

## Tawes (*Barbonymus gonionotus*)

### Ecological Risk Screening Summary

U.S. Fish & Wildlife Service, April 2015

Revised, October 2017

Web Version, 8/29/2018



Photo: Indra Gumay Yudha. Licensed under Creative Commons BY 3.0. Available: <http://www.fishbase.org/photos/UploadedBy.php?autoctr=14824&win=uploaded>. (October 6, 2017).

## 1 Native Range and Status in the United States

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### Native Range

Froese and Pauly (2017) indicate that *Barbonymus gonionotus* is native to: Cambodia (Rainboth 1996), Indonesia (Kottelat 1998), Laos (Kottelat 1998), Thailand (Vidthayanon et al. 1997), and Viet Nam (Khoa and Huong 1993).

From Froese and Pauly (2017):

“Occurs in the Mekong basin [in Cambodia] [Rainboth 1996; Kottelat 1998]. Found around the Tonle Sap [R]iver and Great Lake [Thuok and Sina 1997].”

“Found in Sumatra and Java [Weber and De Beaufort 1916].”

“Occurs in the Mekong [in Laos] and the lower Xe Bangfai [Kottelat 1998]. Known from above Pak Beng to the Khone Falls [Hill and Hill 1994].”

“Known from the MaeKlong, Chao Phraya, Mekong, Peninsular and Southeast Thailand river systems [Vidthayanon et al. 1997]. Reported from Nakhon Nayok, Phetchaburi, Ratchaburi, Phra Nakhon Si Ayutthaya, Khon Kaen, Ubon Ratchathani, Bangkok, Kanchanaburi, Chanthaburi, Prachin Buri, Surat Thani and Phitsanulok [Monkolprasit et al. 1997]. Also [Sidthimunka 1970; Suvatti 1981; FAO 1993; Doi 1997; Kottelat 1998; Ukkatawewat 2005].”

“Found in Mekong delta [in VietNam] [Khoa and Huong 1993]. Also [Welcomme 1988].”

From CABI (2017):

“It is reportedly native to Indonesia and the Mekong Basin (Cambodia, Laos, Thailand and Vietnam), although recent evidence indicates that it may have been originally introduced to the Mekong from Indonesia.”

## **Status in the United States**

From Daniel (2017):

“A single specimen was found in a Palm City pond, Martin County, Florida (Killer 2017).”

“The status is unknown as the Florida specimen was released after capture.”

According to Daniel (2017), *Barbonymus gonionotus* is in trade in the United States.

## **Means of Introductions in the United States**

From Daniel (2017):

“Because *B. gonionotus* is in the aquarium trade, it is likely an aquarium release (Froese and Pauly 2017). The species is also popular in Southeast Asian aquaculture and cuisine (Davidson 1975) making it a possible released food fish.”

## **Remarks**

*Barbonymus gonionotus* has been used by other countries to control *Ceratophyllum* and *Najas* spp. There are native *Ceratophyllum* and *Najas* species within the United States.

# **2 Biology and Ecology**

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## **Taxonomic Hierarchy and Taxonomic Standing**

According to Eschmeyer et al. (2017), *Barbonymus gonionotus* (Bleeker 1849) is the valid name for this species. It was originally described as *Barbus gonionotus* and has also been previously known as *Puntius gonionotus*, and *Barbodes gonionotus*.

From ITIS (2015):

“Kingdom Animalia  
Subkingdom Bilateria  
Infrakingdom Deuterostomia  
Phylum Chordata  
Subphylum Vertebrata  
Infraphylum Gnathostomata  
Superclass Osteichthyes  
Class Actinopterygii  
Subclass Neopterygii  
Infraclass Teleostei  
Superorder Ostariophysi  
Order Cyprinidae  
Superfamily Cyprinoidea  
Family Cyprinidae  
Genus *Barbonymus*  
Species *Barbonymus gonionotus* (Bleeker, 1850)”

## Size, Weight, and Age Range

From Froese and Pauly (2017):

“Max length: 40.5 cm TL male/unsexed; [Hardjamulia et al. 1988]”

From Daniel (2017):

“Record total length of 90 cm was caught in Malaysia (Fishing World Records.com 2017), but average total length is around 40.5 cm (Hardjamulia et al. 1988).”

