

ADDITION OF THREE CYPRINID FISHES TO THE ESTABLISHED ALIEN FAUNA OF SINGAPORE

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INTRODUCTION

There are presently 40 species of non-native fish species with established populations in Singapore's freshwaters (Baker & Lim, 2008; Ng & Tan, 2010; Yeo & Chia, 2010; Yeo & Lim, 2010). This is a large number considering that the extant indigenous freshwater fish fauna is believed to consist of just 34 species (Baker & Lim, 2008). The introduced fish fauna of Singapore has been, and will continue to be, dynamic. Formerly common species could disappear, such as *Metzia lineata* (see Ng & Lim, 1996 as *Rasborelus lineatus takakii*; Ng & Lim, 1997 as *Rasborelus lineatus*); and previously unrecorded species are likely to surface.

In this article, we report the occurrence of three additional non-native species that appear to have established self-sustaining populations in Singapore. All three belong to the family Cyprinidae, and are native to South and Southeast Asia. They are *Danio albolineata* (the pearl danio), *Rasbora trilineata* (the scissors-tail rasbora), and *Puntius sophore* (the spotfin swamp barb). With these new records, the number of established alien freshwater fish species in Singapore has risen to 43.

MATERIAL AND METHODS

Preserved specimens cited in this article are from the Zoological Reference Collection (ZRC) of the Raffles Museum of Biodiversity Research (RMBR), National University of Singapore, and are catalogued with the prefix ZRC. Sizes of the fish are quoted in millimetres (mm); either in standard length (SL), from tip of snout to base of tail; or in total length (TL), from tip of snout to tip of caudal fin.

RECORDS AND OBSERVATIONS

Danio albolineata (Blyth), the pearl danio

Diagnosis. — Body slender with a blunt snout; lower jaw with symphyseal knob; two pairs of barbels at the mouth, the pair at the corner of the mouth considerably longer and extends to beyond the pectoral-fin base; dorsal fin set on the posterior half of the back, behind the anal-fin origin; dorsal fin with shorter base than anal fin; caudal fin emarginate with round lobes. In life, bluish on the sides with two pink longitudinal stripes on the rear half of the body, the upper stripe broader and more distinct than the lower and extending into the middle of the caudal fin; anal fin with a pink or yellow submarginal stripe. Grows to 40 mm TL (Kottelat & Whitten, 1993; pers. obs.) but apparently capable of attaining 55 mm SL and 60 mm TL in captivity (Sandford, 1995; Cottle, 2010).

Records. — Mandai, streams at Lorong Asrama: two photographed and many more observed by Yeo Suay Hwee on 29 Dec.2007 (Fig. 1); four of 21.5 to 37.1 mm SL collected (ZRC 53162) and many more observed by Kelvin Lim and Yeo Suay Hwee on 18 Sep.2011 (see Fig. 2).

Remarks. — A fairly well-known aquarium fish that is seldom seen in the local market (pers. obs.). The species is a native of Peninsular Malaysia, Thailand, Myanmar, Laos, Cambodia, and Sumatra (Kottelat & Whitten, 1993). In Peninsular Malaysia, *Danio albolineata* is found largely in the northwest including the islands of Penang and Langkawi, to as far south as Selangor (Mohsin & Ambak, 1983). As an aquarium fish, it is undemanding, peaceful, and spawns readily (Cottle, 2010). The many healthy individuals observed by us at Lorong Asrama suggest that the pearl danio has been thriving at that locality at least since 2007. These gregarious fish were observed in the shallow streams (water depth under 15 cm), which flow through scrub vegetation, in rather exposed conditions, together with the introduced Neotropical guppy (Poeciliidae: *Poecilia reticulata*). The guppy inhabits the upper to surface layers of the water column while the pearl danio tends to be benthopelagic.



Fig. 1. *Danio albolineata*, each about 50 mm TL, in a stream at Lorong Asrama, observed on 29 Dec.2007. (Photograph by: Yeo Suay Hwee).



Fig. 2. Lateral view of a specimen of *Danio albolineata* of 37.1 mm SL from Lorong Asrama (ZRC 53162).

Rasbora trilineata Steindachner, the scissors-tail rasbora

Diagnosis. — Body slender with a pointed snout; lower jaw with symphyseal knob; no barbels at the mouth; dorsal fin at the middle of the back, inserted ahead of the anal-fin origin; dorsal and anal fins with short bases; caudal fin forked with round lobes. In life, pale grey with a narrow blackish stripe on the sides of the body; a narrow blackish stripe along the middle of the back; caudal fin with a subterminal black band across each lobe, the black band bordered on both sides by white bands. When the fish swims, each halt in its movement causes the tail fin to splay apart, and each forward movement causes the tail lobes to meet. The black markings exaggerate this scissors-like snipping motion, earning this species its English vernacular name. It grows to >60 mm TL (Kottelat & Whitten, 1993; pers. obs.).

