

50 CFR Part 17

Endangered and Threatened Wildlife and Plants; Proposed Endangered Status for the Shasta Crayfish

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Proposed rule.

SUMMARY: The Service proposes to determine the Shasta (=placid) crayfish (*Pacifastacus fortis*) to be an endangered species. This species occurs only in Shasta County, California, within the Pit River drainage system, including tributaries of the Hat Creek and Fall River subdrainages. The Shasta crayfish is uncommon, and the overall population could number fewer than 3,000 individuals. A survey conducted in 1985 by the California Department of Fish and Game determined that the Shasta crayfish has been extirpated from approximately one-half of its known range since 1978. Throughout its remaining approximately 2,000 acres of habitat, the Shasta crayfish is endangered by: Competition for food and space with two aggressive, adaptive, exotic crayfish species; agricultural development; and aquatic habitat loss because of water diversion and impoundment. Continued habitat loss and degradation present substantial threats to the existence of this crayfish. Determination of the Shasta crayfish as endangered would implement the protection provided under the Endangered Species Act of 1973, as amended. The Service seeks comments and relevant data from the public on this proposal.

DATES: Comments from all interested parties must be received by September

8, 1987. Public hearing requests must be received by August 24, 1987.

ADDRESSES: Comments and materials concerning this proposal should be sent to the Regional Director, U.S. Fish and Wildlife Service, Lloyd 500 Building, Suite 1692, 500 NE., Multnomah Street, Portland, Oregon 97232. Comments and materials received will be available for public inspection, by appointment, during normal business hours at the above address.

FOR FURTHER INFORMATION CONTACT: Mr. Wayne S. White, Chief, Division of Endangered Species (see ADDRESSES above) (503/231-6131 or FTS 429-6131)
SUPPLEMENTARY INFORMATION:

Background

The Shasta crayfish [*Pacifastacus fortis* (Faxon)] is a decapod crustacean of the family Astacidae. William Faxon (1914) originally described this crayfish as *Astacus nigrescens fortis* from specimens taken from Fall River and Hat Creek near Cassel in 1898. Bott (1950) revised the subfamily Astacinae, creating the new genus *Pacifastacus*, which contained most of the western North American species of the subfamily. Hobbs (1972) explicitly placed *Pacifastacus fortis* in that genus and accorded it full species status. Bouchard (1977a) subdivided the genus *Pacifastacus* into two subgenera, *Pacifastacus* and *Hobbsastacus*, placing *Pacifastacus fortis* in the subgenus *Hobbsastacus*.

Adult Shasta crayfish are small to medium-sized crayfish that reach up to 50 millimeters (2 inches) in length of the carapace (shell covering the back over the walking legs). Their color is variable and ranges from dark brownish-green to dark brown on the topside and bright orange on the underside (Eng and Daniels 1982). Occasional blue-green to light blue individuals are found in isolated populations (McGriff, California Department of Fish and Game (CDFG), personal communication 1986). These blue crayfish have a light salmon color on their undersides. Members of the Fall

River population are dark orange-brown on the topside and bright red on the underside, especially on the chelae (pincers) (Eng and Daniels 1982). The distribution of these colors probably provides camouflage for the crayfish among the volcanic rubble substrates of their habitat.

The adults of the Shasta crayfish are sexually dimorphic and can easily be distinguished because the males have narrower abdomens and larger chelae than the females. The first two pair of swimmerets (tiny swimming legs) of the males are hard and modified for sperm transfer to the female during mating. These notable sexual characteristics can be seen in young larvae that are less than 10 millimeters (.4 inches) in total carapace length (Eng and Daniels 1982).

