

Miami Cave Crayfish (*Procambarus milleri*)

Ecological Risk Screening Summary

U.S. Fish and Wildlife Service, April 2014

Revised, January 2018, May 2018

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1 Native Range, and Status in the United States

Native Range

From Cordeiro et al. (2010):

“United States (Florida)”

Status in the United States

From Cordeiro et al. (2010):

“This species was formerly known from two localities in Miami, Dade County, Florida (Franz et al. 1994). These two sites were 24 km apart (Radice and Loftus 1995). This species was recently found again in 1992 (Radice and Loftus 1995), after last being recorded in 1968 and

subsequently described three years later (Hobbs 1971). This species is now known from 14 -15 sites in southern Dade County, mostly from man-made groundwater wells (P. Moler pers. comm. 2010). All known occurrences are found within an area of 210 km² (30 km x 7 km NatureServe 2009).”

It is unclear whether *P. milleri* is present in trade in the United States.

From Cordeiro et al. (2010):

“[...] now being sold into the aquarium trade due to their suitability to aquarium life and attractive colour (Radice and Loftus 1995).”

Means of Introductions in the United States

This species has not been reported as introduced outside of its native range in the United States.

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

From ITIS (2018):

“Kingdom Animalia
Subkingdom Bilateria
Infrakingdom Protostomia
Superphylum Ecdysozoa
Phylum Arthropoda
Subphylum Crustacea
Class Malacostraca
Subclass Eumalacostraca
Superorder Eucarida
Order Decapoda
Suborder Pleocyemata
Infraorder Astacidea
Superfamily Astacoidea
Family Cambaridae
Subfamily Cambarinae
Genus *Procambarus*
Subgenus *Procambarus* (*Leconticambarus*)
Species *Procambarus milleri* Hobbs, 1971”

“Taxonomic Status: valid”

Size, Weight, and Age Range

From NatureServe (2017):

“[LENGTH: to 15 TCL; to 30 TL] [WIDTH: to 4.5]”

Environment

From Cordeiro et al. (2010):

“Freshwater”

Climate/Range

From Cordeiro et al. (2010):

“Temperate”

Distribution Outside the United States

Native

The native range of this species does not extend outside of the United States.

Introduced

According to Faulkes (2015), *Procambarus milleri* is found in the pet trade in Germany (Churcholl 2013) and in the Czech Republic (Patoka et al. 2014; Patoka et al. 2015).

According to Patoka et al. (2014), *P. milleri* is available in the pet trade in the Czech Republic. Its wholesale availability is reported as “very rare.”

Means of Introduction Outside the United States

No introductions of this species into natural habitats have been reported.

Short Description

From NatureServe (2017):

“Body unpigmented, eyes reduced & faceted with small pigment spot; rostrum lacking marginal spines or tubercles, margins tapering to indistinct acumen; cervical spine absent; chela elongate and studded with squamous tubercles, single row of 12-15 low tubercles along mesial margin of palm; hooks on ischia of male 3rd & 4th pereopods, lacking caudomesial boss on coxa of 4th pereopod; male 1st pleopods asymmetrical, terminating in 3 subparallel elements, mesial process slender sinuous and longest by 50%, cephalic process acute and arising from cephalomedian surface, central projection lanceolate and arising from cephalomedian surface, strong caudal knob devoid of process, subapical setae present in cephalic half (Hobbs, Hobbs and Daniel, 1977).”

Biology

From Cordeiro et al. (2010):

“This species is found in subterranean habitats (Radice and Loftus 1995). Nutrients enter the wells, through holes and crevices on the Florida pinelands and marshes, which allow plant and other detritus to filter down into the cave system (Radice and Loftus 1995). Loftus et al. (2001)

found that this species inhabits deep geological formations [*sic*], greater than 5 m beneath the Rocky Glades, with voids of various dimensions that flood periodically but always contain water. The drilling of groundwater abstraction wells seems to provide suitable habitat for this species (P. Moler pers. comm. 2010).”

Human Uses

From Cordeiro et al. (2010):

“Since this species' rediscovery, seven specimens have been used to establish a captive breeding programme and are now being sold into the aquarium trade due to their suitability to aquarium life and attractive colour (Radice and Loftus 1995).”

According to Faulkes (2015), *P. milleri* is present in the pet trade in Germany and the Czech Republic, but not in the United States, Brazil, Ireland, the United Kingdom, the Netherlands, Greece, Slovakia, Turkey, or Singapore.

According to Patoka et al. (2014), the wholesale availability of *P. milleri* in the Czech Republic is reported as “very rare.”

