Rosy Barb (*Pethia conchonius*)
Ecological Risk Screening Summary

U.S. Fish and Wildlife Service, Web Version – 12/7/2017

Photo: Marrabbio2. Licensed under GNU Free Documentation License, Version 1.2. Available: https://commons.wikimedia.org/wiki/File:Puntius_conchonius.jpg. (April 5, 2016).

1 Native Range and Status in the United States

Native Range

From Dhanukar (2015):

"*Pethia conchonius* is found in Afghanistan, Pakistan (Indus river drainage), India (Ganga, Brahmaputra, Mahanadi, Godavari, Krishna and Cauvery river systems and other west-flowing rivers), Nepal, and Bangladesh (Talwar and Jhingran 1991)."

From Froese and Pauly (2016):

"Asia: Afghanistan, Pakistan, India, Nepal, and Bangladesh [Talwar and Jhingran 1991]. Reported from Myanmar [Oo 2002]."

Status in the United States

From Nico and Neilson (2016):

"A few specimens were taken from a Lake Worth Drainage District canal L-15, adjacent to a fish farm in Palm Beach County, Florida, in the late 1960s or early 1970s (Courtenay et al. 1974; Courtenay and Hensley 1979). No additional specimens have been taken there. Individuals were also collected from a tributary of Big Branch Bayou, St. Tammany Parish, Louisiana, in 2004 (K. Piller, pers. comm.). The rosy barb is also established in a variety of reservoirs, lakes, and streams in Puerto Rico (Lee et al. 1983; Erdsman 1984; Kwak et al 2007)."

"Failed in Florida and Louisiana; established in Puerto Rico."

From FAO (2016):

"*Puntius conchonius* introduced to United States of America from India"
"Date of introduction: 1960"
"Status of the introduced species in the wild: Not established"

"*Puntius conchonius* introduced to Puerto Rico from United States of America"
"Date of introduction: before 1971"
"Status of the introduced species in the wild: Established"

Nico and Neilson (2016) stated that the introductions in the United States could be the result of escapes from farm ponds or aquarium releases which indicates that there is some level of trade of *Pethia conchonius* species in the U.S.

Means of Introductions in the United States

From Nico and Neilson (2016):

"Probable escape or release from fish farm, or aquarium release."

From FAO (2016):

"Reasons of Introduction: 1) ornamental"

From CABI (2016):

"In the USA, the species was collected from a Lake Worth Drainage District canal adjacent to a fish farm in Palm Beach County, Florida, in the late 1960s or early 1970s (Courtenay et al., 1974), though further collections have not occurred (Nico, 2010)."

Remarks

Pethia conchonius is the valid name of this species (Eschmeyer et al. 2017). Not all databases have incorporated the genus change to *Pethia* from the previously valid *Puntius*; therefore

information searches were performed using both names in order to reasonably obtain all pertinent information for this species.

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

From Eschmeyer et al. (2017):

"***conchonius, Cyprinus*** Hamilton [F.] 1822:317, 389 [An account of the fishes found in the river Ganges; […] Ponds of northeastern Bengal; Kosi and Ami rivers, India. No types known. •Valid as *Puntius conchonius* (Hamilton 1822) -- (Shrestha 1978:36 […], Ataur Rahman 1989:131 […], Coad 1981:11 […], Paxton et al. 1989:217 […], Talwar & Jhingran 1991:266 […], Singh & Yazdani 1993:198 […], Sen 1995:514 […], Kullander et al. 1999:108 […], Rema Devi & Raghunathan 1999:153 […], Sen 1999:192 […], Rema Devi et al. 1999:156 […], Menon 1999:90 […], Fuller et al. 1999:142 […], Menon et al. 2000:267 […], Arunachalam et al. 2000:293 […], Rafique 2000:324 […], Mirza 2000:355 […], Karmakar 2000:28 […], Allen et al. 2002:361 […], Raju Thomas et al. 2002:49 […], Arunkumar & Tombe Singh 2003:481 […], Mirza 2003:8 […], Yadav 2003:12 […], Ataur Rahman 2003:149 […], Vishwanath & Laisram 2004:134 […], Kullander & Fang 2005:297 […], Jameela Beevi & Ramachandran 2005:85 […], Shantakumar & Vishwanath 2006:2279 […], Allen et al. 2006:347 […], Kullander 2008:59 […], Shestha 2008:78 […], Kullander & Britz 2008:61 […], Conway et al. 2011:1755 […]). •Valid as *Pethia conchonius* (Hamilton 1822) -- (Pethiyagoda et al. 2012:81 […], Ahmed et al. 2013:286 […], Ahmed et al. 2013:286 […], Mayanglambam & Vishwanath 2013:88 […], Kottelat 2013:140 […], Lalramliana et al. 2014:372 […], Katwate et al. 2014:244 […], Katwate et al. 2014:213 […], Atkore et al. 2015:295 […], Katwate et al. 2016:2043 […]). **Current status:** Valid as *Pethia conchonius* (Hamilton 1822). Cyprinidae: Cyprininae."

