

# Bluefin Killifish (*Lucania goodei*)

## Ecological Risk Screening Summary

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## 1 Native Range and Status in the United States

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### Native Range

From Froese and Pauly (2018):

“North America: throughout Florida, except in panhandle only as far west as Choctawhatchee River drainage; sporadically along Atlantic Coast as far north as central South Carolina (where possibly introduced); southeastern Alabama in Chipola River drainage.”

From NatureServe (2013):

“Mostly confined to peninsular Florida. West in Florida to lower Choctawhatchee River drainage, north in coastal Georgia to Ogeechee River drainage. Also recorded from central South Carolina coast (presumably introduced). Record from Chipola River drainage, southeastern Alabama.”

The native range of *Lucania goodei* is Florida and southern Alabama and Georgia. All other populations are non-indigenous.

## **Status in the United States**

The native range of *Lucania goodei* is within the United States, see Native Range above.

From Fofonoff et al. (2018):

“Introduced populations have been reported from fresh and brackish waters in North Carolina, South Carolina, Texas, and California.”

“Invasion History on the West Coast:

Specimens of *Lucania goodei* were caught in 1980 in a lily pond at north entrance to Los Angeles County Museum. This population only survived for a few months (Swift et al. 1993; USGS Nonindigenous Aquatic Species Program 2018). In 2000, seven individuals of *L. goodei* were caught in the San Dieguito River lagoon, in San Diego County, California, at ~16 PSU [practical salinity unit, equivalent to ppt] (Huang et al. 2003). The fish persisted through 2001 when the salinity increased to 34-35 PSU and where [*sic*] captured in 2004 (Steele et al. 2007), indicating an established population, however, no specimens have been captured since then (David Huang, personal communication, 8/8/2018). In October 2017, 15 specimens of *L. goodei* were caught in Snodgrass Slough, on the Upper Mokelumne River, on the inland edge of the Sacramento-San Joaquin Delta [CA]. The specimens were genetically identified (USGS Nonindigenous Aquatic Species Program 2018).”

“Invasion History on the East Coast:

Populations of Bluefin Killifish (*L. goodei*) established in the Cooper River, South Carolina, upstream of Charleston starting in 1973 (Loyacano 1975; Christie and Curtis 1975), and in Cape Fear River tributaries near Wilmington, North Carolina in 1977 (Lindquist et al. 1977; [Menhinick] 1991). On the Gulf Coast, these fish were collected in an artificial wetland at a business near Victoria, Texas in 1998. This population has apparently spread, because fish collected in canals near Green Lake, near the mouth of the Guadalupe River, flowing into San Antonio Bay in 2009. In 2011, fish were found in Buffalo Bayou, in the suburbs of Houston (USGS Nonindigenous Aquatic Species Program 2018)”

From Fuller (2018):

“Established [as non-indigenous] in California, North Carolina, and South Carolina.”

According to Nunziata (2010), *Lucania goodei* is in trade as an aquarium fish in the United States.

## Means of Introductions in the United States

From Fuller (2018):

“Unknown. Based on meristics, the South Carolina population came from Florida (Christie and Curtis 1983). The Texas population was most likely introduced with shipments of aquatic nursery plants from Florida.”

From Fofonoff et al. (2018):

“These scattered introductions of the Bluefin Killifish are likely due to releases of aquarium fish, or of eggs transported in aquatic plants shipped from Florida.”

## Remarks

No additional remarks.

## 2 Biology and Ecology

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### Taxonomic Hierarchy and Taxonomic Standing

According to Fricke et al. (2018), *Lucania goodei* Jordan 1880 is the valid name for this species; it is also the original name.

