

## Short Note

# A Wanderer in the Mediterranean Sea: The Case of a Humpback Whale (*Megaptera novaeangliae*) from the West Indies

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The humpback whale (*Megaptera novaeangliae*; Borowski, 1781) is a cosmopolitan species found in all oceans with distinct populations. These whales can cross the equator and perform one of the longest migrations among marine mammals (Stone et al., 1990; Stevick et al., 2011). In the North Atlantic, a population estimate of > 11,000 indicates substantial recovery after the end of commercial hunting (Stevick et al., 2003). In winter, large concentrations of humpbacks can be found breeding/calving in the West Indies, from Mouchoir, Silver, and Navidad Banks to Samaná Bay in the Dominican Republic (Winn et al., 1975; Smith et al., 1999; Kennedy et al., 2013), the southeastern Caribbean (Stevick et al., 2018), and the Cape Verde archipelago (Hazevoet & Wenzel, 2000; Wenzel et al., 2009, 2020; Ryan et al., 2013, 2014). Whales migrating from the Dominican Republic have been found in the higher latitude feeding grounds of the Gulf of Maine, Newfoundland, Labrador, Gulf of St. Lawrence, West Greenland, Iceland, and Norway (Stevick et al., 2006; Kennedy et al., 2013). Humpbacks from the southeastern Caribbean (Stevick et al., 2018) and Cape Verde Islands appear to migrate in higher proportions to the eastern North Atlantic, Norway, and Iceland (Jann et al., 2003; Wenzel et al., 2009, 2020; Kennedy et al., 2013).

Humpback whales are identified by the distinct black and white patterns found on the ventral side of their flukes (Katona & Whitehead, 1981), and by other features such as dorsal fin shape and scars (Smith et al., 1999). Since 1976 to the present,

the *North Atlantic Humpback Whale Catalogue* (NAHWC) has identified and catalogued nearly 11,000 individuals from all major areas of humpback aggregation, thanks to photos submitted by more than 700 international contributors from throughout the North Atlantic. The NAHWC is maintained at Allied Whale (College of the Atlantic, Bar Harbor, ME, USA; [www.coa.edu/allied-whale](http://www.coa.edu/allied-whale)). No photographic matches have been documented between Cape Verde whales and those in the western North Atlantic feeding grounds (Wenzel et al., 2009, 2020; Stevick et al., 2016, 2018), supporting the hypothesis that humpbacks from Cape Verde constitute a Distinct (breeding) Population Segment (DPS), estimated to be about 300 whales (Wenzel et al., 2020). Although wide movements have been documented between feeding aggregations of distances ranging from 900 to 1,300 km (Stevick et al., 2006), four individuals have been recaptured between the breeding areas of Guadeloupe (southeastern Caribbean) and Cape Verde, a distance of 4,000 km (Stevick et al., 2016).

Humpback whales are not a common species within the Mediterranean Sea. Occasionally, they enter through the Gibraltar Strait and are, therefore, classified as a “visitor” species (International Union for Conservation of Nature [IUCN], 2003; Reeves & Notarbartolo di Sciara, 2006). Indeed, no viable populations are known to live either in the Mediterranean or Black Sea. To date, no evidence of breeding has been reported, and the occurrence pattern within the Mediterranean

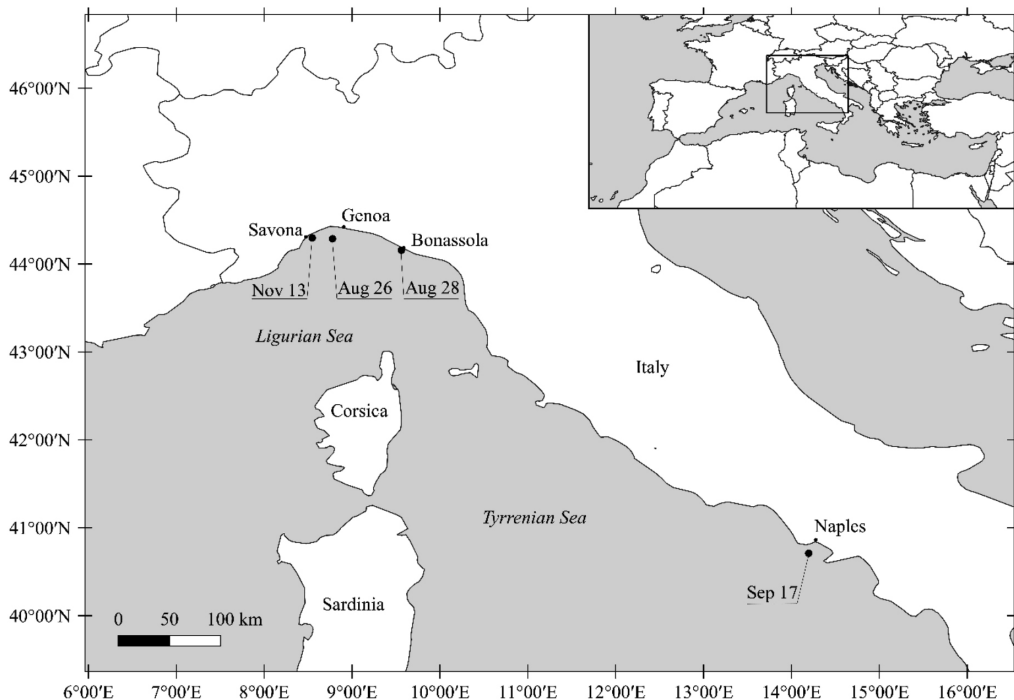
remains unknown. The use of the Mediterranean as a feeding ground was supported by coincidence between sightings of solitary individuals and areas of high-chlorophyll concentration (Ruíz et al., 2018), and feeding activity was observed in two records (Frantzis et al., 2004; Panigada et al., 2014). Bianucci et al. (2006) suggested the Mediterranean may have been an “ancient” breeding area by documenting whale barnacle, *Coronula*, fossil presence in Pliocene/Pleistocene deposits. Considering that barnacles often detach from whale skin in breeding areas, the authors concluded that humpbacks may have used the Mediterranean as a breeding ground during the Pliocene and Pleistocene eras. In general, humpback whales have become more frequent visitors to the Mediterranean and were reclassified from “accidental” to “occasional” species (Frantzis et al., 2004).

Herein, we document exceptional sightings and the movement of a mother–calf humpback whale pair within the Mediterranean Sea in 2020, and describe changes in the mother’s body condition over the sighting period. We also report the first photographic recapture of a humpback between the West Indies and the Mediterranean Sea. Following published and unpublished records to date, this is the 45th reported sighting of humpback whales

within the Mediterranean Sea and the first confirmed record of a mother–calf pair.

