1 Native Range and Status in the United States

Native Range
From Eschmeyer et al. (2018):

“Amazon and Paraguay River basins: Bolivia, Brazil, Ecuador, Paraguay (?) and Peru (?)”

Status in the United States
There are no confirmed records of introduction or establishment of *Metynnis maculatus* in the United States; however, Nico et al. (2018) report that the genus *Metynnis* (species uncertain) is locally established in Florida.
From Nico et al. (2018):

“A member of this genus [Metynnis] was collected in Florida from a lake on Marco Island, Collier County in January, 1980 (FSBC 19822; listed as Metynnis lippincotianus in Courtenay et al. 1984, and as Metynnis sp. in Courtenay and Stauffer 1990 and in Courtenay et al. 1991). A reproducing population was found in Halpatiokee Regional Park Conservation Area in Martin County in 2005, with additional specimens taken in 2006 and 2007 (Shafland et al. 2008; Florida Fish and Wildlife Conservation Commission 2009). In Kentucky, a single fish (originally identified as a piranha and as Metynnis roosevelti) was taken by hook and line from Lighthouse Lake, Louisville, Jefferson County, in the summer of 1981 (Anonymous 1981; Fossett 1981).

“There is considerable confusion surrounding the Kentucky record. In original published accounts, the fish was identified as a piranha, but the scientific name provided was Metynnis roosevelti (= Metynnis maculatus). However, in a photograph of the fish accompanying the newspaper article (Fossett 1981), the specimen actually appears to have a short adipose fin and is probably a pacu, possibly Piaractus brachypomus. The collectors gave the live fish to the Louisville Zoo, where it was kept in aquaria; when the fish later died, it was supposedly not preserved. The Kentucky specimen has been the basis for inclusion of the species in published lists of nonestablished foreign species, with earlier listings identifying it as Metynnis roosevelti (e.g., Courtenay et al. 1984) and later simply as Metynnis sp. (i.e., Courtenay and Stauffer 1990; Courtenay et al. 1991).”

Means of Introductions in the United States
From Nico et al. (2018):

“Records [for Metynnis sp.] mostly likely represent aquarium releases.”

Remarks
From Ota et al. (2016):

“Taxonomic confusion is rife in the literature dealing with Metynnis species. There are 28 nominal species and only around half of them are recognized as valid. The elevated number of synonyms is probably a consequence of the enormous variability of body shape and color pattern, which in turn are highly influenced by ontogeny and sexual dimorphism (Zarske & Géry, 1999; Jégù, 2003; Pavanelli et al., 2009; Ota et al., 2013). As a consequence, there is little information about the phylogenetic relationships among species of Metynnis.”

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing
From ITIS (2018):

“Kingdom Animalia
Phylum Chordata
Subphylum Vertebrata  
Superclass Osteichthyes  
Class Actinopterygii  
Subclass Neopterygii  
Infraclass Teleostei  
Superorder Ostariophysi  
Order Characiformes  
Family Characidae  
Genus Metynnis Cope, 1878  
Species Metynnis maculatus (Kner, 1858)

“Taxonomic Status: valid”

**Size, Weight, and Age Range**
From Froese and Pauly (2017):

“Max length : 18.0 cm TL male/unsexed; [Jégu 2003]”

**Environment**
From Froese and Pauly (2017):

“Freshwater; pelagic; pH range: 6.0 - 7.2; dH range: ? - 10. […] 20°C - 28°C [Baensch and Riehl 1991; assumed to be recommended aquarium water temperature]”

**Climate/Range**
From Froese and Pauly (2017):

“Tropical […]”

**Distribution Outside the United States**
Native
From Eschmeyer et al. (2018):

“Amazon and Paraguay River basins: Bolivia, Brazil, Ecuador, Paraguay (?) and Peru (?)”

