

CANDIDATE ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM

SCIENTIFIC NAME: *Procaris hawaiiana*

COMMON NAME: Anchialine pool shrimp

LEAD REGION: Region 1

INFORMATION CURRENT AS OF: February 2003

STATUS/ACTION (Check all that apply):

New candidate

Continuing candidate

Non-petitioned

Petitioned - Date petition received: \_\_\_\_

90-day positive - FR date: \_\_\_\_

12-month warranted but precluded - FR date: \_\_\_\_

Listing priority change

Former LP: \_\_

New LP: \_\_\_\_

Latest date species first became a Candidate: \_\_\_\_\_

Candidate removal: Former LP: \_\_\_\_ (Check only one reason)

A - Taxon more abundant or widespread than previously believed or not subject to a degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status.

F - Range is no longer a U.S. territory.

M - Taxon mistakenly included in past notice of review.

N - Taxon may not meet the Act's definition of "species."

X - Taxon believed to be extinct.

ANIMAL/PLANT GROUP AND FAMILY: Animal; Crustacea, Procarididae

HISTORICAL STATES/TERRITORIES/COUNTRIES OF OCCURRENCE: Hawaii, islands of Maui and Hawaii.

CURRENT STATES/COUNTIES/TERRITORIES/COUNTRIES OF OCCURRENCE: Hawaii, islands of Maui and Hawaii.

LEAD REGION CONTACT (Name, phone number): Scott McCarthy (503/231-6131)

LEAD FIELD OFFICE CONTACT (Office, name, phone number): Pacific Islands Office, Mike Richardson (808/541-3441)

BIOLOGICAL INFORMATION (Describe habitat, historic vs. current range, historic vs. current population estimates (# populations, #individuals/population), etc.):

*Procaris hawaiiiana* (Holthuis 1973) is reported from 10-30 millimeters (mm)(0.40-1.18 inches (in.)) in total length. This species has a pink to light-red pigmentation which is darkest along the midline with the dorsal thorax being white to yellow. Black pigments are associated with the eyes. Conspicuous chelapeds (claws) are lacking. Locomotion is accomplished by swimming with the swimmerets (pareopods and uropods) and occurs just above the substrate to mid-water. Almost nothing is known about the reproductive biology or the diet of this shrimp although it has been documented to scavenge other species of anchialine shrimp and has taken frozen brine shrimp (Maciolek in Holthuis 1973) when in captivity. The shrimp family Procarididae is represented by a small number of species globally and there are only two species within the genus *Procaris*. The second species, *P. ascensionis*, is restricted to similar habitats on Ascension Island in the south Atlantic Ocean. They are regarded as an ancient lineage of shrimp and their current range is considered to be relictual of an early global distribution.

*Procaris hawaiiiana* is known to occur from mid-salinity (19-25 parts per thousandth (ppt)) anchialine pools. Anchialine pools are land-locked bodies of water that occur coastally but are not openly connected to the ocean (Maciolek 1983). They are mixohaline, with salinities typically ranging from 2 ppt to concentrations just below that of sea water (32 ppt), although there are pools recorded as having salinities as high as 41 ppt (Maciolek 1983). Anchialine pools are subject to tidal fluctuations. Except for some records of endemic eels, anchialine pools in Hawaii do not support native species of fish although some species of alien fish have been introduced and are currently recognized as problems (see below). Although anchialine pools are widespread, reported in areas such as Saudi Arabia, Madagascar, Fiji, and other Indo-Pacific islands, the total area occupied by them globally is extremely small. While a number of species of anchialine shrimp (e.g., *Calliasmata pholidota*) have disjunct, global distributions within these habitats, most geographic locations contain some endemic taxa. In the state of Hawaii, there are estimated to be over 650 anchialine pools, with an estimated 90% of these occurring on the island of Hawaii. Unfortunately, approximately 90 percent of the pools on that island have been destroyed or otherwise impacted by development or other human uses (Richard Brock, Univ. of Hawaii, pers. comm., 1998).

*Procaris hawaiiiana* is only known to occur in anchialine pools on the Hawaiian islands of Maui (two sites) and Hawaii (one site). Due to their rarity within these locations, population estimates have never been attempted. Many of the rare species of anchialine shrimp, including *P. hawaiiiana*, have merely been noted as present or absent from pools that have been appropriately surveyed (often with the aid of baiting). Loss of shrimp species from suitable habitat is likely the best, or only, measure of species decline since population sizes are not easily determined.

