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

Scientific Name:

Metabetaeus lohena

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

_X_ 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
>
> _X_ 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

_X_ 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, Honolulu, HI, Maui, HI
- **Countries**: United States

Current States/Counties/Territories/Countries of Occurrence:

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

Land Ownership:

On Hawaii and Maui, pools are located on State lands managed by State Parks and the Department of Land and Natural Resources (DLNR) through the State Natural Area Reserve (NAR) System and the Division of Boating and Ocean Recreation (see Fig. 2). Also on Hawaii and Maui, a

smaller number of pools are located on Federal lands managed by the National Park Service (NPS). On Oahu, pools are located on State lands managed by the Division of Aquatic Resources (DAR) and Parks and Recreation Department, and on Federal lands managed by the U.S. Fish and Wildlife Service (Service). Land ownership of habitat in Rapa Nui is unknown.

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Biological Information

Species Description:

Metabetaeus lohena grows up to 0.7 inches (18 millimeters) in length, and body coloration ranges from pale pink to brilliant red. There is a conspicuous mandibular (mouthpart) spot (Banner and Banner 1960, p. 301). Its chelae (claws) are relatively large and conspicuous. Locomotion is accomplished by crawling along the substrate. Although it has been thought to feed on another anchialine pool shrimp *Halocaridina rubra* (Holthuis 1973, p. 36), close observation in captivity and in the field indicate that they are likely not primarily predators (Iwai 2010, pers. comm.).

Taxonomy:

Metabetaeus lohena was described by Banner and Banner (1960, pp. 299-303). This species of caridean shrimp in the family Alpheidae was recognized as a valid taxon by Holthuis (1973, p. 10).

Habitat/Life History:

Metabetaeus lohena is known to occur in both low- and high-salinity anchialine pools on the Hawaiian islands of Maui, Hawaii, and Oahu. Anchialine pools are land-locked bodies of water that occur coastally but are not openly connected to the ocean. They are mixohaline, with salinities ranging from two parts per thousand (ppt) to concentrations just below that of sea water (32 ppt) (Maciolek 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 do not support native species of fish although some species of nonnative fish have been introduced (see Disease or Predation section below) (Bailey-Brock and Brock 1993, p. 354; Brock 2004, p. i). On Rapa Nui, *M. lohena* is reported from an anchialine pool and from shallow coastal wells (Anker 2008, p. 11; Anker 2010, p. 37; De Grave 2012, pers. comm.).

The biogeographical relationships and genetic structure of anchialine pool shrimp are not well understood, particularly for those with widely separated populations. While the Rapa Nui population

has not been genetically characterized, studies of the subpopulations of *Metabaeus lohena* across the Hawaiian Islands indicate that the species exhibits relatively low genetic diversity with a high level of gene flow suggesting a recent colonization event or a life history pattern that accommodates geographic dispersal (Russ et al. 2010, pp. 165-167). *M. lohena* utilizes a planktotrophic larval feeding mode (i.e., larvae lack a yolk sac and feed on plankton) which may facilitate dispersal to anchialine habitats on different islands (Palumbi, 1995 p. 551; Russ et al. 2010, pp. 160 *and references therein*, 166). Researchers with the State of Hawaii have attempted breeding *M. lohena* in captivity and found that when larvae molt into the fourth instar stage, they develop a long spike (Fig. 1). This type of morphological adaptation in crustaceans is thought to be a defensive structure used to deter predators in the open ocean (Martin et al. 2014). After molting to this stage, the captive larvae die. This suggests not only that larvae are capable of surviving in the open ocean (where they would encounter predators) but that dispersing outside of the anchialine pools may be an essential part of their life history. The genetic similarity among the Hawaiian Islands subpopulations of *M. lohena* is unlike most other anchialine pool shrimp which show multiple distinct lineages within and among island archipelagos (Weese et al. 2013, p. 35). This information supports the assumption that *M. lohena* larvae leave the anchialine pools during the early stages of life.