### Humpback Whale Sightings in the Mediterranean Sea During 2020

Four sightings were reported between August and November 2020 on the Italian West Coast (Figure 1). Two humpback whales were sighted off Genoa (Figure 2a) on 26 August 2020 during an opportunistic whale-watching trip. Due to their close association, the difference in the size of the blows, and the marked body size difference between the two, we classified them as a mother–calf pair (see Szabo & Duffus, 2008). Photos of the ventral side of the mother’s fluke and of the dorsal fins and flanks of both individuals were collected for photo-identification. The pair were swimming in an eastward direction, 11.5 km from the coast, and with a consistent speed of 7 km/h. No feeding activity was observed. Subsequently, members of the general public reported two sightings off Bonassola (eastern Ligurian Sea) on 28 August and off Naples (Tyrrhenian Sea) on 17 September, 2 d and 22 d after the Genoa sighting, respectively. In both events, two individuals with a marked size difference were observed breaching and traveling south, but



**Figure 1.** Map of Mediterranean Sea humpback whale (*Megaptera novaeangliae*) sightings in 2020



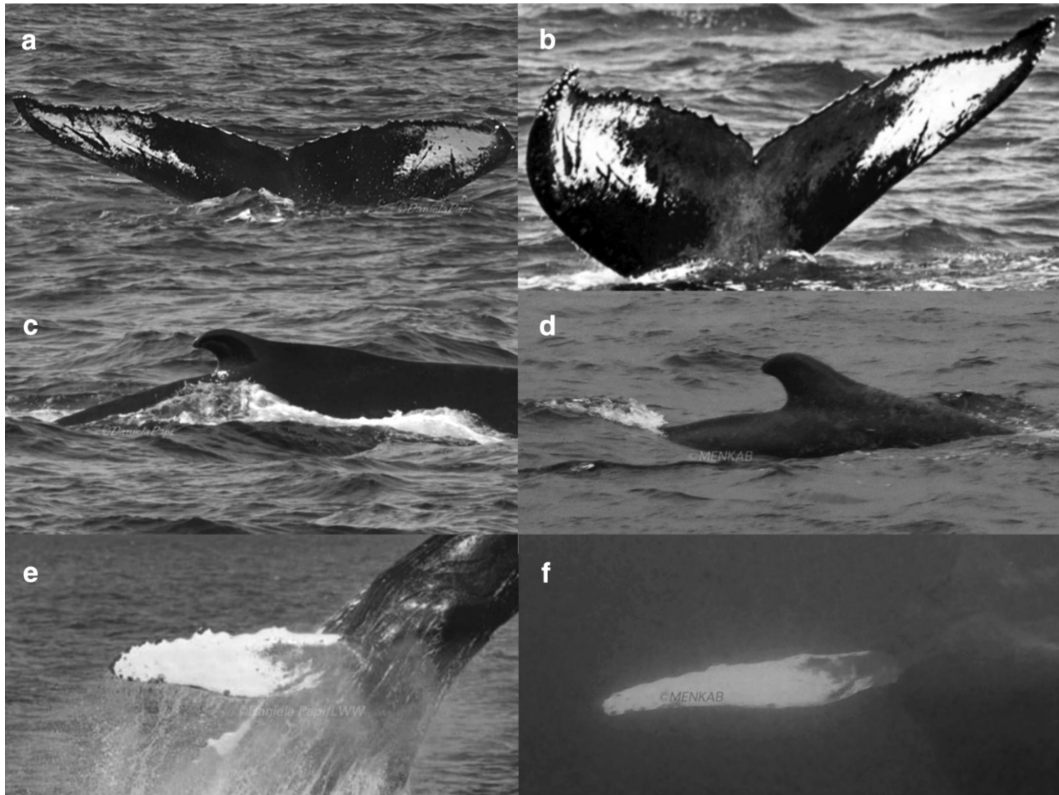
**Figure 2.** Humpback whale sighting in the Ligurian Sea: (a) mother–calf pair on 26 August 2020; and (b) mother alone on 13 November 2020 (Photo credits: [a] © Daniela Papi, Golfo Paradiso Whale Watching; and [b] © Giulia Calogero, Menkab)

good-quality images for photo-identification were not available. Lastly, an adult humpback whale was sighted off Savona at sunset on 13 November 2020 by the Menkab team during a sperm whale (*Physeter macrocephalus*) monitoring survey in the Ligurian Sea (Figure 2b). This whale was alone, swimming at 3 km/h in the NE direction, 4.6 km from the coast. Photos of the dorsal fin profile and underwater images of patches on the left pectoral fin were collected for photo-identification. In this observation, aerial drone images were used to estimate body length, as described in Christiansen et al. (2016). No further sightings have been reported.

#### **Photographic Matching to North Atlantic Humpback Whale Catalogue**

Fluke photographs collected during the 26 August 2020 sighting were compared to those in the NAHWC, the *North Norwegian Humpback Whale*

*Catalogue*, and the Happywhale database (<https://happywhale.com>). Happywhale uses a recently developed, fast, high-quality algorithm for automated image recognition of humpback whale flukes (Cheeseman et al., 2021). Opportunistic or otherwise noted publicly available images from the NAHWC collection are accessible on the Happywhale website for automated image recognition. Furthermore, photographs collected during the 26 August 2020 and 13 November 2020 sightings were compared to find a match between those sightings. From the NAHWC subset, a positive photo-identification emerged for the mother in the first 2020 sighting (Figure 3a & b). The whale, identified as NA05503, was first photographed on Silver Bank, north of the Dominican Republic, on 12 February 1986—the only known sighting of this individual for the past 34 y and 6 mo. Following Carlson et al. (1990), we found no marked changes in the ventral fluke pattern and



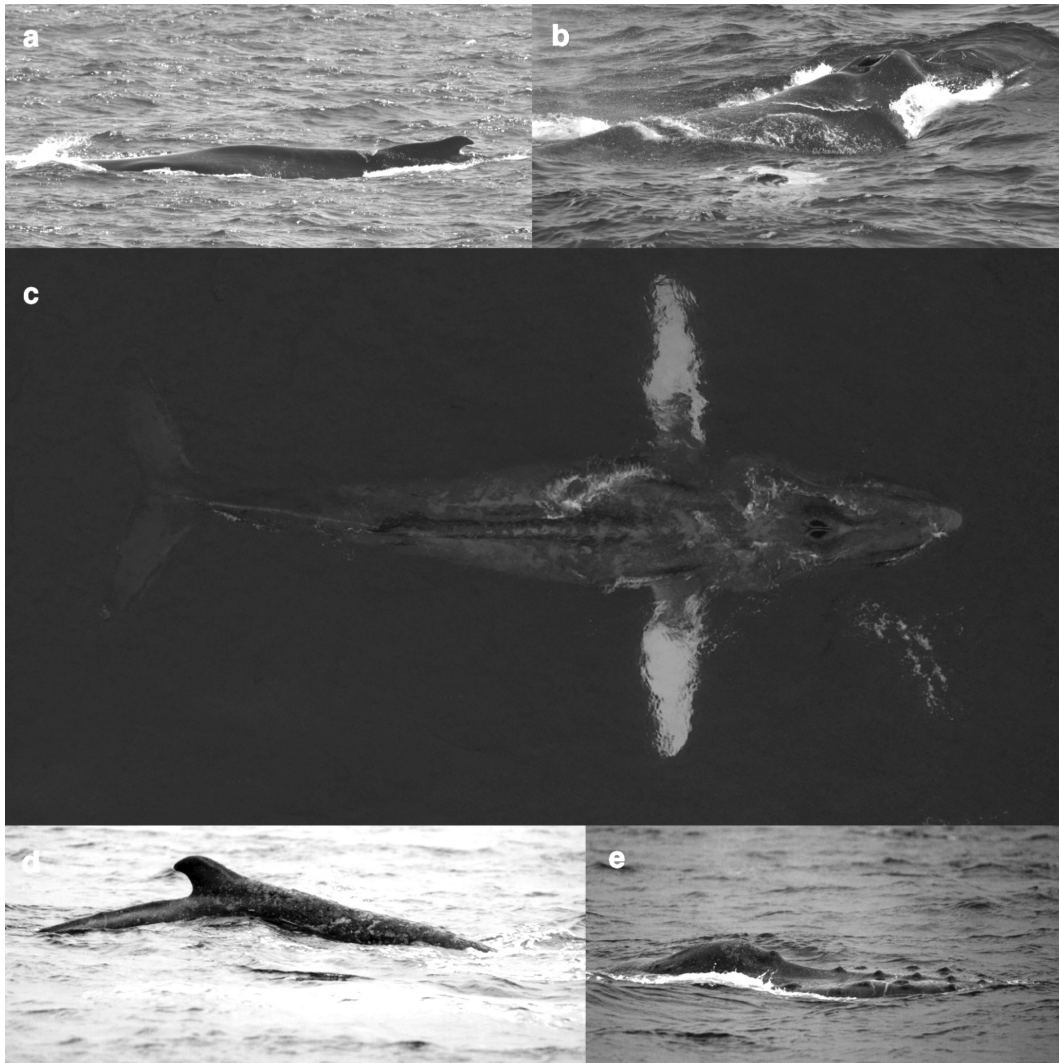
**Figure 3.** Matching events: fluke photo-ID confirmation between (a) Genoa sighting and (b) Silver Bank, Dominican Republic, of whale NA05503 in the NAHWC, contributed by ORES; dorsal fin profile confirmation between (c) Genoa and (d) Savona sightings; pectoral flipper white patch confirmation between (e) Genoa and (f) Savona sightings. (Photo credits: [a & c] © Daniela Papi, Golfo Paradiso Whale Watching; [b] © Kevin Chu, Ocean Research Education Society [ORES], maintained in the NAHWC and made available on the Happywhale database; [d] © Giulia Calogero, Menkab; and [e & f] © Biagio Violi, Menkab)