## Environment

From Froese and Pauly (2017):

“Freshwater; benthopelagic; potamodromous [Riede 2004]; depth range 15 - ? m [Rainboth 1996]. [...]; 22°C - 28°C [assumed to be water temperature]; [...]”

## Climate/Range

From Froese and Pauly (2017):

“Tropical; [...]; 24°N - 8°S”

## Distribution Outside the United States

Native

Froese and Pauly (2017) indicate that *Barbonymus gonionotus* is native to: Cambodia (Rainboth 1996), Indonesia (Kottelat 1998), Laos (Kottelat 1998), Thailand (Vidthayanon et al. 1997), and Viet Nam (Khoa and Huang 1993).

From Froese and Pauly (2017):

“Occurs in the Mekong basin [in Cambodia] [Rainboth 1996; Kottelat 1998]. Found around the Tonle Sap river and Great Lake [Thuok and Sina 1997].”

“Found in Sumatra and Java [Weber and De Beaufort 1916].”

“Occurs in the Mekong [in Laos] and the lower Xe Bangfai [Kottelat 1998]. Known from above Pak Beng to the Khone Falls [Hill and Hill 1994].”

“Known from the Maeklong, Chao Phraya, Mekong, Peninsular and Southeast Thailand river systems [Vidthayanon et al. 1997]. Reported from Nakhon Nayok, Phetchaburi, Ratchaburi, Phra Nakhon Si Ayutthaya, Khon Kaen, Ubon Ratchathani, Bangkok, Kanchanaburi, Chanthaburi, Prachin Buri, Surat Thani and Phitsanulok [Monkolprasit et al. 1997]. Also [Sidthimunka 1970; Suvatti 1981; FAO 1993; Doi 1997; Kottelat 1998; Ukkatawewat 2005].”

“Found in Mekong delta [in VietNam] [Khoa and Huong 1993]. Also [Welcomme 1988].”

From CABI (2017):

“It is reportedly native to Indonesia and the Mekong Basin (Cambodia, Laos, Thailand and Vietnam), although recent evidence indicates that it may have been originally introduced to the Mekong from Indonesia.”

### Introduced

Froese and Pauly (2017) indicate that *Barbonymus gonionotus* is introduced to: Bangladesh (Rahman 1989), China (Welcomme 1988), India (Welcomme 1988), Malaysia (Chong et al. 2010), Myanmar (Thame 2003), Nepal, Philippines (Welcomme 1988), Singapore (Bartley 2006), and Fiji (Lewis and Pring 1986).

From Froese and Pauly (2017):

“Introduced in Lake Poso [Indonesia] [Kottelat 1990].”

“[In Malaysia:] Present in Sungai Trengganu, Sungai Perak [Mohsin and Ambak 1983]. Recorded from the Rajang Basin in Sarawak, Borneo [Parenti and Lim 2005] and Gelami and Tinggi Rivers, Pahang River system [Miyazaki et al. 2013]. Also [Kottelat 1998; Welcomme 1988; Chong et al. 2010].”

“Occurs in Koshi, Bagmati, Kamala and Rapti [in Nepal] [Shrestha 2008].”

“[In Philippines:] Well established in rivers and lakes, where it reproduces naturally [FAO 1997]. Found in Laguna Lake [Palma et al. 2005]. Also [ASAP 1996].”

“Established in the Rewa River and its tributaries [in Fiji]. Also [Andrews 1985; Welcomme 1988; Lever 1996; Seeto and Baldwin 2010].”

FAO (2013) lists *Barbonymus gonionotus* as introduced to but not established in Papua New Guinea, Singapore, and Sri Lanka.

FAO (2013) lists *Barbonymus gonionotus* as introduced to and established in Bangladesh, China, Fiji, India, Malaysia, Philippines, and Singapore.

GISIN (2017) lists *Barbonymus gonionotus* as introduced in Taiwan.

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

From Froese and Pauly (2017):

“Escapees from culture installations have become established in rivers [...]”

From Singh and Lakra (2011):

“This species [*Barbonymus gonionotus*] was introduced into India in 1972 from Indonesia with a view to control aquatic weeds (Das et al. 1994).”

