Threespot Gourami (*Trichopodus trichopterus*)
Ecological Risk Screening Summary

U.S. Fish & Wildlife Service, February 2011
Revised, November 2018
Web Version, 9/10/2019

Photo: Gourami Watcher/Wikimedia Commons. Licensed under Creative Commons BY-SA 3.0 Unported. Available: https://commons.wikimedia.org/wiki/File:Three_Spot_Gourami_female.jpg. (September 10, 2019).

1 Native Range and Status in the United States

Native Range

From Froese and Pauly (2018a):

"Asia: Mekong basin in Laos, Yunnan, Thailand, Cambodia and Viet Nam; Southeast Asia [including Myanmar] [Kottelat 1998]."

"[In Cambodia:] Occurs in the Mekong basin [Rainboth 1996; Kottelat 1998]. Known from Stung Sen, Tuk Sap, Stung Chang, Kompong Kléang and Beng Kebal Damrey [Kottelat 1985] and Lake Tonle Sap near Siem Reap [Motomura et al. 2002]. Much more common in small streams and canals than in the Mekong River [Sokheng et al. 1999]."

"[In China:] Occurs in the Mekong (=Lancang Jiang) in Yunnan [Kottelat 1998]."

"[In Indonesia:] Known from Sumatra, Java and Borneo [Kottelat 1985]."

"[In Laos:] Known from the Mekong basin in the middle Xe Bangfai river [*sic*] [Kottelat 1998] and in Ban Hang Khone at Don Khone, 3 km below the fall line of the great waterfalls at Lee Pee [Roberts 1993]."

"[In Malaysia:] Recorded from the lower Segama [Martin-Smith and Tan 1998], Pulau Tioman [Ng et al. 1999] and Rajang Basin in Sarawak, Borneo [Parenti and Lim 2005] and Gelami and Tinggi Rivers, Pahang River system [Miyazaki et al. 2013]."

"[In Thailand:] Found in Mekong, Chao Phraya, Maeklong, Salween, Peninsular and Southeast Thailand river systems [Vidthayanon et al. 1997]. In Chiang Khong and Nong Khai Provinces, it is uncommon in the Mekong River, but common in small streams and canals [Sokheng et al. 1999]. At Mukdahan, it migrates from the Mekong River into its tributaries [Sokheng et al. 1999]."

"[In Vietnam:] Found in the Mekong basin [Khoa and Huong 1993]. Also observed in January 2000 in Cua Lo, east of Vinh in northern Vietnam [Kottelat 2001b]."

Status in the United States

From Froese and Pauly (2018a):

"A popular aquarium fish, found in 75% of pet shops near Lakes Erie and Ontario [Rixon et al. 2005]."

From CABI (2018):

"It was collected in Palm Beach and Dade Counties in Florida, USA, in the 1970s, likely as the result of release or escape from fish farms (Courtenay et al., 1974; Courtenay and Hensley, 1979). These introductions have been considered unsuccessful (Courtenay et al., 1984; Rixon et al., 2005). […] In 2007, a population, now abundant, was detected in Lajas Irrigation Canal, Puerto Rico, probably resultant of an aquarium release (Nico and Fuller, 2014)."

Means of Introductions in the United States

From Froese and Pauly (2018a):

"Accidentally released from aquaria […]"

From CABI (2018):

"Researchers have speculated that the release of unwanted ornamental fish is the most likely explanation for the presence of many nonindigenous populations of *T. trichopterus* (Lintermans, 2004; Nico and Fuller, 2014)."

Remarks
Information searches were conducted using the valid name *Trichopodus trichopterus* and the frequently used synonym *Trichogaster trichopterus* (Fricke et al. 2019).

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing
From Fricke et al. (2019):

"**Current status:** Valid as *Trichopodus trichopterus* (Pallas 1770)."

From Froese and Pauly (2018b):

"Animalia (Kingdom) > Chordata (Phylum) > Vertebrata (Subphylum) > Gnathostomata (Superclass) > […] Actinopterygii (Class) > Perciformes (Order) > Anabantoidei (Suborder) > Osphronemidae (Family) > Luciocephalinae (Subfamily) >*Trichopodus* (Genus) > *Trichopodus trichopterus* (Species)"

Size, Weight, and Age Range
From Froese and Pauly (2018a):

"Max length : 15.0 cm SL male/unsexed; [Baird et al. 1999]; common length : 10.0 cm SL male/unsexed; [Vidthayanon 2002]"

Environment
From Froese and Pauly (2018a):

"Freshwater; benthopelagic; pH range: 6.0 - 8.0; dH range: 5 - 19; potamodromous [Riede 2004]. […]; 22°C - 28°C [assumed to be recommended aquarium temperature] [Riehl and Baensch 1991]; […]"

From CABI (2018):

"*T. trichopterus* is found in a wide variety of lentic and slow-flowing lotic aquatic environments across its natural range. The species is generally absent from fast flowing streams and rivers. […] It occupies peaty and black waters (i.e. highly acidic waters), polluted anthropogenically-modified environments, and it can temporarily occupy brackish waters (Pinter, 1986)."

