Spotted Steed (*Hemibarbus maculatus*)

Ecological Risk Screening Summary

U.S. Fish & Wildlife Service, August 2012
Revised, February 2017
Web Version, 1/14/2018

Photo: Chinese Academy of Fishery Sciences. Licensed under CC BY-NC. Available: http://www.fishbase.se/photos/PicturesSummary.php?ID=4752&what=species. (February 2017).

1 Native Range and Status in the United States

Native Range

From Froese and Pauly (2016):

"Asia: China, Korea, Japan and Amur River basin."

Status in the United States

This species has not been reported as introduced or established in the United States.

Means of Introductions in the United States

This species has not been reported as introduced or established in the United States.

Remarks

From CABI (2017):

"Other Scientific Names

Acanthogobio maculatus Kreyenberg & Pappenheim, 1908
Acanthogobio paltschevskii Nikolskii, 1903
Barbus schlegeli Fowler, 1924
Barbus semibarbus Günther, 1889
Gobiobarbus labeo maculatus Bleeker, 1871
Hemibarbus barbus Abbott, 1901
Hemibarbus joiteni Jordan & Starks, 1904
Hemibarbus labeo maculatus Bleeker, 1871
Hemibarbus longibarbis Fang, 1938"

"The genus *Hemibarbus* has been revised by Yue (1995). The species previously identified as *H. maculatus* is in fact an assemblage of several species and the fishes from the Xijiang basin previously referred to this species are a distinct species, *H. macracanthus*."

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

From ITIS (2017):

"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 *Hemibarbus*
Species *Hemibarbus maculatus* Bleeker, 1871"

"Taxonomic Status: valid"

Size, Weight, and Age Range

From Froese and Pauly (2016):

"Max length : 47.0 cm TL male/unsexed; [Berg 1964]; 34.3 cm TL (female); common length : 26.0 cm TL male/unsexed; [Novikov et al. 2002]; max. published weight: 1.7 kg [Novikov et al. 2002]"

Environment

From Froese and Pauly (2016):

"Freshwater; benthopelagic; pH range: 7.0 - ? ; dH range: 20 - ?."

"10°C - 24°C [Baensch and Riehl 1991; assumed to be recommended aquarium water temperature]"

"Adults usually found in streams and creeks with moderate flow and sandy bottom [Kottelat 2001a]."

Climate/Range

From Froese and Pauly (2016):

"Temperate; […]"

Distribution Outside the United States

Native

From Froese and Pauly (2016):

"Asia: China, Korea, Japan and Amur River basin."

Introduced

From CABI (2017):

"Cambodia [Wildlife Conservation Society 2006] Tonle Sap Biosphere Reserve"
"Laos [Mekong River Commission 2009]"
"Uzbekistan [Khurshut 2010]"

Means of Introduction Outside the United States

From CABI (2017):

"It was accidentally introduced together with Chinese carp fry from the Yangtze River, China to the USSR […] Its occurrence in the Mekong tributaries in northern Laos apparently results from intentional introductions upriver in China (Kottelat, 2001b)."

Short Description

From Froese and Pauly (2016):

"Vertebrae: 42 - 44. Both sides of the body with 7-11 large and blackish spots. Deep body with clearly convex dorsal profile. Head length shorter than body depth. Snout length shorter or equal to postorbital head length. Lips not developed, lateral lobes of lower lip narrow, without folds, the median process large and marked. Barbel length slightly thick, 1/2-2/3 of eye diameter. Dorsal spine strong, equal to HL. Origin of dorsal fin nearer the tip of snout than the caudal base [Yue 1995]. Anal fin with 6 1/2 branched anal rays; last simple dorsal ray ossified, spine-like [Kottelat 2001a]."

Biology

From Froese and Pauly (2016):

"Feed mainly on insects and mollusks in summer and on crustaceans in winter [Berg 1964]"

From CABI (2017):

"Reproductive Mode: dioecism, fertilization: external, reproductive guild: non-guarders open water/substratum egg scatterers. Description of life cycle and mating behaviour: Mature at 3 years of age. Spawns from May to June, with water temperatures from 19-25°C. Eggs are pasted on to underwater plants. Egg diameter is about 2 mm. Development time is about 4 days. Larvae live in the pelagic zone for the first 6 days (Baensch and Riehl, 1991)."