Diseases

No information available. No OIE reportable diseases have been documented for this species.

Threat to Humans

No information reported for this species.

3 Impacts of Introductions

According to Patoka et al. (2014),

P. milleri has a potential invasiveness (FI-ISK score) of three and a risk category (FI-ISK category) of Medium. The abbreviation “FI-ISK” stands for the Freshwater Invertebrate Invasiveness Scoring Kit.

4 Global Distribution

No georeferenced occurrences were reported for *P. milleri* by GBIF Secretariat (2017).



Figure 1. Map of the State of Florida, showing the location of Miami-Dade County, where *Procambarus milleri* is native. Image: Author unknown. Licensed under Creative Commons CC BY-SA 3.0. Available: <https://en.wikipedia.org/w/index.php?curid=7815758>. (May 2018).

5 Distribution Within the United States



Figure 2. Map of the State of Florida, showing the location of Miami-Dade County, where *Procambarus milleri* is native. Image: Author unknown. Licensed under Creative Commons CC BY-SA 3.0. Available: <https://en.wikipedia.org/w/index.php?curid=7815758>. (May 2018).

6 Climate Matching

Summary of Climate Matching Analysis

The climate match (Sanders et al. 2014; 16 climate variables; Euclidean Distance) was high in most of peninsular Florida. Medium matches occurred in northern Florida, and along the coasts of Texas, Georgia, and South Carolina. The rest of the United States had a low match. Climate 6 score indicated that the contiguous U.S. has a medium climate match overall. The range of scores for a medium climate match is between 0.005 and 0.103; the Climate 6 score of *Procambarus milleri* was 0.010.