trailing edge. Despite the lack of useful identification photos collected during the second and third 2020 sightings, it can be speculated that, due to the time frame, travel route, and rarity of humpback occurrence in the Mediterranean, those individuals were likely the same ones sighted off Genoa, probably disoriented and following the Western Italian coastline. The pair covered, respectively, *ca* 60 km in 2 d from Genoa to Bonassola and *ca* 560 km in 20 d from Bonassola to Naples, with a minimum mean speed of 28 km/d (1.17 km/h). A positive identification of the mother occurred between the first and fourth 2020 sightings through analyses of the dorsal fin images (Figure 3c & d) and images of the white patches on the upper part of the left pectoral fin (Figure 3e & f). Because of the poor skin conditions and whale lice coverage, the back and flank area could not be used as a second feature to confirm identification. During the August sighting, a patch was visible on the right side of the back, but in the November sighting it was no longer visible,

probably consumed by cyamids. Considering all Mediterranean sightings of the mother NA05503, a north-south-north displacement of 79 d was assessed with a shortest straight-line distance separating the first and fourth observations, covering about 1,200 km. The pair reached Naples in 22 d, and then separated at some point during the following 57 d before the final sighting of the mother (NA05503) in November. We presume the calf had died as it was present during the third sighting (Naples) but not during the fourth sighting (Savona).

#### Change of Body Conditions Between First and Fourth Sightings in 2020

Some differences between the first and the fourth sightings of the mother (NA05503) emerged while analysing behaviour and her body condition. During the first sighting of 2020, the pair breached several times and the mother fluked twice. Fat loss was observed along the vertebral column



**Figure 4.** NA05503 body condition changes: (a) left and (b) right sides with signs of fat loss in August sighting; aerial drone view (c), dorsal fin (d), and blow hole area (e) with cyamid presence in November sighting. (Photo credits: [a, b] © Daniela Papi, Golfo Paradiso Whale Watching; [c] © Gabriele Principato, Artescienza; and [d, e] © Samuele Würtz, Artescienza)

and near the blowhole region of the mother, but no presence of whale lice was reported (Figure 4a & b). During the fourth sighting, a different behaviour was observed. The mother did not exhibit active surface behaviours, never fluked, and was observed logging and nearly motionless a few meters below the surface when the Menkab boat approached. The poor nutritional state of the whale was confirmed by concave epaxial muscles and the absence of fat reserves (Figure 2a; see also the supplemental video for this short note; the supplemental video is available in the “Supplemental Material” section of the *Aquatic Mammals* website:

[https://www.aquaticmammalsjournal.org/index.php?option=com\\_content&view=article&id=10&Itemid=147](https://www.aquaticmammalsjournal.org/index.php?option=com_content&view=article&id=10&Itemid=147)). Aerial images revealed a pronounced decrease in width along the larger portion of the body (Figure 4c). Furthermore, the body was covered with whale lice, which had spread everywhere except for the pectoral fins (Figure 4d & e). Aerial measurements estimated a body length of 13.7 m (SD = 0.3). No sign of ship strike or entanglement were observed.

Humpback whales are famous for undertaking some of the longest mammalian migrations (see Stone et al., 1990; Stevick et al., 2011). Within the

**Table 1.** Records of humpback whales (*Megaptera novaeangliae*) in the Mediterranean Sea. Extended from Notarbartolo di Sciara & Birkun (2010), Cagnolaro et al. (2015), Rodrigues et al. (2016), and Ruíz et al. (2018). \* = recapture attempts with NAHWC. Body length given in parentheses.

Record	Date	West/East Mediterranean	Location	Notes	References
1	November 1885	West	France: Toulon	Bycaught individual in fishing nets (6.8 m)	Aguilar, 1989
2	14 March 1986	West	Spain: Majorca, Balears	Sighting of two individuals—unconfirmed female with calf	Aguilar, 1989
3	March 1990	West	Spain: Bay of Aigua Blava, Catalonia	Sighting of one individual, probably adult	Pers. comm. by A. Aguilar <sup>1</sup> to Frantzis et al., 2004
4	2 October 1992	West	Tunisia: Gulf of Gabés	Bycaught individual found dead (8 m)	Chakroun, 1994
5	21 May 1993	West	France: Cavalaire	Bycaught female found alive (7 m)	Bompar, 2000
6	August 1993	West	France: Toulon	Sighting of two individuals	Frantzis et al., 2004
7	24 January 1998	West	Italy: Gulf of Oristano, Sardinia	Sighting of one individual (7-8 m)	Frantzis et al., 2004
8	12 December 1999	West	Spain: off Marbella, Málaga	Bycaught and released individual (~10 m)	Bellido et al., 2006
9*	17 April 2001	East	Greece: Bay of Tolo, Argolikos Gulf	Sighting of one individual observed feeding nearshore. Not found within NAHWC and subsequently added as NA04923 (8-11 m).	Frantzis et al., 2004
10	19 July 2002	East	Greece: Lefkada Island	Sighting of emaciated individual	Frantzis et al., 2004
11	4 August 2002	East	Italy: Senigallia	Sighting of one emaciated individual, probably resighting of Lefkada record 10 (~9 m)	Affronte et al., 2003
12	5 April 2003	East	Syria: Tartous (Syria)	A floating dead, immature male (7.85 m)	Saad, 2004; Kerem et al., 2012
13	17 February 2004	East	Greece: Corfu Island	A bycaught female found dead with fishing nets in its mouth (7.2 m)	Frantzis et al., 2004
14	2 April 2004	East	Italy: Siracusa, Sicily	Bycaught alive and released individual (~10 m)	Centro Studi Cetacei, 2006
15	2004	West	Spain: Ceuta	--	Rojo-Nieto et al., 2011
16	2008	West	Morocco: Marruecos	--	Rojo-Nieto et al., 2011
17*	February-April 2009	East	Slovenia: Gulf of Trieste	Sighting of a young individual observed repeatedly in good condition; not found within NAHWC (10-12 m).	Genov et al. (2009); pers. comm. by R. Seton <sup>2</sup>
18	7 August 2010	West	Spain: Bay of Algeciras	Sighting of one individual (~8 m)	Pers. comm. by FIRMM team <sup>3</sup>
19	26-28 August 2010	West	Italy: Sestri Levante, Ligurian Sea	Sighting of one individual in several days (10-13 m)	Pers. comm. by S. Nuti <sup>4</sup>
20	17 September 2010	West	Spain: San Antonio Cape, Jávea, Alicante	Sighting of two individuals	Pers. comm. by J. A. Raga & P. Gozalbes <sup>5</sup>
21*	March 2011	West	Gibraltar: Strait of Gibraltar	Individual resighted out of Mediterranean, in Ireland, and in Cape Verde. Identified within NAHWC as NA04740	Berrow et al., 2021
22	24 March 2011	West	Italy: Off Savona, Ligurian Sea	Sighting of one individual	Pers. comm. by M. Rosso <sup>6</sup>

