

**U.S. FISH AND WILDLIFE SERVICE
SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM**

SCIENTIFIC NAME: *Palaemonella burnsi*

COMMON NAME: Anchialine pool shrimp

LEAD REGION: Region 1

INFORMATION CURRENT AS OF: March 2007

STATUS/ACTION

☐ Species assessment - determined we do not have sufficient information on file to support a proposal to list the species and, therefore, it was not elevated to Candidate status

☐ New candidate

☒ Continuing candidate

☐ Non-petitioned

☒ Petitioned - Date petition received: May 11, 2004

☐ 90-day positive - FR date:

☐ 12-month warranted but precluded - FR date: May 11, 2005

☒ Did the petition request a reclassification of a listed species?

FOR PETITIONED CANDIDATE SPECIES:

a. Is listing warranted (if yes, see summary of threats below)? Yes

b. To date, has publication of a proposal to list been precluded by other higher priority listing actions? Yes

c. If the answer to a. and b. is "yes", provide an explanation of why the action is precluded.

We find that the immediate issuance of a proposed rule and timely promulgation of a final rule for this species has been, since publication of the last CNOR, and continues to be, precluded by higher priority listing actions (including candidate species with lower LPNs) because most of our national listing budget has been consumed by work on various listing actions to comply with court orders and court-approved settlement agreements, meeting statutory deadlines for petition findings or listing determinations, emergency listing evaluations and determinations, and essential litigation-related, administrative, and program management tasks. We will continue to monitor the status of this species as new information becomes available. This review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures. For information on listing actions taken, see the discussion of "Progress on Revising the Lists" in the current CNOR, which can be viewed on our Internet website (<http://www.fws.gov/endangered>).

___ Listing priority change

Former LP: ___

New LP: ___

Date when the species first became a Candidate (as currently defined): October 25, 1999

___ Candidate removal: Former LPN: ___

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

___ U – Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species.

___ F – Range is no longer a U.S. territory.

___ I – Insufficient information exists on biological vulnerability and threats to support listing.

___ M – Taxon mistakenly included in past notice of review.

___ N – Taxon does not meet the Act's definition of "species."

___ X – Taxon believed to be extinct.

ANIMAL/PLANT GROUP AND FAMILY: Crustaceans; Family Palaemonidae (anchialine pool shrimp)

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.

LAND OWNERSHIP : The three known Maui pool groups containing *Palaemonella burnsi* are located on State land within the Ahihi-Kinau Natural Area Reserve (NAR), and the one known pool group on Hawaii Island is on Federal property, in the Kaloko-Honokohau National Historic Park.

LEAD REGION CONTACT: Scott McCarthy, (503) 231-6131, scott_mccarthy@fws.gov

LEAD FIELD OFFICE CONTACT: Pacific Islands Fish & Wildlife Office, Christa Russell (808) 792-9400, christa_russell@fws.gov

BIOLOGICAL INFORMATION

Species Description

The carapace length of *Palaemonella burnsi* (Holthuis 1973) ranges from 0.2 to 0.3 inches (in) (6

to 9 millimeters (mm)). This anchialine pool shrimp is transparent, greyish-green to red, the body being somewhat transparent with coloration dependent on chromatophore (pigment cells) expansion/contraction. There is often a transverse, median pale band across the carapace arranged of white chromatophores. The conspicuous, elongate chelapeds (claws) typically are greyish-green. Black pigments are associated with the well developed eyes. It is likely the shrimp are omnivorous and feed upon algae and detritus. Collected females have been found to carry numerous, small eggs on the ventral abdomen (Holthuis 1973).

Taxonomy

We have reviewed the taxonomic background of *Palaemonella burnsi* and find it to be a valid taxon. *Palaemonella burnsi* was described as a new species by Holthuis in 1973 and this species is recognized as a valid taxon in McLaughlin *et al.* (2005).

Habitat/Life History

Palaemonella burnsi is known to occur from high-salinity (24 to 27 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; Brock *et al.* 1987). 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 nonnative fish have been introduced and are currently recognized as problems (see Disease or Predation below) (Bailey-Brock and Brock 1993; Brock 2004).

Historical Range/Distribution

Although anchialine pools are widespread, being found in areas such as Saudi Arabia, Madagascar, Fiji, and other Indo-Pacific islands, the total area occupied by them globally is extremely small (Maciolek 1983). While a number of species of anchialine shrimp have disjunct, global distributions within these habitats, most geographic locations contain some endemic taxa (Maciolek 1983). *Palaemonella burnsi* is one of these endemic taxa known only from the islands of Hawaii and Maui in the state of Hawaii.

