A Review of Cetaceans from Waters off the Arabian Peninsula

Robert Baldwin[1]
Michael Gallagher[2]
Koen van Waerebeek[3]

[1] *P.O. Box 2531, CPO 111, Sultanate of Oman. (wosoman@gto.net.om)*

[2] *83 West Front, Pagham, Bognor Regis, W Sussex, PO21 4TB, England. (michaelgallagher2@compuserve.com)*

[3] *Peruvian Centre for Cetacean Research (CEPEC), Jorge Chavez 302, Pucusana, Lima 20, Peru. (kvwaere@mail.cosapidata.com.pe)*

Abbreviations used: Natural History Museum, London (BM), Natural History Museum, Kuwait (NHMK), Marine Science and Fisheries Centre, Oman (MSFCO), Museum National d'Histoire Naturelle, Paris (MNHN), Oman Cetacean Database (OMCD), Oman Natural History Museum (ONHM), Sharjah Natural History Museum (SNHM), Sultan Qaboos University (SQU), United Arab Emirates Cetacean Database (UAECD), Zoological Museum, Amsterdam (ZMA),

1 Introduction

This chapter reviews our current knowledge of the cetaceans known to occur in waters off the Arabian Peninsula. Cetacean observations in the region date back to at least the late 1800s (Ainsworth 1888, Blanford 1876, Cheesman 1926 and Gervais 1883). More recent research on cetaceans has focussed on particular geographical areas of the region, with most of the available information coming from waters off Oman and the southern shores of the Arabian Gulf. There have been no population estimates in the region, making assessment of abundance and status difficult or impossible, and there is also little information available on stock identity, on incidental takes of cetaceans and other threats, on life history, and on disease and parasitic infestation. This review is based on the available literature, on the records of the Oman Cetacean Database held at the Oman Natural History Museum, the United Arab Emirates Cetacean Database held by the Emirates Natural History Group and on our own observations. We define the waters off the Arabian Peninsula as the coastal and offshore waters of the Arabian Gulf, Gulf of Oman, Arabian Sea, Gulf of Aden and the Red Sea, including the Gulfs of Aqaba and Suez. We include data from elsewhere, such as along the African coast of the Red Sea, where relevant.

Data on cetaceans in the Arabian region were reviewed by Leatherwood (1986) and De Silva (1987), and information was also collated by the Secretariat for the Global Action for the Conservation, Management and Utilisation of Marine Mammals of the United Nations Environment Programme (Beadon 1991, Chantrapornsyl *et al.* 1991, Gallagher 1991a, 1991b, Kruse *et al.* 1991, Leatherwood *et* al. 1991, Papastavrou & Salm 1991, Small & Small 1991). Early records are available for the western (Al-Robaae 1969, 1970, 1971a, 1971b, 1974, 1975, Mahdi 1967, Mahdi & Georg 1969, Nader and Al-Khalili 1978) and eastern Arabian Gulf (Pilleri & Gihr 1973-4, Pilleri & Gihr 1975), the Gulf of Oman (Gallagher & van Bree 1978, van Bree & Gallagher 1978), Red Sea (Peacock 1978). Gallagher (1991a) documented collections of odontocete cetacean skulls from Bahrain, United Arab Emirates and Oman in the period 1969-1990. Historical whaling records provide further information (Berzin 1971, Brown 1957, Townsend 1931, Slijper *et al*. 1964, Yukhov 1969, Wray & Martin 1980), as do other incidental observations, particularly along the coast of Oman (Papastavrou & Salm 1991, Salm *et al.* 1993, Anon. 1992) and Yemen (Anon. 1996).

Systematic cetacean surveys began in 1973 (Pilleri 1973), with several during the early 1980s (Alling 1986, Harwood 1981, Keller *et al.* 1982, Robineau & Rose 1984), including a survey of *Sousa chinensis* in the UAE in 1984 (UAECD). Recent surveys in the Arabian Gulf have focussed on odontocetes (Baldwin 1996a, 1996b) Robineau & Fiquet 1992, 1994b, 1996), and there have been surveys in the Gulf of Oman and the Arabian Sea (Baldwin 1995, 1997, Small& Small 1991, Ballance *et* al 1996). Other investigators report specific sightings in the region (Eyre

1994, Ross 1981, Smeenk *et* al 1996, Weitkovitz 1992). A survey of dugongs (*Dugong dugon*) in the Arabian Gulf and Red Sea in 1989 included cetacean sightings (Preen 1989), and prompted an investigation of extensive marine mammal mortality (Anon. 1986). The well-being of cetaceans was further investigated following the 1992 Gulf War (Henningsen & Constantine 1992, Robineau & Fiquet 1994a). Several general texts on the natural history of Arabia refer to cetaceans (Basson *et* al 1977, Sheppard *et* al 1992), and several works on whales and dolphins make reference to the region (Gilpatrick *et* al 1987, Hershkovitz 1966, Leatherwood & Reeves 1983, Miyazaki & Perrin 1994, Perrin *et* al 1987, Perrin 1990, Perrin *et* al 1994, Perrin & Gilpatrick 1994, Ross *et* al 1994). Other texts specifically treat cetaceans of Arabian waters (Baldwin 1995, Baldwin & Salm 1994, Frazier *et* al 1987, Preen 1987, Van Waerebeek *et al*., in ms).

2. Occurrence and Distribution

Five species of baleen whales (Mysticeti) and 16 of toothed whales, dolphins and porpoises (Odontoceti) are known to occur in waters off the Arabian Peninsula. Other species may occur in the region, particularly in rarely surveyed offshore waters. The following accounts and maps detail the occurrence of the known species in the region, listed according to Reeves and Leatherwood (1994). A list of curated specimens is provided in the Appendix.

2.1 MYSTICETI (BALEEN WHALES), FAMILY BALAENOPTERIDAE (THE RORQUALS)

Balaenoptera acutorostrata (Minke whale, Figure ?). Earliest record in the region is of a stranding 20 km south of Jizan on the Red Sea coast of Saudi Arabia in May 1969 (Leatherwood 1986). Small baleen whales, possibly *B. acutorostrata*, have been reported from the Gulf of Aden (Yukhov 1969) and at the entrance to the Red Sea (Gordon & Smeenk pers. comm., in Frazier *et al.* 1987). Four sightings are confirmed from the Gulf of Oman and Arabian Sea in March, September, November and December involving groups of 1-3 individuals (OMCD). There are additional unconfirmed sightings off the UAE coast of the Arabian Gulf (Slijper *et al.* 1964).

Balaenoptera borealis (Sei whale, Figure 1c). Occurrence in the region uncertain, with unconfirmed sightings in the Gulf of Oman and Arabian Sea (Salm *et al.* 1993).

Balaenoptera edeni (Bryde's whale, Figure 1d). First record in the region was of a skeleton from the Sinai peninsula in 1893 (De Silva 1987). There are records from the Red Sea and Gulf of Aden (Yukhov 1969, Gasperetti undated, see also Appendix), and in the Arabian Gulf, a stranding in Iraq in February 1967 (Mahdi 1967, Al-Robaae 1969), vertebrae collected from Qishm Island, Iran, (Pilleri & Gihr 1973-4) and a stranding of a 14.5 m individual on Abu Ali Island, Saudi Arabia in March 1995 (Robineau & Fiquet 1996). Two were seen east of Socotra Island in May 1995 (Ballance *et al.* 1996). Known also off Oman in the Arabian Sea and Gulf of Oman, where it is probably resident. Individuals have been commonly seen during March and April near Muscat (Baldwin & Salm 1994), with other records in February, May, November and December (OMCD). Live sightings (n= 21) are of groups of 1-3, most commonly pairs.

Balaenoptera musculus (Blue whale, Figure 1a). Earliest record is of one taken by whalers off Kuria Muria (Al Halaaniyaat islands) in the Arabian Sea off Oman in December 1868 (Wray and Martin 1980). Most recently, an individual seen in November 1996 *c*. 6 km north of Muscat Island, Oman (R. Baldwin in OMCD). Al-Robaae (1971b) reports one specimen from Kuwait on 6 June 1963, which is still in the Kuwait Natural History Museum (M. Shihab *in litt.* to MG); reports of an earlier specimen are now doubted. Six were seen off Somalia in October-December 1985 and October 1986 (Small & Small 1991). Sightings of whales identified as 'pygmy blue whales' have been reported in October in the Gulf of Aden (Yukhov 1969).

Balaenoptera physalus (Fin whale, Figure 1b). In the Arabian Gulf the earliest record is of two incomplete skeletons from the Dhahran coast *c*. 1970 (De Silva 1987). Two other records are also indicated from this area (Baloutch 1972, Al-Robaae 1982). There are two recent records, one measuring 18 m in length washed ashore at Jebel Ali, UAE in April 1995 and one of unconfirmed identity found on Rafiq Island, UAE in May 1995 (UAECD). Sightings include several unconfirmed records from the Arabian Gulf, Gulf of Oman and Arabian Sea (OMCD, UAECD), and one positive sighting in the Arabian Sea in October 1997 (Baldwin 1997).

Megaptera novaeangliae (Humpback whale, Figure ?). Earliest record in the region is of a skeleton from Bassore Bay, Iraq (Gervais 1883), described as the type specimen of *M. indica*.. There are a number of other early records (Brown 1957, Slijper *et al.* 1964, Van Beneden 1887) although, with the exception of Gervais (1883), these were based on unconfirmed identifications (Reeves *et al.* 1991). Off Oman, occurrence is now confirmed in all months except July, with greatest numbers sighted in November, May and March (Reeves *et al.* 1991, Salm *et al.* 1993, Baldwin 1997, 1998, Mikhalev 1997, OMCD, Figure 2). The apparent peak in abundance in November may be a result of relative observer effort, rather than a true reflection of seasonal distribution, and the lack of reports in July may be due to the fact that observation in the Arabian Sea in the rough seas of the southwest monsoon is rarely possible. Geographic distribution in the region appears to be centred off Oman with greatest number of records off the islands of Masirah and al Halaaniyaat (OMCD) in the Arabian Sea. Records also indicate its presence in the Gulf of Oman, where the most northerly record is of an individual at Khor Fakkan, UAE in 1973 (M. Barwani pers. comm.). Sightings in the Gulf of Aden are limited (Yukhov 1969) and there is one sighting in the Red Sea (P. Vine, pers. comm.). Majority of observations are of animals either in pairs or alone, occasionally in groups of 2-4 or, rarely, 15-20. During a survey in October-November 1997 south of Masirah Island, Oman, 43 sightings were made totalling 72 individuals, possibly with some repeated sightings, in water depths ranging 12-82 m (Baldwin 1997). Measurements of dead and net captured individuals, and estimates from sightings, give lengths of 6.4-15 m (OMCD). In the Arabian Sea, Mikhalev (1997) reported males of 9.5-14.9 m (mean = 12.8±SE 0.9 m) and females of 9.5-15.2 m (mean = 13.3±SE 1.3 m). Estimated adult lengths during the survey south of Masirah Island (Baldwin, 1997, 1998) were 11-15 m, mean 13.5 m (n=17). Lengths in the Gulf of Oman are smaller at 6.4-10 m (OMCD). Ventral tail fluke coloration patterns observed on *M. novaeangliae* off Oman are predominantly white, with fewer individuals observed with predominantly black colouration and fewer still with mixed/marbled white and black (Mikhalev 1997, OMCD, Papastavrou 1990).