23	25 April 2011	West	Spain: Sagunto, Valencia	Sighting of one individual	Pers. comm. by J. A. Raga & P. Gozalbes <sup>5</sup>
24*	13 June 2011	West	France: Port of Carry-le Rouet	Young female stranded dead. Fluke photo compared to the NAHWC, not found, and NA# not added due to the age/small size of individual (7.40 m).	Dhermain et al., 2015; pers. comm. by L. Jones
25	28 June 2012	West	France: 32.1 km off Nice	Sighting of one individual; same as in records 30 & 33 (8-10 m).	Panigada et al., 2014
26*	31 August 2012	West	France: Off Cerbère, Gulf of Lyon	Sighting of two individuals. One fluke obtained, not found within NAHWC, and subsequently added as NA06397.	Pers. comm. by N. Gandilhon, C. Azzinari, G. Oms <sup>7</sup> in Cagnolaro et al., 2015; pers. comm. by L. Jones
27	31 October 2012	West	Algeria: Targa's Beach, Ain Temouchent	Stranding of a juvenile male (9.30 m)	Bouslah et al., 2016
28	12 November 2012	West	Spain: Estepona	Stranded individual (5.37 m)	Consejería de Medio Ambiente y Ordenación del Territorio, 2015
29	10 January 2013	East	Libya: Sirte	Stranding	Pers. comm. by A. Saied <sup>8</sup> & S. Diryaq <sup>9</sup>
30	March 2013	West	Italy: Off Lampedusa	Sighting of same individual as in records 25 & 33; feeding recorded.	Panigada et al., 2014
31	10 June 2013	West	France: Canet port, Perpignan	Sighting of one individual (12-13 m)	Pers. comm. by N. Gandilhon <sup>7</sup>
32	10 July 2013	West	Gibraltar: Strait of Gibraltar	Sighting of one individual	Gauffier et al., 2018
33*	23 July 2013	West	France: Between Nice and Calvi	Sighting of one individual following a fin whale; same individual as in records 25 & 30. Not found within NAHWC and subsequently added as NA09114.	Panigada et al., 2014; Pers. comm. by L. Jones
34	10 December 2015	West	Italy: Gulf of Naples	Sighting of one individual in a shallow area (8-9 m)	Maio et al., 2016; Russo et al., 2016
35	March-April 2016	West	Spain: Bay of Algeciras	Sighting of one individual from 20 March to 9 April	Ruíz et al., 2018
36	20 July 2016	West	Italy: Procida Island, Naples	Sighting of one individual	Maio et al., 2019
37	July 2018	West	Spain: Caños de Meca, Cádiz	Sighting of one juvenile	Pers. comm. by Clemente Picorell in Ruíz et al., 2018
38*	6 August 2018	West	Spain: Cabo Tiñoso, Murcia	Sighting of one juvenile; not found within NAHWC and subsequently added as NA11926.	Pers. comm. by A. Méndez <sup>10</sup> ; pers. comm. by L. Jones
39	10 March 2019	West	Italy: Gulf of Naples	Sighting of one individual, heading south	Maio et al., 2019
40	18 June 2019	West	Italy: Capraia Island	Sighting of one individual by Grandi Navi Veloci ferry	Local media
41	22 June 2019	West	Spain: Gandia, Valencia	Stranded female; animal code Mn190622 in BEVACET database (8.34 m).	Pers. comm. by J. A. Raga, <sup>5</sup> P. Gozalbes, <sup>5</sup> and J. L. Crespo Picazo <sup>11</sup>
42*	26 August 2020	West	Italy: Genova, Ligurian Sea	Sighting of a mother-calf pair. The adult was identified within NAHWC as NA05503.	This study

43	28 August 2020	West	Italy: Bonassola, Ligurian Sea	Sighting of two individuals by member of the public. Probably same pair as record 42.	This study
44	17 September 2020	West	Italy: Napoli, Ligurian Sea	Sighting of two individuals by member of the public. Probably same pair as records 42 and 43.	This study
45	13 November 2020	West	Italy: Savona, Ligurian Sea	Sighting of one individual in emaciated condition. Confirmed matching with record 42 (13.7 m).	This study

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<sup>6</sup>Massimiliano Rosso, Cima Research Foundation, Via A. Magliotto, 2, 17100 Savona, Italy; March 2021

<sup>7</sup>Nadège Gandilhon, Caroline Azzinari, Georges Azzinari, Sonia Gara, and Catherine Oms, Breach NGO Mediterranean, Rue des Matins Bleus, 11, 66300, Ponteilla, France; April 2021

<sup>8</sup>Almokhtar Saied, Marine and Wildlife Section, Ministry of Environment, Janzur Road, Alghiran, Tripoli, Libya; May 2021

<sup>9</sup>Salih Diryaaq, Ministry of Environment, Alswawa Street, Sirte, Libya; May 2021

<sup>10</sup>Antonio Méndez, Cetáceos & Navegación, c/o Magistrado Hilario Sáez 7, 30860, Puerto de Mazarrón Murcia, Spain; April 2021

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Mediterranean Sea, individuals are occasionally sighted and considered *wanderers* from the North Atlantic population crossing the Gibraltar Strait (Aguilar, 1989). Photo-identification is a non-invasive methodology useful for monitoring cetacean movements over broad space and time scales. To date, seven photographic recapture attempts with animals from the Mediterranean to the North Atlantic Ocean were performed: four unpublished (all negatives; L. Jones, pers. comm., 30 April 2021; see records 24, 26, 33, and 38 in Table 1) and three published (see records 9, 17, and 21 in Table 1). In the latter, the only positive recapture was an individual sighted in Gibraltar in 2011, recaptured in Ireland in 2015, and then resighted/recaptured off the Cape Verde Islands in 2019 (identified as NA04740; see Berrow et al., 2021). In this context, we report the eighth photographic recapture attempt and the second positive resighting between the Mediterranean Sea and the North Atlantic Ocean. This is the first documented recapture record between the humpback whale breeding/calving ground of the West Indies and the Mediterranean Sea. The whale NA05503 was sighted only once on Silver Bank, Dominican Republic, in 1986 and was likely an adult whale when photographed as estimated by the size of the individual and the black and white pigmentation of the fluke pattern (Carlson et al., 1990). This individual had not been documented since 1986 either on the feeding or breeding grounds where contributors regularly collect, contribute, and share data with NAHWC and Happywhale databases (no positive matches were

found for the calf). While the NAHWC database has grown enormously, thanks to photos from whale-watching trips and dedicated and opportunistic platforms from across the North Atlantic, it is difficult to interpret effort by region and/or by year because of data heterogeneity (Wenzel et al., 2009). However, within the NAHWC, over 80 whales have been resighted over a 30-y gap (L. Jones, unpub. data, 30 April 2021). In this context, the increase in the North Atlantic population after the end of whaling (Stevick et al., 2003) may influence the recapture probability of sighting individuals (Hammond, 1990). The first sighting of this whale in February 1986 coincides with the peak of humpback abundance in Dominican Republic waters during the breeding season (Balcomb & Nichols, 1982; Whitehead, 1982; Whitehead & Moore, 1982). In this scenario, despite the West Indies comprising one of the most intensely studied populations of large whales in the world, this whale may not have been photographed from among the thousands of whales using the area regularly each year (see review in Kennedy & Clapham, 2018). It is known that humpback whales complete large longitudinal movements, especially in changeable or unpredictable circumstances (see Stevick et al., 2006, 2011), but what may have driven this pair into the Mediterranean is hard to assess.

