

# Lyre Goby (*Evorthodus lyricus*)

## Ecological Risk Screening Summary

U.S. Fish and Wildlife Service, July 2017

Revised, December 2017

Web Version, 9/11/2018

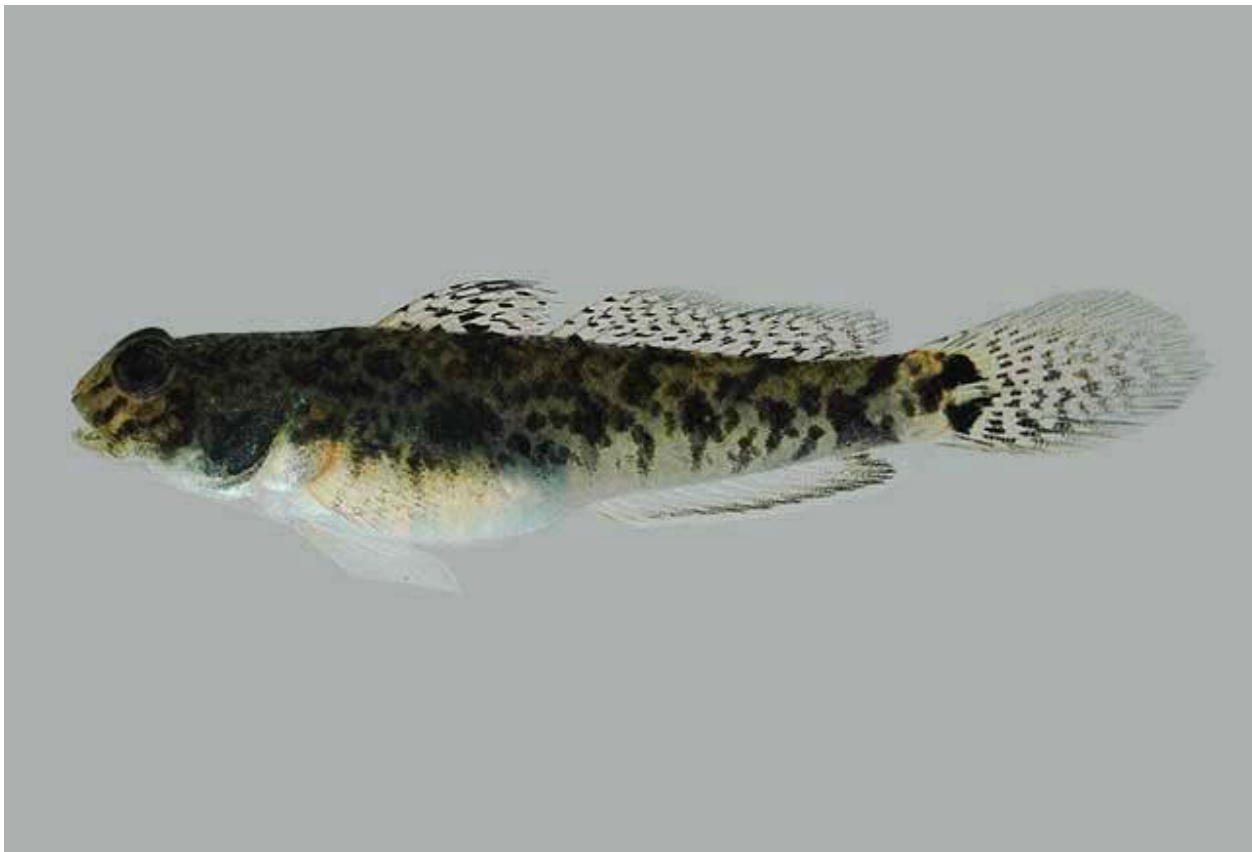


Photo: Van Tassell and Robertson, Smithsonian Tropical Research Institute. Used with permission. Available: <http://biogeodb.stri.si.edu/caribbean/en/pages/random/3050>. (December 2017).

