

Rapid Communication

A Southeast Asian species in the Ganges Delta: on spreading extent of non-native croaking gourami *Trichopsis vittata* (Cuvier, 1831) in Bangladesh

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Abstract

The croaking gourami *Trichopsis vittata* (Cuvier, 1831), a small Southeast Asian freshwater fish, has long been a non-native enigma to the ichthyologists and hobbyists of Bangladesh. The species has been seen regularly in the Ganges Delta and exotic fish keepers are well aware of its presence there, although nothing is known about the source of introduction. Its first scientific documentation in Bangladesh only occurred in 2012 and in India in 2015. In this paper, we report observation records of *T. vittata* in Bangladesh through field work, and photographic and literary evidence. From March 2014 to August 2017, 33 confirmed observations were made pinpointing 25 different distribution localities. Plotting observations and localities against time indicated that *T. vittata*, already a proven sturdy invader in Florida, USA, is steadily spreading its range across the deltaic floodplains of Bangladesh.

Key words: distribution, invasive species, non-native species, pet trade, ornamental fish

Introduction

The croaking gourami *Trichopsis vittata* (Cuvier, 1831; Family Osphronemidae) is a small fish of freshwater swamps, floodplains, monsoonal river banks and shallow, stalled canals with vegetation beds (Vidthayanon 2012). The genus *Trichopsis* is an obligate air-breather, lacks a lateral line system and possesses marked filamentation in the pelvic, anal and caudal fins (Rainboth 1996). However, in contrast to all other osphronemids, all *Trichopsis* can produce audible sounds or croaks via specialized vibration of their pectoral fins (Ladich 1998). Despite this, only *T. vittata* has been popularized in the aquarium trade as the “croaking gourami”.

Trichopsis vittata, together with the other two *Trichopsis* (*T. schalleri* Ladiges, 1962 and *T. pumila* [Arnold, 1936]), shares a sympatric distribution concentrated primarily throughout the drainages of Southern Thailand and the lower Mekong tributaries of Indochina (Rainboth 1996; Kottelat 2013). Since its description in Cuvier and Valenciennes (1831), the natural range of *T. vittata* has been extended

westward to the lower Salween River of Myanmar and southward down to the Greater Sunda Islands. This southernmost population requires further taxonomic evaluation (Vidthayanon 2012). Of the three *Trichopsis*, only *T. vittata* has been documented to have non-native populations. Recently, Norén et al. (2017) found *T. vittata* further west in the Ayeyarwady and the Yangon Rivers of Myanmar. Feral establishment of the species has also occurred in the USA (Florida), the Philippines and India (Vidthayanon 2012; Schofield and Pecora 2013; Knight and Balasubramanian 2015).

The species was first found in Bangladesh in 2012 (Hossain et al. 2012). Morphometric and morphometric attributes of feral specimens collected from Bangladesh have been documented (Islam 2014) and it was again reported by Hossain (2014). The International Union for Conservation of Nature (IUCN) Bangladesh (2015) described the species as Least Concern and speculated it would spread across the country. Most recently, Norén et al. (2017) ran a DNA-based study on specimens collected from Bangladesh and Myanmar validating fifteen localities of which six were from Bangladesh.



Figure 1. *Trichopsis vittata* at Site 04: (A) live *T. vittata* in captivity; (B) Habitat of *T. vittata*; (C) *T. vittata* catch (6 February 2014); (D) *T. vittata* catch (9 October 2016). Photo credit: Muntasir Akash.

Sightings of *T. vittata* have not been definitively followed up in Bangladesh. Its source of introduction and pattern of spread in the country are subjects of investigation. Compilation of observation records of the species in Bangladesh is a first step in clarification of these shortfalls, as well as in understanding the significance of its presence in the Ganges.

Methods

In quest of *T. vittata*, multiple expeditionary field visits were conducted from March 2014 to August 2017 in different regions of Bangladesh. Sampling sites were chosen targeting local landing centres and visited at their respective peak market time. This protocol was particularly followed for the rivers around the districts of Dhaka, Munshiganj and Manikganj. Opportunistic encounters during this time were also taken into account and noted. Specimens were caught with push net or collected from fishermen. Samples from vouchered localities have been preserved in 10% formalin and deposited in the Department of Zoology, the University of Dhaka, Bangladesh. A map depicting the localities was prepared with ArcGIS® 10.3.2 software.

