



Review Article

Review of the Freshwater Sharks of Iran (Family Carcharhinidae)

Brian W. Coad*

Canadian Museum of Nature, Ottawa, Ontario, K1P 6P4 Canada.

Abstract: The systematics, morphology, distribution, biology, economic importance and conservation of the bull shark (*Carcharhinus leucas*) in Iran are described, the species is illustrated, and a bibliography on this fish in Iran is provided.

Article history:

Received 2 May 2015

Accepted 27 July 2015

Available online 25 August 2015

Keywords: Biology, Morphology, *Carcharhinus*.

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 for one family, while the relevant section of that website is now closed down. Other families will also be addressed in a similar fashion.

Family Carcharhinidae

This family, the requiem or ground sharks, contains about 12 genera and about 58 species of large sharks found world-wide in tropical to warm-temperate waters (Eschmeyer and Fong, 2011). There is only one species found in Iranian fresh waters. A second species is reported from an Iranian river under special circumstances and is not regarded as a regular occurrence. This was *Carcharhinus dussumieri* (Müller and Henle, 1839) found dead in the saline Mehran River, Hormozgan and kindly identified by L.J.V. Compagno (see Sources and below) (Fig. 1). About 30 of these fish were found

above shallow rapids and were probably trapped there, dying from an influx of fresher water, higher temperatures and/or low oxygen levels. This species is also recorded from the lower Mand River at 28.1353°N, 51.4309°E, possibly under similar circumstances.

Requiem sharks are distinguished from other sharks by a complex of characters including having an anal fin, 5 gill slits, 2 dorsal fins, no fin spines, nictitating eyelids, and a scroll intestinal valve. The first dorsal fin base is in front of the pelvic bases, there is a wavy dorsal tail fin margin, well-developed, knife-like teeth with cutting edges, usually no spiracles, and precaudal pits.

This is one of the largest and most economically important shark families. Most members are voracious predators as their common name suggests (requiem = a mass said for the dead) and they are frequently dangerous to man. Some of these species enter rivers and remain there for long periods causing human fatalities. These sharks are usually viviparous. Food includes a variety of fishes, sharks, rays, squids, crustaceans, marine reptiles, birds and mammals, and carrion and garbage.

Shark flesh can be eaten and is religiously permissible in Iran.

* Corresponding author: Brian W. Coad
E-mail address: bcoad@mus-nature.ca



Figure 1. *Carcharhinus dussumieri* from the Mehran River, Hormozgan, 19 March 1978, CMNFI 1979-0410, Brian W. Coad.

Genus *Carcharhinus* Blainville, 1816

There are about 31 species of gray sharks found world-wide but only one regularly enters fresh water in Iran. A detailed definition of the genus is given by Compagno (1988).

Carcharhinus leucas (Müller & Henle, 1839)

(Figs. 2-6)

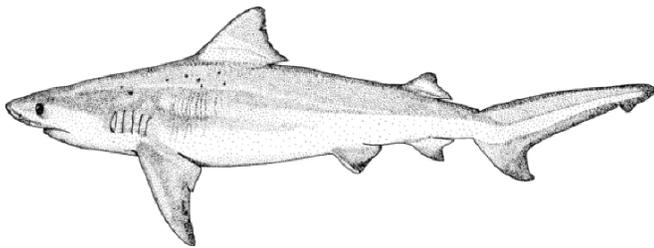


Figure 2. Line drawing of *Carcharhinus leucas* by S. Laurie-Bourque.

Common names: kooseh, kuseh, kooseh-kuli, sag mahi (= dog fish). [kosetch or kossage, jarjur in Arabic; bull shark].