From ITIS (2016):

"Kingdom Animalia
Subkingdom Bilateria
Infrakingdom Deuterostomia
Phylum Chordata
Subphylum Vertebrata
Infraphylum Gnathostomata
Superclass Osteichthyes
Class Actinopterygii
Subclass Neopterygii
Infraclass Teleostei
Superorder Ostariophysi
Order Cypriniformes
Superfamily Cyprinoidea
Family Cyprinidae
Genus *Puntius* [ITIS has not yet incorporated the genus change to *Pethia*]

Species *Puntius conchonius* (Hamilton, 1822)"

Froese and Pauly (2016) list the following names as synonyms to *Pethia conchonius*: *Barbus conchonius*, *B. conchonlus*, *B. pyrhopterus*, *Cyprinus conchonius*, *Puntius conchonius*, *P. conchonius khagariansis*, *Systomus conchonius*, *S. pyropterus*, and *S. pyrrhopterus*.

Size, Weight, and Age Range

From Dhanukar (2015):

"It attains a length of 14 cm and matures at 6 cm (Talwar and Jhingran 1991)."

From Corfield et al. (2008):

"Minimum population doubling time less than 15 months and can reach breeding maturation in less than 1 year (FishBase). Sterba (1966) states that aquarium-reared populations of the genus *Puntius* can begin spawning between 9 and 12 months. Considered to have a high level of resilience (FishBase)."

Environment

From Froese and Pauly (2016):

"Freshwater; benthopelagic; pH range: 6.0 - 8.0; dH range: 5 - 19."

From CABI (2016):

"In the Damodar River, pH ranged from a low of 3.23 at Panchet in monsoon to a high of 7.95 in Tarakeshwar in pre-monsoon. Low pH values were also observed at Tarakeshwar (4.02 in monsoon) and Chandrapura (4.3 in pre-monsoon). Dissolved oxygen ranged from a low of 2.45 mg/l at Chandrapura in monsoon to a high of 9.63 mg/l at Panchet in post-monsoon. Free Carbon dioxide ranged from a low of 6.24 mg/l at Panchet in post-monsoon to a high of 47.64 mg/l at Panchet in pre-monsoon. Alkalinity ranged from a low of 7.15 mg/l at Chandrapura in monsoon to a high of 687 mg/l at Panchet in post-monsoon. Transparency ranged from 1.2 cm at Tarakeshwar in monsoon to 150.8 cm at Panchet in pre-monsoon. Water temperature ranged from a low of 21 °C at Tarakeshwar in monsoon to a high of 39.84 °C at Chandrapura in pre-monsoon (Sarkar and Banjeree 2010)."

"In south-western Australia, the water parameters where Beatty et al. (2006) collected *P. conchonius* at Jingarmup Brook were: temperature approximately 16 °C, conductivity approximately 1200 µS/cm (i.e. approximately 0.6 ppt), pH approximately 7.4 and dissolved oxygen approximately 8.8 ppm (very approximately 8.8 mg/l)."

"Raina and Petr (1999) collected *P. conchonius* in the floodplain lakes and wetlands of the Kashmir Valley in the Indian Himalayas. The physic-chemical parameters of the lakes were: surface water temperature 4 °C - 31.5 °C, Transparency 0.5 m – 4.0 m, pH 7.2 – 10.2, dissolved oxygen 0.25 mg/l – 12.2 mg/l and total alkalinity 50 mg/l – 192 mg/l."

Climate/Range

From Froese and Pauly (2016):

"Subtropical; 18°C - 22°C [mean air temperature] [Riehl and Baensch 1991]; 40°N - 8°N"

Distribution Outside the United States

Native

From Dhanukar (2015):

"*Pethia conchonius* is found in Afghanistan, Pakistan (Indus river drainage), India (Ganga, Brahmaputra, Mahanadi, Godavari, Krishna and Cauvery river systems and other west-flowing rivers), Nepal, and Bangladesh (Talwar and Jhingran 1991)."

From Froese and Pauly (2016):

"Asia: Afghanistan, Pakistan, India, Nepal, and Bangladesh [Talwar and Jhingran 1991]. Reported from Myanmar [Oo 2002]."

Introduced

From Nico and Neilson (2016):

"This species is also established in Queensland and Western Australia (Corfield et al. 2008)."
From Froese and Pauly (2016):

"Introduced worldwide and now very popular with aquarists."