Records. — Bukit Timah Nature Reserve, pond along the Catchment Path at the eastern edge of the Reserve: a thriving population of no less than 20 individuals observed by the authors on 5 Aug.2009 (Fig. 3). Subsequently, four specimens between 19.0 and 27.5 mm SL (ZRC 52131) were obtained by Jake W. J. Lam with a hand-net near the same site, from a stream flowing out of the same pond, on 16 Feb.2011 (Fig. 4).



Fig. 3. Dorso-lateral view of a *Rasbora trilineata* (about 50 mm TL) photographed in-situ at the Catchment Pond, Bukit Timah Nature Reserve, on 5 Aug.2009. Note the conspicuous black blotch on each lobe of the caudal fin. (Photograph by: Tan Heok Hui).



Fig. 4. Lateral view of a freshly preserved 27.5 mm SL *Rasbora trilineata* from the Bukit Timah Nature Reserve (ZRC 52131).

Remarks. — This is a well-known aquarium fish, occasionally seen in the trade. The first record of this species in Singapore was a 25.5 mm SL specimen (ZRC 3210) obtained from a stream at Old Mandai Road in Dec.1964. This specimen was regarded as a doubtful record, most likely an isolated case of discarded aquarium fish (Ng & Lim, 1996; Ng & Lim, 1997). Native to Thailand, Peninsular Malaysia, Sumatra, and Borneo (Kottelat & Whitten, 1993), *Rasbora trilineata*, which is easily observed if present, is believed to be a recently established introduction as the species was not previously reported from Bukit Timah despite extensive surveys of its streams in recent years (see Lim, 1995; Ng & Lim, 1997). Curiously, in Aug.2009, we have noticed the glaring absence of the introduced tiger barb (*Systemus partipentazona*) that used to be plentiful in this same pond along Catchment Path (see Lim, 1995 as *Puntius partipentazona*). It is not known if there is a link between the appearance of the scissor-tail rasbora and the disappearance of the tiger barb, but it does not seem likely for we have noted that both species are sympatric in many river systems in Peninsular Malaysia.

Puntius sophore (Hamilton), the spotfin swamp barb

Diagnosis. — Body ovoid in side view, with lateral line piercing 22–27 scales; mouth terminal with no barbel; dorsal fin with short base and located at middle of back, last dorsal spine with smooth hind margin; caudal fin forked with rounded lobes. Body silver on sides with a black blotch on the centre lower part of the dorsal fin; a large black oval blotch on the caudal peduncle; males with pelvic and anal fins red, hyaline in females; operculum reddish. It attains 13 cm TL (Talwar & Jhingran, 1991).

Records. — 1) Sungei Seletar, stream between the Executive Golf Course of the Upper Seletar Reservoir Park and Upper Thomson Road: one example of 64.9 mm SL (ZRC 41495) was obtained by Robert Teo on 30 Jun.1997; one live example of about 10 cm total length photographed in 1998; and a smaller one seen on 14 May 2004, by Chan Sow Yan. 2) Kranji Reservoir, pond at Kranji Marsh, at the end of Neo Tiew Lane 2: two photographed, several more observed, in the late morning of 22 Mar.2009 by Yeo Suay Hwee; one of about 8 cm TL photographed, several more observed, on the night of 23 May 2009 by Nick Baker (Fig. 5). 3) Sungei Buloh Wetland Reserve, freshwater pond B1: one example of 60.0 mm SL (ZRC 53252) collected by Low Bi Wei on 11 Nov.2011 (Fig. 6).

Remarks. — This species is native to the plains and foothills of Pakistan, India, Nepal, Bangladesh, and Myanmar (Talwar & Jhingran, 1991). It is perceived to have some value as an ornamental fish (Tekriwal & Rao, 1999), but we have never seen it in the aquarium trade in Singapore. Although it does not appear to be locally common, we have little doubt that this species is thriving. Individuals in good condition were seen over a span of about seven years at Upper Seletar Reservoir Park. The stream where the fish were found is linked directly to the Lower Seletar Reservoir. A small population seems to be established at the Kranji Marsh, and most likely in the adjacent Kranji Reservoir.

We have observed that *Puntius sophore* superficially resembles two other locally occurring barbs— the native *Systemus banksi* and the apparently introduced *Systemus rhombeus* (as *Puntius binotatus* in Ng & Lim, 1996)—in having a black blotch on the dorsum. However, the size and position of the black blotches differ in all three. The black blotch on *Puntius sophore* is small and located on the dorsal fin. That of *Systemus rhombeus* is also small but positioned on the back under the dorsal fin. *Systemus banksi* has a large dusky triangular blotch under the dorsal fin. The large black blotch on the caudal peduncle of *Puntius sophore* is absent, or very small on *Systemus banksi* and *Systemus rhombeus*. While *Systemus banksi* and *Systemus rhombeus* have two pairs of barbels at the mouth, these are absent on *Puntius sophore*.



Fig. 5. *Puntius sophore* of about 8 cm TL, photographed in a pond at Kranji Marsh on the night of 23 May 2009. (Photograph by: Nick Baker).