## 1 Native Range and Status in the United States

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### Native Range

From Pezold (2015):

“*Evorthodus lyricus* is distributed in the western Atlantic from the Chesapeake Bay south along the U.S. coast, throughout the Gulf of Mexico and Caribbean Sea, and along the Central and

South American coast from Mexico to Sao Paolo, Brazil (R. Robertson pers. comm. 2014). It is absent in the Bahamas, the Cayman Islands, and the Providencia and San Andres Islands (Colombia).”

“Native: Anguilla; Antigua and Barbuda; Aruba; Barbados; Belize; Bonaire, Sint Eustatius and Saba (Saba, Sint Eustatius); Brazil; Colombia; Costa Rica; Cuba; Curaçao; Dominica; Dominican Republic; French Guiana; Grenada; Guadeloupe; Guatemala; Guyana; Haiti; Honduras; Jamaica; Martinique; Mexico; Montserrat; Nicaragua; Panama; Puerto Rico; Saint Barthélemy; Saint Kitts and Nevis; Saint Lucia; Saint Martin (French part); Saint Vincent and the Grenadines; Sint [sic] Maarten (Dutch part); Suriname; Trinidad and Tobago; United States; Venezuela, Bolivarian Republic of; Virgin Islands, British; Virgin Islands, U.S.”

## Status in the United States

From Pezold (2015):

“*Evorthodus lyricus* is distributed in the western Atlantic from the Chesapeake Bay south along the U.S. coast, throughout the Gulf of Mexico and Caribbean Sea, and along the Central and South American coast from Mexico to Sao Paolo, Brazil (R. Robertson pers. comm. 2014).”

From Froese and Pauly (2017):

“Country: USA. Occurrence: native.”

This species is not known to be in trade in the United States.

## Means of Introduction into the United States

This species is native to the United States (Froese and Pauly 2017, Pezold 2015). No introductions outside this native range have been reported.

## Remarks

According to Eschmeyer et al. (2017), synonyms for *Evorthodus lyricus* (Girard, 1858) include *Evorthodus breviceps* (Gill, 1859), *Smaragdus costalesi* (Poey, 1860), *Ctenogobius curtisi* (Fowler, 1952), *Gobius garmani* (Eigenmann and Eigenmann, 1888), *Mugilostoma gobio* (Hildebrand and Schroeder, 1928), *Gobius lyricus* (Girard, 1858), and *Gobius parvus* (Meek, 1902).

# 2 Biology and Ecology

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## Taxonomic Hierarchy and Taxonomic Standing

From ITIS (2017):

“Kingdom Animalia  
Subkingdom Bilateria  
Infrakingdom Deuterostomia  
Phylum Chordata

Subphylum Vertebrata  
Infraphylum Gnathostomata  
Superclass Actinopterygii  
Class Teleostei  
Superorder Acanthopterygii  
Order Perciformes  
Suborder Gobioidae  
Family Gobiidae  
Genus *Evorthodus* Gill, 1859  
Species *Evorthodus lyricus* (Girard, 1858)”

“Current Standing: valid”

## **Size, Weight, and Age Range**

From Froese and Pauly (2017):

“Maturity:  $L_m$  ? range ? - ? cm  
Max length : 15.0 cm TL male/unsexed; [Claro 1994]”

## **Environment**

From Froese and Pauly (2017):

“Marine; freshwater; brackish; demersal; amphidromous [McDowall 1997].”

“[...] 20°C - 30°C [Baensch and Riehl 1991; assumed to be recommended aquarium temperatures]”

From Pezold (2015):

“Lower depth limit (metres): 10”

From Murdy and Musick (2013):

“Lyre gobies inhabit fresh and brackish waters in shallow muddy estuarine environments, as well as tidal marshes and ponds, and are not common anywhere along the Atlantic coast.”