From FAO (2016):

"*Puntius conchonius* introduced to Mexico from unknown"
"Date of introduction: 1967"
"Status of the introduced species in the wild: probably not established"

"*Puntius conchonius* introduced to Colombia from unknown"
"Date of introduction: unknown"
"Status of the introduced species in the wild: Established"

"*Puntius conchonius* introduced to Australia from unknown"
"Date of introduction: 1970"
"Status of the introduced species in the wild: Established"

"*Puntius conchonius* introduced to Canada from [unknown]"
"Date of introduction: [unknown]"
"Status of the introduced species in the wild: Unknown"

"*Puntius conchonius* introduced to Philippines from [unknown]"

“Date of introduction: [unknown]”
“Status of the introduced species in the wild: Unknown”

“*Puntius conchonius* introduced to Singapore from [unknown]”
“Date of introduction: [unknown]”
“Status of the introduced species in the wild: Established”

From Magalhães and Jacobi (2013):

“Among the 65 non-native aquarium fish currently found in Brazilian inland waters are seven cyprinids, the goldfish *C. auratus*, koi carp *Cyprinus rubrofuscus* Lacepe`de 1803, zebrafish *Danio rerio* (Hamilton 1822), Malabar danio *Devario malabaricus* (Jerdon 1849), Arulius barb *Dawkinsia tambraparniei* (Silas 1954), rosy barb *Pethia conchonius* (Hamilton 1822),”

From Espinosa-Pérez and Ramírez (2015):

“Two of these species: *Pethia conchonius* (Hamilton, 1822) and *Puntius titteya* (Deraniyagala, 1929) were introduced for ornamental purposes and their status is unknown, although Contreras-B and Escalante-C (1984) mentioned them as probably established in Nuevo Leon (northern Mexico), but no recent record has confirmed this information. However, a new record of *P. conchonius* was recently found in a dam in Guerrero (southern Mexico) and the specimen was deposited with the catalog number in CNPE-IBUNAM 20010.”

Means of Introduction Outside the United States

From FAO (2016):

“Reasons of Introduction: 1) ornamental”

From Magalhães and Jacobi (2013):

“The female-biased sex ratio of *P. conchonius* is explained by traditional practices: fish farmers dump these females into the creeks because they are less commercially attractive than the brighter pinkish males (Magalhães et al. 2002; Magalhães and Jacobi 2008).”

From Beatty et al. (2006):

“The wide size range of this species (20-58 mm TL) (Figure 6 [in original source]) suggests that it has formed a self-maintaining population and was probably established after the deliberate release of aquarium specimens (see Fish fauna general discussion).”

From CABI (2016):

“There are two main factors likely to influence the risk of introduction of *P. conchonius* to natural environments; the popularity of the species as an ornamental fish and the number of naturalized introduced populations.”

"*P. conchonius* is a popular ornamental species and it therefore follows that the potential for the release of fish is correlated with the popularity of that species and its abundance among fish hobbyists. For example, in Australia, Corfield et al. (2007) listed the relative importance of *P. conchonius* as a commercial aquarium fish species in Australia as "high" with the volume of fish sold as "medium" (which equates to between 10,000 to 100,000 fish sold per year)."

"There is the potential for the natural dispersal of introduced populations of *P. conchonius* and this is more likely to occur in areas that contain multiple populations and/or larger and widely distributed populations. For example, in Western Australia there is the very high probability of the species spreading within the interconnected streams/rivers and drainage systems of the Canning and Serpentine rivers."

"The status of *P. conchonius* as an introduced species in Western Australia provides an interesting example of the correlation between geographic areas where there is a higher probability of the translocation and release of fishes (i.e. large population centres), and the actual established populations that have been recorded. In south-western Australia, two of the four recorded *P. conchonius* populations (including the oldest) are in sparsely-populated rural areas where it is likely that few people keep ornamental fishes and ornamental fishes are not locally available. Thus, this example demonstrates that various factors influence the establishment and success of introduced fish populations, not only anthropogenic factors (i.e. proximity to large population centres)."

Short Description

From Dhanukar (2015):

"It is most impressively coloured during the mating period, when the normally silvery male takes on a rich claret flush and the slightly larger female becomes more luminous."

From CABI (2016):

"*P. conchonius* has a short to moderately elongated body that is deep and compressed while the abdomen is rounded and the head is short (Saroniya et al., 2013). It is reported to grow to a maximum size of 14 cm total length (TL) (Talwar and Jhingran, 1991)."

"The sizes of individuals vary within *P. conchonius* populations. Individuals from central India (i.e. within its native range) ranged from a minimum of 5.6 cm to a maximum of 10.0 cm TL (mean and standard deviation 6.95 + 0.89 cm) (Saroniya et al., 2013). *P. conchonius* collected from Lake Dal in Kashmir, India, ranged in length from 38 mm to 84 mm with mature fish 45 mm or larger (Shafi et al., 2013). *P. conchonius* collected from an introduced population in south-western Australia individuals ranged from 20-58 mm TL (Beatty et al., 2006)."

