

## Distribution of *Aphanius dispar dispar* (Rüppell, 1829) populations in Iran, with a new record from western Iran (Actinopterygii: Cyprinodontidae)

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**Abstract:** The distribution of *Aphanius dispar dispar* (Rüppell, 1829) populations in Iran, which are mostly known from the eastern and southern parts of the country, and a new population in western Iran about 50 km northwest of Ilam City and 20 km east of the Iran–Iraq border are recorded. The habitat is an odd environment with sulfide water in a remote area. This is the first report of a population of this species in western Iran and at a latitude this high within its distribution range.

**Key words:** Cyprinodontiformes, Ilam, killifish, Middle East, toothcarp

*Aphanius dispar* was originally described from India in streams at the villages of Joorun and Lodai (Coad, 2012). Initially, the Iranian populations were regarded as *Aphanius dispar stoliczkanus* (Day, 1872) in all basins but the Tigris River Basin. The populations in the Tigris Basin were considered *Aphanius dispar richardsoni* (Boulenger, 1907) by Berg (1949). Villwock et al. (1983) and Wildekamp (1993) limited the latter to the Dead Sea Valley of Jordan, and Krupp (1983) regarded *Cyprinodon stoliczkanus* as a synonym of *Aphanius dispar dispar*. Berg (1949) placed Bampur River (Baluchestan) populations in this subspecies as a southern representative of *Aphanius dispar stoliczkanus* (Coad, 2012). Currently, all populations in Iran are regarded as *A. dispar dispar* (Keivany et al., 2011; Coad, 2012). Some meristic variations and the distribution of several populations of this species were studied in southern Iran in 2004

by Keivany et al. (2011). A new genus was proposed for this species, *Aphaniops* Hoedeman, 1951, based on the absence of a dermal sheath around the anterior anal fin rays and the presence of 8–9 dorsal fin rays and 7–8 pelvic fin rays in contrast to the 10–14 dorsal fin rays and 5–7 pelvic fin rays in *Aphanius*; however, this has not been generally accepted (Coad, 2010).

Breeding males of this species are brown-grey with shiny blue flank spots and brown to light orange or light blue, irregular, narrow bars. The anterior belly is blue with pearl spots. The dorsal fin is spotted light blue on a bright orange background and is barred. The caudal fin is barred with 2–3 alternating dark and light blue bars. Outside the breeding season, males are less brightly colored. Females are grey to silvery in color with 8–20 narrow bars on the flank and a dark brown stripe on the back. Dorsal and anal fins are much longer in males, reaching the caudal fin when

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appressed. Their protrusible jaws bear tricuspid teeth. The body is covered by large cycloid scales and the lateral line is indistinct. The caudal fin is truncated to rounded. They reach 8 cm in total length (Carpenter et al., 1997), and sexual maturity is attained at about 3 cm in the first year. Reproduction occurs throughout the year (with a peak in May–July) in areas with some water flow and plants or algae-encrusted rocks. Fecundity is up to 73 mature eggs, each 2.2 mm in diameter (Shafi and Shalli, 1986). Males defend a territory against other males and display fin erection if approached (Haas, 1982). The fish is omnivorous, but food is predominately filamentous algae, diatoms, copepods, rotifers, insects, and detritus (Younis et al., 2001).

Sartang-e Bijar is a short river originating in the Zagros Mountains. After running for about 20 km it enters Iraqi wetlands and finally reaches the Tigris River. The collection was made as part of a joint project of the Iran Environmental Protection Organization and Isfahan University of Technology, collection permission being granted by the former (No. 32/15827). A total of 101 specimens of *A. d. dispar* (Figure 1) were collected using a deep net with a 2-mm stretched mesh size; 20 specimens of each sex were used for the morphological study. The specimens were anesthetized with 1% clove oil solution, fixed in 10% formalin, and after a few days transferred to 70% ethanol. Collected specimens were cataloged in the fish collection of Isfahan University of Technology (IUT13880409-044-01). The procedures of Coad (1988; 1996) were followed for counts and



Figure 1. A pair of *A. d. dispar* individuals captured in Sartang-e Bijar River, Ilam, Iran.

measurements. Measurements were taken point to point by digital caliper with an accuracy of 0.01 mm.

As a result of our investigation in July 2009, some specimens of *A. d. dispar* were found in a stream about 50 km northwest of Ilam City and 20 km east of the Iran–Iraq border (45°51'48"E, 33°41'24"N). The collection site, about 335 m above sea level, had relatively fast water flow over an algae-encrusted rocky bed (Figure 2). No other species coexist with *A. d. dispar* in this locality.

