Amur Sleeper (*Perccottus glenii*)
Ecological Risk Screening Summary

Web Version – September 2014


Photo: © Yuriy Kvach From EOL (2014)

1 Native Range, and Status in the United States

Native Range
From Courtenay (2006):

"Rotan [Amur sleeper, *P. glenii*] is native to freshwater areas of northeastern China and north of North Korea, and is common in the lower to middle portions of the Amur River, its tributaries (Sungari and Ussuri rivers), and Lake Khanka. It is also native to the Tugur River of Siberia, north of the Amur River, which drains into the Sea of Okhotsk, southward to the region of Vladivostok, and the Suifun and Tumannaya rivers (Reshetnikov 2001). Rotan also occurs in freshwater ponds of northwestern Sakhalin, Russian Federation (Nikoforev et al 1989, Pietsch et al. 2001)."

Status in the United States
This species has not been reported in the United States.

Means of Introductions in the United States
This species has not been introduced to the United States.

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing
From ITIS (2012):

"Kingdom Animalia
Phylum Chordata
Subphylum Vertebrata
Superclass Osteichthyes
Class Actinopterygii
Subclass Neopterygii
Infraclass Teleostei
Superorder Acanthopterygii
Order Perciformes
Suborder Gobioidei
Family Odontobutidae
Genus Perccottus
Species Perccottus glenii Dybowski, 1877"

Taxonomic Status: "Valid"

Size, Weight, and Age Range
From Froese and Pauly (2010):

"Max length : 25.0 cm TL male/unsexed; (Baensch and Riehl 1991); max. published weight: 250 g (Reshetnikov 2003); max. reported age: 7 years (Novikov et al. 2002)."

Environment
From Froese and Pauly (2010):

"Freshwater; brackish; demersal."

Climate/Range
From Froese and Pauly (2010):

"Temperate; 15°C - 30°C (Baensch and Riehl 1991); 54°N - 39°N, 106°E - 141°E"

From Grabowska (2011):

"Its present non-native distribution covers the area between 44-63°N; 17-121°E (Reshetnikov 2010).

Distribution Outside the United States

Native

From Froese and Pauly (2010):

"Europe and Asia: Far east of Russia, northeast China, and in northern North Korea (Reshetnikov 2004). Has also been reported from South Korea (Kim et al. 2005)."

Introduced

Latvia, Poland, Western Russia, Hungary, Slovakia, Romania, and Bulgaria (Froese and Pauly 2010.)

Remarks

The Amur sleeper is also known as the rotan.

Means of Introduction Outside the United States

From Grabowska (2011):

"Natural Dispersal (Non-Biotic)

The Amur sleeper has naturally dispersed from several locations since its initial introduction. Reshetnikov and Ficetola (2011) distinguished 13 such dispersal centres for the present non-native distribution range. It is a rather bad swimmer and avoids main river courses; however, large rivers serve as long distance transport corridors downstream during high water levels and especially floods, when they are washed from adjacent oxbow lakes and flood plains, which they often inhabit (Košco et al., 2003; Reshetnikov, 2010; Reshetnikov and Ficetola, 2011)."

"Accidental Introduction

The Amur sleeper has been accidentally introduced several times to many localities with stocking material of herbivorous cyprinids mainly Cyprinus carpio. It seems to be the most probable reason of its appearance in the Vistula and Danube river systems."

"Intentional Introduction

The first specimens were translocated from their natural distribution area, i.e. the far east of Asia to Europe intentionally by a Russian naturalist and later by participants of Amur expeditions. The species is also known to be kept in aquaria (in Moscow in the 1950s it was available on a bird market) and was used as a live bait (Spanovskaya et al., 1964; Reshetnikov, 2004; 2010). Both were probably a source of uncontrolled local introductions by aquarists and anglers."