"Morphological/meristic characteristics of *P. conchonius* are as follows (Talwar and Jhingran, 1991; Saroniya et al., 2013): 9 dorsal fin rays; 11-12 pectoral fin rays; 9 ventral fin rays; 7-8 anal fin rays; 19 caudal fin rays; 24 lateral line scales; 8-11 pre-dorsal scales; 10-12 pre-ventral scales; 15-19 pre-anal scales; 0 barbels."

"The colouration of *P. conchonius* is variable within and between native and introduced populations. Introduced populations of *P. conchonius* lack the reddish colouration of ornamental fish and are drab silver/cream though males may develop reddish colouration during the breeding season. For example, a wild Indian population was described by (Saroniya et al. 2013) as: "… coppery reddish in lower half and blackish in upper half of the body and the upper part of dorsal fin was black during breeding season while bright silvery colour in other period"."

"Introduced populations in Queensland, Australia, are described as: "pinkish-red with silver flecks along the sides; dorsal and anal fins with black tips; during the spawning season males become a deep reddish colour and females become more luminous" (Department of Agriculture, Fisheries and Forestry, 2013)."

"During the breeding season, male *P. conchonius* may change from a drab silvery/grey background colour to red (Froese and Pauly 2013)."

"Male fish of ornamental varieties developed by selective breeding, such as the 'glowlight chilli' maintain an intense red colouration permanently."

"*P. conchonius* (and other members of the *Pethia* and *Puntius* genera) have black markings. *P. conchonius* typically has a black spot at the rear of the body near the start of the caudal peduncle. However, members of these genera have body markings that may vary in size and shape depending upon season, state of maturity and physiological state (Shantakumar and Vishwanath 2006)."

"Images of *P. conchonious* from native Asian populations, introduced populations and ornamental varieties (i.e. long-finned and glowlight chilli) may be viewed at Beatty et al. (2006); Froese and Pauly (2013); Saroniya et al. (2013); Western Australian Department of Fisheries (2013)."

Biology

From Dhanukar (2015):

"It is one of the hardiest of the barbs; a hardy and very popular Asian minnow."

"Generally inhabits lakes and streams."

From Nico and Neilson (2016):

"Rosy barbs are omnivorous, consuming a wide and varied diet including eggs and fry of conspecifics and other species (Sterba 1966; Malhotra and Gupta 1990)."

From Froese and Pauly (2016):

"Feed on worms, crustaceans, insects and plant matter [Mills and Vevers 1989; Allen et al. 2002]. Prolific spawners that tolerate low water temperatures [Allen et al. 2002]."

“Adults inhabit lakes and fast flowing hill streams [Menon 1999; Talwar and Jhingran 1991].”

From Corfield et al. (2008):

“All members of the genus *Puntius* are oviparous. Young hatch 24-36 hours after eggs are laid and avoid predation by staying in close proximity to the substrate and vegetation for 1-2 days. Parents are notorious spawn-robbers and can devour their young (Sterba 1966). For breeding in aquaria, Sterba (1966) recommends a soft and not too pale substrate with a loose and not too dense screen of floating plants. While this recommendation was not specific to *P. conchonius*, or wild populations of this species, it may be that *P. conchonius* requires these habitat conditions in the field for sustaining its populations. Sterba (1966) states that all fine leafed plants are suitable for egg deposition. However, breeding of members of the genus *Puntius* is said to be a relatively simple process (Sterba 1966), which might indicate plasticity in their spawning requirements. For some species of *Puntius*, spawning may be triggered by influxes of fresh water in combination with light incidence during mornings (Sterba 1966).”

From CABI (2016):

“*P. conchonius* is oviparous and like most small barbs is an egg-scattering free spawner that exhibits no parental care.”

“The fecundity of *P. conchonius* was researched by Bahuguna et al. (2007) in the Mandal River in the Himalayas. 73 mature females (53-79 mm) exhibited an absolute fecundity ranging from 523.0-1366. A monthly analysis of the sex ratio of fish varied from 1:1 (April) to 1:1.8 (July) with an annual average 1:1.17.”

“Mature female *P. conchonius* collected from Dal Lake in Kashmir, India, exhibited an absolute fecundity of 154.07-7202.91, and a relative fecundity of 43.0-1268.0 (Shafi et al., 2013). These authors concluded that *P. conchonius* is a “partial” or heterochronal spawner; i.e. spawning takes place over a long period of time and occurs concurrently with the development of eggs at different stages within the ovary. The species is a batch spawner with spawning extending from mid-May with peaks in June and July in Dal Lake.”

“The effects of salinity on embryogenesis and hatching of *P. conchonius* was researched by Bhattacharya et al. (2006). They concluded that embryos at different stages of development were exposed to salinities of 4, 6, 8 and 10 ppt. The results suggested that early development stages (2-4 cell and blastula embryos) were unable to tolerate salinities above 8-10 ppt. Thus, *P. conchonius* is unlikely to be able to reproduce in brackish water systems and certainly not in seawater.”

