiggins 2004), and larvae of other members of this genus feed by scraping periphyton and fine detritus from rock and wood surfaces.

Threats:

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 pollution by grazing, development, and agriculture in the watershed could harm this species. 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 may further threaten the long-term survival of this species. Projected effects of climate change 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: Focus initial survey efforts on Castle Rock Creek in the Umpqua National Forest and on mid- to large streams in the Rogue River National Forest. Since the larvae of this species are unknown, collect and rear out as many life stages as possible, in order to associate immature stages with adults (see Survey Protocol, attached). Further documentation of this species' range and habitat is especially critical for advancing understanding of its status and 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.

Research: Basic research of the habitat, range, life-history, and abundance of this species is needed.

Version 2:

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Date: December 2008

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Date: December 2008

Version 1:

Prepared by: Eric Scheuering
Date: November 2005

ATTACHMENTS:

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

ATTACHMENT 1: References:

Field, C.B., Mortsch, L.D., Brklacich, M., Forbes, D.L., Kovacs, P., Patz, J.A., Running, S.W. and M.J. Scott. 2007. Chapter 14: North America. *In: Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on*

Climate Change (Parry, M.L., Canziani, O.F., Palutikof, J.P., van der Linden, P.J. and Hanson, C.E., eds.). Cambridge University Press, Cambridge, UK. Available at: www.ipcc.ch/pdf/assessment-report/ar4/wg2/ar4-wg2-chapter14.pdf.

NatureServe. 2008. "*Agapetus denningi*." *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/>>.

Ross, H.H. 1951. Phylogeny and biogeography of the caddisflies of the genera *Agapetus* and *Electragapetus* (Trichoptera; Rhyacophilidae). *Journal of the Washington Academy of Science* 41: 347-356.

Wiggins, G.B. 1996. *Larvae of the North American Caddisfly Genera (Trichoptera)*. Second Edition. Toronto and Buffalo: University of Toronto Press, 457pp.

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

Wisseman, Robert W. 2005. 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:

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, 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:

Agapetus denningi

This poorly-understood species is known definitively only from the type locality (Rogue River National Forest, Oregon), where it was collected on an unknown date before 1951. Wisseman (2008, *pers. comm.*) maintains an additional (1999) record for one male pupae of this species from Douglas County, Umpqua National Forest, Castle Rock Creek. Due to differences between the male

genitalia and the original diagrams, however, this record should be considered tentative until an additional series is collected from the site, and/or comparisons are made with the type specimen (Wisseman (2008, *pers. comm.*).

Initial survey efforts should focus on Castle Rock Creek in the Umpqua National Forest, and on mid- to large streams in the Rogue River National Forest. August to September may be the best time to conduct surveys, since the closely related *A. taho* has a late summer and early fall flight season. The larvae of this family build tortoise shell-shaped cases out of rock fragments, and are often conspicuous and abundant on the exposed upper surfaces of rocks (Wiggins 2004). Like other members of its genus, the larvae may be observed scraping periphyton and fine detritus from rock and wood surfaces. The adults are dark brown in color, with slightly lighter legs and venter. Male length is 5 mm (0.2 in.).

If only immature individuals are encountered, a portion of those collected should be reared to adulthood, since species level identification is based on male genitalia. Basic research of the habitat, range, life-history, and abundance of this species is needed.

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References (survey protocol only):

Anderson, N.H. 1976. Distribution and Ecology of Oregon Trichoptera. Technical Bulletin #134. Agricultural Experiment Station, Oregon State University, Corvallis, Oregon, 152 pp.

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of Biology, California State University, Fresno, California. *Reference obtained via pers. comm. with R. Wisseman, 2008.*

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