## **Short Description**

From Froese and Pauly (2017):

“Dorsal spines (total): 4; Dorsal soft rays (total): 8; Anal spines: 3; Anal soft rays: 6 - 7. Body is strongly compressed. The back is elevated, its dorsal profile arched, often concave above the occiput. The head is small; the snout pointed; the mouth terminal. The barbels are very minute or rudimentary, especially the upper ones, which sometimes disappear entirely. Color when fresh is silvery white, sometimes with a golden tint. The dorsal and caudal fins are gray to gray-yellow; the anal and pelvic fins light orange, their tips reddish; the pectoral fins pale to light yellow [Taki 1974]. Very few tubercles on the snout which are not visible without magnification; snout length much less than the width of the eye socket [McConnell 2005]. Anal-fin with 6-7 branches rays [Rainboth 1996].”

## **Biology**

From Froese and Pauly (2017):

“Occurs at midwater to bottom depths in rivers, streams, floodplains, and occasionally in reservoirs. Seems to prefer standing water habitats instead of flowing waters. Inhabits the flooded forest during high water period [Rainboth 1996]. Feeds on plant matter (e.g. leaves, weeds, *Ipomea reptans* and *Hydrilla*) and invertebrates [Mohsin and Ambak 1983]. A migratory species but not considered to be a long-distance migrant. Regarded as local migrant which moves from the Mekong up into small streams and canals and onto flooded areas during the rainy season and back again during receding water [Sokheng et al. 1999]. Some reports indicated that upstream migration of this fish is triggered by the first rains and rising water levels. When it

finds a tributary, canal or stream it moves upstream and eventually onto flooded areas. When water recedes, it migrates back into canals and streams and into the Mekong again [Sokheng et al. 1999].”

“Feeds on plants, insects and detritus [Yap 1988].”

## Human Uses

From Froese and Pauly (2017):

“Often used as a pituitary donor for artificial propagation in aquaculture. Escapees from culture installations have become established in rivers and form the basis for capture fisheries on several Southeast Asian islands [Welcomme 1988]. Useful in cropping excessive vegetation in reservoirs [Davidson 1975]. Used for lap pa (in the preparation of which the numerous small bones are ground fine) or grilled or used to make som pa. Usually marketed fresh and occasionally seen in the aquarium trade [Rainboth 1996].”

From Daniel (2017):

“*Barbonymus gonionotus* is an important food fish in Thai, Lao and Cambodian cuisine (Davidson 1975) and a common aquaculture species in Southeast Asia (FishStatJ 2016).”

From CABI (2017):

“Even though considered by many as a second-rate fish, *B. gonionotus* is widely used in polyculture as well as weed control throughout South-East Asia. *B. gonionotus* is an important species for integrated rice-fish farming. The interest in *B. gonionotus* as a means of biological control of weeds is increasing since the use of grass carp entails the risk that they may escape into natural waterways and destroy valuable plants (Perschbacher, 1999).”

## Diseases

**Epizootic ulcerative syndrome is on the 2017 list of OIE reportable diseases.**

From Froese and Pauly (2017):

“Sporozoa-infection (*Myxobolus* sp.), Parasitic infestations (protozoa, worms, etc.)  
Piscinoodinium Infection, Parasitic infestations (protozoa, worms, etc.)  
Anchor worm Disease, Parasitic infestations (protozoa, worms, etc.)”

Poelen (2014) lists *Acanthosentis siamensis*, flesh-eating bacteria (*Aeromonas hydrophila*), *Haplorchis taichui*, *Haplorchoides mehrai*, *Dactylogyrus siamensis*, *D. kanchanaburiensis*, *D. lampam*, *D. pseudosphyrna*, *D. puntii*, *D. tapienensis*, *D. tonguthaii*, *D. viticulus*, Southeast Asian liver fluke (*Opisthorchis viverrini*), and *Paracapillaria philippinensis* as parasites and pathogens of *Barbonymus gonionotus*.

*Barbonymus gonionotus* carries the infective agent for Epizootic Ulcerative Syndrome (Pallewatta et al. 2003).

## Threat to Humans

From Froese and Pauly (2017):

“Harmless”

## 3 Impacts of Introductions

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Acosta and Gupta (2005) state that *Barbonymus gonionotus* has had a beneficial economic impact in Bangladesh and China.

The following state that there are negative impacts of introduction but provide no scientifically defensible details.