2.2 ODONTOCETI (TOOTHED WHALES, DOLPHINS & PORPOISES)

2.2.1 Family Phocoenidae

Neophocaena phocaenoides (Finless porpoise, Figure 1c). First records in the Arabian region were of a sighting in the Strait of Hormuz near Qishm Island (Pilleri 1973), two specimens (1973, 1974) in Iraqi waters (Al-Robaae 1975) and three found on Bahrain by J. Herdson on 7 March 1976 (Herdson *in litt.*, Gallagher 1991a: 95). Appears to be restricted to the Arabian Gulf where it is associated with shallow water, estuaries and mangrove creeks. Also found along the Pakistan coast where its requirements and distribution are discussed by Pilleri & Gihr (1975). It has occurred from Iraqi waters in the extreme west, to southern shores near Dubai (UAECD), with records from Saudi Arabia (Preen 1989, Robineau & Fiquet 1996), Bahrain (Preen 1989, Gallagher 1991a) and Abu Dhabi (Baldwin 1995). Rare in Arabia with only 18 individuals including both specimens and sightings, the latter singly or in pairs (Pilleri 1973, Preen 1989). Reference to occurrence in the Arabian Sea (Sheppard *et al.* 1992) appears to be erroneous.

2.2.2 Family Delphinidae

Delphinus spp. (Common dolphin, Figure 1a). *D. delphis*, *D. tropicalis* and *D. capensis* have been named from the region (van Bree 1971, Heyning and Perrin 1994, Robineau & Rose 1984, Robineau & Fiquet 1996, Smeenk *et al.* 1996), but their taxonomic status is unresolved. First records in the region were a skull collected before 1965 and skeletal material from the Gulf of Aden shores of British Somaliland in 1949 (Leatherwood 1986). Widely distributed and abundant, occurring off Saudi Arabia (Robineau & Fiquet 1996) and the UAE (Gallagher 1991a, Baldwin 1995) in the Arabian Gulf, in the Gulf of Oman and Arabian Sea (Gallagher 1991a, Papastavrou & Salm 1991, Baldwin & Salm 1994, Anon. 1996, Ballance *et al.* 1996) and in the Red Sea (Alling 1986, Leatherwood 1986). The most common cetacean off Oman (181 records, OMCD), with >12,500 recorded in groups of 2-1,700 (mean *c*. 130), frequently in mixed groups with *Stenella longirostris*. During the Indian Ocean cetacean survey of Ballance *et al.* (1996) all sightings of *Delphinus* occurred off Oman and were attributed to *D. cf. tropicalis*. In March 1993 at Abu Ali Island in the Arabian Gulf *Delphinus* was encountered (in groups of 2-60) more frequently (n=12) than any other cetacean (Robineau & Fiquet 1996). In the Red Sea four

sightings during September 1981 to May 1982 were in groups of 20-100 (Anne Collet pers. comm. in Leatherwood 1986).

Grampus griseus (Risso's dolphin, Figure 1b). First records in the region were two skeletons collected from Oman by A.S.G. Jayakar in 1891 (Leatherwood 1986). Widely distributed in Arabian waters, most commonly in water depths >100 m (Alling 1986, Kruse *et al* 1991, OMCD, UAECD). Appears to prefer waters seaward of the continental shelf, particularly where steep bathygraphic features occur (Kruse *et al* 1991). Occurs throughout the Gulf of Oman (Salm *et al.* 1993, Gallagher 1991a, Balance *et al.* 1996, OMCD, UAECD), in the Arabian Sea (Alling 1986, Ballance *et al.* 1996, Baldwin 1997, OMCD), the Gulf of Aden (Kruse *et al*. 1991) and throughout the Red Sea (Frazier *et al.* 1987) including the Gulf of Aqaba (Beadon 1991). There is an unconfirmed, and unlikely, sighting in the Arabian Gulf (Kruse *et al.* 1991). Sighted in Omani waters (n=43) in groups of 2-500 (mean=50), which is greater than that reported for the Indian Ocean (mean=17, n=36, Kruse *et al.* 1991). 65% of 49 sightings during the Indian Ocean cetacean survey were recorded off Oman (Ballance *et al.* 1996). The six records from the Gulf of Oman were in groups of 2-15 (Baldwin 1995, UAECD). This species is apparently "not uncommon throughout the Red Sea" in herds usually numbering <12 (Frazier *et al.* 1987), where it may be encountered in pelagic waters. Sightings were reported "once or twice a week" in the Straits of Tiran and "daily" around Tiran Island in the Gulf of Aqaba during September 1980 - September 1981 in groups averaging 30-40 individuals, maximum 100 (Beadon 1991).

Sousa chinensis (Indo-Pacific humpbacked dolphin, Figure 1d). Although treated here as *S. chinensis*, individuals in the region resemble more closely the description of *S. plumbea* in Ross *et al.* (1994). First recorded (as *S. plumbea*) in the region from a skull collected on Karaman Island in the Red Sea in 1948 (Leatherwood 1986). In the Arabian Gulf it occurs in Iraqi waters (Al-Robaae 1970, 1974), and in coastal and offshore waters of Bahrain (Gallagher 1991a), Saudi Arabia (Robineau & Fiquet 1996), Kuwait (De Silva 1987), Qatar (Leatherwood 1986), UAE (Preen 1989, Baldwin 1995) and Musandam (Pilleri & Gihr 1973-1974, Baldwin & Salm 1994, OMCD), but apparently does not occur between Musandam and Ra's al Hadd (Salm *et al.* 1993, Baldwin & Salm 1994).

Appears to be continuous along the Arabian Sea coast of Oman (Baldwin & Salm 1994), and there are records from the Gulf of Aden (Leatherwood 1986), the Arabian coast of the Red Sea (De Silva 1987, Leatherwood 1986), the Gulf of Suez (Beadon 1991), near Djibouti (Alling *et al.* 1982) and along the coast of Somalia (Small & Small 1991). The second most commonly recorded cetacean off Oman (173 records, OMCD), with sightings of small groups (1-20, mean 9.8) along the Oman coast, and unusually large groups of 30-100 individuals off the Arabian Sea coast of Oman (OMCD). Of 79 sightings in UAE waters the largest group was 30-32 (UAECD).

Stenella attenuata (Spotted dolphin, Figure 1e). First record was a skull from Saham in the Gulf of Oman in 1973 (Gallagher 1991a). Known from the Arabian Gulf (Gallagher 1991a, UAECD), Gulf of Oman (Gallagher 1991a, Baldwin & Salm 1994), Arabian Sea (Ballance *et al.* 1996), Gulf of Aden (Alling 1986, Small & Small 1991) and the Red Sea (Leatherwood & Reeves 1983, Frazier *et al.* 1987, Perrin *et al.* 1987, Beadon 1991). Appears to be the most common dolphin in the Red Sea (Frazier *et al.* 1987, Beadon 1991) in groups of 1-50, occasionally up to 300, and also relatively abundant in the Gulf of Aden (Small & Small 1991). There are relatively few records off Oman (Alling 1986, Ballance *et al.* 1996, OMCD).

Stenella coeruleoalba (Striped dolphin, Figure 1f). Distribution in the region poorly known. First record was a skull found near as Suwayq in the Gulf of Oman in 1977, and a second skull was collected from Ra's al Hadd (Gallagher 1991a). Alling (1986) did not record this species in the NW Indian Ocean and reports by Perrin *et al* (1994) could not be traced to their original sources. Additional records requiring verification include occasional sightings in the southern Red Sea (J. Gordon & C. Smeenk, pers. comm. in Frazier *et al.* 1987). Ballance *et al.* (1996) report sightings south of Socotra and in the Arabian Sea.

Stenella longirostris (Spinner dolphin, Figure 1g). First record from Oman was of a skull from Masirah in 1975 (Leatherwood 1986). Appears to be relatively abundant in coastal waters of the

Gulf of Oman between the Daymaniyat Islands and Sur and in offshore waters of the same area (Baldwin & Salm 1994, Ballance *et al.* 1996, OMCD). Records from the Arabian Sea are fewer, but indicate a distribution from Masirah (Gallagher 1991a) to Socotra Island (Ballance *et al.* 1997). Most of the 143 records (Harwood 1980, Leatherwood 1986, Gallagher 1991a, Salm *et al*. 1993, Baldwin & Salm 1994, Ballance *et al.* 1997, OMCD) are sightings in the Gulf of Oman totalling 21,000 individuals in groups of 1-1,800 (mean=216). Also known from the Gulf of Aden and Red Sea (Leatherwood 1986, J. Gordon & C. Smeenk pers. comm. in Frazier *et al.* 1987, Gilpatrick *et al* 1987, Robineau & Rose 1984, Small & Small 1991, Eyre 1994). In the Arabian Gulf recent records are limited to skulls collected on Merawah Island (Baldwin 1995), but Morzer-Bruyns (1971) noted that "this dolphin will always be seen on any voyage to the Persian Gulf, concentrations of thousands have been observed around Ra's Fartak and on either side of Strait Hormez". Stock identity in Arabian waters is problematical, with possibly three subspecies (Perrin 1990).

Steno bredanensis (Rough-toothed dolphin, Figure 1h). First authenticated record is of a calvaria found at Ra's Madrakah in October 1984, recently identified (Van Waerebeek *et al.* in ms). There were sightings of two groups of four and 12 off the coast of Oman in July 1995, and of groups of up to 60 south of Socotra in May 1995 (Ballance *et al.* 1996). Other records are from the Gulf of Aden and Red Sea (Frazier *et al.* 1987) and possible sightings in the Gulf of Aden (Hershkovitz 1966, Miyazaki & Perrin 1994).

