LAKE TAHOE BENTHIC STONEFLY
(*Capnia lacustra*)
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Distribution

The Lake Tahoe benthic stonefly, *Capnia lacustra,* is endemic to Lake Tahoe. This species is associated with deep-water plant beds and is most abundant at depths from 60 to 110 m (200 to 360 ft) although it has been found as deep as 274 m (899 ft) in McKinney Bay (Frantz and Cordone 1996). Although complete surveys of these plant bed assemblages have not been conducted, such communities have documented in two locations, both in the southeast part of Lake Tahoe (Beauchamp et al. 1992). (For further discussion on deep-water plant beds, see the Ecologically Significant Area account for deep-water plant beds in this chapter, Appendix C.)

Ecology

C. lacustra is a small wingless stonefly that ranges from 4.5 to 5.5 mm in length with little pigmentation (Frantz and Cordone 1996). Little is noted of the life history of *C. lacustra*. Even the manner in which they obtain oxygen is of some debate because they do not possess external gills (Frantz and Cordone 1996, Jewett 1963). This stonefly spends its entire life cycle at depths of 60 to Appendix O *Lake Tahoe Watershed Assessment* O-119 almost 275 m (200 to almost 900 ft) in Lake Tahoe. The only other known stonefly with a similar life cycle is a member of the genus *Baikaloperla*; it is found in Lake Baikal, Siberia. Both species are "wingless and share similar morphological and ecological characteristics" (Frantz and Cordone 1996 p. 22, after Baumann 1979).

Cordone (pers. comm.) suggests that the introduction of the Opossum shrimp (*Mysis relicta*) may also adversely impact *C. lacustra*. *M. relicta* is both a predator and filter feeder. Zooplankton tend to serve as the primary food source; however, when zooplankton are scarce, *M. relicta* will feed on detritus and/or benthic organic material (Foster 1997). Additionally, Linn and Frantz (1965) note that *M. relicta* also feed on phytoplankton. Such opportunistic feeding habits have made dramatic changes in certain aquatic communities and "extinctions of native zooplankton communities have been attributed to this lifestyle." (Foster 1997, p.1) And although Goldman et al. (1979) suggest that *M. relicta* may in part be responsible for the population decline in three pelagic cladoceran species, Frantz and Cordone (1996) note direct effects of *M. relicta* on the macrobenthos such as *C.lacustra* in Lake Tahoe have note been documented. This is due to the fact that studies of *M. relicta* vertebrate and invertebrate interactions in Lake Tahoe have been complicated by eutrophication, fish stocking, and fishing pressure (Richards et al. 1991). Members of the genus *Capnia* are shredders (Merrit and Cummins 1996). Thus, it is not surprising that *C. lacustra*, as previously noted, is associated with the deep-water plant beds of Lake Tahoe.

Habitat Relationships

Lake Tahoe's deep-water plant beds "are composed of bryophytes (mosses and liverworts), multicellular algae of the 'filamentous' type and Characeae (stoneworts)" (Frantz and Cordone 1996, p. 30). Frantz and Cordone (1966) note that the maximum depths of these deep-water plant beds are the deepest noted in any lake and that distribution of these deep-water plant beds is dependent on available light. Thus, as water clarity diminishes, decreases in the vertical distribution of these plant beds can be expected. Further Frantz and Cordone (1996) state, "Should further significant enrichment occur, reduced light penetration might permanently eliminate this unique plant community. It may already be too late for some of the plant beds. The loss of the deep-water plant beds at Lake Tahoe would substantially reduce the lake's biological diversity." (See the Ecologically Significant Area account for deep-water plant beds in this chapter, Appendix X, for further discussion.)

Effects of Human Activities

Human activities that lead directly or indirectly to increases in phytoplankton and/or sediment transport will decrease lake clarity (Frantz and Cordone, 1996, Jassby et al. 1999); such decreases in clarity will have an adverse impact on the deep-water plant beds. Because of the association between *C. lacustra* and these deep-water plant beds, a corresponding decrease in distribution of *C. lacustra* could be expected with such activities. Likewise, competition with introduced exotic invertebrates can be expected to have a negative effect on *C. lacustra* populations.

Conservation

C. lacustra is currently listed as a Species of Concern by the US Fish and Wildlife Service. Additionally, *C. lacustra* is assigned a Global Rank of 1 (G1) and a State Rank of 1 (S1) by the Nevada Natural Heritage Program (NNHP 1998). The G1 ranking indicates that on a global scale *C. lacustra* is "critically imperiled due to extreme rarity, imminent threats, or biological factors" (NNHP 1998). Similarly the S1 rating indicates that "based on distribution within Nevada at the lowest taxonomic level" *C. lacustra* is "critically imperiled due to extreme rarity, imminent threats, or biological factors" (NNHP 1998).

At present, information on the macrobenthos of Lake Tahoe is limited, including information specific to *C. lacustra*. Preliminary baseline information has been provided by Frantz and Cordone (1966, 1996), but the present distribution and abundance of the species are unknown. Given the recent decline in lake clarity, the possible effects on deep-water plant beds, and the introduction of exotic invertebrates, *C. lacustra* could face extinction. Further inventory and research are needed to assess adequately the distribution and frequency of occurrence of *C. lacustra* as well as its association with deep-water plant beds.

Envirogram of the Lake Tahoe Benthic Stonefly

The envirogram of the Lake Tahoe benthic stonefly (Figure O-5) depicts important habitat elements, food resources, interspecific interactions, and reproductive requirements of the species.

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