Human Uses

From CABI (2017):

"*H. maculatus* is a nutritious fish high in protein. In recent years, it has sold well in the east China (Lu et al., 2004). It is also an economically important fish in Thua Hue Orovince, Vietnam (Vo et al., 2006)."

Diseases

From Sohn et al. (2009):

"[…] *H. maculatus* […] were infected with more than 100 metacercariae per infected fish […] A total of 13 *C*[*lonorchis*] *sinensis* metacercariae were found in 3 out of 10 *Hemibarbus maculatus* examined."

"Metacercariae of *Metagonimus* sp. were detected in 18 species of fish [including *H. maculatus.*] Those of *H*[*aplorchis*] *taichui* were found in 15 fish species, such as […] *H. maculatus* […] *H*[*aplorchis*] *pumilio* metacercariae were detected in 18 fish species, i.e., […] *H. maculatus* […]"

From Okabe (1939):

"Okabe has found the cysts of *Metagonimus yokogawai* in 6 species of fish in North Manchuria, *viz*., […] *Hemibarbus maculatus*."

Threat to Humans

From Froese and Pauly (2016):

"Potential pest [Kottelat 2001a]"

3 Impacts of Introductions

From CABI (2017):

"*H. maculatus* has been recorded to be a serious competitor to and threat for the native benthic fishes, where it is introduced (Kottelat, 2001b). When it was, for example, introduced from the Yangtze River, China in the USSR, it has partially displaced local species (Welcomme, 1988). One of the characteristics of this species that make it a successful invader is the fact that it shows more rapid growth and higher fecundity under introduced compared to native conditions (Rosenthal, 1976)."

4 Global Distribution

Figure 1. Known global established locations of *Hemibarbus maculatus*. Map from VertNet (2016). A location reported in Singapore from the same source is not shown on this map and was excluded because it does not represent an established population.

5 Distribution Within the United States

This species has not been reported as introduced or established in the United States.

6 Climate Matching

Summary of Climate Matching Analysis

The climate match (Sanders et al. 2014; 16 climate variables; Euclidean Distance) was high in the North-Central U.S. and southern Florida. The climate match was medium in the Plains states and along the Atlantic coast as far north as Virginia. Low matches were found in the West, Northeast, and in the Appalachian region. The Climate 6 proportion indicated that the contiguous U.S. has a high climate match. The range of scores indicating a high climate match is 0.103 and greater; the Climate 6 proportion of *Hemibarbus maculatus* was 0.191.