All records were considered only after proper evaluation using Rainboth (1996) and valid photographic evidence. From the other two valid species under the genus, *T. vittata* can be separated by its larger size and further elongation of anal fin rays up to the end of caudal fin. *Trichopsis vittata* also possesses more banding and striping. It has three darker horizontal bands, a thin conspicuous line behind the eye and a dark spot above the pectoral fin (Figure 1, spot not visible). This fish has a neon blue ring around eye and an iridescent blue hue in prime condition. Under stress, it exhibits a drab greyish colour.

Results

We encountered 33 observations of *T. vittata* from 25 localities (Figure 2). Details of observational remarks are provided in the Supplementary material Table S1. The presence of *T. vittata* was always associated with nearly stagnant, freshwater habitats marked with zero salinity and rich in submerged and floating vegetation (Figure 1B).

Figure 2 and Table S1 clearly denote the spread of *T. vittata* in Bangladesh over the last four years with a north-eastwardly colonization pattern. River

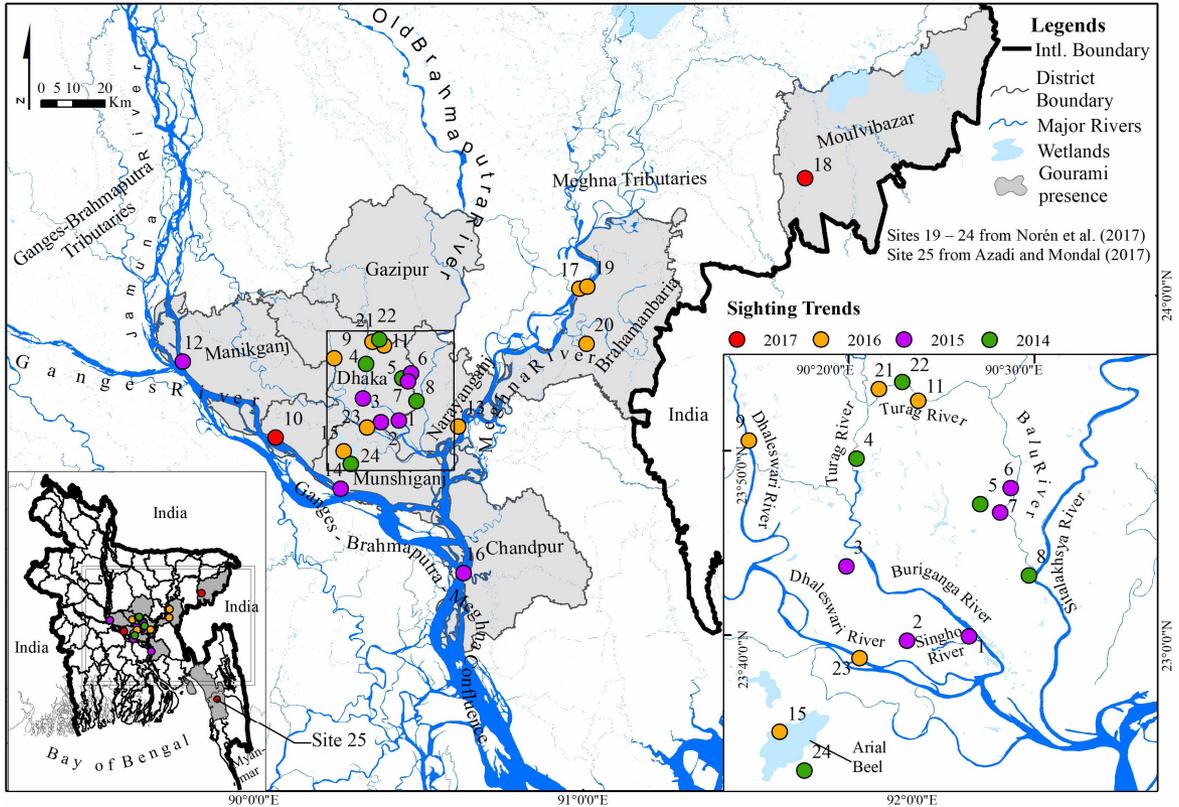


Figure 2. Observation records of *Trichopsis vittata* and its year-wise trend in Bangladesh. Site Codes denote the observational briefs given in Supplementary material Table S1.

