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## Original Article

### Threatened fishes of the world: *Paracobitis vignai* Nalbant and Bianco, 1998 (Nemacheilidae)

Hamed Mousavi-Sabet\*<sup>1</sup>, Keyvan Abbasi<sup>2</sup>, Saber Vatandoust<sup>3</sup>, Soheil Eagderi<sup>4</sup>

<sup>1</sup>Department of Fisheries, Faculty of Natural Resources, University of Guilan, Sowme Sara, P.O. Box 1144, Guilan, Iran.

<sup>2</sup>Iranian Fisheries Sciences research, Inland Waters Aquaculture Research Center, Agricultural Research Education and Extension Organization (AREEO), Bandar Anzali, Iran.

<sup>3</sup>Department of Fisheries, Babol Branch, Islamic Azad University, Babol, Iran.

<sup>4</sup>Department of Fisheries, Faculty of Natural Resources, University of Tehran, Karaj, Alborz Province, Iran.

**Abstract:** *Paracobitis vignai* is a Nemacheilid loach endemic to the Sistan basin. It occurs in the Helmand River and its related reservoirs in Sistan-va-Baluchistan Province in southeastern Iran and probably in Afghanistan. This species is currently endangered due to habitat loss or degradation, damming and droughts. Therefore, this paper reviews the available data on taxonomy and distribution of *P. vignai*, provides its morphometric features, and recommends actions for its conservation.

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**Keywords:** Endemic species, Sistan basin, Conservation, Iran.

## Introduction

The loaches with a high dorsal dermal-crest have been placed in the genus *Paracobitis* Bleeker, 1863 for many years, specifically those from Central Asia (Banarescu and Nalbant, 1964), Vietnam (Nguyen, 2005), the Middle East (Prokofiev, 2009) and China (Min et al., 2010). The genus *Paracobitis* was appointed by Bleeker (1863) for *Cobitis malapterura*. This genus is restricted to Near East and Middle Asia, and the species of *Paracobitis* from China should be assigned to the genera *Homatula* and *Schistura* (Nalbant and Bianco, 1998). The species of the genus *Paracobitis* are comparatively large-sized loaches inhabiting freshwaters of western Asia (Bănărescu and Nalbant, 1995; Nalbant and Bianco, 1998). There are thirteen valid species of the genus *Paracobitis* in the world, which eleven of them are reported from Iran (Kottelat, 2012; Coad, 2016; Mousavi-Sabet et al., 2014; Freyhof et al., 2014; Jouladeh-Roudbar et al., 2015). According to Freyhof et al. (2014), Mousavi-Sabet et al. (2015), and Jouladeh-Roudbar et al. (2015b), the valid

*Paracobitis* species in Iran comprise *P. atrakensis* Esmaeili, Mousavi-Sabet, Sayyadzadeh, Vatandoust & Freyhof, 2014, *P. basharensis* Freyhof, Esmaeili, Sayyadzadeh & Geiger, 2014, *P. hircanica* Mousavi-Sabet, Sayyadzadeh, Esmaeili, Eagderi, Patimar & Freyhof, 2015, *P. iranica* Nalbant and Bianco, 1998, *P. longicauda* Kessler, 1872, *P. malapterura* (Valenciennes, 1846), *P. molavii* Freyhof, Esmaeili, Sayyadzadeh & Geiger, 2014, *P. persa* Freyhof, Esmaeili, Sayyadzadeh & Geiger, 2014, *P. rhadinaea* (Regan, 1906), *P. smithi* (Greenwood, 1976), and *P. vignai* Nalbant and Bianco, 1998. However, Freyhof et al. (2014) believe that *P. iranica* is a synonym of *P. malapterura*.