"*T. trichopterus* is the hardiest species of the genus (Pinter, 1986), being able to tolerate wide ranges of water hardness, pH, temperature, salinity and dissolved oxygen conditions (TropWater, 2014). The species tolerates lower [water] temperatures than others in the genus (Pinter, 1986), although there are conflicting reports of its minimum temperature being 18, 22 or 23°C (Axelrod et al., 1967; Degani 1989; Froese and Pauly, 2014). Anecdotal reports from aquarists/ornamental industry suggest the species can cope in temperatures as low as 18°C (Premier Pet, 2018)."

Climate/Range

From Froese and Pauly (2018a):

"Tropical; […]; 26°N - 10°N, 99°E - 108°E"

Distribution Outside the United States

Native

From Froese and Pauly (2018a):

"Asia: Mekong basin in Laos, Yunnan, Thailand, Cambodia and Viet Nam; Southeast Asia [including Myanmar] [Kottelat 1998]."

"[In Cambodia:] Occurs in the Mekong basin [Rainboth 1996; Kottelat 1998]. Known from Stung Sen, Tuk Sap, Stung Chang, Kompong Kléang and Beng Kebal Damrey [Kottelat 1985] and Lake Tonle Sap near Siem Reap [Motomura et al. 2002]. Much more common in small streams and canals than in the Mekong River [Sokheng et al. 1999]."

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"[In Malaysia:] Recorded from the lower Segama [Martin-Smith and Tan 1998], Pulau Tioman [Ng et al. 1999] and Rajang Basin in Sarawak, Borneo [Parenti and Lim 2005] and Gelami and Tinggi Rivers, Pahang River system [Miyazaki et al. 2013]."

"[In Thailand:] Found in Mekong, Chao Phraya, Maeklong, Salween, Peninsular and Southeast Thailand river systems [Vidthayanon et al. 1997]. In Chiang Khong and Nong Khai Provinces, it is uncommon in the Mekong River, but common in small streams and canals [Sokheng et al. 1999]. At Mukdahan, it migrates from the Mekong River into its tributaries [Sokheng et al. 1999]."

"[In Vietnam:] Found in the Mekong basin [Khoa and Huong 1993]. Also observed in January 2000 in Cua Lo, east of Vinh in northern Vietnam [Kottelat 2001b]."

Introduced

Froese and Pauly (2018a) list *Trichopodus trichopterus* as introduced to Namibia, Réunion, Seychelles, Sri Lanka, India, Indonesia, Philippines, Taiwan, Dominican Republic, Papua New Guinea, and Colombia.

From Froese and Pauly (2018a):

"[In Indonesia:] Introduced into Bali [Kottelat et al. 1993] and Lake Poso [Kottelat 1990]."

"[In Philippines:] Specimens were collected from Lagu Lagu creek, Leyte in 1993 [Kottelat 1993]. Known from Lake Mainit, Mindanao [Pauly et al. 1990; Mercene 1997] and Lake Taal [BFAR 1996; Mercene 1997]. Recorded from Candaba Swamp and Pampanga River [Paz-Alberto et al. 2009]. […] Collected from CLSU fish pond [Central Luzon State University 1996] and recorded from Pantabangan Dam, (Nueva Ecija) [Paz-Alberto et al. 2009]."

"[In Taiwan:] Recorded from Tsengwen River [Kuo and Shao 1999]. Species recorded in the wild, also available in pet stores in the country [Liang et al. 2006]."

"[In Dominican Republic:] During hurricane 'David', the three-spot gouramis escaped, presumably from a tropical fish farm or a private aquarist, into the polluted waters of the Rio Ozama where they are now abundant."

"[In Papua New Guinea:] Common in a few streams near Port Moresby."

According to FAO (2018), *Trichopodus trichopterus* (listed as *Trichogaster trichopterus*) is established through natural reproduction in Papua New Guinea, Philippines, Colombia, Namibia, and Dominican Republic. It is not established in Sri Lanka.

