

POECILIID RESEARCH

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First record of *Poecilia reticulata* Peters, 1859 (Cyprinodontiformes, Poeciliidae) from natural freshwaters of Iran

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Abstract. Guppy - *Poecilia reticulata*, a highly invasive species, is recorded for the first time from natural freshwaters of Iran. *P. reticulata* was probably introduced into Iran as an aquarium fish, but is now established in the natural water bodies of Kashan city in Isfahan basin.

Key Words: guppy, livebearer, aquarium, exotic fish, Isfahan basin.

Introduction. Introductions of fish species into Iranian water bodies dates back a long time but were most prominent in the 1920s when the mosquitofish, *Gambusia holbrooki* (Poeciliidae) was introduced as an anti-malarial Agent (Esmaeili et al 2010). Since then, about 32 species in 10 orders and 12 families have been introduced to Iranian inland waters, which are about 14.7% of its ichthyofauna (Esmaeili et al 2014). Aquaculture, sport fishing, control of malaria, research and accidental introductions have been the main reasons for these introductions (Coad 1996; Esmaeili et al 2007). Recent investigations show that the numbers of exotic species are increasing (Coad 2014).

Poeciliids, including the livebearers, are found in fresh and brackish waters from the eastern United States south through the Caribbean to northeastern Argentina and in Africa (Nelson 2006). Two species of livebearers viz. mosquitofish (*G. holbrooki*) and swordtail (*Xiphophorus hellerii*) have been introduced to Iranian interior waters as a control agent for malaria and released aquarium species, respectively (Esmaeili et al 2010; Coad 2014).

Livebearers are an important group of relatively small and often colorful aquarium fishes. The family Poeciliidae comprises about 37 genera and about 304 species (Nelson 2006). The Poeciliid genus *Poecilia* with 40 recognized species (Nelson 2006) is native to fresh, brackish and salt water in the Americas, and some species in the genus are euryhaline. One of the most important species in livebearers ornamental fish culture is the guppy - *Poecilia reticulata*, which is one of the world's most widely distributed tropical fish, and one of the most popular freshwater aquarium fish species. *P. reticulata* is a highly adaptable fish and thrives in many different environmental and ecological conditions (Magurran 2005). Guppies have been introduced to many different countries on every continent except Antarctica (Froese & Pauly 2014). This exotic fish observed for the first time from natural water bodies of Iran.

Material and Method. The *P. reticulata* specimens were collected by hand-net during fieldwork in the Esfahan basin, central Iran on 31 October 2014 (Figure 1). The habitat is Soleiman spring in Kashan city (33°56'44"N, 51°22'23"E 1041), Esfahan Province, Iran. The specimens were preserved in 10% formalin after anesthetizing with 1% clove solution and transferred to laboratory for further processing. Species *Capoeta aculeata* and *X. hellerii* were also collected during sampling.

A total of 23 morphometric features were measured by using a caliper to the nearest 0.1 mm including: total length (TL), standard length (SL), head length (HL), head depth, pre-dorsal distance, postdorsal distance, body depth, pre-anal distance, caudal peduncle length, caudal peduncle depth, caudal fin length, dorsal fin length, dorsal fin height, anal fin length, anal fin height, pectoral fin length, ventral fin length, pecto-ventral distance, ventral-anal distance, snout length, eye diameter, postorbital length and head depth. The percentage ratios of morphometric characters in relations to SL and HL were analyzed. Six meristic characteristics of the specimens including dorsal, anal, pectoral, ventral, and caudal fins branched rays and scales on lateral line were counted using a stereomicroscope. Methods for taking counts and measurements follow Hubbs & Lagler (1958).



Figure 1. Site of introduced guppy *Poecilia reticulata* in Iran (Kashan, Isfahan basin, in central Iran) (modified from Esmail et al 2014).

Results and Discussion. The collected specimens were characterized by an anteriorly pointed and compressed body, a depressed head, large cycloid scales on the head and body, a large dorsal fin, and a small and terminal mouth with a lower projecting jaw (Figure 2). Sexual dimorphism is clear in adult specimens as males have a developed gonopodium, a specialized reproductive fin found only in male fish (Mousavi-Sabet et al 2012). Morphometric and meristic characters of the collected specimens are given in Table 1. According to the wide distribution of *G. holbrooki* in Iranian water basins and its record from Soleiman spring (Esmaili et al 2010), we compared the caught fish which we identified it as *P. reticulata* with *G. holbrooki* (Figure 3), which are obviously different. *P. reticulata* is easily distinguished from *G. holbrooki* by its colorful body and caudal fin in males (Figure 4).

It seems that *P. reticulata* was introduced into Iran as an aquarium fish, but is now established in at least one natural habitat in Soleiman spring, in Kashan. Kashan city is the largest center of livebearer ornamental fish production in Iran with more than 1500 farms that produce more than 40% of ornamental fishes in Iran (Iranian Agriculture Department of Kashan 2014).

P. reticulata from sampling station showed a restricted distribution and established breeding populations, acting as invaders. This species may have negative impact on native fish populations such as *C. aculeata* through competition, habitat changes, and introduction of parasites and diseases (Esmaili et al 2010; 2014).



Figure 2. *Poecilia reticulata*: above - male, below - female; Iran, Esfahan basin, Soleiman spring.



Figure 3. *Gambusia holbrooki*: above - male, below - female; Iran, Tigris River basin.



Figure 4. Male specimen: above - *Gambusia holbrooki*, Iran, Tigris River basin;
below - *Poecilia reticulata*, Iran, Esfahan basin.