Systematics: *Carcharhinus leucas* was originally described from the Antilles. A number of shark species have been reported as entering rivers of the Tigris-Euphrates basin including Iranian tributaries (Günther, 1874; Day, 1875-1878; Sykes, 1902; Kennedy, 1937; Hunt, 1951; Khalaf, 1961; Mahdi, 1962; Zorzi, 1995). The species appeared under such names as *Carcharhinus gangeticus* (Müller and Henle, 1839), *Eulamia* (= *Carcharhinus*) *lamia* (Blainville, 1820), and *Carcharhinus menisorrhah* (Valenciennes in Müller and Henle, 1839). A revision of carcharhinid sharks by Garrick (1982) cites only *Carcharhinus leucas* from fresh waters of

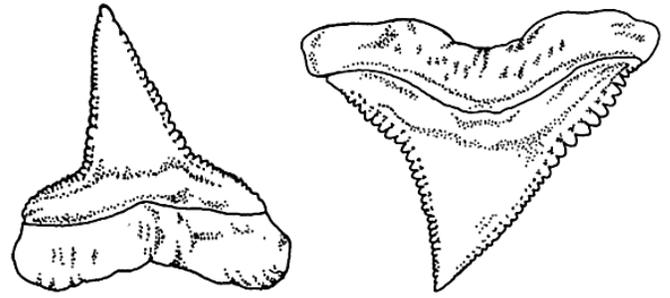


Figure 3. Upper and lower tooth of *Carcharhinus leucas* by S. Laurie-Bourque.

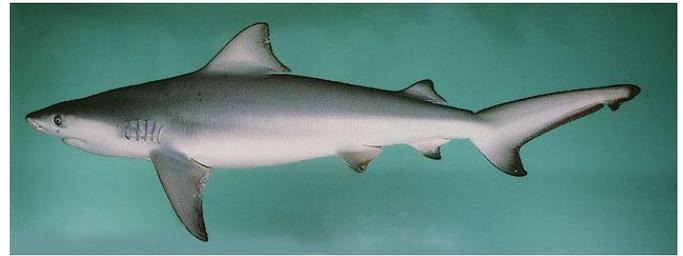


Figure 4. *Carcharhinus leucas*, Cochin, India, 69cm total length, courtesy of J. E. Randall.

the Tigris-Euphrates basin and Compagno (1984) concurs. Coad and Papahn (1988) and Coad (2010) also list specimens and data which confirm this species to be present.

Key characters: This is the only shark species commonly encountered in Iranian fresh waters and can be recognised by the 5 gill slits, upper caudal fin lobe larger than lower, and the arched mouth armed with teeth on the underside of the head. Distinction from other sharks is given in Compagno (1984).

Morphology: This is a heavily-built shark with a very short snout which is rounded and ends bluntly. Snout length is less than the distance between the nostrils and much less than the mouth width. Eyes are small. There are 12-14, usually 13, teeth on each side of a median tooth in the upper jaw and 12-13, usually 12, teeth on each side of a median tooth in the lower jaw. Teeth are heavy, broad, almost triangular, erect near the jaw symphysis but becoming slightly oblique and more concave or notched nearer the mouth corners. The teeth are strongly serrated, more so near the base, and upper teeth more so than lower teeth.

The first dorsal fin lies over or just behind the level of the axil of the pectoral fin. The apex of the first



Figure 5. *Carcharhinus leucas*, BM(NH)1924.10.1:1, Tigris River at Al Karradah near Baghdad, Brian W. Coad.

dorsal fin is pointed to somewhat rounded. The second dorsal fin is high, has a short posterior lobe and lies just over the level of the anal fin origin. Pectoral fins are broad and their tips are narrow and pointed. There is no interdorsal ridge (the back is smooth between the dorsal fins). The upper precaudal pit is well-developed while the lower pit is weak.

Sexual dimorphism: Males bear claspers. The pelvic fins are partially modified into grooved, rod-like structures which are held together to form a tube and are used in mating. They are not used to clasp the female but as an intromittent organ. Females are larger than males.

Colour: The body is overall grey with a pale to white underside. Fin tips are dusky to black, particularly in young, fading with age. There is no other obvious colour pattern although the back is darker than the belly, being bluish, grey or brown. Fins are similar



Figure 6. *Carcharhinus leucas*, BM(NH) 1874.4.28:9, Tigris River near Baghdad, Brian W. Coad.

in colour to the neighbouring body.