From Courtenay (2006):

“Reshetnikov (2004) provided a thorough history of the introduction of Rotan to western parts of Eurasia. The first importation of Rotan into Russia occurred in 1912 when a Russian naturalist brought specimens to the Lisiy Nos settlement near St. Petersburg from the Zeya River, a tributary of the Amur River in far eastern Russia. Live specimens were kept in aquaria until 1916 when four were released into a pond where they established. From there they spread to other waters (Makhlin 1990). In 1948, ichthyologists from Moscow State University, involved with an expedition to the Amur River, brought specimens of Rotan to Moscow where they were released into several ponds in Moscow and Moscow Province (Reshetnikov 2004). In years following the scientific expedition to the Amur River, several acclimatization stations were developed in many parts of the former Soviet Union, and Rotan were brought to several of these stations accidentally with shipments of potentially commercial fishes from the Amur basin.”

“Between 1958 and 1961, Rotan arrived at the Akkurgan fish farm in Usbekistan mixed in shipments of Silver Carp (Hyopophthalmichthys molitrix) and Grass Carp (Ctenopharyngodon idella) from China from which they escaped or were released (Vasil’eva and Makeyeva 1988; Welcomme 1988). Rotan originating from a fish farm in Khabarovsk, far eastern Russia, were introduced with young of potentially commercial fishes into Gusinoe Lake in the Lake Baikal basin. Presence of Rotan was also noted at the Ilevsk fish farm in Nizhniy Novgorod Province of Russia in 1970 and 1971 (Kuderskiy 1980). These fish farms and surrounding waters invaded by Rotan are considered the centers of distribution from which this fish was translocated to more western waters of Eurasia and Europe. Rotan was moved by transfers between fish farms and also by anglers who used this fish as bait. Rotan is said to tolerate movement over long distances, and most, probably all, introductions can be attributed to transfers by humans (Reshetnikov 2004).”

Short description

From Froese and Pauly (2010):

“Dorsal spines (total): 6 - 8; Dorsal soft rays (total): 9-11; Anal spines: 1-3; Anal soft rays: 7 - 10. Distinguished from other European freshwater species by the following characters: 2 dorsals with the first with 6-8 simple rays, and the second with 2-3 simple and 8-12 branched rays; no spines on first dorsal; no barbels; pelvics not fused into a disc; no lateral line canals; males during spawning period, develop a hump on nape and become black with bright green spots on body and unpaired fins (Kottelat and Freyhof 2007).”

Biology

From Froese and Pauly (2010):

“Occurs in lentic waters, lakes, ponds, backwaters and marshes with dense underwater vegetation and avoids river stretches with fast and even slow current (Kottelat and Freyhof 2007). Prefers stagnant rivers and bogs (Reshetnikov 2003). Can tolerate poorly oxygenated water and able to survive in dried out or completely frozen water bodies by digging itself into mud where it hibernates. A voracious predatory fish (wide variety of invertebrates, tadpoles and fish) constituting a most serious threat to aquatic fauna wherever it occurs. In small water bodies; known to extirpate almost all other fish species and amphibian larvae. Spawns for the first time at 1-3 years and about 6.0 cm SL. Spawns several potions [sic] of eggs in May to June at 15-20°C. Elongated eggs (3.8 x 1.3 mm) with sticky filaments usually deposited in one row close to water surface on underwater structures such as roots, leaves and others. Males guard the eggs and pelagic larvae (Kottelat and Freyhof 2007)."

Human uses

From Froese and Pauly (2010):

"Fisheries: minor commercial; aquarium: potential."

Diseases

None reported.

Threat to humans

From Froese and Pauly (2010):

"Potential pest."

3 Impacts of Introductions

From Lusk et al. (2004):

"First observed in the Latorica river in Eastern Slovakia in 1998. Within 5 years, it has occupied Latorica, Bodrog and Tisza together with aquatic habitats in their floodplains. Abundant in stagnant or slowly flowing water with aquatic vegetation. Has been implicated in the decrease in populations of native species Umbra krameri, Carassius carassius and Leucaspius delineatus which were abundant in the past through competition for identical habitat requirements."

From Bogutskaya and Naseka (2002):

"Accidentally introduced together with Chinese carp fry. Has partially displaced local species in Tashkent where the species shows a better growth rate and higher fecundity than in native waters (Welcomme 1988). Rapidly expanded its range after introduction and has now widely established self-sustaining populations. This is used as bait, another reason why it is widely distributed in Russia (Reshetnikov 2004). Recorded from the Dniester river. Dissections of specimens collected from Lake Glubokoe Reserve show that they consume a wide range of animal prey (Reshetnikov 2003). They have been causing the decline of macroinvertebrates, non noxious (tadpoles) amphibians and indigenous fish in the area (Reshetnikov 2004, Manteifel and Reshetnikov 2002)."

