

Review of the Freshwater Cuskfishes of Iran (Family Lotidae)

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Abstract: The systematics, morphology, distribution, biology, economic importance and conservation of the burbot (*Lota lota*) of Iran are described, the species is illustrated, and a bibliography on this fish is provided. The chin barbel and two dorsal fins, both lacking spines, are distinctive characteristics of this fish. This species favours well-oxygenated, cool, clear rivers and large, deep lakes where it is most active at night or at twilight (crepuscular). *Lota lota* species is found rarely in the Caspian Sea basin.

Keywords: Biology, Morphology, Distribution, *Lota*.

Citation: Coad B.W. 2016. Review of the freshwater Cuskfishes of Iran (Family Lotidae). Iranian Journal of Ichthyology 3(4): 229-235.

Introduction

The freshwater ichthyofauna of Iran comprises a diverse set of families and species. These form important elements of the aquatic ecosystem and a number of species are of commercial or other significance. The literature on these fishes is widely scattered, both in time and place. Summaries of the morphology and biology of these species were given in a website (www.briancoad.com) which is updated here, while the relevant section of that website is now closed down.

Family Lotidae

The Lotidae (variously called and including cuskfishes, hakes and burbots, lings or rocklings) may be included within the cod family Gadidae by some authors (Nelson 2006). The family is found in temperate to cold marine waters in the Northern Hemisphere, with only one species always resident in fresh water. There are about 6 genera and 21 species in the family (Eschmeyer & Fong 2011). Biodiversity and zoogeography in relation to other Iranian fishes is summarised in Coad (1987, 1998) and Coad & Abdoli (1996). Maximum size exceeds 1.5m. Cuskfishes are recognised by the single barbel

usually present under the chin, 1-2 dorsal fins and 1 anal fin, the caudal fin usually extends around the dorsal and ventral tip of the caudal peduncle and is rounded, no fin spines, wide gill openings with the branchiostegal membranes free or narrowly attached to the isthmus, 6-8 branchiostegal rays, vomer bone in the roof of the mouth toothed, gas bladder not connected to the auditory capsules and with two slender, anterior processes, scales small and cycloid, an obvious lateral line, and the egg with an oil globule. Eggs and larvae are usually pelagic.

Genus *Lota* Oken, 1817

This genus has a single species found in North America and Eurasia, rarely in Iran. The characters of the species are therefore the same as for the genus.

Lota lota (Linnaeus, 1758)

(Figs. 1-3)

Common names: mahi charb (= fat or greasy fish), lot. [nalim in Russian; burbot, eelpout, and many others].

Systematics: *Gadus Lota* was originally described from European lakes. Iranian specimens are presumed to be the type subspecies with a long and low caudal peduncle and high meristic counts

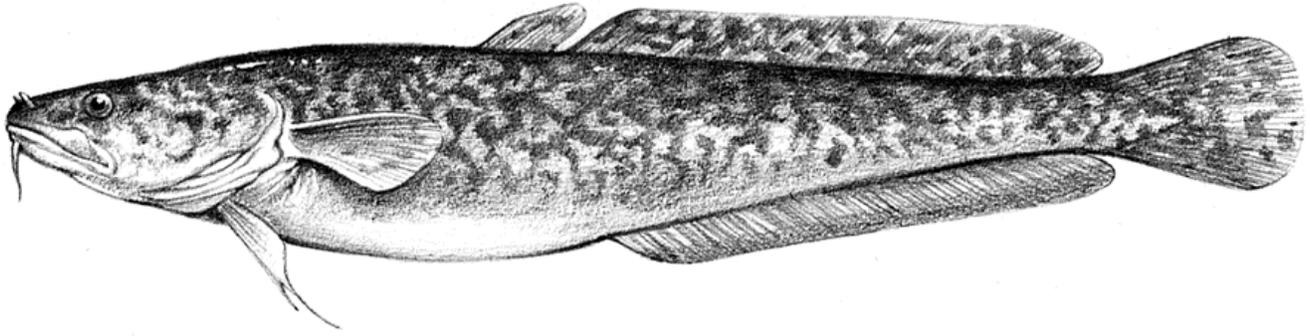


Fig.1. Line drawing of *Lota lota* by C. H. Douglas.

(Pivnička 1970). Subspecies defined on numbers of pyloric caeca are not accepted since there is clinal and size variation (Kottelat 1997).

Key characters: The chin barbel and two dorsal fins, both lacking spines, are distinctive.

Morphology: First dorsal fin rays 7-16, second dorsal fin rays 60-96, anal fin rays 58-86, pectoral fin rays 15-24, pelvic fin rays 5-10, gill rakers 4-12, short, rounded and spinulose, discrete or almost reaching the base of the adjacent raker when appressed, pyloric caeca 21-67, and vertebrae 50-72. The head is flattened, the anterior body rounded and the posterior body compressed. Scales on the body are minute, cycloid, embedded, with few circuli and no radii, and extend onto fin bases and gill covers, and to the level of the nostrils on the head. The second pelvic fin ray is elongated. The anterior nostril is a barbel-like tube. The gut has numerous pyloric caeca, and anterior and posterior loops. The chromosome number is $2n=48$ (Klinkhardt et al. 1995).

Sexual dimorphism: Unknown.

Colour: Overall colour is a yellowish to olive-green to dark brown and may be black, with large light blotches on the head, body and vertical fins. The belly is yellow to white and may be finely spotted. All fins are strongly mottled. Mottling is most evident in younger fish; adults tend to become uniformly dark.

Size: Reaches 1.52m and 32.0kg, possibly 2.1m and 36.0kg (Machacek (1983-2012), accessed 27 July 2012).

Distribution: Found across northern Eurasia and

northern North America. Recorded as a single specimen from the lower Safid River in 1921 (Derzhavin 1934, Berg 1948-1949) and possibly waters in Gilan but apparently extremely rare in Iran. Armantrout (1969) states that reports are uncertain. Berra (1981) omits the distribution in Iran and the southern Caspian Sea basin of Azerbaijan. Modern works on Iranian Caspian fishes such as Abbasi et al. (1999), Jolodar & Abdoli (2004) and Abdoli & Naderi (2009) do not mention this species while Abdoli (2000) lists it but has no recent record.

Zoogeography: Populations in the Kura River of Azerbaijan may be disjunct from northern populations but their characters have not been thoroughly examined. Abbasov (1980) did not report this species from the Aras River on the northern border of Iran so the Iranian fish, if not strays, may be disjunct even from the southern populations in the Kura River.

Habitat: This species favours well-oxygenated, cool, clear rivers and large, deep lakes where it is most active at night or at twilight (crepuscular). Those fish living in rivers tend to congregate in deep holes throughout the year, except when spawning. It may also be found from estuaries to small mountain streams. It hides under rocks and plant roots, or in holes in river banks, during the day. Young fish remain in shallow weeded areas or rocky streams. It is found only in the lower reaches of rivers along the Iranian shore and does not penetrate upstream (Berg 1948-1949). This species can tolerate 6‰ and so may enter the Caspian Sea near river mouths. Embryos of

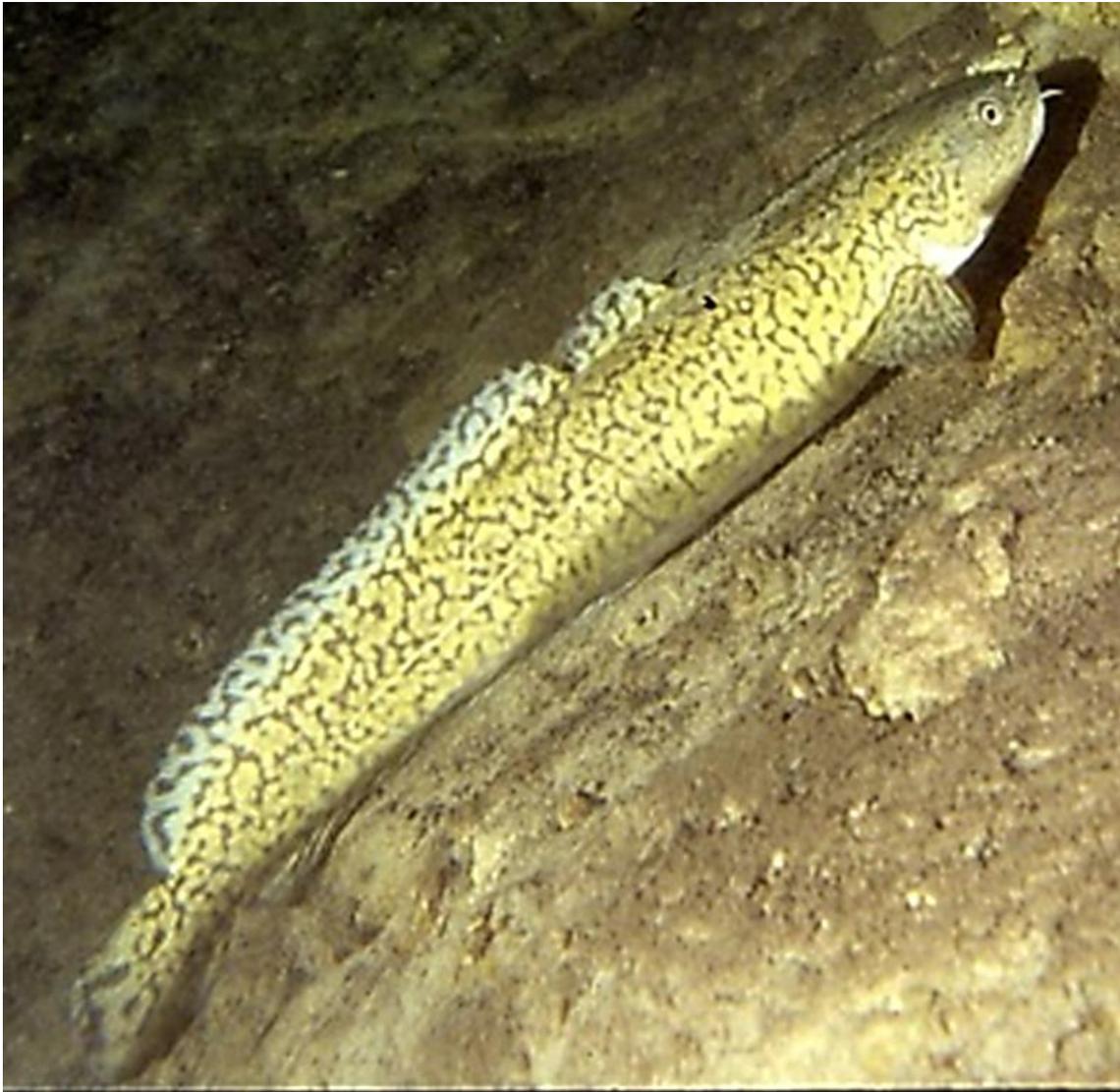


Fig.2. *Lota lota*, Lake Walchensee, Germany (Wikimedia Commons).

this species suffer 50% mortality if pH rises to 8.0 (Mann 1996). Fat reserves in the liver are used up in summer when this species is less active.

Age and growth: Maturity is attained at age 2-7 years, varying with habitat, rarely at 1 year for males. Growth is faster in southern populations and maturity is earlier than for northern populations. Maximum life span is 22 years.

Food: Food when young is mostly aquatic insects, crustaceans and molluscs while older burbot feed voraciously on fishes and their eggs and on frogs. Adults do not feed during the spawning period. Most feeding occurs at night. This fish moves into shallow water for night feeding in summer months. It is

reported to be cannibalistic. Glycogen and fat are stored in the liver during spring and autumn feeding periods, allowing the fish to cope with high water temperatures in summer when the fish is less active and feeding is low, even enabling some growth and gonad development (Kottelat & Freyhof 2007).