Tursiops truncatus Bottlenose dolphin, Figure 1i). Although treated here as *Tursiops truncatus*, there may be at least two species in the region (Ross 1977, Robineau & Rose 1984, Robineau & Fiquet 1994b), namely *T. truncatus* and *T. aduncus,* and taxonomic revision is required. First record in the region was from the Red Sea in 1833 (Leatherwood 1986) and records now indicate that it is widely distributed, occuring from the western Arabian Gulf (Al Robbae 1974) to Khawr Khuwayr in the UAE (Gallagher 1991a), throughout the Gulf of Oman and Arabian Sea (Salm *et al.* 1993) and in the Red Sea (Alling *et al.* 1982, Alling 1986, Frazier *et al.* 1987) including the Gulfs of Suez and Aqaba (Beadon 1991). 160 records from Oman (OMCD) include 4,500 individuals in groups of 10-750 (Ballance *et al.* 1996, Alling *et al.* 1982, Leatherwood 1986, Salm *et al.* 1993). The most common cetacean in the Arabian Gulf (135 records, 402 individuals, UAECD), occurring in groups of up to 35; other records in the Arabian Gulf include Pilleri and Gihr (1973-74), Preen (1989) and Robineau and Fiquet (1996). In the Red Sea Alling *et al.* (1982) document five sightings of *Turisops* in 1981/2 and Beadon (1991) reports bottlenose dolphins as common in the Gulf of Suez during 1980-81 in groups of 20-200. Frazier *et al* (1987) saw "small numbers" of *Tursiops* throughout the Red Sea.

2.2.2 Family Globicephalidae

Feresa attenuata (Pygmy killer whale, Figure 1j). Knowledge of this species in the region is based on relatively few live sightings. The first record was an unconfirmed sighting of 38 individuals in March 1980 in the Gulf of Aden (Leatherwood *et* al 1991). In 1982 three individuals were sighted in the Gulf of Aden, two in the Arabian Sea off the coast of Oman and three in the Gulf of Oman (Alling 1986). Ballance *et* al (1996) sighted a herd of *c*. 15 south of Socotra Island in May 1995.

Globicephala sp. (Pilot whale, Figure 1k). Occurrence in the region unconfirmed despite numerous claims (Leatherwood 1986, Leatherwood *et al* 1991). However, there were confirmed sightings during February - November 1986 in the extreme east of the Gulf of Aden around the Horn of Africa (Small & Small 1991), and from the Maldives in 1998 (R. Brownell, pers. comm.).

Orcinus orca (Killer whale, Figure 1l*).* Earliest record in the region was of a sighting of eight in January 1980 off the Arabian Sea coast of Oman (Leatherwood *et al* 1991). The few additional records from Oman (seven live sightings and one stranding) suggest a wide distribution in the Gulf of Oman and Arabian Sea (Baldwin 1997, OMCD). Occasionally seen in the Red Sea, particularly in summer months and also recorded in the Gulf of Aden (Frazier *et al* 1987, Leatherwood 1986). Records from the Arabian Gulf remain unsubstantiated (Baldwin 1995, Leatherwood *et al* 1991).

Peponocephala electra (Melon-headed whale, Figure 1m). Knowledge of this species in the region is very limited. The only positive records are a damaged calvaria collected from Juzor al Halaaniyaat, Arabian Sea, Oman, in November 1982, and a ramus without data in MSFC (Van Waerebeek e*t al* in ms). The species was identified only once off the Somali coast (Small & Small 1991).

Pseudorca crassidens (False killer whale, Figure 1n). Widely distributed in the region. First records were two sightings of groups of 20-30 individuals off the coast of Oman in January 1961 (Morzer Bruyns in Leatherwood *et* al 1991). Records indicate a distribution in the Arabian Gulf from waters off Kuwait to the Musandam region of Oman (Baldwin 1995, Morzer-Bruyns in Leatherwood *et al* 1991, Al Robaae 1971a, 1974). Records off Oman in the Gulf of Oman and Arabian Sea include 20 sightings of groups of 8-100 individuals (Baldwin 1995, Gallagher 1991a, Leatherwood 1986, OMCD). Also recorded in the Red Sea (Alling *et* al 1982, Alling 1986, Frazier *et* al 1987) including the Gulf of Aqaba (Beadon 1991). Leatherwood *et al.* (1991) suggest that this species is abundant in pelagic equatorial regions of the Indian Ocean, and anecdotal reports from fishermen (OMCD) support this suggestion. However, during the course of a survey in the northern and southern Indian Ocean in March-July 1995 (Ballance *et al* 1996), there were only seven sightings, none in Arabian waters as defined here.

2.2.3 Family Physeteridae

Kogia simus (Dwarf sperm whale, Figure ?). Rarely recorded in the region and currently only known from waters off Oman, with the first record a stranding near Qurm Nature Reserve in May 1979 (Gallagher & van Bree 1978). Later records show a distribution including both the Gulf of Oman and Arabian Sea (Ballance *et al.* 1996 Chantrapornsyl *et* al 1991, Gallagher 1991a, OMCD, Salm *et al.* 1993). Largest groups, sighted near Bandar Jissah, Oman, included five individuals (OMCD). Reference to occurrence in the Arabian Gulf (Robineau & Fiquet 1996) was based on an erroneous figure in Chantrapornsyl *et* al (1991, Figure1, p. 81).

Physeter macrocephalus (Sperm whale, Figure ?). Commercial sperm whaling fleets operating in the Arabian Sea off Oman during the period 1821-1899 and 1964-1966 provide the earliest records of sperm whales in the region (Gallagher 1991b, and references therein). More recent data show the presence of sperm whales off Oman and UAE mostly in deep water (500-1,750 m) both in the Arabian Sea and Gulf of Oman. Groups may include as many as 20-50 individuals, but single animals or small pods of 2-6 are more common (Baldwin 1995, Gallagher 1991b, Salm *et al* 1993, OMCD). During a cetacean survey in the northern and southern Indian Ocean during March-July 1995 sperm whales were the most commonly encountered cetacean, with 99 sightings, including 21 off Oman (Ballance *et al* 1996). Sperm whales have been recorded in the region during all months of the year except February and August (OMCD).

2.2.4 Family Ziphiidae

Ziphius cavirostris (Cuvier's beaked whale, Figure ?). First record was a sighting of two individuals off the coast of Oman in January 1982 (Alling 1986). A skull from Masirah Island, Oman, was found in the same year (Gallagher 1991a). A total of six confirmed records involving 1-2 individuals (OMCD) provides little insight into the life of this shy, deep water cetacean in the region.

3 Ecology and Conservation

3.1 MYSTICETI (BALEEN WHALES)

Information about the lives of baleen whales in Arabian waters is limited. We know more about *Megaptera novaeangliae* than any other species, and have limited information on *Balaenoptera musculus* and *Balaenoptera edeni*. Sightings of *B. musculus* (Small & Small 1991) include a young animal sighted off Somalia in December 1985, with some evidence of feeding activity. Records of *B. edeni* in the Gulf of Oman include a total of seven calves sighted in February, March, April, November and December. Feeding has been witnessed in December and there is indication that feeding may occur in April (OMCD). It seems likely that this species is a breeding and feeding resident in the region.

Several authors (Baldwin 1997, 1998, Papastavrou & Van Waerebeek 1997, Reeves *et al.* 1991, Whitehead 1985, Winn & Winn 1978) have suggested that *M. novaeangliae* is resident off Oman, differing from conspecifics in other parts of the world that generally undertake seasonal migrations from high latitude feeding grounds to tropical breeding areas (Winn & Reichley 1985). Reeves *et al* (1991) first examined this hypothesis in detail, challenging conventional notions that populations in the region belong to Southern hemisphere (Brown 1957, Slijper *et al* 1964) or North Pacific stocks (Slijper *et al* 1964).

The most compelling evidence for the hypothesis comes from analysis of historical data of illegal Soviet Union whaling activity (Mikhalev 1997) which indicates that the breeding season in the Arabian Sea coincides with that of Northern hemisphere populations, with feeding also during this season. Baldwin (1998), Whitehead (1985), Reeves *et al* (1991), Mikhalev (1997) and Papastavrou and van Waerebeek (1997) have suggested a causal link between upwelling events as a means for provision of a sustainable food supply and year-round residence. J.P. Ross (in Reeves *et al* 1991) describes probable feeding activity off Masirah in May 1987, and Salm *et al* (1993) reported feeding on “shoaling sardines and anchovies” along the Batinah coast in the Gulf of Oman during February-March, along the northern coast of Dhofar during March-April, and off the Halaaniyaat Islands during March-December.

Despite the above records, there were no sightings of *M. novaeangliae* during either the March-July 1995 Indian Ocean cetacean survey (Ballance *et al* 1996) or a survey of the NW Indian Ocean during November 1981 - February 1982 (Alling 1986). However, humpback songs linked to breeding were reported off Oman from the latter survey (Whitehead 1985). Since *M. novaeangliae* appears to prefer “shallow banks and in shelf waters” (Leatherwood & Reeves 1983) the lack of sightings during the above surveys probably reflects a preference off Oman for coastal areas and the Kuria Muria (Al Halaanyaat) bay. During a survey south of Masirah, *M. novaeangliae* was observed feeding, and adults accompanied by calves were observed on two occasions in November (Baldwin 1997, 1998). Calves have also been sighted off Oman during December-February and young animals in March (OMCD), with unconfirmed sightings in the Arabian Gulf in November (Slijper *et al* 1964).

Although these data generally provide additional evidence for a discrete, resident population of feeding and breeding humpback whales in the Arabian Sea, records from throughout Oman also indicate that during June-September humpback whales are very rarely recorded, perhaps because monsoon seas at this time of year in the Arabian Sea make observation difficult. Sightings in the Gulf of Oman are uncommon, and have mostly been of young animals. Further work is clearly required before the population identity of *M. novaeangliae* in this region can be adequately assessed.

With the exception of hunted whales (Mikhalev 1997), records of dead *M. novaeangliae* in Oman are relatively few. Of the six dead individuals known (Salm *et al.* 1993, OMCD) three were believed to have become entangled in fishing gear. *M. novaeangliae* entangled in gill nets set by artisanal fishermen off Oman are known (Baldwin 1998, Baldwin and Salm 1994, Salm *et al.* 1993, OMCD). Other threats to *M. novaeangliae* and other large cetaceans include pollution, noise pollution and boat traffic.