The Shasta crayfish is found only in Shasta County, California, in the Pit River drainage and two tributary systems, the Fall River and Hat Creek subdrainages. In the Hat Creek subdrainage, populations have been found in Lost Creek and in Crystal, Baum, and Rising River lakes. In the Fall River subdrainage, populations occur in Fall River; Big Lake; Spring, Squaw, and Lava creeks; and Crystal and Rainbow springs. An additional population in Sucker Spring Creek, a tributary of the Pit River that lies between the two subdrainages (Bouchard 1978, Eng and Daniels 1982), has been extirpated. The populations in Lake Britton, and Burney, Clark, Kosk, Goose, Lost, and Rock creeks were extirpated prior to 1974 (Bouchard 1977b). Since 1978 the Shasta crayfish has been extirpated from Crystal Lake, from Baum Lake, and from Spring Creek near its confluence with the Pit River (McGriff, personal communication 1986).

Daniels (1980) reported the relative density of *P. fortis* in Crystal Lake as 6.89 crayfish per square meter versus 0.09 crayfish per square meter for Baum Lake. He also reported an average density of 3.81 crayfish per square meter for the introduced signal crayfish (*Pacifastacus leniusculus*), in Baum

Lake. The signal crayfish is a known competitor of the Shasta crayfish and apparently was responsible for the low density of the native crayfish in Baum Lake.

During 1985, surveys revealed that most Shasta crayfish were found in the Fall River subdrainage (McGriff, personal communication 1986). At the Spring Creek confluence with the Pit River, *P. leniusculus* and a second exotic crayfish species, *Orconectes virilis*, were present, but there were no *P. fortis* in 1985 (McGriff, personal communication 1986). In a few locations the Shasta crayfish occurs sympatrically with both exotic species; however, it is much less common than the exotics at these sites. It is not known if the Shasta crayfish and the two exotic crayfish species can coexist permanently. Cases of apparent sympatry may be the result of Shasta crayfish having washed down from upstream populations and may not reflect coexisting breeding populations. Distributional data indicate that these two exotic species outcompete native species (Bouchard 1977a, Riegel 1959, Schwartz *et al.* 1963).

Shasta crayfish occur in cool, clear, spring-fed lakes, rivers and streams, usually at or near a spring inflow source, where waters show relatively little annual fluctuation in temperature and remain cool during the summer. Most are found in lentic and slowly to moderately flowing waters. Although Shasta crayfish have been observed in groups under large rocks situated on clean, firm sand or gravel substrates (Bouchard 1978, Eng and Daniels 1982), they also have been observed on a fine, probably organic, material, 1-3 centimeters (.4 to ½ inches) thick, on the bottom of Crystal Lake. The Shasta crayfish is most abundant where plants are absent. Another important habitat requirement appears to be the presence of adequate volcanic rock rubble to provide escape cover from predators.

Although the food habits of the Shasta crayfish are not well known, the morphology of the mouthparts suggests that the species relies primarily on predation, browsing on encrusting organisms, and grazing on detritus to obtain food. The Shasta crayfish probably feeds mainly at night (Eng and Daniels 1982).

P. fortis, like most crayfish, is solitary, but may tolerate the proximity of other crayfish if space is limited or during courtship and mating. Similar to its congeners in its mating habits, the Shasta crayfish mates in late September and October after the final molt (loss of previous skin and the growth of a new, larger skin) of the season. Reproductive maturity of the Shasta crayfish occurs in

the fifth year of life, while in the two exotic crayfish species that occur within its range, reproductive maturity occurs in the second year. Eggs of the Shasta crayfish are laid during the fall, and hatching occurs in the following spring when the water temperature increases slightly. Each newly mature mated female lays 10-70 eggs, with an average of 40 per female. The two exotic crayfish, *Orconectes virilis* and *Pacifastacus leniusculus*, average 110 and 150 egg, respectively, per female. In general, crayfish fecundity increases with the age of the female; older *P. fortis* females produce an average of 60 eggs per female, whereas the exotic species produce up to 300 eggs per older female. Therefore, the introduced crayfish species have a reproductive advantage over the Shasta crayfish (Eng and Daniels 1982).