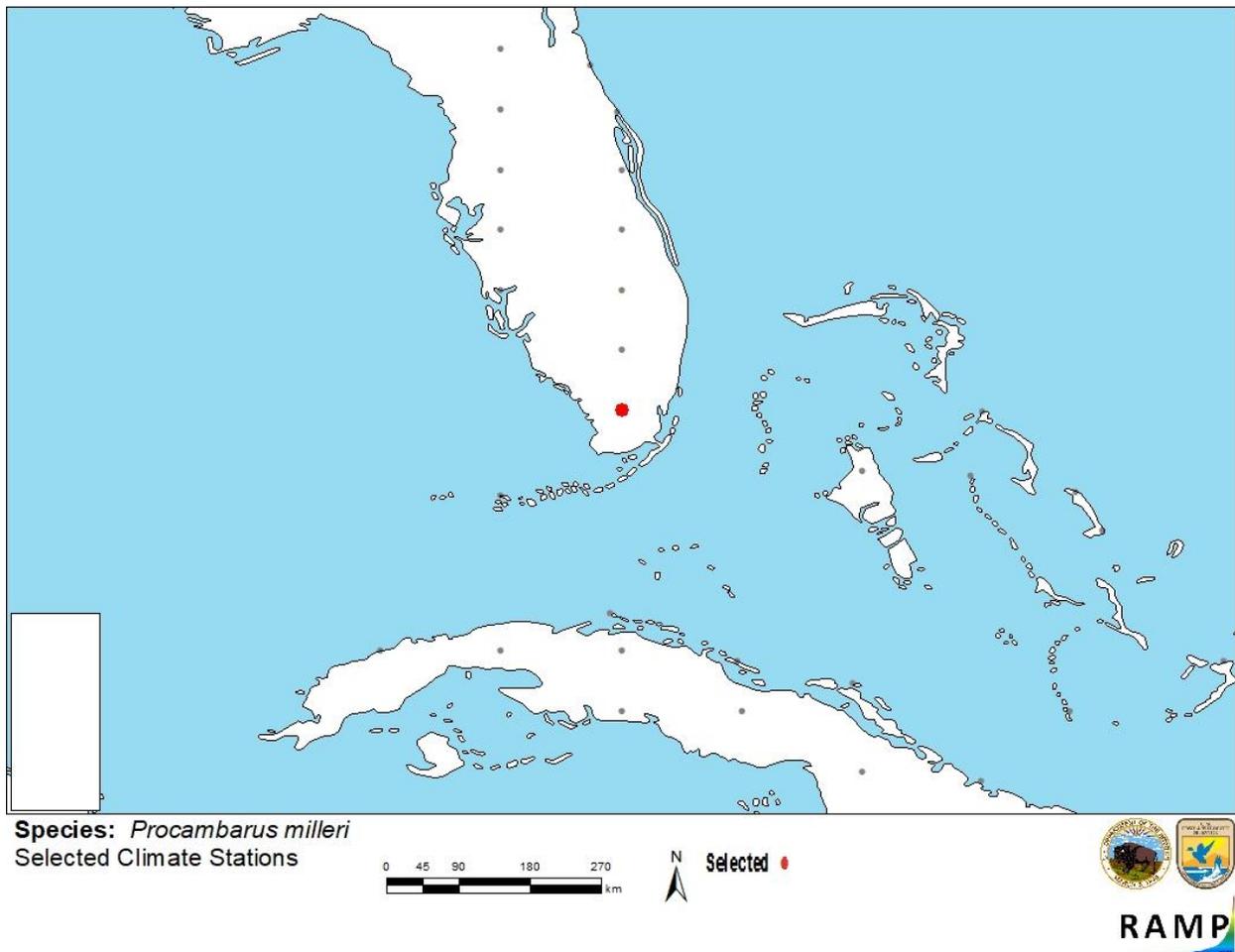


Figure 3. RAMP (Sanders et al. 2014) source map showing weather stations in Florida and the northern Caribbean selected as source locations (red; southern Florida) and non-source locations (gray) for *Procambarus milleri* climate matching. Source location from Franz and Lee (1982).