Several baleen whale species are currently listed as Endangered or Vulnerable to extinction on the IUCN Red List (Table 1). Such listing is largely a result of over-exploitation by commercial whaling. In 1979 the International Whaling Committee declared the entire Indian Ocean, including all Arabian waters, a sanctuary designed to offer protection to whales from hunting and other threats. If relevant guidelines and legislation are implemented and enforced, recovery of many species within the Indian Ocean Sanctuary may result. This requires more control over activities that currently threaten all species, including fishing practices. The conservation management of large baleen whales is complicated by their migratory nature, but if populations prove to be resident in the

Sanctuary, governments and conservation bodies are presented with a good opportunity for regional management.

3.2 ODONTOCETI (TOOTHED WHALES, DOLPHINS & PORPOISES)

We still know relatively little about the ecology of odontocete cetaceans in the Arabian region, and our knowledge of *Ziphius cavirostris*, *Peponocephala electra*, *Feresa attenuata, Orcinus orca, Globicephala* sp.*, Steno bredanensis, Stenella attentuata* and *Stenella coeruleoalba* is particularly poor, coming only from brief observations at sea or limited skeletal material from beaches. Insights into the ecology of other species have been gained from stomach contents and observations at sea.

The stomach of an adult male *Tursiops* from Abu Dhabi contained cuttlefish and several species of unidentified fishes (Baldwin 1995), a single juvenile male *Tursiops* from the Arabian Gulf coast contained a fish of the genus *Platycephalus* and a species of Labridae (Robineau & Fiquet 1996), and Salm (1991) observed *Tursiops* apparently feeding on mackerel along the Arabian Sea coast of Oman. *Pseudorca crassidens* has been observed to feed on yellowfin tuna in the Gulf of Oman (OMCD), as it does in many other parts of its range. In the Arabian Gulf, *Sousa chinensis* has been observed feeding in shallow waters, herding fish onto exposed sand banks and apparently deliberately beaching in order to seize them (Baldwin 1995). Salm (pers. comm.) suggests that *S. chinensis* in Oman may feed on sciaenid fishes. The diving patterns of *Physeter macrocephalus* and *Grampus griseus* suggest feeding activity, particularly in deep water (600-1,500 m) in the Gulf of Oman and Arabian Sea (OMCD). Sightings, including feeding behaviour, of *Stenella longirostris* and *Delphinus* spp. with yellowfin tuna in the Gulf of Oman suggests that these species feed in association (Baldwin & Salm 1994). The local movement of large herds of up to 1,000 *S. longirostris* (sometimes mixed with *Delphinus*) near Muscat, which appear to frequently travel parallel to shore at 2-6 km offshore, is presumed to be linked to feeding (OMCD).

Observations of local movements of cetaceans may also be linked to feeding ecology. A group of up to five *Kogia simus* appears to frequent areas near Bandar Jissah in the Gulf of Oman and *Sousa chinensis* has been repeatedly sighted in relatively discrete areas where groups are probably resident, including near Merawah Island in the Arabian Gulf, in Khor ash Shamm in the Musandam region of Oman, in the Arabian Sea off Oman near Shannah, near Salalah, near Mughsayl (R. Baldwin pers. obs) and in the Arabian Gulf off Jubail (Robineau & Fiquet 1996). Similarly several groups of *Tursiops* appear to be resident near Ra's Muhammad in the Red Sea (Beadon 1991), at Merawah Island off Abu Dhabi (R. Baldwin pers. obs.) and the Daymaniyat Islands in the Gulf of Oman (R. Salm pers. comm.). *Grampus griseus* groups have been sighted repeatedly in the same location near Tiran Island in the Gulf of Aqaba (Beadon 1991) and near Bandar Jissah, Oman (OMCD).

Life histories of most odontocete cetaceans in Arabian waters are poorly known. *Physeter macrocephalus* recorded off Oman include large males and females with calves forming mixed pods, suggesting that this species breeds in both the Gulf of Oman and in the Arabian Sea. An observation of *Pseudorca crassidens* possibly giving birth in the Gulf of Oman in May (Baldwin & Salm 1994) and a record of a live stranded calf in the Gulf of Oman in August (OMCD) suggest that it is a breeding resident. Juveniles of this species have been sighted in the Gulf of Oman in May and October (OMCD), in the Arabian Sea in November (Baldwin 1997) and in the Red Sea (Alling *et al* 1982).

Mating *Sousa chinensis* and adults with calves have been observed in the months of April and May (UAECD, OMCD). Unusually large groups of up to 100 *Sousa* seen in the Arabian Gulf and Arabian Sea may indicate breeding activity or reflect differences in social behaviour between populations here and those elsewhere in the world, where *Sousa* generally occurs in groups of up to 25 (Ross *et al* 1994). *Delphinus* calves have been sighted off Oman in January, May and April in the Gulf of Oman, in May, November and December in the Arabian Sea (OMCD) and in January in the Red Sea (Alling 1986). Calves of *Tursiops* have been sighted off Oman in April, August, September and November, off the UAE during April-June, and mating behaviour has been witnessed off Oman in May and off the UAE in April (OMCD, UAECD). Even less information is available for *Grampus griseus,* for which there is a single record of an individual <1 m in length in May in the Gulf of Oman (OMCD).

Calves of *Stenella longirostris* have most frequently been observed in the Gulf of Oman during April-June, and occasionally in the same areas in August-September (OMCD). Young spinner dolphins (*Stenella* sp.) have been sighted off the coast of Somalia in March-April (Small & Small 1991), and *S. longirostris* calves have been recorded off the coasts of Oman, India and Sri Lanka during January-March (Alling 1986). Records of two juvenile *Neophocaena phocaenoides* indicate that the species may be breeding in Arabian Gulf waters (Baldwin 1995, Robineau & Fiquet 1996).

According to fishermen on Merawah Island, females enter waters <1m deep to give birth (Baldwin 1995).

The IUCN Red List indicates that the world status of many of the odontocetes is poorly known, with a large proportion listed as Data Deficient (Table 1). As with the Mysticeti, the status and population sizes of odontocete cetaceans in Arabian waters is also poorly known, although *Delphinus* and *Stenella longirostris* appear to be relatively abundant, and large pods of 24-50 *Physeter macrocephalus* have recently been seen off Oman (OMCD). Anecdotal reports from fishermen suggest that species inhabiting coastal waters, such as *Sousa chinensis* and *Neophocaena phocaenoides*, may have declined in abundance in the past few decades, perhaps as a result of the general effects of coastal development.

Bycatch as a result of fisheries activities is not systematically reported in any country of the region, but there is ample evidence of its occurrence. Threats include nearshore and offshore gillnetting, beach seining, handlining, commercial trawling and longlining. Intensive fishing activity south of Masirah Island in Oman may be partly responsible for the relatively high number of cetacean strandings in the area. Of seven stranded dolphins on Abu Ali Island in 1993, at least two were killed in fishing gear (Robineau & Fiquet 1996). Twenty-eight *Tursiops* were found in 1995 on 7 km of shoreline on an offshore island in Abu Dhabi waters, possibly a result of fisheries activities (Baldwin 1995). In 1995, a single *Delphinus* was caught in a fishing net off the Island of Merawah in the Arabian Gulf (UAECD). Entrapment in artisanal nets was probably the cause of death of one *Neophocaena phocaenoides* in the UAE (Baldwin 1995).

The abundance of lost or discarded fishing nets in shallow coastal waters off Oman (Salm 1992) is a serious menace to coastal cetaceans. A dead *Pseudorca crassidens* at Ra's Madrakah on the Arabian Sea coast may have drowned in a fishing net (OMCD). *Sousa chinensis* also suffers incidental capture and drowning in fishing nets (Gallagher 1991a), and butchered individuals found in Oman (Papastavrou & Salm 1991) may have been incidentally captured in fishing nets or intentionally caught. OMCD records include dead animals on beaches in the vicinity of fishing boats and a dead animal entangled in a net on the beach. Incidental capture of five *Delphinus* in fishing nets (evidenced by scars and burns) occurred on the Arabian Sea coast of Oman in 1989 (Salm 1991). A young *Grampus griseus* was caught in a shark fishing net off the coast of Dhofar in 1997 (OMCD) and dead *Stenella longirostris* have been found with rope burns and external scars possibly caused by fishing nets (Salm *et al* 1993).

Historically, dolphin flesh was eaten in Oman (Christine Mosseri-Marlio pers. comm.), but evidence for directed catch in Arabia today is largely unsubstantiated. Following interviews with local people, Alling (1983) reported a limited dolphin fishery off Masirah, and observations of butchered animals (*Sousa chinensis, Tursiops truncatus, Stenella longirostris* and *Delphinus*) and interviews with fishermen from Masirah and Juzor al Halaaniyat suggest that a limited directed catch of cetaceans may be occuring in Oman (Gallagher 1991a, Papastavrou & Salm 1991, Baldwin & Salm 1994). Dolphins in Oman have been hunted using small, motorised boats and hand held harpoons (Ali Al-Kiyumi, pers. comm.), but it is uncertain whether this practise continues today. *Pseudorca crassidens* may formerly have been hunted for its ivory in the Arabian Sea (Morzer-Bruyns, cited in Leatherwood *et al* 1991), and *Sousa* was hunted in former years in the Arabian Gulf and Red Sea (Ross *et al* 1994), and possibly in the Arabian Sea (Leatherwood and Reeves 1983).

Effects of pollution on cetaceans is of major concern in the region. The poor circulation in the Arabian Gulf, coupled with intensive human activity, means that contaminants are likely to remain concentrated for extended periods. Normal oil production and transport within the Gulf results in an estimated release of 1.5 million tonnes each decade (Michel *et al* 1986), and large-scale spills increase contaminant levels. At least 33 cetaceans, 38 dugongs (*Dugon dugong*) and thousands of fish were found dead following the Norwuz spill in 1983. At least 57 *Tursiops*, 13 *Sousa*, one *Neophocaena phocaenoides*, seven unidentified cetaceans and 14 *Dugon* were found dead shortly after the deliberate spill of the 1991 Gulf War (Preen 1991).

A much larger die-off of marine mammals occurred in the Arabian Gulf in 1986 when at least 520 cetaceans (*Tursiops* sp., *Sousa chinensis*, *Delphinus* sp. and *Neophocaena phocaenoides*), seven *Dugon*, 36 turtles and 4-8,000 fish were found dead on the beaches of Qatar, Saudi Arabia, Bahrain, Iran, Kuwait and UAE (Anon. 1986, Preen 1991). The cause of this mass mortality was neither established nor fully investigated, although a 'red tide' event was suggested by Preen (1991) as a possible explanation. Poisoning caused by toxins originating from phytoplankton associated with red tides may have caused the death of eight *Sousa chinensis* and seven *Delphinus* found near Duqm on the Arabian Sea coast of Oman in April 1990 (Gallagher 1991a).