From ITIS (2018):

“Kingdom Animalia  
Subkingdom Bilateria  
Infrakingdom Deuterostomia  
Phylum Chordata  
Subphylum Vertebrata  
Infraphylum Gnathostomata  
Subclass Actinopterygii  
Class Teleostei  
Superorder Acanthopterygii  
Order Cyprinodontiformes  
Suborder Cyprinodontoidei  
Family Fundulidae  
Genus *Lucania*  
Species *Lucania goodei* Jordan, 1880”

### Size, Weight, and Age Range

From Fofonoff et al. (2018):

“This fish is small, usually 29 mm, but can reach 50 mm long.”

“The fish mature by their second year, and only live for about 2 years.”

## **Environment**

From Froese and Pauly (2018):

“Freshwater; benthopelagic; pH range: 6.5 - 6.8; dH range: ? - 15; non-migratory. [...]; 12°C - 22°C [assumed to be recommended aquarium temperature] [Riehl and Baensch 1991]; [...].”

From Nunziata (2010):

“In these springs, the *L. goodei* are often found at a depth of 10 feet or more, perhaps giving rise to the reports that they are found in deep water.”

“Many collections of *L. goodei* have been made by members of the Central Florida Region during warm summer months where standing water easily gets into the high 80s°F. Long time hobbyist Dr. Harry Specht reports that he collected them in shallow ditches in direct sunlight when the water was so hot it was uncomfortable for him to stand still and fish (Specht, 2000 [Sarasota, Florida; personal correspondence])! Low temperatures are equally well tolerated. This author has gotten viable eggs from *L. goodei* in water at 62°F, and has collected this species in January where the water temperatures were well below 60°F. Some members report no losses when *L. goodei* is maintained in tanks and tubs outdoors where temperatures as low as the upper 40s°F occur in the winter (Specht, 2000 [pers. cor.]). There are no reports however of breeding occurring at these extremes.”

From NatureServe (2018):

“[...] may occur in waters of moderate salinities (up to 10.3 ppt).”

From Fofonoff et al. (2018):

“It is considered a predominantly freshwater fish, although it has been caught at salinities up to 10 PSU [practical salinity unit, equivalent to ppt] in Florida, and some individuals can survive and develop at 30 PSU (Fuller 2008; Fuller and Noa 2008).”

“The range of Bluefin Killifish (*Lucania goodei*) is limited at the northern boundary by low winter temperatures, but seem to prefer shaded, vegetated, cooler sites in the southern part of the range.”

## **Climate/Range**

From Froese and Pauly (2018):

“Subtropical; [...]; 34°N - 25°N”

From Fofonoff et al. (2018):

“Warm Temperate-Subtropical”

## **Distribution Outside the United States**

Native

Native Range of *Lucania goodei* is entirely within the United States, see Native Range in Section 1.

Introduced

No records of introduction of *Lucania goodei* outside of the United States were found.

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

No records of introduction of *Lucania goodei* outside of the United States were found.

## **Short Description**

From Fofonoff et al. (2018):

“Killifish of the family Fundulidae have a somewhat streamlined body, with soft-rayed dorsal and anal fins, a rounded or squareish tail, abdominal pelvic fins, and moderate-sized scales, and a small upturned mouth. The origin of the dorsal fin is anterior to that of the anal fin. This fish has 9-12 dorsal rays and 29 to 32 lateral line scales. The body is relatively slender and laterally compressed. [...] The back of the fish is dusky to olive brown and the sides are white, with a wide, zigzag black stripe from the tip of the nose to the base of the tail. The dorsal and anal fins of large males are bright blue, with orange at the bases, and black outer margins. Males have an orange tinge at the base of the tail. The fins of the females are clear (Page and Burr 1991; Rohde et al. 1994; Froese and Pauly 2018).”

## **Biology**

From Froese and Pauly (2018):

“[...]; non-migratory.”