**THREATS** (Describe threats in terms of the five factors in section 4 of the ESA providing specific, substantive information. If this is a removal of a species from candidate status or a change in listing priority, explain reasons for change):

A. The present or threatened destruction, modification, or curtailment of its habitat or range.

On the island of Hawaii, Dr. R. Brock (pers. comm., 1998) estimates that up to 90 percent of the anchialine pools have been destroyed or altered by human activities. Introduction of alien fish or bait-fish into such pools may be a major contribution to the decline of these shrimp within their habitat (see below). Although the two known Maui pools, which contain *Procaris hawaiiiana*, occur within a protected state reserve, habitat modifications by early Hawaiians and later inhabitants have occurred in the area. Dumping of refuse and the introduction of fish threaten the known population on the island of Hawaii. Damage from use of anchialine pools for swimming and bathing has been documented in the Hawaiian Islands (R. Brock, *in litt.* 1985). However, this is not documented to be a serious problem in the Maui pools where *Procaris hawaiiiana* occurs. Such impacts to the Hawaii Island pool are possible but have not, at present, been documented.

B. Overutilization for commercial, recreational, scientific, or educational purposes.

Not applicable.

C. Disease or predation.

Predation is considered to be the greatest threat to intact anchialine pool ecosystems (Bailey-Brock and Brock 1993; R. Brock, pers. comm., 1998). Anchialine pools have been used to discard or hold bait-fish and/or aquarium fish (Bailey-Brock and Brock 1993). These fish either directly consume the native shrimp or, as with introduced tilapia (*Oreochromis mossambica*), out-compete the native herbivorous species of shrimp which typically serve as the prey-base for the rarer, predatory species of shrimp.

D. The inadequacy of existing regulatory mechanisms.

No current protection.

E. Other natural or manmade factors affecting its continued existence.

Although not currently active, the location on Maui where *Procaris hawaiiiana* occurs has experienced volcanic activity within the last 250 years. The known anchialine pool on the island of Hawaii that contains *Procaris hawaiiiana* occurs in an area that could be destroyed by on-going volcanic or land subsidence events. However, these are not considered to be imminent threats at either location.

FOR RECYCLED PETITIONS:

- a. Is listing still warranted? \_\_\_\_
- b. To date, has publication of a proposal to list been precluded by other higher priority listing actions? \_\_\_\_
- c. Is a proposal to list the species as threatened or endangered in preparation? \_\_\_\_

d. If the answer to c. above is no, provide an explanation of why the action is still precluded.

**LAND OWNERSHIP** (Estimate proportion Federal/state/local government/private, identify non-private owners): The three anchialine pools known to contain *Procaris hawaiiiana* occur on State land. The two Maui pools are located in a natural area reserve, thus receiving some degree of protection. The Hawaii Island pool occurs on State land managed by a different State agency and is not afforded protection.

**PRELISTING** (Describe status of conservation agreements or other conservation activities):

Two of the known pools containing *Procaris hawaiiiana* lie within a state natural area reserve. The rarity of this shrimp contributed to the current protection received by the Maui anchialine pools (Holthuis 1973). No conservation agreements between Federal, State, or private landowners have been drafted or initiated and, aside from placement of some pools/pool systems within reserves, virtually no conservation activities have been conducted.

**REFERENCES** (Identify primary sources of information (e.g., status reports, petitions, journal publications, unpublished data from species experts) using formal citation format):

Bailey-Brock, J.H. and R.E. Brock. 1993. Feeding, reproduction, and sense organs of the Hawaiian anchialine shrimp *Halocaridina rubra* (Atyidae). *Pacific Science* 47:338-355.

Holthuis, L.B. 1973. Caridean shrimps found in land-locked saltwater pools at four Indo-west Pacific localities (Sinai Peninsula, Funafuti Atoll, Maui and Hawaii Islands), with the description of one new genus and four new species. *Zool. Verhadenlingen* 128:3-55.

Maciolek, J.A. 1983. Distribution and biology of Indo-pacific insular hypogeal shrimps. *Bulletin of Marine Science* 33:606-618.

LISTING PRIORITY (\* after number)

THREAT
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Magnitude	Immediacy	Taxonomy	Priority
High	Imminent	Monotypic genus	1
		Species	2*
		Subspecies/population	3
	Non-imminent	Monotypic genus	4
		Species	5
		Subspecies/population	6
Moderate to Low	Imminent	Monotypic genus	7
		Species	8
		Subspecies/population	9
	Non-imminent	Monotypic genus	10
		Species	11
		Subspecies/population	12

**Rationale for listing priority number:**

*Magnitude:*

*Imminence:*

APPROVAL/CONCURRENCE: Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes to the candidate list, including listing priority changes; the Regional Director must approve all such recommendations.

The Director must concur on all additions of species to the candidate list, removal of candidates, and listing priority changes.

Approve: Rowan Gould March 6, 2003  
Regional Director, Fish and Wildlife Service Date

Concur: \_\_\_\_\_  
Director, Fish and Wildlife Service Date

Do not concur: \_\_\_\_\_  
Director, Fish and Wildlife Service Date

Director's Remarks:

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Date of annual review: 2/03

Conducted by: \_\_\_\_\_

Comments:

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