

## Longhorn Fairy Shrimp (*Branchinecta longiantenna*)

### Status

**State:** Meets the requirements as a “rare, threatened, or endangered species” under CEQA

**Federal:** Endangered

**Critical Habitat:** Designated 2006 (USFWS 2006)

### Population Trend

**Global:** Declining due to habitat loss and fragmentation (Eriksen and Belk 1999)

**State:** As above

**Within Inventory Area:** Unknown

### Data Characterization

The location database for the longhorn fairy shrimp (*Branchinecta longiantenna*) within the inventory area includes 2 records from 1982 and 1990 near the Los Vaqueros Reservoir (Eng et. al. 1990, California Natural Diversity Database 2001). These 2 locations are shallow, sandstone-rock-outcrop vernal pools within non-native grassland. Other natural and artificial habitats have a high probability of being occupied by additional populations of the longhorn fairy shrimp throughout the grassland habitats within the ECCC HCP/NCCP inventory area.

In addition to the original description (Eng et. al. 1990), Eriksen and Belk (1999) presented a brief discussion of the longhorn fairy shrimp and provided a distribution map. Hill and Shepard (1997) produced a scanning electron micrograph of the cyst (resting egg), and Helm (1997) provided some generalized natural history data. No other peer-reviewed technical literature has been published concerning the longhorn fairy shrimp.

### Range

Only 8 populations of the longhorn fairy shrimp are known (U.S. Fish and Wildlife Service 1996). Longhorn fairy shrimp occurrences are rare and highly disjunct with specific pool characteristics largely unknown (USFWS 2003). The Altamont pass subunits of the species occur within clear depression pools in sandstone outcrops (Eriksen and Belk 1999; EBRPD 2001; CNDDDB 2002). Other populations in the middle and southern range of the species occur in loam and shallow alkaline soil, respectively (USFWS 2003).

### Occurrences within the ECCC HCP/NCCP Inventory Area

Two records for this species exist in the ECCC HCP/NCCP inventory area: sandstone outcrops on both the Souza Ranch (type locality), and in Vasco Caves

Regional Preserve. The paucity of data points within the inventory area may be due to a lack of survey effort. Critical habitat has been designated for the species in Vasco Caves Regional Preserve (U.S. Fish and Wildlife Service 2006).

## Biology

### Habitat

Typical habitat for listed fairy shrimp in California include vernal pools, seasonally ponded areas within vernal swales, and ephemeral freshwater habitats (USFWS 2003). Other kinds of depressions that hold water of a similar volume, depth, and area, and for a similar duration and seasonality as vernal pools and ponded areas within swales also may be potential habitat. These other depressions--typically artificial habitats and partially or completely unvegetated--may be suitable for this species. Examples of artificial habitats that may be suitable for this species are railroad toe-drains, roadside ditches, abandoned agricultural drains, ruts left by heavy construction vehicles, and depressions in firebreaks (Eng et al. 1990).

Longhorn fairy shrimp in Contra Costa and Alameda Counties are primarily reported from water pooled in sandstone depressions. Vernal pools in other parts of California that support these fairy shrimp are either loam and sandy loam or shallow, alkaline pools (USFWS 1994). The seasonal pool habitat is subject to seasonal variations, and longhorn fairy shrimp are dependent on the ecological characteristics of such variations. These characteristics include duration of inundation and presence or absence of water at specific times of the year (U.S. Fish and Wildlife Service 1994). The longhorn fairy shrimp is capable of living in vernal pools of relatively short duration (pond 6 to 7 weeks in winter and 3 weeks in spring) (Eriksen and Belk 1999).

### Feeding

Longhorn fairy shrimp are omnivorous filter-feeders. Fairy shrimp indiscriminately filter particles from the surrounding water, including bacteria, unicellular algae, and micrometazoa (Eriksen and Belk 1999). The precise size of items these fairy shrimp are capable of filtering is currently unknown. However, fairy shrimp will attempt to consume whatever material they can fit into their feeding groove and do not discriminate based upon taste, as do some other crustacean groups (Eriksen and Belk 1999).