From CABI (2018):

"*T. trichopterus* has been introduced into at least 17 countries. […] Similarly, the species was noted east of Cave Springs, Alberta, Canada in the 1970s, but has been absent since 1981 (Crossman, 1984). […] *T. trichopterus* is established in the Magdalena and Orinoco watersheds in Colombia (Welcomme, 1988) and in the Gloria Reservoir and Boa Vista stream, Minas Gerais, Brazil (de Magalhaes et al., 2002). In the Dominican Republic, *T. trichopterus* became established in the Rio Ozama immediately after hurricane 'David' in c. 1979 (Lever, 1996; Froese and Pauly, 2014). In 2009, Geheber et al. (2010) collected *T. trichopterus* from a small pond near the northern coast of Jamaica. […] The species has also been introduced to areas of China outside its natural range (Ma et al., 2003; Froese and Pauly, 2014) [*sic*], although little information is available about these introductions. In Australia, *T. trichopterus* (blue Sumatran morph) was first reported in 1998 from a sugar cane irrigation channel, and subsequently from freshwater lagoons associated with the Sheep Station creek, lower Burdekin region, northern Queensland. In 2007, the species was reported from the Barattas system, adjacent to Sheep Station creek, and was considered to have established multiple populations in the lower Burdekin region (Webb, 2007). The species has been collected from Aplin weir, Ross River, Townsville,

and is also known from artificial reservoirs on Saibai Island in the Torres Strait (Webb, 2007; TropWater, 2014)."

From Rodrigues-Filho et al. (2018):

"The present study constitutes the second report of *T. trichopterus* from the Mid-Northeastern Caatinga fish ecoregion, and first report of a species of the genus *Trichopodus* in the state of Ceará (Northeastern Brazil)."

From Knight (2010):

"*Trichogaster trichopterus*, a species of Southeast Asian gourami, commonly called the Three-spot Gourami has naturalized around Chennai (Daniels & Rajagopal 2004; Daniels 2006) and around Vembanad Lake in Kerala [India] (Krishnakumar et al. 2009)."

From Mohammed (2014):

"Aquatic invasive alien species (IAS) have been documented in both Trinidad and Tobago but generally are regarded as established or naturalised exotics, as their potential negative impacts are not appreciated fully. These exotics include a wide range of taxa such as […] and the three-spotted gourami, *Trichogaster trichopterus* (Mohammed et al. 2010[a]), among others."

Ishikawa and Tachihara (2014) list *Trichopodus trichopterus* as introduced to Okinawa-jima Island, Japan between 1981 and 1990. They list its status in the wild as uncertain.

Means of Introduction Outside the United States

From Froese and Pauly (2018a):

"During hurricane 'David', the three-spot gouramis escaped, presumably from a tropical fish farm or a private aquarist, […]"

Short Description

From Froese and Pauly (2018a):

"Dorsal spines (total): 6 - 8; Dorsal soft rays (total): 7-10; Anal spines: 9-12; Anal soft rays: 30 - 38. Color in life brown; shoulders with irregular dark marks, yellowish on opercles and thorax; median fins and pectorals brown, ventrals yellowish. Mouth very small, very oblique, upper jaw vertical and somewhat protractile, lower jaw prominent. Scales of moderate size, irregularly arranged. Lateral line curved, irregular. Caudal fin slightly emarginate or truncate [Taki 1974]. With 8-9 dorsal-fin branched rays; 33-38 branched anal-fin rays; black spot in middle of side and at caudal-fin base [Rainboth 1996]. Body with numerous narrow irregular oblique bars [Kottelat 2001a]."

From CABI (2018):

“It has an elongate body, moderately compressed laterally. […] There are 40-52 scales in lateral series. […] The first ray of the paired ventral pelvic fins forms a pair of long thin sensory filaments and the remainder are vestigial.”

“Several ornamental variants have been produced through selective breeding. The “blue” or “three spot” variety is similar to the wild-type fish, with a relatively uniform darker blue background and the characteristic dark spots. This variety has been introduced to Queensland, Australia. The "cosby" or “opaline” form exhibits a distinct dark blue marbled/shading pattern on the dorsal flank region, which obscures the dark spots on the flank and caudal peduncle. The “gold” form has a golden yellow background colour, usually with a distinct yellow marbling pattern. The eyes are either black or reddish-brown. The “silver” form has a silver background, usually without a marbled pattern nor the distinctive spots (Pinter, 1986; Frankel, 1992; Rainboth, 1996; Cole et al., 1999; Kottelat, 2001a, b; Froese and Pauly, 2014; TropWater, 2014).”

“Sexing in adults and juveniles can usually be determined by the dorsal fin; females have a shorter and rounder dorsal fin, while males exhibit a larger and more pointed flowing dorsal fin, often capable of reaching the caudal fin when relaxed. In adult fish, males tend to be larger, yet slimmer, while females exhibit a rounder stomach region.”

Biology

From Froese and Pauly (2018a):

“Lives in lowland wetlands [Vidthayanon 2002]. Found in marshes, swamps and canals [Kottelat 2001a]. Inhabits shallow sluggish or standing-water with a lot of aquatic vegetation. Occurs in seasonally flooded forests throughout the middle and lower Mekong [Rainboth 1996]. Undertakes lateral migrations from the Mekong mainstream, or other permanent water bodies, to flooded areas during the flood season and returns to the permanent water bodies at the onset of the dry season [Sokheng et al. 1999]. Feeds on zooplankton, crustaceans and insect larvae.”

“Builds bubble nest, usually at the surface. Male usually gathers the eggs, places them in the nest and guards them until they reach free-swimming stage [Pethiyagoda 1991]. Male drives the female away [Riehl and Baensch 1991].”

From CABI (2018):

“The modified pelvic fin filaments have a sensory function, contain tactile and chemo-receptors and are utilized in feeding, courtship, mating and aggressive activities (Scharrer et al., 1947; Picciolo, 1964; Pollak et al., 1978a, b; Bisazza et al., 2001).”

“*T. trichopterus* can reach sexual maturity at 7 cm TL and 12 to 14 weeks of age (McKinnon and Liley, 1987). Under favourable environmental conditions, the species exhibits a protracted breeding period, with temperature and day length being important reproductive cues (Hails and Abdullah, 1982). Axelrod et al. (1967) stated that the minimum temperature for reproduction is

18°C, whereas Degani (1989) and Cole et al. (1999) consider 23°C to be the minimum temperature. All researchers concur that the upper temperature limit is 29°C. Spawning is enhanced in acidic water with a pH range between 5.5 and 6.5 (Reyes-Bustamante and Ortega-Salas, 2002)."

"*T. trichopterus* fecundity is size dependent and usually ranges from 300 for smaller females, up to maximum of 2000 to 4000 eggs for larger females (Zukal, 1983; Richter, 1988; Pethiyagoda, 1991)."

"*T. trichopterus* possesses an auxiliary respiratory structure called the labyrinth organ, which is associated with the gills. This structure enables the species to obtain oxygen through the gills and to breathe air, depending on the amount of available oxygen in the water (Das, 1928; Burggren, 1979; Heisler, 1993; Berra, 2001). Consequently, *T. trichopterus* has a high tolerance to hypoxia and can be present in waters with extremely low oxygen levels."

Human Uses

From Froese and Pauly (2018a):

"Processed into salted, dried fish in Java [Westenberg 1981]. Also marketed fresh and commonly seen in the aquarium fish trade [Rainboth 1996]."

"Development of several captive strains of *Trichogaster trichopterus* have been carried out. The blue colored strains are commonly reported in the aquarium literature as originating from Sumatra but these have never been encountered across the whole range of this species [Tan and Ng 2005]."

"A popular aquarium fish, found in 75% of pet shops near Lakes Erie and Ontario [in the United States] [Rixon et al. 2005]."

From CABI (2018):

"For example, in Australia, Corfield et al. (2007) listed *T. trichopterus* as a commercial aquarium fish species of "high" importance, with a volume between 10,000 and 100,000 fish sold annually."

"The species is also used as a biological research model in many disciplines including, for example, behavioural studies (e.g. Hollis, 1999)."

From Rodrigues-Filho et al. (2018):

"Due to its usefulness in the fight against mosquito larvae […]"

Diseases

Epizootic ulcerative syndrome is an OIE-reportable disease (OIE 2019).

From Lio-Po et al. (2001):

"The epizootic ulcerative syndrome (EUS) is a devastating disease affecting many species of wild and cultured freshwater fishes in Asia (Chinabut, 1998). In the Philippines, affected fish species include snakehead (*Ophicephalus striatus*), catfish (*Clarias batrachus*), gourami (*Trichogaster trichopterus, T. pectoralis*), […]"

From Froese and Pauly (2018a):

"Trichodina Infection 1, Parasitic infestations (protozoa, worms, etc.)
Cauliflower Disease, Viral diseases
Costia Disease, Parasitic infestations (protozoa, worms, etc.)
Dactylogyrus Gill Flukes Disease, Parasitic infestations (protozoa, worms, etc.)
Skin Flukes, Parasitic infestations (protozoa, worms, etc.)
Fin Rot (early stage), Bacterial diseases
Skin Fungi (*Saprolegnia* sp.), Fungal diseases
Bacterial Infections (general), Bacterial diseases
Nocardiosis, Bacterial diseases
Columnaris Disease (e.), Bacterial diseases
Ichthyobodo Infection, Parasitic infestations (protozoa, worms, etc.)
Fungal Infection (general), Fungal diseases"

From CABI (2018):

"The importation of gouramis (including *T. trichopterus*) into Australia has been identified as representing a very high disease risk, because the group hosts significant exotic viruses and/or parasites, which can adversely affect native fauna (Corfield et al., 2007)."

Poelen et al. (2014) list *Pallisentis ophiocephali, Trianchoratus trichogasterium, Camallanus trichogasterae, Transversotrema patialense, Edwardsiella tarda, Haplorchis pumilio, Camallanus anabantis, Gnathostoma spinigerum* as parasites of *Trichopodus trichopterus*.

Threat to Humans

From Froese and Pauly (2018a):

"Harmless"

3 Impacts of Introductions

From Mohammed et al. (2015):

"In contrast, *T. trichopterus* has established mono-species populations among the shallow lagoons near Ramsingh Trace west of Rochard Road as well as near to Nagesar Trace south of

the Penal Rock Road (western end) [Trinidad and Tobago]. Being an anabantid species, it is well adapted to low dissolved oxygen concentrations and has the potential of establishing itself rapidly in stagnant waters (Knight 2010; Mohammed et al. 2010[b]). Capitalising on this, *T. trichopterus* has displaced several native characins from the lagoons (anecdotal evidence and per. comm. with several subsistence fish collectors). It is safe to say that this exotic fish has established breeding populations within the Oropouche Basin."

From Liao and Liu (1989):

"There are still other exotic species not discussed in this report, for lack of data, but which are strongly suspected to have caused damage to the populations of some indigenous fishes. Among these "controversial" exotics are *Poecilia velifera*, which has endangered the native species *Rhyacichthys aspro* and *Mesopristes cancellatus*, and *Tricogaster trichopterus*, which has endangered *Capoeta semifasciolata* […]."

From Krishnakumar et al. (2009):

"Although there is no information on the ecological impacts of the three-spot gourami in its introduced ranges, the species is an opportunistic carnivore having territorial and aggressive behavior [Pest Fish Profiles 2008] that could potentially prove harmful to native [to Kerala, India] ornamental species such as *Pseudosphronemus cupanus* and *Apolocheilus lineatus*."

From CABI (2018):

"Not much information on the impacts of introduced populations of *T. trichopterus* is available, although a number of studies have stated that impacts have occurred. Generalisations can be made taking into account the diet, reproduction and ecology of the species, and potential impacts on sympatric native fishes and aquatic ecosystems. For example, *T. trichopterus* may compete with indigenous fishes for food and, during reproduction, males become aggressive and may displace indigenous fishes (TropWater, 2014)."

"The importation of gouramis (including *T. trichopterus*) into Australia has been identified as representing a very high disease risk, because the group hosts significant exotic viruses and/or parasites, which can adversely affect native fauna (Corfield et al., 2007)."

4 Global Distribution

Figure 1. Known global distribution of *Trichopodus trichopterus*. Locations are in Australia, Papua New Guinea, Indonesia, Malaysia, the Philippines, Taiwan, Vietnam, Cambodia, Laos, Thailand, Myanmar, India, Namibia, Colombia, Brazil, and the United States. Map from GBIF Secretariat (2018). The locations in southern Florida were not used to select source points in the climate match. The introductions of *Trichopodus trichopterus* in Florida are considered to have failed.

Additional georeferenced locations in Trinidad and Tobago are given in Mohammed et al. (2015). Rodriguez-Filho et al. (2018) provide another location in eastern Brazil. These locations were used to select source locations for the climate match (see Figure 3, below).

5 Distribution Within the United States

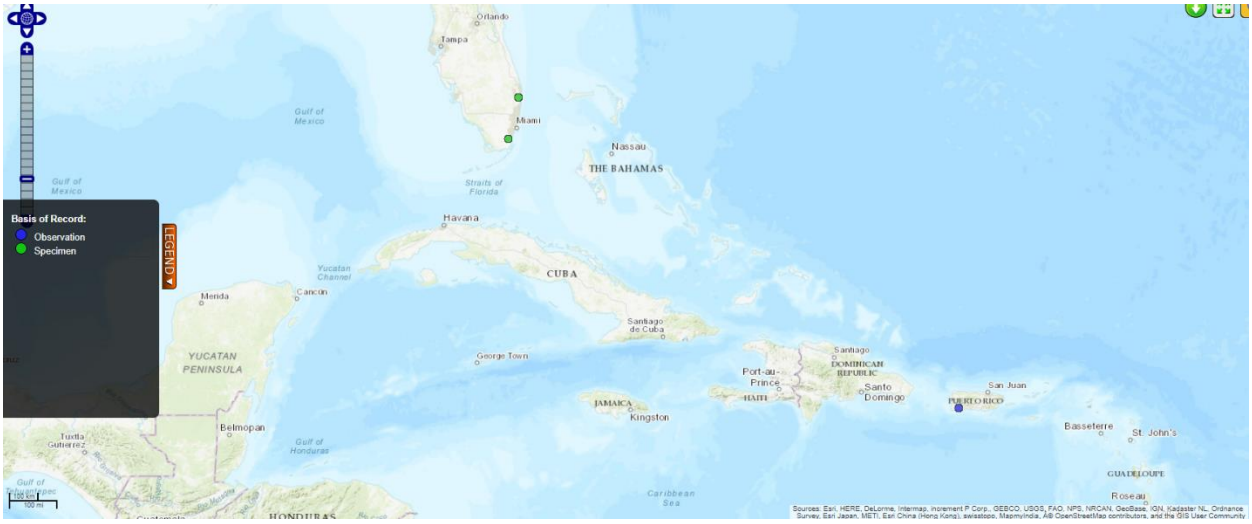

Figure 2. Known distribution of *Trichopodus trichopterus* in the United States. Locations are in southern Florida and Puerto Rico. Map from BISON (2018). The locations in southern Florida were not used to select source points in the climate match. The introductions of *Trichopodus trichopterus* in Florida are considered to have failed.

6 Climate Matching

Summary of Climate Matching Analysis

The climate match for *Trichopodus trichopterus* was low for much of the contiguous United States. There was a band of medium match that stretched from southern Georgia west along the Gulf Coast, and the Mexican border to southern Arizona. There were also areas of medium match in southern California and some interior areas of the State. Southeastern Florida and a very small area in southern Arizona had high matches. The Climate 6 score (Sanders et al. 2018; 16 climate variables; Euclidean distance) for the contiguous United States was 0.012, medium (scores greater than 0.005, but less than 0.103, are classified as medium). All States had low individual Climate 6 scores except for Florida which had a high individual Climate 6 score and Arizona and Texas which had medium individual scores.

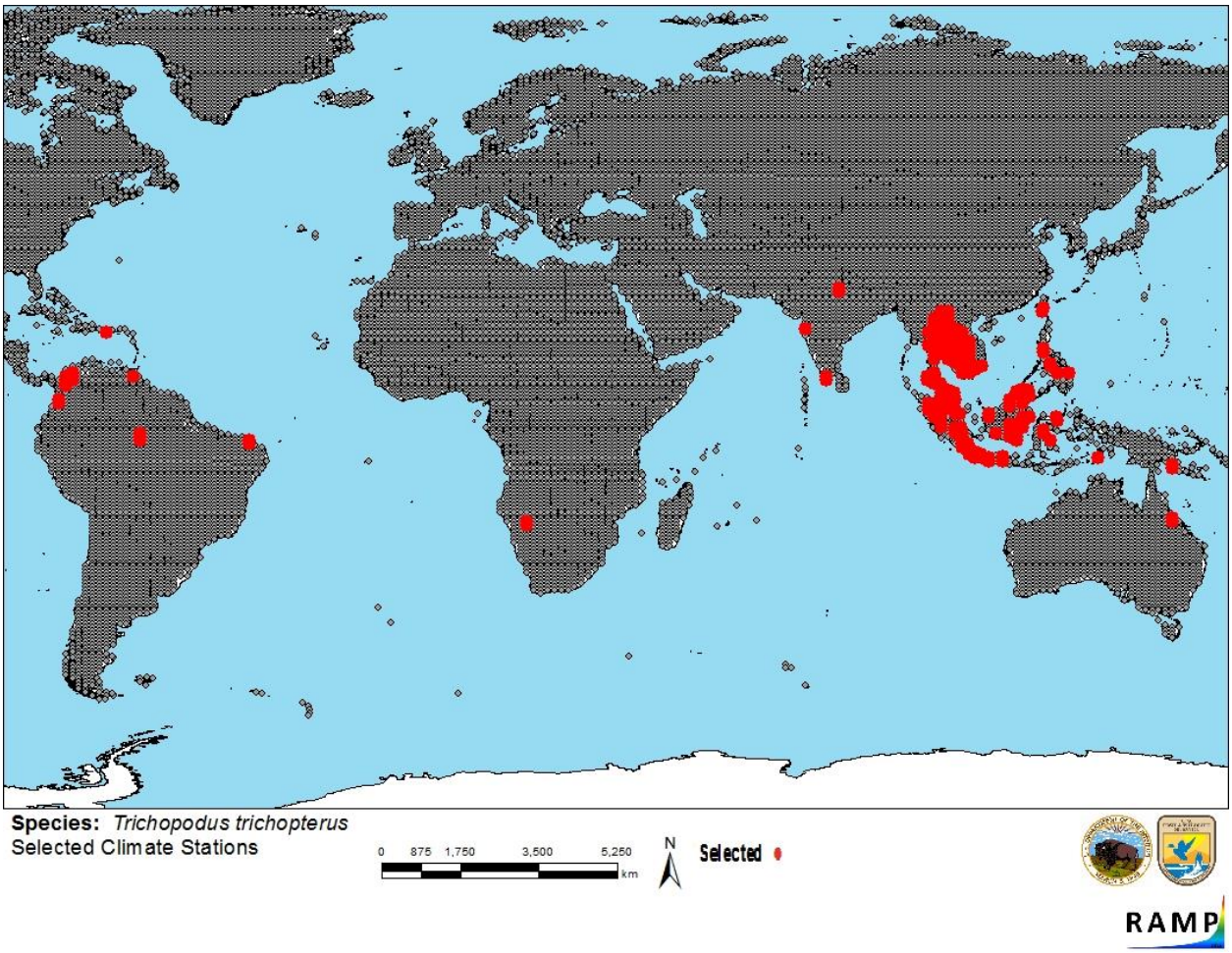

Figure 3. RAMP (Sanders et al. 2018) source map showing weather stations in the Caribbean, South America, southern Africa, southern Asia, and Oceania selected as source locations (red) and non-source locations (gray) for *Trichopodus trichopterus* climate matching. Source locations from Mohammed et al. (2015), BISON (2018), GBIF Secretariat (2018), and Rodriguez-Filho et al. (2018). Selected source locations are within 100 km of one or more species occurrences, and do not necessarily represent the locations of occurrences themselves.