From Fofonoff et al. (2018):

“The Bluefin Killifish (*Lucania goodei*) is a small, primarily freshwater fish, which also has some ability to survive in brackish and marine waters (Fuller 2009; Huang et al. 2011; Froese and Pauly 2018). The sexes are dimorphic, with males tending to be slightly larger, with bright-colored fins. [...] Bluefin Killifish spawn year-round in the southern part of the range, but in the Carolinas they breed in summer (Rohde et al. 1994). Females carry about 200 eggs (Froese and Pauly 2018). Males establish territories in densely vegetated areas, and display by flicking their fins to display and hide the colors. Eggs are probably deposited singly. (Rohde et al. 1994).”

“Bluefin Killifish eggs hatched with ~80% success at 0 and 10 PSU [practical salinity unit, equivalent to ppt], but with ~25% and 10% success at 20-30 PSU. Most of the larvae hatched at 10-20% survived at least to the onset of feeding (Fuller 2008). Usually, Bluefin Killifish prefer thickly vegetated habitats, where they usually swim well below the surface. Their food consists of invertebrates, algae, bits of aquatic plants, such as *Vallisneria* sp. (Froese and Pauly 2018; Rohde et al. 1994).”

From NatureServe (2018):

“Spawns late January to mid-September throughout most of range, with reproductive peak from late March to mid-summer; some populations appear to reproduce throughout year.”

“Eggs are laid in dense vegetation.”

From NatureServe (2013):

“This species is represented by a large number of subpopulations and locations. Total adult population size is unknown but relatively large. Trend over the past 10 years or three generations is uncertain but likely relatively stable or slowly declining.”

From Nunziata (2010):

“Although fry are sexable at three months, *Lucania goodei* will not produce viable eggs until it is eight to 10 months of age.”

## **Human Uses**

From Fofonoff et al. (2018):

“Bluefin Killifish are attractive freshwater aquarium fish, widely sold and kept.”

## **Diseases**

**No records of OIE-reportable diseases were found for *Lucania goodei*.**

Poelen et al. (2014) list *Gyrodactylus trematoclitrus* and *Eustrongylides ignotus* as parasites of *L. goodei*.

## **Threat to Humans**

From Froese and Pauly (2018):

“Harmless.”

### 3 Impacts of Introductions

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From Fuller (2018):

“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.”

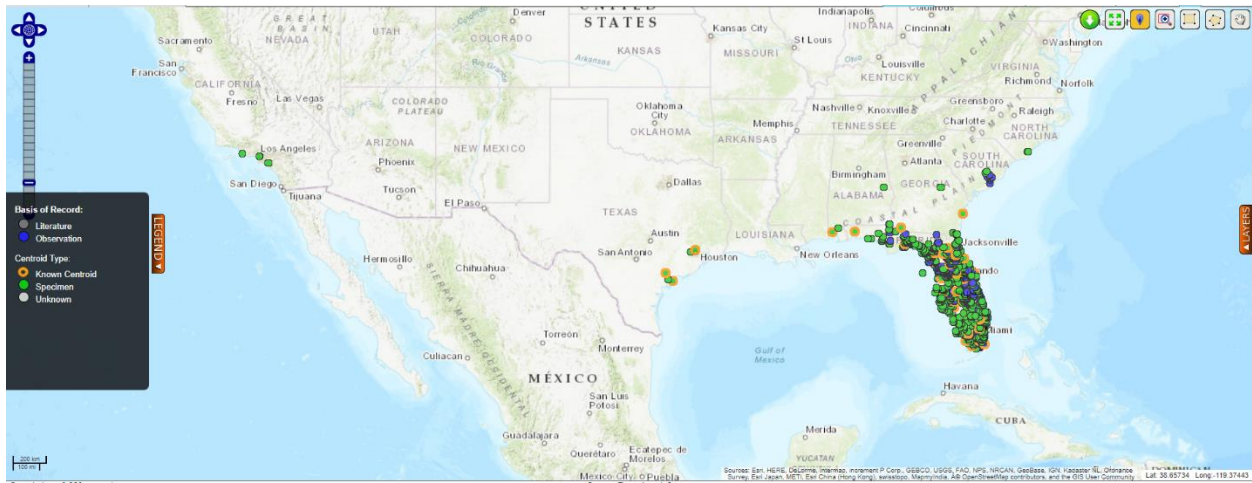
### 4 Global Distribution

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**Figure 1.** Known global distribution of *Lucania goodei*. Locations are in the United States. Map from GBIF Secretariat (2018).