drainage systems and waterbodies in and around of the Dhaka district were found infested with the species; Sites 01 to 10 and Sites 21 to 23 fall within its administrative boundary (Figure 2). Sites 11 to 15 and Site 24 falls within districts adjacent to Dhaka to the west and east. Plotting the findings from the current study together with localities mentioned by Norén et al. (2017) revealed that all the five major rivers of Dhaka (i.e., the Buriganga, the Balu, the Dhaleswari, the Turag and the Sitalakhsya) harbour the species resulting in 21 observations and 14 site localities in total (Figure 2). Of the five rivers, *T. vittata* was found in the Turag River consecutively in each year of the study period; pervasiveness was also the highest in this river with eight observations from four localities (Figure 2). Sites 16 to 22 indicated the invasion of *T. vittata* in the Meghna tributaries. Site 18, encountered in 2017, is situated in the Baikka Beel, a wetland of the northeastern region. It is also one of the two most significant observations as the place is a government-declared wildlife sanctuary. Nevertheless, Site 18 is hitherto the northernmost locality of the species.

Though the Meghna tributaries have been breached by *T. vittata*, almost all records were in close vicinity of rivers as depicted by Hossain et al. (2012).

Site 16 from this study seemed to be the southernmost extent of the species' current range, lying at the mouth of the confluence. However, Azadi and Mondal (2017) mentioned the species from farther south (Presence of the species at Site 25) from a runnel viz., Balukhali Chara of the Chittagong University premises of Chittagong district (geo-coordinates not provided by Azadi and Mondal (2017); Table S1, district shaded in Figure 2). Site 25 is strong evidence that the Ganges-Brahmaputra-Meghna confluence might well be breached by *T. vittata* beyond central Bangladesh.

Discussion

There are about 24 exotic fish species found in inland waters of Bangladesh, which largely reside in the floodplains and tributaries of the Ganges Delta (Siddiqui et al. 2007; IUCN Bangladesh 2015). Introduction of exotic aquatics in Bangladesh was either due to aquarium release or caused by

deliberate aquaculture attempts and bio-control efforts for mosquito larvae (IUCN Bangladesh 2015). *Trichopsis vittata* is apparently a newer addition to this list. Additionally, the source of introduction of *T. vittata* in Bangladesh is still an unsolved issue. However, the fish is gradually expanding its range. Norén et al. (2017) discussed prospective causes and mentioned *T. vittata* was most likely an aquarium escapee. However, we did not find the species to be in high demand in the pet market. This is because stress during handling and transportation, induces *T. vittata* to exhibit drab colouration; hence it yields low interest, demand and monetary value. No aquarium trader is known to import the species; neither are there local breeders cultivating the species for commercial purpose. Moreover, there is no mention of the species in the literature dealing with fish introduction pathways in the Indian Subcontinent that dates back to the 1960s (Rahman 1985). We opine that the establishment of *T. vittata* in the country is likely owing to aquaculture acting as an invasion vector.

Lastly, we stress that the northeastern spread of the species, especially in the Baikka Beel Wetland Sanctuary, should be taken as a grave concern. This species is reported to be sturdy and tolerant to salinity and temperature fluctuations (Schofield and Schulte 2016). Knight and Balasubramanian (2015) surmised its negative impact exerted through species competition. Therefore, studying the biology, ecology and inter-species interactions of *T. vittata* across its non-native range in Bangladesh has become an exigency.