## **Climate/Range**

From Froese and Pauly (2017):

“Subtropical; [...] 40°N - 7°N”

## **Distribution Outside the United States**

### **Native**

From Pezold (2015):

“Anguilla; Antigua and Barbuda; Aruba; Barbados; Belize; Bonaire, Sint Eustatius and Saba (Saba, Sint Eustatius); Brazil; Colombia; Costa Rica; Cuba; Curaçao; Dominica; Dominican Republic; French Guiana; Grenada; Guadeloupe; Guatemala; Guyana; Haiti; Honduras; Jamaica; Martinique; Mexico; Montserrat; Nicaragua; Panama; Puerto Rico; Saint Barthélemy; Saint Kitts and Nevis; Saint Lucia; Saint Martin (French part); Saint Vincent and the Grenadines; Sint Maarten (Dutch part); Suriname; Trinidad and Tobago; [...] Venezuela, Bolivarian Republic of; Virgin Islands, British; Virgin Islands”

### **Introduced**

No introductions of this species have been reported.

## **Means of Introduction Outside the United States**

No introductions of this species have been reported.

## **Short Description**

From Froese and Pauly (2017):

“Dorsal spines (total): 6; Dorsal soft rays (total): 11; Anal spines: 0; Anal soft rays: 12. Caudal fin large and bluntly pointed with dark lyre-shaped mark on base consisting of 2 dark spots separated by pale central area. Snout very short, mouth small and inferior. Adults have first 3 or 4 dorsal fin spines elongate, reaching from third to sixth ray of second dorsal in females, to base of caudal peduncle in males. Predorsal area and top of head scaled as far forward as eye [Smith 1997].”

From Murdy and Musick (2013):

“In lyre gobies, the teeth are bicuspid in females and males smaller than, 60 mm (2 in) SL [...] The caudal fin of lyre gobies is long with a somewhat rounded margin in females, and pointed in large males. [...] Color: Lyre gobies have irregular lateral body markings, but usually with some indication of five or six vertical bars, and faint median blotches; the first dorsal fin of males has several ocelli and is marked with narrow brown lines in females and young males; the caudal-fin base has distinctive upper and lower dusky blotches, and large males have one or two ocelli on the upper part of the caudal fin.”

## **Biology**

From Debrot (2003):

“Little is known about the species [*Evorthodus lyricus*] other than its occurrence in muddy backwaters of bays and estuaries”

From Pezold (2015):

“This demersal, amphidromous species occurs mainly in muddy backwaters of bays and estuaries, often in foul waters and on muddy bottoms in tidal freshwater [Cervigón, 1994]. It spawns in small tidepools constructed on the salt marsh surface (in the growth of smooth cordgrass, *Spartina alterniflora*) and juveniles are found on meiofauna, microalgae and detritus, dominated by diatoms and detritus [Wyanski and Targett 1985].”

From Murdy and Musick (2013):

“Lyre gobies are detritus feeders.”

From Foster and Fuiman (1987):

“Lyre gobies, *Evorthodus lyricus* (Girard), were found in burrows in a shallow, mud-bottomed pool near Yabucoa Bay, southeastern Puerto Rico. After eight gobies had been collected, transported to a laboratory aquarium, and acclimated to fresh water, each fashioned a crude burrow in coarse sand substrate beneath broken clay flowerpots. Agonistic, spawning, and parental behaviors are described. Egg deposition occurred on the interior wall and roof of burrows of dominant males. The minute, pear-shaped eggs were less than 0.5 mm long. Pelagic larvae, 1.9 mm long, hatched 16 to 20 h after fertilization at 26.5°C. Adult males guarded egg masses, fanned them, and physically removed small-sized potential egg predators from the vicinity of the burrow. The larvae did not survive more than 2 days in the aquarium. [...] The lyre goby's distribution is probably related to physical factors such as prevailing coastal currents, which would affect dispersal of the pelagic larvae.”

## Human Uses

From Pezold (2015):

“Use and Trade: *Evorthodus lyricus* is not utilized.”

From Murdy and Musick (2013):

“Neither lyre gobies nor darter gobies have commercial or recreational value.”

## Diseases

No information available.

## Threat to Humans

From Froese and Pauly (2017):

“Harmless”

### 3 Impacts of Introductions

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No introductions of this species have been reported.

### 4 Global Distribution

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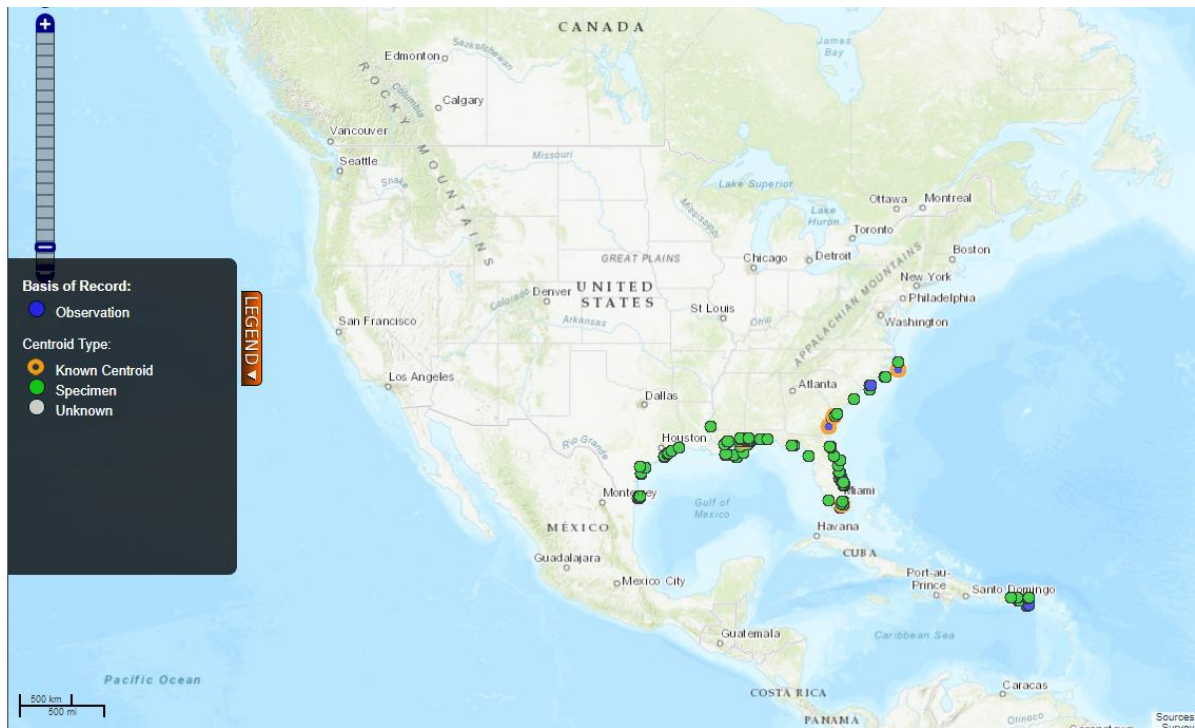


**Figure 1.** Known global distribution of *E. lyricus* reported from North, Central and South America. Map from GBIF Secretariat (2017).

Because the climate matching analysis is not valid for marine waters, no marine occurrences were used in the climate matching analysis. Freshwater and brackish water occurrences were reported in United States (including Puerto Rico), Cuba, Dominican Republic, Mexico, Belize, Honduras, Nicaragua, Costa Rica, Panama, Colombia, Venezuela, Trinidad and Tobago, Guyana, Suriname, French Guiana, and Brazil.

## 5 Distribution Within the United States

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**Figure 2.** Known distribution of *E. lyricus* in the United States. Map from BISON (2017).

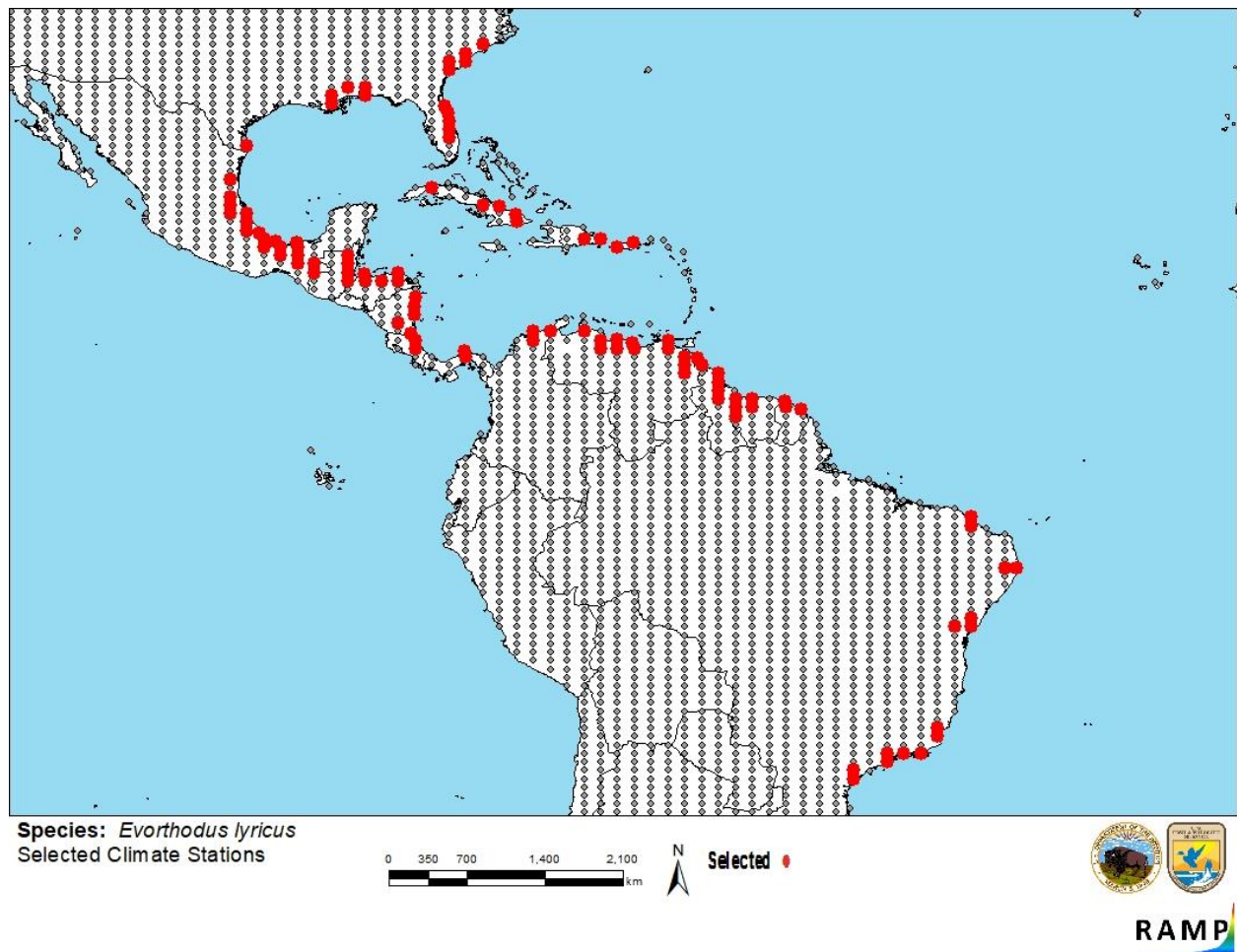
## 6 Climate Matching

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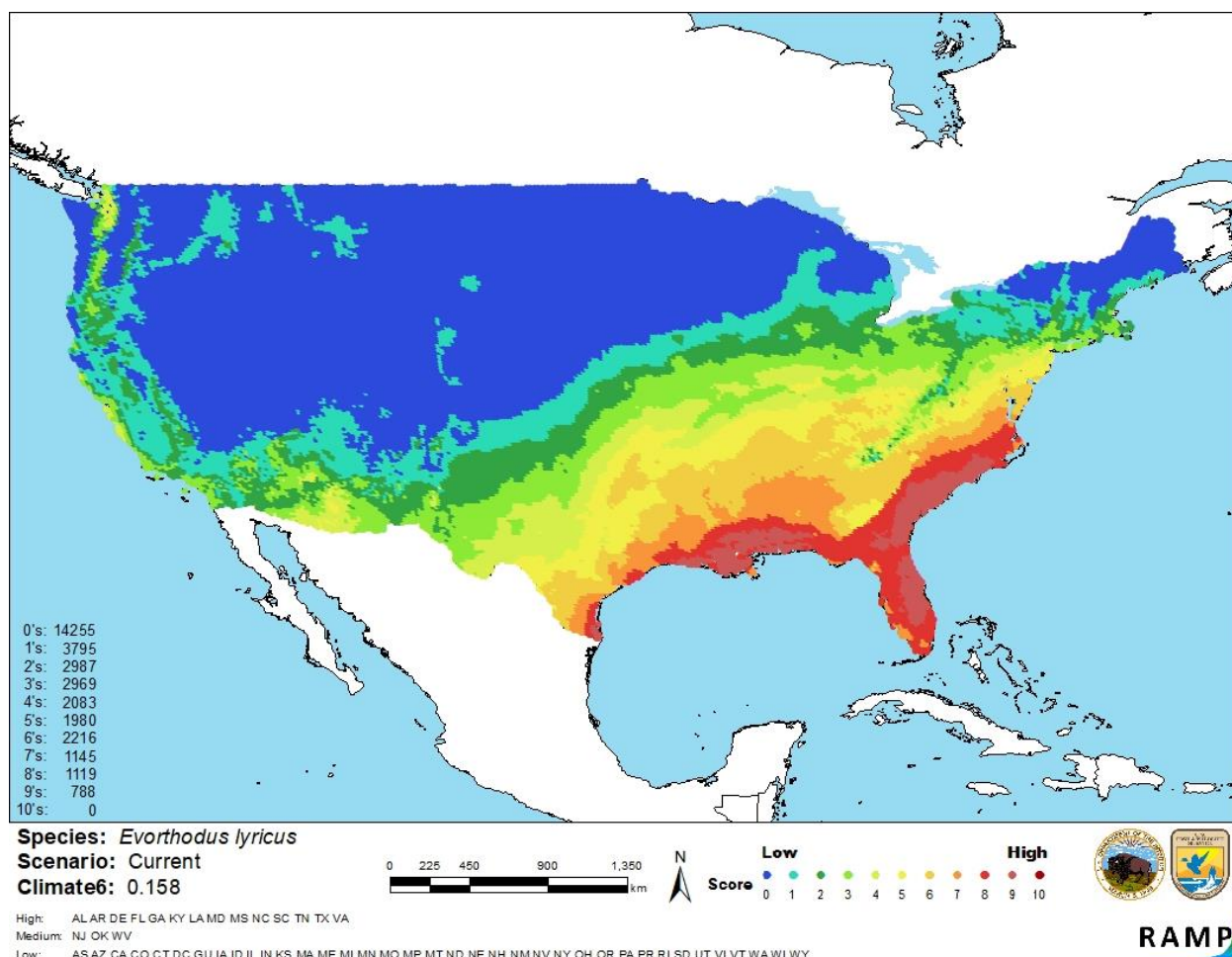
### Summary of Climate Matching Analysis

The climate match presented here refers only to where the species can survive in freshwater and brackish water environments and not in marine environments.

The Climate 6 score (Sanders et al. 2018; 16 climate variables; Euclidean distance) for the contiguous United States was 0.158, indicating a high climate match overall. Scores of 0.103 and higher are classified as high match. The climate match was high along the Atlantic and Gulf Coasts from Virginia to Texas. The Mid-Atlantic region, the inland Southeast region, most of Texas, part of Arizona, and parts of the Pacific coast in California and Washington had medium climate match. The remainder of the contiguous United States had a low climate match.



