

# 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 (Pacific Region)

**Information current as of:**

05/13/2015

**Status/Action**

☐ Funding provided for a proposed rule. Assessment not updated.

☐ Species Assessment - determined species did not meet the definition of the endangered or threatened under the Act and, therefore, was not elevated to the Candidate status.

☐ New Candidate

☐ Continuing Candidate

☒ Candidate Removal

☐ 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

☐ 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

☐ Range is no longer a U.S. territory

☒ Insufficient information exists on biological vulnerability and threats to support listing

- ☐ Taxon mistakenly included in past notice of review
- ☐ Taxon does not meet the definition of "species"
- ☐ Taxon believed to be extinct
- ☐ Conservation efforts have removed or reduced threats
- ☐ More abundant than believed, diminished threats, or threats eliminated.

## Petition Information

☐ Non-Petitioned

☒ Petitioned - Date petition received: 05/11/2004

90-Day Positive:05/11/2005

12 Month Positive:05/11/2005

Did the Petition request a reclassification? **No**

### For Petitioned Candidate species:

Is the listing warranted(if yes, see summary threats below) **No**

To Date, has publication of the proposal to list been precluded by other higher priority listing? **Yes**

## Historical States/Territories/Countries of Occurrence:

- **States/US Territories:** Hawaii
- **US Counties:** Hawaii, HI, Maui, HI
- **Countries:** United States

## Current States/Counties/Territories/Countries of Occurrence:

- **States/US Territories:** Hawaii
- **US Counties:** Hawaii, HI, Maui, HI
- **Countries:** United States

## Land Ownership:

The three known Maui pool groups containing *Palaemonella burnsi* are located on State land within the Ahihi-Kinau Natural Area Reserve (NAR) (see Fig. 1). Two locations are known from Hawaii Island: one is on Federal property in the Kaloko-Honokohau National Historic Park, and an

additional group of pools is located on State property in the Manuka NAR. Land ownership of habitat in Kume-jima, Japan, is unknown.

### **Lead Region Contact:**

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### **Lead Field Office Contact:**

PACIFIC ISLANDS FISH AND WILDL OFC, Kristi Young, 808-792-9419, kristi\_young@fws.gov

## **Biological Information**

### **Species Description:**

The carapace length of *Palaemonella burnsi* (Holthuis 1973) ranges from 6 to 9 millimeters (mm) (0.2 to 0.3 inches). 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. *P. burnsi* are likely omnivorous and feed upon algae and detritus. Collected females have been found to carry numerous, small eggs on the ventral abdomen that measure 0.4 to 0.7 mm in diameter (Holthuis 1973, pp. 24-30).

### **Taxonomy:**

*Palaemonella burnsi* was described as a new species by Holthuis (1973) and this species of caridean shrimp in the family Palaemonidae and Pontoniinae subfamily is recognized as a valid taxon by several references (e.g., Bruce 2002, p. 288; McLaughlin et al. 2005). The species was named after John A. Burns, Governor of Hawaii, in appreciation for declaring the Ahiki-Kinau area a Natural Area Reserve in 1973 (Holthuis 1973, p. 30).

### **Habitat/Life History:**

Little is known about the life history and behaviors of *Palaemonella burnsi*. Shrimp in the Pontoniinae subfamily, known as pontonine shrimp, are known for their cryptic habits (Davie 2002, p. 303). The pontonine shrimp are mostly restricted to tropical and subtropical marine habitats and many species are involved in commensal relationships with other marine invertebrates (e.g., sponges, echinoderms, mollusks) while few are free-living (Kou et al. 2015, p. 369 and references therein). Because *P. burnsi* is not known to be associated with any other species, we assume for the purposes of this assessment that it is free-living. Researchers in Hawaii have noted that *P. burnsi* individuals can only be found at night and are not evident in pools during the day (Hothius 1973, p. 29; Sakihara 2012, p. 88).