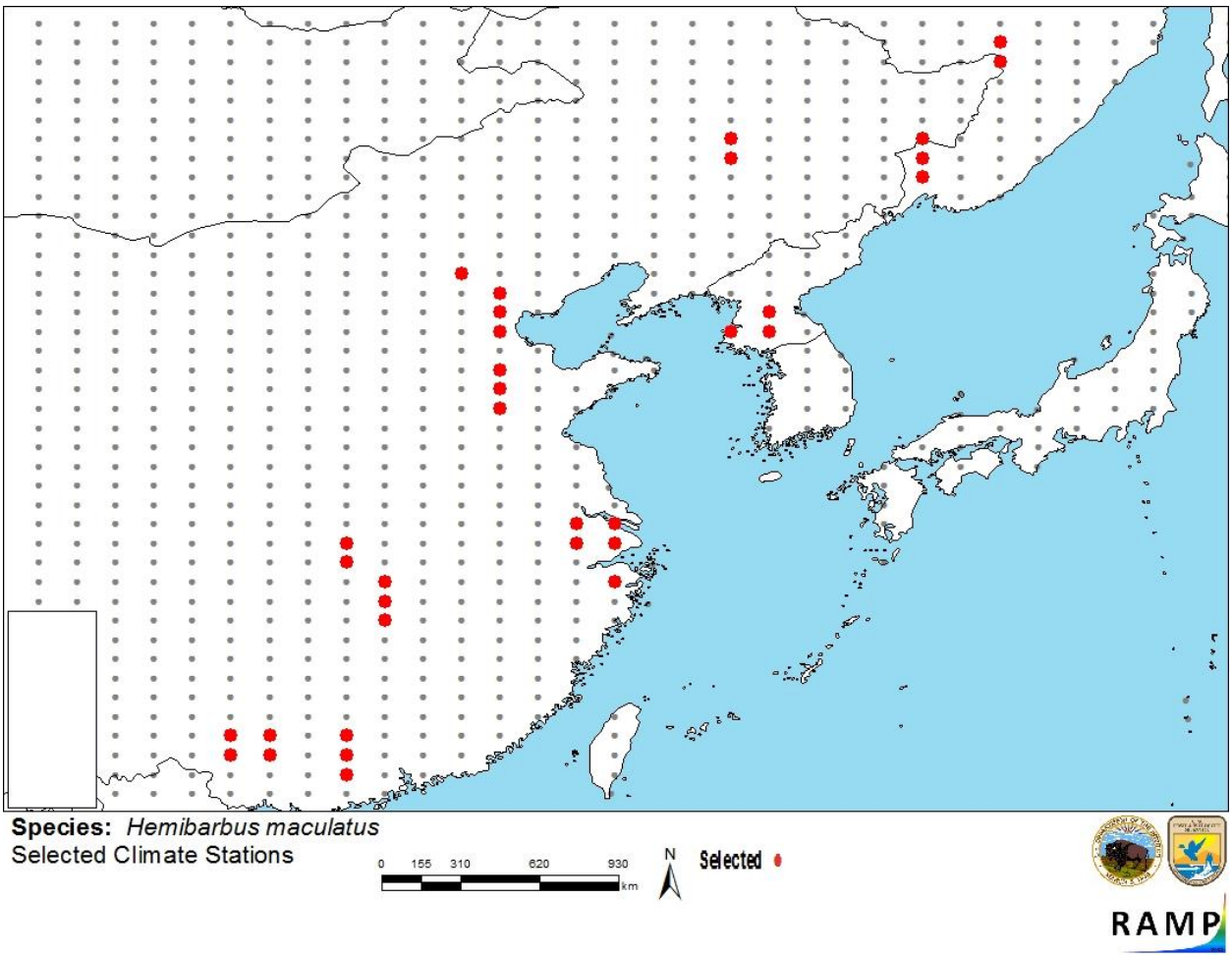

Figure 2. RAMP (Sanders et al. 2014) source map showing weather stations selected as source locations (red) and non-source locations (blue) for *Hemibarbus maculatus* climate matching. Source locations from GBIF (2016) and VertNet (2016).