Size: Attains 3.24 m (Garrick, 1982), 3.4 m (Carpenter et al., 1997), rarely to 4.0 m and an estimated weight of over 600 kg (McCord and Lamberth, 2009). Fish in Iranian fresh waters have been estimated up to 2.8 m in length but naturally circumstances were not always favourable for an objective and detached size judgment.

Distribution: This species is widespread in warmer marine waters world-wide but also entering rivers and lakes. Sharks have long been known to enter fresh waters in the Tigris-Euphrates basin. Zorzi (1995) records a book by Pausanias, "Guide to Greece", written in the late second century A.D. which refers to sharks in "the Euphrates...., which fatten monsters as man-eating as any in existence". One of the earliest distributional records is found in the Arabic work "Wonders of Creation" by Zakariya al-Qazwini published in 1263 A.D. and later translated into Persian. The sharks were found at Basrah on the Tigris River in what is now Iraq and were cited as formidable because of their voracity and teeth like the points of spears. Shark attacks still occur at Basrah (Coad and Al-Hassan, 1989). Subsequently reported in the Tigris River above



Figure 7. Habitat of *Carcharhinus leucas*, Khowr-e Bahmanshir at Tangeh-ye Seh, 23 November 2000, Brian W. Coad.

Baghdad about 850 km from the sea (Günther, 1874; Kennedy, 1937) before dams were built. A recent record for Iraq is documented by Hussain et al. (2012a, 20102b).

Sykes (1902) saw sharks in the Ab-e Gargar (Karun River in Iran) at Shushtar 420 km from the sea, Wilson (1942) reporting on events in 1908 records sharks from between Shushtar and Ahvaz and near Shushtar, Blegvad and Løppenthin (1944) report them from Khorramshahr, and Hunt (1951) reported them from the Karun River, Khowr-e Bahmanshir and Shatt al Arab (Arvand River). Coad and Papahn (1988) report sharks at Ahvaz on the Karun River about 275 km from the sea as well as further up river at Shushtar and down river in the Khowr-e Bahmanshir.

Zoogeography: This shark is found world-wide in

warm temperate to tropical seas and is reported from fresh waters in Africa, Asia, Australia and the Americas.

Habitat: This is a shark of coastal waters such as harbours, bays and estuaries but unusually it will penetrate far up rivers, as far as 4000 km up the Amazon River. It is said to be a sluggish bottom dweller except when attacking prey and in the sea may be found down to at least 150 m although usually at less than 30 m. It can cover great distances, up to 180 km in 24 hours. Movements between fresh, brackish and marine waters are common and random.

They are said to invade the Khowr-e Bahmanshir and Karun River of Iran from July to September when freshwater flow is at a minimum and tidal penetration of salt water is at its highest. However, they do travel well beyond tidal influence in Iran. Local people along the Bahmanshir River near Tangeh-ye Seh (Fig. 7) in Khuzestan maintain that it is dangerous to swim there because of these sharks. They are occasionally trapped in nets set for the clupeid *Tenulosa ilisha* and may be caught on hooks. They are not as common as in the past (N. Najafpour, pers. comm. November 2000). Mohamed et al. (2015) record them from the Shatt Al-Arab near the Iranian border in June and July.

Age and growth: Maturity in males is attained at 1.60-2.25 m and in females at 1.80-2.30 m. Mature fish are about 6 years old and life span is up to 32 years.

Food: Food is a wide variety of fishes including tunas, small sharks, and rays, as well as crabs, shrimps, molluscs, cephalopods, sea snails, sea urchins, turtles, sea birds and mammals, and even garbage. Diet in fresh water has not been investigated in Southwest Asia although Blegvad and Løppenthin (1944) reported that sharks station themselves under the date palms at Khorramshahr to eat the falling dates!

Reproduction: Birth size is about 56-81 cm and takes place in estuaries and river mouths. Females may contain up to 13 embryos and the gestation period is 10-11 months. This species is known to breed in

fresh waters, such as Lake Nicaragua in Central America, but there have been no reports of reproduction in the Tigris-Euphrates basin.

Parasites and predators: None are reported for Iran.