Since there is little information available about various biological and taxonomical aspects of *P. vignai*, a nemacheilid loach endemic to the Sistan basin, this paper reviews the available data on its taxonomy and distribution, provides its morphometric features (along with those of its sympatric species i.e. *P. rhadinaea* that is superficially similar to *P. vignai*), and recommends

\* Corresponding author: Hamed Mousavi-Sabet  
 E-mail address: [mousavi-sabet@guilan.ac.ir](mailto:mousavi-sabet@guilan.ac.ir)

actions for its conservation.

## Materials and Methods

A total of 15 specimens of *P. vignai* and 14 specimens of *P. rhadinaea* were collected from Chahnimeh Reservoirs, near Zahak Town, Sistanva-Baluchestan Province, in September 2014 by gillnet (Fig. 1). After anesthesia with 1% clove solution, the specimens were fixed in 10% buffered formaldehyde and transferred to the laboratory for further processing. Morphometric characters were measured by a caliper to the nearest 0.1 mm (Table 1). All measurements are made point to point according to Kottelat and Freyhof (2007). The percentage ratios of morphometric characters in relations to standard length (SL) and head length (HL) were calculated. Meristic characteristics of the specimens were counted using a stereomicroscope. The last two branched rays articulating on a single pterygiophore in the dorsal and anal fins are noted as "1½".

## Results and Discussion

### *Paracobitis vignai* Nalbant and Bianco, 1998

(Fig. 2)

**Common names:** Saghahi-ye Sistan (Persian); Sistan's Loach (English). The species is endemic to Sistan basin and named for Professor Augusto Vigna Taglianti, La Sapienza University, Rome. The holotype collected from "Nahr Taheri, Zabol, Seistan" by A. Vigna (Nalbant and Bianco, 1998).

**Morphology:** According to original digenesis by Nalbant and Bianco (1998), *Paracobitis vignai* is characterized by a completely scaleless body and large brown blotches in the middle of flanks. The lateral line extends to the base of the caudal fin. Additionally, caudal fin is deeply emarginate or slightly furcate and posterior nare opening is slit-shaped (Freyhof et al., 2014).

*Paracobitis vignai* is superficially similar to *P. rhadinaea* from which it is distinguished by a completely naked body (vs. presence of scales in *P. rhadinaea*) and deeply emarginate or slightly forked caudal fin (vs. moderately or slightly



Figure 1. Map of sampling station (Δ, Chahnimeh Reservoirs) in the Sistan basin.

emarginate in *P. rhadinaea*).

Morphometric characters of *P. vignai* and *P. rhadinaea* are provided in Table 1. For general appearance of *P. vignai* see Figure 2. Meristic values for the studied specimens caught from Iranian parts of the Sistan basin are: dorsal fin unbranched rays 3, dorsal fin branched rays 7½, anal fin unbranched ray 2, anal fin branched ray 5½, pectoral fin branched rays 9, pelvic fin branched rays 7, and caudal branched rays 9+8. In addition, Coad (2016) reported 6-8 branched rays of dorsal-fin, 5-6 anal-fin, 8-10 pectoral-fin rays and 6-7 pelvic-fin for *P. vignai*. The body is slender and compressed, particularly posteriorly. The head is long and the eyes are small. The dorsal adipose crest or keel on the caudal peduncle is well-developed. A slightly developed axillary lobe at the ventral-fin base. Mouth well arched, surrounded by three pairs of short barbels. Maxillary barbels not reaching to the eye origin. Outer mandibular barbels reaching to the nostrils origin. Inner mandibular barbels reaching to maxillary barbels origin. Dark pigmentations at the base and on the mandibular barbels (inner and outer). Lips are well-furrowed and interrupted in their middle. Mental lobes are enlarged. Mental lobes has dark grey pigmentations. The processus dentiformis is slightly developed. Lateral line is

Table 1. Morphometric characters of *Paracobitis rhadinaea* (n = 10) and *Paracobitis vignai* (n = 10).

