



# The Persian Gulf is Part of the Habitual Range of the Arabian Sea Humpback Whale Population

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## Abstract

The humpback whale has long been considered a rare straggler to the Persian Gulf, however new evidence contradicts this and suggests that this species may be habitually present. We here critically review published and new records for *Megaptera novaeangliae* occurrence in the Gulf for the period 1883-2017. Of eight authenticated records (6 specimens, 2 live-sightings), seven are contemporary cases while one is a mid-Holocene specimen from UAE. An additional four possible records are based on unsubstantiated reports. Four current, regional range states are confirmed, i.e. the Islamic Republic of Iran, the Republic of Iraq, the State of Kuwait and the State of Qatar. Four of five newly reported cases are from Iran's coastal waters. We conclude that the Persian Gulf is part of the habitual range of the Arabian Sea humpback whale population, and has been since at least the mid-Holocene. It is unknown whether frequent passage occurs through the Strait of Hormuz or whether humpback whales are (semi) resident. The low abundance of this population and frequent deleterious anthropogenic events, particularly ship strikes and fishing net entanglements, are of major concern. Considering historical and taxonomic relevance, the formal description of *Megaptera indica* Gervais, 1883, from Iraq, is now thought to be a humpback whale subspecies *M. novaeangliae indica*.

## Keywords

Zoogeography; Persian Gulf; Indian Ocean; Net entanglement; Ship strikes; Morphology

## Introduction

A geographically, demographically and genetically isolated population of humpback whales *Megaptera novaeangliae* inhabits the northern Arabian Sea year-round, including the Gulf of Oman [1-5]. The strong upwelling off Oman allows the whales to feed locally and forgo annual migrations [6]. The Arabian Sea humpback whale forms a highly discrete stock that may have been reproductively isolated from other populations for circa 70,000 years [5].

A recent study of nuclear markers [7] was consistent with the view

of a discrete Arabian Sea breeding stock and found the population to be highly genetically differentiated (FST 0.034-0.161;  $P < 0.01$  for all comparisons). The distributional boundaries of that population are poorly known, but extend to the Irani coast in the north [8,9], at least to Pakistan and off Mumbai in NW India in the northeast [4,10], and to the Gulf of Aden [4,11] in the Southwest. It is unknown whether humpback whales sighted in the northern Red Sea [12] belong to this stock. Based on a working document presented to the IWC Scientific Committee [13], we here critically review the long presumed vagrant occurrence of humpback whales in the Persian Gulf (Arabian Gulf) and suggest possible implications for management.

On-going studies off the coast of the Sultanate of Oman, suggest a core distribution area of Arabian Sea humpback whales concentrated off the Island of Masirah, Gulf of Masirah, Halaniyat Islands and Kuria Muria Bay in the Arabian Sea, considering that greatest numbers of records are from these areas [3,14]. Humpback whales are also recorded around Muscat in the Gulf of Oman [15] and are sometimes seen near Fujairah, eastern coast of the United Arab Emirates (UAE) in the western Gulf of Oman [16], while the most northerly report on that coastline is of an individual at Khor [Khawr] Fakkan in 1973, some 80 km south of the Strait of Hormuz [3]. Although reported for the Persian Gulf by seamen [11], till recently there was but a single authenticated record, namely the historical papers by Gervais [17,18]. Due to the lack of further evidence, the humpback whale has long been considered a rare visitor to the Persian Gulf [3,4,15,19]. However, a series of new, substantiated records is contradicting this view. Here we chronologically document and critically examine published humpback whale records, and add previously unreported cases, for the Persian Gulf. A few potential but unsubstantiated reports are also discussed.

## Substantiated Records in the Persian Gulf

### 1. Al-Basra Bay, Iraq

The earliest record in the Persian Gulf is a specimen-supported 19<sup>th</sup> century stranding of an adult humpback whale at the Al-Basra Bay (then named 'baie de Basora') in Iraq, described as the type specimen of *Megaptera indica* Gervais, 1883 [17] by the French taxonomist Paul François Gervais. However, binomial nomenclature for many cetacean species, including the humpback whale, was highly proliferative and unstable at the end of the 19<sup>th</sup> century with the introduction of many synonyms based on individual variation [10,20]. The *M. indica* nominal species has been universally assigned as a junior synonym of *Megaptera novaeangliae* [21-24]. While the subspecific status of the isolated population of the Arabian Sea humpback whale is currently under debate, the identity of the Al-Basra Bay animal as a humpback whale is indisputable thanks to the detailed osteological description including species-diagnostic features [17] and cranial evidence re-examined by cetologist Daniel Robineau [19,23]. Unique among baleen whales, only in *M. novaeangliae* are the coracoid (processus coracoideus) and acromial processes of the scapula absent, or expressed as rudimentary tubercles [20,22,25]. Gervais [17] unequivocally described such a scapula in the Iraqi whale [13], as well as reporting metacarpalia and phalanges in *M. indica* as even more elongated than in a specimen of *Megaptera Boops* (= *M. novaeangliae*) despite the latter measuring 2 m longer than the *M.*