At the time *Palamonella burnsi* was added to the candidate list, it was thought to be restricted to high-salinity (24 to 27 parts per thousand (ppt)) anchialine pools. Anchialine pools are land-locked bodies of water that occur coastally but are not openly connected to the ocean (Macioleck 1983, pp. 607-612). 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 (Macioleck 1983, pp. 607-612; Brock et al. 1987 p. 200). 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 (see Disease or Predation below) (Bailey-Brock and Brock 1993 p. 354; Brock 2004, p. i).

New information gathered since *Palamonella burnsi* was added to the candidate list has revealed that this species is not restricted to anchialine pool habitats. They have been observed in tidepools adjacent to the anchialine pools at Ahihi-Kinau NAR at night (Ramsey 2010, pers. comm.), and in non-anchialine nearshore reef flat habitat on the Ryukyu Islands off the coast of Japan, where one specimen was found in a shallow pool with sea grasses, and one amongst dead coral (Bruce 2005, pp. 212, 215). Because the species has been found to exist in such different and distant habitats than anchialine pools, we realize we do not have a complete understanding of the life history of *P. burnsi* and we do not know the full range of habitats that it uses.

### **Historical Range/Distribution:**

Until recently, *Palaemonella burnsi* was known from anchialine pools on the island of Maui (Ahihi-Kinau) and Hawaii (Kaloko-Honokohau and Manuka). In 2005, a specimen of *P. burnsi* was identified from Kume-jima Island in the Ryukyu archipelago of Japan (Bruce 2005, p. 211). A second individual from the collection was subsequently identified and was an ovigerous (egg-bearing) female (De Grave 2012, pers. comm.), indicating that the species is reproducing in Kume-jima. Anchialine pools are, by definition, coastal habitat features and have sub-surface hydrological connections to the marine environment. The presence of anchialine shrimp in nearshore environments is unusual but not unprecedented and may be indicative of their dispersal capability through hypogeal substrates (Bailey-Brock and Brock 1999, p. 368). The Ryukyu archipelago is composed of over 100 individual islands and islets and has widespread anchialine habitat features including coral-associated limestone areas, cave systems, and mesospaces that are found on numerous individual islands. A number of anchialine and hypogeal decapod crustaceans are known from the Ryukyu Islands including six species of shrimp, two species of facultative troglodytic crabs, and one species of obligate crab (Naruse and Tamura 2006, p. 147). The population on the Ryukyu Islands, while detected only recently, likely occurred historically as well.

Though many surveys for caridean shrimp have been conducted throughout the Indo-Pacific region (see references in Davie 2002, pp. 289-290), the methods used to survey for and capture individuals are often not described in the literature and survey effort is likely incomplete. Therefore, it is likely that the known occupied habitats in Hawaii and the Ryukyu Islands do not represent the

entire range of the species. Because the species' method of dispersal is unknown and its use of different habitat types is not fully understood, we have insufficient information to assess its historical range/distribution.

### 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. Originally, only one pool located in the Kaloko-Honokohau National Historic Park on the island of Hawaii was known to contain *Palaemonella burnsi* (Fig. 1). During recent monitoring efforts by the State's Division of Aquatic Resources (DAR), *P. burnsi* was found in 28 pools within the Manuka NAR (Sakihara 2010, pers. comm.; Sakihara 2012, p. 89). On the island of Maui, this species is found at three sites in the State's Ahihi-Kinau NAR (Holthuis 1973, pp. 24-30; Maciolek 1983, pp. 607-612; Brock 2004, pp. 30-57). It is unknown whether the species occurs elsewhere in Hawaii, as recent surveys have found new populations at Manuka NAR and have shown that daytime surveys efforts are ineffective at detecting the species' presence (Sakihara 2012, p. 89). The species is now also known from Kume-jima Island, Japan, but whether or not it occurs elsewhere in the Ryukyu archipelago is unknown.