Current Range/Distribution

Currently in the state of Hawaii, there are estimated to be over 650 anchialine pools, approximately 90 percent of which occur on the island of Hawaii. Of the approximately 585 anchialine pools found on the island of Hawaii, only one pool contains this species which is located in the Kaloko-Honokohau National Historic Park (Park). On the island of Maui, this species is found at three sites in the State Ahihi-Kinau Natural Area Reserve (NAR) (Brock 2004; Holthuis 1973; Maciolek 1983).

Population Estimates/Status

Like other anchialine pool shrimp species, this species inhabits an extensive network of water-filled interstitial spaces (cracks and crevices) leading to and from the actual pool, and this trait has precluded researchers from obtaining more accurate population size estimates during surveys for the species (Holthuis 1973; Maciolek 1983). Many of the rare species of anchialine shrimp,

including *Palaemonella burnsi*, have merely been noted as present or absent from pools that have been 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 (Holthuis 1973; Maciolek 1983).

THREATS

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

On the island of Hawaii it is estimated that up to 90 percent of the anchialine pools have been destroyed or altered by human activities (Brock 2004). The more recent human modifications of anchialine pools include the bulldozing and filling of pools (Bailey-Brock and Brock 1993). Dumping of refuse and the introduction of nonnative fish (see Disease or Predation below) has impacted other anchialine pools on this island (Brock 2004).

In December 2006, a draft environmental impact statement for the Kona Kai Ola development project on the island of Hawaii, stated that 22 anchialine pools would be destroyed (Oceanit 2006). The one pool in which *Palaemonella burnsi* occurs is adjacent to the area proposed for development. While destruction of the pool containing *P. burnsi* is not expected, the hydrology of this pool may be negatively impacted by the increased water withdrawal required during the life of the project, if it proceeds as planned.

The three known Maui pools that contain *Palaemonella burnsi*, were modified by early Hawaiians and later inhabitants of the area, but are within Ahihi-Kinau NAR. Dumping does occur in the Maui NAR, and while none has yet occurred within the pools, this threat remains a possibility (Brock 2004).

Damage from use of anchialine pools for swimming and bathing has been documented in the Hawaiian Islands (Brock 2004). Similar impacts to the anchialine pools for this species on the island of Hawaii and Maui are possible but have not, at present, been documented.

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

The U.S. Fish and Wildlife Service (Service) has become aware of companies and private collectors using anchialine pool shrimp and related shrimp species for self-contained aquariums similar to those marketed by Ecosphere Associates, Inc. (Ecosphere Associates 2006). One company located in Hawaii, Fuku Bonsai, has already begun using Hawaiian anchialine pool species for the aquarium hobby market (Fuku-Bonsai 2007). For commercial purposes, currently only a State Commercial Marine License is required to collect anchialine pool shrimp. Collection is prohibited from State Natural Area Reserves and National Historic Parks.

C. Disease or predation.

In Hawaii, predation by introduced nonnative fish is considered to be the greatest threat to native shrimp within anchialine pool ecosystems (Bailey-Brock and Brock 1993; Brock 2004). 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 that

typically serve as the prey-base for the rarer, predatory species of shrimp (Bailey-Brock and Brock 1993). Introduction of nonnative fish including bait-fish into such pools may have been a major contributor to the decline of these shrimp (Brock 2004). No alien fish species were seen during the most recent survey of the pools where these shrimp occur (Brock 2004).

Invasion, with human assistance, of anchialine pools by nonnative fish is a potential threat and is the most significant impact to pool shrimp and their habitat. Within the State NARs, disturbance of the pools is prohibited and informative signs have been placed at the sites. However, there are concerns that this may not be adequate protection. For example, since 1985 signage was used to keep people from entering the Waikoloa Achialine Pond Preserve at Waikoloa, North Kona, Hawaii. Visitors were not allowed into the pool preserve but could walk around the perimeter. In December 2003, it was discovered that someone had released tilapia and mosquito fish into the system. Within six months time, alien fish had invaded two thirds of the system and all the anchialine pool shrimp disappeared (Brock 2004).

D. The inadequacy of existing regulatory mechanisms.

Palaemonella burnsi currently receives no protection under Hawaii's endangered species law (HRS, Sect. 195-D) or the Federal Endangered Species Act (16 U.S.C. §1531-1544). Although there are no existing regulatory mechanisms that specifically protect this species, the three Maui pools are located within the Ahihi-Kinau State NAR. This designation specifically prohibits the removal of any native organism and the disturbance of pools (Administrative Rules, Sec. 13-209-4 (www.dofaw.net/nars 2004)). The State NARs were created to preserve and protect samples of Hawaiian biological ecosystems and geological formations; and are actively managed and monitored for their unique ecosystems. Though signs are posted that provide notice to the public that the pools are off-limits to bathers and other activities that could damage the pools, the State's NARs have no funding for proper enforcement to stop such activity.