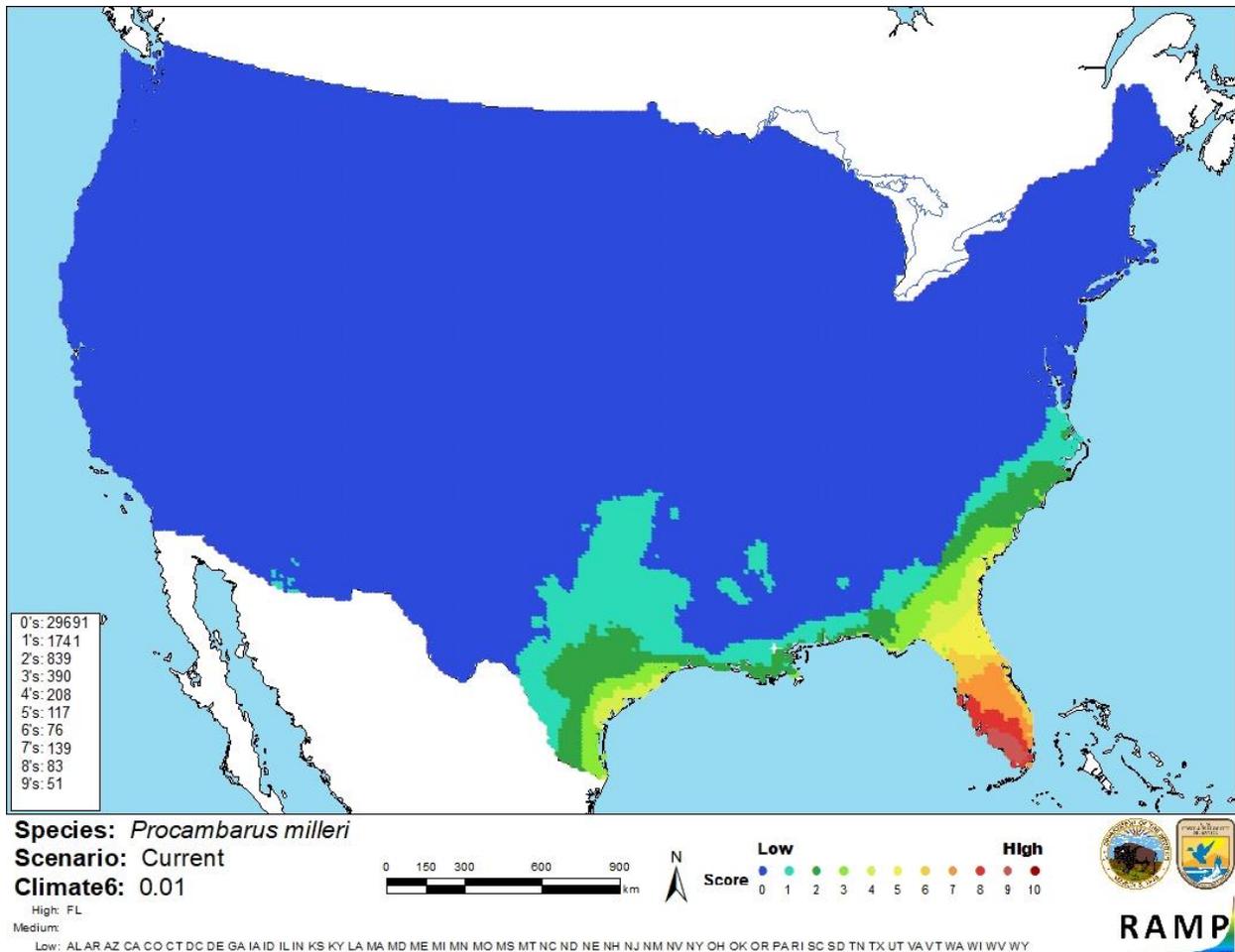


Figure 4. Map of RAMP (Sanders et al. 2014) climate matches for *Procambarus milleri* in the contiguous United States based on source locations reported by Franz and Lee (1982). 0=Lowest match, 10=Highest match.

The “High”, “Medium”, and “Low” climate match categories are based on the following table:

Climate 6: Proportion of (Sum of Climate Scores 6-10) / (Sum of total Climate Scores)	Climate Match Category
$0.000 < X < 0.005$	Low
$0.005 < X < 0.103$	Medium
≥ 0.103	High

7 Certainty of Assessment

Some information on the biology and distribution of this species is available. There are no reports of *P. milleri* in nature outside its native range. The only scientific information available on the impacts of introductions is based on a risk assessment, rather than a study documenting realized impacts. Certainty of this assessment is low.

8 Risk Assessment

Summary of Risk to the Contiguous United States

Procambarus milleri is a freshwater crayfish found in subterranean habitats in Dade County, Florida. It is reported to be available in the pet trade in Germany and the Czech Republic. *P. milleri* has not been reported in nature outside its range. Data on impacts of introductions are lacking. Absence of this information makes the certainty of this assessment low. The climate match with the United States is medium. Overall risk posed by this species is uncertain.

Assessment Elements

- **History of Invasiveness (Sec. 3): Uncertain**
- **Climate Match (Sec.6): Medium**
- **Certainty of Assessment (Sec. 7): Low**
- **Overall Risk Assessment Category: Uncertain**

9 References

Note: The following references were accessed for this ERSS. References cited within quoted text but not accessed are included below in Section 10.

- Cordeiro, J., P. Moler, and K. A. Crandall. 2010. *Procambarus milleri*. The IUCN Red List of Threatened Species 2010: e.T18204A7800206. Available: <http://www.iucnredlist.org/details/biblio/18204/0>. (January 2018).
- Faulkes, Z. 2015. The global trade in crayfish as pets. *Crustacean Research* 44:75-92.
- Franz, R., and D. S. Lee. 1982. Distribution and evolution of Florida's troglobitic crayfishes. *Bulletin of the Florida State Museum, Biological Sciences* 28(3):53-78.
- GBIF Secretariat. 2017. GBIF backbone taxonomy: *Procambarus milleri* (Hobbs 1972). Global Biodiversity Information Facility, Copenhagen. Available: <http://www.gbif.org/species/2227256> (January 2018).
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- NatureServe. 2017. NatureServe Explorer: an online encyclopedia of life, version 7.1. NatureServe, Arlington, Virginia. Available: <http://explorer.natureserve.org>. (January 2018).
- Patoka, J., L. Kalous, and O. Kopecký. 2014. Risk assessment of the crayfish pet trade based on data from the Czech Republic. *Biological Invasions* 16:2489-2494.

Sanders, S., C. Castiglione, and M. H. Hoff. 2014. Risk Assessment Mapping Program: RAMP. U.S. Fish and Wildlife Service.

10 References Quoted But Not Accessed

Note: The following references are cited within quoted text within this ERSS, but were not accessed for its preparation. They are included here to provide the reader with more information.

Franz, R., J. Bauer, and T. Morris. 1994. Review of biologically significant caves and their faunas in Florida and South Georgia. *Brimleyana* 20:1-109.

Hobbs, H. H. 1971. A new troglobitic crayfish from Florida. *Quarterly Journal of the Florida Academy of Sciences* 34(2):114-124.

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Loftus et al. 2001. [Source did not provide full citation for this reference.]

NatureServe. 2009. NatureServe Explorer: an online encyclopedia of life, version 7.1.

Patoka, J., L. Kalous, and O. Kopecký. 2015. Imports of ornamental crayfish: the first decade from the Czech Republic's perspective. *Knowledge and Management of Aquatic Ecosystems* 416:04.

Radice, P., and B. Loftus. 1995. The Miami cave crayfish: a colourful new crustacean for the aquarium. *Tropical Fish Hobbyist* (July):112-116.