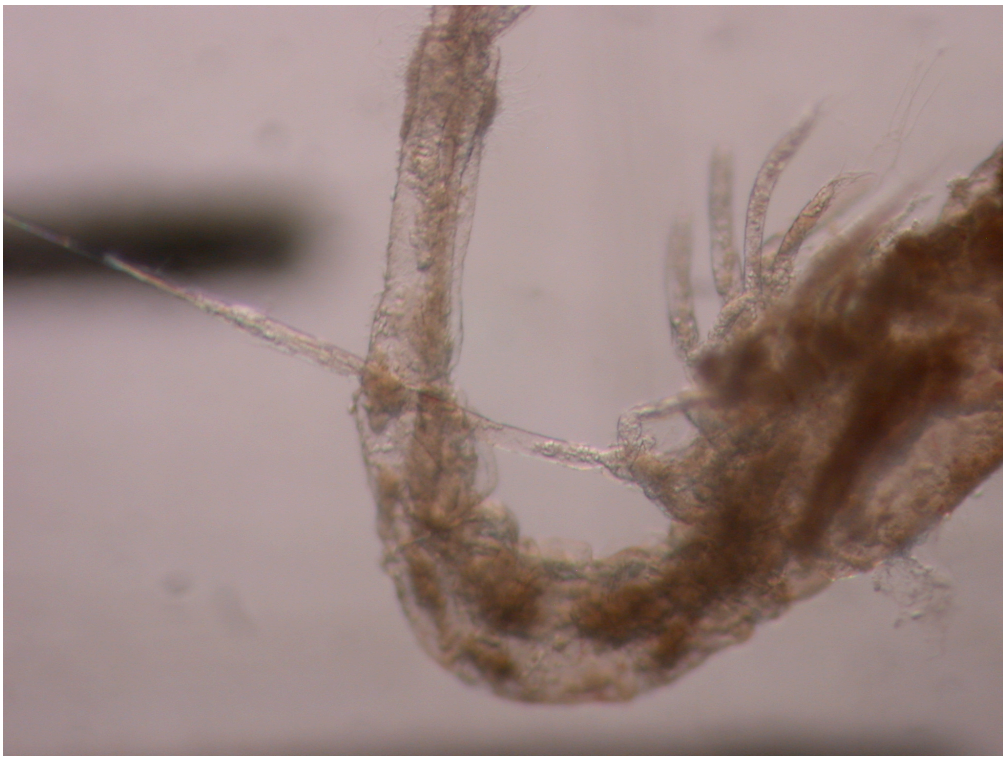

Figure 1.*Metabetaeus lohena* larva with spike at the fourth instar stage. Photo by Lorena Wada.

Historical Range/Distribution:

Anchialine pool habitat is widespread across the globe and is reported from coastal regions in Saudi Arabia, Madagascar, Fiji, and other Indo-Pacific islands. However, the total area occupied by

anchialine pools globally is extremely small (Maciolek 1983, p. 607). Historically, *Metabetaeus lohena* has been reported from at least 61 anchialine pools on the islands of Maui, Hawaii, and Oahu (HBMP 2006).

Metabetaeus lohena was recently documented from Rapa Nui, a special territory of Chile, located 4,400 miles away from Hawaii. Despite its recent discovery, we have no reason to believe it did not occur there historically as well. Specimens originally collected were first misidentified as *M. minutus* , and were determined to be *M. lohena* following reexamination (Anker 2010, p. 37). The species is reported to be widespread across Rapa Nui and was noted to occur in nearly every borehole examined (De Grave 2012, pers. comm.). While Anker (2010, p. 53) indicates potential morphological variation with the individual specimens reviewed, it is highly likely to be *M. lohena* (De Grave 2012, pers. comm.). A single specimen found in Ambon Bay (Maluku Islands, Indonesia) was identified as *M. lohena* as well; however, this determination remains uncertain because the specimen reviewed was highly degraded (De Grave 2012, pers. comm.).

The discovery of at least one, and perhaps two, populations so distant from the Hawaiian Islands suggests that our knowledge of the historical range and distribution of this species is incomplete, and that the species has a much larger range than previously known. 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 Rapa Nui do not represent the entire range of the species. Because the speciesâ 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:

Though the total number is not known, *Metabetaeus lohena* has recently been observed in at least 35 anchialine pools and pool groups on the islands of Maui, Hawaii, and Oahu (Fig. 2). In the most recent survey of Ahihi-Kinau Natural Area Reserve (NAR) on Maui, *M. lohena* was observed in nine pool groups (Brock 2004, pp. 30-57). On the island of Hawaii, the State has been conducting surveys of Manuka NAR since 2008 and found M. lohena in 13 pools (Sakihara 2010, pers. comm.). Additionally, sites including Honaunau, Papawai, Kaloko, Honokohau, Kiholo, Weliweli, Kapalaoa, Aiopio, and Apua Point also support *M. lohena* populations on the island of Hawaii (Conry 2012, pers. comm.). *M. lohena* was also found in one pool at Halape in Hawaii Volcanoes National Park (Jones 2010, pers. comm.). On Oahu, *M. lohena* has been found in one pool in Waianae on State-owned property, one pool at Malaekahana State Park, and, due to recent restoration efforts, this species now is found in a number of pools at the Kalaeloa Unit of the Pearl Harbor National Wildlife Refuge. The species is reported to be hypogeal (occurring below the soil or rock surface) across Rapa Nui (De Grave 2012, pers. comm.).