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

None known.

CONSERVATION MEASURES PLANNED OR IMPLEMENTED

On the island of Hawaii, *Palaemonella burnsi* occurs in one pool group within the Kaloko-Honokohau National Historic Park and it is prohibited to collect the species or disturb the pool.

On Maui, three of the known pool groups containing *Palaemonella burnsi* lie within the Ahihi-Kinau State Natural Area Reserve. Ahihi-Kinau was the first NAR to be established by the State of Hawaii, and in fact, the presence of the anchialine pools and their rare resident shrimp species was a key reason this area received this designation (Holthuis 1973). This species and the three other candidate anchialine pool shrimp species found within this NAR receive some protection under the state statutes that specifically prohibit the disturbance or removal of any plant or wildlife and the disturbance of any pond or lake.

SUMMARY OF THREATS

Based on our evaluation of habitat degradation and loss due to impacts from the threat of human activities (e.g., development; trash dumping; introduction of nonnative fish) and the effects of

predation by nonnative fish we conclude there is sufficient information to develop a proposed rule for this species due to the present and threatened destruction, alteration, or curtailment of its habitat and range, and the threat of the release of nonnative fish in any one of the four known pools. In addition, overcollection by the aquarium hobby market and impacts to anchialine pools from swimming and bathing are potential threats to *Palaemonella burnsi*. Both the NAR and the Park prohibit the collection of the species and the disturbance of the pools. However, enforcement of these prohibitions is difficult and the negative effects from the introduction of nonnative fish are extensive and happen quickly. We find that this species is warranted for listing throughout all its range, and, therefore, find that it is unnecessary to analyze whether it is threatened or endangered in a significant portion of its range.

For species that are being removed from candidate status:

___ Is the removal based in whole or in part on one or more individual conservation efforts that you determined met the standards in the Policy for Evaluation of Conservation Efforts When Making Listing Decisions (PECE)?

RECOMMENDED CONSERVATION MEASURES:

- Monitor known locations periodically
- Conduct ecological research on habitat requirements and basic life history of *Palaemonella burnsi*

LISTING PRIORITY

THREAT			
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: The threats to *Palaemonella burnsi* from habitat degradation and destruction from

human activities (e.g., development; trash dumping or fill; introduction of nonnative fish), and predation by nonnative fish are of high magnitude because this species occurs in only four pool groups. All individuals of this species within a pool may be adversely impacted by a single development project, dumping of trash or fill, release of nonnative fish in any of its four remaining sites. Collection of *Palaemonella burnsi* for sale or trade, and swimming and bathing in anchialine pools are potential threats.

Immediacy of Threats: Threats to *Palaemonella burnsi* from nonnative fish, trash dumping or fill, recreational activities, development and overcollection are nonimminent because they are not ongoing. On the island of Hawaii, *P. burnsi* occurs in one pool adjacent to an area proposed for development, though development has not yet begun. Nonnative fish are not present in the pools in which *P. burnsi* currently occurs.

Rationale for Change in Listing Priority Number (insert if appropriate)

Yes Have you promptly reviewed all of the information received regarding the species for the purpose of determining whether emergency listing is needed?

Is Emergency Listing Warranted?

No. *Palaemonella burnsi* is currently known from four populations, three of which are located within the Ahihi-Kinau State Natural Area Reserve and one in a National Historic Park. State and federal statutes may provide some protection to the species. The species does not appear to be appropriate for emergency listing at this time because the immediacy of the threats is not so great as to imperil a significant proportion of the species' total populations within the time frame of the routine listing process. If it becomes apparent that the routine listing process is not sufficient to prevent large losses that may result in this species' extinction, then the emergency rule process for this species will be initiated. We will continue to monitor the status of *Palaemonella burnsi* as new information becomes available. This review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures.

DESCRIPTION OF MONITORING

We conducted literature searches for recent articles on this species and contacted relevant species experts. The U.S. Geological Survey-Biological Resource Discipline (BRD), State officials with the Department of Land and Natural Resources, and Bishop Museum, University of Hawaii, and Auburn University researchers were contacted regarding the current status of this species. No additional information on the species' status was found over the past year.

This level of monitoring is appropriate to update the status of the species because a thorough literature search was conducted as well as relevant species experts contacted. Information contained in this assessment form was verified by species experts.