Because of its placid behavior, low fecundity, slow maturity, restricted distribution, and specialized habitat requirements, the Shasta crayfish is particularly vulnerable to habitat loss or modification (e.g., changes in the substrates [from rubble to mud bottoms] of its habitat, changes in water quality parameters [increase in temperature, turbidity, hydrogen ions, and nutrients]), water pollution, and displacement by exotic crayfish species. Other threats to the survival of this species include habitat loss through modifications from diking, water diversion projects, hydroelectric projects, agricultural development, water impoundments, and incidental take of the Shasta crayfish by persons fishing for the larger exotic crayfish. A more subtle threat to the Shasta crayfish is the overall increase in human use of the area for outdoor recreational purposes. For example, off-road vehicle trails that cross creeks can cause bank erosion and siltation that degrade the habitat. Fishing with exotic crayfish bait may result in introductions of additional exotic competitors. Damming streams for temporary swimming areas may entrap crayfish, thus increasing the likelihood of predation.

Most of the land in the range of the Shasta crayfish is in private ownership. The U.S. Forest Service and the Bureau of Land Management administer less than 10 acres each.

The Shasta crayfish (under the common name "placid crayfish") was proposed as a threatened species on January 12, 1977, in the Federal Register (42 FR 2507). Comments expressing support for the proposal were received from the California Department of Fish and Game and two private organizations. That proposal was withdrawn on December 10, 1979 (44 FR

70796), under a provision of the 1978 amendments to the Endangered Species Act of 1973 that required withdrawal of all pending proposals that had not been made final within two years of the date of the proposal.

The Shasta crayfish was included in category 1 of the Service's Review of Invertebrate Wildlife for Listing as Endangered or Threatened Species (49 FR 21666; May 22, 1984). Category 1 comprises taxa for which the Service has substantial evidence to support the biological appropriateness of proposing endangered or threatened status. In that notice the Service, following the suggestion of Eng and Daniels (1982), used the common name Shasta crayfish rather than placid crayfish, the name used in the earlier proposal of threatened status.

In the summer of 1978, the California Department of Fish and Game and the U.S. Forest Service initiated studies to further determine the distribution of the Shasta crayfish and gather biological and ecological information necessary for its conservation (see Eng and Daniels 1982). The maps of the distribution of the Shasta crayfish generated in 1979 by CDFG were amended from information gained during a 1985 survey of the distribution and population status of the crayfish. These updated maps and additional data constitute significant new information on which to propose endangered status for the Shasta crayfish.

Summary of Factors Affecting the Species

Section 4(a)(1) of the Endangered Species Act (16 U.S.C. 1531 *et seq.*) and regulations (50 CFR Part 424) promulgated to implement the listing provisions of the Act set forth the procedures for adding species to the Federal Lists. A species may be determined to be an endangered or threatened species due to one or more of the five factors described in section 4(a)(1). These factors and their application to the Shasta crayfish (*Pacifastacus fortis*) are as follows:

A. The Present or Threatened Destruction, Modification, or Curtailment of its Habitat or Range

The total population of Shasta crayfish when sampled in 1978 by Daniels (1980) was estimated to be less than 6,000 individuals. With the recent confirmed loss of the populations in Crystal and Baum Lakes of the Hat Creek subdrainage since 1978, the total population probably numbers about 3,000 individuals. The species has also been extirpated from a site in the Fall

River subdrainage near its connection to the Pit River. At the present rate of extirpation, with at least 3 out of 15 sites being lost since 1978 and possibly only one site remaining in the Hat Creek subdrainage, it is conceivable that the Shasta Crayfish may soon become restricted only to the Fall River subdrainage.

Water diversion and impoundment projects have adversely affected the Shasta crayfish by modifying its habitat into large quiet lakes with silt and mud bottoms and increased aquatic vegetation. These modifications make the habitat unfit for the Shasta crayfish and more suitable for the two exotic species that have done very well in these areas. Lake Britton, Baum Lake, and Crystal Lake are examples of such habitat modification that has led to the displacement of the Shasta crayfish in recent times.

