

A close-up photograph of a crayfish, showing its large claws and textured body. The crayfish is dark brown with some lighter, mottled patterns. It is positioned in the center of the frame, with its head and claws visible. The background is a light, slightly blurred surface.

Species Accounts - Invertebrates
and
Crustaceans

Trinity bristle snail *Monadenia infumata*
ssp. setosa
(= *Monadenia setosa*)

State Threatened 1980
Federal None

General Habitat:

The Trinity bristle snail lives along riparian corridors and uplands within Klamath mixed-conifer forests having a deciduous hardwood understory. The snail is primarily found in moist but well-drained, well-shaded canyons or streamside benches covered with a layer of leaf mold at least four inches deep. It has also been observed in dry sites not considered typical habitat.

Description:

The Trinity bristle snail is named for the short, fine bristles present on the exterior surface of the shell. The snail's body is dull-gray to black, and covered with brick-red to salmon colored tubercles. The relatively flattened and narrow-shouldered shell is brown to chestnut-colored, with a blackish-brown peripheral band and a lighter, more obscure band. The innermost whorls are usually lighter colored than the rest of the shell. In larger individuals, the shell is one to 1.5 inches in diameter, with 6 to 6.75 dextral (right-handed) whorls, and the body is about 1.5 inches long. Age at maturity is estimated to be 15 to 20 years. The snails undergo dormancy during the summer and winter, and can remain dormant for more than 10 years and revive.

Both adults and juveniles primarily live on the ground, feeding upon and living among the top layer (up to 3.5 inches depth) of leaf litter. They also climb to feed upon lichens growing on alder trees, petioles of violets, and stalks of other plants. Individuals have limited home ranges, and are usually sparsely distributed.

Status:

The Trinity bristle snail is thought to be a relict species of the Pleistocene epoch, when the climate was much cooler and moister than at present. This species is confined primarily to habitats where there is shade, fairly low temperature, and fairly high humidity. The snail is most active between May and October and is most likely to be



seen between dusk and dawn, when the air tends to be more humid.

The snail is vulnerable to activities that alter the character of its habitat: removal of leaf litter and cover, increased exposure, slope destabilization, or a decreased amount of large woody debris. Activities such as clear cutting, timber harvest, mining, and off-highway vehicle use can lead to these types of habitat changes. Large, intense fires, often a result of historic fire suppression activities, also threaten the snail. Snails can withstand fire if in deep ground fissures in rocky substrates. Extensive, high intensity fires, however, can eliminate the majority of individuals in local populations, as well as their habitat and food sources.

As a result of very recent genetics research, the Trinity bristle snail is now considered to be a subspecies of *Monadenia infumata*. (Please see Barry Roth, Checklist of the Land Snails and Slugs of California, Santa Barbara Museum of Natural History, Contributions in Science, Vol. 3 for additional information.) Research also shows that this snail is part of a large interbreeding complex, forming a continuum with other species of *Monadenia*. Apparent hybrids of Trinity bristle snail and *Monadenia fidelis* are found in the Eltapom Creek watershed (tributary to the South Fork Trinity River) between Underwood, Chaparral and Hyampom Mountains.

Prior to 1999, the Trinity bristle snail's range was believed to be limited to sections of the Trinity River and its tributaries (i.e., Swede, Big, French, Price, Bidden, Limestone, and Little Swede creeks; an unnamed creek south of Big Bar; and the south side of the Trinity River east of Price Creek). These areas are all located west of the town of Junction City, in the center of Trinity County. The Trinity bristle snail appears to be sparsely distributed within its limited range, which is entirely in the southern Klamath Mountains and within the Shasta-Trinity National Forest.

While conducting mollusk surveys as part of the Northwest Forest Plan during 1999-2002, staff from Shasta-Trinity National Forest found Trinity bristle snails at many new locations that have significantly increased the known range. The species is now known from about 75 locations. The known range includes the South Fork Mountain (Trinity-Humboldt county line) near Blake Mountain west of Hyampom, south to Norse Butte, and east to near Forest Glen. The known range also extends to the Trinity-Humboldt county line, which is also the division between the Shasta-Trinity and Six Rivers national forests. Knowledge of habitat utilization has also expanded as a result of these surveys. In addition to riparian forest, habitat is now known to include upland mixed conifer habitats with canopy cover that are generally suitable for other terrestrial mollusks. Further surveys of these sites and the surrounding areas are needed. Surveys within other national forests would greatly add to information about this species.