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*indica* holotype. The whale's broad, uniformly black baleen<sup>1</sup> are also consistent with humpback whale [13]. Gervais [17] published a second paper on the same specimen which is occasionally, equivocally, cited as the formal *M. indica* description.

While Gervais [17] had access to both cranial and post-cranial bones [13], Robineau [19,23] found only the calvaria (JAC 1883-2255) at the Laboratoire d'Anatomie Comparée of the Muséum national d'Histoire Naturelle in Paris. He measured the calvaria as 3 m in length with the tip of the rostrum missing, which agrees with the condylobasal length (CBL) of an adult humpback whale of some 12 m length, e.g. CBL=314 cm for a 12.20 m humpback whale [20]; CBL=311cm for a 11.96 m skeleton [22].

Gervais [17] considered the Iraq specimen a rare, extralimital record originating from the wider Indian Ocean, a view prevailing till recently [3]. Considering its taxonomic and historical relevance and because it may be hardly accessible to many readers, we here present [13] both the original text in French and an annotated, quasi-literal English translation.

## 2. Kuwait Inner Harbour, Kuwait

Mörzer-Bruyns [26] reported that a humpback whale remained one week in the Kuwait Inner Harbour in the western Persian Gulf, where it finally died after being hit by the propeller of a manoeuvring ship. Evidently pre-1971, there is no indication of the exact date. The Dutch Captain Willem Frederik Jacob Mörzer-Bruyns, during his 40 years at sea, achieved a reputation as an experienced field observer of whales and dolphins and published several scientific papers on cetaceans. His ability to correctly recognise a live or freshly dead humpback whale, arguably the most readily identifiable of all baleen whales, should be undeniable and hence we consider this record to be valid.

## 3. Khour Mousa, Iran

One of us (S.M.B. Nabavi) registered a live-sighting of a single adult humpback whale around Khour Mousa (also spelled: Khur Moosa) in the western Gulf at N 30°6.8492', E 49°10.299', on 18 July 1984. After some 20 hrs the whale was seen to leave the area for deeper waters of the Gulf. The encounter is supported by two good photographs, showing the diagnostic low dorsal fin with a long base and a leading hump, and the flukes with an irregular serrated edge (Figure 1). When surfacing, the whale exposed three deep incisive injuries transversal across its dorsal fin. This pathomorphology is consistent with a sharp force trauma such as following collision with a large-vessel propeller. The injuries appeared unhealed and the survivability of this whale was unclear.

## 4. Bahrekan coast, Iran

The carcass of a juvenile humpback whale washed ashore on the Bahrekan coast in the shallow western Gulf, on 12 August 1996 and was examined by one of us (S.M.B. Nabavi). No exact position is available but the centroid of the Bahrekan coast is approximately at N 30°05', E 49°42'. The body was relatively slender, grey in colour, with the dorsal fin set on a hump. The long right flipper measured ca. ¼ body length, the left flipper was severely damaged (Figure 2). The head had partly collapsed, presumably following loss of some cranial bones. The baleen plates were relatively short. No samples were collected, but

<sup>1</sup>Among balaenopterids, only *Megaptera novaeangliae* and blue whale *Balaenoptera musculus* have predominantly black baleen. Sei whale *B. borealis* has blackish baleen but with white fringe.



**Figure 1:** An adult humpback whale (record #3) sighted near Khour Mousa, Iran, western Persian Gulf on 18 July 1984. Note deep injuries across the dorsal fin, consistent with sharp force trauma from large-ship propeller.



**Figure 2:** Juvenile humpback whale (record #4) stranded on Bahrekan coast, Iran, western Persian Gulf, on 12 August 1996.

one low-resolution print photograph is available (Figure 2), which allowed a length estimate of 8.5-10 m deducted from the relative size of people standing beside the whale. In the field, Nabavi confidently identified it as a humpback whale, but the cause of death could not be established. The Bahrekan coast is an eutrophicated area subjected to organic pollution from wastes and heavy metals (e.g. Pb, Cu, Cd), hydrocarbons, urban wastewater pollution and biological impacts (i.e. fisheries) [27].

## 5. Doha, Qatar

Besides the Iraq record, Baldwin et al. [3] in a comprehensive review mapped two unconfirmed humpback whale cases in the Persian Gulf, one from Qatar, the other from the United Arab Emirates (UAE). Later, Baldwin [15] noted that the Iraq case is one of just two confirmed records from the Persian Gulf, leaving uncertainty about which was his second confirmed record. When queried by one of us (KVV), Robert Baldwin kindly contacted his original source for the second record, Dr. Tony Preen, who confirmed (*in litteris*, 17 Feb. 2017) a record in Qatar from a photo on display at the [National] Museum of Qatar which showed a dead humpback whale being lifted by a crane, presumably in the Doha port. While pre-1999, there is no precise date known for the photo. Considering that Dr. Preen is a highly experienced marine mammalogist we recognize this as a credible, photo-supported, humpback whale record.



**Figure 3:** Three (non-successive) frames sampled from a cell-phone video, showing a gillnet-entangled juvenile humpback whale (record #6) near Qeshm Island, Iran, in 2013. Although grainy, the frames unmistakably show the head with the diagnostic fleshy knobs (tubercles) and a low, stubby dorsal fin with broad base.

## 6. Qeshm Island, Iran

Fishermen Abdolrahman Gurani and Yusof Poozideh, from Guran village, Iran, encountered a juvenile humpback whale entangled in their fishing net (Figure 3) in the channel between Khamir (Iran mainland) and Guran (Qeshm Island) on 6 July 2012. The site (N26°46.082', E55°36.882'), locally known as Mosaageh, forms part of the Hara Mangrove Protected Area on the north coast of Qeshm Island, with estimated water depth some 8-9 m. The monofilament drift gillnet (length= 150 m; depth= 5 m; mesh size=7.5 cm), set to target mainly silver pomfret (*Pampus argenteus*) of 1-6 kg each, is typically soaked for 8-9 days and checked regularly if not daily. As soon as the owner-fisherman had been warned of the entanglement event by fellow fishermen, they proceeded to disentangle the whale to recuperate their net. The fishermen reported the length of the whale to be similar to their boat (6-7 m), corroborated by video which shows a smallish, juvenile humpback whale. The cellphone recorded video (.mp4) documented species-diagnostic characteristics, the head covered with the peculiar fleshy knobs (tubercles) and a dorsal fin set on a hump (Figure 3). Video voucher data are deposited at the Qeshm Environment Administration of the Qeshm Free Area, Qeshm City, Iran, and at the CEPEC library (Lima, Peru).

## 7. Akhtar, Iran

One of us (H. Delshab) first documented the relatively fresh, although bloating, carcass of a juvenile male humpback whale floating alongside the jetty of Akhtar Village (N27°41.722', E52°11.6367'), Bushehr Province, Iran, on 19 April 2017 (Figure 4). The jetty was located on terrain owned by the South Pars Oil Company, near Kangan city. The unmeasured body length will be estimated once the skull is obtained. The cause of death is unknown but, considering juvenile age, is suspected to be anthropogenic, most likely shipping related. Photos showed no evidence of traumatic injuries ventrally, but no dorsal views were available. Upon discovery, due to strong



**Figure 4:** Freshly dead juvenile humpback whale (record #4) floating at the jetty of Akhtar Village, Bushehr Province, Iran, on 23 April 2017.

wind and wave action the carcass could not be secured nor accessed for sampling, and over the next few days it drifted eastwards to wash ashore at N27°36.335', E52°29.735' close to Asalouyeh city, on 23 April 2017. Mostafa Moazeni, head of the Asalouyeh office of the Department of Environment (DoE), directed personnel to collect and bury the whale carcass for later retrieval of the skeleton. Other voucher data include photographs and a video deposited with the Plan for the Land Society, Tehran.

## 8. Musaffah Industrial Channel, Abu Dhabi, UAE

Stewart et al. [28] found whale remains (a left and right mandible, scapula, humerus and fragmentary radius and ulna as well as parts of the cranium and rostrum) belonging to a 'probable humpback whale (*Megaptera cf. novaeangliae*)' in the well-described sabkha sequence exposed in the Musaffah Industrial Channel, Abu Dhabi, UAE. More precisely, the whale remains were found in a series of sediments representing a range of lagoonal facies. The sediments surrounding the whale bones were age-dated (14C) at approximately 5200 yrs BP (Holocene) and are therefore interpreted to correspond to the previously documented late Flandrian sea-level peak, preceding a fall in sea-level which culminated in the supratidal sabkha overprint of the carbonates [28]. *Megaptera novaeangliae* has existed since at least the latest Middle Pleistocene [29] in the western North Pacific (Japan), and the Arabian Sea humpback whale population is thought to have been isolated from others for circa 70,000 yrs [5].