Fig. 6. Lateral view (right side reversed) of *Puntius sophore* of 6 cm SL from the Sungei Buloh Wetland Reserve (ZRC 53252).

DISCUSSION

As with the majority of alien fishes in Singapore, we cannot be sure exactly how the three species came to be present there. For *Rasbora trilineata*, there is, however, a remote possibility for it to have arrived with raw water from across the causeway. Large pipes that run adjacent to the pond where the fish are found carry raw freshwater from Johor where *Rasbora trilineata* is native. The species may have been introduced via water leaked from these pipes. Examples of fish that may have shown up this way are present in Singapore's reservoirs (see Ng & Tan, 2010).

It is not likely for *Danio albolineata* and *Puntius sophore* to have been introduced with raw water, for these two species are not known to be present in southern Peninsular Malaysia. It is also unlikely for them to be derived from discarded individuals of unwanted aquarium pets. This is supported by our observation that *Danio albolineata* is uncommon in the aquarium trade, and we have never seen *Puntius sophore* being sold in the local market. They are more likely to have been deliberately released in considerable numbers by people, but we do not know the criteria for which these two species were selected for release.

The presence of *Rasbora trilineata*, *Danio albolineata*, and *Puntius sophore* does not seem to have any obvious adverse impact on Singapore's native fish fauna. *Puntius sophore* has been found near Seletar Reservoir Park in a stream that drains out of the Nee Soon Swamp Forest (NSSF). The NSSF is inhabited by most of the endangered freshwater fish species in Singapore and is of high conservation value (Ng & Lim, 1997). There is no evidence that *Puntius sophore* occurs in large numbers, and there is no record of this species from within the swamp forest.

Danio albolineata is well established in streams in the Lorong Asrama area which is open scrubland. Our observations of this species in northern Peninsular Malaysia where it is native suggest that it prefers neutral to slightly alkaline water in exposed conditions. Therefore, it would seem unlikely to thrive in the shaded and mildly acidic waters of local forest streams inhabited by most of Singapore's native fish species.

Rasbora trilineata is native to southern Peninsular Malaysia where it occurs together with the very same assemblage of fish species that are present in Singapore's forest streams (pers. obs.). As such, it is not likely to pose as a threat to the native fish fauna. The disappearance of *Systemus partipentazona* at Bukit Timah mentioned earlier is not likely to have been caused by the appearance of *Rasbora trilineata* there.

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LITERATURE CITED

- Baker, N. & K. K. P. Lim, 2008. *Wild Animals of Singapore: A Photographic Guide to Mammals, Reptiles, Amphibians and Freshwater Fishes*. Draco Publishing and Distribution Pte. Ltd. and Nature Society (Singapore). 180 pp.
- Cottle, P. W., 2010. *Danios and Devarios*. P. W. Cottle, Kent, England. ix + 150 pp.
- Kottelat, M. & A. J. Whitten, 1993. *Freshwater Fishes of Western Indonesia*. Periplus Editions Limited. xxxviii + 221 pp., 84 pls.
- Lim, K. K. P., 1995. Fishes. *The Gardens' Bulletin, Singapore, Supplement 3*: 159–163.
- Mohsin, A. K. M. & M. A. Ambak, 1983. *Freshwater Fishes of Peninsular Malaysia*. Universiti Pertanian Malaysia. xvii + 284 pp.
- Ng, H. H. & H. H. Tan, 2010. An annotated checklist of the non-native freshwater fish species in the reservoirs of Singapore. *Cosmos*, **6**(1): 95–116.
- Ng, P. K. L. & K. K. P. Lim, 1996. The freshwater fishes of Singapore. *Journal of the Singapore National Academy of Science*, **22–24**: 109–124.
- Ng, P. K. L. & K. K. P. Lim, 1997. The diversity and conservation status of fishes in the Nature Reserves of Singapore. *The Gardens' Bulletin, Singapore*, **49**(2): 245–265.
- Sandford, G., 1995. *An Illustrated Encyclopedia of Aquarium Fish*. New Burlington Books, London. 256 pp.
- Talwar, P. K. & A. G. Jhingran, 1991. *Inland Fishes of India and Adjacent Countries. Volume 1*. Oxford & IBH Publishing Cp. Pvt. Ltd., New Dehli. xvii + 541 pp.
- Tekriwal, K. L. & A. A. Rao, 1999. *Ornamental Aquarium Fish of India*. TFH Kingdom Books, Waterlooville, England. 144 pp.
- Yeo, D. C. J. & C. S. W. Chia, 2010. Introduced species in Singapore: An overview. *Cosmos*, **6**(1): 23–37.
- Yeo, D. C. J. & K. K. P. Lim, 2010. *Aplocheilus lineatus*, a non-native killifish (Actinopterygii: Cyprinodontiformes: Aplocheilidae) in Singapore. *Nature in Singapore*, **3**: 327–332.