“*P. conchonius* breeds throughout the year under laboratory conditions and may spawn at intervals as short as 8 days (Varadi and Horvath 1993). Eggs hatch within 24-36 hours (Sterba 1966), with Adam et al. (1995) reporting a period of approximately 24 hours from fertilization to hatching at 28 °C.”

“Sex differentiation occurs post-hatching between 18-21 days in females and 36-40 in males (Çek 2006). Çek et al. (2001) observed the sex ratio in 300 laboratory fish to be 210:80 in favour of female fish. Maturation of female *P. conchonius* may occur in as short a period of time as 112 days (Çek et al., 2001).”

“Fry avoid predation by staying in close proximity to the substrate and/or vegetation for a number of days (Sterba 1966).”

“Like most successful small, introduced freshwater fishes, *P. conchonius* is an omnivore with undemanding dietary requirements. Its diet is reported to consist of worms, insects, crustaceans and plant matter. The species will also reportedly consume the eggs and fry of conspecifics and other species (Sterba, 1966; Mills and Vevers, 1989).”

“Malhotra and Gupta (1990) researched the seasonal diet of *P. conchonius* from the freshwater Lake Mansar. They found that the species is an omnivore and consumed primarily plant/algal material though also aquatic invertebrates and detritus. The “plant material” included plankton (zoo and phyto), desmids, diatoms and multicellular algae and macrophytes. The aquatic invertebrates included cladocera and copepoda. Food intake increased from December to April with the authors speculating that this was driven by the growth of the gonads prior to spawning in May.”

“*P. conchonius* is reported to be cannibalistic (Sterba 1966).”

Human Uses

From Dhanukar (2015):

“One of the most undemanding and beautiful tropical fishes and a great favourite. It is perhaps the best known and most popular of the genus, as far as aquarists are concerned. It is one of the hardiest of the barbs. The fish is docile and can generally be kept together with other small fishes in aquariums (Talwar and Jhingran 1991).”

From CABI (2016):

“*P. conchonius* has been used as a model for: clinical toxicology/phycology trials (Gill and Pant, 1983; Kumar and Pant, 1988; Kuhlbe et al., 1995), fish physiology (Khanna and Singh, 1983), genetics (Varadi et al., 1995), developmental biology (Amanze, 1994), fish behaviour (Pyanov, 1993) and histochemistry (Hill and Womersley, 1993).”

Diseases

Infection with *Gyrodactylus salaris* is on the 2016 list of OIE reportable diseases. Corfield et al. (2008) does not specify which species of *Gyrodactylus* can be carried by *Pethia conchonius*.
Infection with *Aphanomyces invadans* is on the 2016 list of OIE reportable diseases.

From Froese and Pauly (2016):

"White spot Disease, Parasitic infestations (protozoa, worms, etc.)
Bacterial Infections (general), Bacterial diseases
Fatty degeneration, Nutritional deficiencies
Edwardsiellosis, Bacterial diseases
Enteric Septicaemia of Catfish, Parasitic infestations (protozoa, worms, etc.)"

From Corfield et al. (2008):

"Bacteria
Aeromonas hydrophila India (Devashish et al. 1999)
Edwardsiella ictaluri Australia – quarantine (Humphrey et al. 1986)
Streptococcus sp. Humphrey (1995b)
Fungi
Aphanomyces invadans Thailand (Tonguthai 1985, Roberts et al. 1986)
Protozoa
Piscinoodinium pillulare Malaysia (Shaharom-Harrison et al. 1990)
Metazoa
Gyrodactylus sp. Philippines (Lumanlan et al. 1992)
Procamallanus spiculogubernaculus (Hine and Diggles 2005)
Pseudocapillaria margolisi India (De and Maity 1996)"

Threat to Humans

From Froese and Pauly (2016):

"Harmless"

3 Impacts of Introductions

From Nico and Neilson (2016):

"Unknown."

From Magalhães and Jacobi (2013):

"Competition for food is possible between the non-native cyprinids *C. auratus*, *C. rubrofuscus*, *D. tambraparniei*, *P. conchonius* and *P. nigrofasciata*, and the native cichlids *G. obscurus* and *A. muriae*, since they are all omnivorous and usually live in the deep layer of streams (Froese and Pauly 2007; Menezes et al. 2007)."

From Corfield et al. (2008):

"Impacts in Australia: Unknown. None reported to date. Currently only reported from streams in and around Brisbane."

"There are no reports of impacts on native fish in the wild, but this reflects a lack of study as against a lack of impacts."

From CABI (2016):

"No definitive data is available on the environmental impact of *P. conchonius*, though generalisations can be made regarding the diet, reproduction and ecology of the species."

"*P. conchonius* is omnivorous and may consume worms, insects, crustaceans and plant matter (Sterba, 1966; Mills and Vevers, 1989; Malhotra and Gupta, 1990). The species is therefore likely to be important in the structuring of food webs (Malhotra and Gupta, 1990)."