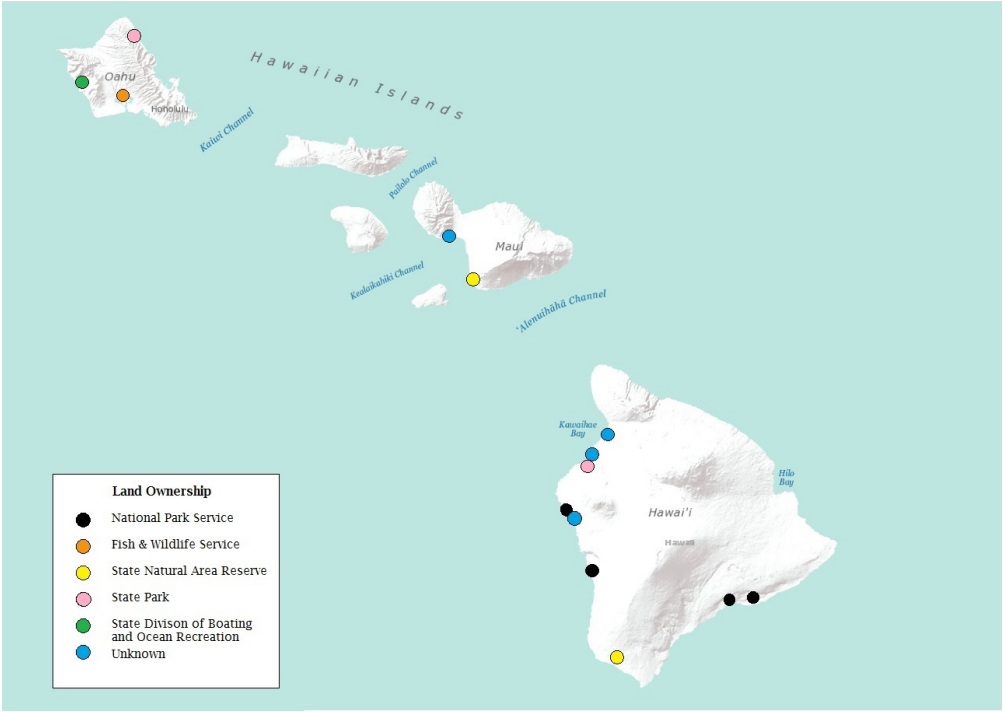

Figure 2. Land ownership of sites occupied by *Metabetaeus lohena* in the Hawaiian Islands.

Population Estimates/Status:

Like other anchialine pool shrimp species, *Metabetaeus lohena* 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 *M. lohena*, 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 M. lohena currently occupies 35 pools and pool groups in Maui, Hawaii, and Oahu; and that it has occupied most of these pools since surveys began. Pools occupied by *M. lohena* in Manuka NAR were discovered more recently. The known range expanded recently to include pools at Pearl Harbor National Wildlife Refuge following restoration efforts that took place. The species is reported to be widespread across Rapa Nui and was noted to occur in nearly every borehole examined (De Grave 2012, pers. comm.).

While we have some information on the speciesâ distribution and presence in the Hawaiian Islands and Rapa Nui, we do not fully understand the speciesâ range, and therefore, can only assess its population status in the part of the range that is known.

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, the majority of anchialine pools currently occupied by *Metabetaeus lohena* on the Hawaiian Islands exist in protected areas that are not likely to be impacted by development or habitat destruction in the foreseeable future (see section D below). Although trash dumping has been documented at least one pool occupied by *M. lohena*, the species has been observed to recolonize pools that were previously filled with trash (Wada 2006, pers. comm.).

Damage from use of anchialine pools for swimming and bathing has been documented in the Hawaiian Islands (Brock 2004, pp. 13-17), but we have no specific information on the impacts to *Metabataeus lohena* from these activities. In surveys conducted in 2010, *M. lohena* were observed in the Pohoiki pool on Maui which has some recreational use by swimmers (Wada 2010, pers. comm.). The pools on Oahu are too small to be used for swimming or bathing. Swimming and bathing do not appear to be a threat on Rapa Nui where the majority of individuals are reported from collections in boreholes rather than surface waters (De Grave 2012, pers. comm.).