## 5 Distribution Within the United States



**Figure 2.** Known distribution of *Lucania goodei* in the United States. Map from BISON (2018).

The northernmost locations in Alabama and Georgia (Figure 2) were not used as a source points for the climate match. The record information for these observations indicate that the specimens were part of a captive experiment at Auburn University (GBIF Secretariat 2018) and they do not represent established wild populations.



**Figure 3.** Additional known distribution of *Lucania goodei* in the United States. Orange shading indicates the native range of the species. Map from Fuller (2018).

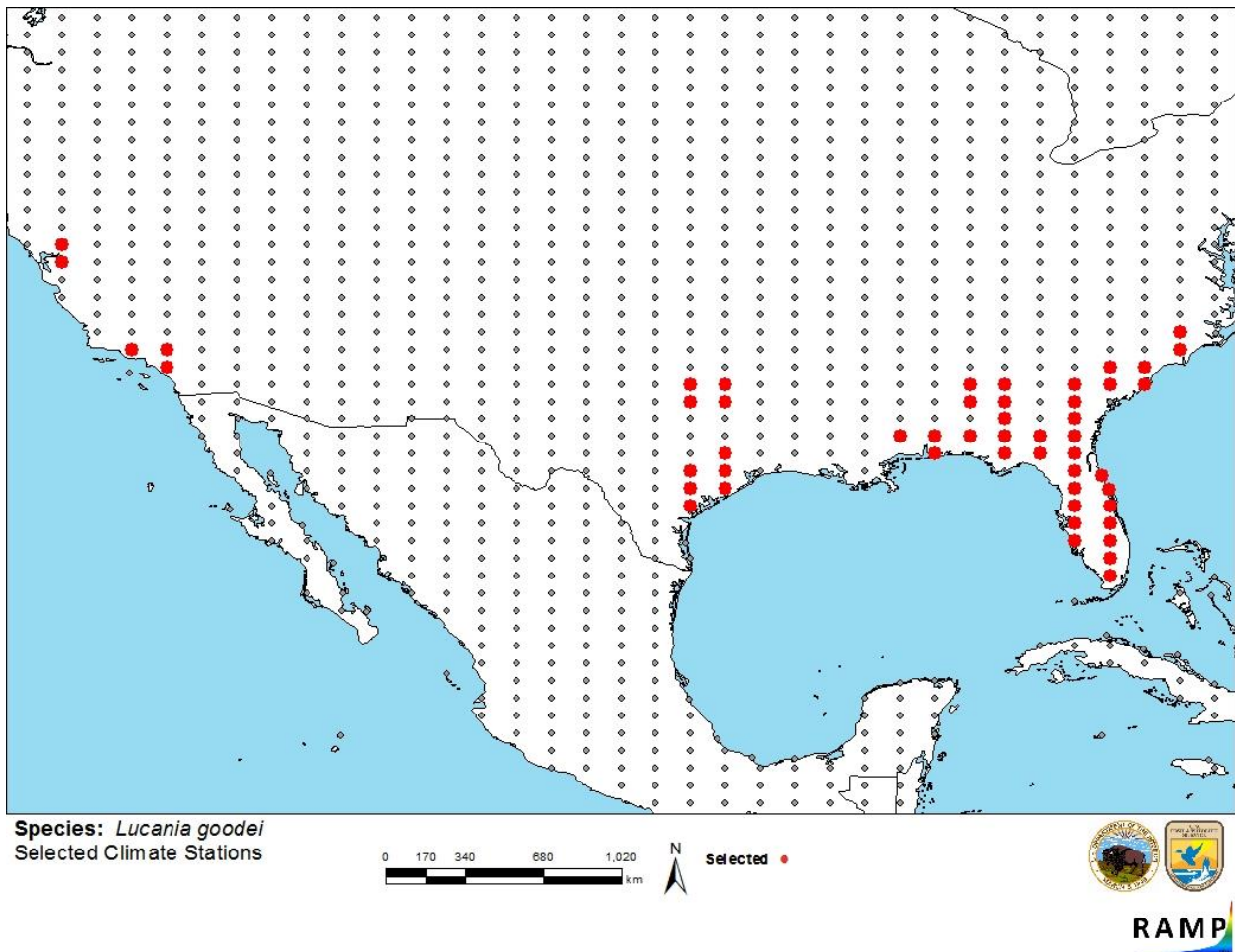
According to Fuller (2018), all points in Figure 3 represent established populations and were used as source points for the climate match.



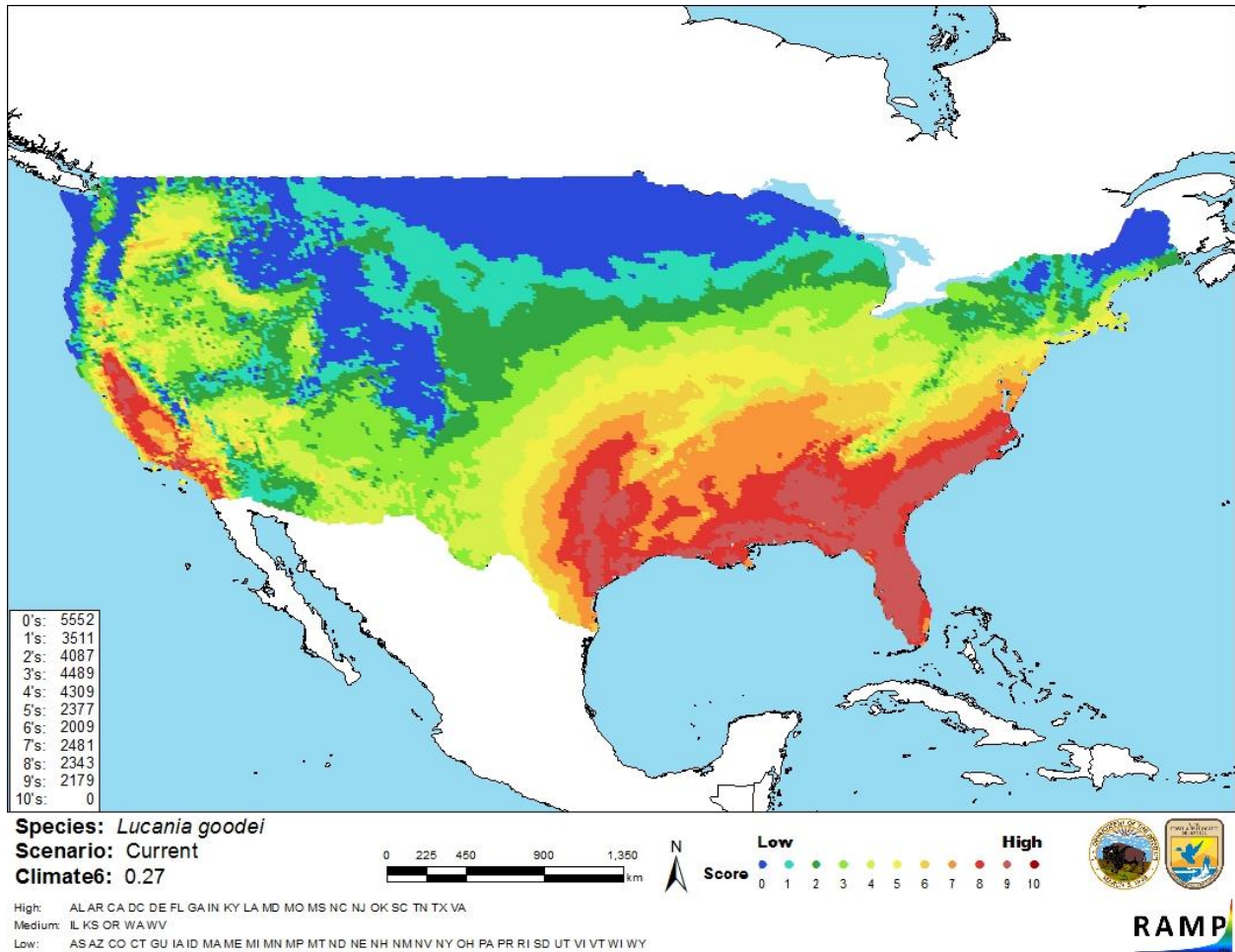
## 6 Climate Matching

### Summary of Climate Matching Analysis

The climate match for *Lucania goodei* was high in the Southeast and the southern Pacific Coast. The area of high match in the Southeast stretched from New Jersey to eastern Texas, which includes the species native range and areas with established populations. Northern New England, New York, the upper Midwest, much of the Northern Great Plains, Colorado and the Pacific Northwest had a low climate match. Everywhere else had a medium climate match. The Climate 6 score (Sanders et al. 2018; 16 climate variables; Euclidean distance) for the contiguous United States was 0.270, high. Scores above 0.103 are classified as a high match. The following States had high individual climate scores: Alabama, Arkansas, California, Delaware, Florida, Georgia, Indiana, Kentucky, Louisiana, Maryland, Missouri, Mississippi, North Carolina, New Jersey, Oklahoma, South Carolina, Tennessee, Texas, and Virginia.



**Figure 4.** RAMP (Sanders et al. 2018) source map showing weather stations in North America selected as source locations (red; California, Texas, Mississippi, Alabama, Georgia, Florida, South Carolina, North Carolina) and non-source locations (gray) for *Lucania goodei* climate matching. Source locations from BISON (2018), Fuller (2018), and GBIF Secretariat (2018).



**Figure 5.** RAMP (Sanders et al. 2018) climate matches for *Lucania goodei* in the contiguous United States based on source locations reported by BISON (2018), Fuller (2018), and GBIF Secretariat (2018). 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
$0.000 \leq X \leq 0.005$	Low
$0.005 < X < 0.103$	Medium
$\geq 0.103$	High