Numerous hydroelectric projects have been constructed on Hat Creek and the Pit River since the early part of the century. Lake Britton and Baum Lake are manmade reservoirs used for hydroelectric power production, water impoundment, and recreation. These installations have adversely affected the Shasta crayfish by blocking access to and egress from refugia in the remaining spring pools. These refugia formerly served as sources of immigrant individuals for reestablishing populations that had become locally extirpated from suitable habitat as the result of natural events (i.e., flooding, landslides, and log or debris jams). These manmade dam installations isolate and separate Shasta crayfish populations to such an extent that when habitats become available, the crayfish are unable to recolonize them.

Agricultural development within the range of the Shasta crayfish has increased demands on the water resources, thus lowering the water table and causing seasonal interruptions of spring flow. This has occurred on some of the small unnamed tributaries of Fall River and Hat Creek (R. Brown, CDFG, personal communication 1986). In conjunction with the increase in water usage, an extensive, diverse agricultural industry has increased the use of pesticides in the area. These pesticides when washed into the waterways can kill aquatic invertebrates directly or over a period of time by bioaccumulation.

Livestock grazing near watercourses has increased the turbidity of some of the streams. Turbidity inhibits the penetration of sunlight to lower depths of the spring pools, where it promotes the growth of encrusting organisms on which the Shasta crayfish feeds. Pasture

runoff increases the nutrients in the streams, thus increasing planktonic (free-floating) algal and aquatic macrophyte growth. Because Shasta crayfish prefer areas with sparse plant growth, these areas become unfit for the crayfish. Further, such conditions encourage the invasion of exotic crayfish that compete with the Shasta crayfish.

B. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

The incidental capture of Shasta crayfish for human consumption occurs through fishing for the large exotic crayfish species. The Shasta crayfish is rarely the target of the catch because of its small size, but is extremely vulnerable to such fishing pressures because of its placid behavior.

C. Disease or Predation

Not applicable.

D. The Inadequacy of Existing Regulatory Mechanisms

In 1980 the California State Fish and Game Commission listed the Shasta crayfish as a Rare species under State law, thus offering protection from take, possession, or sale within the State of California. Other State regulations prohibit the take, possession, or use for bait of any crayfish species at any time of the year within the range of the Shasta crayfish. These regulations were enacted to protect the Shasta crayfish and prevent the spread of exotic crayfish by unintentional introductions. Because of the large size and remoteness of the area, these regulations are difficult to enforce.

E. Other Natural or Manmade Factors Affecting its Continued Existence

The spread of the two exotic species, *Pacifastacus leniusculus* and *Orconectes virilis*, into the range of the Shasta crayfish continues at an alarming rate. Both species are recent introductions to the Pit River drainage (Daniels 1980). These species compete for food, space, and other resources with the Shasta crayfish. Because they are more fecund and mature much more quickly than the Shasta crayfish, and have less specific habitat requirements, the exotic crayfish have been successful in colonizing the modified habitat, probably displacing the Shasta crayfish. Since *O. virilis* is probably able to move overland under conditions of high humidity, it may invade the Fall River as it has Hat Creek. Both exotic species have displaced native species in other regions (Bouchard 1977a and 1976b, Riegel 1959, Schwartz *et al.* 1963). If the

habitat of *P. fortis* continues to be degraded and becomes better suited for the exotic species, the Shasta crayfish may be displaced from its remaining habitat in the near future. With the introduction of the exotic crayfish, the populations of Shasta crayfish in Crystal and Baum lakes, Lake Britton, and Clark, Rock, Goose, Kosk, Lost and Spring creeks have been lost, thus significantly reducing the limited range of the native crayfish. These extirpations occurred in less than 10 years.

The Service has carefully assessed the best scientific and commercial information available regarding the past, present, and future threats faced by this species in determining to propose this rule. Based on this evaluation, the preferred action is to list the Shasta crayfish as endangered. Its significantly reduced distribution, loss of habitat, and substantial potential for continued habitat modification or loss indicate that the species warrants endangered rather than threatened status. Critical habitat is not being proposed for the species at this time for the reasons discussed below.