USFWS considers the Trinity bristle snail a Federal Special Concern Species. However, this designation does not afford the species any special protection under the law. During 1997, the International Union for Conservation of Nature (IUCN) included the Trinity bristle snail in their worldwide Red List of Threatened Species.

The status in 2002 of the Trinity bristle snail: *Unknown.*

Shasta crayfish

Pacifastacus fortis

State	Threatened	1980
	Endangered	1988
Federal	Endangered	1988

General Habitat:

The Shasta crayfish generally lives in cool, spring-fed headwaters characterized by clean, volcanic cobbles and boulders overlying sand or gravel substrates. These spring-fed habitats are stable year-round, with almost no change in flow, temperature, or turbidity. In a few areas, small numbers of Shasta crayfishes may be found in altered or degraded habitats, where water temperature and clarity may vary considerably. The Shasta crayfish is limited to the mid-sections of the Pit River drainage, primarily the Fall River and Hat Creek drainages in Shasta County.

Description:

The Shasta crayfish is mostly dark brown dorsally and bright orange red ventrally, especially on the underside of the claws. Adult Shasta crayfish are between two and four inches in total length, including the tail. When compared to other species of crayfish, the Shasta crayfish is medium-sized, and the body and claws are relatively robust. Like most species of crayfish, the Shasta crayfish is active at night and remains hidden during the day. Unlike other species, this crayfish is primarily herbivorous, feeding upon the periphyton (composed of benthic algae and diatoms, organic detritus, and small benthic invertebrates) which forms a surface film upon volcanic rock substrates. The Shasta crayfish is relatively sedentary and does not display aggressive behavior when disturbed.

Status:

The Shasta crayfish is the only extant species of crayfish native solely to California. It is a relatively long-lived species, but has limited reproductive potential; it matures slowly (at age five years) and produces relatively few eggs. Competition with, and predation by, signal crayfish, an invasive nonnative species, is one factor contributing to the decline of the Shasta crayfish. Although the species has been reported from seven populations, recent studies found Shasta crayfish at only three of the previous seven known locations, apparently due to invasion by signal crayfish. The remaining populations range in size from fewer than 50 to about 1000 individuals. Little or no genetic exchange occurs between these small, disjunct populations.



The largest population of Shasta crayfish is found in upper Spring Creek, a tributary to the Fall River. Until recently, this population has been protected from nonnative signal crayfish invasions via a series of four culverts that convey the creek waters under the road. The velocity of water passing through the culverts prevents signal crayfish from migrating upstream. When the Fall River flooded in January 1997, the road crossing was inundated for several hours, causing a temporary flow reversal in the culverts, which allowed signal crayfish to migrate through the culverts. Between June and August 1997, two collection efforts resulted in the capture of four adult and 18 juveniles. All of the signal crayfish were collected within 25 feet of the culverts on the upstream side. The DFG searched the area farther upstream of the culverts, but no additional signal crayfish were found. Using Cantara Chemical Spill Restoration funds, the DFG is currently funding a project that will replace the aging culverts and maintain them as a barrier to signal crayfish invasion.

In 1997, the DFG closed its Pit River Hatchery at Sucker Springs Creek to protect the Shasta crayfish. The DFG operated the trout-rearing facility for more than 30 years. The hatchery ponds supported the largest known population of Shasta crayfish in the mid-reaches of the Pit River. Fortunately, due to the design of the hatchery, the pond weirs function as barriers against signal crayfish. The DFG is currently restoring Sucker Springs Creek to a more natural state, incorporating improvements that would further protect the Sucker Springs Creek population from signal crayfish invasions. To date, the DFG has trapped and removed over a thousand signal crayfish from Sucker Springs. Continued trapping efforts at Sucker Springs during 2000, 2001, and 2002 have not been successful at eradicating the signal crayfish. Other methods and techniques are being considered in conjunction with a 2003 Section 6 Proposal that will assess existing populations of Shasta crayfish and search for potential refugia sites.

In August 1998, the USFWS completed the Recovery Plan for the Shasta crayfish. Recovery actions include: 1) protecting Shasta crayfish through eradication of, or preventing nonnative crayfish invasions, restoring habitat, and eliminating adverse impacts of land management practices; 2) determining the status, distribution, and relative abundance of Shasta crayfish in the mainstem of the Pit River; 3) conducting research on the ecology, behavior, and pathology (i.e., viral and bacterial infectious agents) of Shasta crayfish; 4) monitoring and assessing Shasta crayfish populations; 5) developing effective watershed and ecosystem management plans for all drainages supporting Shasta crayfish populations; and 6) providing public education on Shasta crayfish.