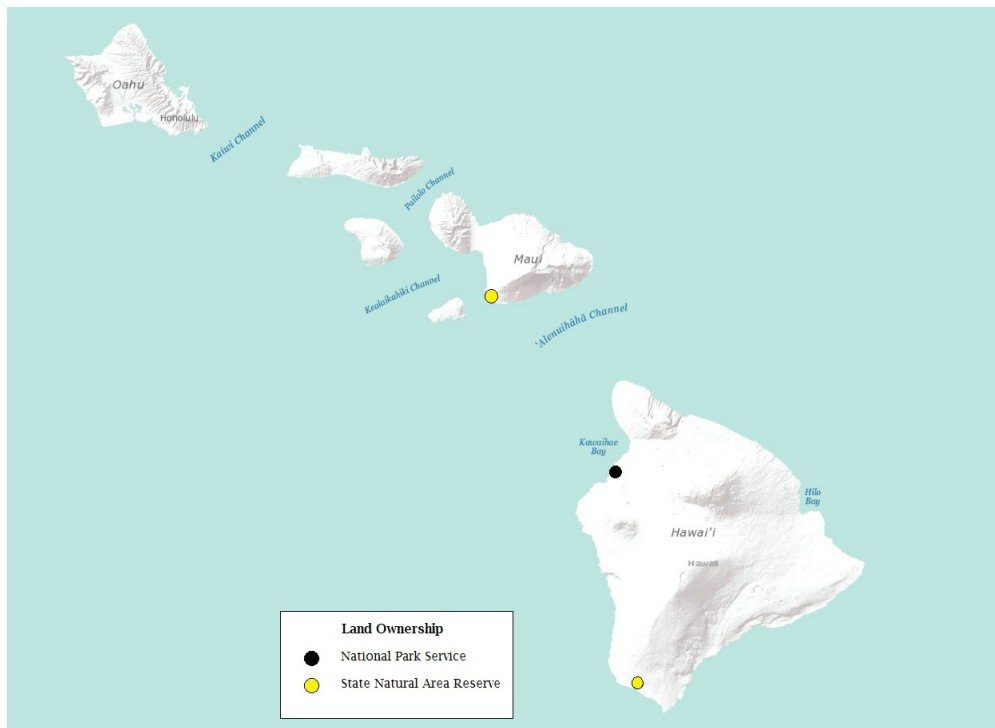


Figure 1. Land ownership of sites occupied by *Palaemonella burnsi* in the Hawaiian Islands.

### Population Estimates/Status:

Like other anchialine pool shrimp species, *Palaemonella burnsi* inhabits networks of water-filled interstitial spaces (cracks and crevices) leading to and from surface water that form pools, and this trait has precluded researchers from obtaining accurate population estimates during surveys for the species (Holthuis 1973, p. 36; Maciolek 1983, pp. 613-616). Many species of anchialine shrimp,

including *P. burnsi*, have merely been noted as present or absent from pools that have been surveyed (often with the aid of baiting). Loss of local populations from previously occupied habitat is likely the best, or only, measure of species decline because accurate estimates of abundance are not easily determined (Holthuis 1973, pp. 7-12; Maciolek 1983, pp. 613-616). From surveys conducted by the Service and the State of Hawaii, we know that *P. burnsi* currently occupies pools and pool groups in Maui and Hawaii; and that it has occupied Kaloko-Honokohau National Historic Park and Ahihi-Kinau NAR since surveys began. Pools occupied by *P. burnsi* in Manuka NAR were discovered more recently. The status of populations in the Ryuku Islands is not known at this time.

## Threats

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

In the State of Hawaii, it is estimated that up to 90 percent of the anchialine pools were destroyed or altered by human activities (Brock 2004, p. i). Recent human modifications of anchialine pools include the bulldozing and filling of pools (Bailey-Brock and Brock 1993, p. 354). Dumping of refuse has impacted other anchialine pools on the island (Brock 2004, pp. 13-17). However, all of anchialine pools occupied by *Palaemonella burnsi* in Hawaii exist in protected areas that are not likely to be impacted by development or habitat destruction in the foreseeable future (see section D below).