Critical Habitat

Section 4(a)(3) of the Act, as amended, requires that to the maximum extent prudent and determinable, the Secretary designate any habitat of a species which is considered to be critical habitat at the time the species is determined to be endangered or threatened. The Service finds that designation of critical habitat is not prudent for this species at this time. As discussed under Factors D and E in the "Summary of Factors Affecting the Species," State laws to protect the Shasta crayfish from taking and from introductions of exotic crayfish species are difficult to enforce. Publication of critical habitat descriptions and maps in the *Federal Register* would make this species easier to locate and thereby make its habitats more vulnerable to possible vandalism and would increase enforcement problems. All involved parties and landowners will be notified of the locations and importance of protecting this species' habitat. Protection of the habitat of the Shasta crayfish will be addressed through the recovery and section 7 consultation process. Therefore, it would not be prudent to determine critical habitat for the Shasta crayfish at this time.

Available Conservation Measures

Conservation measures provided to species listed as endangered or threatened under the Endangered Species Act include recognition,

recovery actions, requirements for Federal protection, and prohibitions against certain practices. Recognition through listing encourages and results in conservation actions by Federal, State, and private agencies, groups, and individuals. The Endangered Species Act provides for possible land acquisition and cooperation with the States and requires that recovery actions be carried out for all listed species. Such actions are initiated by the Service following listing. The protection required of Federal agencies and the prohibitions against taking and harm are discussed, in part, below.

Section 7(a) of the Act, as amended, requires Federal agencies to evaluate their actions with respect to any species that is proposed or listed as endangered or threatened and with respect to its critical habitat, if any is being designated. Regulations implementing this interagency cooperation provision of the Act are codified at 50 CFR Part 402. Section 7(a)(4) requires Federal agencies to confer informally with the Service on any action that is likely to jeopardize the continued existence of a proposed species or result in destruction or adverse modification of proposed critical habitat. If a species is listed subsequently, section 7(a)(2) requires Federal agencies to ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of such a species or to destroy or adversely modify its critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency must enter into formal consultation with the Service. Some Federal involvement with the U.S. Army Corps of Engineers and the Federal Energy Regulatory Commission (FERC) permitting processes for hydroelectric facilities is anticipated.

The Act and implementing regulations found at 50 CFR 17.21 set forth a series of general prohibitions and exceptions that apply to all endangered wildlife. These prohibitions, in part, make it illegal for any person subject to the jurisdiction of the United States to take, import or export, ship in interstate commerce in the course of commercial activity, or sell or offer for sale in interstate or foreign commerce any listed species. It also is illegal to possess, sell, deliver, carry, transport, or ship any such wildlife that has been taken illegally. Certain exceptions apply to agents of the Service and State conservation agencies.

Permits may be issued to carry out otherwise prohibited activities involving endangered wildlife species under

certain circumstances. Regulations governing permits are at 50 CFR 17.22 and 17.23. Such permits are available for scientific purposes, to enhance the propagation or survival of the species, and/or for incidental take in connection with otherwise lawful activities. In some instances, permits may be issued during a specified period of time to relieve undue economic hardship that would be suffered if such relief were not available.

Public Comments Solicited

The Service intends that any final action resulting from this proposal will be as accurate and as effective as possible. Therefore, any comments or suggestions from the public, other concerned governmental agencies, the scientific community, industry, or any other interested party concerning any aspect of this proposal are hereby solicited. Comments particularly are sought concerning:

- (1) Biological, commercial trade, or other relevant data concerning any threat (or lack thereof) to this species;
- (2) The location of any additional populations of this species and the reasons why any habitat should or should not be determined to be critical habitat as provided by section 4 of the Act;
- (3) Additional information concerning the range and distribution of this species; and
- (4) Current or planned activities in the subject area and their possible impacts on this species.

Final promulgation of the regulation on this species will take into consideration the comments and any additional information received by the Service, and such communications may lead to adoption of a final regulation that differs from this proposal.

The Endangered Species Act provides for a public hearing on this proposal, if requested. Requests must be filed within 45 days of the date of the proposal. Such requests must be made in writing and addressed to the Regional Director (See ADDRESSES section).