The status in 2002 of the Shasta crayfish: Declining.

California freshwater shrimp

*Syncaris
pacifica*

State	Endangered	1980
Federal	Endangered	1988

General Habitat:

The California freshwater shrimp is found in shallow low-elevation, low-gradient streams 12 to 36 inches in depth with exposed live roots of trees such as alder and willow along undercut banks greater than six inches with overhanging woody debris or stream vegetation and vines such as stinging nettles, grasses, vine maple and mint.

Description:

The California freshwater shrimp is the State's only native, stream-dwelling shrimp. This species resembles its marine relatives but rarely attains a carapace length (measured from the eye socket to tip of the tail) of more than two inches. The shrimp feeds on decomposing plants and other detritus. Juveniles are nearly transparent, whereas adults are mostly translucent with small, diffuse, dark spots that camouflage the body outline. When disturbed, they can change their color, from translucent to entirely dark brown or purple, to blend in with their surroundings. Females can darken their bodies to a greater degree and are also generally larger and deeper bodied than males.

Status:

Historically, the shrimp was probably common in low elevation, perennial freshwater streams in Marin, Sonoma, and Napa counties. Today, it is found in 17 stream segments within these counties. The distribution can be separated into four general geographic regions: 1) tributary streams in the lower Russian River drainage, which flows westward into the Pacific Ocean; 2) coastal streams flowing westward directly into the Pacific Ocean; 3) streams draining into Tomales Bay; and 4) streams flowing southward into northern San Pablo Bay. All known occurrences are threatened by introduced fish, deterioration or loss of habitat resulting from water diversion, impoundments, livestock and dairy activities, agricultural activities and developments, flood control projects, gravel mining, timber harvesting, migration barriers, and water pollution. The USFWS completed its Recovery Plan for the California Freshwater Shrimp in August 1998. This plan developed the framework for habitat restoration, reintroduction of the shrimp to sites from which it had been extirpated, and an assessment of the effects of various conservation efforts on cohabiting native species.

USGS has recently implemented a research project in Olema and Lagunitas Creeks in Point Reyes National Seashore and Golden Gate National Recreation Area. The goals of this project are to 1) to determine if shrimp are homogeneously distributed throughout Lagunitas and Olema creeks or if their distribution is concentrated in certain



localities; and 2) to determine if shrimp distribution is associated with selected habitat characteristics (e.g., stream morphometry, water quality, types and amounts of underwater cover, cohabiting fish species). The results from this study will be used to identify management actions that benefit the shrimp population in Olema Creek, but could also benefit shrimp in Lagunitas Creek and elsewhere. The ecological data will also contribute to recovery of this species. Data collected began in early 2003. Preliminary results on Lagunitas Creek show seasonal variation in numbers of juvenile and adult shrimp, with more juvenile shrimp in August and November and more adult shrimp in February and May. Approximately 1000 shrimp were captured during the four 2003 sampling periods. The majority of shrimp occur in "slides" rather than pools and riffles. Most were captured on the fine roots of blackberry in slow moving waters.

A number of agencies and private groups have contributed to the conservation of the California freshwater shrimp. Partners in this effort include the NRCS, the WCB, the NPS, Marin County, Napa County, the California Coastal Conservancy, local schools, ranchers, and watershed groups. Habitat restoration on Stemple Creek in Marin County exemplifies this partnership. A watershed approach to stream restoration was funded by a variety of means, including a grant from the WCB, a USFWS Partners for Wildlife grant, and funds from the Marin Community Foundation. Using a variety of land management tools and historic data, riparian restoration began in the late 1990s. About 20 miles have been restored and ranchers have reconfigured pastures to protect the stream and reduce runoff from fields.

Restoration was also accomplished through a Center for Ecoliteracy project entitled "The STRAW Project" or "Students and Teachers Restoring a Watershed." Students involved in the project benefit from working alongside watershed restoration experts. The 4th Grade Brookside School students and their teacher worked cooperatively to map riparian habitat, monitor water quality, research native species, clear debris from creeks, and implement public awareness campaigns. Prior to the STRAW Project, it was estimated that 50 years would be needed to effect a change in the shrimp population levels in the degraded reaches of the Stemple Creek. However, the California freshwater shrimp could be found in the restored areas of Stemple Creek within three years.