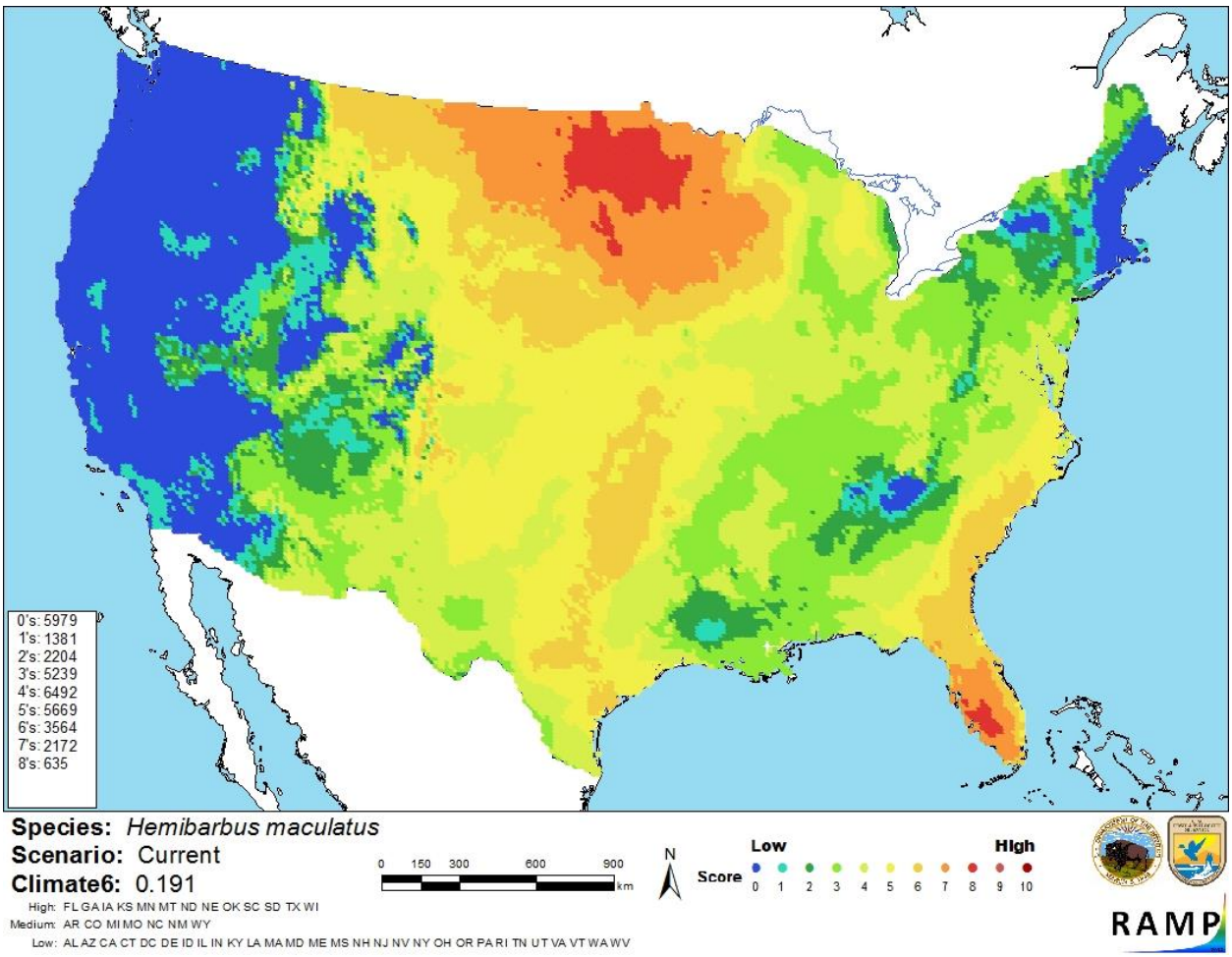

Figure 3. Map of RAMP (Sanders et al. 2014) climate matches for *Hemibarbus maculatus* in the contiguous United States based on source locations reported by GBIF (2016) and VertNet (2016). 0=Lowest match, 10=Highest match. Counts of climate match scores are tabulated on the left.

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

7 Certainty of Assessment

Information is available on the biology and ecology of *Hemibarbus maculatus*, but information on the distribution of *H. maculatus* is scarce, particularly for introduced populations. Impacts of introduction have been cited, but the information is not clear and convincing. Certainty of this assessment is low.

8 Risk Assessment

Summary of Risk to the Contiguous United States

Hemibarbus maculatus is a cyprinid fish native to East Asia, where it is an economically important food fish. *H. maculatus* has been introduced to Laos and Uzbekistan, where impacts of introduction are purportedly negative but clear data are not available to back up such claims. The climate match analysis resulted in a high match for the contiguous United States. Overall risk posed by *H. maculatus* is uncertain.

Assessment Elements

- **History of Invasiveness: None Documented**
- **Climate Match: High**
- **Certainty of Assessment: Low**
- **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.

CABI. 2017. *Hemibarbus maculatus* (spotted steed) [original text by B. Kang]. Invasive Species Compendium. CAB International, Wallingford, U.K. Available: http://www.cabi.org/isc/datasheet/110573. (February 2017).

Froese, R., and D. Pauly, editors. 2016. *Hemibarbus maculatus* Bleeker, 1871. FishBase. Available: http://www.fishbase.se/summary/Hemibarbus-maculatus.html. (February 2017).

