

REVIEW

A review of cetacean occurrence in West African waters from the Gulf of Guinea to Angola

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ABSTRACT

1. The cetacean fauna of the west coast of Africa is poorly described. Therefore, literature on the occurrence of cetacean species in the waters of 13 potential West African range states from the Gulf of Guinea to Angola was reviewed, including sighting, stranding, capture, bycatch and whaling records.

2. At least 28 species of cetacean were documented in the study region, comprising seven baleen whale species and 21 species of toothed whale (including at least 17 delphinid species).

3. Cetaceans could be broadly split into seven ecological categories, based on their distribution. A warm temperate/tropical deep-water cetacean community dominated the study area. Cooler water from the Benguela Current influenced southern Angola ($\leq 16^{\circ}\text{S}$ latitude) and at least three cetacean species occurred predominantly in this region.

4. Only three or fewer species were confirmed in the waters of Togo, Nigeria, Cameroon and the Democratic Republic of Congo. Seventeen or more species were documented in Ghana, Gabon and Angola, where dedicated cetacean research projects have been initiated in recent years. Angola had the most diverse documented cetacean community: 28 confirmed species.

5. The humpback whale *Megaptera novaeangliae* was the most widely recorded species, and was documented in 11 (85%) countries. Sperm whales *Physeter macrocephalus*, Bryde's whales *Balaenoptera cf. brydei*, bottlenose dolphins *Tursiops truncatus* and Atlantic spotted dolphins *Stenella frontalis* were recorded in over half of the countries.

Keywords: Africa, Atlantic Ocean, cetacean communities, dolphins, whales

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INTRODUCTION

The cetacean fauna along the west coast of Africa is poorly described and is predominantly known from opportunistic strandings, captures and sightings, few of which are recent. Most information is available from Mauritania and Senegal in North-West Africa (e.g. Cadenat 1959, Maigret 1994, Jefferson et al. 1997), and from Namibia and the west coast of South Africa in the south (Findlay et al. 1992). However, cetacean occurrence in the area extending from the Gulf of Guinea south

towards Angola remains poorly documented, and with the exception of St Helena, no country maintains systematic cetacean sighting or stranding schemes.

Jefferson et al. (1997) reviewed dolphin and porpoise records in a large area extending from the Straits of Gibraltar south to the Congo River. Knowledge of the occurrence of cetaceans in the Gulf of Guinea region has since increased markedly due to the onset of dedicated cetacean research off Ghana (Ofori-Danson et al. 2003), Benin (Van Waerebeek et al. 2002a), Gabon (Rosenbaum & Collins 2006), São Tomé (Picanço et al. 2009), Angola (Weir 2008a) and St Helena (MacLeod & Bennett 2006; Fig. 1).

In this paper, I review existing literature on cetaceans occurring between the Gulf of Guinea and Angola off West Africa with the aims of: (i) updating the Jefferson et al. (1997) checklist of small odontocete occurrence; (ii) providing an initial review of large odontocete and mysticete occurrence; and (iii) summarizing available data on group size and composition, seasonality and habitat of each species. I summarize existing information as a prelude to present-day cetacean research. The review is timely given the growing interest in cetaceans in the region in relation to offshore exploration by the oil and gas industry (Weir 2008b), fisheries bycatch in some regions (Ofori-Danson et al. 2003) and the potential for cetacean-based ecotourism (Van Waerebeek et al. 2002a).

METHODS

Study area

The study area extended from the Gulf of Guinea south to Angola in the eastern Atlantic Ocean (Fig. 1). According to the International Hydrographic Organization, the oceanic border of the Gulf of Guinea extends from Cape Palmas in Liberia (20km east of the border with Côte d'Ivoire) to Cape Lopez in Gabon (Anonymous 1953). The coastlines of 11 mainland states from Côte d'Ivoire south to Angola are included in this review [the offshore islands of Annobón (also known as Pagalu) and Bioko are governed by, and considered with, Equatorial Guinea]. Two offshore island states, St Helena (UK) and the Democratic Republic of São Tomé and Príncipe, are included, producing a total of 13 potential range states. While the study area is primarily tropical in nature, southern Angola is influenced by the Benguela Current, which originates in the central Atlantic and Indian Oceans and brings nutrient-rich cold water northwards along the coasts of Namibia and South Africa (Hardman-Mountford et al. 2003).

Data compilation

Published material and 'grey literature', containing cetacean records from West Africa, were compiled. Records fell into four main categories: (i) historical whaling records; (ii) sightings; (iii) strandings; and (iv) deliberate and accidental (i.e. 'bycatch') capture records. Given the cessation of most whaling activities and the modern protection of many cetacean species, most published records of deliberate capture of cetaceans date from prior to 1970.

Records were reviewed and attempts were made to verify species identification by using the methods described by Fertl et al. (2003) and Jefferson et al. (2009). Whaling records were accepted as published (although confusion between sei *Balaenoptera borealis* and Bryde's *B. cf. brydei* whales in the whaling statistics is discussed). Stranding and capture records were verified via documented voucher skulls or

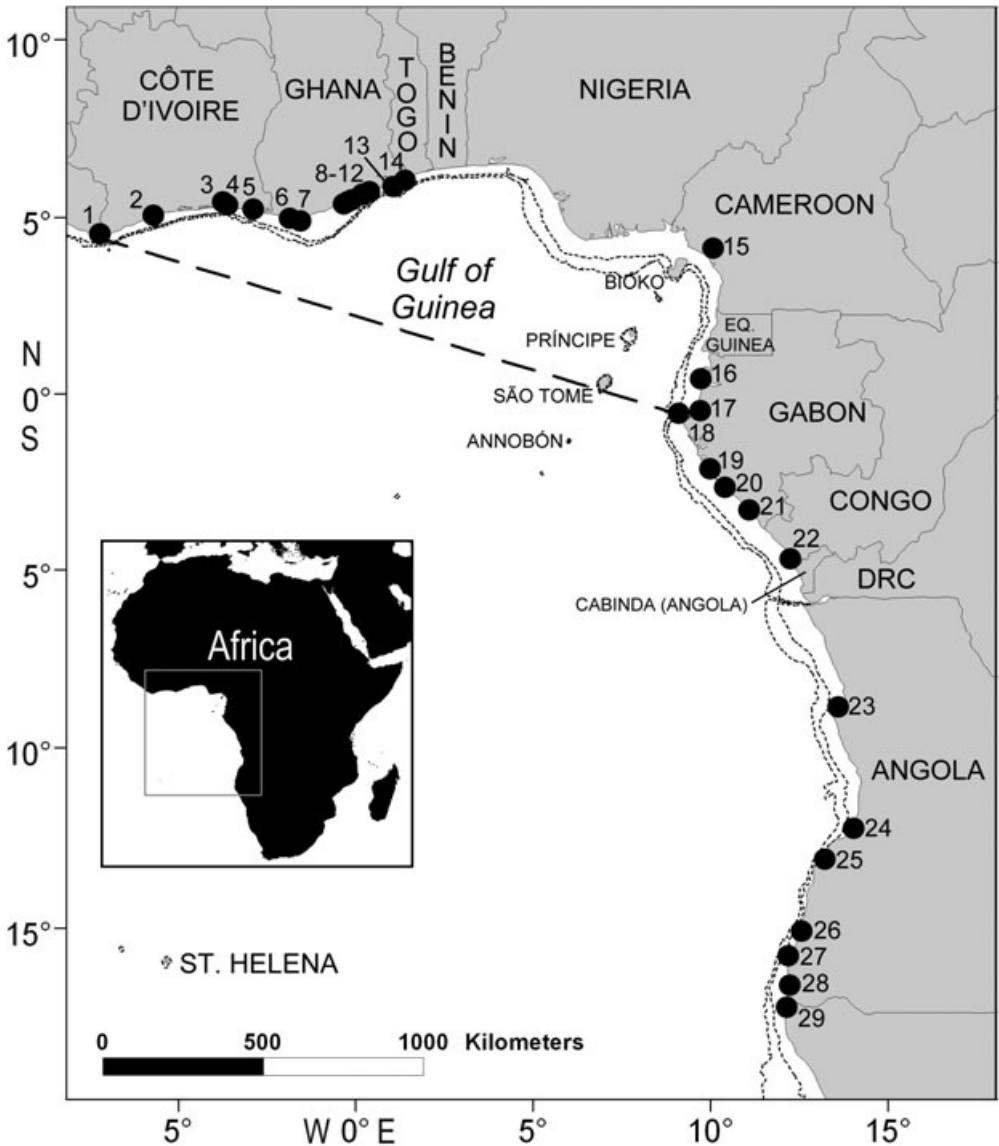


Fig. 1. The study area in West Africa, showing the 200 and 1000m water depth contours, the area delimited as the Gulf of Guinea (within the dashed line; Anonymous 1953), the countries or range states, and place names mentioned in the text: 1-Cape Palmas, 2-Sassandra, 3-Abidjan, 4-Vridi, 5-Assini, 6-Axim, 7-Dixcove, 8-Apam, 9-Winneba, 10-Senya Beraku, 11-Accra and Jamestown, 12-Tema, 13-Ada/Volta river mouth, 14-Keta, 15-Bay of Warships, 16-Pointe Pongara/Gabon Estuary, 17-Cap Esterias, 18-Cap Lopez, 19-Petit Loango, 20-Nyanga River, 21-Mayumba, 22-Pointe Noire, 23-Luanda, 24-Lobito, 25-Baia dos Elefantes, 26-Namibe, 27-Tombwa, 28-Baia dos Tigres, 29-Cunene River mouth.

skeletal material, or via published photographs. Sightings were accepted when detailed written descriptions or photographs were available, or when recorded by experienced, trained observers familiar with the species in question. Verification is particularly important for species such as *Clymene Stenella clymene* and Fraser's *Lagenodelphis hosei* dolphins, which were not fully described in the field until

relatively recently (Perrin et al. 1973, 1981), for species readily confused in the field (particularly sei and Bryde's whales, beaked whale species, melon-headed *Peponocephala electra* and pygmy killer *Feresa attenuata* whales, bottlenose *Tursiops truncatus* and rough-toothed *Steno bredanensis* dolphins, Pantropical spotted *Stenella attenuata* and Atlantic spotted *S. frontalis* dolphins, and Clymene and common dolphins *Delphinus* spp.), and for sightings which represent new species records for particular countries. Consequently, some previously published species records were rejected.

Rejected and accepted records

Anonymous (2000) lists the blue whale *B. musculus* as occurring at Togo. However, the source of this record is unknown and no supporting information is provided, so it is not included in this review. Brown (1959) reported sightings of humpback *Megaptera novaeangliae* and sperm *Physeter macrocephalus* whales in the study area. However, these records are not included due to the unknown observers and lack of supporting data.

Mörzer Bruyns (1971) reported several sightings of species considered problematic to identify at sea. Records of Cuvier's beaked whale *Ziphius cavirostris* and pygmy killer whales are not included here due to an absence of supporting details or photographs. However, one sighting of *Mesoplodon* whales (Mörzer Bruyns 1968) was accepted due to the descriptive information provided by the author for whales of this genus.

Tormosov et al. (1980) report a number of cetacean sightings from the study area, but without providing verifying information. Their records of common and bottlenose dolphins and pygmy killer whales are not included in this review.

The remaining records (Appendix 1) were accepted, and are discussed below and summarized in Table 1.

SPECIES ACCOUNTS

Southern right whale *Eubalaena australis*

The southern right whale migrates between high-latitude summer feeding grounds and lower-latitude winter mating and breeding grounds in the Southern Hemisphere.

Confirmed range states

A single female right whale was mistakenly (illegally) captured off Cap Lopez in Gabon (1°S) during 1951 (Budker 1952, Budker & Collignon 1952). An individual was recently sighted off Gabon at similar latitude (Anonymous 1999). The northernmost 18th and 19th century whaling ground for southern right whales in the eastern Atlantic was at Baía dos Tigres in southern Angola (Best 1981). Animals were occasionally captured further north in Angola, for example, one was taken off Tombwa during 1913 (Olsen 1914) and one at 7°S off northern Angola (Townsend 1935). A reported catch of 17 southern right whales at Baía dos Elefantes in Angola during 1925 was probably erroneous and more likely related to Bryde's whales (Best 1990).

Biology

Right whale catches off Angola occurred predominantly during June and July (Best 1981), when the whales occupy their breeding grounds in the coastal waters of South

Table 1. Conservation status and range states (showing coastline length in parentheses) for cetacean species confirmed within the study area

Species	IUCN status	Côte d'Ivoire (515km)	Ghana (539km)	Togo (56km)	Benin (121km)	Nigeria (853km)	Cameroon (402km)	Equatorial Guinea (296km)	São Tomé & Príncipe (209km)	Gabon (885km)	Congo (169km)	Dem. Rep. of Congo (37km)	Angola (1600km)	St Helena (60km)
<i>Eubalaena australis</i>	LC	X	X	X	X	X	X	X	X	S,W	X	X	W	X
<i>Balaenoptera musculus</i>	EN	X	X	X	X	X	X	X	X	W	X	X	W	X
<i>Balaenoptera physalus</i>	EN	X	X	X	X	X	X	X	W	W	X	X	S,W	X
<i>Balaenoptera borealis</i> *	EN	X	X	X	X	X	X	X	X	W	X	X	S	X
<i>Balaenoptera cf. brydei</i>	DD	W	W	X	X	X	X	W	W	W	W	X	S,W	X
<i>Balaenoptera bonaerensis</i>	DD	X	X	X	X	X	X	X	X	X	X	W	Str	X
<i>Megaptera novaeangliae</i>	LC	X	Str	S	S	S	X	S,W	S,W	S,W	W	W	S,W	S,W
<i>Physeter macrocephalus</i>	VU	S	Str	X	X	X	X	W	S,W	W	W	W	S,W	W
<i>Kogia sima</i>	DD	X	C	X	X	X	X	X	X	X	X	X	S	X
<i>Ziphius cavirostris</i>	LC	X	X	X	X	X	X	X	X	X	X	X	S	X
Unidentified beaked whales	DD	X	X	X	X	X	X	X	X	X	X	X	S	X
<i>Orcinus orca</i>	DD	S	S,C	X	X	X	X	U	S	U	X	X	S	X
<i>Globicephala macrorhynchus</i>	DD	S,C	C	X	X	X	X	X	S	S	X	X	S	X
<i>Pseudorca crassidens</i>	DD	Str	C	X	U	X	X	X	X	S,Str	X	X	S	X
<i>Peponocephala electra</i>	LC	X	C	X	X	X	X	X	X	S,U	X	X	S	X
<i>Sousa teuszii</i>	VU	X	X	X	X	?	Str	X	X	S,U	X	X	S	X
<i>Steno bredanensis</i>	LC	C	S,C	X	X	X	X	X	X	S	X	X	S	S
<i>Lagenorhynchus obscurus</i>	DD	X	C	X	X	X	X	X	X	X	X	X	S	S
<i>Grampus griseus</i>	LC	S	C	X	X	X	X	X	X	S	X	X	S	X
<i>Tursiops truncatus</i>	LC	C	C	X	U	X	X	X	X	S	X	X	S	X
<i>Stenella attenuata</i>	LC	X	S,C	X	X	X	X	X	S	S,C	X	X	S	S,C
<i>Stenella frontalis</i>	DD	C	C	X	S	X	X	U	X	U	X	X	S	C?
<i>Stenella longirostris</i>	DD	C	C,S	X	X	X	X	X	X	X	X	X	S	U
<i>Stenella clymene</i>	DD	C	S,Str,C	X	X	X	X	X	X	X	X	X	S	U
<i>Stenella coeruleoalba</i>	LC	Str	X	X	X	X	X	X	X	X	X	X	S	X
<i>Delphinus</i> spp.†	LC	Str,C	C	X	S	X	X	X	X	X	X	X	S,Str,C	X
Short-beaked form	LC	Str,C	C	X	X	X	X	X	X	S,Str,C	Str,C	X	Str,C	X
Long-beaked form	DD	Str,C	C	X	X	X	X	X	X	Str,C	Str,C	X	Str,C	X
<i>Lagenodelphis hosei</i>	LC	X	C	X	X	S?	X	X	X	X	X	X	Str,C	X
<i>Cephalorhynchus heavisidii</i>	DD	X	X	X	X	X	X	X	X	X	X	X	S,C	X

S, at-sea sighting; Str, stranding; C, capture; W, whaling record; U, record of unknown origin; X, no record.