Economic importance: This shark has a considerable impact on people using water directly in Khuzestan. A number of severe injuries and fatalities have been reported in fresh waters through shark attacks. The first comprehensive report in modern times was by Hunt (1951) although accounts date back to the thirteenth century (Coad and Papahn, 1988). The latter summarize recorded attacks and add new ones for a total of 34 in the period 1941-1985, of which about half were fatal. Additionally, Wilson (1942) reports a woman taken by a shark while drawing water between Shushtar and Ahvaz and a 2.8 m one near Shushtar which killed two boys and a girl. These Iranian records are a significant proportion of freshwater attacks worldwide, about 28%. A number of soldiers were apparently victims during the Iran-Iraq war but no records have come to light. Men, women and children are attacked as well as horses and sheep, only the massive water buffalo is said to be safe. Many minor attacks and narrow misses are probably not reported. Attacks are said to have declined in recent years since shark oil is no longer used to caulk boats but this is probably a local legend. People were attacked while swimming, paddling, bathing, washing vehicles or fishing. There were no apparent triggering factors for the attacks as victims were dressed in various colours and types of clothing, engaged in various activities and environmental conditions where known varied between attack sites.

Shark attacks at Basrah, Iraq are summarised in Coad and Al-Hassan (1989). Freshwater shark attacks have even appeared in a novel set in Persia, "Harem", by Mossanen (2002).

Specimens from a fish shop in Ahvaz have been investigated for gelatin and collagen yield, for their use in food and pharmaceutical industries (Aberoumand, 2010, 2011). In other parts of the world, this species has been used for its flesh and fins, as leather, for its liver oil and for fishmeal.

Conservation: This shark appears to still be common in Iranian fresh waters judging from the attacks reported over the past 50 years or more and no conservation measures are needed (or likely to be acceptable to the local population).

Sources: Garrick (1982) and Compagno (1984, 1988) for general anatomy and biology. Further details on collections examined can be found in the museum catalogues.

Comparative material: BM(NH) 1874.4.28:9, 1, ca. 76.8 cm total length, Iraq, Tigris River near Baghdad (ca. 33°21'N, ca. 44°25'E); BM(NH) 1924.10.1:1 1, (head only, recorded length 1.25 m), Tigris River at Al Karradah near Baghdad (33°17'N, 44°23'E). *Carcharhinus dussumieri*: CMNFI 1979-0410, 2 (kept of ca. 30), 449-461 mm total length, Hormozgan, Mehran River (26°53'N, 55°17'E)

Acknowledgements

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.

References

- Aberoumand A. (2010). Edible gelatin from some fishes skins as affected by chemical treatments. *World Journal of Fish and Marine Sciences*, 2(1): 59-61.
- Aberoumand A. (2011). Isolation of collagen from some fish skins in Iran. *Journal of Agricultural Technology*, 7(3): 783-788.
- Blegvad H., Løppenthin B. (1944). *Fishes of the Iranian Gulf*. Einar Munksgaard, Copenhagen. 247 p. (1999 translation into Farsi by E. Etemad and B. Mokayyer with supplement, Tehran University Publications No. 1744: 26 + 416 pp.).
- Carpenter K.E., Krupp F., Jones D.A., Zajonz U. (1997). *Living Marine Resources of Kuwait, Eastern Saudi Arabia, Bahrain, Qatar, and the United Arab Emirates*. FAO Species Identification Field Guide for Fishery Purposes, Food and Agriculture Organization, Rome. 293 p.

- Coad B.W. (2010). Freshwater Fishes of Iraq. Pensoft Publishers, Sofia-Moscow. 294 p.
- Coad B.W., Al-Hassan, L.A.J. (1989). Freshwater shark attacks at Basrah, Iraq. *Zoology in the Middle East*, 3: 49-53.
- Coad B.W., Papahn F. (1988). Shark attacks in the rivers of southern Iran. *Environmental Biology of Fishes*, 23(1-2): 131-134.
- Compagno L.J.V. (1984). FAO Species catalogue. Volume 4. Sharks of the world. An annotated and illustrated catalogue of shark species known to date. Part 1 - Hexanchiformes to Lamniformes, Part 2 - Carcharhiniformes. Food and Agriculture Organization, Rome, Fisheries Synopsis, 125(4), part 1: 1-249; part 2: 251-655.
- Compagno L.J.V. (1988). Sharks of the Order Carcharhiniformes. Princeton University Press, Princeton, New Jersey. 486 p.
- Day F. (1875-1878). The Fishes of India; being a natural history of the fishes known to inhabit the seas and fresh waters of India, Burma and Ceylon. Vol. 1, London. 778 p.
- Eschmeyer W.N., Fong J.D. (2011). Pisces. In: Z.-Q. Zhang (Ed.). *Animal biodiversity: An outline of higher level classification and survey of taxonomic richness*. *Zootaxa*, 3148: 26-38.
- Garrick J.A.F. (1982). Sharks of the genus *Carcharhinus*. National Oceanic and Atmospheric Administration Technical Report, National Marine Fisheries Service Circular 445. 194 p.
- Günther A. (1874). A contribution to the fauna of the River Tigris. *The Annals and Magazine of Natural History*, 4(14): 36-38.
- Hunt R.S. (1951). The sharks of Ahwaz. *Journal of the Royal Army Medical Corps*, 97(1): 79-85.
- Hussain N.A., Rasen A.K., Al-Kafiji B.Y., Coad B.W. (2012a). Bull shark occurrence *Carcharhinus leucas* (Valenciennes, 1839) at the inland waters of southern Iraq. The 1st Scientific Agricultural Conference, Faculty of Agriculture and Forestry - University of Duhok, April 10-12th 2012, Duhok - Kurdistan Region - Iraq, p. 25.
- Hussain N.A., Rasen A.K., Al-Kafiji, B.Y., Coad, B.W. (2012b). Bull shark occurrence *Carcharhinus leucas* (Valenciennes, 1839) at the inland waters of southern Iraq. *Journal of the University of Duhok Iraq*, 15(special issue 1): 140-143.
- Kennedy W.P. (1937). Some additions to the fauna of Iraq. *Journal of the Bombay Natural History Society*, 39: 745-749.
- Khalaf K.T. (1961). The marine and freshwater fishes of Iraq. Ar-Rabitta Press, Baghdad. 164 p.
- Mahdi N. (1962). Fishes of Iraq. Ministry of Education, Baghdad. 82 p.
- McCord M.E., Lamberth S.J. (2009). Catching and tracking the world's largest Zambezi (bull) shark *Carcharhinus leucas* in the Breede Estuary, South Africa: the first 43 hours. *African Journal of Marine Science*, 31(1): 107-111.
- Mohamed A-R.M., Hussein S.A., Lazem L.F. (2015). Spatiotemporal variability of fish assemblage in the Shatt Al-Arab River, Iraq. *Journal of Coastal Life Medicine*, 3(1): 27-34.
- Mossanen D.L. (2002). Harem. Scribner Paperback Fiction, New York. 378 p.
- Sykes P.M. (1902). Ten thousand miles in Persia; or, eight years in Iran. John Murray, London. 481 p.
- Wilson A. (1942). S.W. Persia. Letters and diary of a young political officer 1907-1914. Readers Union Limited and Oxford University Press, London. 305 p.
- Zorzi G.D. (1995). The biology of freshwater elasmobranchs: an historical perspective. *Journal of Aquaculture and Aquatic Sciences*, 7: 10-31.



چکیده فارسی

مروری بر کوسه‌ماهیان آب شیرین ایران (خانواده *Carcharhinidae*)

برایان کد

موزه تاریخ طبیعی کانادا، اتاوا، انتاریو، K1P 6P4، کانادا.

چکیده:

سیستماتیک، ریخت‌شناسی، پراکنش، زیست‌شناسی، اهمیت اقتصادی و حفاظت کوسه‌کولی (*Carcharhinus leucas*) در ایران توصیف شده و به تصویر کشیده می‌شود. همچنین یک فهرست منابع در مورد این ماهی در ایران ارائه می‌گردد. کلمات کلیدی: زیست‌شناسی، ریخت‌شناسی، *Carcharhinus*.