Including our sightings, we list 45 records to date within the Mediterranean Sea, consisting of mainly solitary individuals, three dyads, and an unconfirmed female and calf pair (Table 1). We provide the first confirmed case of a mother–calf pair of



humpbacks in the Mediterranean. Occurrence in the Ligurian Sea and in the Pelagos Sanctuary is in concordance with Aguilar's (1989) speculation on humpback whale movement towards the summer feeding area of the northwestern Mediterranean as found for fin whales (*Balaenoptera physalus*; Orsi Relini & Giordano, 1992; Notarbartolo di Sciarra et al., 2003). Humpback whales feed both on euphausiids and on various species of schooling fishes (Clapham et al., 1997), such as *Sardinella* sp., that are found in the Mediterranean. However, we did not observe any feeding activity, and the adult whale showed progressive fat reduction between the August and November sightings, whether due to disease and/or starvation is unknown. Moreover, in contrast to the August sighting where NA05503 showed a healthy skin condition, with a very light load of whale lice, in November, we observed extensive whale lice across her whole body. Whale lice are usually found on humpback whales; they feed on the whales' skin containing pigment (Leung, 1970; Rowntree, 1996; Pfeiffer, 2009). In previous studies, high whale lice coverage was described on an injured humpback whale off Hawaii in 1996 (Osmond & Kaufman, 1998) and on a humpback whale (called "Scarlet") carrying fishing gear off Newport Beach, California, in August 2016 (Scarlet was found dead in April 2017; see <https://happy-whale.com/individual/2461;enc=8989>). During our fourth sighting, there was no sign of ship strikes or entanglements. The whale's emaciated condition may be linked to a prolonged period of starvation, but this was not confirmed as the cause. This whale's physical condition, combined with a reduced swimming speed and water flow over the body, created suitable conditions for further increase of cyamid aggregations (Rowntree, 1996).

It is important to point out that previous humpback whale observations of feeding activity within the Mediterranean were of solitary juvenile whales (see Table 1). In our case, this pair would have different nutritional needs as compared with a solitary individual (Lockyer, 1981) and probably did not feed enough or at all. The blubber layer of females is most often thickest during pregnancy and depletes throughout lactation (Lockyer, 1984, 1986; Reeves & Mitchell, 1986; Christiansen et al., 2016). Once weaning occurs, females start to replenish their blubber layer (Pettis et al., 2004). A nursing whale uses her reserves to increase milkfat concentrations, which reach a peak at 6 mo as a calf nurses, after which milkfat concentrations begin to decrease (Ofstedal et al., 1997). This may explain the initial fat loss observed for the mother in August. In early autumn, weaning may have occurred, as reported by Baraff & Weinrich (1993), and the calf may have separated from the mother. Still, lactation may last for 10.5 mo (Chittleborough, 1958) to over 1 y (see

Ofstedal et al., 1997). Although it has not been documented for baleen whales, maternal body condition in other marine mammals influences offspring survival (McMahon et al., 2000); throughout both gestation and lactation, female baleen whales likely place their own fitness and survival above that of their offspring (Christiansen et al., 2014, 2016). It is likely that this mother did not feed enough or at all in the Mediterranean as confirmed by her emaciated condition observed in November; and the calf, who likely did not nurse sufficiently, might have been unable to follow her, and its survival could not be ascertained.

The photographic recapture (after 79 d) of the mother from this observed mother-calf pair and its north-south-north displacement (~1,200 km) was similar to an observation reported by Panigada et al. (2014; see records 25, 30, and 33 in Table 1), although Panigada et al. also observed feeding activity and saw the whale over a period of 14 mo. In our case, the occurrences of the mother (NA05503) in the northern part of the western Mediterranean 2.5 mo apart may reflect a double attempt to "find the way to the North Atlantic" feeding areas, while also suggesting an inability to "find the way back to the ocean." Similarly, within the eastern Mediterranean (Adriatic Sea), an emaciated humpback was sighted heading north, between July and August 2002 (see records 10 and 11 in Table 1). Although not described for baleen whales, a prolonged starvation state was documented for sperm whales stranded in the Adriatic Sea in 2009 and 2014; this state induced the release of chemicals into the bloodstream that provoke neurotoxic and immunotoxic effects that could alter the health and the orientation of the whales (Mazzariol et al., 2011, 2018). Furthermore, diseased conditions were speculated for fin whales sighted nearshore in the Ligurian Sea in the summer of 2020 that displayed emaciated conditions with a marked presence of *Pennella* on the body (B. Violi & A. Verga, pers. obs., 5 April 2021). Still, without pathological analyses, it is difficult to address this hypothesis both in fin whales and in NA05503. After the fourth sighting of the mother, NA05503, in Savona, no further sightings were reported, and we believe it is unlikely this whale survived.

## Conclusion

In conclusion, we compiled records of humpback whales in the Mediterranean Sea and confirmed 45 total sightings from 1885 to 2020—37 in the western Mediterranean basin and eight in the eastern basin. As speculated by Frantzis et al. (2004), such occurrences may reflect an increase in the North Atlantic population (Stevick et al., 2003) or changes in oceanographic conditions within the Gibraltar Strait area and the Mediterranean Sea. Following Stevick et al.'s (2011) conclusions on the flexibility

in movement patterns of a typically philopatric species, we believe that the “explorer instinct” of mammals may have played a key role in a similar longitudinal shift. Herein, we report for 2020 on the second case of a positive match between the North Atlantic Ocean and the inner Mediterranean Sea of a humpback whale, a visitor cetacean species. Prior to NA05503, a pod of five killer whales (*Orcinus orca*) from western Iceland were photo-recaptured in the Ligurian Sea, though none of these individuals survived (Mrusczoek et al., 2021). Given these two recent observations, the Mediterranean Sea might be a “dead end” for some North Atlantic oceanic species. In this framework, a wide and collaborative research network within the Mediterranean must be a priority to report and efficiently monitor the occurrence of visitor species from the Atlantic Ocean, as well as to propose and efficiently coordinate management plans.