Conservation status, as assigned by the International Union for Conservation of Nature (Anonymous 2009b), is defined as: EN, endangered; VU, vulnerable; LC, least concern; DD, data deficient.

*Most (if not all) whaling records of sei whales are now considered to be misidentified Bryde's whales. Whaling records are therefore listed under Bryde's whales in this table. †Two morphological forms of common dolphin ('short-beaked' and 'long-beaked') occur within the study region but their taxonomy is unclear and they are often not distinguished in the literature. Both of the forms are therefore considered here, together with unidentified common dolphins, as '*Delphinus* spp.' The two forms are also shown separately, based on the identification provided in the original records.

Africa and Namibia (Best 1981). Historically, right whales have never been abundant in Angolan waters. Although 31 animals were taken at Baía dos Tigres during 1801 (Best 1981), only two animals were captured off Angola and Gabon between 1909 and 1959 (Best & Ross 1986). No whaling records are expected for the right whale after 1935, when the species received some international protection. The population of right whales that formerly inhabited Baía dos Tigres has not recovered to pre-exploitation levels (Best 1981).

Blue whale *Balaenoptera musculus*

Blue whales are distributed throughout the world's polar, temperate and tropical regions. In the Southern Hemisphere, at least two subspecies occur: the Antarctic blue whale *B. m. intermedia* and the pygmy blue whale *B. m. breviceuda* (Branch et al. 2007).

Confirmed range states

In the eastern Atlantic, the distribution of blue whales historically extended northwards from Antarctica as far as Angola and Gabon (Tønnessen & Johnsen 1982, Yochem & Leatherwood 1985). Single blue whales were landed at Cap Lopez in Gabon during 1926 and 1934 (Harmer 1928, Budker & Collignon 1952, Best 1994). Harmer (1928, p. 86) considered blue whales to be relatively 'numerous' off Angola (13–14°S), and Best (1994) reports 1844 blue whales captured there between 1909 and 1928.

Biology

Over 95% of blue whales captured in Angolan waters were juvenile animals (Tønnessen & Johnsen 1982). However, the body lengths recorded for some individuals caught in Angolan waters exceed the 24m maximum length of *B. m. breviceuda*, so they were almost certainly *B. m. intermedia* (T. Branch, pers. comm.). The study area apparently remains an area of substantial blue whale depletion: there are no confirmed recent records (Branch et al. 2007).

Fin whale *Balaenoptera physalus*

The fin whale is cosmopolitan in distribution. Fin whales are predominantly concentrated south of 50°S during the summer and migrate northwards into West African waters during the winter (Gambell 1985a).

Confirmed range states

Fin whale catches off Gabon include 240 animals during 1913, five in 1914, 21 during 1934 and two in 1951 (Budker & Collignon 1952, Best 1994). Two fin whales were captured north of São Tomé between July and October 1951 (Budker & Collignon 1952). Harmer (1928) reported that fin whales were much scarcer than blue whales off Angola (13–14°S). A total of 701 fin whales was landed in Angola between 1910 and 1928; a peak of 213 animals was captured in 1915 (Best 1994). Four fin whale sightings were reported off Angola between 2003 and 2006 (Weir 2008a).

Biology

Sightings off Angola were of single animals or pairs of animals, located in deep water seaward of the shelf edge (Weir 2008a). Sightings occurred during August and September, which together with whaling records indicate a winter and spring occurrence in West African waters.

Sei whale *Balaenoptera borealis*

Sei whales occur worldwide although the locations of their low-latitude wintering grounds are poorly known (Gambell 1985b).

Confirmed range states

The occurrence of sei whales within the study area is known primarily from whaling data, and there is considerable doubt over the species identification for many of these data (see Bryde's whale account). The only confirmed sei whale records appear to be the capture of a 14m female at the Cap Lopez whaling station in Gabon in September 1950 (Budker 1950), and a sighting of two animals off Angola during August 2004 (Weir 2008a).

Biology

The only at-sea sighting for the region occurred over deep water (>1600m) during the austral winter (Weir 2008a).

Bryde's whale *Balaenoptera cf. brydei*

Bryde's whale is the only baleen whale species inhabiting tropical waters that does not make extensive migrations to high latitude feeding grounds (Best 2001). The taxonomic status of Bryde's whale is confused, and although the International Whaling Commission (IWC) recognizes the existence of at least two species, it currently lists only a single species (*B. edeni*). However, recent molecular analysis conclusively separated Bryde's whale into two species: *B. edeni* and *B. brydei* (Wada et al. 2003). *B. brydei* was originally described from the west coast of South Africa (Olsen 1913), and Best (2007) adopts *brydei* for all Bryde's-like whales occurring in the study area based on the lack of records in the region of a small form referable to *edeni*. Consequently, the Bryde's whales occurring within the study area are referred to as *Balaenoptera cf. brydei* throughout this paper.

Confirmed range states

The occurrence of Bryde's whale within the study area is known primarily from whaling data. However, prior to the 1960s, even experienced whalers could not reliably distinguish sei from Bryde's whales (Ruud 1952, Best 1994, 1996). Catches of 'sei whales' recorded along the coast of West Africa are therefore considered likely to have comprised mostly Bryde's whales (Harmer 1928, Ruud 1952, Budker 1953, Budker & Roux 1968, Best 1994, 1996). For example, 42 animals from the 1952 'sei whale' catch off Gabon were re-identified as Bryde's whales following examination of their baleen plates (Ruud 1952), and 'sei whale' captures by the whaling vessel *Sierra* throughout the study area during the 1970s have been subsequently re-identified as Bryde's whales (Best 1996, 2001).

The *Sierra* caught Bryde's whales off Côte d'Ivoire and Ghana during the 1970s (Best 1996). A single whale thought to be this species was captured during the

aboriginal whale hunt at Annobón (Equatorial Guinea) in 1959 (Aguilar 1985). Evidence suggests that the 504 'sei whales' landed in Gabon between 1914 and 1958 (Harmer 1928, Budker 1952, Budker & Collignon 1952, Ruud 1952, Budker 1953, Budker & Roux 1968, Best 1994), and 336 whales landed at São Tomé in 1951 (Budker & Collignon 1952) were almost certainly predominantly Bryde's whales (Ruud 1952, Best 1996, 2001). The São Tomé catches have been reported as Bryde's whales by subsequent authors (Figueiredo 1960, Brito et al. 2005). During the 1970s, the *Sierra* took Bryde's whales from Gabon and São Tomé, and from Congo, the Democratic Republic of Congo (DRC) and Angola (Best 1996, 2001). Ruud (1952) mentions takes of Bryde's whale off both Congo and Angola. A total of 936 'sei whales' (probably predominantly misidentified Bryde's whales) were landed in Angola between 1911 and 1928 (Harmer 1928, Best 1994); a further 141 animals recorded as Bryde's whales were landed between 1915 and 1925 (Harmer 1928, Best 1994). In his 1913 description of Bryde's whale, Olsen mentions whales likely to be this species observed off Tombwa and Lobito in Angola. Weir (2008a) reported 19 sightings of Bryde's whales off Angola between 2003 and 2006.

Biology

Best (1996, 2001) proposed two forms of Bryde's whale off the west coast of South Africa: an 'inshore' form occupying shelf waters, and an 'offshore' form inhabiting oceanic waters. Weir (2008a) reported similar findings in Angolan waters, where 42% of sightings occurred in <100m depth and 58% occurred in oceanic waters exceeding 1600m depth. The highest relative abundance occurred in neritic waters (Weir 2008a). Best (1996, 2001) described a seasonal migration of the offshore Bryde's whale population from Angola during March, to as far north as São Tomé during April, to off Gabon between May and July, and returning to southern Angola during August to October. Olsen (1913) described a June to October seasonality in their occurrence off Tombwa in Angola, and recent sightings in the region occurred predominately between June and November (Weir 2008a).

Common minke whale *Balaenoptera acutorostrata* and Antarctic minke whale *B. bonaerensis*

The IWC formally recognizes the common minke whale and the Antarctic minke whale, and it is possible that both occur (and overlap) in the Gulf of Guinea region.

Confirmed range states

Tønnessen and Johnsen (1982, p. 657) state that the whaling vessel *Sierra* caught three minke whales off Angola during 1968. Mörzer Bruyns (1971, p. 173) describes seeing minke whales 'regularly . . . on both coasts of tropical Africa (Mozambique and Angola)', while Stewart and Leatherwood (1985, p. 102) describe minke whales as being 'present but uncommon off western South Africa and Angola'. However, it is unclear which species of minke whale these records refer to, and none of the records can be verified. Van Waerebeek et al. (1999) concluded that no confirmed minke whale sightings existed from the Gulf of Guinea south towards the equator. Best (2007) reported the Antarctic minke whale occurring as far north as 15°S in Angola. This record, based on a photograph of a minke whale stranded at the Coroca River mouth near Tombwa (15°45'S) during March 1970 (photograph held in the

Museu do Mar, Cascais, Portugal; P. Best, pers. comm.), confirms the occurrence of Antarctic minke whales in southern Angolan waters.

Humpback whale *Megaptera novaeangliae*

Humpback whales occur worldwide and migrate seasonally between low-latitude breeding and high-latitude feeding areas. The whales wintering off West Africa belong to the Southern Hemisphere IWC humpback whale stock B, which comprises sub-stocks B1 off Gabon and B2 off west South Africa, Namibia and Angola. Van Waerebeek et al. (2001) propose an additional 'Bight of Benin' sub-stock extending from the Volta river mouth (Ghana) to western Nigeria. Bennett and MacLeod (2006) suggest that St Helena may also represent a breeding ground.

Confirmed range states

Van Waerebeek et al. (2001, 2002a) and Bamy et al. (2006) mention credible reports that the breeding range of Southern Hemisphere humpback whales may extend to Côte d'Ivoire. The fresh carcass of a humpback whale calf was recorded off Ada in Ghana during 1997 (Van Waerebeek & Ofori-Danson 1999). Anecdotal reports indicate regular humpback whale occurrence off Togo (Van Waerebeek et al. 2001, 2002a). Over 20 humpback whale sightings were recorded off Benin during October 2000 and 2002 (Van Waerebeek et al. 2001, 2002a), and two groups of whales were observed in Nigerian waters during the same studies. Townsend's (1935) whaling charts show humpback catches off Bioko and mainland Equatorial Guinea, Gabon, São Tomé and Príncipe, Congo, the DRC and Angola. An aboriginal catch of one to three immature humpbacks occurred annually off Annobón from 1885 to the 1950s, continuing opportunistically until at least 1975. Humpback whales are 'observed regularly from shore in Equatorial Guinea, with frequent observations of calves' (Walsh et al. 2000, p. 66). A total of 7883 humpback whales was landed at whaling stations in Gabon between 1912 and 1930 (Harmer 1928, Best 1994); a further 7080 were landed in the 9 years of intermittent whaling between 1934 and 1959 (Budker & Collignon 1952, Budker 1952, 1953, Budker & Roux 1968). Recent survey work off Gabon included 20 humpback whale sightings off Cap Lopez in August 1998 (Walsh et al. 2000), and the photo-identification of over 800 whales between 2000 and 2003 (Rosenbaum & Collins 2006). Around São Tomé, a total of 323 humpbacks was captured during 1951 (Budker & Collignon 1952), while survey work produced 65 sightings between 2002 and 2005 (Picanço et al. 2009). A total of 10409 humpbacks was landed in Angola between 1909 and 1928 (Harmer 1928, Best 1994); recent records include 48 sightings off northern Angola in September 1998 (Best et al. 1999) and 205 sightings in offshore Angolan waters between 2003 and 2006 (Weir, 2008a, b). Humpbacks were also hunted around St Helena (MacLeod & Bennett 2006), and 192 dedicated and opportunistic humpback whale sightings were made from St Helena between 2003 and 2005 (Bennett & MacLeod 2006).

Biology

Budker and Roux (1968) reported that most humpback whale captures occurred close to shore off Gabon, and recent sightings from Benin, Gabon, São Tomé and Angola were also located primarily over the shelf (Best et al. 1999, Walsh et al. 2000, Van Waerebeek et al. 2001, 2002a, Picanço et al. 2009). Off Angola, where deep water

has been extensively surveyed, many sightings also occurred in oceanic areas (Weir 2008a). However, the highest relative abundance was recorded over the Angolan continental shelf (Weir 2008a). Whaling records indicate a seasonal presence of humpbacks between Angola and Bioko from June to October (Townsend 1935, Budker & Collignon 1952, Aguilar 1985), and recent sightings data confirm this seasonality in occurrence (Bennett & MacLeod 2006, Rosenbaum & Collins 2006, Weir 2008a). However, some sightings occur outside the June to October period, for example, records off São Tomé during November (Carvalho et al. 2005), off Angola during May and from November to January (Weir 2008a), and off St Helena during November and December (Bennett & MacLeod 2006). The July to December seasonality of whale records north of the equator off Togo and Benin (Van Waerebeek et al. 2002a) indicates that the animals seen also originate from the wintering Southern Hemisphere population. This strong seasonality is due to the use of the study area by humpback whales as a winter calving and mating ground; the presence of surface-active competitive (presumed mating) groups, cow and calf pairs, and singing males are all considered to be indicative of humpback breeding activity (Rosenbaum & Collins 2006). Cow and calf pairs comprise 5% of humpback groups sighted off Gabon (Walsh et al. 2000, Rosenbaum & Collins 2006), 60% of sightings from São Tomé (Carvalho et al. 2005) and ~20% of sightings from Angola (Best et al. 1999, Weir 2008a). Calves have also been sighted off Togo and Benin (Van Waerebeek et al. 2001, 2002a) and regularly around St Helena (Bennett & MacLeod 2006). Surface-active groups are also documented from Togo and Benin (Van Waerebeek et al. 2001), Gabon (Walsh et al. 2000, Rosenbaum & Collins 2006) and Angola (Best et al. 1999, Weir 2008a). A lack of vocal activity and absence of competitive mating groups around São Tomé suggests that this region may primarily represent a calving rather than a mating ground (Carvalho et al. 2005).

Sperm whale *Physeter macrocephalus*

Although found worldwide, the sperm whale exhibits spatial segregation according to age and sex. Female and immature animals occur primarily in warm waters, while males depart these 'nursery groups' at puberty and migrate towards higher latitudes (Best 1979). Townsend (1935) describes the year-round 'Coast of Africa' sperm whaling ground between 3 and 23°S. Best (1974) defined the West African sperm whale stock as occurring between 20°W and 20°E.

Confirmed range states

Sightings offshore of Côte d'Ivoire are reported by Best (1974). An 8–9m sperm whale stranded at Accra in Ghana during July 1994 (Van Waerebeek & Ofori-Danson 1999). The Coast of Africa sperm whale ground included the waters off Annobón (Equatorial Guinea), Gabon, Congo, the DRC, Angola and St Helena (Townsend 1935). In Gabon, 211 whales were landed between 1913 and 1936 while 94 and 14 animals were landed in 1951 and 1959, respectively (Budker & Collignon 1952, Budker 1952, Budker & Roux 1968, Best 1994). Fifty-three sperm whales were landed at São Tomé during 1951 (Budker & Collignon 1952), and a sighting was reported there in 2005 (Picanço et al. 2009). A sperm whale was marked off the DRC during a scientific whaling cruise (Best 1974). In Angolan waters, a total of 443 sperm whales was captured between 1912 and 1928 (Harmer 1928, Best 1994); Mikhalev et al. (1981a) report further catches during the 1970s. Weir (2008a, b) recorded 139

sightings offshore of Angola between 2003 and 2006. A few sperm whales were captured on the 'Cornell Ground' around St Helena (Townsend 1935).

Biology

Sperm whale sightings within the study area are expected to comprise primarily 'nursery groups' of females and immature animals. Fourteen whales captured from a school off Gabon in July 1959 comprised 13 females and an immature male (Budker & Roux 1968). Nursery groups were also confirmed off Angola, where mean group size was 9.2 animals and 55% of groups included immature animals (Weir 2008a). Sperm whales in Southern Hemisphere waters have their peak calving period during February and March (Best et al. 1984). Whaling records indicate that sperm whales inhabit deep waters within the study area (Townsend 1935), and sightings off Angola were located exclusively seaward of the shelf break (Weir 2008a). Sperm whales occur within the study area throughout the year (Townsend 1935, Mikhalev et al. 1981a, Weir 2008a), however, seasonality may occur within particular regions. For example, Weir (2008a) found that sightings offshore of Angola peaked between January and May. Best (1969) showed that catches of sperm whales were consistent with a northward movement in autumn and a southward movement in spring, and marking experiments by Soviet whalers indicated movements of both male and female sperm whales between the DRC (~6°S) and the tip of South Africa (Best & Ross 1989).

