U.S. Fish & Wildlife Service

Japanese Medaka (*Oryzias latipes*)
Ecological Risk Screening Summary

U.S. Fish & Wildlife Service, February 2011
Revised, June 2019
Web Version, 5/7/2020

Organism Type: Fish
Overall Risk Assessment Category: Uncertain

Photo: Seotaro. Licensed under Creative Commons Attribution 3.0 Unported. Available: https://commons.wikimedia.org/wiki/File:Oryzias_latipes(Hamamatsu,Shizuoka,Japan,2007)-1.jpg. (June 2019).

1 Native Range and Status in the United States

Native Range

From Froese and Pauly (2019):

"Asia: Japan, Korea, China and Viet Nam. Reported from the middle Nam Theun, Mekong, Irrawaddy, Salween, Red River and Nanpangjiang in basins [Kottelat 1998]."

Froese and Pauly (2019) lists *Oryzias latipes* as native to China, Hong Kong, Japan, Korea (South), Laos, Myanmar, Ryukyu Island, and Viet Nam.

Fuller and Nico (2019):

"Native Range: Eastern Asia. Japan, Korea, Taiwan, middle and eastern China as far south as Hainan (Lee et al. 1980 et seq.; Mauda et al. 1984)."

Status in the United States

Froese and Pauly (2019) state that *Oryzias latipes* was introduced to California, Hawaii, and New York, none of these populations have become established in the United States.

According to Fuller and Nico (2019), nonindigenous occurrences of *Oryzias latipes* have been reported in the following states, with range of years and hydrologic units in parentheses:

- California (1980; Coyote)
- Hawaii (1922; Oahu)
- New York (1978-1986; Southern Long Island)

From Fuller and Nico (2019):

"Status: The New York population was extirpated as a result of the cold winter of 1978; the California population disappeared for reasons unknown (Courtenay et al. 1984). Contrary to information provided by some authors, the species was reported but apparently never established in California (Dill and Cordone 1997). In Hawaii, the species never became established (Brock 1960; Maciolek 1984)."

Oryzias latipes can be found for sale within the United States.
From Goldorado Aquatics (2020):

"Japanese Rice Fish (*Oryzias latipes*)
$20.00"

Means of Introductions in the United States

From Froese and Pauly (2019):

"Accidentally released from aquaria."

"The species was intentionally stocked in unknown numbers in Hawaii in 1922, possibly as a potential biological control for mosquitoes. In Hawaii, the species never became established [Maciolek 1984]."

From Fuller and Nico (2019):

"Means of Introduction: The California introduction reportedly resulted from an aquarium release (Snyder 1935). It was intentionally stocked in unknown numbers in Hawaii (Brock 1960; Maciolek 1984), possibly as a potential biological control for mosquitoes. Sources of and reasons for introductions in New York are not known, but may be associated with research or aquarium releases (Lee et al. 1980 et seq.)."

Remarks

No additional remarks.

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

From Fricke et al. (2019):

"**Current status:** Valid as *Oryzias latipes* (Temminck & Schlegel 1846)."

From ITIS (2019):

Kingdom Animalia
  Subkingdom Bilateria
    Infrakingdom Deuterostomia
      Phylum Chordata
        Subphylum Vertebrata
          Infraphylum Gnathostomata
            Superclass Actinopterygii
              Class Teleostei
                Superorder Acanthopterygii
                Order Beloniformes
                Suborder Adrianichthyoidei
                Family Adrianichthyidae
                Subfamily Oryziinae
                Genus *Oryzias*
                Species *Oryzias latipes* (Temminck and Schlegel, 1846)

Size, Weight, and Age Range

From Froese and Pauly (2019):

"Max length : 3.2 cm SL male/unsexed; [Nakabo 2002]"

Environment

Froese and Pauly (2019):

"Freshwater; brackish; benthopelagic; pH range: 7.0 - 8.0; dH range: 9 - 19; amphidromous [Riede 2004]. […]; 18°C - 24°C [Baensch and Riehl 1985; assumed to be recommended aquarium temperature]; […]"

Climate/Range

Froese and Pauly (2019):

"Subtropical; […]; 55°N - 10°N, 85°E - 105°E"

Distribution Outside the United States

Native

From Froese and Pauly (2019):

"Asia: Japan, Korea, China and Viet Nam. Reported from the middle Nam Theun, Mekong, Irrawaddy, Salween, Red River and Nanpangjiang in basins [Kottelat 1998]."