Introduced
From Langeani et al. (2005):

“[…] became very common in the reservoirs of the Upper Paraná [southeastern Brazil] after the construction of Itaipu dam, whose waters covered the Salto de Sete Quedas, a natural physical barrier between Upper Paraná and remaining portion of the Paraná-Paraguay system. Despite having a low abundance in the studied stream, all non-native species show a relative dispersion success because they have been registered also in many other streams of the Upper Paraná (Pavanelli and Caramaschi, 1997; Castro et al., 2003; Castro et al., 2004).”
From Freitas Terra et al. (2010):

“The introduced species (Cichla kelberi, Metynnis maculatus, Piaractus mesopotamicus, Plagioscion squamosissimus and Oreochromis niloticus) amounted to 14% of the total number of species when considering all sampled zones [Paraíba do Sul River and Funil Reservoir, Brazil]. In the reservoir, the introduced species amounted to 22% and 23% of the total number of individual fish in zones 2 and 3, respectively. Metynnis maculatus and C. kelberi were the most abundant introduced species in zones 2 and 3, respectively, comprising 70% and 72% of the total number of non-native individuals.”

From Gomes et al. (2012):

“It was introduced one decade ago in the Lajes reservoir, a well preserved 30 km$^2$ impoundment area in south-eastern Brazil, located in the upper slopes of Sea Mountains (southeast Brazilian Coast) and became common in this oligotrophic reservoir.”

From Rocha et al. (2011):

“The most recent inventories of fishes in Tietê River [southeastern Brazil] reservoirs evidenced the occurrence 81 species of fish from which 19 were non-native species. Among these […] 14 were allochtonous [including …] Metynnis maculatus Kner, 1858.”

From Loures and Pompeu (2012):

“We sampled 995 individuals belonging to 4 orders, 11 families, 24 genera and 33 species [near Três Marias Hydroelectric Dam, Minas Gerais, Brazil]. The orders Characiformes (29.8%) and Siluriformes (69.7%) together represented 99.5% of the total capture. Our sample included six migratory species and one exotic to the São Francisco River basin, Metynnis maculatus.”

Alves et al. (2007) report $M.~maculatus$ as introduced in the Paraíba do Sul, Doce, and high Paraná river basins in the state of Minas Gerais, Brazil.

**Means of Introduction Outside the United States**

From Gomes et al. (2012):

“It is becoming widely spread in Brazilian rivers and reservoirs where it has been introduced for sport fishing purposes.”

From Langeani et al. (2005):

“[…] became very common in the reservoirs of the Upper Paraná [southeastern Brazil] after the construction of Itaipu dam, whose waters covered the Salto de Sete Quedas, a natural physical barrier between Upper Paraná and remaining portion of the Paraná-Paraguay system.”
**Short Description**
From Eigenmann (1912):

“Iridescent steel-blue above; opercles very bright orange; lower parts white, tinged with orange; anal [fin] orange in front, fading out behind; margin of caudal [fin] bluish, with a submarginal orange band, rest of caudal [fin] olive; pectorals yellowish.”

**Biology**
From Froese and Pauly (2017):

“This fish feeds on fruits and plants, and in extreme conditions or in captivity, may go for fish, crustaceans or maybe meat, but still are not considered dangerous.”

From Gomes et al. (2012):

“The reproductive period, from August to January, seems to be more associated with the highest water level, increasing temperature and rainfall. […] The reproductive strategy of *M. maculatus* is to produce [a] large number of small eggs.”

**Human Uses**
From Froese and Pauly (2017):

“Fisheries: minor commercial; aquarium: commercial.”

**Diseases**
From Casal et al. (2002):

“Light and electron microscopy studies of a myxosporean, parasitic in the intertubular interstitial tissue of the kidney of the freshwater teleost fish *Metynnis maculatus* Kner, 1860 (Characidae) from the lower Amazon River (Brazil), are described. Based on the morphological differences and specificity of the host, we propose the creation of a new species named *Myxobolus maculatus* n. sp.”

No OIE-reportable diseases have been documented for this species.

**Threat to Humans**
From Froese and Pauly (2017):

“Harmless”
3 Impacts of Introductions

From Gomes et al. (2012):

“The efficient use of the Lajes reservoir, constructed about one century ago, by the non-native *M. maculatus*, which was introduced in this system in the early 1980s, is probably associated with its opportunistic strategy characterized by a long reproductive period, batch spawning, with batches relatively small, small oocytes and body size relatively small. In the Lajes reservoir, *M. maculatus* ranks among the most abundant species (Santos et al. 2008) and seems to be well adapted having occupied empty niches successfully (Herbold and Moyle 1986), forming a population of small-sized fish with high-reproductive compensation.”