### Ecology

Longhorn fairy shrimp are a component of the planktonic crustacea within seasonal temporary pools and can occur in densities as high as 200 per liter of water. Planktonic crustacea are important in the food web, as they represent a high-fat, high-protein resource for migratory waterfowl. Mallard, Green-winged

Teal, Greater Yellowlegs, and Killdeer all forage actively in Central Valley vernal pools on the invertebrate and amphibian fauna during the winter months.

Predator consumption of fairy shrimp cysts (resting eggs) aids in distributing populations of fairy shrimp. Predators expel viable cysts in their excrement, often at locations other than where they were consumed (e.g., Wissinger et al. 1999). If conditions are suitable, these transported cysts may hatch at the new location and potentially establish a new population. Cysts can also be transported in mud carried on the feet of animals, including livestock, that may wade through their habitat (Eriksen and Belk 1999).

Beyond inundation of the habitat, the specific cues for hatching are unknown (Eriksen and Belk 1999), although temperature is believed to play a large role. Typically, midvalley fairy shrimp mature in about 16 days when water temperatures reach at least 20 degrees Celsius (Eriksen and Belk 1999). Longhorn fairy shrimp have been reported to co-occur with the vernal pool fairy shrimp (*Branchinecta lynchi*).

## Threats

Longhorn fairy shrimp are threatened by the same activities as other vernal pool invertebrates. These threats include the conversion of vernal pool habitat to agricultural lands and urban development, and extinction because of the small and isolated nature of remaining populations (U.S. Fish and Wildlife Service 1994). The limited and disjunct distribution of vernal pools, coupled with the even more limited distribution of the longhorn fairy shrimp, means that any reduction in vernal pool habitat could adversely affect this species.

Habitat fragmentation can isolate and reduce population size, resulting in a process of progressive population extinction. Small or isolated populations are more susceptible to extinction from random environmental disturbance. Recolonization opportunities are also diminished when physical barriers, such as development or lack of vernal pool habitat, isolate populations from one another or inhibit transport of cysts. Isolated populations are potentially more susceptible to inbreeding depression, which can result in local extinction or reduced fitness (Gilpin and Soule 1986, Goodman 1987a, 1987b). However, this has never been demonstrated for branchiopod crustaceans.

Activities that alter the suitability of habitat may impact the special-status crustaceans dependent on these habitats. These activities include damaging the impermeable clay and /or hardpan layers of the habitat bottom, filling in the habitat, altering (e.g. through contaminants) or destroying the watershed that conveys overland flow into the habitat. Additionally, introduction of non-native plants, destruction or degradation of the surrounding upland habitat, introduction of fish (such as *Gambusia* spp.) into special-status shrimp habitats, and activities that would discourage or prevent waterfowl and waders from feeding at occupied habitats and thereby restrict gene-flow between populations would also significantly affect longhorn fairy shrimp populations.

## Conservation and Management

Because comprehensive surveys for the longhorn fairy shrimp in the ECCC HCP/NCCP inventory area have not been conducted and known occurrences throughout the species range are based mostly on incidental observations (e.g., CNDDDB), the population size and locations of this species in the ECCC HCP/NCCP inventory area are not known. Also, suitable habitat for the longhorn fairy shrimp in the ECCC HCP/NCCP inventory area was identified based on a general classification of land-cover types. Field evaluation of the habitat classification has not been conducted, and the extent to which vernal pools in the inventory area meet the habitat requirements of longhorn fairy shrimp is unknown. Also, the importance of artificial habitats that may support longhorn fairy shrimp in the ECCC HCP/NCCP inventory area has not been evaluated.

However, the dependency of this species on vernal pool habitats provides some useful information on the types of impacts that can occur to longhorn fairy shrimp from covered activities. Based on its restricted distribution, the current USFWS conservation requirement for this species is that no take (individuals or habitat) will be allowed.

## Species Distribution Model

No species distribution model could be developed for the longhorn fairy shrimp because suitable microhabitats (sandstone vernal pools) occur at too small a scale to be mapped in the inventory area.

## Literature Cited

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