Froese and Pauly (2019) lists *Oryzias latipes* as native to China, Hong Kong, Japan, Korea (South), Laos, Myanmar, Ryukyu Island, and VietNam.

Fuller and Nico (2019):

"Native Range: Eastern Asia. Japan, Korea, Taiwan, middle and eastern China as far south as Hainan (Lee et al. 1980 et seq.; Mauda et al. 1984)."

Introduced

Froese and Pauly (2019) states that *Oryzias latipes* has been introduced to and become established in Afghanistan, Iran, Kazahstan, Turkmenistan, Russia, and Cuba.

From Froese and Pauly (2019):

"Introduced [and is currently established] to the Tedzhen River basin [Turkmenistan]."

"Found from waters on the borders of Iran or confluent with Iranian drainages [Coad 1995]."

"Introduced [to Kazakhstan] in Ili river [Reshetnikov et al. 1997] and Lake Balkhash [Mitrofanov and Petr 1999]. Originally reported in the Ili river basin where it became abundant."

"It was reported from the Kuban basin [Russia] in 1978 [Reshetnikov et al. 1997]."

Means of Introduction Outside the United States

From Froese and Pauly (2019):

"Was most likely introduced into the Soviet Union together with commercially valuable fish species. It was originally reported in the Ili River basin and later became abundant. It was artificially distributed in order to reduce the number of vector insects."

"Introduced in Ili river [Reshetnikov et al. 1997] and Lake Balkhash [Mitrofanov and Petr 1999]. Originally reported in the Ili river basin where it became abundant. It was artificially distributed in order to reduce the number of vector insects. [Reshetnikov et al. 1997]."

Short Description

From Froese and Pauly (2019):

"Dorsal soft rays (total): 6-7; Anal soft rays: 15 - 21; Vertebrae: 30 - 31. Meristic characters mainly from Nam Theun, Laos sample only [Roberts 1998]. Scale count refers to the scales in longitudinal row [Nakabo 2002]."

Biology

From Froese and Pauly (2019):

"Adults occur in ponds, marshes, paddy fields and small flows of plains [Nakabo 2002]. They prefer slow-moving streams. Inhabit mainly waters of lowlands and brackish water, and also known to inhabit tide pools of coasts of certain regions in Japan and Korea. They can withstand a wide range of salinity [Yamamoto 1975]. Omnivorous [Yamamoto 1975]. For indoor culture, a diluted sea water is rather better than the freshwater , and the use of a balanced salt solution is recommended, if the tap water proves to be unsuitable [Yamamoto 1975]. […] Non-annual breeders."

"Carries eggs for some time before deposition [Balon 1990]. Oocytes mature at night followed by ovulation at dawn [Iwamatsu 2004]."

Human Uses

From Froese and Pauly (2019):

"Bioluminescent fish (a genetically modified fish - product of fluorescent protein extracted from jellyfish and attaching to DNA in embryonic fish) has been imported from Taiwan for aquarium enthusiasts."

"The species was intentionally stocked in unknown numbers in Hawaii in 1922, possibly as a potential biological control for mosquitoes."

"Used in experimental research [Robins et al. 1991]."

"Fisheries: of no interest; aquarium: commercial"

Oryzias latipes can be found for sale within the United States.
From Goldorado Aquatics (2020):

"Japanese Rice Fish (*Oryzias latipes*)
$20.00"

Diseases

No records of OIE-reportable diseases (OIE 2020) were found for *Oryzias latipes.*

Poelen et al. (2019) lists *Diplostomum*, and *pallisentis nagpurensis* as parasites of *Oryzias latipes*.

Threat to Humans

From Froese and Pauly (2019):

"Harmless"

3 Impacts of Introductions

From Fuller and Nico (2019):

"Impact of Introduction: The impacts of this species are currently unknown, as no studies have been done to determine how it has affected ecosystems in the invaded range. The absence of data does not equate to lack of effects. It does, however, mean that research is required to evaluate effects before conclusions can be made."

4 History of Invasiveness

Oryzias latipes is a small minnow species native to Asia that was introduced to California, Hawaii, and New York, but none of these populations have become established. Reasons for introduction include aquaria releases, mosquito control, and possibly research releases. It. has been introduced to and become established in Afghanistan, Iran, Kazahstan, Turkmenistan, Russia, and Cuba. These introductions are reported to be primarily for insect control. No information is available on whether or not there have been impacts to native species or ecosystems. Based on this information, the history of invasiveness for this species is "Data Deficient".