Reproduction: Spawning takes place at night from November to March, even under ice, at temperatures of 0.5-4.0°C on gravel, sand or hard bottoms. Successive matings occur with the male and female swimming head down along the bottom until the male rotates and pushes his belly against hers, releasing eggs and sperm in a cloud. The female beats her tail, mixing the gametes and dispersing the



Fig.3. Head of *Lota lota* to show barbel, from the Mississippi River, Ontario, Canada, 22 July 2006, Brian W. Coad.

fertilized eggs. One or two females may be surrounded by many males in a spawning ball. The eggs are easily moved by water currents because of a large oil globule in the yolk but gradually sink and lodge in interstices in gravel and sand. Up to 5 million eggs are produced with a diameter about 1.9mm. About 80 "day degrees" are needed for the eggs to hatch and since they are laid in winter this takes some weeks, e.g., about 6 weeks at 2°C. Juveniles become benthic after about 2 months and grow rapidly, reaching about 8cm standard length within the first year.

Parasites and predators: None reported from Iran.

Economic importance: This species is of economic importance in the former U.S.S.R. and the flesh is said to be excellent (if somewhat dry) as is the liver. The flesh is mainly sold salted and the liver smoked or canned in Europe. It is a source of oil and fishmeal. The eggs have been used as caviar but are also reported as toxic (Halstead 1967-1970, Coad 1979). It is not an important sport fish because of its nocturnal habits and slow movements. It is too rare in Iran to be a food fish and a potential health hazard.

Conservation: Classified as rare to intermediate by

Lelek (1987) for Europe, and the IUCN (2015) give its world status as of Least Concern. Abdurakhmanov (1962) gives data on only one specimen from the southern Caspian Sea basin, indicative of its rarity. It may be extirpated from Iranian waters. Anglers and commercial fishermen should report any captures of this rare species in Iranian waters. Specimens should be preserved for comparison with northern populations.

Sources: Counts are taken from Pivnička (1970). There is an extensive literature on this species in Europe and North America, briefly summarised above from Froese & Pauly (2014) (FishBase) and Coad et al. (1995).

Further details on collections examined can be found in the museum catalogues.

Comparative material: CMNFI 1958-0348, 1, 142.1mm standard length, Canada, Québec, Moss River (51°15'N, 65°42'W); CMNFI 1979-1225, 4, 76.6-90.1mm standard length, Canada, Ontario, Ottawa River at Kettle Island (45°28'N, 75°38'W); CMNFI 1986-0461, 1, 283.1mm standard length, Germany, Danube River above Vilshofen (48°36'N, 13°12'E).

Acknowledgments

I am indebted to the Department of Biology, Shiraz University and the Canadian Museum of Nature, Ottawa for funding of research. Numerous colleagues and co-authors assisted in developing the website on Iranian fishes, providing specimens, data and photographs and are listed at www.briancoad.com.

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مقاله مروری

مروری بر چرب ماهی های ایران (خانواده لوتیده)

برایان کد

موزه تاریخ طبیعی کانادا، اتاوا، انتاریو، KIP 6P4، کانادا.

چکیده: در این مقاله مروری، سیستماتیک، ریخت شناسی، پراکنش، زیست شناسی، اهمیت اقتصادی و حفاظت *Lota lota* شرح داده شده، تصاویری از آن ارائه گردیده و فهرستی از منابع موجود درباره این گونه لیست شده است. وجود سیبک چانه‌ای و دو باله پشتی بدون خار از ویژگی‌های این ماهی است. این گونه رودخانه‌ها و دریاچه‌های عمیق سرد، زلال و دارای اکسیژن کافی را ترجیح می‌دهد و اکثراً شب فعال بوده و یا در غروب دیده می‌شود. روغن ماهی به‌ندرت در حوضه دریای خزر دیده می‌شود.
کلمات کلیدی: زیست‌شناسی، ریخت شناسی، پراکنش، *Lota*.