From Solarz (2005):

"Invaded densely vegetated littoral zone of lakes (particularly shallow), slowly flowing rivers, oxbows, ponds and drying reservoirs. Tolerates oxygen deficit and fluctuations in water temperature. Displaced several species of native fishes."

From Reshetnikov (2003):

"The fish rotan (*Perccottus glenii* Dybowski) was accidentally introduced into European Russia from the Amur River basin. Rotan is capable of colonising small waterbodies - favourable breeding sites of native amphibians. To reveal its influence on the native aquatic fauna, monitoring of small waterbodies has been carried out since 1994 in the region of Lake Glubokoe Reserve (Moscow Province, Russia). The fish's diet includes a wide range of animal species of all trophic levels. Rotan considerably decreases the species richness of aquatic macro invertebrates and larval amphibians. As a rule, most amphibian species (*Triturus cristatus, T vulgaris, Rana temporaria, R. arvalis, R. lessonae*) and the fish *Carassius carassius* failed to breed successfully in ponds inhabited by rotan. In contrast, the toad Bufo bufo bred successfully in such sites because its larvae are distasteful to rotan. Rotan-amphibian interactions are discussed."

From Grabowska (2011):

"Impact Summary

Category	Impact
Environment (generally)	Negative"

"Impact: Economic
Litvinov and O'Gorman (1996) suggest the potential negative influence of Amur sleeper presence in the Selenga River (the Lake Baikal basin) on commercially important fish species such as Siberian roach (Rutilus rutilus lacustris) and Siberian dace (*Leuciscus leuciscus baicalensis*), as these species must now share food resources with Amur sleeper. Siberian roach and Siberian dace together accounted for about 50% of weight of commercial harvest in the Barguzin commercial area (Litvinov and O'Gorman, 1996)."

"Impact: Environmental
<u>Impact on Biodiversity</u>
Amur sleeper is a predator with morphological features that enable hunting of a large variety of aquatic organisms with inclusion of relatively big prey items (Miller and Vasil'eva, 2003). When evaluating the potential impact of this species on ecosystems it might be concluded that several taxonomic groups of native hydrofauna, both macroinvetebrates and vertebrates would be potentially affected by the presence of this new predator. Its diet has been studied mostly in its native range (Sinelnikov, 1976) as well as in some invaded ecosystems in Russia (Spanovskaya et al., 1964; Litvinov and O'Gorman, 1996; Reshetnikov, 2001; 2003; 2008), Slovakia (Košco et al., 2008) and Poland (Grabowska et al., 2009). In all cases the species is reported to be a voracious predator with broad diet, constituting of crustaceans (Cladocera, Copepoda, Malacostraca), larvae and imagos of insects (Ephemeroptera, Odonata, Hemiptera, Diptera,

Trichoptera, Coleoptera), molluscs, fish and even larvae of amphibians (frogs and newts). Effects of the species predation on local aquatic communities in Russia were reported as deteriorative (Spanovskaya et al., 1964; Reshetnikov, 2001; 2003; 2008). Reshetnikov (2001; 2003) revealed that in small waterbodies Amur sleeper depressed populations of macroinvertebrates, as well as other fishes (e.g. Carassius carassius, Leucaspius delineatus), newts (*Triturus cristatus*, *T. vulgaris)* and frogs *(Rana temporaria, R. arvalis, R. lessonae*) that cannot reproduce successfully due to predation pressure, as the result the negative correlation between the presence and abundance of Amur sleeper and species richness of aquatic animals was observed. Long-term studies near Moscow (Spanovskaya et al., 1964) showed that the composition of consumed food changed along with alterations caused by Amur sleeper in local communities of available prey species. After abrupt impoverishment of large invertebrate fauna, and elimination of eggs, larvae and juveniles of crucian carp, tadpoles appeared in the predator's diet and cannibalistic behaviour was noted. This shows Amur sleeper is an effective "switch-predator"."

"Among hunted fish in the Wloclawski Reservoir (Poland) the most prevalent prey were cyprinids: bitterling *Rhodeus sericeus*, bleak *Alburnus alburnus* and roach *Rutilus rutilus* (Grabowska et al., 2009). According to Zaloznykh (1984), Amur sleeper preferred enamoured fish preys as compared to those that possess spines. However, in guts of large individuals from the Wloclawski Reservoir some sticklebacks, and even remains of spiny-cheek crayfish Orconectes limosus were also found in spring, probably because juveniles of unarmoured fish species were not available yet (Grabowska et al., 2009)."

"For some fish species native to central Europe like *Umbra kramerii*, *Leucaspius delineatus*, *Carassius carassius*, *Rhodeus sericeus* and larvae of other species, the Amur sleeper is a real threat not only due to predation but also as regards trophic competition (Košco et al., 2003). It essentially causes them to disappear from the localities invaded by Amur sleeper. Under special concern should be native species of high conservation status like the mud minnow *Umbra krameri* in Slovakia and the swamp minnow *Eupallasella percnurus* in Poland (Wolnicki and Kolejko, 2008) as they show similar microhabitat requirements with Amur sleeper. These endangered and regionally highly endangered species locally suffer from Amur sleeper presence mainly due to predation. Similarly, in the Selenga River (the Lake Baikal basin) the invasion of Amur sleeper is expected to cause population decline of endemic fish species (Siberian roach, *Rutilus rutilus lacustris* and Siberian dace, *Leuciscus leuciscus baicalensis*) through resource competition and predation on their juveniles (Litvinov and O'Gorman, 1996)."

"It is expected that the recent rapid expansion of Amur sleeper in Central European waters will cause a serious threat to local aquatic communities."

"Threatened Species

Species	Conservation Status	Location	Mechanism	Reference
Rhynchocypris percnurus (lake minnow)	IUCN red list: Endangered	Poland	Predation	Wolnicki & Kolejko, 2008
Umbra krameri	IUCN red list:	Slovakia	Competition -	Kosco et al.,

(European mud minnow)	Vulnerable		monopolizing resources, Predation	2008"

"Risk and Impact Factors
<u>Invasiveness</u>
Capable of securing and ingesting a wide range of food
Fast growing
Has a broad native range
Has high reproductive potential
Highly adaptable to different environments
Highly mobile locally
Is a habitat generalist
Proved invasive outside its native range"

"<u>Impact outcomes</u>
Altered trophic level
Modification of natural benthic communities
Modification of nutrient regime
Negatively impacts aquaculture/fisheries
Reduced native biodiversity
Threat to/ loss of endangered species
Threat to/ loss of native species"

"<u>Impact mechanisms</u>
Competition - monopolizing resources
Interaction with other invasive species
Predation"

"<u>Likelihood of entry/control</u>
Difficult/costly to control
Highly likely to be transported internationally accidentally
Highly likely to be transported internationally illegally"

From Courtenay (2006):

"Manteifel and Zhushev (1996), Manteifel and Reshetnikov (2002), and Reshetnikov (2003) have documented that Rotan has serious negative effects on frog tadpoles and juvenile newts through direct predation. In fact, Reshetnikov (2003) noted that in small bodies of water where Rotan was present, most amphibians and a native European fish, Crucian Carp (*Carassius carassius*), failed to reproduce successfully, causing population depressions in Moscow Province, Russia."

"Reshetnikov (2000) also reported that Rotan, introduced to reservoirs that contained only Crucian Carp, eliminated all individuals of that cyprinid species less than 40 mm in length. Shlyapkin and Tikhonov (2001) documented complete elimination of a small cyprinid, Moderlieschen (*Leucaspius delineatus*), from small reservoirs of the upper Volga River following introduction and establishment of Rotan. Nabatov (1914) and Froese and Pauly (2010) listed the species as a potential pest."

4 Global Distribution

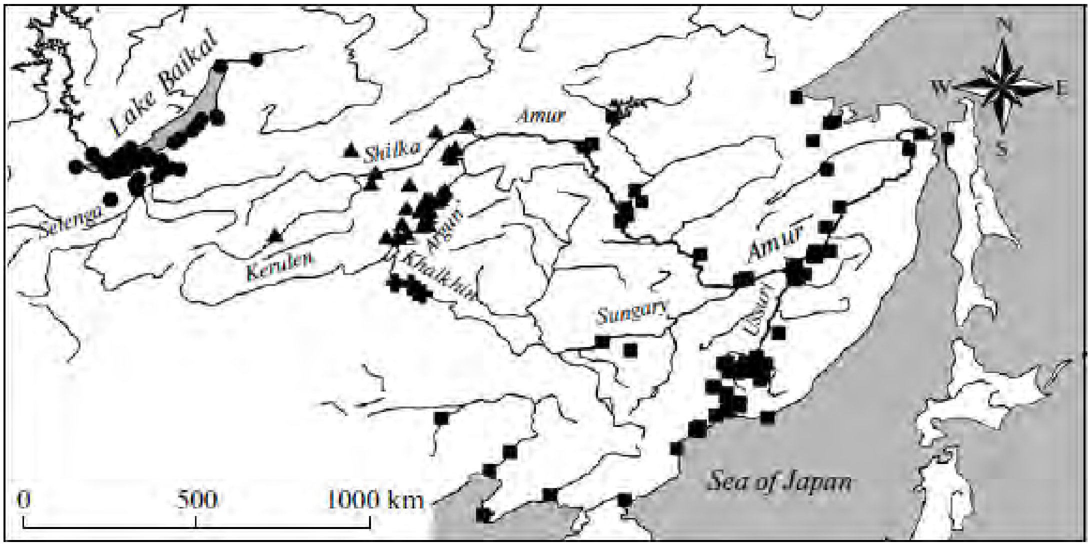

Figure 1 (above). Native range (squares) and some of the introduced locations (triangles and circles) of *P. glenii*. Map from Reshetnikov (2010).

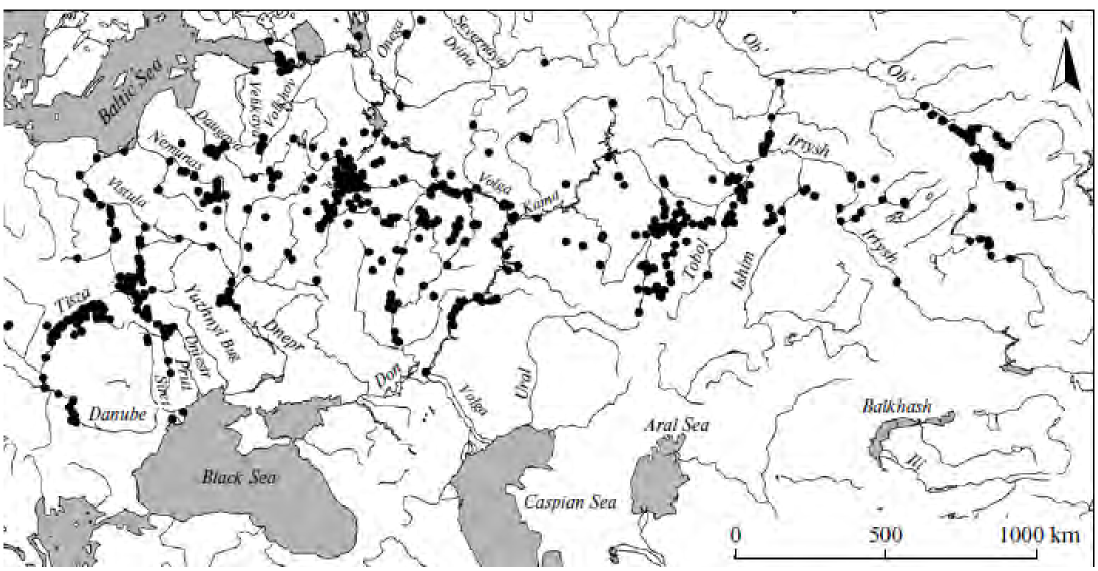

Figure 2 (above). Non-native range of *P. glenii*. Map from Reshetnikov (2010).

5 Distribution within the United States

This species has not been introduced to the United States.

6 Climate Matching

Summary of Climate Matching Analysis

The climate match (Australian Bureau of Rural Sciences 2008; 16 climate variables; Euclidean Distance) was high throughout the Great Lakes and the Mountain West. Climate 6 match indicated that the Continental U.S. has a high climate match. The range for a high climate match is 0.103 and greater, climate match of *P. glenii* is 0.457.

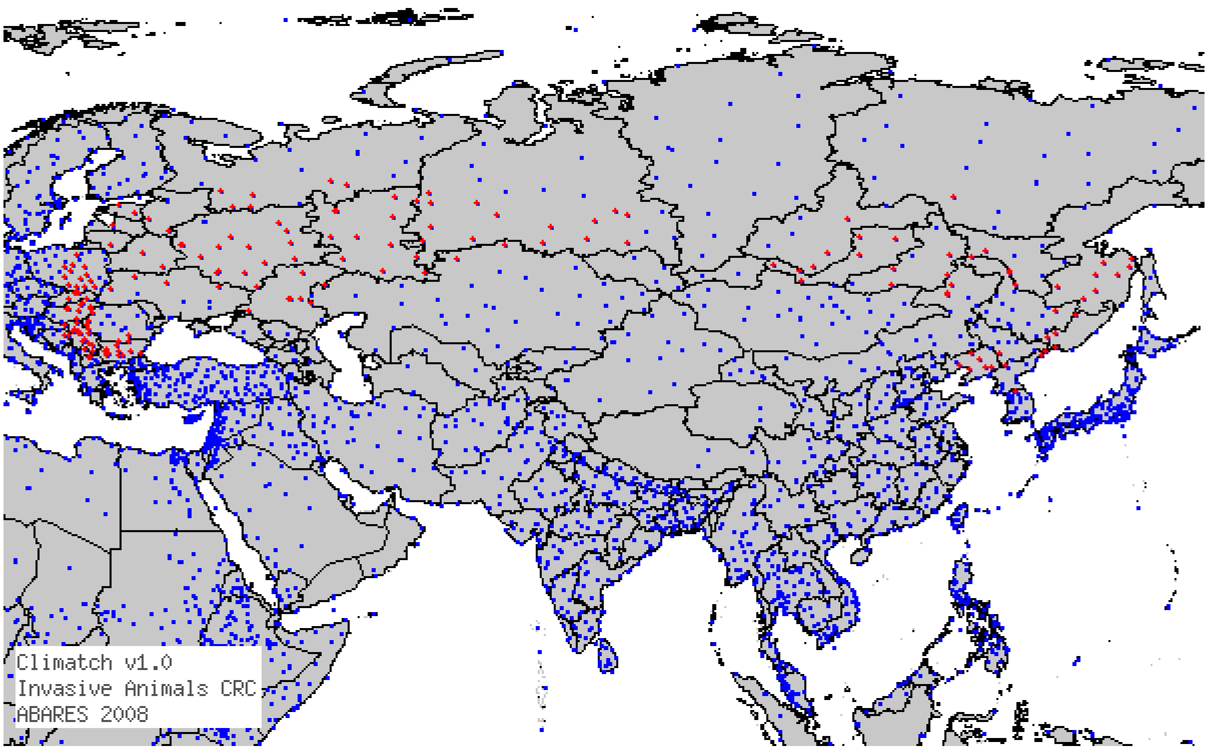

Figure 3 (above). CLIMATCH (Australian Bureau of Rural Sciences 2008) source map showing weather stations selected as source locations (red) and non-source locations (blue) for *P. glenii* climate matching. Source locations from Reshetnikov (2010).

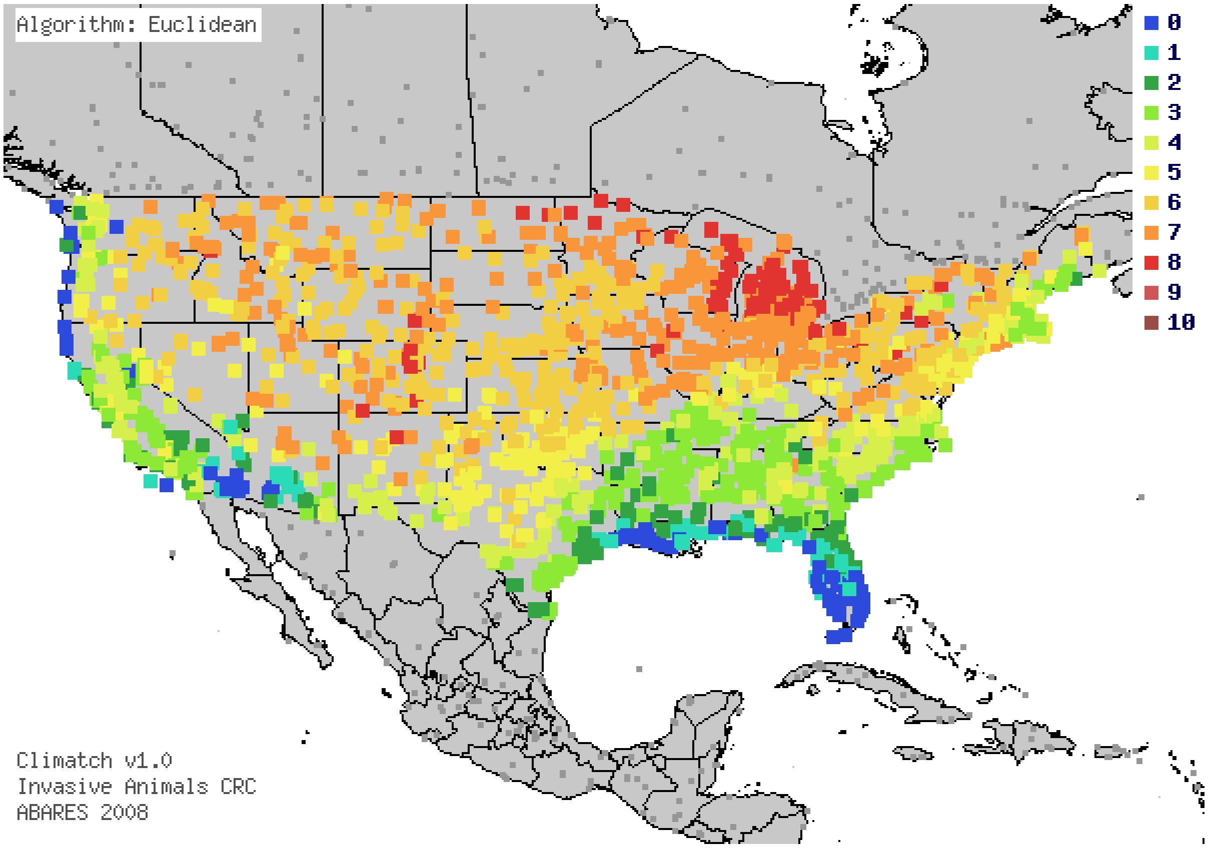

Figure 4 (above). Map of CLIMATCH (Australian Bureau of Rural Sciences 2008) climate matches for *P. glenii* in the continental United States based on source locations reported by Reshetnikov (2010). 0= Lowest match, 10=Highest match.

Table 1. CLIMATCH (Australian Bureau of Rural Sciences 2008) climate match scores

CLIMATCH Score	0	1	2	3	4	5	6	7	8	9	10
Count	96	75	120	291	258	231	444	370	89	0	0
Climate 6 Proportion =		0.457									

7 Certainty of Assessment

Peer-reviewed, published information on this species is abundant, both on its biology and on the impacts caused by introduction of this species. Certainty of this assessment is high.

8 Risk Assessment

Summary of Risk to the Continental United States

Perccottus glenii is native to parts of Russia, China, and North Korea. This species has been introduced both intentionally and unintentionally throughout Central Asia and far Eastern Europe, and will likely become introduced and established in more parts of Europe in the near future. Climate match with the continental United States is high, especially in the Great Lakes and Mountain West states. This species has caused the reduction and displacement of multiple species in multiple freshwater habitats, and may cause changes to the trophic structure of habitats.

Assessment Elements

- **History of Invasiveness(See Section 3):** High
- **Climate Match (See Section 6):** High
- **Certainty of Assessment (See Section 7):** High
- **Overall Risk Assessment Category: High**

Sec. 9 References

Note: References cited within quoted text but not accessed for this ERSS are included in Section 10 below.

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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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