Dwarf sperm whale *Kogia sima*

Kogia whales, comprising the closely related dwarf *K. sima* and pygmy *K. breviceps* sperm whales, inhabit tropical and warm temperate regions worldwide (Caldwell & Caldwell 1989). The pygmy sperm whale has not yet been documented within the study area.

Confirmed range states

Van Waerebeek and Ofori-Danson (1999) report on a single dwarf sperm whale landed at Apam in Ghana as fisheries bycatch in August 1998. There were 14 sightings of dwarf sperm whales offshore of Angola between 2003 and 2006 (Weir 2008a).

Biology

Dwarf sperm whales typically inhabit deep-water areas worldwide, and the sightings off Angola occurred over depths of 1290–2009m (Weir 2008a). Maigret (1994) reports that *Kogia* species are migratory off West Africa, but sightings from Angola suggest a year-round occurrence (Weir 2008a). Sightings off Angola comprised small groups of one to three animals (Weir 2008a).

Cuvier's beaked whale *Ziphius cavirostris*

Cuvier's beaked whales are the most wide-ranging beaked whale species. They inhabit deep-water regions of the world's tropical to cold temperate waters (Heyning 1989).

Confirmed range states

Only a single sighting off Angola during January 2005 (Weir 2006a, 2008a) could be verified for the study area.

Biology

The Angolan sighting reported by Weir (2006a) occurred in 2250m water depth and comprised a group of three animals.

Unidentified beaked whales

The distribution of most beaked whale species has been determined primarily from strandings, since these species are elusive and difficult to identify at sea, and inhabit predominantly offshore waters (Mead 1989). Although the distribution of Cuvier's, Blainville's *Mesoplodon densirostris* and Gervais' *M. europaeus* beaked whales is likely to be continuous along the entire tropical west coast of Africa (Weir 2006a), records are scarce.

Confirmed range states

Mörzer Bruyns (1968) describes a sighting of three unidentified *Mesoplodon* whales off Angola in July 1966. Seven sightings of unidentified beaked whales were recorded off Angola between 2003 and 2006 (Weir 2006a, 2008a). At least one of these sightings comprised a *Mesoplodon* species and another was considered very likely to be Cuvier's beaked whale. There is one record of a stranded adult male Gervais' beaked whale from the mouth of the Cunene River (on the Angola-Namibia border) in 1997, which, although considered a Namibian record (Griffin & Coetzee 2005), is indicative of an occurrence in Angolan waters.

Biology

Beaked whale sightings off Angola occurred in oceanic habitat seaward of the shelf edge (Weir 2008a). Beaked whales were observed in groups of one to three animals (Weir 2006a).

Killer whale *Orcinus orca*

Killer whales are the most widely distributed cetacean species worldwide, although they are more numerous at high latitude than in the tropics (Dahlheim & Heyning 1999).

Confirmed range states

Although Cadenat (1959) describes killer whales as occurring frequently off the Côte d'Ivoire, the only documented record was of a group sighted 28–37km south of Abidjan in June 1958. Hammond and Lockyer (1988) describe a further sighting from Côte d'Ivoire and three sightings off Ghana, all during August 1972. One killer whale was landed in Ghana as bycatch between 1998 and 2000 (Ofori-Danson et al. 2003). Reeves and Mitchell (1988) report killer whale presence around Annobón Island (Equatorial Guinea) and off Gabon. There were six sightings around São Tomé between 2002 and 2004 (Picanço et al. 2009). Sightings from Angola include one south of Namibe during July 1966 (Mörzer Bruyns 1971), one from an offshore whaling vessel during the 1960s or 1970s (Mikhalev et al. 1981b), and seven recent sightings from coastal and offshore waters (Weir 2008a).

Biology

Killer whales within the study area are usually in small groups, for example, single or pairs of animals off Côte d'Ivoire and Ghana (Hammond & Lockyer 1988) and groups of one to nine off Angola (Mörzer Bruyns 1971, Weir 2008a). Sightings have been reported from shelf, shelf edge, oceanic and island habitats (Hammond & Lockyer 1988, Weir 2008a, Picanço et al. 2009), and this species is considered cosmopolitan. Killer whales appear to inhabit the region year-round (Mikhalev et al. 1981b, Hammond & Lockyer 1988, Weir 2008a).

Short-finned pilot whale *Globicephala macrorhynchus*

The exact distribution of short-finned *G. macrorhynchus* and long-finned *G. melas* pilot whales off the west coast of Africa is unclear (due to the lack of survey effort, and difficulties in distinguishing between them at sea). It is possible that some records from southern Angola might relate to long-finned pilot whales which are found in cooler waters off Namibia to the south (Findlay et al. 1992). However, the pigmentation pattern of some individuals photographed off Angola (pers. obs.) resembles that of Southern Hemisphere short-finned pilot whales rather than that of long-finned pilot whales (Best 2007). The majority of records within the study area are therefore assumed to relate to short-finned pilot whales, which inhabit warm waters worldwide.

Confirmed range states

Cadenat (1959) reports the capture of an immature female pilot whale from a large pod observed south of Vridi in Côte d'Ivoire during 1958, and notes that pilot whales were observed off Abidjan in December 1957, April 1958 and May 1958. Two individuals were landed as fisheries bycatch in Ghana between 1998 and 2000 (Ofori-Danson et al. 2003). Pilot whales are known to occur off Gabon (Walsh et al. 2000, Weir 2008a). Picanço et al. (2009) report one sighting from São Tomé during 2003. Off Angola, Tormosov et al. (1980) report one sighting in the 1970s and Weir (2008a) describes 22 sightings between 2003 and 2006. Fishermen report seeing pilot whales around St Helena (MacLeod & Bennett 2006), but the sightings remain unconfirmed.

Biology

Sightings from Angola and São Tomé occurred seaward of the shelf edge (Weir 2008a, Picanço et al. 2009). Pilot whales off Angola were recorded in groups of four to 200 animals, frequently in association with bottlenose dolphins and occasionally with rough-toothed dolphins (Weir 2008a). The seasonal distribution of sighting and stranding records is suggestive of a year-round occurrence of pilot whales in the study area.

False killer whale *Pseudorca crassidens*

The worldwide distribution of false killer whales includes both tropical and temperate areas (Odell & McClune 1999), although records for West Africa are scarce.

Confirmed range states

Van Bree (1972) described the skull of a false killer whale stranded at Assini, Côte d'Ivoire during March 1970. Odell and McClune (1999) report a record of this species south of Ghana, while Ofori-Danson et al. (2003) report that a single animal was

caught in fishing nets off Ghana between 1998 and 2000. Van Waerebeek et al. (2001) describe a false killer whale specimen originating in Benin. In Gabon, a juvenile false killer whale stranded at Cap Esterias in July 1992 (Van Waerebeek & de Smet 1996), and there has been at least one recent at-sea sighting (Findlay et al. 2006). Nine sightings have been recorded offshore of Angola (Weir 2008a).

Biology

Angola is the only region for which sighting information has been published. Sightings comprised groups of up to 35 animals and occurred only in water depths of over 1400m; the highest relative abundance occurred at depths of 2000–2500m (Weir 2008a). False killer whales were sighted in 8 months of the year and are considered resident offshore of Angola (Weir 2008a).

Melon-headed whale *Peponocephala electra*

Melon-headed whales inhabit deep, warm waters worldwide (Perryman et al. 1994), but until recently, the nearest record of this species to the study area was a 1912 capture record from the central Atlantic (Goodwin 1945).

Confirmed range states

Ofori-Danson et al. (2003) report a single melon-headed whale landed as fisheries bycatch in Ghana between 1998 and 2000. The species has been recorded offshore of Gabon (Findlay et al. 2006) and there are three confirmed records from Angola (Weir 2008a).

Biology

Three Angolan sightings were of groups of 100 to 300 animals, at water depths of 1330–2265m.

Pygmy killer whale *Feresa attenuata*

The pygmy killer whale is distributed throughout tropical and subtropical waters worldwide. Despite mentions in the literature (Mörzter Bruyns 1971, Tormosov et al. 1980, Jefferson et al. 1997), its occurrence in the study area remains unverified.

Atlantic humpback dolphin *Sousa teuszii*

The Atlantic humpback dolphin is endemic to tropical and subtropical West Africa, where it occupies coastal waters from Morocco south to Angola (Van Waerebeek et al. 2004). However, its distribution appears to be discontinuous over that range, and Van Waerebeek et al. (2004) propose that there are eight management stocks separated by gaps in occurrence.

Confirmed range states

Maigret (1994, p. 314) made reference to artisanal fisheries occurring off Nigeria in an area where 'both the hump-backed dolphin and the manatee live'. However, there appears to be no supporting evidence for the occurrence of the species in Nigerian waters (Van Waerebeek et al. 2004). The Atlantic humpback dolphin type specimen is a carcass originating from the Bay of Warships, Cameroon in 1891 (Kükenthal 1892). In Gabon, the species was originally known from a skull found in the Gabon Estuary in the 1940s (Van Waerebeek et al. 2004). More recently, a

skeleton was discovered at Mayumba and seven sightings were reported off Pointe Pongara, Petit Loango and the Nyanga River between 2002 and 2003 (Collins et al. 2004). Small groups were seen off southern Angola during January and February 2004 (not in 1997 as reported by Van Waerebeek et al. 2004) between Namibe and Tombwa (Weir 2008a). Weir (in press) reported 71 sightings of this species off Flamingos in southern Angola during the summer and winter of 2008.

Biology

Sightings from Gabon and Angola indicate that Atlantic humpback dolphins occur exclusively in shallow, coastal waters (Collins et al. 2004, Weir 2008a, in press) as documented throughout their known range (Van Waerebeek et al. 2004). Sightings in both regions suggest a year-round occurrence (Collins et al. 2004, Weir 2008a, in press). Two sightings off Gabon comprised between 6 and 15 animals, while a further record consisted of 30 to 40 dolphins (Collins et al. 2004). Group size off Angola is smaller: pods consist of eight or fewer animals (Van Waerebeek et al. 2004, Weir 2008a, in press). In a photo-identification study of this species off Flamingos in southern Angola, only 10 individuals were identified as using the region in 2008 (Weir in press). The same animals were present during both summer and winter.

Rough-toothed dolphin *Steno bredanensis*

The rough-toothed dolphin inhabits warm seas worldwide, and its distribution is assumed to include most of the west coast of Africa (Jefferson et al. 1997).

Confirmed range states

Cadenat (1959) described three specimens of *S. bredanensis* captured separately 28–33km south of Abidjan, Côte d'Ivoire during 1958, comprising two males and a pregnant female. There are two sightings from offshore waters south of Ghana during August 1972 (C. W. Oliver, pers. comm., Jefferson et al. 1997), and two individuals were landed as bycatch at Apam in Ghana during 1998 (Van Waerebeek & Ofori-Danson 1999, Ofori-Danson et al. 2003). At least two sightings have been recorded off Gabon (Findlay et al. 2006, Weir 2006b), while three groups were observed offshore of Angola (Weir 2006b, 2008a). A photograph of rough-toothed dolphins off St Helena is included in an article by Kramer (1961) and MacLeod and Bennett (2006) recorded two groups off St Helena in June 2003.

Biology

Rough-toothed dolphins primarily inhabit shelf-edge and deep oceanic waters. Captures took place seaward of the shelf edge in Côte d'Ivoire (Cadenat 1959), and sightings were in water depths of 402 to over 4000m off Ghana, Gabon and Angola (C. W. Oliver, pers. comm., Weir 2006b, 2008a). However, sightings occurred 'close to shore' off the island of St Helena (MacLeod & Bennett 2006). Rough-toothed dolphins are usually seen in groups of <20 animals (MacLeod & Bennett 2006, Weir 2006b, 2008a), although a pod of 40 was observed south of Ghana (C. W. Oliver, pers. comm.). They are a gregarious species, associating with bottlenose dolphins off Gabon and St Helena (MacLeod & Bennett 2006, Weir 2008a) and with short-finned pilot whales off Angola and Gabon (Weir 2006b, 2008a).

Dusky dolphin *Lagenorhynchus obscurus*

Dusky dolphins typically inhabit cool waters of less than 18°C (Van Waerebeek et al. 1995), and their occurrence off the west coast of Africa is linked to the cold-water Benguela Current system running northwards along the South African and Namibian coasts (Findlay et al. 1992).

Confirmed range states

Dusky dolphins are likely to occur only in the far south of Angola, and the only published record for the study area is of two animals photographed off Lobito (12°22'S) in Angola (Kramer 1961, Findlay et al. 1992, Best & Meyer 2009).

Risso's dolphin *Grampus griseus*

Risso's dolphins are distributed worldwide in tropical and temperate seas and are most commonly encountered seaward of the shelf edge (Kruse et al. 1999). They are assumed to inhabit waters throughout West Africa (Jefferson et al. 1997).

Confirmed range states

A small pod of Risso's dolphins was encountered 46km off the Côte d'Ivoire during July 1958 (Cadenat 1959). In Ghana, four Risso's dolphins were landed as fisheries bycatch between 1998 and 2000 (Ofori-Danson et al. 2003). At least two sightings have been reported from Gabon (Findlay et al. 2006, Weir 2008a), and there are seven sightings from offshore Angola (Weir 2008a).

Biology

The wide distribution of records suggests that Risso's dolphins may inhabit the entire study area, and their occurrence at least off Angola appears to be year-round (Weir 2008a). Off Angola, all sightings occurred in deep water exceeding 1300m, but a sighting over the Gabon shelf in April 2004 indicates that Risso's dolphins also inhabit shelf waters (Weir 2008a). Group size is small: 15 or fewer animals (Cadenat 1959, Weir 2008a).

Common bottlenose dolphin *Tursiops truncatus*

The common bottlenose dolphin is a cosmopolitan species with a worldwide distribution in tropical and temperate regions. The taxonomic status of *Tursiops* in the eastern Atlantic has not been studied. However, *Tursiops* dolphins assumed to be *T. truncatus* are widespread in West Africa and probably inhabit nearshore areas along the entire coast (Jefferson et al. 1997).

Confirmed range states

Five bottlenose dolphins were harpooned in the waters off Vridi in Côte d'Ivoire during 1957 and 1958 (Cadenat & Lassarat 1959a, Cadenat 1959). In Ghana, bottlenose dolphins were landed at Jamestown in 1994 and at Senya Beraku and Tema on unknown dates (Van Waerebeek & Ofori-Danson 1999), while nine animals were landed at fishing ports between 1998 and 2000 (Ofori-Danson et al. 2003). Van Waerebeek et al. (2008) mention the presence of bottlenose dolphins off Benin. Off Gabon, sightings were recorded off Petit Loango during November 2003 (Collins et al. 2004) and in offshore waters during September 2005 (Weir 2008a). Forty-two sightings were reported around São Tomé between 2002 and 2005 (Picanço et al.

2009). In Angola, Weir (2008a) reported 15 sightings between 2003 and 2006. Off St Helena, Perrin (1985) made two sightings during 1983, and MacLeod and Bennett (2006) made nine sightings in June 2003.

Biology

Bottlenose dolphins have been seen in a range of habitats including shelf and coastal waters (Cadenat & Lassarat 1959a, Collins et al. 2004, Weir 2008a), the shelf edge (Weir 2008a), waters around volcanic islands (MacLeod & Bennett 2006, Picanço et al. 2009) and deep, oceanic waters (Weir 2008a). Sightings off Angola suggest a year-round occurrence (Weir 2008a). Reported group sizes are fewer than 30 animals (Cadenat & Lassarat 1959a, MacLeod & Bennett 2006, Weir 2008a). One-third of bottlenose dolphins seen off Angola were in deep water associations with short-finned pilot whales (Weir 2008a), and they occurred with Pantropical spotted dolphins and rough-toothed dolphins around St Helena (MacLeod & Bennett 2006). Their coastal tendency makes them susceptible to anthropogenic threats including bycatch in gillnet fisheries (e.g. off Ghana; Ofori-Danson et al. 2003), and deliberate capture (e.g. off Côte d'Ivoire; Cadenat & Lassarat 1959a, and off St Helena; Perrin 1985).