GBIF (Global Biodiversity Information Facility). 2016. GBIF backbone taxonomy: *Hemibarbus maculatus* Bleeker, 1871. Global Biodiversity Information Facility, Copenhagen. Available: http://www.gbif.org/species/2365995. (February 2017).

ITIS (Integrated Taxonomic Information System). 2017. *Hemibarbus maculatus* Bleeker, 1871. Integrated Taxonomic Information System, Reston, Virginia. Available: https://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=689204#null. (February 2017).

Okabe, K. 1939. On the trematode cysts of the fresh water fishes in North Manchuria. Fukuoka Acta Medica 32(2):289-296.

Sanders, S., C. Castiglione, and M. Hoff. 2014. Risk Assessment Mapping Program: RAMP. U.S. Fish and Wildlife Service.

Sohn, W.-M., K. S. Eom, D.-Y. Min, H.-J. Rim, E.-H. Hoang, Y. Yang, and X. Li. 2009. Fishborne trematode metacercariae in freshwater fish from Guangxi Zhuang Autonomous Region, China. Korean Journal of Parasitology 47(3):249-257.

VertNet. 2016. VertNet. Available: http://vertnet.org/. (February 2017).

10 References Quoted But Not Accessed

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.

Baensch, H. A., and R. Riehl. 1991. Aquarien atlas, volume 3. Mergus, Verlag für Natur-und Heimtierkunde, Melle, Germany.

Berg, L. S. 1964. Freshwater fishes of the U.S.S.R. and adjacent countries, volume 2, 4th edition. Israel Program for Scientific Translations Ltd, Jerusalem.

Khurshut, E. 2010. Invasive fishes in the Aral Sea basin, arid Central Asia. 17th International Conference on Aquatic Invasive Species (ICAIS 2010), SanDiego. Available: http://www.icais.org/pdf/2010abstracts/Ernest_Khurshut.pdf.

Kottelat, M. 2001a. Fishes of Laos. WHT Publications Ltd., Colombo, Sri Lanka.

Kottelat, M. 2001b. Freshwater fishes of northern Vietnam. A preliminary check-list of the fishes known or expected to occur in northern Vietnam with comments on systematics and nomenclature. The World Bank, Environment and Social Development Unit, East Asia and Pacific Region.

Lu, H.-F., Z.-Q. Li, and M.-J. Fang. 2004. A primary study on the biological characteristics and artificial breeding of *Hemibarbus maculatus* Bleeker in pond. Journal of Zhejiang Ocean University (Natural Science) 23(3):211-213.

Mekong River Commission. 2009. Number of species found rises to 166 in Sekong drainage, 84 in Nam Ou drainage. Catch and Culture 15(3):unpaginated. Available: http://www.mrcmekong.org/Catch-Culture/vol15_3Dec09/number-of-species-found.htm.

Novikov, N. P., A. S. Sokolovsky, T. G. Sokolovskaya, and Y. M. Yakovlev. 2002. The fishes of Primorye. Far Eastern State Technical Fisheries University, Vladivostok, Russia.

Rosenthal, H. 1976. Implications of transplantations to aquaculture and ecosystems. FAO Technical Conference on Aquaculture, Kyoto, Japan, 26 May-2 June 1975. FAO, Rome.

Vo Van, P., T. T. C. Ha , and H. T. Hong. 2006. An assessment of the fish fauna of the Green Corridor Forest Landscape, Thua Thien Hue Province, Vietnam. Green Corridor Project, WWF Greater Mekong, Vietnam Country Programme. Report no. 5. FPD Thua Thien Hue

Province, Vietnam. Available: http://www.huegreencorridor.org/toolkit/English/documents/GCP/GCP_Report5_Fish_EN.pdf.

Welcomme, R. L. 1988. International introductions of inland aquatic species. FAO Fisheries Technical Paper no. 294. FAO, Rome.

Wildlife Conservation Society. 2006. An assessment of exotic species in the Tonle Sap Biosphere reserve, and associate threats to biodiversity, a resource document for the management of invasive alien species.

Yue, P. Q. 1995. A revision of the cyprinid fishes of the genus *Hemibarbus* in China (Cypriniformes: Cyprinidae). Acta Zootaxonomica Sinica 20(1):116-123.