The three known anchialine pools that contain *Palaemonella burnsi* on Maui were modified by early Hawaiians and later inhabitants of the area, but they are now protected as part of Ahihi-Kinau NAR. Dumping of trash has been documented in the Maui NAR, but not within occupied pools (Brock 2004, p. i). Damage from use of anchialine pools for swimming and bathing has been documented in the Hawaiian Islands (Brock 2004, pp. 13-17). However, swimming and bathing have not been documented in pools occupied by *P. burnsi*.

Large-scale water withdrawal from groundwater resources has been known to adversely impact some anchialine pool habitats by increasing the salinity within the pools (Conry 2012, pers. comm.). Due to the delicate balance of the mixohaline environment, it is possible that such a change in the water composition could impact the biodiversity of species present. However, *Palaemonella burnsi* is known to survive a wide range of salinity levels from freshwater to saline. We do not have specific information suggesting *P. burnsi* is currently being impacted by water withdrawals, or that it is likely to be impacted by water withdrawals in the foreseeable future; therefore, we do not consider groundwater withdrawal to be a current threat to the species in Hawaii. Because *P. burnsi* occurs in saltwater habitat at Kume-jima, not in anchialine pools, groundwater withdrawal is not a threat to the species in the Ryuku Islands.

### **B. Overutilization for commercial, recreational, scientific, or educational purposes:**

The U.S. Fish and Wildlife Service (Service) is 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, p. 1), but there is no evidence that overcollection is currently a threat to *Palaemonella burnsi* (Gewecke 2015, pers. comm.). One company located in Hawaii, Fuku Bonsai, uses Hawaiian anchialine pool species for the aquarium hobby market; however, the company currently sells only Hawaiian red shrimp (*Halocaridina rubra*) cultured stock (Fuku-Bonsai 2007, p. 1). For commercial purposes, a DLNR DOFAW-issued Native Invertebrate Research and Collecting permit is required to collect anchialine pool shrimp. All terrestrial and aquatic invertebrates (including anchialine pool shrimp) are protected under the State of Hawaii Revised Statutes (1993) Chapter 195D-4-f License; and (2) DLNR Chapter 124 Indigenous Wildlife, Endangered and Threatened Wildlife, and Introduced Wild Birds. Collection is prohibited in National Parks and State NARs where this species occurs (Conry 2012, pers. comm.).

In the Ryuku Islands, individuals collected in Kume-jima were not located in anchialine pool habitat but were found associated with coral rubble substrate in a reef flat (Bruce 2005, p. 211). The entire island of Kume-jima is ringed by coral reefs. In accordance with domestic resource law, coral reefs are a protected habitat type throughout Japan; however, fishery resource utilization is allowable throughout the region and the specific level of protection for nearshore shrimp habitat occupied by *Palaemonella burnsi* is not known. Overcollection is not known to be a threat in Kume-jima.

### **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 where fish have not historically occurred (Bailey-Brock and Brock 1993, p. 354; Brock 2004, pp. 13-17). Over the last 30 years, it is estimated that 90 percent of Hawaii's anchialine habitat has been biologically degraded due to the introduction and spread of alien fishes, primarily mosquito fish and tilapia (Brock 2004, p. i; pp.13-17). Many anchialine pools in Hawaii are relatively easy to access and a significant number have been subject to unauthorized and careless introductions of nonnative fish. Populations of anchialine pool shrimp rapidly disappear from pools with introduced fish due to the effect of direct predation as well as competition for food and space (Bailey-Brock and Brock 1993, p. 354). This has been directly observed at numerous locations and was previously considered to pose a significant risk to *Palaemonella burnsi* (Brock 2004, pp.13-17). However, new research suggests that pool shrimp that are active at night, such as *P. burnsi*, appear to coexist in pools with diurnal marine fish species present (Sakihara 2012, p. 91).

In August 2007 and May 2010, Service biologists jointly resurveyed Ahihi-Kinau with personnel from the State NAR and the State Division Aquatic Resources (DAR). *Palaemonella burnsi* was found in one of the pool groups from which it was known to occur and nonnative fish were not observed.

The effects of predation and disease to populations of *Palaemonella burnsi* in the Ryukyu Islands are unknown.