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### Literature Cited

- Affronte, M., Stanzani, L. A., & Stanzani, G. (2003). First record of humpback whale, *Megaptera novaeangliae* (Borowski, 1781) in the Adriatic Sea. *Annales (Annals for Istrian and Mediterranean Studies)*, 13, 51-54.
- Aguilar, A. (1989). A record of two humpback whales, *Megaptera novaeangliae*, in the western Mediterranean Sea. *Marine Mammal Science*, 5(3), 306-309. <https://doi.org/10.1111/j.1748-7692.1989.tb00344.x>
- Balcomb, K. C., & Nichols, G. (1982). Humpback whale censuses in the West Indies. *Reports of the International Whaling Commission*, 32, 401-406.
- Baraff, L., & Weinrich, M. T. (1993). Separation of humpback whale mothers and calves on a feeding ground in early autumn. *Marine Mammal Science*, 9(4), 431-434. <https://doi.org/10.1111/j.1748-7692.1993.tb00476.x>
- Bellido, J. J., Castillo, J. J., Farfan, M. A., Martin, J. J., Mons, J. L., & Real, R. (2006). Primera cita de una yubarta *Megaptera novaeangliae* (Borowski, 1781) en el litoral Español del Mar de Alborán [First sighting of a humpback whale *Megaptera novaeangliae* (Borowski, 1781) in the Spanish coast of Alborán Sea]. *Galemys*, 18, 40-42.
- Berrow, S. D., Massett, N., Whooley, P., Jann, B. V., Lopez-Suárez, P., Stevick, P. T., & Wenzel, F. W. (2021). Resightings of humpback whales (*Megaptera novaeangliae*) from Ireland to a known breeding ground: Cabo Verde, West Africa. *Aquatic Mammals*, 47(1), 63-70. <https://doi.org/10.1578/AM.47.1.2021.63>

- Bianucci, G., Landini, W., & Buckeridge, J. (2006). Whale barnacles and Neogene cetacean migration routes. *New Zealand Journal of Geology and Geophysics*, 49(1), 115-120. <https://doi.org/10.1080/00288306.2006.9515152>
- Bompar, J.-M. (2000). *Les cétacés de Méditerranée* [Cetaceans of the Mediterranean]. Edisud. 188 pp.
- Bouslah, Y., Larbi Doukara, K., Bouderbala, M., Merzoug, D., & Boutiba, Z. (2016). First record and trace element concentration in humpback whale (*Megaptera novaeangliae*) stranding on the coast of Algeria (southwestern Mediterranean Sea). *International Journal of Sciences: Basic and Applied Research (IJSBAR)*, 26, 405-414.
- Cagnolaro, L., Cozzi, B., Notarbartolo di Sciarra, G., Podestà, M. (2015). Fauna d'Italia [Fauna of Italy]. In *Mammalia IV – Cetacea* (Vol. XLIX, pp. 236-242). Calderini.
- Carlson, C. A., Mayo, C. A., & Whitehead, H. (1990). Changes in the ventral fluke pattern of the humpback whale (*Megaptera novaeangliae*), and its effect on matching; evaluation of its significance to photo-identification research. *Reports of the International Whaling Commission (Special Issue)*, 12, 105-111.
- Centro Studi Cetacei. (2006). Cetacei spiaggiati lungo le coste italiane. XIX. Rendiconto 2004 [Stranded cetaceans along Italian coastlines] (XIX. Report 2004). *Atti della Società Italiana di Scienze Naturali e del Museo Civico di Storia Naturale di Milano*, 147(1), 145-157.
- Chakroun, F. (1994). Status of cetaceans in Tunisian marine waters. *European Research on Cetaceans*, 8, 107.
- Cheeseman, T., Southerland, K., Park, J., Olio, M., Flynn, K., Calambokidis, J., Jones, L., Garrigue, C., Frisch, A., Howard, A., Reade, W., Neilson, J., Gabriele, C., & Clapham, P. (2021). Advanced image recognition: A fully automated, high-accuracy photo-identification matching system for humpback whales. *Mammalian Biology*.
- Chittleborough, R. G. (1958). The breeding cycle of the female humpback whale, *Megaptera nodosa* (Bonnaterre). *Marine and Freshwater Research*, 9(1), 1-18. <https://doi.org/10.1071/MF9580001>
- Christiansen, F., Vikiingsson, G. A., Rasmussen, M. H., & Lusseau, D. (2014). Female body condition affects foetal growth in a capital breeding mysticete. *Functional Ecology*, 28(3), 579-588. <https://doi.org/10.1111/1365-2435.12200>
- Christiansen, F., Dujon, A. M., Sprogis, K. R., Arnould, J. P., & Bejder, L. (2016). Noninvasive unmanned aerial vehicle provides estimates of the energetic cost of reproduction in humpback whales. *Ecosphere*, 7(10), e01468. <https://doi.org/10.1002/ecs2.1468>
- Clapham, P. J., Leatherwood, S., Szczepaniak, I., & Brownell, R. L., Jr. (1997). Catches of humpback and other whales from shore stations at Moss Landing and Trinidad, California, 1919-1926. *Marine Mammal Science*, 13(3), 368-394. <https://doi.org/10.1111/j.1748-7692.1997.tb00646.x>
- Consejería de Medio Ambiente y Ordenación del Territorio. (2015). *Programa de gestión sostenible del medio marino Andaluz – Informe 2015* [Sustainable management program of marine environment of Andalusia – Report 2015] (Annual report). Junta de Andalucía. [www.juntadeandalucia.es/medioambiente/portal\\_web/web/temas\\_ambientales/biodiversidad/1\\_medio\\_marino/informes\\_anuales/informe\\_anual\\_2015.pdf](http://www.juntadeandalucia.es/medioambiente/portal_web/web/temas_ambientales/biodiversidad/1_medio_marino/informes_anuales/informe_anual_2015.pdf)
- Dhermain, F., Astruc, G., Cesarini, C., Dupont, L., Dupraz, F., Godenir, J., Keck, N., Labach, H., & Wafo, E. (2015). Recensement des échouages de cétacés sur les côtes françaises de Méditerranée, entre 2010 et 2012 [Census of cetacean strandings on the French Mediterranean coast, between 2010 and 2012]. *Scientific Reports of Port-Cros National Park*, 29, 103-126. [https://www.gecem.org/sites/gecem.org/files/29\\_103-126\\_echouages\\_cetaces\\_dhermain.pdf](https://www.gecem.org/sites/gecem.org/files/29_103-126_echouages_cetaces_dhermain.pdf)
- Frantzis, A., Nikolaou, O., Bompar, J. M., & Cammedda, A. (2004). Humpback whale (*Megaptera novaeangliae*) occurrence in the Mediterranean Sea. *Journal of Cetacean Research and Management*, 6(1), 25-28.
- Gauffier, P., Verborgh, P., Giménez, J., Esteban, R., Sierra, J. M. S., & de Stephanis, R. (2018). Contemporary migration of fin whales through the Strait of Gibraltar. *Marine Ecology Progress Series*, 588, 215-228. <https://doi.org/10.3354/meps12449>
- Genov, T., Kotnjek, P., & Lipej, L. (2009). New record of the humpback whale (*Megaptera novaeangliae*) in the Adriatic Sea. *Annales*, 19(1), 25-30.
- Hammond, P. S. (1990). Heterogeneity in the Gulf of Maine? Estimating humpback whale population size when capture probabilities are not equal. *Reports of the International Whaling Commission (Special Issue)*, 12, 135-139.
- Hazevoet, C. J., & Wenzel, F. W. (2000). Whales and dolphins (Mammalia, Cetacea) of the Cape Verde Islands, with special reference to the humpback whale *Megaptera novaeangliae* (Borowski, 1781). *Contributions to Zoology*, 69(3), 197-211. <https://doi.org/10.1163/18759866-06903004>
- International Union for Conservation of Nature (IUCN). (2003). *Guidelines for application of IUCN red list criteria at regional levels: Version 3.0*. IUCN Species Survival Commission. <https://www.iucnredlist.org/resources/categories-and-criteria>
- Jann, B., Allen, J., Carrillo, M., Hanquet, S., Katona, S. K., Martin, A. R., Reeves, R. R., Seton, R., Stevick, P. T., & Wenzel, F. W. (2003). Migration of a humpback whale (*Megaptera novaeangliae*) between the Cape Verde Islands and Iceland. *Journal of Cetacean Research and Management*, 5(2), 125-130.
- Katona, S. K., & Whitehead, H. P. (1981). Identifying humpback whales using their natural markings. *Polar Record*, 20(128), 439-444. <https://doi.org/10.1017/S003224740000365X>
- Kennedy, A. S., & Clapham, P. J. (2018). From whaling to tagging: The evolution of North Atlantic humpback whale research in the West Indies. *Marine Fisheries Review*, 79(2), 23-37. <https://doi.org/10.7755/MFR.79.2.2>
- Kennedy, A. S., Zerbini, A. N., Vásquez, O. V., Gandilhon, N., Clapham, P. J., & Adam, O. (2013). Local and migratory movements of humpback whales (*Megaptera novaeangliae*) satellite-tracked in the North Atlantic Ocean.