GISIN (2017) reports that *Barbonymus gonionotus* is harmful in Taiwan but does not provide further details.

The following detail potential impacts of introductions or instances where impacts of introduction are implied but are not supported with scientifically defensible studies.

Hossain (2014) states that Thai sarpunti *Barbonymus gonionotus* compete with local sarpunti for foods and space.

From Pallewatta et al. (2003):

“Epizootic Ulcerative Syndrome has been causing large-scale fish mortality in the floodplains. The occurrence of Epizootic Ulcerative Syndrome disease was first reported in February 1988 from Chandpur. Ali (1991) reported that the disease broke out almost all over Bangladesh causing heavy mortalities of native fish such as Snakeheads (‘taki,’ ‘shol’), eel (‘baim’), perches (‘Koi,’ ‘Kholisha,’ ‘meni’), barbs (‘punti’), and gobies (‘bele’). Major species of local carps and their fingerlings in floodplains and ponds were also affected. Minkin (1988) suspected that this disease possibly entered Bangladesh through the introduction of alien fish, *Puntius [Barbonymus] gonionotus*, a carrier of the infective agent to Bangladesh. This disease has been reported from Thailand, Philippines, Myanmar, Sri Lanka, Malaysia and Laos (Minkin, 1988). The Fisheries Specialist Study in Bangladesh's 6th Flood Action Plan (FAP6, 1993) reiterates the suspicion that the disease was introduced into the country through imported alien species, and indicates that this fish disease has played an important role in reducing fish production in Bangladesh.”

From Singh and Lakra (2011):

“However, a lack of information on its compatibility, growth performance and interaction [of *B. gonionotus*] with local species of culture has been a major limitation in risk assessment. A recent study on the compatibility of silver barb with other local species used in polyculture reported that silver barb had a higher level of competition with *Labeo rohita* than *C. catla*.”

From Daniel (2017):

“The impact is unknown [in Florida]. However, because *Barbonymus gonionotus* is an herbivore (Rainboth 1996; Froese and Pauly 2017) it has the potential to alter habitats.”

From Mer et al. (2016):

“It has been reported that the Silver barb (*Puntius [Barbonymus] gonionotus*) controlled dense vegetation of *Najas* from a 284 ha reservoir in East Java, Indonesia within 8 months of stocking.”

“It has also been reported that the silver barb (*Puntius [Barbonymus] gonionotus*) controlled dense vegetation of *Ceratophyllum* from a 284 ha reservoir in East Java, Indonesia within 8 months of stocking. Java barb also generally feeds on *Ceratophyllum*.”

From Rashid et al. (2015):

“Most of introduced fish species captured in this study, however, were not considered invasive, and mainly introduced for the purposes of aquaculture, such as *P. bocourti*, *P. hypophthalmus*, *B. gonionotus*, [...]”

## 4 Global Distribution

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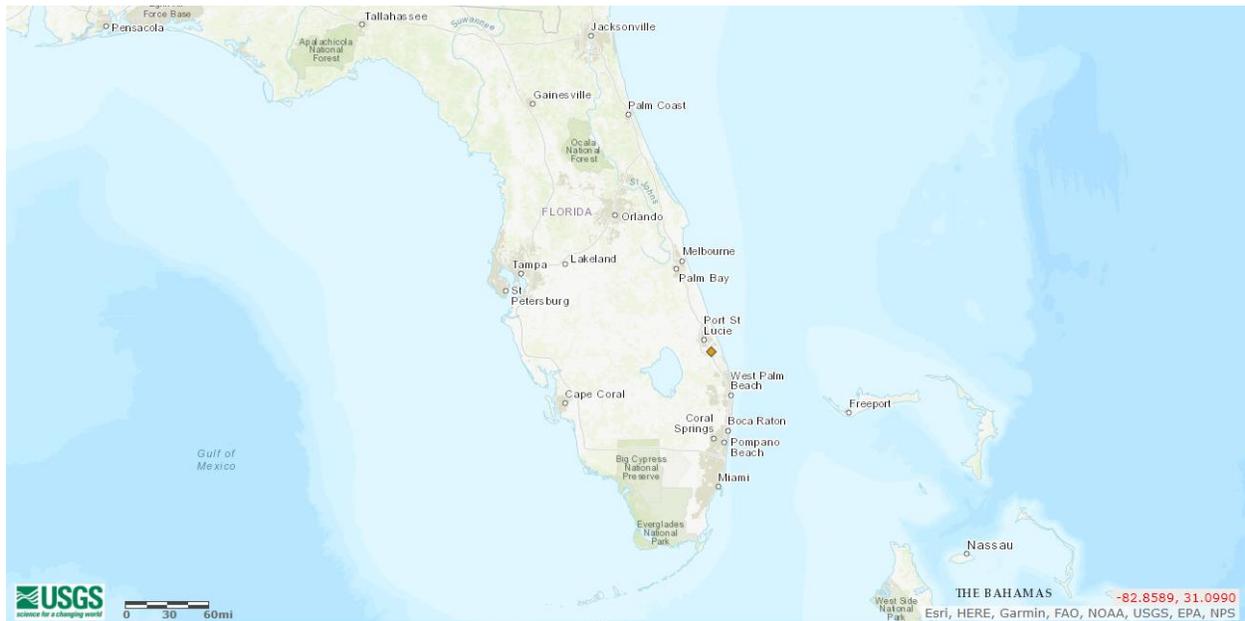