**Figure 3.** RAMP (Sanders et al. 2018) source map showing weather stations in North, Central, and South America selected as source locations (red; United States (including Puerto Rico), Cuba, Dominican Republic, Mexico, Belize, Guatemala, Honduras, Nicaragua, Costa Rica, Panama, Colombia, Venezuela, Guyana, Suriname, French Guiana, Brazil) and non-source locations (gray) for *E. lyricus* climate matching. Source locations from GBIF Secretariat (2017).



**Figure 4.** Map of RAMP (Sanders et al. 2018) climate matches for *E. lyricus* in the contiguous United States based on source locations reported by GBIF Secretariat (2017). 0= Lowest match, 10= Highest match. Counts of climate match scores are tabulated on the left.

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

| Climate 6: Proportion of<br>(Sum of Climate Scores 6-10) / (Sum of total Climate Scores) | Climate Match<br>Category |
|------------------------------------------------------------------------------------------|---------------------------|
| $0.000 \leq X \leq 0.005$                                                                | Low                       |
| $0.005 < X < 0.103$                                                                      | Medium                    |
| $\geq 0.103$                                                                             | High                      |

## 7 Certainty of Assessment

The distribution of *Evorthodus lyricus* is documented and some information is available on its biology and ecology, although the species is not well understood. The species is amphidromous, spending part of its life cycle in marine environments and part in freshwater and brackish water. However, which parts of the life cycle are spent in which environment is unclear. This knowledge gap contributes to uncertainty about the results of the climate matching analysis because the analysis is not valid for marine environments. *E. lyricus* has never been introduced

outside its native range and is not currently in trade, therefore there is no information on impacts of introductions. The certainty of this assessment is low given the lack of information about introductions available for this species.

## 8 Risk Assessment

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### Summary of Risk to the Contiguous United States

Lyre Goby (*Evorthodus lyricus*) is a fish native to the Atlantic coasts of North, Central and South America from the southeastern United States to southern Brazil. *E. lyricus* has a high climate match with the contiguous United States. The highest match is in the southeastern United States, which is part of its native range. *E. lyricus* has not been documented inland beyond backwaters of bays and estuaries, and inhabits a wide range of salinities. RAMP (Sanders et al. 2018) was not developed for use in assessing climate match for marine species so the climate match in a marine environment cannot be assessed with an ERSS. Because there are no known introductions or establishments of *E. lyricus* outside its native range, the history of invasiveness is uncertain and certainty of assessment is low. Therefore, the overall risk categorization of this species is uncertain.

### Assessment Elements

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

## 9 References

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

BISON. 2017. Biodiversity Information Serving Our Nation (BISON). U.S. Geological Survey. Available: <https://bison.usgs.gov>. (December 2017).

Debrot, A. O. 2003. A review of the freshwater fishes of Curaçao, with comments on those of Aruba and Bonaire. *Caribbean Journal of Science* 39(1):100-108.

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Foster, N. R., and L. A. Fuiman. 1987. Notes on the behavior and early life history of captive lyre gobies, *Evorthodus lyricus*. *Bulletin of Marine Science* 41(1):27-35.

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- Murdy, E. O., and J. A. Musick. 2013. Fishes of the Chesapeake Bay. Johns Hopkins University Press, Baltimore, Maryland.
- Pezold, F. 2015. *Evorthodus lyricus*. The IUCN Red List of Threatened Species 2015: e.T185999A1801806. Available: <http://dx.doi.org/10.2305/IUCN.UK.2015-2.RLTS.T185999A1801806.en>. (July 2017).
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## 10 References Quoted But Not Accessed

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**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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- McDowall, R. M. 1997. The evolution of diadromy in fishes (revisited) and its place in phylogenetic analysis. Reviews in Fish Biology and Fisheries 7(4):443-462.
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Wyanski, D. M., and T. E. Targett. 1985. Juvenile development of the Lyre Goby, *Evorthodus lyricus* (Girard) (Pisces: Gobiidae), with a discussion of early life history. Bulletin of Marine Science 36:115-123.