"*P. conchonius* may directly predate upon the eggs and fry of conspecifics and other species (Sterba, 1966; Malhotra and Gupta, 1990)."

4 Global Distribution

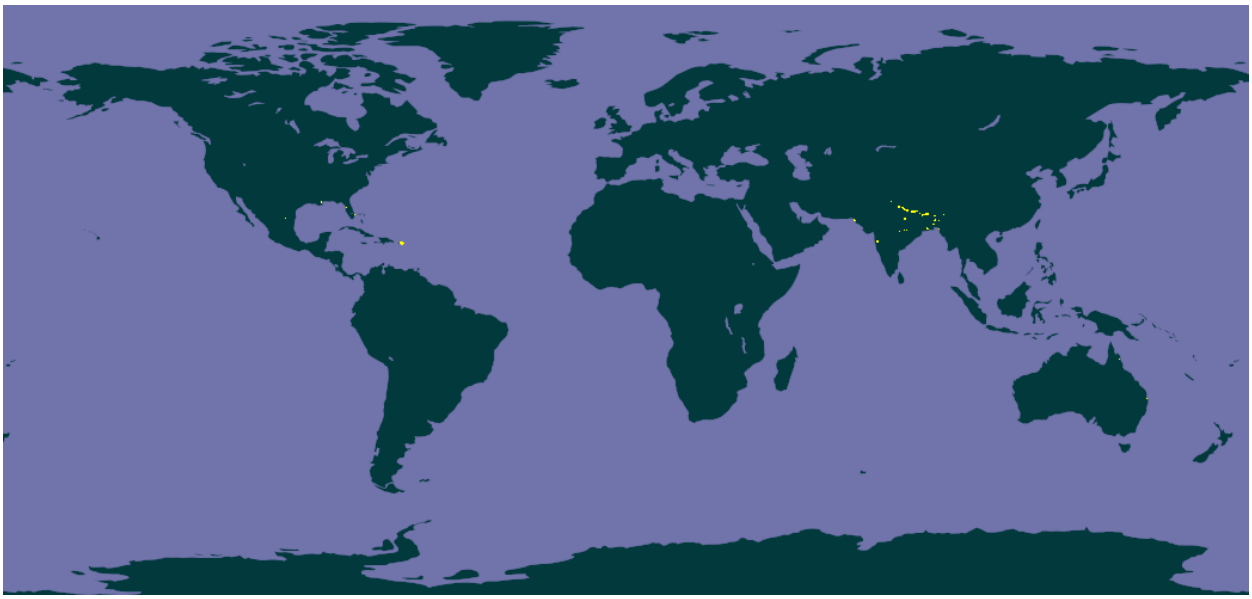

Figure 1. Known global distribution of *Pethia conchonius*. Map from GBIF Secretariat (2016).

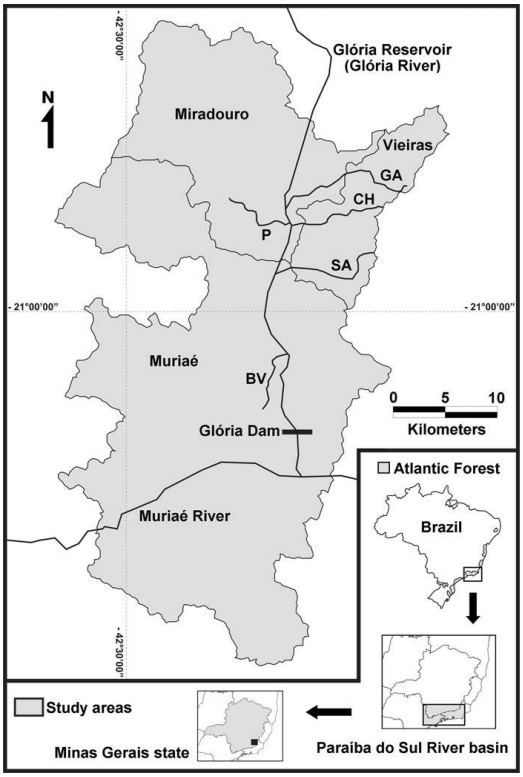

Figure 2. Study area of Magalhães and Jacobi (2013). Reproducing populations of *Pethia conchonius* were found within the study area.

Columbia is listed as having an introduced, established population of *Pethia conchonius* but no specific location information is available for that population(s). It was not used as a source point for the climate match.

Singapore also is listed as having an introduced, established population of *Pethia conchonius* with no specific location information. However, Singapore covers such a small geographic area that it was able to be used as a source point in the climate match.

5 Distribution Within the United States

Figure 3. Known distribution of *Pethia conchonius* in the United States. Map from Nico and Neilson (2016).

Nico and Neilson (2016) list the observations in Florida and Louisiana as the result of failed introductions and not established populations. Those points were not used as source points in the climate match.