Large-scale water withdrawal from groundwater resources has been known to adversely impact 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, *Metabetaeus lohena* is known to survive a wide range of salinity levels from freshwater to saline. We do not have specific information suggesting *M. lohena* is currently being impacted by water withdrawals, nor 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.

Rapa Nui supports a permanent population of approximately 6,000 people. Groundwater resources on the island have generally been considered adequate, and shallow water boreholes (wells), where numerous *Metabetaeus lohena* have been observed, are the primary source of water for domestic and agricultural use (Rosa 2013, p. 52-53). However, with increasing tourism and a growing human population, protection of groundwater from overuse and surface-derived pollutants is increasingly important (Rosa 2013, p. 53). Protection of groundwater from human-caused pollution due to wastewater discharge and contamination from landfills is receiving increased attention in the vicinity of population centers (Rosa 2013, p. 52). Impacts to potential *M. lohena* habitat as a result of development of freshwater sources in Rapa Nui, if any, are not known, and there is no confirmation that these activities currently pose a threat to groundwater-supported habitat occupied by *M. lohena*.

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

The 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 *Metabetaeus lohena* (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 (Conry 2012, pers. comm.). Collection is prohibited in National Parks and State NARs but not within the State Parks or on City and County property.

The island of Rapa Nui is a UNESCO-designated a cultural World Heritage Site and is under International Union for Conservation of Nature (IUCN) Management Category II, which protects large-scale ecological processes and provides conservation opportunities that allow those processes to continue in perpetuity (IUCN 2014). The park is under the administrative control of the Conservation Department of Chile's National Forestry Corporation. It is not known if environmental protections that would prevent *Metabetaeus lohena* from overutilization for commercial, recreational, scientific, or educational purposes are effectively enforced. Overcollection is considered unlikely due to the small population of only 6,000 residents and the tourism-based economy.

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, pp. i, 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 *Metabataeus lohena* (Brock 2004, pp.13-17). *M. lohena* is primarily observed in anchialine habitats that are free of invasive species (Russ et al. 2010, p. 167). However, in one pool in Manuka NAR, where nonnative fish have become established, *M. lohena* individuals have been observed in great abundance at night even though they were not observed in the pool during the day (Sakihara 2012, p. 91). This suggests that *M. lohena* has modified its behavior to become active at night to avoid predation by diurnal nonnative fish (Sakihara 2012, p. 91). It also suggests that *M. lohena* may not be limited to pools that are free of nonnative fish; however, it is unclear under what conditions *M. lohena* can coexist with nonnative fish.

Aside from the single pool in Manuka NAR, none of the anchialine pools where *Metabataeus lohena* is known to occur are inhabited by nonnative fish species. Nonnative fish were not seen during the most recent survey of the occupied Maui and Hawaii pools (Brock 2004, p. i). Nonnative fish were not observed during additional surveys by Service personnel in 2007 and 2010 (Wada 2007 and 2010, pers. comm.). In 2006, there was no evidence of nonnative fish in either of the pools on the island of Oahu during site visits by Service employees (Wada 2006, pers. comm.).

As a result of its extreme geographic isolation and small human population, it is unlikely that baitfish or aquarium fish introductions occur in aquatic habitats harboring *Metabataeus lohena* in Rapa Nui. The only freshwater fish reported from the island is the introduced mosquitofish, *Gambusia affinis*, which was found in one of three small crater lakes located on Rapa Nui (Magliulo-Cepriano 2003, p. 178). In other locations where mosquitofish have been observed coexisting with anchialine pool shrimp, the shrimp did not disappear from the pools, but did change their diel behavior and were only active at night (Capps et al. 2009, p. 33).

While the invasion of nonnative fish was previously considered the greatest threat to the species, new information on the species distribution, dispersal capabilities, and its ability to modify its behavior to be more active at night when nonnative fish are present reduce the magnitude of the potential magnitude of this stressor. In addition, *Metabataeus lohena* occurs primarily within protected public land, making it less likely that an invasion will occur. If a pool within a protected area (e.g., NAR, Refuge, State or National Park) were invaded by nonnative fish that resulted in the loss of the species, these agencies are likely to respond with appropriate conservation actions (see Factor D, below). Following restoration, *M. lohena* has been observed recolonizing habitats that were previously uninhabitable. Because *M. lohena* occurs in at least 35 pools and pools groups in the Hawaiian Islands, there is sufficient redundancy for it to be reasonable to assume that natural dispersal methods would allow the species to recolonize restored pools as it has in the past.