## 7 Certainty of Assessment

The certainty of assessment for *Lucania goodei* is low. Information on the biology of this species is readily available. There are records of established populations outside the native range. However, no information on impacts of introduction was available.

## 8 Risk Assessment

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### Summary of Risk to the Contiguous United States

The Bluefin Killifish (*Lucania goodei*) is a small species of topminnow that is native to Florida and southern Alabama and Georgia. It is widely sold in the aquarium industry. *L. goodei* is in trade in the United States, but no information on the duration or volume of trade was available. The history of invasiveness for *Lucania goodei* is none documented. Introductions have resulted in established populations. However, there is no information on impacts of introduction available. Introductions are believed to be from aquarium releases and eggs transported with shipments of nursery plants. The climate match for the contiguous United States was high. Areas of high match in the Southeast extended from New Jersey to Texas; the southern Pacific Coast also had a high match. The certainty of assessment is low due to lack of information about invasiveness. Overall risk assessment for *Lucania goodei* is uncertain.

### Assessment Elements

- **History of Invasiveness (Sec. 3): None Documented**
- **Climate Match (Sec. 6): High**
- **Certainty of Assessment (Sec. 7): Low**
- **Remarks/Important additional information: No additional information**
- **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.**

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## 10 References Quoted But Not Accessed

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