From Pereira et al. (2013):

“Among invasive fish species, the characid *M. maculatus* deserves special attention. It is a small (approximately 18 cm), herbivorous fish that is endemic to South America and native to the Paraguay and Amazon Basins (Kullander, 2003). It has been introduced into and is becoming invasive in South America (Langeani et al., 2007), especially in lakes and river branches in Southeast Brazil where it is very well acclimatised [sic]. It is the most frequently caught species in some regions (Langeani et al., 2005; Gomes et al., 2008); however, this fish is not used for human consumption.”
4 Global Distribution

*Figure 1.* Known global distribution of *Metynnis maculatus*. Map from GBIF Secretariat (2017). Occurrences reported in Guyana and Venezuela were excluded from the climate matching analysis because the species is not known to be established in these locations. The easternmost point in Brazil was excluded from the climate matching analysis because of a misidentification (GBIF Secretariat 2017). Georeferenced occurrences were not available for the part of the species range in Ecuador.

5 Distribution Within the United States

There is currently no known distribution of *Metynnis maculatus* within the United States; however, unidentified species of *Metynnis* are listed as locally established in Florida.

6 Climate Matching

**Summary of Climate Matching Analysis**

The Climate 6 score (Sanders et al. 2018; 16 climate variables; Euclidean distance) for the contiguous United States was 0.028, which is medium. The range for a medium climate score is between 0.005 and 0.103. There was a high match in peninsular Florida. Medium matches occurred across the southeastern United States from Virginia to southern Texas, along the southern California coast, and in Arizona near the border with Mexico. The remainder of the contiguous United States had a low match.
Figure 2. RAMP (Sanders et al. 2018) source map showing weather stations selected as source locations (red; Brazil, Bolivia, Colombia, Peru) and non-source locations (gray) for *Metynnis maculatus* climate matching. Source locations from GBIF Secretariat (2017).
Figure 3. Map of RAMP (Sanders et al. 2018) climate matches for *Metynnis maculatus* in the contiguous United States based on source locations reported by GBIF Secretariat (2017). 0=Lowest match, 10=Highest match.

The “High”, “Medium”, and “Low” climate match categories are based on the following table:

<table>
<thead>
<tr>
<th>Climate 6: Proportion of (Sum of Climate Scores 6-10) / (Sum of total Climate Scores)</th>
<th>Climate Match Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.000≤X&lt;0.005</td>
<td>Low</td>
</tr>
<tr>
<td>0.005&lt;X&lt;0.103</td>
<td>Medium</td>
</tr>
<tr>
<td>≥0.103</td>
<td>High</td>
</tr>
</tbody>
</table>

7 Certainty of Assessment

Peer-reviewed literature on the biology, ecology, distribution, and potential invasiveness associated with *Metynnis maculatus* is available but somewhat limited. High abundance of this species, where introduced, suggests possible impacts, but demonstrated impacts to native species and the environment are hard to discern. Assessment of this species is complicated due to uncertain identification of *Metynnis* spp. captured and established in the United States, and the
need for systematic revision of the genus. Based on available data, the certainty of this assessment is low.

8 Risk Assessment

**Summary of Risk to the Contiguous United States**

Spotted metynnis (*Metynnis maculatus*) is a freshwater fish native to the Amazon and Paraguay river basins in South America. *M. maculatus* is used in commercial fisheries and aquariums. While *M. maculatus* is considered invasive in several rivers and reservoirs where it has been introduced, studies supporting this characterization are lacking. Means of introduction for this species include introduction for sport fishing, and movement when reservoirs flood natural barriers to movement. This species is known to have high reproductive potential, and is highly abundant in several locations where it has been introduced. This suggests that there may be ecological and economic impacts, although this is not confirmed in the literature. Given the absence of scientific studies confirming harm to native species, the environment, the economy or human health, history of invasiveness is classified as none documented. The climate match for *M. maculatus* in the contiguous United States is medium, with highest matches in the Southeast and Southwest. There are no known introductions of this species in the United States, but members of the *Metynnis* genus (species uncertain) have been collected beyond their native range in Florida, where their status is listed as locally established. Certainty of assessment is low because of the lack of definitive impacts and the uncertain taxonomy of this genus. Overall risk for this species is Uncertain.

**Assessment Elements**

- **History of Invasiveness (Sec. 3):** None Documented
- **Climate Match (Sec. 6):** Medium
- **Certainty of Assessment (Sec. 7):** 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.


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.