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References

Azadi MA, Mondal K (2017) Fin and shell fish diversity and abundance in relation to water quality in a hilly stream (Balukhali Chara) of the Chittagong University campus. In: Book of Abstracts of the 20th International Biennial Conference and AGM of the Zoological Society of Bangladesh, December 9-10,

2017. The Zoological Society of Bangladesh and the Department of Zoology, University of Dhaka, Dhaka, Bangladesh, pp 85
- Cuvier G, Valenciennes A (1831) Histoire naturelle des poissons, Tome 7. F.G. Levrault, Paris, France, 531 pp
- Hossain MAR (2014) Habitat and fish diversity: Bangladesh perspective. In: Wahab MA, Shah MS, Hossain MAR, Barman BK, Hoq ME (eds), Advances in Fisheries Research in Bangladesh: I. Proceedings of the 5th Fisheries Conference & Research Fair 2012. Dhaka, Bangladesh, January 18–19, 2012. Bangladesh Agricultural Research Council, Dhaka, Bangladesh Fisheries Research Forum, Dhaka, Bangladesh, pp 1–26
- Hossain MAR, Wahab MA, Belton B (2012) The checklist of the riverine fishes of Bangladesh. *FAN-Bangladesh 2*: 29–39
- Islam MS (2014) Morphometric, meristic and landmark-based analysis of a rare indigenous Croaking gourami, *Trichopsis vittata*. MS Thesis, Bangladesh Agricultural University, Mymensingh, Bangladesh, 129 pp
- IUCN Bangladesh (2015) Red List of Bangladesh, Volume 5, Freshwater Fishes. IUCN, International Union for Conservation of Nature, Bangladesh Country Office, Dhaka, Bangladesh, xvi+360 pp
- Knight JDM, Balasubramanian S (2015) On a record of two alien fish species (Teleostei: Osphronemidae) from the natural waters of Chennai, Tamil Nadu, India. *Journal of Threatened Taxa* 7(3): 7044–7046, <https://doi.org/10.11609/JoTT.o4135.7044-6>
- Kottelat M (2013) The fishes of the inland waters of Southeast Asia: a catalogue and core bibliography of the fishes known to occur in freshwaters, mangroves and estuaries. *Raffles Bulletin of Zoology* 27: 1–663, <http://zoobank.org/urn:lsid:zoobank.org:pub:0B66AE04-C644-43CD-9B76-043848FAA9FE>
- Ladich F (1998) Sound Characteristics and Outcome of Contests in male Croaking Gouramis (Teleostei). *Ethology* 104: 517–529, <https://doi.org/10.1111/j.1439-0310.1998.tb00087.x>
- Norén M, Kullander SO, Rahman MM, Mollah AR (2017) First records of Croaking Gourami, *Trichopsis vittata* (Cuvier, 1831) (Teleostei: Osphronemidae), from Myanmar and Bangladesh. *Check List* 13: 81–85, <https://doi.org/10.15560/13.4.81>
- Rahman AKA (1985) Introduction of Exotic Fishes in Bangladesh. Fishery Research and Training Centre, Chandpur, Bangladesh, pp 1–16
- Rainboth WJ (1996) Fishes of the Cambodian Mekong - FAO species identification field guide for fishery purposes. FAO, Food and Agricultural Organisation, Rome, Italy, 265 pp
- Schofield PJ, Pecora DJ (2013) Croaking gourami, *Trichopsis vittata* (Cuvier, 1831), in Florida, USA. *BioInvasions Records* 2: 247–251, <https://doi.org/10.3391/bir.2013.2.3.12>
- Schofield PJ, Schulte JM (2016) Small but tough: What can ecophysiology of croaking gourami *Trichopsis vittata* (Cuvier, 1831) tell us about invasiveness of non-native fishes in Florida? *NeoBiota* 28: 51–65, <https://doi.org/10.3897/neobiota.28.5259>
- Siddiqui KU, Islam MA, Kabir SMH, Ahmad M, Ahmed ATA, Rahman AKA, Haque EU, Ahmed ZU, Begum ZNT, Hasan MA, Khondker M, Rahman MM (2007) Encyclopedia of Flora and Fauna of Bangladesh, Volume 23, Freshwater Fishes. Asiatic Society of Bangladesh, Dhaka, Bangladesh, 300 pp
- Vidthayanon C (2012) *Trichopsis vittata*. The IUCN Red List of Threatened Species 2012: e.T187906A1833853, <https://doi.org/10.2305/IUCN.UK.2012-1.RLTS.T187906A1833853.en>

Supplementary material

The following supplementary material is available for this article:

Table S1. A summary of the observations of *Trichopsis vittata* from 2014 to 2017.

This material is available as part of online article from:

http://www.reabic.net/journals/bir/2018/Supplements/BIR_2018_Akash_Hossain_Table_S1.xlsx