Boat traffic is another threat to cetaceans; a young *Grampus griseus* was killed by a boat propeller near Muscat in 1987 (OMCD). Associated with boat traffic is the potentially serious threat of noise

pollution, which although unlikely to be responsible for mortality, may cause significant behavioural disturbance. Baldwin (1997) documented avoidance behaviour of *Delphinus* and *Tursiops* as a result of seismic activity in the Arabian Sea.

A more generalised concern is that habitat loss and degradation may have had a substantial impact on coastal cetaceans. The current rarity of *Neophocaena phocaenoides*, for example, may be a result of the impingement of coastal development activities such as land reclamation, construction and dredging upon available habitat.

4 Requirements for Further Research

The assessment of cetacean abundance together with stock identity research, taxonomic studies, and independent, systematic monitoring and reporting of bycatch are all basic requirements in the region. Such research is of particular importance for the coastal populations of both mysticete and odontocete species. Measurements of the contaminant burdens carried by cetaceans in the region are required, especially given the chronic exposure to hydrocarbon contaminants in the Arabian Gulf. Further investigation of the population status, distribution, ecology and behaviour of *Megaptera novaeangliae* off Oman and in the NW Indian Ocean region in general is required, particularly in the light of the probable resident status of this species and the implications that this has on its conservation. The collection and curation of dead specimens should be continued, and expanded to include the establishment of a network to detect, record, examine and collect biological samples from stranded cetaceans on a systematic basis. A reporting network could be further enhanced to cover live strandings and animals entangled in fishing nets. Sample collections should include biopsies for genetic analyses and pollution assays. The research outlined here would provide the basis for both short- and long-term conservation management strategies to ensure a healthy future for cetaceans living in the waters off the Arabia Peninsula.

5 Summary

Interest in cetaceans is relatively new in the Arabian region and most records refer to observations made in the past 2-3 decades. Published accounts of cetaceans therefore remain relatively scarce and two databases (one maintained at the Oman Natural History Museum since 1988 and the other by the Emirates Natural History Group since 1995) contain the majority of recorded data. Most information other than that collected in Oman and UAE and stored on these databases comes from recent surveys along the Arabian Gulf coast of Saudi Arabia.

Five species of baleen whales and 16 of toothed whales, dolphins and porpoises are known to occur in waters off the Arabian Peninsula. Other species may occur in the region, particularly in rarely surveyed offshore waters. Of the baleen whales confirmed to occur in the region, including minke, Bryde's, blue, fin, and humpback whales, most information is available on the humpback whale. Aspects of the behavioural ecology and appearance of apparently resident populations of humpback whales in the region suggest differences from their migratory conspecifics elsewhere in the world. Seasonal upwellings, which bring elevated nutrient levels to coastal and offshore waters of the Arabian Sea may provide the mechanism for an abundant food resource that allows humpback whales (known to feed in this area) to remain in the region year-round. The Bryde's whale is also known to be resident off Oman at least, but data are generally limited on this and other baleen whale species in the region.

Among the toothed cetaceans, porpoises are represented by just one species in the region, the finless porpoise. This species is evidently extremely rare and apparently restricted in its distribution in the region to the Arabian Gulf, where it is also known to breed. Among other odontocetes, limited finds of skeletal remains and very few live sightings in the region form the basis of our knowledge of the rough-toothed dolphin, striped dolphin, killer whale, Cuvier's beaked whale and dwarf sperm whale. Pygmy killer whales are known only from brief encounters at sea and all information on the melon-headed whale comes from a single damaged calvaria collected from Juzor al Halaaniyat (Arabian Sea) and a single ramus without data. An additional odontocete tentatively identified from live sightings in the region, but that requires confirmation, is the pilot whale.

More frequently recorded are the Indo-Pacific humpback dolphin, Risso's dolphin, bottlenose dolphin, spotted dolphin, spinner dolphin, common dolphin, false killer whale and sperm whale. The Indo-Pacific humpback dolphin is a coastal, shallow water species occurring throughout the region (with

resident groups in many locales), with the apparent exception of the area between the Strait of Hormuz and Ra's al Hadd, suggesting that the Arabian Gulf population is a separate stock. Unusually large groups of this species (up to 100 individuals) are known off Oman and in the Arabian Gulf. This species, like the Risso's dolphin, bottlenose dolphin, spinner dolphin, common dolphin and false killer whale, is also known to breed in the region and there are limited data on feeding for all of these species.

Bottlenose dolphins, common dolphins and spinner dolphins are probably the most widely distributed and abundant cetacean species in the region, although the spotted dolphin appears to be most abundant in the Red Sea, The spinner dolphin is apparently less common than either the bottlenose or common dolphin in the Arabian Gulf and Red Sea, and the centre of distribution may be the Gulf of Oman. Sub-specific, and even specific, identification of all three species remains unresolved and spinner dolphins known from the Gulf of Oman (off Muscat) may represent a discrete population. All three species may be encountered in nearshore or offshore waters, with largest groups of common dolphins and spinner dolphins (sometimes mixed) of up to 1,700 and 1,800 individuals. The Risso's dolphin, false killer whale and sperm whale are considered offshore species and although less well known than other species, limited offshore surveys suggest that they may be relatively abundant in the region. Data on false killer whales and sperm whales suggest resident, breeding populations are present, which may also be true of Risso's dolphins.

Population estimates of cetaceans in the region are lacking and the status of most species remains poorly known. Anecdotal reports from fishermen from different parts of the region suggest that species inhabiting coastal waters may have declined in abundance in the past few decades, perhaps as a result of increased human activity. Fisheries activities, pollution, shipping traffic and general habitat degradation and loss as a result of coastal and offshore development in the region have been identified as threats to cetaceans, and coastal species are most at risk. Mass die-offs of cetaceans and other marine life in the Arabian Gulf in the 1980's and 90's may have been linked to hydrocarbon pollution. Poisoning caused by toxins originating from phytoplankton associated with 'red tide' events has also been suggested as a possible cause of mortality in some cases. Research to address such issues relating to the conservation of cetaceans, as well as that required to fill basic gaps in our knowledge of cetaceans of the region is required.

Acknowledgements

We thank HH Sheikh Nahayan bin Mabarak Al-Nahayan, H–H Sheikh Mohammed bin Zayed Al Nahyan and the Union National Bank, Abu Dhabi for their support of research in the UAE, HH Said Faisal bin Ali Al-Said for support in the Sultanate of Oman, Triton Oman for the opportunity to observe cetaceans in Oman from the SV Calgary, Fairdeal for the use of Diva off the coast of UAE, Samira Mustafa Al-Latawi of the Oman Natural History Museum and Rebecca Rees for updating the Oman and UAE Cetacean Databases respectively, and the support of IFAW and the Gesellschaft zum Schutz der Meeressaugetiere to KVW.

References

Ainsworth, W. (1888). *A personal narrative of the Euphrates Expeditions.* Two vols. Kegan Paul.

Alling, A. (1983). *A Preliminary Report of Marine Mammal Fisheries in Djibouti, Oman and Sri Lanka*. Paper NARA/SMMIO/SP32 presented to the Symposium on Marine Mammals of the Indian Ocean, Colombo, Sri Lanka (unpublished). 4pp.

Alling, A. (1986). Records of odontocetes in the northern Indian Ocean (1981-1982) and off the coast of Sri Lanka (1982-1984). *Journal of the Bombay Natural History Society* 83: 376-394.

Alling, A., Gordon, J., Rotten, N. & Whithead, H. (1982). WWF-Netherlands Indian Ocean Sperm Whale Study, 1981-1982 Interim Report. Paper SC/34/Sp9 presented to the IWC Scientific Committee, June 1982 (unpublished). 46pp.

Al-Robaae, K. (1969). Bryde's Whale on the Coast of Iraq. *Saugetierkundliche Mitteilungen,* 34: 120-125.[with umlaut]

Al-Robaae, K. (1970). First record of the speckled dolphin, *Sotalia lentiginosa* Gray, 1866, in the Arabian Gulf. *Saugetierkundlicke Mitteilungen* 28: 227-228.

Al-Robaae, K. (1971a). False killer whale *Pseudorca crassidens*, a new record for the Arab Gulf. *Bulletin of the Iraq Natural History Museum* 5: 31-34.

Al-Robaae, K. (1971b). Notes on a Blue Whale (Baleanoptera musculus) skeleton in Natural History Museum, Kuwait. *Bulletin of the Iraq Natural History Museum* 5: 43-44.

Al-Robaae, K. (1974). *Tursiops aduncus*, bottlenose dolphin: A new record for the Arab Gulf, with notes on Cetacea of the region. *Bulletin of the Basrah Natural History Museum* Vol. 1: 7-16.

Al-Robaae, K. (1975). *Neophocaena phocaenoides*, Asiatic black finless porpoise: A new record for the Arabian Gulf. *Bulletin of the Basrah Natural History Museum* 2: 47-49.

Al-Robaae, K. (1982). The common rorqual, *Balaenoptera physalus*, a new record for the Arabian Gulf. *Bulletin of the Basrah Natural History Museum* Vol. 5: 17-22.

Anon. (1986). *Report of the First Meeting of Experts on Mortality of Marine Mammals*. Kuwait, November 22-23, 1980. Regional Organisation for the Protection of the Marine Environment, Kuwait. 29 pp.

Anon. (1992). *Study for Wildlife and Conservation Areas - Master Plan for the Coastal Areas of the Barr al Hikman and Masirah Island*. Weidleplan, Muscat, Oman. Unpublished report for the Government of Oman.

Anon. (1996). Mission Report for the Conservation and Sustainable Use of the Biodiversity of Socotra, March 1996. McAllister Elliot and Partners, Hampshire, UK (unpublished report).

Baillie, J. & Groombridge, B., eds. (1996) *1996 IUCN Red List of Threatened Animals*. IUCN, Gland, Switzerland.

Baldwin, R.M. (1995). *Whales and Dolphins of the United Arab Emirates*. 111 pp., Emirates Printing Press, Dubai.

Baldwin, RM 1996a. Marine Mammals of the United Arab Emirates. Pp 199-212 in *Natural Emirates*, Trident Press, London.