**Figure 1.** Known global distribution of *Barbonymus gonionotus*. Locations are in India, Thailand, Laos, Cambodia, Malaysia, Indonesia, Philippines, and Papua New Guinea. Map from GBIF Secretariat (2017).

There are records of established, wild populations in India, China (FAO 2013), and Taiwan (GISIN 2017) but no further location information for those populations was available.

## 5 Distribution Within the United States

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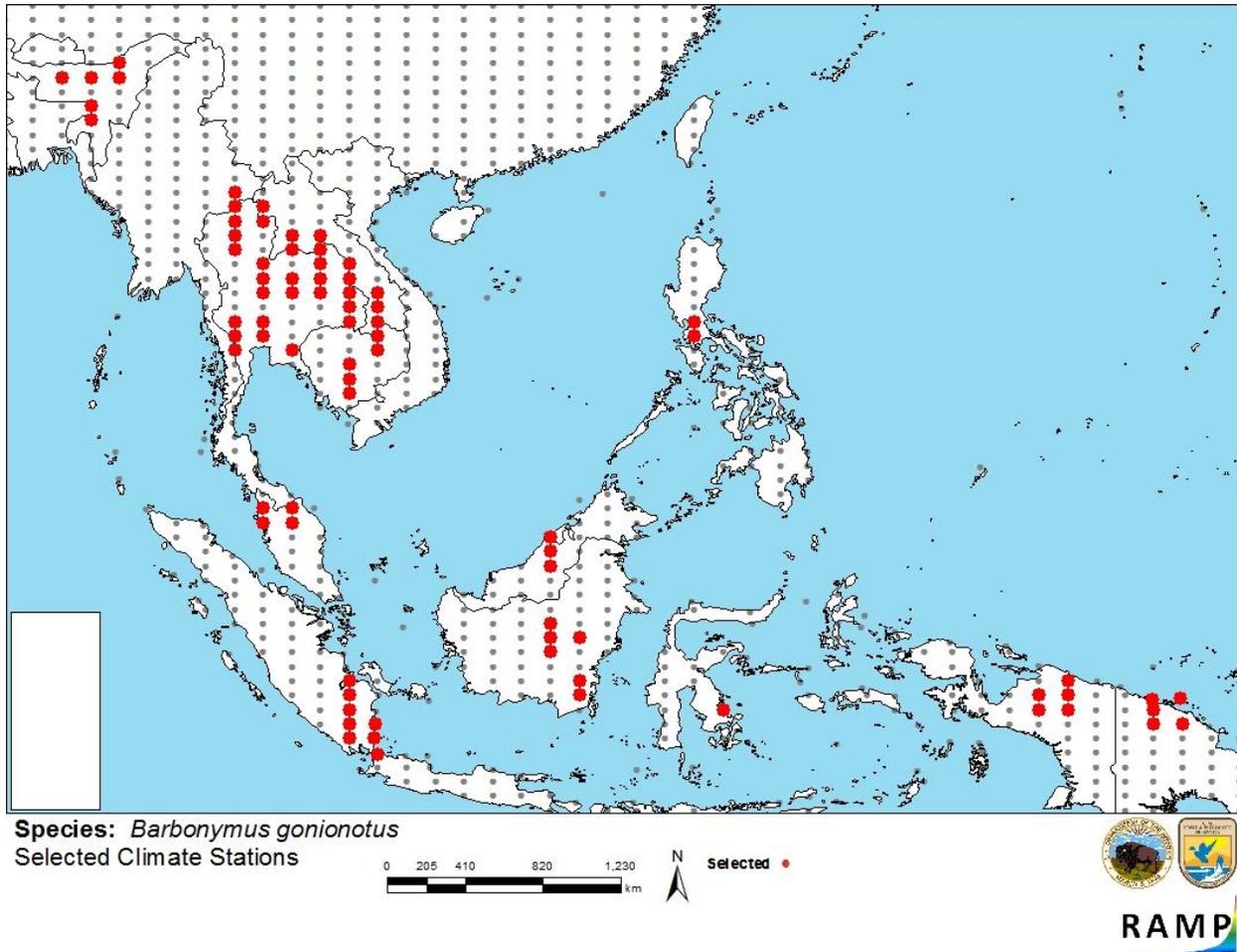
**Figure 2.** Known distribution of *Barbonymus gonionotus* in the United States. A single specimen was collected from the Palm City area on the southeastern coast of Florida. Map from Daniel (2017).