Character	<i>Paracobitis rhadinaea</i>		<i>Paracobitis vignai</i>	
	Range	Mean $\pm$ SD	Range	Mean $\pm$ SD
Total length mm	147.15 - 193.85		108.69 - 117.99	
Standard length mm	126.97 - 168.38		92.48 - 101.11	
<b>In % Standard length</b>				
Head length	22.49 - 25.64	24.36 $\pm$ 1.05	18.07 - 21.11	19.89 $\pm$ 0.87
Head depth	9.23 - 11.60	10.79 $\pm$ 0.75	10.48 - 11.23	10.66 $\pm$ 0.45
Maximum body depth	13.87 - 16.92	14.97 $\pm$ 1.03	13.82-15.40	14.61 $\pm$ 1.11
Predorsal length	47.73 - 50.88	48.16 $\pm$ 1.35	44.48 - 49.83	46.66 $\pm$ 1.29
Postdorsal length	39.91 - 43.53	41.11 $\pm$ 1.20	41.82-45.40	43.61 $\pm$ 1.11
Pre anal length	73.30 - 77.51	75.05 $\pm$ 1.33	72.54 - 75.80	74.17 $\pm$ 1.18
Caudal peduncle depth	7.53 - 9.24	8.64 $\pm$ 0.45	8.56 - 9.85	9.21 $\pm$ 0.49
Caudal peduncle length	17.30 - 23.59	19.57 $\pm$ 2.23	17.00 - 20.11	18.50 $\pm$ 2.15
Caudal fin length	12.59 - 15.63	13.89 $\pm$ 1.15	13.35 - 14.72	13.54 $\pm$ 0.75
Dorsal fin length	13.73 - 16.05	14.80 $\pm$ 0.62	13.01 - 15.95	14.13 $\pm$ 0.79
Dorsal fin base	9.20 - 11.98	10.62 $\pm$ 0.81	9.72 - 10.94	9.91 $\pm$ 0.77
Anal fin length	7.90 - 10.08	9.09 $\pm$ 0.65	8.76 - 10.07	9.47 $\pm$ 0.39
Anal fin base	8.07 - 9.82	9.12 $\pm$ 0.62	7.59 - 9.68	8.21 $\pm$ 1.01
Pectoral fin length	12.79 - 15.51	14.86 $\pm$ 1.15	12.88 - 15.42	14.55 $\pm$ 0.79
Ventral fin length	11.72 - 13.41	12.43 $\pm$ 0.63	11.64 - 14.24	12.31 $\pm$ 1.23
Pecto-ventral distance	26.86 - 32.07	28.79 $\pm$ 2.56	27.73 - 32.13	31.93 $\pm$ 1.27
Ventral-anal distance	20.87 - 23.92	21.97 $\pm$ 1.03	21.82 - 24.40	23.61 $\pm$ 1.11
Pecto-anal distance	49.49 - 52.94	51.48 $\pm$ 1.28	48.09 - 53.44	52.77 $\pm$ 1.45
Crest length	25.26 - 32.06	28.11 $\pm$ 3.85	30.69 - 32.45	31.07 $\pm$ 0.83
<b>Head length %</b>				
Snout length	38.15 - 41.19	39.87 $\pm$ 1.04	34.95 - 37.17	35.56 $\pm$ 0.86
Eye diameter	7.67 - 10.58	9.57 $\pm$ 0.88	9.15 - 12.42	11.21 $\pm$ 0.89
Head depth	44.07 - 49.51	47.28 $\pm$ 1.91	47.41 - 54.36	52.89 $\pm$ 2.08
Post orbital distance	44.29 - 54.67	49.10 $\pm$ 3.43	46.29 - 54.92	51.11 $\pm$ 3.98
Inter orbital length	20.99 - 25.38	22.56 $\pm$ 1.35	22.38 - 25.72	23.55 $\pm$ 1.23
Inter nasal length	17.68 - 22.81	18.87 $\pm$ 1.90	17.61 $\pm$ 22.41	19.01 $\pm$ 1.56

Figure 2. *Paracobitis vignai*, about 25 cm in TL, Sistan basin, Iran.

complete, reaching to base of caudal-fin, with 118-121 pores. Cephalic lateral line system bears 9 supraorbital, 4+15 infraorbital, 13 preoperculo-mandibular and 3 supratemporal pores. Nostril is slit-shape and flap does not covers the nostril.