- Canadian Journal of Zoology*, 92(1), 9-18. <https://doi.org/10.1139/cjz-2013-0161>
- Kerem, D., Hadar, N., Goffman, O., Scheinin, A., Kent, R., Boisseau, O., & Schattner, U. (2012). Update on the cetacean fauna of the Mediterranean Levantine basin. *The Open Marine Biology Journal*, 6(1). <https://doi.org/10.2174/1874450801206010009>
- Leung, Y. M. (1970). First record of the whale-louse genus *Synchyamus* (Cyamidae: Amphipoda) from the western Mediterranean, with notes on the biology of odontocete cyamids. *Investigations on Cetacea*, 2, 243-247.
- Lockyer, C. (1981). Estimation of the energy costs of growth, maintenance and reproduction in the female minke whale, (*Balaenoptera acutorostrata*), from the southern hemisphere. *Reports of the International Whaling Commission*, 31, 337-343.
- Lockyer, C. (1984). Review of baleen whale (Mysticeti) reproduction and implications for management. *Reports of the International Whaling Commission*, 6, 27-50.
- Lockyer, C. (1986). Body fat condition in Northeast Atlantic fin whales, *Balaenoptera physalus*, and its relationship with reproduction and food resource. *Canadian Journal of Fisheries and Aquatic Sciences*, 43(1), 142-147. <https://doi.org/10.1139/f86-015>
- Maio, N., Maione, V., & Sgammato, R. (2016). First record of a humpback whale *Megaptera novaeangliae* (Borowski, 1781) in the Tyrrhenian Sea (Cetacea Balaenopteridae). *Biodiversity Journal*, 6(3), 761-766.
- Maio, N., Petraccioli, A., De Stasio, R., Loreto, A., Viglietti, S., De Maio, L., & Pollaro, F. (2019). Anche la cetofauna sta cambiando: Avvistamenti di specie di cetacei rare o mai osservate prima nei mari della Campania (Mar Tirreno) [Cetacean fauna is also changing: Sightings of rare cetaceans species or never observed before in Campania seas (Tyrrhenian Sea)]. *Quaderni del Museo Civico di Storia Naturale di Ferrara*, 7, 81-90. <https://storianaturale.comune.fe.it/modules/core/lib/d.php?c=Inot5>
- Mazzariol, S., Di Guardo, G., Petrella, A., Marsili, L., Fossi, C. M., Leonzio, C., Zizzo, N., Vizzini, S., Gaspari, S., Pavan, G., Podestà, M., Garibaldi, F., Ferrante, M., Copat, C., Traversa, D., Marcer, F., Airoidi, S., Frantzis, A., De Bernaldo Quiros, Y., Cozzi, B., & Fernández, A. (2011). Sometimes sperm whales (*Physeter macrocephalus*) cannot find their way back to the high seas: A multidisciplinary study on a mass stranding. *PLOS ONE*, 6(5), e19417. <https://doi.org/10.1371/journal.pone.0019417>
- Mazzariol, S., Centelleghè, C., Cozzi, B., Pavinelli, M., Marcer, F., Ferri, N., Di Francesco, G., Badagliacca, P., Profeta, F., Olivieri, V., Guccione, S., Cocumelli, C., Terracciano, G., Troiano, P., Beverelli, M., Garibaldi, F., Podestà, M., Marsili, L., Fossi, M. C., Mattiucci, S., . . . Di Guardo, G. (2018). Multidisciplinary studies on a sick-leader syndrome-associated mass stranding of sperm whales (*Physeter macrocephalus*) along the Adriatic coast of Italy. *Scientific Reports*, 8(1), 1-18. <https://doi.org/10.1038/s41598-018-29966-7>
- McMahon, C. R., Burton, H. R., & Bester, M. N. (2000). Weaning mass and the future survival of juvenile southern elephant seals, *Mirounga leonina*, at Macquarie Island. *Antarctic Science*, 12(2), 149-153. <https://doi.org/10.1017/S0954102000000195>
- Mruszczok, M.-T., Violi, B., Fakhri, M., Calogero, G., Biasissi, E., Jaouhar, A., Scullion, A., & Würtz, M. (2021). Long-distance movements of North Atlantic killer whales (*Orcinus orca*) from Iceland via Spain and Italy to Lebanon. *Marine Mammal Science* [early view], 1-10. <https://doi.org/10.1111/mms.12866>
- Notarbartolo di Sciarra, G., & Birkun, A., Jr. (2010). *Conserving whales, dolphins and porpoises in the Mediterranean and Black Seas: An ACCOBAMS status report, 2010* (ACCOBAMS Technical Report). ACCOBAMS. [www.vliz.be/imisdocs/publications/228937.pdf](http://www.vliz.be/imisdocs/publications/228937.pdf)
- Notarbartolo di Sciarra, G., Zanardelli, M., Jahoda, M., Panigada, S., & Airoidi, S. (2003). The fin whale *Balaenoptera physalus* (L. 1758) in the Mediterranean Sea. *Mammal Review*, 33(2), 105-150. <https://doi.org/10.1046/j.1365-2907.2003.00005.x>
- Oftedal, O. T. (1997). Lactation in whales and dolphins: Evidence of divergence between baleen- and toothed-species. *Journal of Mammary Gland Biology and Neoplasia*, 2(3), 205-230. <https://doi.org/10.1023/A:1026328203526>
- Orsi Relini, L., & Giordano, A. (1992). Summer feeding of the fin whale, *Balaenoptera physalus*, in the Liguro-Provençal Basin. *European Research on Cetaceans*, 6, 138-141.
- Osmond, M. G., & Kaufman, G. D. (1998). A heavily parasitized humpback whale (*Megaptera novaeangliae*). *Marine Mammal Science*, 14(1), 146-149. <https://doi.org/10.1111/j.1748-7692.1998.tb00698.x>
- Panigada, S., Frey, S., Pierantonio, N., Garziglia, P., & Giardina, F. (2014). Are humpback whales electing the Mediterranean Sea as new residence? *Proceedings of the Twenty Eighth Annual Conference of the European Cetacean Society*, Liege, Belgium. 203 pp. [https://www.researchgate.net/publication/261530754\\_Are\\_humpback\\_whales\\_electing\\_the\\_Mediterranean\\_Sea\\_as\\_new\\_residence](https://www.researchgate.net/publication/261530754_Are_humpback_whales_electing_the_Mediterranean_Sea_as_new_residence)
- Pettis, H. M., Rolland, R. M., Hamilton, P. K., Brault, S., Knowlton, A. R., & Kraus, S. D. (2004). Visual health assessment of North Atlantic right whales (*Eubalaena glacialis*) using photographs. *Canadian Journal of Zoology*, 82(1), 8-19. <https://doi.org/10.1139/z03-207>
- Pfeiffer, C. J. (2009). Whale lice. In W. F. Perrin, B. Würsig, & J. G. M. Thewissen (Eds.), *Encyclopedia of marine mammals* (2nd ed., pp. 1220-1223). Academic Press. <https://doi.org/10.1016/B978-0-12-373553-9.00279-0>
- Reeves, R. R., & Mitchell, E. (1986). American pelagic whaling for right whales in the North Atlantic. *Reports of the International Whaling Commission (Special Issue)*, 10, 221-254.
- Reeves, R. R., & Notarbartolo di Sciarra, G. (2006). *The status and distribution of cetaceans in the Black Sea and Mediterranean Sea*. IUCN Centre for Mediterranean Cooperation. 137 pp. <https://portals.iucn.org/library/node/9075>