Pantropical spotted dolphin *Stenella attenuata*

Pantropical spotted dolphins inhabit tropical and subtropical waters worldwide, although records from West Africa are scarce (Jefferson et al. 1997).

Confirmed range states

Although the Pantropical spotted dolphin has been reported from Côte d'Ivoire (Cadenat & Lassarat 1959b, Jefferson et al. 1997), the record was erroneous (photographs show *Stenella frontalis* rather than *S. attenuata*; Cadenat & Lassarat 1959b) and its occurrence there remains unconfirmed. At least 10 Pantropical spotted dolphins were landed as bycatch at Ghanaian fishing ports between 1998 and 2000 (Ofori-Danson et al. 2003), and one was seen south of Ghana during August 1972 (C. W. Oliver, pers. comm., Jefferson et al. 1997). An '*S. frontalis*' seen (and subsequently captured) off Cap Lopez in Gabon (Fraser 1950) has been identified as a Pantropical spotted dolphin from photographs (Perrin et al. 1987). Picanço et al. (2009) report 14 sightings from São Tomé between 2002 and 2005, and Weir (2008a) described five sightings off Angola between 2003 and 2006. There are 45 specimen records (Perrin et al. 1987) and numerous sightings from St Helena (Perrin 1985, MacLeod & Bennett 2006).

Biology

Sightings off Ghana, Gabon and Angola occurred in deep water over, and seaward of, the shelf edge. Around São Tomé and St Helena, Pantropical spotted dolphins may use shallow water to rest and move into deeper water to feed (Perrin 1985, MacLeod & Bennett 2006, Picanço et al. 2009). Published group sizes in the study area range from ≤ 4 animals (Fraser 1950) to 'several hundred' animals (Perrin 1985). Until 1979, 50–300 Pantropical spotted dolphins were killed annually in targeted hunts around St Helena (Perrin 1985).

Atlantic spotted dolphin *Stenella frontalis*

The Atlantic spotted dolphin is endemic to the tropical and warm temperate Atlantic Ocean, but its distribution off West Africa is poorly known.

Confirmed range states

In 1958, a male and a pregnant female were harpooned separately off Vridi, Côte d'Ivoire (Cadenat & Lassarat 1959b, Cadenat 1959). Further specimens from Côte d'Ivoire were reported by van Bree (1971) and Perrin et al. (1987). Three animals were landed at Ghanaian fishing ports between 1998 and 2000 (Ofori-Danson et al. 2003). A group was recorded off Benin during October 2002 (Van Waerebeek et al. 2002a, Van Waerebeek 2003). Perrin et al. (1987) report specimen records from Bioko (Equatorial Guinea) and from Cap Lopez in Gabon. The largest number of Atlantic spotted dolphin records originates from Angola, where 38 sightings were made between 2003 and 2006 (Weir 2008a). Two 19th Century Atlantic spotted dolphin skulls originating from St Helena may actually have been collected by seafarers *en route* to the island (Perrin et al. 1987).

Biology

The Atlantic spotted dolphin appears to be one of the most numerous delphinids off Angola (Weir 2008a), where it inhabits shelf-edge and oceanic waters (Weir 2008a). The record from Benin was from the shelf edge in water of 230m depth (Van Waerebeek et al. 2002a), and the capture locations described by Cadenat and Lassarat (1959b) were seaward of the shelf edge. At-sea group sizes range from one to 500 animals (Van Waerebeek et al. 2002a, Weir 2008a), and this species often occurs in large schools exceeding 100 animals off Angola (Weir 2008a). Atlantic spotted dolphins inhabit Angolan waters year-round (Weir 2008a).

Spinner dolphin *Stenella longirostris*

The spinner dolphin occurs in tropical and warm temperate waters worldwide, but its distribution within West African waters is poorly known.

Confirmed range states

van Bree (1971) describes a spinner dolphin skeleton originating from off Vridi in Côte d'Ivoire. In Ghana, two spinner dolphins were landed during bycatch monitoring between 1999 and 2001 (Ofori-Danson et al. 2003). Three sightings were seen offshore from Ghana in the Gulf of Guinea during 1972 (C. W. Oliver, pers. comm.). The species is known to occur in Angola (Weir 2008a). Perrin (1985) describes a spinner dolphin skull apparently collected at St Helena during 1926.

Biology

The three Gulf of Guinea records were in water depths exceeding 3500m, and in groups of 20 to 200 animals (C.W. Oliver, pers. comm.).

Clymene dolphin *Stenella clymene*

Clymene dolphins are endemic to deep waters of the tropical and subtropical Atlantic Ocean where they are known from fewer than 200 records (Fertl et al. 2003).

Confirmed range states

Van Waerebeek and Ofori-Danson (1999) described the skeleton of a Clymene dolphin which was stranded at Keta, Ghana during 1956. A group was photographed

in deep water south of Ghana during August 1972 (C. W. Oliver, pers. comm., Perrin et al. 1981, Fertl et al. 2003), while 20 animals were landed at Ghanaian fishing ports between 1998 and 2000 (Van Waerebeek & Ofori-Danson 1999, Fertl et al. 2003, Ofori-Danson et al. 2003). Single sightings were reported off the Republic of Congo in 2005 and Angola in 2004 (Weir 2006c, 2008a). A further record (with photographs) from Angola is, at 14°26'S, the southernmost location that this species has been recorded at in the study area (R. Leslie, pers. comm.).

Biology

The sightings indicate a shelf-edge and oceanic occurrence within the region, over water depths ranging from 466m to >5000m. Van Waerebeek and Ofori-Danson (1999) consider Clymene dolphins to be the most common cetaceans off Ghana, based on bycatch records. The species appears to be gregarious: the four at-sea sightings comprised groups of 12, 50, 250 and 1000 animals. The group of 12 occurred within a large mixed-species school of around 350 animals including common dolphins (Weir 2006c). Unknown numbers of Clymene dolphins are caught in tuna purse seine fisheries within the Gulf of Guinea (Maigret 1981).

Striped dolphin *Stenella coeruleoalba*

The striped dolphin inhabits warm temperate and tropical waters worldwide (Perrin et al. 1994). It probably occurs throughout pelagic West African waters (Jefferson et al. 1997), but published records are scarce.

Confirmed range states

A striped dolphin stranding at Au Large de Sassandra in Côte d'Ivoire during 1970 (Wilson et al. 1987) is the only verified record for the northern Gulf of Guinea. Two sightings were reported offshore Angola during October 1974 (Wilson et al. 1987, Perrin et al. 1994), while a further nine sightings were reported off Angola by Weir (2008a) between 2003 and 2006.

Biology

The 11 sightings off Angola occurred in pelagic waters ranging from 1500 to 2400m depth (Wilson et al. 1987, Weir 2008a). The school size ranged from eight to 200 animals (Weir 2008a). Sightings off Angola have been recorded in 7 months of the year (Wilson et al. 1987, Weir 2008a) and the species probably occurs year-round in deep-water habitat.

Common dolphins *Delphinus delphis* and *D. capensis*

Although two species of common dolphin, the short-beaked (*D. delphis*) and the long-beaked (*D. capensis*) common dolphin, have been identified in the eastern North Pacific (Heyning & Perrin 1994), the taxonomic status of *Delphinus* elsewhere remains unresolved. In a recent review, Jefferson et al. (2009) referred to long-beaked *Delphinus* occurring in the Atlantic Ocean as *D. capensis*, though they acknowledged that these may later be reallocated to another species. More recently, several studies have indicated that *Delphinus* morphological types are not supported by consistent genetic differentiation (Anonymous 2009a). For the purposes of this review, I therefore adopt a precautionary approach to allocating species status to common dolphins in the West Africa study area, with all records being considered

simply as 'common dolphin' *Delphinus* spp. However, when published records contain adequate information or photographs of morphology, common dolphins are described in the species account as a 'short-beaked' form (cf. *D. delphis*) and a 'long-beaked' form (cf. *D. capensis*). In the absence of genetic data for the region, the term 'form' is preferred over species (as recommended by Anonymous 2009a). Mörzner Bruyns (1971) describes common dolphins as occurring throughout the tropical Atlantic south to Luanda and Namibe (Angola), while Jefferson et al. (1997) consider them to be the most common offshore delphinids in West African waters.

Confirmed range states

Cadenat (1959) described 24 common dolphins stranded at Côte d'Ivoire between 1956 and 1958, all of which were identified as a 'short-beaked' form. However, at least one animal (Fig. 1 in Cadenat 1959) had a long beak and flatter melon, and Cadenat (1959) states that it is not impossible that some were the 'long-beaked' form. Van Bree and Purves (1972) describe single 'short-beaked' and 'long-beaked' specimens from Côte d'Ivoire. Off Ghana, single 'short-beaked' and 'long-beaked' common dolphins were landed as bycatch between 1998 and 2000 (Ofori-Danson et al. 2003). Three common dolphin sightings were recorded off Benin during October 2002 (Van Waerebeek et al. 2002a). Both 'short-beaked' and 'long-beaked' forms of *Delphinus* have been identified from skulls in Gabon (van Bree & Purves 1972, Van Waerebeek 1997), and several common dolphin sightings were recorded off Cap Lopez, Gabon between 1997 and 1999 (Walsh et al. 2000). A single skull from a 'long-beaked' form originates from Pointe Noire in the Republic of Congo (Van Waerebeek 1997). Off Angola, skulls of both 'short-beaked' and 'long-beaked' forms have been described (van Bree & Purves 1972, Van Waerebeek 1997), and 47 common dolphin sightings were reported between 2004 and 2007 (Weir & Coles 2007, Weir 2008a). Catches of common dolphins during eight tuna purse seine sets in 1967 occurred just west of Cape Palmas at the border between Liberia and Côte d'Ivoire (Simmons 1968), and not off Angola as reported by Jefferson et al. (1997). One 'short-beaked' specimen was captured 740km south of St Helena (van Bree & Purves 1972).

Biology

The 'short-beaked' and 'long-beaked' forms of the common dolphin appear to be broadly sympatric throughout the study area. In Angola, four 'long-beaked' skulls originated from shelf waters, while the only skull recorded from shelf-edge waters was from a 'short-beaked' form (Van Waerebeek 1997), corresponding with observed habitat partitioning between *D. capensis* and *D. delphis* in the North-east Pacific (Heyning & Perrin 1994). Common dolphins occur in shelf, shelf-edge and deep oceanic waters, but their highest relative abundance is over shelf waters in Angola (Weir & Coles 2007, Weir 2008a). Reported common dolphin group sizes range from one to 500 animals, and in Angola the group size appears to decrease with increasing water depth (Weir & Coles 2007). Sighting and specimen records indicate a year-round occurrence of common dolphins within the study area (Cadenat 1959, Weir 2008a). Bycatch of common dolphins occurs in artisanal fisheries off Ghana (Ofori-Danson et al. 2003) and in tuna purse-seine nets in the western Gulf of Guinea (Simmons 1968).

Fraser's dolphin *Lagenodelphis hosei*

Fraser's dolphins inhabit deep, tropical and subtropical oceans worldwide, although their occurrence in the Gulf of Guinea has been confirmed only recently (Weir *et al.* 2008).

Confirmed range states

Four Fraser's dolphin specimens were landed as bycatch at Axim and Dixcove in Ghana during 2000 (Debrah 2000, Ofori-Danson *et al.* 2003, Weir *et al.* 2008). At-sea records are limited to two groups photographed off northern Angola during 2007 and 2008, and a probable sighting of this species south of Nigeria in the Gulf of Guinea during 2004 (Weir *et al.* 2008).

Biology

All sightings occurred in over 1000m water depth, indicating a deep-water habitat (Weir *et al.* 2008). The sightings comprised 60 to 150 animals. The dolphin bycatch off Ghana was considered likely to originate from drift gillnets. The sighting and specimen records originate from at least five different months of the year (Weir *et al.* 2008), although most ($n = 3$) are from the winter. However, Fraser's dolphins are expected to occur in the study area year-round and the data are too few to draw conclusions on seasonality.

Heaviside's dolphin *Cephalorhynchus heavisidii*

Heaviside's dolphin is endemic to the west coast of South Africa and Namibia, where it inhabits shelf waters with temperatures of less than 15 °C (Best & Abernethy 1994). The northern limit of occurrence is currently uncertain.

Confirmed range states

There is one record of two specimens caught by a fishing trawler near the Angola-Namibia border at 17°09'S (Findlay *et al.* 1992, P. Best, pers. comm.), approximately 12km north of the Cunene River mouth (although this position is uncertain). While officially in Namibian waters, a dolphin caught in fishing net off the Cunene River mouth during January 1982 (Windhoek Museum specimen WM 11708; P. Best, pers. comm.) also supports occurrence in southern Angolan waters. More recently, Heaviside's dolphins were seen during surveys off southern Angola at latitude 16°30'S (Best 2007), equivalent to the waters around Baia dos Tigres.

Biology

Within the study area, Heaviside's dolphins are probably restricted to Angolan coastal waters south of 16°S which are influenced by cooler water from the Benguela Current.

DISCUSSION

The eastern Atlantic Ocean remains one of the most poorly documented regions for cetacean occurrence. However, in this review, I identify at least 28 cetacean species within the study area, comprising seven baleen whale species, four species of toothed whale (including at least one unidentified *Mesoplodon* species) and 17 or 18 dolphin species (depending on how the species status of common dolphins in the region is resolved in the future). The rejection of unsupported records meant that

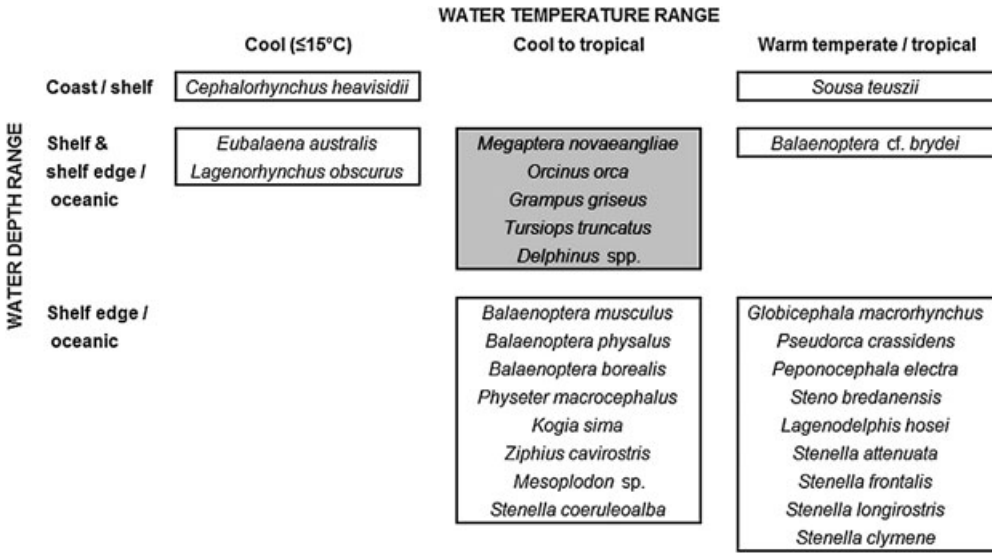


Fig. 2. Broad cetacean communities occurring within the study area, based on water depth and temperature. Cosmopolitan species, which are found in a wide range of waters within the study area, are shown in a shaded box. The Antarctic minke whale, which is known from a single stranding in southern Angola, is not included.

one dolphin species (the pygmy killer whale) fewer was identified in the present review than in the review by Jefferson et al. (1997). Although pygmy killer whales were reported (Mörzer Bruyns 1971, Tormosov et al. 1980), and might be expected in the region based on their worldwide distribution, the records could not be confirmed.

Cetaceans within the study area could be broadly classed into seven ecological categories based on their distribution (Fig. 2). Nine warm temperate to tropical dolphin species were found in deep water areas, and a further seven cetacean species occurred in deep water of cool to tropical temperature. Together with five cosmopolitan species (found in a wide range of waters within the study area) and Bryde's whale, these species comprise a cetacean community similar to communities occurring in deep, tropical waters worldwide, for example in the Gulf of Mexico (Mullin & Fulling 2004), the western Indian Ocean (Ballance & Pitman 1998) and the Maldives (Anderson 2005). Two ecological categories comprised single endemic dolphin species (Fig. 2): the Atlantic humpback dolphin which occurs coastally in warm temperate to tropical waters, and Heaviside's dolphin which inhabits cool shelf waters. The latter species, together with dusky dolphins and the southern right whale, occurred only in the south of Angola, where the cold-water influence of the Benguela Current extended the northern distribution limit of a temperate cetacean community common off South Africa and Namibia (Findlay et al. 1992) into the study area.

The transition between the cool and warm temperate to tropical cetacean communities probably varies with the spatio-temporal movements of the Benguela Current, but appears to occur at around 14–16°S latitude where the northern extent of the cold-water upwelling occurs (Hardman-Mountford et al. 2003). Members of

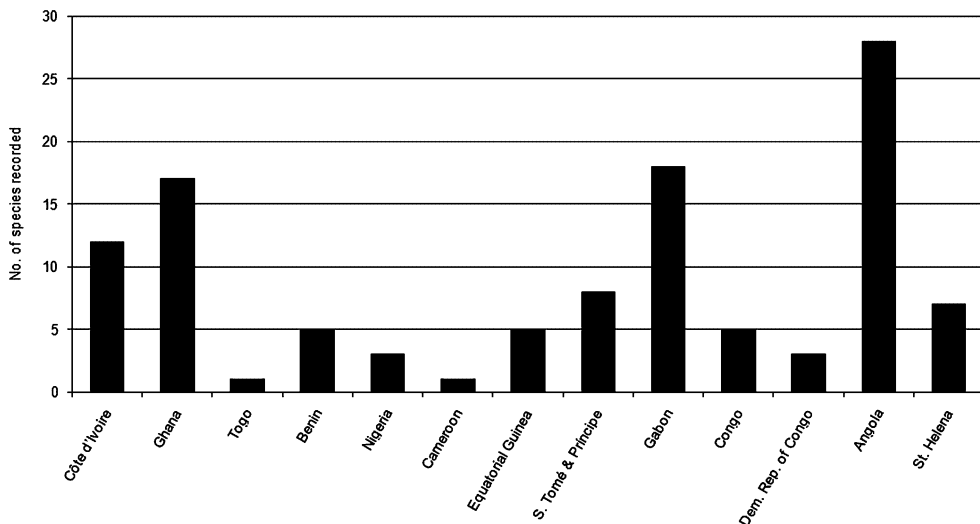


Fig. 3. Number of cetacean species ($n = 28$; common dolphin species are analysed together as *Delphinus* spp.) recorded in each of the 13 countries within the study area.

the temperate community are likely to be most common and extend further into the study area during the austral winter when the Benguela Current pushes furthest northwards. A similar situation occurs in the western Atlantic, where the transition between tropical and temperate cetacean communities occurs in São Paulo state, an area influenced by both the warm Brazil current and the cold Malvinas current (Martuscelli et al. 1996).

The highest diversity of cetacean species was recorded in Ghana, Gabon and Angola (Fig. 3), which are all countries in which dedicated cetacean research projects recently commenced (Ofori-Danson et al. 2003, Rosenbaum & Collins 2006, Weir 2008a). The range state with the highest number of confirmed species was Angola, reflecting the fact that its varied oceanographic regime and the prevalence of deep-water cetacean survey effort (Weir 2008a) resulted in a high likelihood of documenting the cetacean communities outlined in Fig. 2. In contrast, only five or fewer species could be confirmed in seven countries. These low diversities should be interpreted as paucity of survey effort rather than a lack of cetacean occurrence, since most species are expected to occur throughout the study area (Jefferson et al. 1997). The length of coastline of each range state (Table 1) is also undoubtedly a contributory factor.

Although present on only a seasonal basis, the humpback whale was recorded in the most countries ($n = 11$ or 85%; Fig. 4) due to its prevalence in West African whaling records (Best 1994), its occurrence close to shore and its high visibility. A further four species were recorded in over half of the 13 countries (Fig. 4): sperm and Bryde's whales were documented in whaling records, and bottlenose dolphins were widely recorded due to their occurrence in coastal waters. While primarily inhabiting deep-water areas, the Atlantic spotted dolphin was verified in seven countries and is considered to be one of the most numerous dolphin species inhabiting the study area (Weir 2008a).

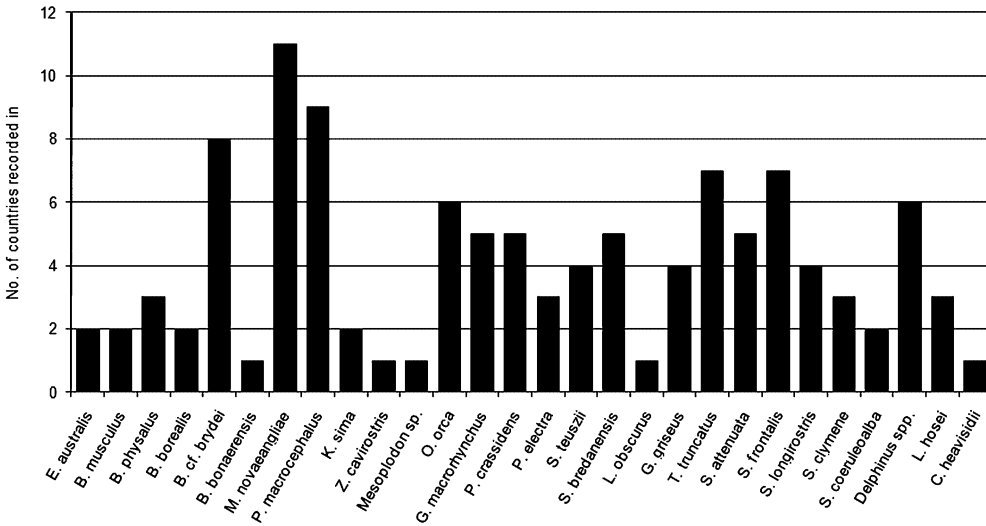


Fig. 4. Number of countries ($n = 13$) in which each cetacean species was recorded in the study area.

West Africa’s cetacean fauna faces a number of threats. Both artisanal and commercial fisheries including gillnets, beach seines, trawls, driftnets and tuna purse seines are known to capture dolphins in the region (Simmons 1968, Maigret 1994, Ofori-Danson et al. 2003). Many West African countries have large coastal communities and limited food (especially protein) supplies. The likelihood of cetaceans being caught for human consumption is therefore high, and Alfaro-Shigueto and Van Waerebeek (2001) reported the use of dolphin meat for food in five surveyed West African countries including Ghana and Togo. Habitat loss and pollution are widespread problems as human coastal communities increase in size, and as the study area represents one of the world’s principal oil and gas exploration regions, there are potential impacts from pollution and anthropogenic sound (Rosenbaum & Collins 2006). Further at-sea studies of cetaceans are needed throughout the West African region to improve the documentation of the occurrence and ecology of species in the region as a baseline for mitigating these potential impacts.

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REFERENCES

Aguilar A (1985) Aboriginal whaling off Pagalu (Equatorial Guinea). *Reports of the International Whaling Commission* 35: 385–386.

- Alfaro-Shigueto J, Van Waerebeek K (2001) Drowning in the sea of silence: the bushmeat concept applied for marine fauna. Fourth Biennial Zoos and Aquariums: Committing to Conservation Conference, Cocoa Beach, Florida, 28 November–2 December 2001.
- Anderson RC (2005) Observations of cetaceans in the Maldives, 1990–2002. *Journal of Cetacean Research and Management* 7: 119–135.
- Anonymous (1953) *International Hydrographic Organisation Special Publication 23, Limits of Oceans and Seas*, 3rd ed. International Hydrographic Bureau, Monaco.
- Anonymous (1999) Right whales sighted off Norway and Gabon. *Right Whale News* 6: 8.
- Anonymous (2000) Report of the workshop on the conservation and management of small cetaceans of the coast of Africa. *Tenth meeting of the CMS Scientific Council*, pp. 27. May 2001. [Translation by WF Perrin].
- Anonymous (2009a) *International Whaling Commission Annex L: Report of the Sub-Committee on Small Cetaceans*. http://www.iwcoffice.org/_documents/sci_com/SCRepFiles2009/Annex%20L%20-%20Final-sq.pdf (accessed 13 August 2009).
- Anonymous (2009b) *IUCN Red List of Threatened Species*. Version 2009.2. <http://www.iucnredlist.org> (accessed 14 November 2009).
- Ballance LT, Pitman RL (1998) Cetaceans of the Western Tropical Indian Ocean: distribution, relative abundance, and comparisons with cetacean communities of two other tropical ecosystems. *Marine Mammal Science* 14: 429–459.
- Bamy IL, Van Waerebeek K, Bah SS, Dia M, Kaba B, Keita N, Konate S, Tall H (2006) The cetaceans of Guinea, a first check-list of documented species. *Paper SC/58/O15 Presented to the IWC Scientific Committee*, pp. 7. May 2006.
- Bennett E, MacLeod CD (2006) Seasonal occurrence of humpback whales around Saint Helena, South Atlantic Ocean: evidence of a previously unknown breeding ground? *Abstract Book of the 20th Conference of the European Cetacean Society*, pp. 202. Gdynia, Poland, 2–7 April 2006.
- Best PB (1969) The sperm whale (*Physeter catadon*) off the west coast of South Africa, 4: distribution and movements. *Investigational Report of the Division of Sea Fisheries of South Africa* 78: 1–12.
- Best PB (1974) The biology of the sperm whale as it relates to stock management. In: Schevill WE (ed.) *The Whale Problem: a Status Report*, 257–293. Harvard University Press, Cambridge, Massachusetts, USA.
- Best PB (1979) Social organization in sperm whales, *Physeter macrocephalus*. In: Winn HE, Olla BL (eds) *Behaviour of Marine Animals, Volume 3, Cetaceans*, 227–289. Plenum Press, New York, USA and London, UK.
- Best PB (1981) The status of right whales (*Eubalaena glacialis*) off South Africa, 1969–1979. *Investigational Report of the Sea Fisheries Institute, South Africa* 123: 1–44.
- Best PB (1990) The 1925 catch of right whales off Angola. *Reports of the International Whaling Commission* 40: 381–382.
- Best PB (1994) A review of the catch statistics for modern whaling in Southern Africa, 1908–1930. *Reports of the International Whaling Commission* 44: 467–485.
- Best PB (1996) Evidence of migration by Bryde's whales from the offshore population in the southeast Atlantic. *Reports of the International Whaling Commission* 46: 315–322.
- Best PB (2001) Distribution and population separation of Bryde's whale *Balaenoptera edeni* off southern Africa. *Marine Ecology Progress Series* 220: 277–289.
- Best PB (2007) *Whales and Dolphins of the Southern African Subregion*. Cambridge University Press, Cape Town, South Africa.
- Best PB, Abernethy RB (1994) Heaviside's dolphin *Cephalorhynchus heavisidii* (Gray, 1828). In: Ridgway SH, Harrison R (eds) *Handbook of Marine Mammals, Volume 5, the First Book of Dolphins*, 289–310. Academic Press, San Diego, California USA.
- Best PB, Canham PAS, Macleod N (1984) Patterns of reproduction in sperm whales, *Physeter macrocephalus*. *Reports of the International Whaling Commission* 6: 51–79.
- Best PB, Meyer MA (2009) Neglected but not forgotten: southern Africa's dusky dolphins. In: Würsig B, Würsig M (eds) *The Dusky Dolphin: Master Acrobats off Different Shores*, 291–312. Elsevier Science & Technology, Oxford, UK.
- Best PB, Reeb D, Morais M, Baird A (1999) A preliminary investigation of humpback whales off northern Angola. *Paper SC/51/CAWS33 Presented to the IWC Scientific Committee*, pp. 12. May 1999.
- Best PB, Ross GJB (1986) Catches of right whales from shore-based establishments in southern Africa, 1792–1975. *Reports of the International Whaling Commission* 10: 275–289.

- Best PB, Ross GJB (1989) Whales and whaling. In: Payne AIL, Crawford RJM (eds) *Oceans of Life off Southern Africa*, 315–338. Vlaeberg Publishers, Cape Town, South Africa.
- Branch TA, Stafford KM, Palacios DM, Allison C, Bannister JL, Burton CLK, Cabrera E, Carlson CA, Galletti Vernazzani B, Gill PC, Hucke-Gaete R, Jenner KCS, Jenner M-NM, Matsuoka K, Mikhalev YA, Miyashita T, Morrice MG, Nishiwaki S, Sturrock VJ, Tormosov D, Anderson RC, Baker AN, Best PB, Borsa P, Brownell JR RL, Childerhouse S, Findlay KP, Gerrodette T, Ilangakoon AD, Joergensen M, Kahn B, Ljungblad DK, Maughan B, McCauley RD, McKay S, Norris TF, Oman Whale and Dolphin Research Group, Rankin S, Samaran F, Thiele D, Van Waerebeek K, Warneke RM (2007) Past and present distribution, densities and movements of blue whales *Balaenoptera musculus* in the Southern Hemisphere and northern Indian Ocean. *Mammal Review* 37: 116–175.
- van Bree PJH (1971) On skulls of *Stenella longirostris* (Gray, 1828) from the eastern Atlantic (Notes on Cetacea, Delphinoidea IV). *Beaufortia* 19: 99–106.
- van Bree PJH (1972) Sur la présence de *Pseudorca crassidens* (Owen, 1846) (Cetacea, Globicephalinae) au large des côtes d'Afrique occidentale. *Bulletin De l'Institut Francais D'Afrique Noire* 34A: 212–218.
- van Bree PJH, Purves PE (1972) Remarks on the validity of *Delphinus bairdii* (Cetacea, Delphinidae). *Journal of Mammalogy* 53: 372–374.
- Brito C, Carvalho I, Reiner F (2005) Historical records of cetaceans in S. Tomé and Príncipe. *Projecto Delfim – Centro Português de Estudo dos Mamíferos Marinheiros*, pp. 4. Portugal.
- Brown SG (1959) Whales observed in the Atlantic Ocean: notes on their distribution. *Norsk Hvalfangst-Tidende* 48: 289–308.
- Budker P (1950) Sur un Rorqual de Rudolphi, ou (Sei-Whale) (*Balaenoptera borealis*, Lesson), capturé au Cap Lopez (Gabon). *Mammalia* 14: 154–158.
- Budker P (1952) Quelques considerations sur la Campagne Baleinière 1951 au Cap Lopez (Gabon). *Mammalia* 16: 1–6.
- Budker P (1953) Les Campagnes baleinières 1949–1952 au Gabon. *Mammalia* 17: 129–148.
- Budker P, Collignon J (1952) Trois campagnes baleinières au Gabon: 1949–1950–1951. *Bulletin de l'Institut d' Etudes Centrafricaines* 3: 75–100.
- Budker P, Roux C (1968) The 1959 summer whaling season at Cape Lopez (Gabon). *Norsk Hvalfangsttid* 57: 141–145.
- Cadenat J (1959) Rapport sur les petits cétacés ouest-africains: résultats des recherches entreprises sur ces animaux jusqu'au mois de mars 1959. *Bulletin De l'Institut Francais D'Afrique Noire, Série A: Sciences Naturelles* 21: 1367–1409.
- Cadenat J, Lassarat A (1959a) Notes sur les Delphinidés ouest-africains, III. Note complémentaire sur *Tursiops truncatus* en Côte d'Ivoire. *Bulletin De l'Institut Francais D'Afrique Noire* 21: 416–419.
- Cadenat J, Lassarat A (1959b) Notes sur les delphinidés ouest-africains: 4. Sur un Prodelphinus indéterminé de Côte d'Ivoire. *Bulletin De l'Institut Francais D'Afrique Noire, Série A: Sciences Naturelles* 21: 777–781.
- Caldwell DK, Caldwell MC (1989) Pygmy sperm whale *Kogia breviceps* (de Blainville, 1838): Dwarf sperm whale *Kogia sima* Owen, 1866. In: Ridgway SH, Harrison R (eds) *Handbook of Marine Mammals, Volume 4, River Dolphins and the Larger Toothed Whales*, 235–260. Academic Press, San Diego, California, USA.
- Carvalho I, Brito C, Rosenbaum H (2005) The importance of the West African archipelago of São Tomé and Príncipe for humpback whale mother-calf pairs. *Abstracts of the 16th Biennial Conference of the Society for Marine Mammalogy*, San Diego, California, USA, 12–16 December 2005.
- Collins T, Ngouesso S, Rosenbaum HC (2004) A note on recent surveys for Atlantic humpback dolphins, *Sousa teuszii* (Kukenthal, 1892) in the coastal waters of Gabon. *Paper SC/56/SM23 Presented to the IWC Scientific Committee*, 6 July 2004.
- Dahlheim ME, Heyning JE (1999) Killer whale – *Orcinus orca* (Linnaeus, 1758). In: Ridgway SH, Harrison R (eds) *Handbook of Marine Mammals, Volume 6, the Second Book of Dolphins and the Porpoises*, 281–322. Academic Press, San Diego, California, USA.
- Debrah JS (2000) *Taxonomy, Exploitation and Conservation of Dolphins in the Marine Waters of Ghana*. MSc thesis, University of Ghana, Legon, Ghana.
- Fertl D, Jefferson TA, Moreno IB, Zerbini AN, Mullin KD (2003) Distribution of the Clymene dolphin *Stenella clymene*. *Mammal Review* 33: 253–271.
- Figueiredo JM (1960) Pescarias de baleia nas províncias africanas. *Portuguesas. Boletim da Pesca* 66: 29–37.

- Findlay KP, Best PB, Ross GJB, Cockcroft VG (1992) The distribution of small odontocete cetaceans off the coasts of South Africa and Namibia. *South African Journal of Marine Science* 12: 237–270.
- Findlay KP, Collins T, Rosenbaum HC (2006) Environmental Impact Assessment and mitigation of marine hydrocarbon exploration and production in the Republic of Gabon. *Report of the Wildlife Conservation Society*, 169. 2300 Southern Blvd., Bronx, New York, USA.
- Fraser FC (1950) Description of a dolphin *Stenella frontalis* (Cuvier) from the coast of French Equatorial Africa. *Atlantidae Reports* 1: 61–84.
- Gambell R (1985a) Fin whale *Balaenoptera physalus* Linnaeus, 1758. In: Ridgway SH, Harrison R (eds) *Handbook of Marine Mammals, Volume 3, the Sirenians and Baleen Whales*, 171–192. Academic Press, San Diego, California, USA.
- Gambell R (1985b) Sei whale *Balaenoptera borealis* Lesson, 1828. In: Ridgway SH, Harrison R (eds) *Handbook of Marine Mammals, Volume 3, the Sirenians and Baleen Whales*, 155–170. Academic Press, San Diego, California, USA.
- Goodwin GG (1945) Record of a porpoise new to the Atlantic. *Journal of Mammalogy* 26: 195.
- Griffin M, Coetzee CG (2005) Annotated checklist and provisional national conservation status of Namibian mammals. *Technical Reports of Scientific Services No. 4.*, 207. Directorate of Scientific Services, Ministry of Environment and Tourism, Windhoek, Namibia.
- Hammond PS, Lockyer C (1988) Distribution of killer whales in the eastern North Atlantic. *Rit Fiskideildar* 11: 24–41.
- Hardman-Mountford NJ, Richardson AJ, Agenbag JJ, Hagen E, Nykjaer L, Shillington FA, Villacastin C (2003) Ocean climate of the South East Atlantic observed from satellite data and wind models. *Progress in Oceanography* 59: 181–221.
- Harmer SF (1928) History of whaling. *Proceedings of the Linnaean Society, London* 140: 51–95.
- Heyning JE (1989) Cuvier's beaked whale – *Ziphius cavirostris* G. Cuvier, 1823. In: Ridgway SH, Harrison R (eds) *Handbook of Marine Mammals, Volume 4, River Dolphins and the Larger Toothed Whales*, 289–308. Academic Press, London, UK and San Diego, California, USA.
- Heyning JE, Perrin WF (1994) Evidence for two species of common dolphins (genus *Delphinus*) from the eastern North Pacific. *Contributions in Science, Los Angeles County Museum of Natural History* 442: 1–35.
- Jefferson TA, Curry BE, Leatherwood S, Powell JA (1997) Dolphins and porpoises of West Africa: a review of records (Cetacea: Delphinidae, Phocoenidae). *Mammalia* 61: 87–108.
- Jefferson TA, Fertl D, Bolaños-Jiménez J, Zerbini AN (2009) Distribution of common dolphins (*Delphinus* spp.) in the western Atlantic Ocean: a critical re-examination. *Marine Biology* 156: 1109–1124.
- Kramer MO (1961) Dolphins have the laugh on us . . . as far as speed goes. *South African Yachting News* 1961: 28–30.
- Kruse S, Caldwell DK, Caldwell MC (1999) Risso's dolphin *Grampus griseus* (G. Cuvier, 1812). In: Ridgway SH, Harrison R (eds) *Handbook of Marine Mammals, Volume 6, the Second Book of Dolphins and the Porpoises*, 183–212. Academic Press, San Diego, California, USA.
- Kükenthal W (1892) *Sotalia teuszii* n. sp. eine pflanzenfressender (?) Delphin aus Kamerun. *Zoologische Jahrbucher, Abteilung für Systematik* 6: 442–446.
- MacLeod CD, Bennett E (2006) Pan-tropical spotted dolphins (*Stenella attenuata*) and other cetaceans around St Helena. *Journal of the Marine Biological Association* 87: 339–344.
- Maigret J (1981) Rapports entre les cétacés et la pêche thonière dans l'Atlantique tropical oriental. *Notes Africaines* 171: 77–84.
- Maigret J (1994) Marine mammals and fisheries along the West African coast. *Reports of the International Whaling Commission* 15: 307–316.
- Martuscelli P, Olmos F, Silva RSE, Mazzarella IP, Pino FV, Raduan EN (1996) Cetaceans of São Paulo, southeastern Brazil. *Mammalia* 60: 125–140.
- Mead JG (1989) Beaked whales of the Genus *Mesoplodon*. In: Ridgway SH, Harrison R (eds) *Handbook of Marine Mammals, Volume 4, River dolphins and the Larger Toothed Whales*, 349–430. Academic Press, London, UK and San Diego, California, USA.
- Mikhalev JA, Savusin VP, Kishiyan NA, Ivashin MV (1981a) To the problem of the feeding of sperm whales from the Southern Hemisphere. *Reports of the International Whaling Commission* 31: 737–745.
- Mikhalev YA, Ivashin MV, Savusin VP, Zelenaya FE (1981b) The distribution and biology of killer whales in the Southern Hemisphere. *Reports of the International Whaling Commission* 31: 551–565.

- Mörzer Bruyns WFJ (1968) Sight records of cetacea belonging to the Genus *Mesoplodon* Gervais, 1850. *Zeitschrift für Säugetierkunde* 33: 106–107.
- Mörzer Bruyns WFJ (1971) *Field Guide of Whales and Dolphins*. CA Mees, Amsterdam, the Netherlands.
- Mullin KD, Fulling GL (2004) Abundance of cetaceans in the oceanic northern Gulf of Mexico, 1996–2001. *Marine Mammal Science* 20: 787–807.
- Odell DK, McClune KM (1999) False killer whale – *Pseudorca crassidens* (Owen, 1846). In: Ridgway SH, Harrison R (eds) *Handbook of Marine Mammals, Volume 6, the Second Book of Dolphins and the Porpoises*, 213–243. Academic Press, San Diego, California, USA.
- Ofori-Danson PK, Van Waerebeek K, Debrah S (2003) A survey for the conservation of dolphins in Ghanaian coastal waters. *Journal of the Ghana Science Association* 5: 45–54.
- Olsen Ø (1913) On the external characters and biology of Bryde's whale (*Balaenoptera brydei*), a new rorqual from the coast of South Africa. *Proceedings of the Zoological Society of London* 1913: 1073–1090.
- Olsen Ø (1914) Hvaler og hvalfangst I Sydafrika. *Bergens Museums Aarbok* 15: 1–56.
- Perrin WF (1985) The former dolphin fishery at St Helena. *Reports of the International Whaling Commission* 35: 423–428.
- Perrin WF, Best PB, Dawbon WH, Balcomb KC, Gambell R, Ross GJB (1973) Rediscovery of Fraser's dolphin *Lagenodelphis hosei*. *Nature* 241: 345–350.
- Perrin WF, Mitchell ED, Mead JG, Caldwell DK, van Bree PJH (1981) *Stenella clymene*, a rediscovered tropical dolphin of the Atlantic. *Journal of Mammalogy* 62: 583–598.
- Perrin WF, Mitchell ED, Mead JG, Caldwell DK, Caldwell MC, van Bree PJH, Dawbin WH (1987) Revision of the spotted dolphins, *Stenella* spp. *Marine Mammal Science* 3: 99–170.
- Perrin WF, Wilson CE, Archer FI (1994) Striped dolphin – *Stenella coeruleoalba* (Meyen, 1833). In: Ridgway SH, Harrison R (eds) *Handbook of Marine Mammals, Volume 5, the First Book of Dolphins*, 129–160. Academic Press, San Diego, California, USA.
- Perryman WL, Au DWK, Leatherwood S, Jefferson TA (1994) Melon-headed whale *Peponocephala electra* Gray, 1846. In: Ridgway SH, Harrison R (eds) *Handbook of Marine Mammals, Volume 6, the Second Book of Dolphins and the Porpoises*, 363–386. Academic Press, San Diego, California, USA.
- Picanço C, Carvalho I, Brito C (2009) Occurrence and distribution of cetaceans in São Tomé and Príncipe tropical archipelago and their relation to environmental variables. *Journal of the Marine Biological Association of the United Kingdom* 89: 1071–1076.
- Reeves RR, Mitchell E (1988) Killer whale sightings and takes by American pelagic whalers in the North Atlantic. *Rit Fiskideildar* 11: 7–23.
- Rosenbaum HC, Collins T (2006) The ecology, population characteristics and conservation efforts for humpback whales (*Megaptera novaeangliae*) on their wintering grounds in the coastal waters of Gabon. *Bulletin of the Biological Society of Washington* 12: 425–433.
- Ruud JT (1952) Catches of Bryde-whale off French Equatorial Africa. *Norsk Hvalfangst-Tidende* 12: 662–663.
- Simmons DC (1968) Purse seining off Africa's west coast. *Commercial Fisheries Review* 30: 21–22.
- Stewart BS, Leatherwood S (1985) Minke whale *Balaenoptera acutorostrata* Lacépède, 1804. In: Ridgway SH, Harrison R (eds) *Handbook of Marine Mammals, Volume 3, the Sirenians and Baleen Whales*, 91–136. Academic Press, San Diego, California, USA.
- Tønnessen JN, Johnsen AO (1982) *The History of Modern Whaling*. University of California Press, Berkeley and Los Angeles, CA, USA.
- Tormosov DD, Budylenko GA, Sazhinov EG (1980) Biocenoological aspects in the investigations of sea mammals. *Paper SCI/32/02 Presented to the IWC Scientific Committee*, pp. 9. July 1980.
- Townsend CH (1935) The distribution of certain whales as shown by logbook records of American whalships. *Zoologica, NY* 19: 1–50 + 6 maps.
- Van Waerebeek K (1997) Long-beaked and short-beaked common dolphins sympatric off central-West Africa. *Paper SCI/49/SM46 Presented to the IWC Scientific Committee*, pp. 4. October 1997.
- Van Waerebeek K (2003) A newly discovered stock of humpback whales in the northern Gulf of Guinea. *CMS Bulletin* 18: 6–7.
- Van Waerebeek K, Ofori-Danson PK (1999) A first checklist of cetaceans off Ghana, Gulf of Guinea, and a shore-based survey of interactions with coastal fisheries. *Paper SCI/51/SM35 Presented to the IWC Scientific Committee*, pp. 8. May 1999.

- Van Waerebeek K, de Smet WMA (1996) A second confirmed record of the false killer whale *Pseudorca crassidens* (Owen, 1846) (Cetacea: Delphinidae) from West Africa. *Mammalia* 60: 319–322.
- Van Waerebeek K, van Bree PJH, Best PB (1995) On the identity of *Prodelphinus petersii* Lütken, 1889 and records of dusky dolphin *Lagenorhynchus obscurus* (Gray, 1828) from the southern Indian and Atlantic Oceans. *South African Journal of Marine Science* 16: 25–35.
- Van Waerebeek K, André M, Sequeira M, Martin V, Robineau D, Collet A, Papastavrou V, Ndiaye E (1999) Spatial and temporal distribution of the minke whale *Balaenoptera acutorostrata* Lacépède 1804 in the southern Northeast Atlantic and the Mediterranean Sea, with comments on stock identity. *Journal of Cetacean Research and Management* 1: 223–237.
- Van Waerebeek K, Tchiboza S, Montcho J, Nobime G, Sohou Z, Sehouhoue P, Dossou C (2001) The Bight of Benin, a North Atlantic breeding ground of a Southern Hemisphere humpback whale population, likely related to Gabon and Angola substocks. *Paper SC/53/IA21 Presented to the IWC Scientific Committee*, pp. 7. July 2001.
- Van Waerebeek K, Nobimé G, Sohou Z, Tchiboza S, Dossou-Bodrènou JS, Dossou C, Dossou-Hountoudou A (2002a) Introducing whale and dolphin watching to Benin, 2002 exploratory survey. *Report to the Netherlands Committee for IUCN*, pp. 9. Amsterdam, the Netherlands.
- Van Waerebeek K, Barnett L, Camara A, Cham A, Diallo M, Djiba A, Jallow A, Ndiaye E, Samba Ould Bilal AO, Bamy IL (2002b) *Conservation of Cetaceans in The Gambia and Senegal 1999–2001, and Status of the Atlantic Humpback Dolphin*, 56. UNEP/CMS Secretariat, Bonn, Germany.
- Van Waerebeek K, Barnett L, Camara A, Cham A, Diallo M, Djiba A, Jallow AO, Ndiaye E, Samba Ould Bilal AO, Bamy IL (2004) Distribution, status, and biology of the Atlantic humpback dolphin, *Sousa teuszii* (Kükenthal, 1892). *Aquatic Mammals* 30: 56–83.
- Van Waerebeek K, Bamy IL, Jiddou AM, Sequeira M, Diop M, Ofori-Danson PK, Tchiboza S, Campredon P (2008) Indeterminate status of West African populations of inshore common bottlenose dolphins *Tursiops truncatus* cautions against opportunistic live-capture schemes. *Report to the Fondation Internationale du Banc d'Arguin*, pp. 9.
- Wada S, Oishi M, Yamada TK (2003) A newly discovered species of living baleen whale. *Nature* 426: 278–281.
- Walsh PD, Fay JM, Gulick S, Sounguet GP (2000) Humpback whale activity near Cap Lopez Gabon. *Journal of Cetacean Research and Management* 2: 63–67.
- Weir CR (2006a) Sightings of beaked whales (Cetacea: Ziphiidae) including first confirmed Cuvier's beaked whales *Ziphius cavirostris* from Angola. *African Journal of Marine Science* 28: 173–175.
- Weir CR (2006b) Sightings of rough-toothed dolphins (*Steno bredanensis*) off Angola and Gabon, South-east Atlantic Ocean. *Abstracts of the 20th Annual Conference of the European Cetacean Society*, Gdynia, Poland, 2–7 April 2006.
- Weir CR (2006c) First confirmed records of Clymene dolphin *Stenella clymene* (Gray, 1850) from Angola and Congo, South-east Atlantic Ocean. *African Zoology* 41: 297–300.
- Weir CR (2008a) The distribution and seasonal occurrence of cetaceans off northern Angola. *Journal of Cetacean Research and Management* 9: 225–239.
- Weir CR (2008b) Overt responses of humpback whales (*Megaptera novaeangliae*), sperm whales (*Physeter macrocephalus*), and Atlantic spotted dolphins (*Stenella frontalis*) to seismic exploration off Angola. *Aquatic Mammals* 34: 71–83.
- Weir CR (in press) Distribution, behaviour and photo-identification of Atlantic humpback dolphins (*Sousa teuszii*) off Flamingos, Angola. *African Journal of Marine Science* 31/2009.
- Weir CR, Coles P (2007) Morphology of common dolphins (*Delphinus* spp.) photographed off Angola. *Abstracts of the 17th Biennial Conference of the Society for Marine Mammalogy*, San Diego, California, USA, Cape Town, South Africa, 29 November–3 December, 2007.
- Weir CR, Debrah J, Ofori-Danson PK, Pierpoint C, Van Waerebeek K (2008) Records of Fraser's dolphin *Lagenodelphis hosei* Fraser, 1956 from the Gulf of Guinea and Angola. *African Journal of Marine Science* 30: 241–246.
- Wilson CE, Perrin WF, Gilpatrick JW, Leatherwood S (1987) Summary of worldwide locality records of the striped dolphin, '*Stenella coeruleoalba*'. *NOAA-TM-NMFS-SWFC-90*, pp. 72.
- Yochem PK, Leatherwood S (1985) Blue whale *Balaenoptera musculus* Linnaeus, 1758. In: Ridgway SH, Harrison R (eds) *Handbook of Marine Mammals, Volume 3, the Sirenians and Baleen Whales*, 193–240. Academic Press, San Diego, California, USA.