National Environmental Policy Act

The Fish and Wildlife Service has determined that an Environmental Assessment, as defined under the authority of the National Environmental Policy Act of 1969, need not be prepared in connection with regulations adopted pursuant to section 4(a) of the Endangered Species Act of 1973, as amended. A notice outlining the Service's reasons for this determination was published in the *Federal Register* on October 25, 1983 (48 FR 49244).

References Cited

- Bott, R. 1950. Die Flusskrebse Europas (Decapoda, Astacidae). *Adhandlungen Senckenbergischen Naturforschenden Gesellschaft* 483:1-36.
- Bouchard, R.W. 1977a. Distribution, systematic status, and ecological notes on five poorly known species of crayfish in western North America (Decapoda: Astacidae and Cambaridae). *Freshwater Crayfish* 3:409-423.
- Bouchard, R.W. 1977b. Morphology of the mandible in Holarctic crayfishes (Decapoda: Astacidae and Cambaridae): Ecological and phylogenetic implications. *Freshwater Crayfish* 3:425-452.
- Bouchard, R.W. 1978. Taxonomy, distribution, and general ecology of the genera of North America crayfishes. *Fisheries* 3:11-19.
- Daniels, R.A. 1980. Distribution and status of crayfishes in the Pit River drainage, California. *Crustaceana* 38:131-138.
- Eng, L.L., and Daniels, R.A. 1982. Life history distribution, and status of *Pacifastacus fortis* (Decapoda: Astacidae). *California Fish and Game* 68:197-212.
- Faxon, W. 1914. Notes on the Crayfishes in the United States National Museum and the Museum of Comparative Zoology with descriptions of new species and subspecies to which is appended a catalogue of the known species and subspecies. *Memoirs of the Museum of Comparative Zoology (Harvard)* 40:351-427.
- Hobbs, H.H. 1972. Crayfishes (Astacidae) of North and Middle America. *Identification Manual No. 9 in Biota of Freshwater Ecosystems*. U.S. Environmental Protection Agency, Water Pollution Control Research Series. 18050, ELD05/72. 173 pp.
- Riegel, J.A. 1959. The systematics and distribution of crayfishes in California. *California Fish and Game* 45:29-50.
- Schwartz, F.J., R. Rubelmann, and J. Allison, 1963. Ecological population expansion of the introduced crayfish, *Orconectes virilis*. *Ohio Journal of Science* 63:266-273.

Author

The primary author of this rule is Dr. Jeurel Singleton, Sacramento Endangered Species Office, U.S. Fish and Wildlife Service, 2800 Cottage Way, Room E-1823, Sacramento, California (916/978-4866 or FTS 460-4866).

List of Subjects in 50 CFR Part 17

Endangered and threatened wildlife, Fish, Marine mammals, Plants (agriculture).

Proposed Regulation Promulgation

Accordingly, it is hereby proposed to amend Part 17, Subchapter B of Chapter I, Title 50 of the Code of Federal Regulations, as set forth below:

PART 17—[AMENDED]

1. The authority citation of Part 17 continues to read as follows:

Authority: Pub. L. 93-205, 87 Stat. 884; Pub. L. 94-359, 90 Stat. 911; Pub. L. 95-632, 92 Stat. 3751; Pub. L. 96-159, 93 Stat. 1225; Pub. L. 97-304, 96 Stat. 1411 (16 U.S.C. 1531 *et seq.*).

2. It is proposed to amend § 17.11(h) by adding the following, in alphabetical order under "CRUSTACEANS," to the List of Endangered and Threatened Wildlife:

§ 17.11 Endangered and threatened wildlife.
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 (h) * * *

Species		Historic range	Vertebrate population where endangered or threatened	Status	When listed	Critical habitat	Special rules
Common name	Scientific name						
CRUSTACEANS
Crayfish, Shasta (= placid crayfish)...	<i>Pacifastacus fortis</i>	U.S.A. (CA).....	NA.....	E.....	.	NA	NA

Dated: June 19, 1987.
 Susan Recce,
 Acting Assistant Secretary for Fish and Wildlife and Parks.
 [FR Doc. 87-15682 Filed 7-9-87; 8:45 am]
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