Baldwin, RM 1996b. Whale and Dolphin research in the United Arab Emirates. Pp 34-35 in *Arabian Wildlife*, Vol. 2 (3). Planet Publishing, London.

Baldwin, R.M. (1997). *Records of Wildlife and Observed Operational Impacts on Wildlife. Seismic Survey, Block 22, Oman*. Environmental Observation Report 1. Unpublished report for Triton Oman Inc., Oman. 76 pp.

Baldwin, R. (1998). Humpback Whales *(Megaptera novaeangliae)* of the Sultanate of Oman. Document SC/50/CAWS21 presented to International Whaling Commission. Pp 8.

Baldwin, R.M. & Salm, R.V. (1994). *Whales and Dolphins along the Coast of Oman*. Muscat Printing Press, Muscat, Oman. 65pp.

Baloutch, M. (1972). Presence de *Balaenoptera physalus* dans le golfe Persique. *Mammalia* 36: 160-161.

Ballance, L.T., Pitman, R.L., Reilly, S.B. & Force, M.P. (1996). *Report of A Cetacean, Seabird, Marine Turtle and Flying Fish Survey of the Western Tropical Indian Ocean Aboard the Research Vessel* Malcolm Baldridge*, March 21 - July 26, 1995*. NOAA Technical Memorandum NMFS (NOAA-TM-NMFS-SWFSC-224). 132 pp.

Basson, P.W., Burchard, J.E., Hardy, J.T. & Price, A.R.G. (1977). *Biotopes of the Western Arabian Gulf*. Aramco, Dhahran. 284pp.

Beadon, J.J. (1991). A note on cetaceans seen and live-captured in the Gulf of Aqaba and the Gulf of Suez, 15 September 1980 through 1 September 1981. *UNEP, Marine Mammal Technical Report* 3: 111-114.

Berzin, A.A. (1971). *Kashalot*. Izdatel'stvo 'Pishchevaya Promyshlennost', Moscow. 324pp. [Translated in 1972 as *The Sperm Whale* by the Israel Program for Scientific Translations, Jerusalem. i-v + 394pp.].

Blanford, W.T. (1876). *Eastern Persia - an Account of the Journeys of the Persian Boundary Commission 1870-71-72, Vol.II, The Zoology and Geology*. Macmillan. 516pp.

Bree, P.J.H .van (1971). *Delphinus tropicalis*, a new name for *Delphinus longirostris* G. Cuvier, 1829. *Mammalia* 35: 345-346.

Bree, P.J.H. van & Gallagher, M.D. (1978). On the taxonomic status of *Delphinus tropicalis* van Bree, 1971 (notes on Cetacea, Delphinoidea IX). *Beaufortia* 28: 1-8.

Brown, S.G. (1957). Whales observed in the Indian Ocean. Notes on their distribution. *Marine Observation*. 27:157-165.

Chantrapornsyl, S., Kinze, C.C., Leatherwood, S. & Prematunga, W.P. (1991). Notes on the genus *Kogia* in the Northern Indian Ocean. *UNEP, Marine Mammal Technical Report* 3: 79-88.

Cheesman, R.E. (1926). *In Unknown Arabia*. Appendix I, Mammals. Macmillan. xx+447pp.

De Silva, P.H.D.H. (1987). Cetaceans (whales, dolphins and porpoises) recorded off Sri Lanka, India and from the Arabian Sea and Gulf, Gulf of Aden and the Red Sea. *Journal of the Bombay Natural History Society* 84: 505-525.

Eyre (1994). *Observations of Cetaceans in the Indian Ocean Whale Sanctuary, May - July 1993*. Paper SC/46/O 27 presented at IWC Puerto Vallarta (unpublished). 12pp.

Frazier, J.G., Bertram, G.C. & Evans, P.G.H. (1987). Turtles and Marine Mammals. Pp. 288-314 in A.J. Edwards & S.M. Head (eds.) *Red Sea*. Pergammon Press, Oxford.

Gallagher, M.D. (1981).

Gallagher, M.D. (1991a). Collections of skulls of Cetacea: Odontoceti from Bahrain, United Arab Emirates and Oman, 1969-1990. *UNEP, Marine Mammal Technical Report* 3: 89-97.

Gallagher, M.D. (1991b). Strandings of sperm whales (*Physeter macrocephalus*) on the shores of Oman, Eastern Arabia. *UNEP, Marine Mammal Technical Report* 3: 241-245.

Gallagher, M.D. & van Bree P.J.H. (1978). On a dwarf sperm whale *Kogia simus* (Owen, 1866) from the Sultanate of Oman. *Zeitschrift für Säugetierkunde* 45: 53-57.

Gasperetti, J. (undated). *Check List of Marine Mammals Recorded Or Which May Be Recorded in the Northwestern Indian Ocean and Arabian Sea*. Unpublished manuscript. 312 pp.

Gervais, H.P. (1883). Sur un nouvelle espece du genre Megaptere provenant de la baie de Bassora (Golfe Persique). *C. R. Acad. Sci.* 97: 1566.

Gilpatrick, J.W., Perrin, W.F., Leatherwood, S. & Shiroma, L. (1987). *Summary of Distribution Records of the Spinner Dolphin,* Stenella longirostris*, and the Pantropical Spotted Dolphin,* S. attenuata*, from the Western Pacific Ocean, Indian Ocean and Red Sea*. NOAA Technical Memorandum NMFS. NOAA-TM-NMFS-SWFC-89. 42 pp.

Harwood, J. (1980). *Observations of Cetaceans in the Arabian Sea, November-December 1980.* Sea Mammal Research Unit, Cambridge, UK. Unpublished manuscript. 8pp.

Harwood, J. (1981). *Observation of Cetaceans in the Arabian Sea, November - December 1980*. Doc. 7 presented to the Workshop to Plan a Programme of Scientific Research on Cetaceans in the Indian Ocean Sanctuary, Zeist, Netherlands, 1981 (unpublished). 7pp.

Henningsen, T. & Constantine, R. (1992). Cetaceans in the Persian Gulf: after the war. *Sixth Annual Conference of the European Cetacean Society, San Remo, Abstracts*: Vol. 42.

Hershkovitz, P. (1966). *Catalog of living whales*. Museum of Natural History, Smithsonian Institution, 259 pp.

Heyning, J.E., and W.F. Perrin. (1994). Evidence for two species of common dolphins (genus *Delphinus*) from the eastern North Pacific. Los Angeles Conuty Museum iof Natural History Contributions in Science 442: 1-35.

Keller, R.W., Leatherwood, S. & Holt S.J., (1982). Indian Ocean Cetacean Survey, Seychelles Islands, April through June 1980. *Report of the International Whaling Commission* Vol. 32 pp503-513.

Kruse, S., Leatherwood, S., Prematunga, W.P., Mendes, C. & Gamage, A. (1991). Records of Risso's dolphins, *Grampus griseus*, in the Indian Ocean, 1891-1986. *UNEP, Marine Mammal Technical Report* 3: 67-77.

Leatherwood, S. (1986). Whales, dolphins and porpoises of the Indian Ocean Sanctuary: a catalogue of available information. *Hubbs Marine Research Centre Technical Report* # 87-197. 206 pp.

Leatherwood, S., McDonald, D., Prematunga, W.P., Girton, P., Ilangakoon, A. & McBrearty, D. (1991). Records of the 'Blackfish' (Killer, False Killer, Pilot, Pygmy Killer and Melon-headed Whales) in the Indian Ocean, 1772-1986. *UNEP, Marine Mammal Technical Report* 3: 33-65.

Leatherwood, S. & Reeves R.R., (1983). *The Sierra Club Handbook of Whales and Dolphins*. Sierra Club Books, San Francisco. 302 pp.

Mahdi, N. (1967). First record of the Bryde's whale *Balaenoptera edeni* Anderson from the Arab Gulf, with notes on earlier literature. *Bulletin of the Iraq Natural History Museum* 3: 1-6.

Mahdi, N. & Georg, P.V. (1969). *A Systematic List of the Vertebrates of Iraq*. Bulletin 26: 72-73. University of Bagdad.

Mikhalev, 1997. Humpback whales *Megaptera novaeangliae* in the Arabian Sea. *Mar. Ecol. Prog. Ser*. 149: 13-21.

Michel, J., Gundlach, E.R. & Hayes, M.O. (1986). Oil spill contingency planning in the Arabian Gulf. Pp. 249-262 in Halwagy *et al*. (eds) *Marine Environment and Pollution. Proceedings of the Arabian Gulf Conference on Environment and Pollution, Kuwait*

Miyazaki, N. & Perrin, W.F. (1994). Rough-toothed dolphin *Steno bredanensis* (Lesson, 1828). Pp1-21 in S.H. Ridgway & R. Harrison (eds.). *Handbook of Marine Mammals* 5, 416p. Academic Press.

Morzer-Bruyns, W.F.J. 1971. Field guide of whales and dolphins. Tor/ c.a. Mees, Amsterdam. 258pp.

Nader, I.A. & Al-Khalili, A.D. (1978). A second record of the Bottle-nosed Dolphin, *Tursiops aduncus* (Ehrenberg, 1833) from the Arabian Gulf. *Journal of the Saudi Arabian Natural History Society* 22: 22-24.

Papastavrou, V. (1990). Oman's Desert Whale Song. *Sonar*. Vol 3. p18.

Papastavrou, V. & Salm, R.V (1991). A note on the recent sightings of cetaceans in Oman: Ra's Suwadi to Rakhyut. *UNEP*, *Marine Mammal Technical Report* 3: 211-218.

Papastavrou, V. & Van Waerebeek, K. (1998). A Note on the Occurrence of Humpback Whales (*Megaptera novaeangliae)* in Tropical and Subtropical Areas: The Upwelling Link. Document SC/48/0 39 presented to the International Whaling Commission, 4pp.

Peacock, N.A. (1978). *The Distribution of the Fishing Communities Along the Red Sea Coast of Saudi Arabia, Their Fleets and Landings*. Progress Report. White Fish Authority, Field Report No. 21. Report to Ministry of Agriculture and Water of Saudi Arabia.

Perrin, W.F. (1990). Subspecies of *Stenella longirostris* (Mammalia: Cetacea: Delphinidae). *Proceedings of the Biological Society of Washington* 103: 453-463.

Perrin, W.F. & Gilpatrick, J.W.Jr. (1994). Spinner dolphin *Stenella longirostris* (Gray, 1828). Pp. 99-128 in S.H. Ridgway & R. Harrison (eds.). *Handbook of Marine Mammals* Vol. 5, p 416. Academic Press.

Perrin, W.F., Mitchell, E.D., Mead, J.G., Caldwell, D.K., van Bree, P.J.H. & Denkin, W.H. (1987). Revision of the spotted dophins, *Stenella* spp. *Marine Mammal Science* 3: 99-170.

Perrin, W.F., Wilson, C.E. & Archer, F.I. (1994). Striped dolphin *Stenella coeruleoalba* (Meyen, 1833). Pp. 129-159 in S.H. Ridgway & R. Harrison (eds.). *Handbook of Marine Mammals* Vol. 5, p 416. Academic Press.

Pilleri, G. (1973). *Cetologische Expedition Zum Indus Perzischen Golf Und Forschungsreise Nach Goa Und Thailand Im Jahre 1973*. Verlag Hirnanatomisches Institut, Waldau-Bern. 52 pp.

Pilleri, G. & Gihr, M. (1973-1974). Contribution to the knowledge of the cetaceans of Southwest and Monsoon Asia (Persian Gulf, Indus Delta, Malabar coast, Andaman Sea and Gulf of Siam). *In: Investigations on Cetacea* 5: 95-149 Pileri, G. (ed.) Verlag Hirnanatomisches Institut, Waldau-Bern.

Pilleri, G. & Gihr, M. (1975).On the Taxonomy and Ecology of the Finless Black Porpoise, *Neophocaena* (Cetacea, Delphinidae). *Mammalia* 39: 657-673.

Preen, A. (1987). Dugongs, dolphins and porpoises. Pp. 74-77 in C. Gross (ed.) *Mammals of the Southern Gulf*. Motivate Publishing, Dubai. 80pp.

Preen, A. (1989). *Dugongs. Vol 1. The Status and Conservation of Dugongs in the Arabian Region*. MEPA Coastal and Marine Management Series, report No. 10. MEPA, Jeddah, 200 pp.

Preen, A. (1991). *Report of the die-off of marine mammals associated with the Gulf War oil spill*. Unpublished report for the National Commission for Wildlife Conservation and Development. 8 pp.

Reeves, R.R. and Leatherwood, S. (1994). Dolphins, Porpoises and Whales: 1994-1998 Action Plan for the Conservation of Cetaceans. IUCN, Gland, Switzerland. 92pp.

Reeves, R.R.,Leatherwood, S. & Papastavrou, V. (1991) Possible Stock Affinities of Humpback Whales in the Northern Indian Ocean. *UNEP Marine Mammal Technical Report* 3: 259-269.

Robineau, D. & Fiquet, P. (1992). Initial Data on the Marine Mammals (Sirenia, Cetacea) of the Wildlife Sanctuary for the Gulf Region. Pp 208-218 in *Establishment of a Marine Habitat and Wildlife Sanctuary for the Gulf Region (Phase 1).* Jubail & Frankfurt, CEC/NCWCD.

Robineau, D. & Fiquet, P. (1994a). Cetaceans of Dawhat ad-Dafi and Dawhat al-Musallamiyah (Saudi Arabia) one year after the Gulf War oil spill. *Courier Forschungsinstitut Senckenberg.* 166: 76-80.

Robineau, D. & Fiquet, P. (1994b). Cetaceans of the Gulf Sanctuary and adjacent waters. Pp. 501-513 in *Establishment of a Marine Habitat and Wildlife Sanctuary for the Gulf Region. Final Report for Phase II.* Jubail & Frankfurt, CEC/NCWCD.

Robineau, D. & Fiquet, P. (1996). The Cetacea of the Jubail Marine Wildlife Sanctuary, Saudi Arabia. Pp. 438-458 in *A Marine Wildlife Sanctuary for the Arabian Gulf. Environmental Research and Conservation Following the 1991 Gulf War Oil Spill*. NCWCD, Riyadh and Senckenberg Institute, Frankfurt a.M.

Robineau, D. & Rose, J.M. (1984). Les cetaces de Djibouti. Bilan des connaissances actuelles sur la fauna cetologique de la mer Rouge at du golfe d'Aden. *Bulletin of the Museum National Histoire Naturelle, Paris* (4)6(1): 219-49

Ross, G.J.B. (1977). The taxonomy of bottlenosed dolphins *Tursiops* species in South African waters, with notes on their biology. Ann. *Cape Province Museum of Natural History* 11: 135-194.

Ross, J.P. (1981). Recent marine mammal sightings in the Sultanate of Oman (1980/1981). Document 23 presented at *Workshop to Plan A Programme of Scientific Research on Cetaceans in the Indian Ocean Sanctuary*. Zeist, Netherlands, 28 September-1 October.

Ross, G.J.B., Heinsohn, G.E. & Cockcroft, V.G. (1994). Humpback Dolphins - *Sousa chinensis* (Osbeck, 1765), *Sousa plumbea* (G. Cuvier, 1829) and *Sousa teuszii* (Kukenthal, 1892). Pp. 23-

42 in S.H. Ridgway & R. Harrison (eds.). *Handbook of Marine Mammals* Vol. 5, p 416. Academic Press.
Salm, R.V. (1991). *Live and Beached Cetacean Observations, Sultanate of Oman. Scientific Results of the IUCN Coastal Zone Management Project*. CZMP4:F14. Report prepared for the Ministry of Commerce and Industry, Oman. 26 pp.
Salm, R.V. (1992). *Impact of Fisheries on Environment and Wildlife, Sultanate of Oman. Scientific Results of the Iucn Coastal Zone Management Project*. CZMP4:F17. Report prepared for the Ministry of Commerce and Industry, Oman. 19 pp.
Salm, R.V., Jensen, R.A.C. & Papastavrou, V.A. (1993). *Marine Fauna of Oman: Cetaceans, Turtles, Seabirds and Shallow Water Corals*. IUCN, Gland, Switzerland. 66 pp.
Sheppard, C., Price, A. & Roberts, C. (1992). *Marine Ecology of the Arabian Region. Patterns and Processes in Extreme Tropical Environments*. Academic Press, London. 359pp.
Slijper, E.J., van Utrecht, W.L. & Naaktgeboren, C. (1964). Remarks on the distribution and migration of whales, based on observations from Netherlands ships. *Bijdragen tot de Dierkunde* 34: 3-93.
Small, J.A. & Small, G. (1991). Cetacean Observations from the Somali Democratic Republic, September 1985 through May 1987. *UNEP, Marine Mammal Technical Report* 3: 179-210.
Smeenk, C., Addink, M.J., van den Berg, A.B., Bosman, C.A.W. & Cade, G.C. (1996). Sightings of *Delphinus cf. tropicalis* van Bree, 1971 in the Red Sea. *Bonner Zoologische Beitraege* 46: 389-398.
Townsend, C.H. (1931). Where the 19th Century whaler made his catch. *Bulletin of the New York Zoological Soc*iety 34:173-9.
Van Beneden, P. J. 1887. Histoire naturelle de la baleine a bosse (*Megaptera boops*). *Mem. Couronnes Acad. R. Belg*. 40: 1-42. (In French)
Van Waerebeek, K., Gallagher, M.D., Papastavrou, V. & Al-Lawati, S.M. (in manuscript) Cranial evidence of melon-headed whale and rough-toothed dolphin from Oman and the Arabian Sea.
Weitkovitz, W. (1992). Sightings of whales and dolphins in the Middle East. *Zoology in the Middle East* 6: 1-12.
Whitehead, H. 1985. Humpback whale songs from the Northern Indian Ocean. *Investigations on Cetacea*, 17: 157-162.
Whitehead, H., Gilligan, P., Smyth, C., Weilgart, L. & Converse, C. (1983). *WWF/IUCN Indian Ocean Whale Project. Interim Report*, Oct-Dec. 1983. (Unpublished)
Winn, H.E. and L.K. Winn. 1978. The song of the humpback whale *Megaptera novaeangliae* in the West Indies. *Mar. Biol*. 47(2):97-114.
Winn, H.E. and N.E. Reichley. 1985. Humpback whale - *Megaptera novaeangliae* (Borowski, 1781). pp. 241-73. *In*: S.H. Ridgway and R. Harrison (eds.) *Handbook of Marine Mammals*. Vol. 3. *The Sirenians and Baleen Whales*. Academic Press, London and Orlando.
Wray, P. & Martin, K.R. (1980). *Historical Whaling Records From the Western Indian Ocean*. Document IWC/CS/32/08 to the International Whaling Commission. 55 pp.
Yukhov, V.L. (1969). Observations of cetaceans in the Arabian Sea. Pp. 327-328 in V.A. Arsenev, B.A. Zenkovich & K.K. Chapski (eds.). *Marine Mammals*. Akad. Nausk., Moscow. (Original in Russian, this article translated by S. Pearson, National Marine Laboratory, Seattle, USA).

Appendix. Curated Specimens

Mysticeti, Family Balaenopteridae
Balaenoptera acutorostrata: Baleen from Oman in ONHM (ONHM1271).

Balaenoptera borealis: None

Balaenoptera edeni: Skeleton from near Tor, Sinai, in 1893 (BM 1905.12.12.7) (De Silva, 1987). Vertebrae collected from Qishm Island, Iran, in the private collection of G Pilleri (Leatherwood 1986). One incomplete skull (ONHM345) and baleen (ONHM716) from Oman.

Balaenoptera musculus: Skeleton from Khadimah, Kuwait, 6 June 1963, in NHMK (Al-Robaae 1971b).

Balaenoptera physalus: One skeleton fromRas al Khaima on 6 April 1978 in Natural \History Museum of UAE University (Al-Robaae 1982). Two skeletons from Dhahran in University Zoological Museum, King Saud University, Riyadh. Mandible from Jebel Ali beach, UAE, at Dubai Zoo.

Megaptera novaeangliae: Skeleton from Bassore Bay, Arabian Gulf, in MNHN (1883-2255; reportedly type specimen, Gervais 1983). Two specimens of baleen (ONHM2133, 1970) from Oman in ONHM.

Odontoceti

Family Delphinidae

Delphinus spp: Collections from the UAE: Skulls (BM 1973.108, 1973.1746, 1981.711, ZMA 16.995; Gallagher 1991a, Leatherwood 1986); skull at SNHM. Collections from Oman: Skulls with partial or complete skeleton (ONHM 471, 1389, 1988, 2572); skulls (ONHM 428, 429, 478, 496, 564, 659, 836, 839, 840, 863, 873, 1137, 1140, 1204, 1386, 1390, 1391, 1392, 1393, 1394, 1395, 1479, 1490, 1499, 1502, 1518, 1562, 1678, 2106.06, 2604, 2676, ZMA 20.318, 20.319, 20.321, 20.322, 20.898, 21.169, 06419, BM 72.807, 72.808, 1965.12.17.1); other skeletal remains (ONHM 1563, 1565, 1566, 1567, 1568, 1570). Collections from the Gulf of Aden: Skull from Djibouti and two skulls from Berbera, Somaliland (MNHN {1981-161} and BM 1949.7.15.4, 1954.9.9.2) respectively.