6 Climate Matching

Summary of Climate Matching Analysis

The climate match for *Pethia conchonius* was high in southern Texas, along the Mexican border with Arizona and Nevada and in Florida. The climate had a medium match for much of the southern contiguous United States; elsewhere it was a low match. The Climate 6 score (Sanders et al. 2014; 16 climate variables; Euclidean distance) for the contiguous U.S. was 0.062, medium. Arizona, Florida, New Mexico, and Texas had individually high climate matches.

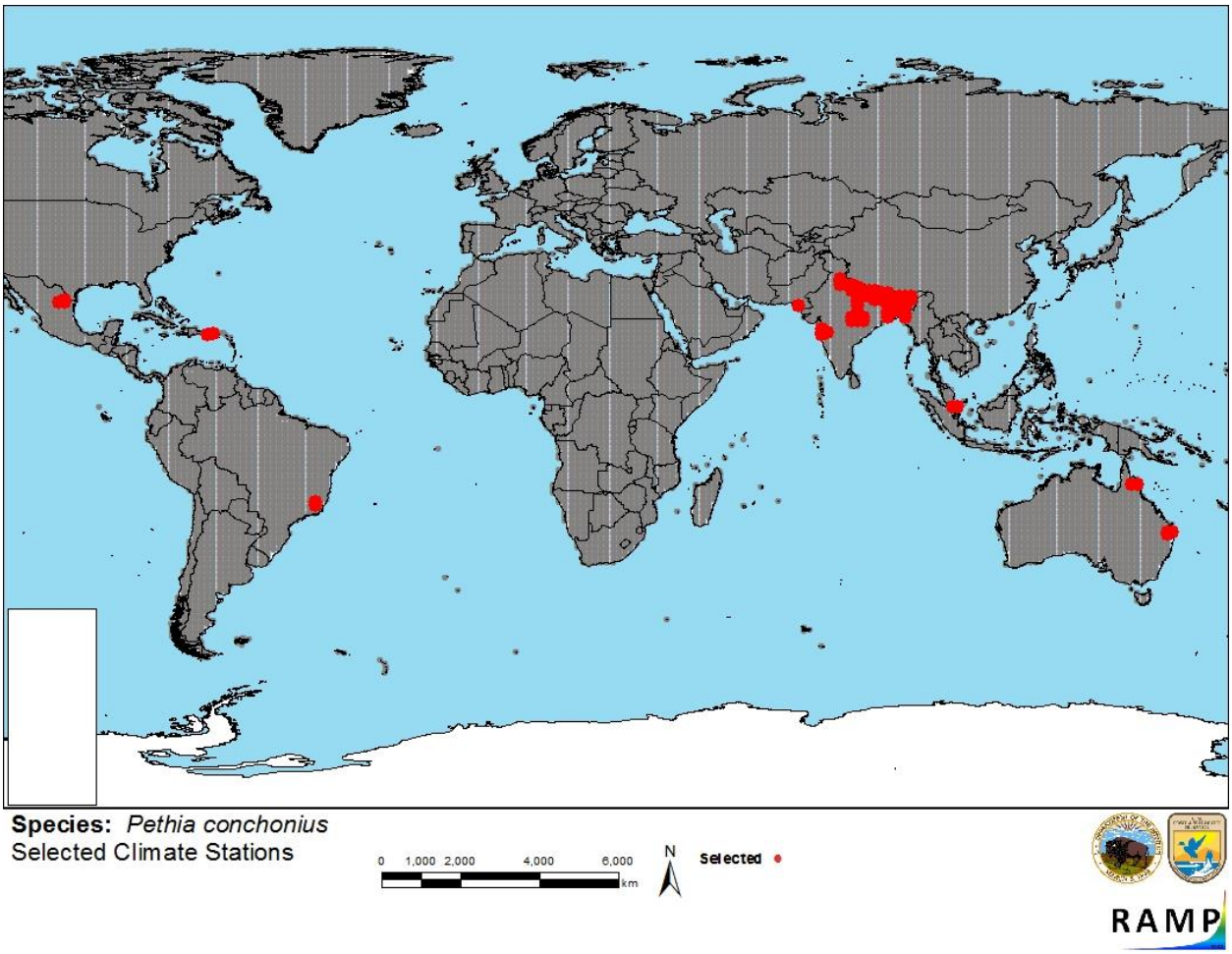

Figure 4. RAMP (Sanders et al. 2014) source map showing weather stations selected as source locations (red) and non-source locations (grey) for *Pethia conchonius* climate matching. Source locations from Magalhães and Jacobi (2013), FAO (2016), GBIF Secretariat (2016), and Nico and Neilson (2016).

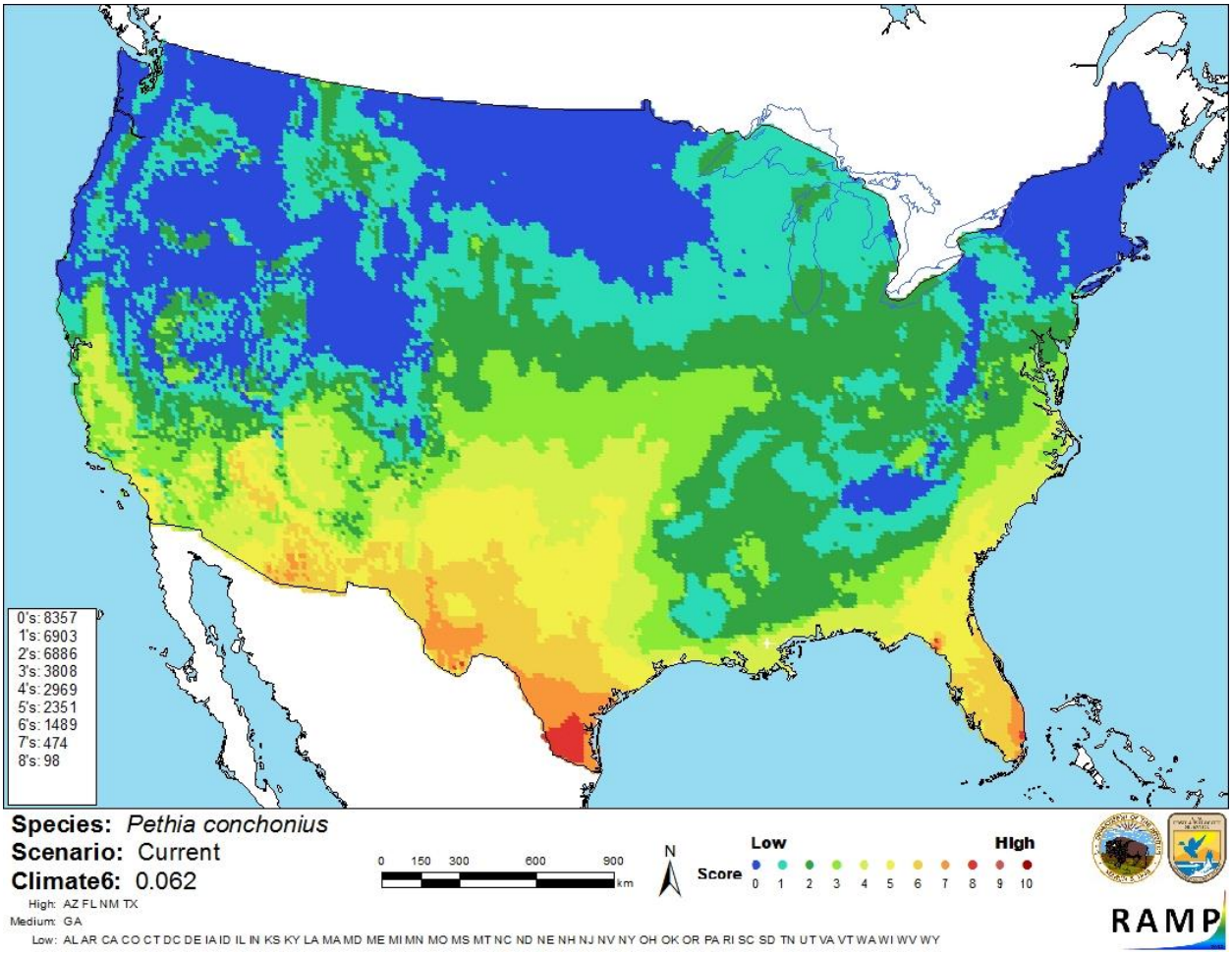

Figure 5. Map of RAMP (Sanders et al. 2014) climate matches for *Pethia conchonius* in the contiguous United States based on source locations reported by Magalhães and Jacobi (2013), FAO (2016), GBIF Secretariat (2016), and Nico and Neilson (2016). 0 = Lowest match, 10 = Highest match.

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
≥ 0.103	High

7 Certainty of Assessment

The certainty of assessment for *Pethia conchonius* is medium. There was adequate ecological and biological information available. Records of introductions and established non-native populations were found. There was little information on the impacts of those populations and the

information that was available was on potential and not realized impacts. There was some information missing for the climate match.

8 Risk Assessment

Summary of Risk to the Contiguous United States

The history of invasiveness for *Pethia conchonius* is not documented. There are many records of introductions and some resulted in established populations. However, there are no recorded demonstrated impacts from those populations. One source attributed that to a lack of research and not a lack on impacts. The climate match is medium. There could potentially be a suitable climate for *Pethia conchonius* in many areas of the southern United States. 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): Medium**
- **Remarks/Important additional information** No additional remarks.
- **Overall Risk Assessment Category: Uncertain**

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