It is unknown if the single specimen caught in Florida represents an established population (Daniel 2017). This location was not used as a source point for the climate match.

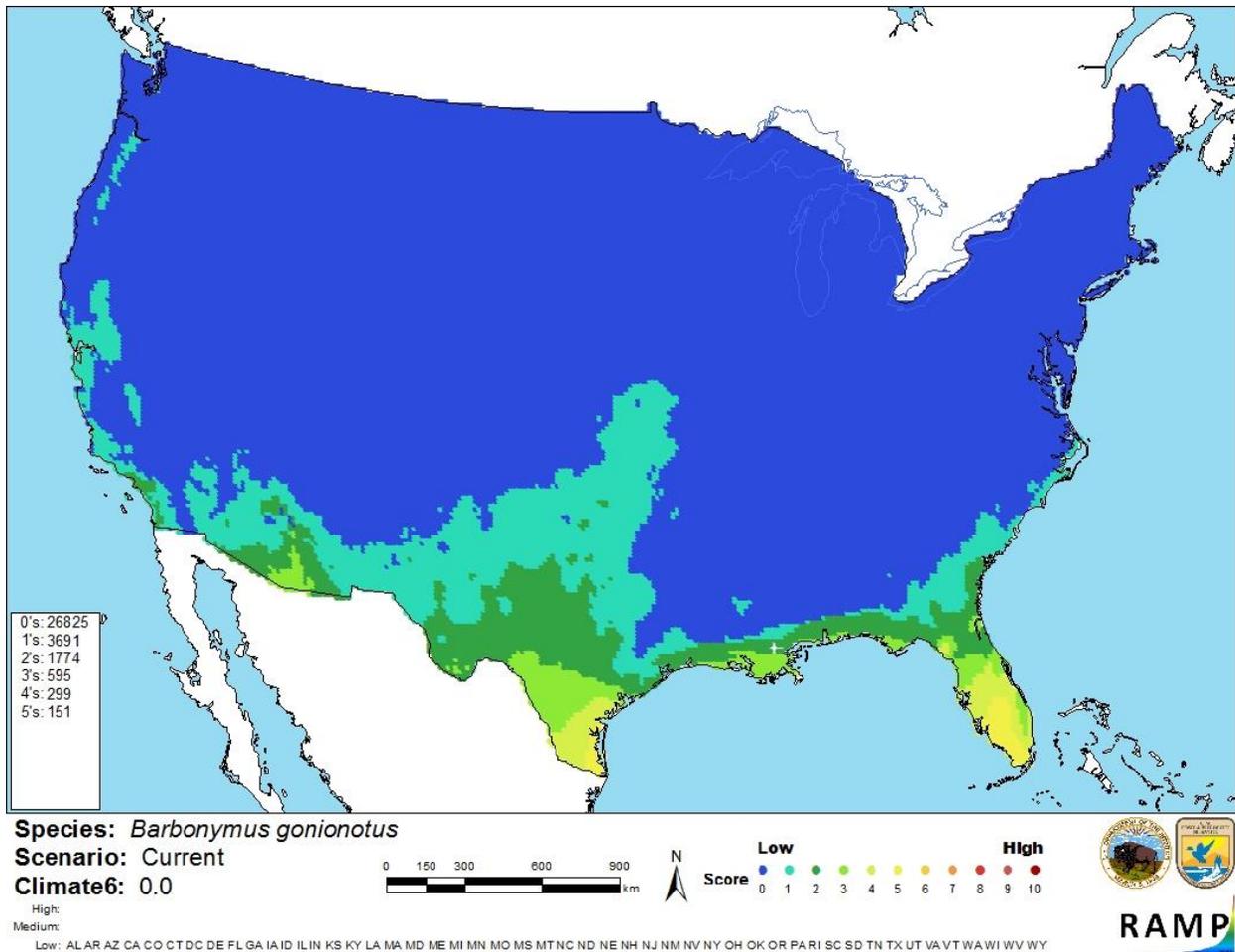
## 6 Climate Matching

### Summary of Climate Matching Analysis

The climate match for *Barbonymus gonionotus* was medium in southern Florida and Texas. The climate match was low everywhere else. The Climate 6 score (Sanders et al. 2014; 16 climate variables; Euclidean distance) for the contiguous United States was 0.000, low, and no states had individually high climate scores.



**Figure 3.** RAMP (Sanders et al. 2014) source map showing weather stations in Southeast Asia selected as source locations (red; India, Myanmar, Thailand, Cambodia, Laos, Malaysia, Indonesia, Philippines, Papua New Guinea) and non-source locations (gray) for *Barbonymus gonionotus* climate matching. Source locations from GBIF Secretariat (2017) and VertNet (2017).



**Figure 4.** Map of RAMP (Sanders et al. 2014) climate matches for *Barbonymus gonionotus* in the contiguous United States based on source locations reported by GBIF Secretariat (2017) and VertNet (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 (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 this assessment is medium. There was a large amount of quality biological and ecological information available for *Barbonymus gonionotus*. Records of introductions were found. There were many papers that mentioned impacts from introduction. Much of the impact information was generalized or about potential impacts, providing no scientifically defensible

information about realized negative impacts of introduction. A record of positive economic impacts in two countries was found.

## 8 Risk Assessment

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### Summary of Risk to the Contiguous United States