D. The inadequacy of existing regulatory mechanisms:

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

Many pools occupied by *Metabetaeus lohena* are located within protected State NARs. Within the NARs, State statutes specifically prohibit the disturbance or removal of any plant or wildlife, including *M. lohena*, and the disturbance of any pond or lake (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.

At the Pearl Harbor National Wildlife Refuge, protection and restoration of anchialine pools are among the Refuge's primary objectives in the Kalaeloa Unit, where *Metabetaeus lohena* is listed as a priority resource of concern (Service 2010, pp. 2-5, 4-3). The Refuge actively removes pest plants near the anchialine pools, and removes previously deposited rocks and earthen debris to

reestablish hydrological connections between groundwater and the ocean (Service 2010, pp. 2-15, B-11; Service 2015). To protect the anchialine pools from human disturbance, the Kalaeloa Unit is closed to the general public, and visiting groups are led by a guide.

Within National Parks, *Metabetaeus lohena* 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).

Resource conservation in Rapa Nui is carried out by the Conservation Department of Chile's National Forestry Corporation and the entire island is a UNESCO-designated cultural World Heritage Site under IUCN Management Category II. The sufficiency of these and other domestic legal and administrative frameworks as regulatory mechanisms for the protection of *Metabetaeus lohena* is not known.

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 NPS's draft long-term monitoring plan for anchialine pools within their boundaries on the island of Hawaii. The NPS's anchialine pool biological monitoring plan is still under development; however, water quality monitoring is underway at pools located on NPS 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 in January 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 and Hawaii Islands, several anchialine pool complexes containing *Metabetaeus lohena* lie within the Ahihi-Kinau State NAR; and the Manuka State NAR and Hawaii Volcanoes National Park; respectively. 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.

On the island of Oahu, pool restoration efforts were implemented between 2006 and 2009 at the Pearl Harbor National Wildlife Refuge, Kalaeloa Unit. Thirteen of fourteen pools were completely restored and *Metabetaeus lohena* naturally recruited into the majority of restored pools. The

addition of this subpopulation demonstrated that *M. lohena* is capable of dispersing naturally to suitable habitat where it was previously found following successful restoration efforts.

In July 2010, the Service jointly surveyed Pohiki on Hawaii Island with State NAR and State DAR personnel. The pool acts as a hot spring containing warmer water than the nearby ocean and many people were observed swimming and soaking in it. However, *Metabetaeus lohena* individuals were present along the sides of the pool and on portions of the bottom of the pool.

Summary of Threats :

At the time *Metabetaeus lohena* 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 *M. lohena* exists across a much greater area than was previously believed (Anker 2010, p. 37), has a greater geographic dispersal ability than previously known (Russ et al. 2010, pp. 165-167), can naturally recolonize restored habitats, and largely exists in protected areas where it is known to occur. Given this new information, in conjunction with the lack of information on the survey effort for this species outside of Hawaii, we find that we lack sufficient information to conclude that *M. lohena* 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 *Metabetaeus lohena* to suggest that it is warranted for listing throughout all of its range. Despite having information that the range of *M. lohena* was recently extended to include Rapa Nui (4,400 miles beyond the extent of its previously known range) and the species is capable of geographic dispersal, we lack information on surveys outside of Hawaii. As a result, we have insufficient information to circumscribe the current range of the species. Without knowing the current range of *M. lohena*, 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

Metabetaeus lohena on Rapa Nui and in the Hawaiian Islands.
- Gather specific information regarding populations, distribution, and potential threats of *Metabetaeus lohena* on Rapa Nui.

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 *Metabetaeus lohena* and reduced threat status. We provided our preliminary analysis and conclusion to remove the species from candidate status. The State is in agreement with removing *M. lohena* from the candidate list and has not provided further comment.

Literature Cited:

Anker, A. 2008. A worldwide review of stygobiotic and stygophilic shrimps of the family Alpheidae (Crustacea, Decapoda, Caridea). Subterranean Biology 6: 1-16.

Anker, A. 2010. *Metabetaeus* Borradaile, 1899 revisited, with description of a new marine species from French Polynesia (Crustacea: Decapoda: Alpheidae). Zootaxa 2552: 37-54.

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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: