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Edited by Pritpal S. Soorae

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The re-introduction of the Ushimotsugo minnow in Gifu Prefecture, Japan

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Introduction

The Ushimotsugo minnow (*Pseudorasbora pumila* subsp.) is a threatened cyprinid fish endemic to the Tokai region (Gifu, Mie, and Aichi Prefectures) of central Honshu, Japan. Although this fish remains to be taxonomically described, it is recognized as a subspecies, because its color pattern and mtDNA phylogeny clearly differentiate it from the nominotypical subspecies. In the last several decades, most of its habitat (i.e. brooks and swamps) has been destroyed by human activities such as urbanization and improvement of paddy fields. Wild populations are now found in only approximately 10 irrigation ponds scattered in hilly lowlands. The remaining habitats are facing a crisis of environmental changes, including engineering works, accumulation of litter, vegetation succession, and invasion by the alien predators *Micropterus salmoides and Lepomis macrochirus*. Owing to its drastic habitat loss, this species was listed as an endangered species under the Law for the Conservation of Endangered Species of Gifu, Mie, and Aichi Prefectures in 2004 (Gifu & Mie) and 2010 (Aichi). This species was also catalogued as “Critically Endangered” in the Red Data Book of the Environmental Agency of Japan. An on-going re-introduction program aims to restore its habitat in Mino and Seki cities in Gifu Prefecture.

Goals

- Goal 1: To retain all of the wild populations of the Ushimotsugo minnow in Gifu Prefecture.
- Goal 2: To increase restored habitats surrounding each wild population.
- Goal 3: To restore native aquatic fauna, including the Ushimotsugo minnow, in several areas in the cities.

Success indicators

- Indicator 1: Successful captive breeding without inbreeding.
- Indicator 2: Exclusion of alien predators from destroyed habitats.
- Indicator 3: Establishment of re-introduced population in restored habitats.
- Indicator 4: Settlement of native animals, insects, and plants moved from the surrounding areas.

Project Summary

Feasibility: Gifu Prefecture was known to contain only a few habitats of the Ushimotsugo minnow in the 1990s. In the early 1990s, the habitat in the western

areas of the prefecture had already been destroyed by environmental changes, and since then, the captive stock has been maintained in Lake Biwa Museum. A habitat located in the eastern areas of the prefecture has been protected by the local people. In one of the habitats located in the central area, minnow populations were destroyed by the black bass (*Micropterus salmoides*), introduced by anglers. In 2004 - 2005, only 2 habitats existed in the central area of Gifu prefecture: a field survey indicated that most of the potential habitats surrounding these habitats had been invaded and occupied by alien predators, the black bass and the bluegill (*Lepomis macrochirus*). Therefore, the exclusion of alien fishes and re-introduction of minnows were considered necessary to restore the native habitat.

Ushimotsugo minnow
(*Pseudorasbora pumila* subsp.)

Implementation: In central Gifu prefecture, two native habitats were concealed and protected. The local naturalist group “Gifu Mino Ecological Research Group” appealed to other local groups for support in averting the crisis of habitat destruction for the Ushimotsugo minnow. Thus, in 2005, Gifu Prefectural Research Institute for Freshwater Fish and Aquatic Environments, Gifu World Fresh Water Aquarium, local offices of Seki and Mino cities, and Gifu Mino Ecological Research Group formed “The Group for Conservation of Ushimotsugo minnow.” This conservation group bred a minnow stock from one habitat in Seki, Gifu Prefecture. The stock was divided into sub-stocks, and individuals were exchanged between sub-stocks every year to avoid inbreeding. In the autumn of 2005, the conservation group chose a small irrigation pond for restoration and completely drained the pond. The pond had contained many black bass, bluegill, and non-indigenous carps (*Carassius cuvieri* and Chinese carp *Cyprinis carpio*), but no native fish. After exclusion of alien species, the city office made the billboard to announce the Law for Endangered Species of Gifu Prefecture and the Invasive Alien Species Act of Japan, and set the ropes around the pond to stop lure fishing. Breeding Ushimotsugo minnow stock was released, and a conservation program was announced to the public. Monitoring by the local community proved to be effective in preventing illegal poaching of the minnow and illegal release of the black bass. In 2005, the breeding stock was also released into an artificial pond that was inaccessible to the public. In 2006, the

The restored habitat and billboard

conservation group completely drained two other ponds, excluded the alien predators, and re-introduced the minnows.

Post-release monitoring: After the release, the establishment of the minnow populations was monitored. In the first two ponds, satisfactory breeding of the minnow was observed, and the populations were found to increase. However, in one of the ponds open to the public, the population of the non-indigenous crawfish (*Procambarus clarkii*) increased explosively in 2007, because its predator, the black bass, had been excluded. The crawfish can hide in mud; thus, drying the pond was not effective in excluding them. To control the crawfish population, the Gifu Mino Ecological Research Group and local people catch the crawfish every year. Consequently, the number of crawfish has been controlled at a low level since 2008. Although this open habitat has faced invasion by an alien species, this habitat is useful for conservation education. The condition of another pond inaccessible to the public has been better. The minnow population in this pond has become well established, and many native semi-aquatic insects have also settled. However, re-introduction in the two ponds used for the second attempt in 2006 has not yet been successful. In 2011, some native cyprinid and gobid species were observed in these ponds, and the Ushimotsugo minnow had not been found at all.

Major difficulties faced

- A lack of re-introduction sites: Genetic analyses have already indicated that the remaining local populations of the Ushimotsugo minnow were genetically different (Watanabe & Mori, 2008; Mukai, unpublished data). Thus, re-introduction sites must be within the same areas as source populations to avoid genetic disturbance from other areas. In addition, potential habitats, without alien predators within the restricted area, are often valuable for the establishment of endangered aquatic insects and plants. Thus, these habitats need to be reserved for these endangered species, and disturbance by minnow introduction should be avoided. The best places for restoration were habitats invaded by alien predators, but only where they could be successfully removed. Although many invaded ponds were potentially available, the invasive species could be successfully excluded only from a few ponds.
- Prevention of the illegal release of the black bass: Some anglers want to maintain the black bass or other game fish in irrigation ponds. We experienced

problems entailing the illegal release of black bass and other non-indigenous fishes into ponds where aliens had been excluded.

Alien predators - black bass and blue gills caught from a pond in Seki City

- Controlling of the non-indigenous crawfish and bullfrog: The Ushimotsugo minnow can cohabitate with the non-indigenous invasive crawfish (*Procambarus clarkii*) and the American bullfrog (*Rana catesbeiana*). However, the crawfish and bullfrog eat native aquatic insects, amphibians, and plants, and prevent the restoration of native fauna and flora. Furthermore, exclusion of the black bass often caused explosive increases in crawfish and bullfrog populations.
- Competition among native fishes: In the habitat with successfully re-introduced Ushimotsugo minnow, it was the only the fish inhabited and therefore the minnow did not face competition. In the ponds where restoration failed, however, populations of the competitive cyprinid fishes *Zacco platypus* and *Nipponocypris sieboldii* increased and displaced the Ushimotsugo minnow.

Major lessons learned

- Exclusion of invasive alien species is essential for conservation and restoration: Conditions observed for successful re-introduction indicated that invasion of the black bass is a major factor in the destruction of a suitable habitat for the minnow in central Gifu.
- Public awareness is a powerful aid: The re-introduction project had been announced to the local people through newspapers, the public news, and direct interaction. Monitoring by the people was useful in the protection of the restored pond from illegal activity.
- Combining re-introduced native species poses a difficult problem: Although the native Ushimotsugo minnow sometimes coexists with other cyprinids, the successful cases excluded other fishes. If the restored habitat is very large, there is a possibility that the minnow can establish a population in the presence of other native fishes. However, further ecological research should be conducted on the restoration of native fauna, including the Ushimotsugo minnow and other fishes.

Success of project

Highly Successful	**Successful**	Partially Successful	Failure
	√		

Reason(s) for success/failure:

- Captive breeding was successful.
- By using breeding stock, re-introduction of minnow resulted in established populations within two restored habitats.
- One of the restored habitats has been successfully protected by local people.
- Another enclosed re-introduction habitat has become suitable for the minnow and native fauna.

References

Watanabe, K. & Mori, S. 2008. Comparison of genetic population structure between two cyprinids, *Hemigrammocypris rasborella* and *Pseudorasbora pumila* subsp., in the Ise Bay basin, central Honshu, Japan. Ichthyol. Res. 55: 309 - 320