Tawes (*Barbonymus gonionotus*) is a species of cyprinid native to river drainages in southeastern Asia. It will enter flooded forests during the wet season. *B. gonionotus* is a food fish that is raised in aquaculture and also wild caught. The species has been used for vegetation control in reservoirs. The history of invasiveness is not documented. There were many records of introductions found. A few records of ‘harmful’ impacts were found but no details were provided; no scientifically defensible studies could be found that concluded this species had harmful impacts after an introduction and establishment. One source recorded competition between this species and native co-geners but did not indicate the impact this competition has on the native species. Another source documented that the importation, culture, and establishment of this species has had a beneficial economic impact. However, Pallewatta et al. (2003) stated that this species is suspected as the most likely vector for introducing epizootic ulcerative syndrome to Bangladesh, causing wide spread fish mortality. This disease is on the 2017 list of OIE reportable diseases. *B. gonionotus* has been shown to have the ability to control populations of *Najas* and *Ceratophyllum* in areas where they have been introduced for that purpose. Those species are native to the United States and could be significantly impacted if *B. gonionotus* were to establish a population. The climate match is low; the Climate 6 score was 0.000, low. Southern Texas and Florida had areas of medium climate match. The certainty of assessment is medium. The overall risk assessment category is uncertain.

### Assessment Elements

- **History of Invasiveness (Sec. 3): None Documented**
- **Climate Match (Sec. 6): Low**
- **Certainty of Assessment (Sec. 7): Medium**
- **Remarks/Important additional information** *Barbonymus gonionotus* is a popular species in aquaculture. It has been used by other countries to control *Ceratophyllum* and *Najas* spp. There are native *Ceratophyllum* and *Najas* species within the United States. This species is the mostly likely cause of an epizootic ulcerative syndrome outbreak in Bangladesh. It is unknown if the specimen caught in Florida represents an established population or just the single individual.
- **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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**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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