## **D. The inadequacy of existing regulatory mechanisms:**

*Palaemonella burnsi* occurs on State and federal property that is subject to a variety of protective mechanisms (Fig. 2). These mechanisms have been adequate to protect *P. burnsi* when they were properly enforced thus far.

Most of the pools occupied by *Palaemonella burnsi* are located within protected State NARs. Within the NARs, State statutes specifically prohibit the disturbance or removal of any plant or wildlife, including *P. burnsi*, and the disturbance of any pond or lake (Administrative Rules, Sec. 13-209-4 ([www.dofaw.net/nars](http://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.

Within National Parks, *Palaemonella burnsi* is legally protected from direct human disturbance (36 CFR 2.2 (a)(2)) and from dumping of trash (36 CFR 2.14 (1)). Kaloko-Honokohau National Historical Park strictly forbids swimming and fishing within the pools to prevent contamination and disturbance to the shrimp (NPS 2013, pp. 2-3).

## **E. Other natural or manmade factors affecting its continued existence:**

None known.

## **Conservation Measures Planned or Implemented :**

In February 2011, the Service reviewed and commented on the National Park Service's draft long-term monitoring plan for anchialine pools within their boundaries on the island of Hawaii. The National Park Service's anchialine pool biological monitoring plan is still under development; however, water quality monitoring is underway at pools located on Park Service lands.

A symposium on anchialine pool conservation and management was held at the 89th annual meeting of the American Association for the Advancement of Science, Pacific Division in June 2008. In addition, a statewide meeting concerning the monitoring of anchialine pools was hosted by the Service on January 15, 2009. Results of that meeting included an update on the status of monitoring efforts across the State, development of a common monitoring protocol which is in use by several resource agencies, and the establishment of a listserv which has proven useful for technical discussions regarding anchialine pool-related topics (<http://listserv3.auburn.edu/mailman/private/hawaii-anchialine-ponds/>).

On Maui, three of the known pool groups containing *Palaemonella burnsi* lie within the Ahihi-Kinau State NAR. Ahihi-Kinau was the first NAR to be established by the State of Hawaii, and the presence of the anchialine pools and resident shrimp species was a key reason the area received this designation (Holthuis 1973, pp. 4-5). Signs have been placed at the pool locations at both NARs forbidding disturbance of the pools.



## Summary of Threats :

At the time that *Palaemonella burnsi* became a candidate, it was considered to be an endemic shrimp to the Hawaiian Islands, restricted to small anchialine habitats that were thought to have imminent threats. Our review of the best available scientific information indicates that *P. burnsi* exists across a much greater area than was previously believed (Bruce 2005, p. 211; De Grave 2012, pers. comm.), is not restricted to anchialine habitats (Bruce 2005, pp. 212, 215), and largely exists in protected areas where it is known to occur. Given this new information, in conjunction with the lack of data on the survey effort for this species outside of Hawaii, we find that we lack sufficient information to conclude that *P. burnsi* is warranted for listing under the ESA.

### Significant Portion of the Range

Under the ESA and our implementing regulations, a species may warrant listing if it is an endangered or a threatened species throughout all or a significant portion of its range. We published a final policy interpreting the phrase "Significant Portion of its Range" (SPR) in 2014 (79 FR 37578). The policy states that (1) if a species is found to be an endangered or a threatened species throughout a significant portion of its range, the entire species is listed as an endangered or a threatened species, respectively, and the Act's protections apply to all individuals of the species wherever found; (2) a portion of the range of a species is "significant" if the species is not currently an endangered or a threatened species throughout all of its range, but the portion's contribution to the viability of the species is so important that, without the members in that portion, the species would be in danger of extinction, or likely to become so in the foreseeable future, throughout all of its range; (3) the range of a species is considered to be the general geographical area within which that species can be found at the time the Service or the National Marine Fisheries Service makes any particular status determination; and (4) if a vertebrate species is an endangered or a threatened species throughout an SPR, and the population in that significant portion is a valid distinct population segment (DPS), we will list the DPS rather than the entire taxonomic species or subspecies.