5 Global Distribution

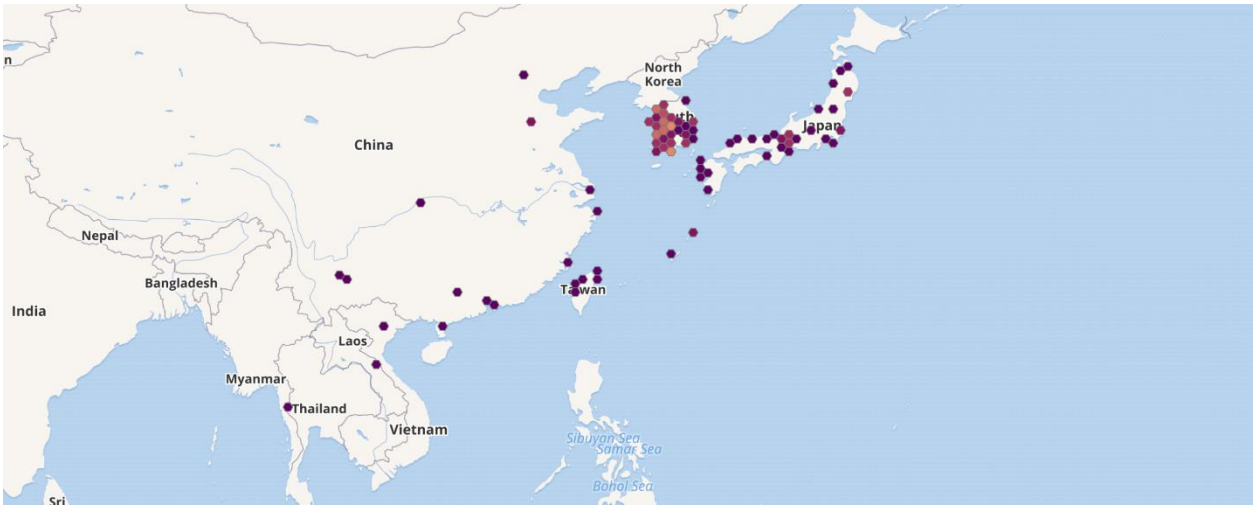

Figure 1. Known global distribution of *Oryzias latipes* reported from Japan, South Korea, China, Taiwan, Vietnam, and Thailand. Map from GBIF Secretariat (2020).

No georeferenced observations were available from Laos or Myanmar.

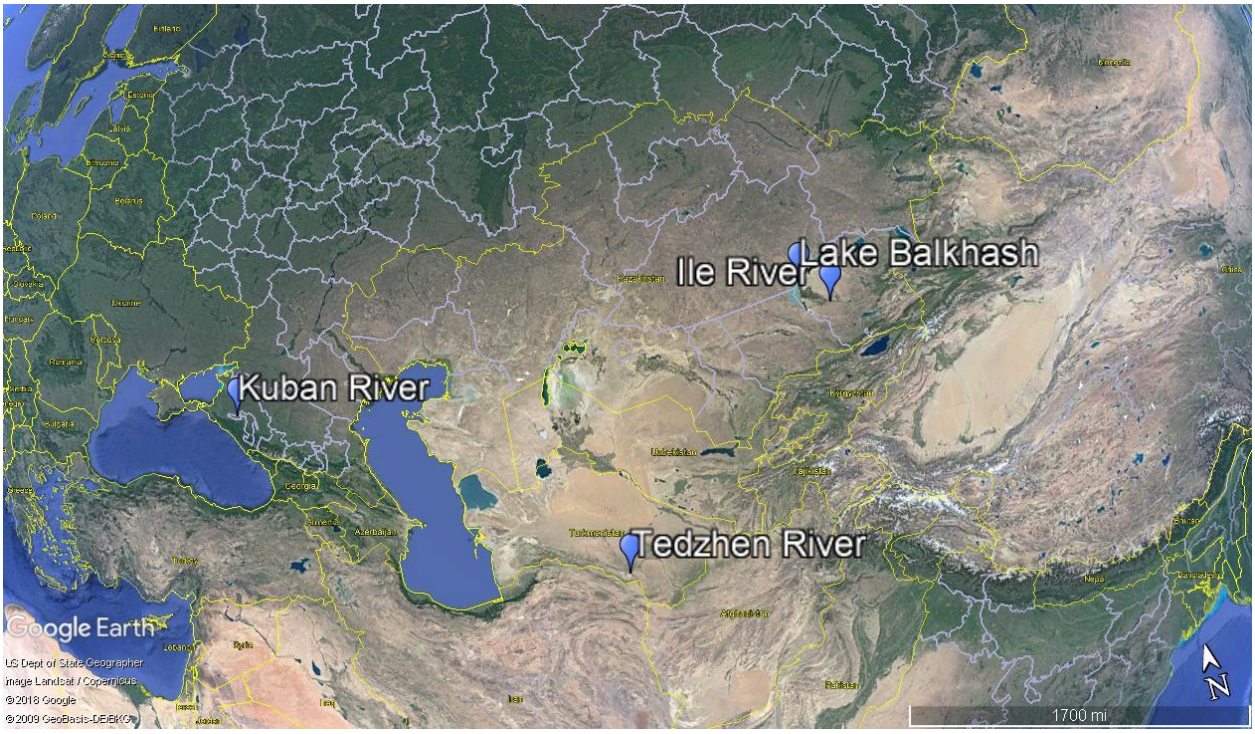

Figure 2. Known established introduced populations of *Oryzias latipes.* Locations are in Kazakhstan, Turkmenistan, and Russia. Map from Google Earth, Google Inc. (2019). Locations of known established populations given by Froese and Pauly (2019).

The established populations in Afghanistan, Iran, and Cuba were not used to select source points for the climate match as there was no additional information on the exact location provided.

6 Distribution Within the United States

Figure 3. Map of the United States showing known locations where *Oryzias latipes* has been reported. Reported from California and New York. Map from Fuller and Nico (2019). These locations were not used to select source points for the climate match as they do not represent established populations.

Figure 4. Map of Hawaii showing a known location where *Oryzias latipes* has been reported. Map from Fuller and Nico (2019). This location was not used to select source points for the climate match as it does not represent an established population.

7 Climate Matching

Summary of Climate Matching Analysis

The climate match for *Oryzias latipes* was medium to high for the majority of the contiguous United States with patches of low match along the West Coast, in the Pacific Northwest, Rocky Mountains, and interior New England. The areas of highest match could be found in southern Florida, the southern Great Lakes, and in patches throughout the Rocky Mountains. The Climate 6 score (Sanders et al. 2018; 16 climate variables; Euclidean distance) for the contiguous United States was 0.590, high (scores of 0.103 or greater are classified as high). A majority of the States had high individual Climate 6 scores. Alabama and New Hampshire had medium individual scores, and Louisiana, Maine, and Mississippi had low individual scores.