**Coloration:** In preserved specimens, the body is pale brown to cream with a row of dark-grey blotchs on middle of the back and on the mid-sides of the body may be occasionally fused (Fig. 2). In live specimens the flanks are pale olivaceous with 9-14 dark grey

blotches on dorsal and lateral, which are connected together by a row of pale grey small blotches. The blotches extend onto the adipose crest. Blotches are line up in flank row anteriorly and posteriorly. All over the head, opercula and snout covered by dark grey blotches. The caudal fin base has a distinct dark bar. The belly is whitish. No distinct dark stripe from eye to snout. All fins are orange (in live specimens) or hyaline (in preserved specimens); dorsal, pectoral and caudal fins with dark spots on rays; pelvic and

anal fins without dark pigmentation. When touching the dorsal margin of the crest, the reticulations make the crest there dark, otherwise the crest is light cream along the margin. The lateral line is light, sometimes in marked contrast to the rest of the flank. The rostral barbels and their bases are strongly dark pigmented, but the maxillary pair is almost immaculate (slightly pigmented in some specimens).

**Size:** The maximum size of the recent caught materials is about 25 cm in TL.

**Distribution:** This endemic species is restricted to the Sistan basin of Iran and presumably Afghanistan. The species was distributed in the Hirmand (Helmand) River, the Hamoun Wetland and its related reservoirs (in southeast of Iran and probably southwest of Afghanistan).

**Conservation status:** IUCN Red List: not evaluated; Iran: unknown.

**Abundance:** Low.

**Habitat and ecology:** The species typically prefers sandy or gravel bottoms in the Chahnimeh Reservoirs and related streams. We caught some of specimens from the Hirmand (Helmand) River, at its entrance to the Chahnimeh Reservoirs, a shallow and narrow (up to 10 m wide; and 30-70 cm depth at the sampling time) river with diverse structures (pools, muddy shore, etc.), at 493 m altitude, and the water was unclear and muddy with slow current at the time of sampling. Details of its ecology, reproduction and feeding are unknown.

**Co-existing species:** Fish species of the Iranian part of the Sistan Basin comprised 24 species in 19 genera, 4 families, and 3 orders. They comprise 4 endemic species, including *Paraschistura alta* (Nalbant & Bianco 1998), *Schizothorax zarudnyi* (Nikol'skii, 1897), *Paracobitis rhadinaea* (Regan, 1906) along with *P. vignai*, 11 exotic species, including *Alburnus hohenerkeri* Kessler, 1877, *Carassius auratus* (Linnaeus, 1758), *C. gibelio* (Bloch, 1782), *Ctenopharyngodon idella* (Valenciennes, 1844), *Cyprinus carpio* Linnaeus, 1758, *Hemiculter leuciscus* (Basilewsky, 1855), *Hypophthalmichthys molitrix* (Valenciennes, 1844), *H. nobilis* (Richardson, 1844), *Pseudorasbora parva*

(Temminck and Schlegel, 1846), *Oncorhynchus mykiss* (Walbaum, 1792) and *Gambusia holbrooki* Girard, 1859, and 9 native species, including *Cyprinion watsoni* (Day, 1872), *Garra rossica* (Nikol'skii, 1900), *Gonorhynchus adiscus* (Annandale, 1919), *Schizocypris alitidorsalis* Bianco and Bănărescu, 1982, *Schizothorax intermedius* McClelland, 1842, *S. zarudnyi* (Nikol'skii, 1897), *Schizopygopsis stoliczkai* Steindachner, 1866, *Paraschistura kessleri* (Günther, 1889), and *Triplophysa stoliczkai* (Steindachner, 1866) that co-exists with *P. vignai*.