List of Experts Contacted:

Name	Date	Affiliation
------	------	-------------

Richard Brock	August 25, 2006	University of Hawaii
Ronald Englund	August 25, 2006	Bishop Museum
David Foote	August 25, 2006	U.S. Geological Survey, BRD
Betsy Gagne	August 29, 2006	Hawaii Dept of Land and Natural Resources
Thomas Iwai	August 14, 2006	Hawaii Division of Aquatic Resources
Michael Kido	August 25, 2006	University of Hawaii
Atlantis Russ	August 25, 2006	University of Hawaii
Scott Santos	August 25, 2006	Auburn University
Michael Yamamoto	August 14, 2006	Hawaii Division of Aquatic Resources

The Hawaii Biodiversity and Mapping Program (HBMP) lists this species as imperiled (HBMP 2006). *Palaemonella burnsi* is included in the list of species in Hawaii's 2005 Comprehensive Wildlife Conservation Strategy (Mitchell *et al.* 2005). In addition, in 2007, the State of Hawaii is initiating a separate strategic plan focusing exclusively on invertebrates. It is expected that *Palaemonella burnsi* will be one of the species covered by the new plan.

COORDINATION WITH STATES

On July 13, 2006, we provided the Hawaii Division of Forestry and Wildlife with copies of our most recent candidate assessments for their review and comment. In addition, on August 14, 2006, we provided the Hawaii Division of Aquatic Resources with copies of our most recent aquatic invertebrate candidate assessments for their review and comment. Betsy Gagne, Executive Secretary for the Hawaii Natural Area Reserves System Commission, reviewed the information for this species and provided no additional information or corrections (B. Gagne, Natural Area Reserves System Commission, pers. comm. 2006).


LITERATURE CITED

- 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.
- Brock, R.E. 2004. Anchialine Resources in Two Hawaii State Natural Area Reserves: Ahihi Kinau, Maui Island and Manuka, Hawaii Island with Recommendations for Their Management. Prepared for the U.S. Fish and Wildlife Service by Environmental Assessment, LLC.
- Brock, R.E., J.E. Norris, D.A. Ziemann, and M.T. Lee. 1987. Characteristics of water quality in anchialine ponds of the Kona, Hawaii, coast. *Pacific Science* 41:200-208.
- Ecosphere Associates. 2006. Ecosphere Associates Inc. The perfect balance of science and art. <http://eco-sphere.com>. Downloaded on 6 April 2007.
- Fuku-Bonsai. 2007. Fuku-Bonsai Inc. The amazing Hawaiian micro-lobsters. <http://fukubonsai.com>. Downloaded on 6 April 2007.
- Hawaii Biodiversity and Mapping Program. 2006. *Palaemonella burnsi*.

<http://hbmp.hawaii.edu/>. Downloaded on 6 April 2007.

- 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.
- Kensley, B. and D. Williams. 1986. New shrimps (families Procarididae and Atyidae) from a submerged lava tube on Hawaii. *J. Crustacean Biol.* 6: 417-437.
- Maciolek, J.A. 1983. Distribution and biology of Indo-pacific insular hypogeal shrimps. *Bulletin of Marine Science* 33:606-618.
- McLaughlin, P.A., D.K. Camp, M.V. Angel. 2005. Common and scientific names of aquatic invertebrates from the United States and Canada: Crustaceans. American Fisheries Society Special Publication 31. Bethesda MD, USA. 545pp.
- Mitchell, C., C. Ogura, D.W. Meadows, A. Kane, L. Strommer, S. Fretz, D. Leonard, and A. McClung. 2005. *Hawaii's Comprehensive Wildlife Conservation Strategy*. Department of Land and Natural Resources. Honolulu, Hawaii. 722 pp.
- Oceanit. 2006. Kona Kai Ola draft environmental impact statement Kealahou, North Kona district, island of Hawaii. Honolulu, Hawaii. 189pp.
- Personal Communications:
- Gagne, B., Executive Secretary for the Hawaii Natural Area Reserves System Commission, Email regarding State's response to candidate assessment forms, August 29, 2006.

APPROVAL/CONCURRENCE: Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve: 
Regional Director, Fish and Wildlife Service

6/1/07
Date

Concur: 
Acting Director, U.S. Fish and Wildlife Service

November 27, 2007
Date

Do not concur: _____
Director, Fish and Wildlife Service

Date

Director's Remarks:

PIFWO Review

Date of annual review: April 9, 2007

Conducted by: Lorena Wada, Pacific Islands FWO
Biologist, Prelisting and Listing Program

Reviewed by: Christa Russell
Prelisting and Listing Program Coordinator

Date: April 10, 2007

Gina Shultz
Assistant Field Supervisor,
Endangered Species

Date: April 13, 2007

Patrick Leonard
Field Supervisor

Date: April 13, 2007