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APPENDIX 1
Non-whaling records of cetacean species within the study area

Species	Record date	Range state	Location	Record type*	Specimen No.†	Source type‡	Source
<i>Eubalaena australis</i>	N/A	Gabon	Cap Lopez, Gabon	Sighting (n = 1)	N/A	G	Anonymous (1999)
<i>Balaenoptera physalis</i>	2003–2006	Angola	Offshore Angola	Sightings (n = 4)	N/A	P	Weir (2008a)
<i>Balaenoptera borealis</i>	Aug 2004	Angola	Offshore Angola	Sighting (n = 1)	N/A	P	Weir (2008a)
<i>Balaenoptera cf. brydei</i>	2003–2006	Angola	Offshore Angola	Sightings (n = 19)	N/A	P	Weir (2008a)
<i>Balaenoptera bonaerensis</i>	Mar 1970	Angola	Curoca River mouth, Tombwa	Stranding (n = 1)	N/A	P	Best (2007), P. Best (pers. comm.)
<i>Megaptera novaeangliae</i>	1997	Ghana	5°48'N 0°38'W	Stranding (n = 1)	N/A	G	Van Waerebeek and Ofori-Danson (1999)
<i>Megaptera novaeangliae</i>	2000	Togo	Togo	Sightings	N/A	G	Van Waerebeek et al. (2001)
<i>Megaptera novaeangliae</i>	Oct 2002	Benin	Benin	Sightings (n = 20)	N/A	G	Van Waerebeek et al. (2002a)
<i>Megaptera novaeangliae</i>	Oct 2000	Benin	Benin	Sightings (n = 22)	N/A	G	Van Waerebeek et al. (2001)
<i>Megaptera novaeangliae</i>	Oct 2000	Nigeria	Western Nigeria	Sightings (n = 2)	N/A	G	Van Waerebeek et al. (2001)
<i>Megaptera novaeangliae</i>	N/A	Equatorial Guinea	Equatorial Guinea	Sightings	N/A	P	Walsh et al. (2000)
<i>Megaptera novaeangliae</i>	2000–2003	Gabon	Gabon shelf	Sighting (n = 857)	N/A	P	Rosenbaum and Collins (2006)
<i>Megaptera novaeangliae</i>	Aug 1998	Gabon	Cap Lopez	Sightings (n = 20)	N/A	P	Walsh et al. (2000)
<i>Megaptera novaeangliae</i>	2003–2005	St Helena	St Helena	Sighting (n = 192)	N/A	P	Bennett and MacLeod (2006), MacLeod and Bennett (2006)
<i>Megaptera novaeangliae</i>	2002–2005	São Tomé	São Tomé	Sightings (n = 65)	N/A	P	Picanço et al. (2009)
<i>Megaptera novaeangliae</i>	2003–2006	Angola	Offshore Angola	Sightings (n = 205)	N/A	P	Weir (2008a)
<i>Megaptera novaeangliae</i>	17–28 Sep 1999	Angola	6°51.63'S 12°23.41'E	Sightings (n = 48)	N/A	G	Best et al. (1999)
<i>Physeter macrocephalus</i>	<1964	Côte d'Ivoire	Côte d'Ivoire	Sightings	N/A	P	Best (1974)
<i>Physeter macrocephalus</i>	Jul 1994	Ghana	Accra	Stranding (n = 1)	N/A	G	Van Waerebeek and Ofori-Danson (1999)
<i>Physeter macrocephalus</i>	2005	São Tomé	North of São Tomé	Sighting (n = 1)	N/A	P	Picanço et al. (2009)
<i>Physeter macrocephalus</i>	2003–2006	Angola	Offshore Angola	Sightings (n = 139)	N/A	P	Weir (2008a)
<i>Kogia sima</i>	23 Aug 1998	Ghana	Apam	Bycatch (n = 1)	N/A	G	Van Waerebeek and Ofori-Danson (1999)
<i>Kogia sima</i>	2003–2006	Angola	Offshore Angola	Sightings (n = 14)	N/A	P	Weir (2008a)
<i>Ziphius cavirostris</i>	15 Jan 2005	Angola	9°15.75'S 11°49.02'E	Sighting (n = 1)	N/A	P	Weir (2006a)
Beaked whale sp.	24 Jan 2005	Angola	9°07.39'S 11°48.26'E	Sighting (n = 1)	N/A	P	Weir (2006a)

APPENDIX 1 (Continued)

Species	Record date	Range state	Location	Record type*	Specimen No.†	Source type‡	Source
Beaked whale sp.	21 Feb 2005	Angola	6°12.56'S 10°35.85'E	Sighting (n = 1)	N/A	P	Weir (2006a)
Beaked whale sp.	8 Mar 2005	Angola	6°28.47'S 10°58.19'E	Sighting (n = 1)	N/A	P	Weir (2006a)
Beaked whale sp.	23 Aug 2005	Angola	6°09.65'S 10°42.91'E	Sighting (n = 1)	N/A	P	Weir (2006a)
Beaked whale sp.	26 Aug 2005	Angola	6°12.69'S 10°48.51'E	Sighting (n = 1)	N/A	P	Weir (2006a)
Beaked whale sp.	20 Mar 2005	Angola	7°15.84'S 11°07.79'E	Sighting (n = 1)	N/A	P	Weir (2006a)
Beaked whale sp. (Mesoplodon)	8 Mar 2004	Angola	8°15.99'S 12°26.72'E	Sighting (n = 1)	N/A	P	Weir (2006a)
Beaked whale sp. (Mesoplodon)	29 Jul 1966	Angola	12°04'S 12°02'E	Sighting (n = 1)	N/A	P	Mörzer Bruyns (1968)
<i>Orcinus orca</i>	Jun 1958	Côte d'Ivoire	28–37 km south of Abidjan	Sighting (n = 1)	N/A	P	Cadenat (1959), Hammond and Lockyer (1988)
<i>Orcinus orca</i>	26 Aug 1972	Côte d'Ivoire	3°26'N 2°33'W	Sighting (n = 1)	N/A	P	Hammond and Lockyer (1988)
<i>Orcinus orca</i>	1998–2000	Ghana	Ghanaian fishing ports	Bycatch (n = 1)	N/A	P	Ofori-Danson et al. (2003)
<i>Orcinus orca</i>	25 Aug 1972	Ghana	3°17'N 1°58'W	Sighting (n = 1)	N/A	P	Hammond and Lockyer (1988)
<i>Orcinus orca</i>	1 Aug 1972	Ghana	4°34'N 0°53'E	Sighting (n = 1)	N/A	P	Hammond and Lockyer (1988)
<i>Orcinus orca</i>	6 Aug 1972	Ghana	4°02'N 0°21'E	Sighting (n = 1)	N/A	P	Hammond and Lockyer (1988), C. W. Oliver (pers. comm.)
<i>Orcinus orca</i>	N/A	Equatorial Guinea	Annobón Island	N/A	N/A	P	Reeves and Mitchell (1988)
<i>Orcinus orca</i>	N/A	Gabon	Gabon	N/A	N/A	P	Reeves and Mitchell (1988)
<i>Orcinus orca</i>	2002–2004	São Tomé	São Tomé	Sightings (n = 6)	N/A	P	Picanço et al. (2009)
<i>Orcinus orca</i>	Nov	Angola	Offshore Angola	Sighting	N/A	G	Mikhalev et al. (1981b)
<i>Orcinus orca</i>	Jul 1966	Angola	South of Namibe	Sighting (n = 1)	N/A	P	Mörzer Bruyns (1971)
<i>Orcinus orca</i>	2003–2006	Angola	Offshore Angola	Sightings (n = 7)	N/A	P	Weir (2008a)
<i>Globicephala macrorhynchus</i>	16 May 1958	Côte d'Ivoire	15 km south of Vridi	Capture (n = 1)	N/A	P	Cadenat (1959)
<i>Globicephala macrorhynchus</i>	Dec 1957	Côte d'Ivoire	Off Abidjan	Sighting	N/A	P	Cadenat (1959)
<i>Globicephala macrorhynchus</i>	Apr 1958	Côte d'Ivoire	Off Abidjan	Sighting	N/A	P	Cadenat (1959)

<i>Globicephala macrorhynchus</i>	May 1958	Côte d'Ivoire	Off Abidjan	Sighting	N/A	P	Cadenat (1959)
<i>Globicephala macrorhynchus</i>	1998–2000	Ghana	Ghanaian fishing ports	Bycatch (n = 2)	N/A	P	Ofori-Danson et al. (2003)
<i>Globicephala macrorhynchus</i>	2003–2006	Gabon	Offshore Gabon	Sighting	N/A	P	Weir (2008a)
<i>Globicephala macrorhynchus</i>	N/A	Gabon	Cap Lopez	Sightings	N/A	P	Walsh et al. (2000)
<i>Globicephala macrorhynchus</i>	2003	São Tomé	São Tomé	Sighting (n = 1)	N/A	P	Picanço et al. (2009)
<i>Globicephala macrorhynchus</i>	1976–1978	Angola	Offshore Angola	Sighting	N/A	G	Tormosov et al. (1980)
<i>Globicephala macrorhynchus</i>	2003–2006	Angola	Offshore Angola	Sightings (n = 22)	N/A	P	Weir (2008a)
<i>Pseudorca crassidens</i>	Mar 1970	Côte d'Ivoire	Assini	Stranding (n = 1)	ZMA 13.084	P	van Bree (1972)
<i>Pseudorca crassidens</i>	1998–2000	Ghana	Ghanaian fishing ports	Bycatch (n = 1)	N/A	P	Ofori-Danson et al. (2003)
<i>Pseudorca crassidens</i>	N/A	Ghana	Offshore Ghana	N/A	N/A	P	Odell and McClune (1999)
<i>Pseudorca crassidens</i>	N/A	Benin	Benin	Specimen (n = 1)	No number. Kept at DP	G	Van Waerebeek et al. (2001)
<i>Pseudorca crassidens</i>	N/A	Gabon	Offshore Gabon	Sighting (n = 1)	N/A	G	Findlay et al. (2006)
<i>Pseudorca crassidens</i>	29 Jul 1992	Gabon	0°37'N 9°29'E	Stranding (n = 1)	N/A	P	Van Waerebeek and de Smet (1996)
<i>Pseudorca crassidens</i>	2003–2006	Angola	Offshore Angola	Sightings (n = 9)	N/A	P	Weir (2008a)
<i>Peponocephala electra</i>	1998–2000	Ghana	Ghanaian fishing ports	Bycatch (n = 1)	N/A	P	Ofori-Danson et al. (2003)
<i>Peponocephala electra</i>	N/A	Gabon	Offshore Gabon	Sighting	N/A	G	Findlay et al. (2006)
<i>Peponocephala electra</i>	2003–2006	Angola	Offshore Angola	Sightings (n = 3)	N/A	P	Weir (2008a)
<i>Sousa teuszii</i>	1891	Cameroon	Bay of Warships, Douala	Carcass (n = 1)	BMNH 1893.8.1.1	P	Kükenthal (1892), Van Waerebeek et al. (2004)
<i>Sousa teuszii</i>	Jul/Aug 2002	Gabon	0°21.6'N 9°21'E	Sighting (n = 1)	N/A	G	Collins et al. (2004)
<i>Sousa teuszii</i>	24 Oct 2003	Gabon	0°21.6'N 9°21'E	Sighting (n = 1)	N/A	G	Collins et al. (2004)
<i>Sousa teuszii</i>	6 Nov 2003	Gabon	0°21.6'N 9°21'E	Sighting (n = 1)	N/A	G	Collins et al. (2004)
<i>Sousa teuszii</i>	Apr 2003	Gabon	2°16.8'S 9°34.8'E	Sighting (n = 1)	N/A	G	Collins et al. (2004)

APPENDIX 1 (Continued)

Species	Record date	Range state	Location	Record type*	Specimen No.†	Source type‡	Source
<i>Sousa teuszii</i>	16 Nov 2003	Gabon	2°16.8'S 9°34.8'E	Sighting (n = 1)	N/A	G	Collins et al. (2004)
<i>Sousa teuszii</i>	2002	Gabon	2°40.2'S 9°51.6'E	Sightings (n = 2)	N/A	G	Collins et al. (2004)
<i>Sousa teuszii</i>	2001	Gabon	3°31.8'S 10°46.2'E	Skeleton (n = 1)	N/A	G	Collins et al. (2004)
<i>Sousa teuszii</i>	1940s	Gabon	0°10'N 10°04'E	Skull (n = 1)	AMNH 120268	G,P	Van Waerebeek et al. (2002b, 2004), Collins et al. (2004)
<i>Sousa teuszii</i>	Jan/Feb 2004	Angola	Between Namibe and Tombwa	Sightings (n = 4)	N/A	P	Van Waerebeek et al. (2004), Weir (2008a)
<i>Sousa teuszii</i>	Jan and Jun/ Jul 2008	Angola	Flamingos	Sightings (n = 71)	N/A	P	Weir (in press)
<i>Steno bredanensis</i>	9 May 1958	Côte d'Ivoire	28–33 km south of Abidjan	Capture (n = 1 female)	N/A	P	Cadenat (1959)
<i>Steno bredanensis</i>	24 Oct 1958	Côte d'Ivoire	28–33 km south of Abidjan	Capture (n = 1 male)	N/A	P	Cadenat (1959)
<i>Steno bredanensis</i>	4 Jul 1958	Côte d'Ivoire	28–33 km south of Abidjan	Capture (n = 1 male)	N/A	P	Cadenat (1959)
<i>Steno bredanensis</i>	1998	Ghana	Apam	Bycatch (n = 2)	N/A	G,P	Van Waerebeek and Ofori-Danson (1999), Ofori-Danson et al. (2003)
<i>Steno bredanensis</i>	2 Aug 1972	Ghana	4°10'N 0°26'E	Sighting (n = 1)	N/A	U	C. W. Oliver (pers. comm.)
<i>Steno bredanensis</i>	3 Aug 1972	Ghana	4°11.6'N 0°20'E	Sighting (n = 1)	N/A	U	C. W. Oliver (pers. comm.)
<i>Steno bredanensis</i>	N/A	Gabon	Gabon	Sighting	N/A	G	Findlay et al. (2006)
<i>Steno bredanensis</i>	N/A	Gabon	Gabon	Sighting (n = 1)	N/A	G	Weir (2006b)
<i>Steno bredanensis</i>	Jun 2003	St Helena	St Helena	Sightings (n = 2)	N/A	P	MacLeod and Bennett (2006)
<i>Steno bredanensis</i>	N/A	St Helena	St Helena	Sighting (n = 1)	N/A	G	Kramer (1961)
<i>Steno bredanensis</i>	2004–2005	Angola	Offshore Angola	Sightings (n = 3)	N/A	G,P	Weir (2006b, 2008a)
<i>Lagenorhynchus obscurus</i>	N/A	Angola	Lobito (12°22'S)	Sighting (n = 1)	N/A	G,P	Kramer (1961), Findlay et al. (1992), Best and Meyer (2009)
<i>Grampus griseus</i>	4 Jul 1958	Côte d'Ivoire	46 km off Côte d'Ivoire	Sighting (n = 1)	N/A	P	Cadenat (1959)
<i>Grampus griseus</i>	1998–2000	Ghana	Ghanaian fishing ports	Bycatch (n = 4)	N/A	P	Ofori-Danson et al. (2003)

<i>Grampus griseus</i>	N/A	Gabon	Gabon	Sighting	N/A	G	Findlay et al. (2006)
<i>Grampus griseus</i>	Apr 2004	Gabon	Gabon	Sighting (n = 1)	N/A	P	Weir (2008a)
<i>Grampus griseus</i>	2003–2006	Angola	Offshore Angola	Sightings (n = 7)	N/A	P	Weir (2008a)
<i>Tursiops truncatus</i>	19 Dec 1957	Côte d'Ivoire	18.5 km off Vridi	Capture (n = 1)	N/A	P	Cadenat and Lassarat (1959a)
<i>Tursiops truncatus</i>	17 Apr 1958	Côte d'Ivoire	18.5 km south of Vridi	Capture (n = 1)	N/A	P	Cadenat and Lassarat (1959a)
<i>Tursiops truncatus</i>	24 Apr 1957	Côte d'Ivoire	28 km off Vridi	Capture (n = 1)	N/A	P	Cadenat and Lassarat (1959a)
<i>Tursiops truncatus</i>	1 Jun 1957	Côte d'Ivoire	28 km south of Vridi	Capture (n = 1)	N/A	P	Cadenat and Lassarat (1959a)
<i>Tursiops truncatus</i>	10 Apr 1958	Côte d'Ivoire	30 km south of Vridi	Capture (n = 1)	N/A	P	Cadenat and Lassarat (1959a)
<i>Tursiops truncatus</i>	N/A	Ghana	Senya Beraku	Bycatch (n = 1)	N/A	G	Van Waerebeek and Ofori-Danson (1999)
<i>Tursiops truncatus</i>	N/A	Ghana	Tema	Bycatch (n = 1)	N/A	G	Van Waerebeek and Ofori-Danson (1999)
<i>Tursiops truncatus</i>	5 Feb 1994	Ghana	Jamestown	Bycatch (n = 2)	N/A	G	Van Waerebeek and Ofori-Danson (1999)
<i>Tursiops truncatus</i>	1998–2000	Ghana	Ghanaian fishing ports	Bycatch (n = 9)	N/A	P	Ofori-Danson et al. (2003)
<i>Tursiops truncatus</i>	N/A	Benin	Benin	N/A	N/A	G	Van Waerebeek et al. (2008)
<i>Tursiops truncatus</i>	16 Nov 2003	Gabon	2°16.8'5 9°34.8'E	Sighting (n = 1)	N/A	G	Collins et al. (2004)
<i>Tursiops truncatus</i>	Sep 2005	Gabon	Offshore Gabon	Sighting (n = 1)	N/A	P	Weir (2008a)
<i>Tursiops truncatus</i>	2 Jun 1983	St Helena	Off Sugar Loaf Point	Sighting (n = 1)	N/A	G	Perrin (1985)
<i>Tursiops truncatus</i>	5 Jun 1983	St Helena	5–7 km north-east of St Helena	Sighting (n = 1)	N/A	G	Perrin (1985)
<i>Tursiops truncatus</i>	2002 to 2005	São Tomé	São Tomé	Sightings (n = 42)	N/A	P	Picanço et al. (2009)
<i>Tursiops truncatus</i>	Jun 2003	St Helena	St Helena	Sightings (n = 9)	N/A	P	MacLeod and Bennett (2006)
<i>Tursiops truncatus</i>	2003–2006	Angola	Offshore Angola	Sightings (n = 15)	N/A	P	Weir (2008a)
<i>Stenella attenuata</i>	1998–2000	Ghana	Ghanaian fishing ports	Bycatch (n = 10)	N/A	P	Ofori-Danson et al. (2003)
<i>Stenella attenuata</i>	2 Aug 1972	Ghana	4°11'N 0°45'E	Sighting (n = 1)	N/A	U,P	Jefferson et al. (1997), C. W. Oliver (pers. comm.)

APPENDIX 1 (Continued)

Species	Record date	Range state	Location	Record type*	Specimen No.†	Source type‡	Source
<i>Stenella attenuata</i>	3 Mar 1946	Gabon	0°15'N 8°44'E	Sighting, then capture (n = 1)	BMNH Atlatlidde specimen	P	Fraser (1950), Perrin et al. (1987)
<i>Stenella attenuata</i>	N/A	St Helena	St Helena	Capture (n = 45)	USNM 347651; BMNH 1946.9.10.4; BMNH 1956.11.2.1-6; BMNH 1957.5.9.1-8; BMNH 1958.5.27.1-3; BMNH 1959.2.23.1-8; BMNH 1959.12.31.1-11; BMNH 1960.6.24.1-5; BMNH 1961.11.24.1	P	Perrin et al. (1987)
<i>Stenella attenuata</i>	May/Jun 1983	St Helena	St Helena	Sightings	N/A	G	Perrin (1985)
<i>Stenella attenuata</i>	2002-2005	São Tomé	São Tomé	Sightings (n = 14)	N/A	P	Picanço et al. (2009)
<i>Stenella attenuata</i>	Jun 2003	St Helena	St Helena	Sightings (n = 7)	N/A	P	MacLeod and Bennett (2006)
<i>Stenella attenuata</i>	2003-2006	Angola	Offshore Angola	Sightings (n = 5)	N/A	P	Weir (2008a)
<i>Stenella frontalis</i>	7 Mar 1958	Côte d'Ivoire	26 km off Vridi	Capture (n = 1 female)	ZMA 22.964	P	Cadenat (1959), Cadenat and Lassarat (1959b)
<i>Stenella frontalis</i>	28 Feb 1958	Côte d'Ivoire	18.5 km off Vridi	Capture (n = 1 male)	N/A	P	Cadenat (1959), Cadenat and Lassarat (1959b)
<i>Stenella frontalis</i>	N/A	Côte d'Ivoire	Vridi	Specimen (n = 1)	ZMA 13.546	P	van Bree (1971)

<i>Stenella frontalis</i>	N/A	Côte d'Ivoire	Vridi	Specimen (n = 2)	ZMA 13.148	Perrin et al. (1987)
<i>Stenella frontalis</i>	1998–2000	Ghana	Ghanaian fishing ports	Bycatch (n = 3)	N/A	Ofori-Danson et al. (2003)
<i>Stenella frontalis</i>	Oct 2002	Benin	Benin shelf edge	Sighting (n = 1)	N/A	Van Waerebeek et al. 2002a
<i>Stenella frontalis</i>	N/A	Equatorial Guinea	Bioko	Specimen (n = 1)	BMNH [18]62.12.2.6	Perrin et al. (1987)
<i>Stenella frontalis</i>	N/A	Gabon	Cap Lopez, Gabon	Specimen (n = 1)	ZMA 15.171	Perrin et al. (1987)
<i>Stenella frontalis</i>	19th century	St Helena	St Helena	Skull (n = 1)	UZMC Prodelphinus no.1	Perrin et al. (1987)
<i>Stenella frontalis</i>	19th century	St Helena	St Helena	Skull (n = 1)	MNH A-3031	Perrin et al. (1987)
<i>Stenella frontalis</i>	2003–2006	Angola	Offshore Angola	Sightings (n = 38)	N/A	Weir (2008a, b)
<i>Stenella longirostris</i>	1960s	Côte d'Ivoire	Off Vridi	Capture (n = 1)	USNM 470.557	van Bree (1971)
<i>Stenella longirostris</i>	1998–2000	Ghana	Ghanaian fishing ports	Bycatch (n = 2)	N/A	Ofori-Danson et al. (2003)
<i>Stenella longirostris</i>	17 Aug 1972	Ghana	2°45'N 2°24'W	Sighting (n = 1)	N/A	C. W. Oliver (pers. comm.)
<i>Stenella longirostris</i>	12 Aug 1972	Ghana	3°41'N 2°10'W	Sighting (n = 1)	N/A	C. W. Oliver (pers. comm.)
<i>Stenella longirostris</i>	5 Aug 1972	Ghana	4°25'N 0°50'E	Sighting (n = 1)	N/A	C. W. Oliver (pers. comm.)
<i>Stenella longirostris</i>	10 Oct 1926	St Helena	St Helena	Skull (n = 1)	CMNH 2413	Perrin (1985)
<i>Stenella longirostris</i>	N/A	Angola	Offshore Angola	Sighting (n = 1)	N/A	Weir (2008a)
<i>Stenella clymene</i>	23 Sep 1998	Ghana	Winneba	Bycatch (n = 1)	N/A	Van Waerebeek and Ofori-Danson (1999), Fertl et al. (2003)
<i>Stenella clymene</i>	1998–2000	Ghana	Ghanaian fishing ports	Bycatch (n = 20)	N/A	Ofori-Danson et al. (2003)
<i>Stenella clymene</i>	20 Aug 1972	Ghana	2°10'N 2°30'W	Sighting (n = 1)	N/A	Perrin et al. (1981), Fertl et al. (2003)
<i>Stenella clymene</i>	May 1956	Ghana	5°55'N 0°59'E	Stranding (n = 1)	N/A, UoG	Van Waerebeek and Ofori-Danson (1999), Fertl et al. (2003)
<i>Stenella clymene</i>	26 Sep 2005	Congo (Republic)	4°23.77'S 10°32.41'E	Sighting (n = 1)	N/A	Weir (2006c, 2008a)
<i>Stenella clymene</i>	18 Mar 2004	Angola	6°26.15'S 11°25'E	Sighting (n = 1)	N/A	Weir (2006c, 2008a)

APPENDIX 1 (Continued)

Species	Record date	Range state	Location	Record type*	Specimen No.†	Source type‡	Source
<i>Stenella clymene</i>	7 Mar 2006	Angola	14°26'S 12°09'E	Sighting (n = 1)	N/A	U	R. Leslie (pers. comm.)
<i>Stenella coeruleoalba</i>	27 Mar 1970	Côte d'Ivoire	4°58'N 6°08'W	Stranding (n = 1)	ZMA 13.149	G	Wilson et al. (1987)
<i>Stenella coeruleoalba</i>	19 Oct 1974	Angola	9°15'S 12°15'E	Sighting (n = 1)	N/A	G,P	Wilson et al. (1987), Perrin et al. (1994)
<i>Stenella coeruleoalba</i>	2 Oct 1974	Angola	13°59'S 012°03'E	Sighting (n = 1)	N/A	G,P	Wilson et al. (1987), Perrin et al. (1994)
<i>Stenella coeruleoalba</i>	2003–2006	Angola	Offshore Angola	Sightings (n = 9)	N/A	P	Weir (2008a)
<i>Delphinus</i> – 'short-beaked' form	N/A	Côte d'Ivoire	Off Vridi	Specimen (n = 1)	ZMA 13.411	P	van Bree and Purves (1972)
<i>Delphinus</i> – 'short-beaked' form	1998–2000	Ghana	Ghanaian fishing ports	Bycatch (n = 1)	N/A	P	Ofori-Danson et al. (2003)
<i>Delphinus</i> – 'short-beaked' form	Nov 1970	Gabon	Off Mayoumba	Specimen (n = 1)	ZMA 14.594	P,G	van Bree and Purves (1972), Van Waerebeek (1997)
<i>Delphinus</i> – 'short-beaked' form	N/A	St Helena	740 km south of St Helena	Specimen (n = 1)	BMNH 1846.7.27.1	P	van Bree and Purves (1972)
<i>Delphinus</i> – 'short-beaked' form	9 Aug 1971	Angola	10°50'S 13°15'E	Skull (n = 1)	ZMA 15.236	G	Van Waerebeek (1997)
<i>Delphinus</i> – 'long-beaked' form	N/A	Côte d'Ivoire	Off Vridi	Specimen (n = 1)	USNM 470.549	P	van Bree and Purves (1972)
<i>Delphinus</i> – 'long-beaked' form	1998–2000	Ghana	Ghanaian fishing ports	Bycatch (n = 1)	N/A	P	Ofori-Danson et al. (2003)
<i>Delphinus</i> – 'long-beaked' form	18 Aug 1972	Gabon	1°50'S 9°05'E	Skull (n = 1)	ZMA 15.521	G	Van Waerebeek (1997)
<i>Delphinus</i> – 'long-beaked' form	18 Aug 1972	Gabon	1°50'S 9°05'E	Skull (n = 1)	ZMA 15.522	G	Van Waerebeek (1997)
<i>Delphinus</i> – 'long-beaked' form	18 Aug 1972	Gabon	1°50'S 9°05'E	Skull (n = 1)	ZMA 15.523	G	Van Waerebeek (1997)
<i>Delphinus</i> – 'long-beaked' form	Nov 1970	Gabon	Off Mayoumba	Specimen (n = 1)	ZMA 14.593	P,G	van Bree and Purves (1972), Van Waerebeek (1997)

<i>Delphinus</i> – 'long-beaked' form	14 Apr 1972	Congo (Republic)	Off Pointe Noire	Skull (n = 1)	ZMA 15.524	G	Van Waerebeek (1997)
<i>Delphinus</i> – 'long-beaked' form	N/A	Angola	10°S 13°05'E	Skull (n = 1)	ZMA 15.235	G	Van Waerebeek (1997)
<i>Delphinus</i> – 'long-beaked' form	Nov 1970	Angola	Off Porto Amboim	Specimen (n = 1)	ZMA 14.592	P,G	van Bree and Purves (1972), Van Waerebeek (1997)
<i>Delphinus</i> sp.	1956–1958	Côte d'Ivoire	Côte d'Ivoire	Stranding (n = 24)	N/A	P	Cadenat (1959)
<i>Delphinus</i> sp.	Oct 2002	Benin	Benin shelf waters	Sightings (n = 3)	N/A	G	Van Waerebeek et al. (2002a)
<i>Delphinus</i> sp.	1997–1999	Gabon	Cap Lopez	Sightings	N/A	P	Walsh et al. (2000)
<i>Delphinus</i> sp.	2003–2006	Angola	Offshore Angola	Sightings (n = 38)	N/A	P	Weir (2008a)
<i>Delphinus</i> sp.	2004–2007	Angola	Offshore Angola	Sightings (n = 47)	N/A	G	Weir and Coles (2007)
<i>Lagenodelphis hosei</i>	10 Sep 2000	Ghana	4°52'N 2°15'W	Bycatch (n = 1)	N/A	G,P	Debrah (2000), Weir et al. (2008)
<i>Lagenodelphis hosei</i>	21 Jun 2000	Ghana	4°52'N 2°15'W	Bycatch (n = 1)	UoG 20/002A	P	Ofori-Danson et al. (2003), Weir et al. (2008)
<i>Lagenodelphis hosei</i>	2000	Ghana	4°48'N 1°57'W	Bycatch (n = 2)	N/A	P	Weir et al. (2008)
<i>Lagenodelphis hosei</i>	8 Mar 2004	Nigeria	3°10.1'N 6°47.0'E	Sighting (n = 1)	N/A	P	Weir et al. (2008)
<i>Lagenodelphis hosei</i>	4 Jul 2007	Angola	7°38.3'S 11°20.8'E	Sighting (n = 1)	N/A	P	Weir et al. (2008)
<i>Lagenodelphis hosei</i>	30 Aug 2008	Angola	7°39.8'S 11°41.3'E	Sighting (n = 1)	N/A	P	Weir et al. (2008)
<i>Cephalorhynchus heavisidii</i>	6 Nov 1977	Angola	17°09'S 11°24'E	Capture (n = 2)	ZM 40010, ZM 40014	U,P	Findlay et al. (1992), P. Best (pers. comm.)
<i>Cephalorhynchus heavisidii</i>	N/A	Angola	16°30'S	Sightings	N/A	P	Best (2007)

*n refers to the number of records.

†Museum abbreviations: AMNH, American Museum of Natural History, New York, USA; BMNH, British Museum (Natural History), London, UK; CMNH, Cleveland Museum of Natural History, Ohio, USA; DP, Direction des Pêches, Ghana; MNHN, Muséum National d'Histoire Naturelle, Paris, France; UoG, University of Ghana, Ghana; USNM, U.S. National Museum of Natural History, Washington D.C., USA; UZMC, Zoologisk Museum, Copenhagen, Denmark; ZM, Iziko South African Museum, South Africa; ZMA, Zoologisch Museum, University of Amsterdam, the Netherlands.

#Source type: U, unpublished information; P, published articles and book chapters; G, 'grey' literature, i.e. conference abstracts, theses, cruise reports, IWC papers, government reports.