**Threats:** Above mentioned 11 co-existing exotics species with *P. vignai* could have major effects on the population of this endemic species through competition, habitat changes and introduction of parasites. Furthermore, water pollution due to agricultural and industrial activities and hydrological alterations such as dam construction (about 10 main earth and concrete dams on the Helmand River in Afghanistan) and pumping water from this river which feeds the Hamoun Wetland have effected *P. vignai* populations. Since the construction of dams on the Helmand River in Afghanistan, the Hamoun Wetland was dried during the last decade and the fishes has only survived in related reservoirs (three main water reservoirs naming as Chahnimeh 1 to 3). Natural drought in recent decades is the most important natural disturbance of freshwater fishes of Iran (Esmaeil and Valavi, 2016; Jouladeh-Roudbar et al., 2015a). Due to severe drought, many rivers of the Iranian part of the Sistan Basin dried out causing the habitat loss of *P. vignai* populations. Unintended poaching is another main threat for this endemic species. Local people do not eat the fish, therefore it is not economically or nutritionally important but its population is damaged as incidental catch or by-catch in fishing from the Chahnimeh Reservoirs.

**Conservation action:** Not protected in Iran and Afghanistan.

**Conservation recommendations:** Urgent habitat protection is suggested. The ecological right of water of the Hamoun Wetland and the related reservoirs should be respected (which is ignored by the

damming) to prevent drought. Education of local fishermen should be initiated. Fishing programs should be forbidden or at least should be limited in the habitat of *P. vignai*, especially during its reproduction season. Also fishing equipment and methods should be edited according to minimum bycatch (Mousavi-Sabet et al., 2013). Finally, developing a conservation strategy for the species, habitat monitoring, conducting ecological and biological studies, and captive breeding could conserve this endemic crested loach having their future generations.

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## چکیده فارسی

### *Paracobitis vignai* Nalbant and Bianco, 1998 (Nemacheilidae) ماهیان در معرض تهدید دنیا:

سید حامد موسوی ثابت<sup>۱\*</sup>، کیوان عباسی<sup>۲</sup>، صابر وطن دوست<sup>۳</sup>، سهیل ایگدري<sup>۴</sup>

<sup>۱</sup>گروه شیلات، دانشکده منابع طبیعی، دانشگاه گیلان، صومعه سرا، ایران.

<sup>۲</sup>موسسه تحقیقات علوم شیلاتی کشور، مرکز تحقیقات آبی پروری آب‌های داخلی، سازمان تحقیقات و آموزش کشاورزی، بندر انزلی، ایران.

<sup>۳</sup>گروه شیلات، واحد بابل، دانشگاه آزاد اسلامی، بابل، ایران

<sup>۴</sup>گروه شیلات، دانشکده منابع طبیعی، دانشگاه تهران، کرج، ایران.

#### چکیده:

*Paracobitis vignai* یک سگ‌ماهی جویباری بومی حوضه آبریز سیستان است که در رودخانه هلمند و منابع آبی مرتبط با آن در استان سیستان و بلوچستان در جنوب شرق ایران و احتمالاً افغانستان یافت می‌شود. این گونه اخیراً به واسطه تخریب و ازدست دادن زیستگاه، سدسازی و خشکسالی در معرض تهدید قرار گرفته است. بنابراین این مقاله داده‌های در دسترس در مورد آرایه‌شناسی و پراکنش *P. vignai* را مرور می‌کند، و ویژگی‌های ریخت‌سنجی آن و اقدامات توصیه‌ای برای حفاظت آن را ارائه می‌نماید.  
**کلمات کلیدی:** گونه بومی، حوضه آبریز سیستان، حفاظت، ایران.