Table 1

Morphometric and meristic characteristics (Mean \pm SD) of *Poecilia reticulata* from Soleiman spring in Kashan city, Esfahan basin (SD = Standard Deviation; number of specimens: 22 males and 16 females)

Character	Mean \pm SD		Character	Mean \pm SD	
	Female	Male		Female	Male
TL (mm)	52.4 \pm 19.6	44.2 \pm 1.7	Pectoral fin length	18.9 \pm 4.0	11.8 \pm 1.6
SL (mm)	41.6 \pm 16.1	35.1 \pm 1.4	Ventral fin length	15.6 \pm 2.4	14.4 \pm 2.1
<i>Standard length (%)</i>			Pectoventral distance	20.6 \pm 4.6	14.0 \pm 1.4
Head length	21.2 \pm 2.0	23.1 \pm 1.0	Ventral-anal distance	19.9 \pm 3.9	10.9 \pm 2.3
Head depth	11.8 \pm 1.9	12.8 \pm 1.7	<i>Head length (%)</i>		
Pre-dorsal distance	63.1 \pm 1.7	57.0 \pm 1.7	Snout length	22.6 \pm 1.5	24.6 \pm 1.0
Post-dorsal distance	29.7 \pm 4.1	37.2 \pm 2.5	Eye diameter	30.8 \pm 1.6	36.6 \pm 4.9
Body depth	32.2 \pm 1.7	29.8 \pm 1.9	Postorbital length	53.6 \pm 2.9	45.0 \pm 3.2
Pre-anal distance	63.2 \pm 1.5	52.4 \pm 2.4	Head depth	55.4 \pm 1.8	55.1 \pm 2.3
Caudal peduncle depth	15.9 \pm 1.3	18.6 \pm 1.1	<i>Meristic counts</i>		
Caudal peduncle length	32.9 \pm 1.1	43.5 \pm 2.3	Dorsal fin branched rays	6.8 \pm 0.4	6.4 \pm 0.5
Caudal fin length	26.8 \pm 4.3	30.0 \pm 3.2	Anal fin branched rays	6.2 \pm 0.4	5.4 \pm 0.6
Dorsal fin length	8.6 \pm 2.2	7.9 \pm 1.3	Pectoral fin branched rays	12.2 \pm 0.4	11.8 \pm 0.5
Dorsal fin height	17.2 \pm 2.4	19.5 \pm 2.1	Ventral fin branched rays	5.8 \pm 0.5	5.8 \pm 0.4
Anal fin length	8.6 \pm 0.9	7.9 \pm 1.7	Caudal fin branched rays	20.0 \pm 0.2	20.0 \pm 0.1
Anal fin height	17.9 \pm 1.4	20.7 \pm 3.2	Scales on lateral line	30.1 \pm 0.2	31.0 \pm 0.7

Conclusions. *P. reticulata*, like the other introduced species, may cause harm to native fishes because of its ability to reproduce rapidly. As the introduction of exotic fishes may affect populations of native fishes through predation, competition, habitat changes, genetic changes, and introduction of parasites and diseases, special care should be taken to prevent such introductions. Eradication programs can be successful in the case of *P. reticulata*. Since, there is a possible chance of success because of the have yet very limited distribution. However, such programs have to be accompanied by a public awareness campaign to ensure that the aquarium trade and hobbyists do not release these pet fishes into natural habitats.

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References

- Coad B. W., 1996 Exotic fish species in the Tigris-Euphrates basin. *Zoology in the Middle East* 13: 71-83.
- Coad B. W., 2014 Freshwater fishes of Iran (Available at <http://www.briancoad.com>) (accessed on 15 November 2014).
- Esmaili H. R., Teimori A., Gholamhosseini G., 2007 Freshwater ichthyodiversity and its conservation in Iran. XII European Congress on Ichthyology, Cavata (Dubrovnik), Croatia, pp. 200-201.
- Esmaili H. R., Gholamifard A., Teimori A., Baghbani S., Coad B. W., 2010 *Xiphophorus hellerii* Heckel, 1848 (Cyprinodontiformes, Poeciliidae), a newly introduced fish recorded from natural freshwaters of Iran. *Journal of Applied Ichthyology* 26: 937-939.
- Esmaili H. R., Teimori A., Owfi F., Abbasi K., Coad B. W., 2014 Alien and invasive freshwater fish species in Iran: diversity, environmental impacts and management. *Iranian Journal of Ichthyology* 1(2): 61-72.

- Froese R., Pauly D., 2014 FishBase (Available at <http://www.fishbase.org>) (Accessed on 11 November 2014).
- Hubbs C. L, Lagler K. F., 1958 Fishes of the Great Lakes Region. University of Michigan Press, Ann Arbor, 213 pp.
- Iranian Agriculture Department of Kashan, 2014 Production of Kashan - Fisheries and animal husbandry section (Available at <http://www.agri-kashan.ir>) (Accessed on 02 November 2014).
- Magurran A. E., 2005 Evolutionary ecology: the Trinidadian guppy. New York: Oxford University Press, 224 pp.
- Mousavi-Sabet H., Langroudi H. F., RohaniRad M., 2012 Sex reversal, mortality rate and growth of guppy (*Poecilia reticulata*) affected by 17-alpha methyltestosterone. *Poec Res* 2(1):1-8.
- Nelson J. S., 2006 Fishes of the world. 4th edition, John Wiley and Sons, Inc., New Jersey, USA, 624 pp.

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