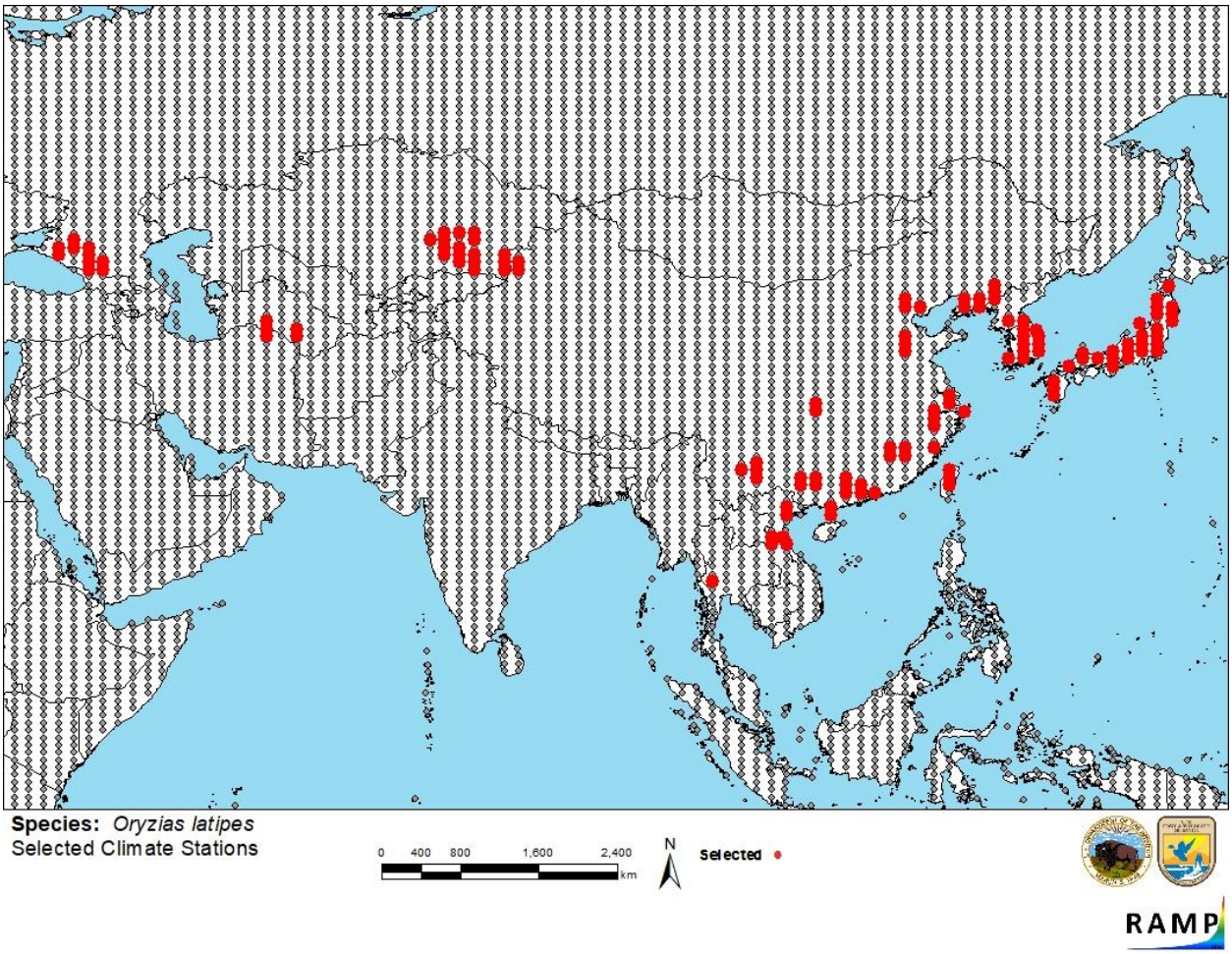

Figure 5. RAMP (Sanders et al. 2018) source map showing weather stations in eastern Europe and Asia selected as source locations (red; China, Taiwan, Japan, South Korea, North Korea, Laos, Thailand, Vietnam, Kazakhstan, Turkmenistan, Iran, Russia) and non-source locations (gray) for *Oryzias latipes* climate matching. Source locations from GBIF Secretariat (2020) and Froese and Pauly (2019). Selected source locations are within 100 km of one or more species occurrences, and do not necessarily represent the locations of occurrences themselves.

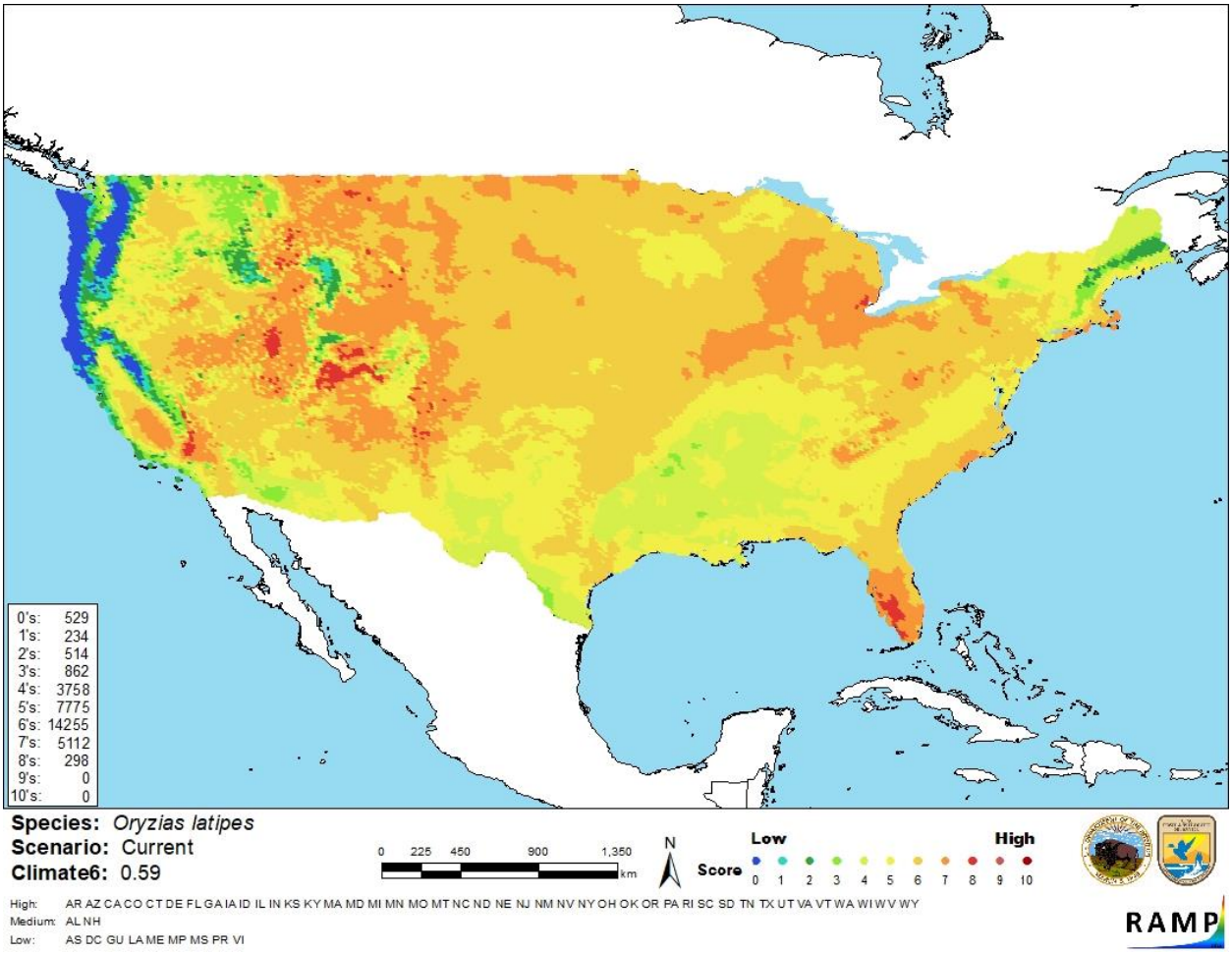

Figure 6. Map of RAMP (Sanders et al. 2018) climate matches for *Oryzias latipes* in the contiguous United States based on source locations reported by GBIF Secretariat (2020) and Froese and Pauly (2019). Counts of climate match scores are tabulated on the left. 0/Blue = Lowest match, 10/Red = Highest match.

The High, Medium, and Low Climate match Categories are based on the following table:

Climate 6: (Count of target points with climate scores 6-10)/ (Count of all target points)	Overall Climate Match Category
0.000≤X≤0.005	Low
0.005<X<0.103	Medium
≥0.103	High

8 Certainty of Assessment

The certainty of assessment for *Oryzias latipes* is low. The range is well known and there is sufficient information on the biology. Information on introductions and established populations was found for *Oryzias latipes*; however, no information was found on the impacts of introductions.

9 Risk Assessment

Summary of Risk to the Contiguous United States

Japanese Medaka, *Oryzias latipes*, is a minnow species native to Eastern Asia and is present in the aquarium industry. In the past it was used as a biocontrol for mosquitos and other vector insects. *O. latipes* may also be used in research. This species can tolerate a wide range of salinities and it is recommended to use diluted seawater in captive cultivation of the species. The history of invasiveness is Data Deficient. *Oryzias latipes* has been introduced outside of its' native range; however, no information has been found on impacts from the introductions. The overall climate match for the contiguous United States was high. The entire contiguous United States had a medium to high match with the exception of the West Coast, in the Pacific Northwest, Rocky Mountains, and interior New England. The certainty of assessment is low due to lack of information of impact of introductions. The overall risk assessment category for *Oryzias latipes* is uncertain.

Assessment Elements

- **History of Invasiveness (Sec. 4): Data Deficient**
- **Overall Climate Match Category (Sec. 7): High**
- **Certainty of Assessment (Sec. 8): Low**
- **Remarks/Important additional information:** No additional remarks
- **Overall Risk Assessment Category: Uncertain**

10 Literature Cited

Note: The following references were accessed for this ERSS. References cited within quoted text but not accessed are included below in Section 11.

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11 Literature Cited in Quoted Material

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.

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