The fan-shaped scapula without coracoid and acromion processes [28], the absent or reduced olecranon of the ulna, and the relatively more laterally directed zygomatic processes of the squamosal compared to *Balaenoptera* [22,30,31] demonstrate that there is no doubt about its taxonomic identity as humpback whale.

## Possible But Unsubstantiated Reports

1. An unconfirmed report relates to a vertebra and a rib in the Iraqi Natural History Museum found circa 1954. There is an old report that a Turkish gunboat killed this whale about a century ago in the Shatt-al-Arab' (river dividing Iraq and Iran) [32,33]. The original source was R. Hatt, 1959 but was not seen. We could not verify whether these bones or any associated information still exist. In view of the positive Al-Basra Bay (#1) and Kuwait harbour (#2) records, also from the western Gulf, a humpback whale in the Shatt-al-Arab is plausible.

2. Slijper et al. [11] mapped three sightings of humpback whales in the Persian Gulf, one off the UAE in May and two at the extreme western end of the Gulf, in the period 1954-1956. However these observations were made by seamen, not biologists, and the lack of voucher material does not allow us to verify identifications. Slijper et

al. [11] believed they were reliable. The 'possible record' for the UAE [3] was based on this information.

## Discussion

After reviewing published and unpublished evidence we authenticated eight records of humpback whales in the Persian Gulf, seven contemporary cases and one mid-Holocene specimen. Four current regional range states are confirmed, i.e. the Islamic Republic of Iran (n=4), the Republic of Iraq (n=1), the State of Kuwait (n=1) and the State of Qatar (n=1). No documented records exist from coastal waters of Saudi Arabia or Bahrain [3,15,16]. The UAE yielded the subfossil record but although its central coast has been flagged as a potential location of recent occurrence [11,34], no hard evidence could be located (R. Baldwin, *in litteris* to KVV). Also, we found no published sightings for international waters of the Persian Gulf.

Four of five new records originated from Iran. Humpback whales are commonly cited in check-lists of the mammals of Iran [35-39]. Owfi et al. [9] suggest that 'these records appear to be based on *Balaenoptera* sp. skeletons that have been mis-identified as humpbacks'. However, until specimens are properly identified to species, unrecognised cases of *M. novaeangliae* may appear. Three reports for Iran's Gulf of Oman coast [8,9] originate from the Sistan/Baluchistan Province. These include a mother-calf pair sighted near Chabahar in September 2004, a stranding at Pozm (50 km W. of Chabahar) in October 2004 and a third stranding at an unspecified location in December 2003. Unfortunately no details or verifiable voucher materials, customary for new range state records, were presented. Therefore the cases reported here actually represent the first fully documented records of *M. novaeangliae* in Iranian waters.

Of the seven contemporary records (i.e. excluding mid-Holocene specimen), six (86%) originate from the northern and northwestern Persian Gulf (Figure 5) despite the fact that dedicated marine mammal surveying has been principally directed to southern Gulf waters off the UAE, Bahrain and Saudi Arabia [40-43]. While lacks of comparable effort data impede statistical analysis, the evident distributional frequency difference suggests that humpback whales may preferentially occupy northern and north western coastal waters of the Gulf.

The Arabian Sea humpback whale is the only known population of this species in the region. A number of records for the NW Gulf

of Oman near the entrance of the Strait of Hormuz [3,5,14] allow us to reasonably assume a single-stock continuous distribution into the Persian Gulf. Tissue samples for molecular genetics should ascertain this. The mid-Holocene specimen from UAE [28] indicates that humpback whale presence in the Persian Gulf is not the result of any recent ecological or climatic changes, but that the Gulf has long been part of the habitual range of the Arabian Sea population. At least, two other baleen whale species inhabit the Gulf, the apparently common Bryde's whale *Balaenoptera brydei* [8,9,44,45] and the recently confirmed Omura's whale *B. omurai* [46].

Hopefully, future more systematic marine mammal surveying will also collect environmental data which should shed light on the factors that make the Persian Gulf a suitable long-term habitat, if not permanent residence, for humpback whales. This shallow sea may offer favourable feeding or reproductive conditions, or both. In the Gulf of Oman, humpback whales sometimes enter very shallow water to feed on schools of sardines, anchovies, chub mackerel, scad and similar small fishes [1,16]. Whales in the Persian Gulf may be both piscivore or prey on euphausiids. Surprisingly perhaps, high densities of the euphausiid *Pseudeuphausia latifrons* (200-299 and >300 individuals/100 m<sup>3</sup>) are reported from the northern Persian Gulf off Iran [47,48]. In six of the seven reported cases in the Gulf, the whales were encountered in shallow, nearshore waters. The net-entangled juvenile near Qeshm Island (#6) is thought to have been feeding. Predators may also influence distribution. The killer whale (*Orcinus orca*), a known predator of humpback whales [24], has been mentioned for the Persian Gulf [3,15,16], however no substantiated records have been formally published [9] (but see footnote)<sup>2</sup> and their density in the Persian Gulf can only be guessed at. However, if *O. orca* were uncommon in parts or all of the Persian Gulf, as absence of specimens suggest, it might offer an additional incentive for humpback whales to reside there, considering that *O. orca* is widely distributed in the Gulf of Oman and Arabian Sea [3].

The deleterious anthropogenic effects on humpback whales in the Persian Gulf are of major concern. Of the seven confirmed contemporary records, only two whales were seen alive, one of which was net-entangled (#6) and the second (#3) was severely injured by a propeller collision. Among the five dead whales, at least three were juveniles that suffered an untimely death. One was a confirmed collision case (#2), and three were probable collision victims (#1,5,7) as they were suspiciously found inside a port or in the general vicinity of a portuary area. In addition, albeit an unconfirmed record, a whale was allegedly killed by a gunboat in Iraq. Other possible threats may include chemical contamination and oil spills [40,41] and infectious diseases [47-49].

One might argue that four of the humpback whales may have died considerable distances from location of reporting. For instance, conceivably the Qatar specimen (#2) might have been struck and killed by a large ship, and transported, wrapped on the ship's bulbous bow, many tens or even hundreds of km from Doha. Al-Robaae [44] documented a Bryde's whale that was transported this way and stranded at Port Umm Qasr, Iraq. Except that, while *M. novaeangliae* globally is the second-most commonly killed whale species by ship collisions, unlike other balaenopterids the species remains rarely stuck on the bow of vessels [50], probably because of its anteroposterior asymmetric body shape causing unequal drag that readily dislodges

<sup>2</sup>Killer whales spotted in Abu Dhabi waters". In: Gulf News Environment, United Arab Emirates, 8 June 2008.



**Figure 5:** Distribution of eight substantiated records of humpback whales (red dots) in nearshore areas of the Persian Gulf [clockwise starting at Qeshm]: Qeshm Island, Iran; Musaffah, UAE; Doha, Qatar; Bahrein harbour, Kuwait; Bay of Bassora (Basra), Iraq; Khour Moussa, Iran; Bahrekan Coast, Iran; Akhtar, Bushehr Province, Iran. No sightings are reported from offshore, International waters. Base map by Marble Virtual Globe.

the carcass. Only very few vessels (only military) had a bulbous bow in the late 19<sup>th</sup> century, and we suggest that the Iraq humpback whale (#1) probably died near Al-Basra Bay.

Morphological [17,18], genetic [5,14], behavioural [51] and distributional (i.e., non-migratory) [4,6] lines of evidence concord that the Arabian Sea humpback whale population has been reproductively isolated from other populations sufficiently long to differentiate. Enhanced genetic drift within a small population may accelerate the speciation process, and we agree with [5] Pomilla et al., that the Arabian Sea population deserves subspecific status, *Megaptera novaeangliae indica*. A comparative-morphological study with new specimens should re-examine earlier findings. Gervais [14] may have emphasized disproportionate importance to variation seen in the sternum and tympanic bulla. Sternal morphology is highly variable intraspecifically in Mysticeti, and its variability is so great that it can hardly be used as a criterion for the separation of species [52,53]. Sterna in humpback whales may be triangular, heart-shaped, trilobate or U-shaped [53].

The world's so-called 'most isolated' and endangered humpback whale population combined with very low, declining, population abundance (82 ind., 95%CI 60-111 from capture-recapture; 90-142 ind. from genetic data) [5] raises extreme concern for this population's continued survival. Soviet whaling data suggested still at least 400 individuals 50 years ago [5]. Dedicated marine mammal research, such as Diaz et al. [43] should be augmented throughout the Persian Gulf, and besides the recording of biological data also information on human-caused mortality and morbidity, i.e. predominantly fisheries interactions and ship strikes. Finally, epidemiology of emerging infectious diseases also deserve priority attention [49], as the strong isolation may mean that members of this population are likely immunologically naïve and thus highly susceptible to certain lethal epizootics.

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