Grampus griseus: Collections from Oman: Skeletons (BM 1891.2.5.4, 1891.2.5.5, ONHM 1669, 1699); skulls (ZMA 20.316, 20.713, 21.185, Z06425, BM1980.523, 1980.794, OHMN 15, 1503, 1729, 1987, 2429, 2700, 2705); partial skull (ONHM 11). and a skull at SQU. Cast and complete skeleton of a calf from Muscat (ONHM1699) previously erroneously assigned to the false killer whale (in Papastavrou & Salm 1991). Collections form the Red Sea: A calvaria collected near Port Sudan (BM1924.9.20.1; Leatherwood 1986).

Neophocaena phocaenoides: Two specimens from Iraq (May 1974, April 1975) in Basrah Natural History Museum (Al-Robaae 1975). Skull from Bahrain (ZMA 20.292; Gallagher 1991a). Complete specimen at Saudi Arabian National Museum of Natural History (Robineau & Fiquet 1996). Complete specimen from UAE at the SNHM.

Sousa chinensis: Thirteen collections from Bahrain (BM 1970.1505, 1970.1506, 1970.1507, 1970.1508, 1970.1509, 1970.1510, 1973.1748, 1984.1758, 1984.1759, 1984.1761, 1984.1762, 1984.1763, 1984.1768; Gallagher 1991a, Robineau & Fiquet 1996). One collection from Qatar: Museum of Comparative Zoology, USA (MC47000; Leatherwood 1986). No mention of curation of the 4 specimens collected near Jubail (Robineau & Fiquet 1996). Collections from Oman: Partial/complete skeleton with skull (ONHM 1049); skulls (ONHM 439, 523, 524, 525, 526, 683, 684, 1015, 1016, 1017, 1020, 1022, 1045, 1047, 1050, 1222, 1483, 1516, 1558, 1559, 1560, 1564, 1571, 1572, 1662, 1679, 1911, 1918, 1972, 1973, 2482, 2631, 2632, 2633, 2635, 2677, ZMA 20.721, 20.725, 20.726, 20.727, 20.728, 20.736, 20.737, 20.738, 20.899, 21.431, 21.437, 21.450, 21.451); skull and left mandible (ONHM 1017); skull and one mandible (ONHM 1557); right mandible (ONHM 1045); one calvaria (KVW-3035) at the Peruvian Centre for Cetacean Research, Lima. Collections from the Red Sea: A calvaria from the Gulf of Aden (BM 1955.2.23.1); a skull from the Suez Canal (BM 1924 {or 1929}.9.11.1); three skulls from the Red Sea (BM 1948.3.13.1; -1962.2.19.1; -1962.7.19.1; Leatherwood, 1986).

Additional records of *Sousa chinensis* referred to as *Sotalia lentiginosa (*Al-Robaae 1970) collected off Iraq on 25 July 1967, and preserved in the Department of Zoology of the Basrah University and *Sotalia fergosoni* collected off Kuwait in spring 1962 (Al-Robaae 1974) and preserved in the Audio-visual aids department, Kuwait.

Stenella attenuata: Skull (BM 1973.1750) from UAE. Skulls from Oman(BM 1973.1749, 1980.792, ZMA 21.005; Gallagher 1991a).

Stenella coeruleoalba: Skulls from Oman (BM 1980.788, ZMA 21.440; Gallagher 1991a).

Stenella longirostris: Collections from Oman: Partial/complete skeletons, including skulls (ONHM 659, 1021, 1735, 1736, 2121); skulls (ONHM 1410, 2106.01, 2106.02, 2106.03, 2106.04, 2717, BM 1980.872, 1980.873, 1980.791, ZMA 20.320, 20.317, 20.724, 21.443, 21.447, 23.539); other material marked *Stenella* ?*longirostris*, including one ramus (ONHM 1179) and one skull (ONHM 1728). One skull with partial skeleton at SQU. The collection at ONHM also includes a cast (ONHM1736). Collections from Red Sea and Gulf of Aden: Skull from Mersa Alam on the Red Sea coast of Egypt, at the 'Field Museum of Natural History' (105019); skeleton from Djibouti, Gulf of Aden, at MNHN (1981-159) (Robineau & Rose 1983, Leatherwood 1986).

Steno bredanensis: Collections from Oman: A heavily worn calvaria (ONHM 880), previously listed as *Tursiops* sp. in Gallagher (1991), and a pair of mandibles at MSFCO without data (Van Waerebeek *et al*., in ms.).

Tursiops truncatus: Collections from Bahrain (BM 1970.1511, 1970.1512, 1984.1756, 1984.1757, 1984.1760, 1984.1764) and UAE (BM 1973.1747, 1973.1751) (Gallagher 1991a). Additional collections from Arabian Gulf: A mandible (BM 1970.1508); a skeleton in the private collection of G. Pilleri (T-559; Leatherwood 1986); skeleton (accessioned as T. aduncus) collected 15 Jan 1974 from Ras al Mataf (Iraq), in Basrah Natural History Museum Al-Robaae 1974); skull collected from Dubai in June 1973, deposited at the Museum of College of Education (Nader & Al-Khalili1978). Collections from Oman: Complete skeletons (ONHM 1028, BM1888.10.24.4, 888.10.24.3); skull and lower jaw (ONHM 1018); skulls (ONHM 183, 1018, 1019, 1028, 1046, 1048, 1006, BM 1980.793, 1980.789, 1980.874, ZMA20.090, 20.328 (*Tursiops* sp.), 20.329 (*Tursiops* sp.), 21.173, 21.434, 21.452, Z06426); other skeletal material (ONHM 1019); mandible (BM 1980.790); skull at University of Tubingen (DE-4); skull and partial skeleton (ONHM 658). Collections from the Red Sea: Skull (Senckenberg Museum, USNM# -ST02271); skull and a skull and incomplete skeleton at the Forschungsinstitut Naturmuseum, Senckenberg (SMF 1522, 4337) (Leatherwood 1986).

Family Globicephalidae

Feresa attenuata: None.

Globicephala spp: None confirmed. Two specimens (ONHM1014, 834) provisionally identified by van Bree and listed as ?*G. macrorhynchus* (Gallagher 1991a) now identified as *P. crassidens,* although the identification of one (ONHM834) remains tentative (K. Van Waerebeek, pers. comm., May 1996, OMCD).

Orcinus orca: A skull and nearly complete skeleton (ONHM 2739) from Ra's Mirbat, Dhofar.

Peponocephala electra: A damaged calvaria from Al Haalaniyaat, Oman (ONHM 835), previously listed as *Tursiops* sp. in Gallagher (1991)

Pseudorca crassidens: One collection from Kuwait in NHMK (Al Robbae, 1971a). Collections from Oman: Skulls (BM 72-809, 1980.795, ZMA 21.168, 21.186, ONHM 1044, 1023, 64, 728.2, 1044, 1023, 2234, 2413, 2596, 2642); partial skulls (ONHM 834, 1014); complete mounted skeleton (ONHM 689).

Family Physeteridae

Kogia simus: Four collections from Oman (ONHM 1024, 1139, 1330, ZMA 20.712).

Physeter macrocephalus: Skull and near complete skeleton from Barka, Oman mounted in ONHM (866). Skull and near complete skeleton of an immature animal from near Sohar, Oman (ONHM 29).

Family Ziphiidae

Ziphius cavirostris: Four collections from Oman: Skull with partial skeleton (OHNM 901); two skulls (ONHM 344.14, 1141); partial skull (ONHM 1800).

Table 1. Cetaceans known to occur in the waters off the Arabian Peninsula, with their global Red List status (Baillie & Groombridge 1996) taken from the Red List database at the Internet site http://www.wcmc.org.uk/species/animals/. EN Endangered, VU Vulnerable, LR:nt Lower Risk: Near Threatened, DD Data Deficient, LR:lc Lower Risk: least concern (i.e. not on the Red List).

Species (by Family)	Red List status	Notes
Mysticeti (baleen whales), Family Balaenopteridae (the rorquals)		
Balaenoptera physalus (fin whale)	EN	
Balaenoptera borealis (sei whale)	EN	Not confirmed to occur in Arabian waters
Balaenoptera edeni (Bryde's whale)	DD	
Balaenoptera musculus (blue whale)	LR:cd	Arabian blue whales could be of the pygmy race, *B. m. brevicauda* (DD)
Balaenoptera acutorostrata (Minke whale)	LR:nt	
Megaptera novaeangliae (Humpback whale)	VU/A1ad	Possibly represented by a resident population in the northwest Indian Ocean
Odontoceti (toothed whales, dolphins and porpoises), Family Delphinidae		
Delphinus sp. *(*common dolphin)	LR:lc	
*Grampus griseus (*Risso's dolphin)	DD	
Neophocaena phocaenoides (finless porpoise)	DD	
*Sousa chinensis (*humpbacked dolphin)	DD	
*Stenella attenuata (*spotted dolphin)	LR:cd	
*Stenella coeruleoalba (*striped dolphin)	LR:cd	
*Stenella longirostris (*spinner dolphin)	LR:cd	Taxonomic research indicates possible subspecies off Oman
*Steno bredanensis (*rough-toothed dolphin)	DD	
*Tursiops truncatus (*bottlenose dolphin)	DD	
Odontoceti (toothed whales, dolphins and porpoises), Family Globicephalidae		
*Feresa attenuata (*pygmy killer whale)	DD	
*Globicephala macrorhynchus (*pilot whale)	LR:cd	Not confirmed to occur in the Arabian region
*Orcinus orca (*killer whale)	LR:cd	
Peponocephala electra (melon-headed whale)	LR:lc	
*Pseudorca crassidens (*false killer whale)	LR:lc	
Odontoceti (toothed whales, dolphins and porpoises), Family Physeteridae		
Kogia simus (dwarf sperm whale)	LR:lc	
Physeter macrocephalus (sperm whale)	VU/A1bd	
Odontoceti (toothed whales, dolphins and porpoises), Family Ziphiidae		
Ziphius cavirostris (Cuvier's beaked whale)	DD	