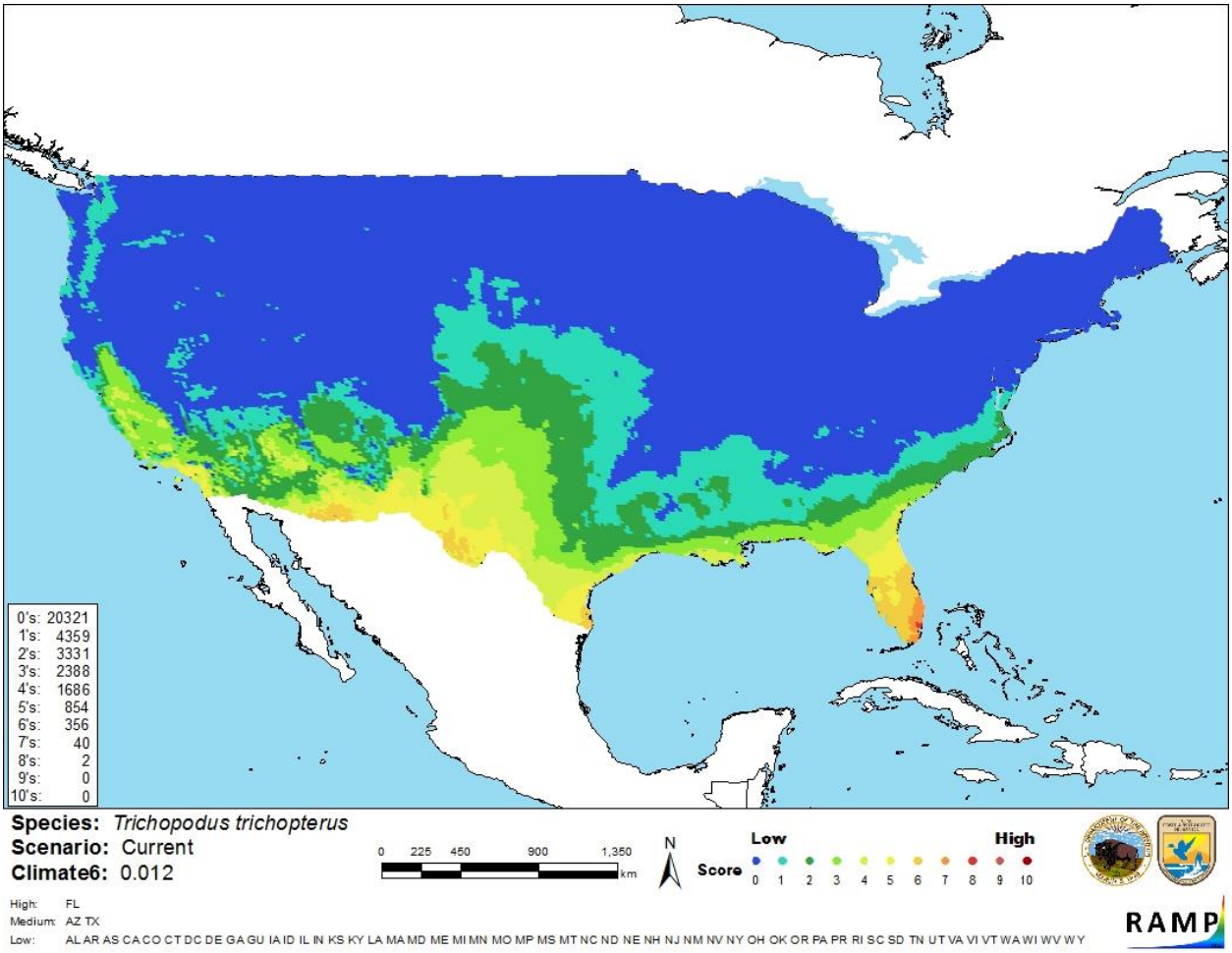

Figure 4. Map of RAMP (Sanders et al. 2018) climate matches for *Trichopodus trichopterus* in the contiguous United States based on source locations reported by Mohammed et al. (2015), BISON (2018), GBIF Secretariat (2018), and Rodriguez-Filho et al. (2018). 0 = Lowest match, 10 = Highest match.

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≤X≤0.005	Low
0.005<X<0.103	Medium
≥0.103	High

7 Certainty of Assessment

The certainty of assessment is low. There is quality information available about the biology and ecology of *Trichopodus trichopterus*. Records of introduction and established wild populations were found. Information about multiple impacts of introduction was found but was not available

from a peer-reviewed study, and conclusions were not definitive or pertained to a potential and not realized impact.

8 Risk Assessment

Summary of Risk to the Contiguous United States

Threespot Gourami (*Trichopodus trichopterus*) is a species of freshwater fish native to Southeast Asia. This species is adapted to degraded environmental conditions and has the ability to breathe air when needed. *T. trichopterus* is widely used in the aquarium trade, has been used as a food fish, for research, and for mosquito control. This species can be infected with epizootic ulcerative syndrome, an OIE-reportable disease. The history of invasiveness is none documented. There are multiple records of introductions that have resulted in established populations, including in Puerto Rico. Impacts of introduction include reports of displacing native fish species and causing population declines in an endangered fish species, but these possible impacts have not been clearly demonstrated in a scientific study. An additional potential impact is introducing and spreading diseases. The climate match is medium. Much of the contiguous United States had a low climate match, but there was a stretch of medium match more or less from southern Georgia in the east to southern California in the west. Southeastern Florida had an area of high climate match. The certainty of assessment is low. There is enough quality information about *T. trichopterus* biology and range to make an assessment, but the information on impacts of introduction are equivocal. The overall risk assessment category is uncertain.

Assessment Elements

- **History of Invasiveness (Sec. 3): None documented**
- **Climate Match (Sec. 6): Medium**
- **Certainty of Assessment (Sec. 7): Low**
- **Remarks/Important additional information:** This species can be infected with epizootic ulcerative syndrome, an OIE-reportable disease.
- **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.

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