- Rodrigues, A. S., Horwitz, L. K., Monsarrat, S., & Charpentier, A. (2016). Ancient whale exploitation in the Mediterranean: Species matters. *Antiquity*, 90(352), 928-938. <https://doi.org/10.15184/aqy.2016.109>
- Rojo-Nieto, E., Álvarez-Díaz, P. D., Morote, E., Burgos-Martín, M., Montoto-Martínez, T., Sáez-Jiménez, J., & Toledano, F. (2011). Strandings of cetaceans and sea turtles in the Alboran Sea and Strait of Gibraltar: A long-term glimpse at the north coast (Spain) and the south coast (Morocco). *Animal Biodiversity and Conservation*, 34(1), 151-163.
- Rowntree, V. J. (1996). Feeding, distribution, and reproductive behavior of cyamids (Crustacea: Amphipoda) living on humpback and right whales. *Canadian Journal of Zoology*, 74(1), 103-109. <https://doi.org/10.1139/z96-014>
- Ruíz, R. E., Olaya-Ponzono, L., & García-Gómez, J. C. (2018). Humpback whale in the bay of Algeciras and a mini-review of this species in the Mediterranean. *Regional Studies in Marine Science*, 24, 156-164. <https://doi.org/10.1016/j.rsma.2018.08.010>
- Russo, D., Sgammato, R., & Bosso, L. (2016). First sighting of the humpback whale *Megaptera novaeangliae* in the Tyrrhenian Sea and a mini-review of Mediterranean records. *Hystrix, the Italian Journal of Mammalogy*, 27(2).
- Ryan, C., Wenzel, F. W., Suárez, P. L., & Berrow, S. D. (2014). An abundance estimate for humpback whales *Megaptera novaeangliae* breeding around Boa Vista, Cape Verde Islands. *Zoologia Caboverdiana*, 1(2), 75-99.
- Ryan, C., Craig, D., Lopez-Suárez, P., Vázquez Perez, J., O'Connor, I., & Berrow, S. D. (2013). Breeding habitat of poorly studied humpback whales (*Megaptera novaeangliae*) in Boa Vista, Cape Verde. *Journal of Cetacean Research and Management*, 13(2), 175-180. <https://research.thea.ie/handle/20.500.12065/237>
- Saad, A. (2004). First record of a humpback whale stranding on the coast of Syria (Eastern Mediterranean). *FINS*, 1(1), 10. [https://www.accobams.org/wp-content/uploads/2016/06/FINS\\_2.pdf](https://www.accobams.org/wp-content/uploads/2016/06/FINS_2.pdf)
- Smith, T. D., Allen, J., Clapham, P. J., Hammond, P. S., Katona, S., Larsen, F., Lien, J., Mattila, D., Palsbøll, P. J., Singurjónsson, J., Stevick, P. T., & Øien, N. (1999). An ocean-basin-wide mark-recapture study of the North Atlantic humpback whale (*Megaptera novaeangliae*). *Marine Mammal Science*, 15(1), 1-32. <https://doi.org/10.1111/j.1748-7692.1999.tb00779.x>
- Stevick, P. T., Bouveret, L., Gandilhon, N., Rinaldi, C., Rinaldi, R., Broms, F., & Wenzel, F. (2018). Migratory destinations and timing of humpback whales in the southeastern Caribbean differ from those off the Dominican Republic. *Journal of Cetacean Research and Management*, 18, 127-133.
- Stevick, P. T., Neves, M. C., Johansen, F., Engel, M. H., Allen, J., Marcondes, M. C., & Carlson, C. (2011). A quarter of a world away: Female humpback whale moves 10,000 km between breeding areas. *Biology Letters*, 7(2), 299-302. <https://doi.org/10.1098/rsbl.2010.0717>
- Stevick, P. T., Berrow, S. D., Bérubé, M., Bouveret, L., Broms, F., Jann, B., Kennedy, A., Suarez, P. L., Meunier, M., Ryan, C., & Wenzel, F. (2016). There and back again: Multiple and return exchange of humpback whales between breeding habitats separated by an ocean basin. *Journal of the Marine Biological Association of the United Kingdom*, 96(4), 885-890. <https://doi.org/10.1017/S0025315416000321>
- Stevick, P. T., Allen, J., Clapham, P. J., Friday, N., Katona, S. K., Larsen, F., Lien, J., Mattila, D. K., Palsbøll, P. J., Sigurjónsson, J., Smith, T. D., Øien, N., & Hammond, P. S. (2003). North Atlantic humpback whale abundance and rate of increase four decades after protection from whaling. *Marine Ecology Progress Series*, 258, 263-273. <https://doi.org/10.3354/meps258263>
- Stevick, P. T., Allen, J., Clapham, P. J., Katona, S. K., Larsen, F., Lien, J., Mattila, D. K., Palsbøll, P. J., Sears, R., Sigurjónsson, J., Smith, T. D., Vikingsson, G., Øien, N., & Hammond, P. S. (2006). Population spatial structuring on the feeding grounds in North Atlantic humpback whales (*Megaptera novaeangliae*). *Journal of Zoology*, 270(2), 244-255. <https://doi.org/10.1111/j.1469-7998.2006.00128.x>
- Stone, G., Florez-Gonzalez, L., & Katona, S. (1990). Whale migration record. *Nature*, 346(6286), 705. <https://doi.org/10.1038/346705a0>
- Szabo, A., & Duffus, D. (2008). Mother-offspring association in the humpback whale, *Megaptera novaeangliae*: Following behaviour in an aquatic mammal. *Animal Behaviour*, 75(3), 1085-1092. <https://doi.org/10.1016/j.anbehav.2007.08.019>
- Wenzel, F. W., Allen, J., Berrow, S., Hazevoet, C. J., Jann, B., Seton, R. E., Steiner, L., Stevick, P., Suárez, P. L., & Whooley, P. (2009). Current knowledge on the distribution and relative abundance of humpback whales (*Megaptera novaeangliae*) off the Cape Verde Islands, Eastern North Atlantic. *Aquatic Mammals*, 35(4), 502-510. <https://doi.org/10.1578/AM.35.4.2009.502>
- Wenzel, F. W., Broms, F., López-Suárez, P., Lopes, K., Veiga, N., Yeoman, K., Rodrigues, M. S. D., Allen, J., Fernald, T. W., Stevick, P. T., Jones, L., Jann, B., Bouveret, L., Ryan, C., Berrow, S., & Corkeron, P. (2020). Humpback whales (*Megaptera novaeangliae*) in the Cape Verde Islands: Migratory patterns, resightings, and abundance. *Aquatic Mammals*, 46(1), 21-31. <https://doi.org/10.1578/AM.46.1.2020.21>
- Whitehead, H. (1982). Populations of humpback whales in the northwest Atlantic. *Reports of the International Whaling Commission*, 32, 345-353.
- Whitehead, H., & Moore, M. J. (1982). Distribution and movements of West Indian humpback whales in winter. *Canadian Journal of Zoology*, 60(9), 2203-2211. <https://doi.org/10.1139/z82-282>
- Winn, H. E., Edell, R. K., & Taruski, A. G. (1975). Population estimate of the humpback whale (*Megaptera novaeangliae*) in the West Indies by visual and acoustic techniques. *Journal of the Fisheries Board of Canada*, 32(4), 499-506. <https://doi.org/10.1139/f75-061>