The meristic characters of the studied specimens are shown in the following Table. All the meristics are in the range observed in other populations of *A. d. dispar*. The specimens ranged from 26.70 to 52.72 mm in total length. This species is distributed in almost all of the river estuaries of the Tigris to Makran basins that drain to the Persian Gulf and the Sea of Oman (Arvand Rud, Zohreh, Hendijan, Shapur, Dalaki, Helleh, Mond, Kul, Hasan Langi, Minab, Jagin, and Bahu Kalat rivers), the endorheic Jazmurian (Halil and Bampur rivers) and Mashkil basins, and Qeshm Island (Figure 3). However, this is the first report of a collection of this species in western Iran and at a latitude this high within its distribution range. This subspecies has been recorded from neighboring Pakistan, Arab countries on the southern Persian Gulf coasts, and Iraq (Coad, 2010). It has not yet been recorded from Turkey, as it is not included in Wildekamp et al. (1999); however, with more extensive field work it may be possible to find it there.



Figure 2. The collection site of *A. d. dispar* at Sartang-e Bijar River, Ilam, Iran.

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Table. Meristic characters of 20 male and 20 female specimens of *A. d. dispar* collected from Sartang-e Bijar, Ilam, Iran.

Character	Sex	Range	Mean $\pm$ SD
Total length (mm)	♂	26.70–39.76	31.74 $\pm$ 3.07
	♀	30.73–52.72	35.02 $\pm$ 4.53
Dorsal fin rays	♂	9–10	9.15 $\pm$ 0.37
	♀	9–10	9.30 $\pm$ 0.47
Anal fin rays	♂	9–10	9.80 $\pm$ 0.41
	♀	9–10	9.90 $\pm$ 0.31
Pectoral fin rays	♂	13–14	13.40 $\pm$ 0.50
	♀	13–15	13.65 $\pm$ 0.67
Pelvic fin rays	♂	7	7.00 $\pm$ 0.00
	♀	7	7.00 $\pm$ 0.00
Caudal fin rays	♂	14–15	14.30 $\pm$ 0.47
	♀	14–15	14.45 $\pm$ 0.51
Lateral series scales	♂	31–32	31.7 $\pm$ 0.66
	♀	31–32	31.60 $\pm$ 0.68
Scales between lateral series and dorsal fin	♂	4–5	4.10 $\pm$ 0.31
	♀	4–5	4.10 $\pm$ 0.31
Scales between lateral series and anal fin	♂	6–7	6.10 $\pm$ 0.31
	♀	4–6	6.15 $\pm$ 0.37
Predorsal scales	♂	14–16	15.6 $\pm$ 0.60
	♀	14–16	15.6 $\pm$ 0.60
Caudal peduncle scales	♂	14–18	16.2 $\pm$ 1.11
	♀	15–16	15.7 $\pm$ 1.34
Gill rakers	♂	16–22	17.95 $\pm$ 2.06
	♀	16–22	18.70 $\pm$ 1.84
Flank bars	♂	8–12	9.1 $\pm$ 1.33
	♀	6–9	7.87 $\pm$ 0.92

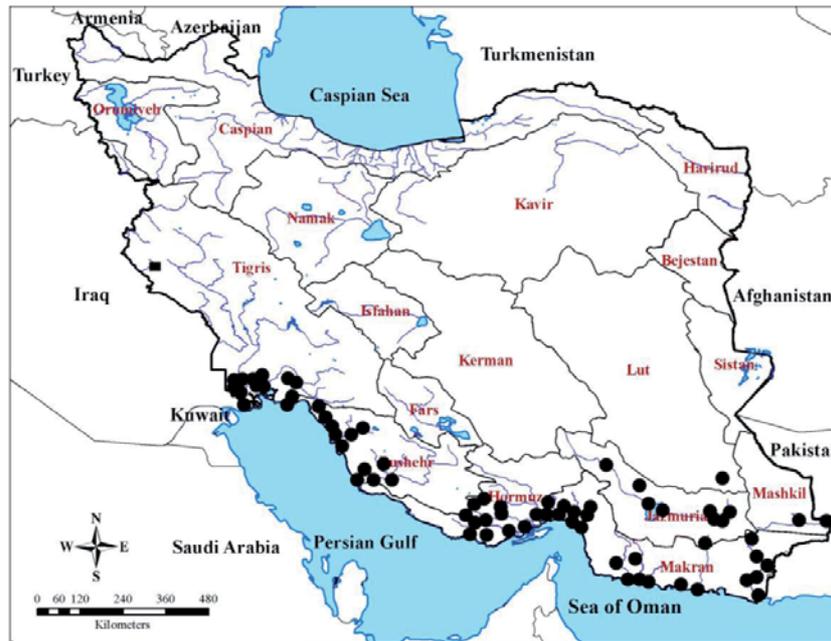


Figure 3. Distribution map of *A. d. dispar* in Iran according to basins. Circles are previously known localities; the square corresponds to the new record locality near the Iran–Iraq border.

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