The SPR policy is applied to all status determinations, including analyses for the purposes of making listing, delisting, and reclassification determinations. The procedure for analyzing whether any portion is an SPR is similar, regardless of the type of status determination we are making. The first step in our analysis of the status of a species is to determine its status throughout all of its range. If we determine that the species is in danger of extinction, or likely to become so in the foreseeable future, throughout all of its range, we list the species as an endangered (or threatened) species and no SPR analysis will be required. If the species is neither an endangered nor a threatened species throughout all of its range, we determine whether the species is an endangered or a threatened species throughout a significant portion of its range. If it is, we list the species as an endangered or a threatened species, respectively; if it is not, we conclude that listing the species is not warranted.

When we conduct an SPR analysis, we first identify any portions of the species' range that warrant further consideration. The range of a species can theoretically be divided into portions in an infinite number of ways. However, there is no purpose to analyzing portions of the range that are not

reasonably likely to be significant and either an endangered or a threatened species. To identify only those portions that warrant further consideration, we determine whether there is substantial information indicating that (1) the portions may be significant and (2) the species may be in danger of extinction in those portions or likely to become so within the foreseeable future. We emphasize that answering these questions in the affirmative is not a determination that the species is an endangered or a threatened species throughout a significant portion of its range--rather it is a step in determining whether a more detailed analysis of the issue is required. In practice, a key part of this analysis is whether the threats are geographically concentrated in some way. If the threats to the species are affecting it uniformly throughout its range, no portion is likely to warrant further consideration. Moreover, if any concentration of threats apply only to portions of the range that clearly do not meet the biologically based definition of "significant" (i.e., the loss of that portion clearly would not be expected to increase the vulnerability to extinction of the entire species), those portions will not warrant further consideration.

We have concluded that we have insufficient information regarding the current status of *Palaemonella burnsi* to suggest that it is warranted for listing throughout all of its range. Despite having information that the range of *P. burnsi* was recently extended to include the Ryuku Islands (4,800 miles beyond the extent of its previously known range) and the species is not restricted to anchialine pool habitats, we lack information on surveys outside of anchialine pools in Hawaii. As a result, we have insufficient information to circumscribe the current range of the species. Without knowing the current range of *P. burnsi*, we have insufficient information to suggest that any portion of the range is "significant" in that it is so important to the viability of the species that, without the members in that portion, the species would be in danger of extinction, or likely to become so in the foreseeable future.

**For species that are being removed from candidate status:**

  No   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 :**

- Continue monitoring known occupied pools for evidence of trash dumping, presence of nonnative fish and other habitat changes.
- Conduct ecological research on habitat requirements, basic life history, and dispersal of *Palaemonella burnsi* in Hawaii and the Ryukyu Islands.
- Gather specific information regarding populations and distribution of *Palaemonella burnsi* in the Ryukyu archipelago.

**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. We have updated the information within this form based, in part, on their input.

**Indicate which State(s) (within the range of the species) provided information or comments on the species or latest species assessment:**

none

**Indicate which State(s) did not provide any information or comment:**

Hawaii

**State Coordination:**

On March 26, 2015, we provided the Hawaii DLNR Division of Forestry and Wildlife and Division of Aquatic Resources with information regarding the range expansion of *Palaemonella burnsi* and unconfirmed threat status across its range. We provided our preliminary analysis and conclusion to remove the species from candidate status. The State is in agreement with removing *P. burnsi* from the candidate list and has not provided further comment.

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#### Personal Communications:

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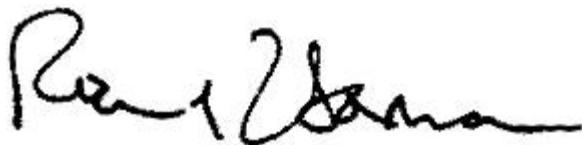
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#### **Approval/Concurrence:**

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:



06/23/2015

Date

Concur:



12/15/2015

Date

Did not concur:

\_\_\_\_\_

\_\_\_\_\_  
Date

Director's Remarks: