

ABSTRACTS OF PAPERS ARISING FROM THE INDIAN OCEAN CETACEAN SYMPOSIUM 2009



Paradise Island Resort & Spa, Maldives

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**Organized by the
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www.mrc.gov.mv**

Abstracts of papers arising from the Indian Ocean Cetacean Symposium, 2009

The Indian Ocean Cetacean Symposium (IOCS) was held in Maldives in July 2009. It marked the 30th anniversary of the International Whaling Commission's (IWC) Indian Ocean Sanctuary. The Symposium was a scientific meeting, convened by the Maldivian Marine Research Centre, and it attracted some 60 scientists from 22 countries. The meeting was opened by the Vice President of the Republic of Maldives. Keynote addresses were given by Dr. Sidney Holt and Dr. Roger Payne. A total of 43 presentations were made, demonstrating the wide range of cetacean research being carried out within the Indian Ocean. Following the IOCS, over 20 papers were submitted for publication in a peer-reviewed 'proceedings volume'. This was published in 2012, with 15 papers, as a dedicated Indian Ocean issue of the IWC's **Journal of Cetacean Research and Management**. Abstracts of these papers, and author contact details, are provided here. For further information on the JCRM, including purchasing details, see: www.iwcoffice.org.

In addition to the presentations, and the JCRM Indian Ocean issue, the IOCS provided an opportunity for cetacean scientists to discuss common problems and future collaborations. The Indian Ocean Sanctuary was acknowledged as an important management tool for the protection of large whales (which suffered very high, and illegal, catches mainly by Soviet whalers in the 1960s). However, the Indian Ocean Sanctuary provides little protection for small cetaceans, which suffer from a range of threats, but particularly from fisheries by-catch. The IOCS formulated and adopted the **Lankanfinolhu (Maldives) Declaration**, which among other things called upon the IWC to ensure the continuation of the Indian Ocean Sanctuary in perpetuity; and on coastal countries to monitor and reduce catches of cetaceans in their fisheries; stressed the importance of improved education; reminded all Indian Ocean parties to the Convention on Biological Diversity of their commitments to protect at least 10% of all ecosystems, including marine and coastal waters; supported the wider adoption of responsible whale and dolphin watching guidelines and regulations; and encouraged Indian Ocean states, in collaboration with the IWC and other relevant organizations, to develop a collectively agreed action plan to improve conservation outcomes for cetaceans in the Indian Ocean Sanctuary. Another physical output from the IOCS was a poster of Indian Ocean cetaceans (distributed to all participants and to every school in the Maldives). A report of the IOCS, including the Lankanfinolhu Declaration, was compiled by Saatar et al. (2009) and is available at: www.mrc.gov.mv.

Sattar S.A., Anderson R.C. and Adam M.S. (compilers) (2009) Report of the Indian Ocean Cetacean Symposium 2009, held at Paradise Island Resort and Spa, Maldives, 18-20 July 2009. Marine Research Centre, Maldives. 46pp. Revised edition 2012. www.mrc.gov.mv

HOLT, SIDNEY (2012) Negotiating the Indian Ocean Whale Sanctuary. J. CETACEAN RES. MANAGE. 12(2): 145–150.

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This paper provides an overview of the establishment of the International Whaling Commission's Indian Ocean Sanctuary in 1979. The International Convention for the Regulation of Whaling enables the IWC to designate sanctuaries as well as open and closed areas for whaling. The author reflects upon the background to the issue of whale sanctuaries within the IWC and the particular role of the Seychelles Government in the development of the proposal for a sanctuary in the Indian Ocean. He notes the political, scientific and practical factors surrounding the acceptance of the proposal by the IWC and briefly discusses subsequent events.

ADULYANUKOSOL, KANJANA, SURASAK THAONGSUKDEE and KONGKIAT KITTIWATTANAWONG (2012) Cetaceans and mass strandings in Thai waters. J. CETACEAN RES. MANAGE. 12(2): 151–158.

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A total of 25 species of cetaceans have been recorded in Thai waters from stranding and sighting records. A summary of these, together with details of five mass strandings on the Andaman Sea coast of Thailand, are reported here. The first mass stranding, of nine spinner dolphins (*Stenella longirostris*) was at Talibong Island, Trang Province, in January 1999; six carcasses were examined and three were lost. The second record comprised five spotted dolphins (*Stenella attenuata*) stranded at Ban Ko Kho Khao, Phang-nga, in February 1999; two dolphins were released alive. The third stranding was of eight spotted dolphins at Mai Phai Island, Phang-nga, in March 2006; five animals died and three were released alive. The fourth mass stranding was of 30 false killer whales (*Pseudorca crassidens*) at Racha Yai Island, Phuket, in June 2008; 29 animals were released while one drowned. The fifth record consisted of three rough-toothed dolphins (*Steno bredanensis*) stranded at Nam Bor Bay, Phuket, in July 2008; all three were returned to the open sea. It was difficult to determine the causes of death of the stranded dolphins. However, it was possible that the first two mass strandings were caused by disease. Some strandings were possibly influenced by the landscape of the stranding locations (narrow bay in one case, wide gently sloping beach in another).

KUMARRAN R.P. (2012) Cetaceans and cetacean research in India. J. CETACEAN RES. MANAGE. 12(2): 159–172.

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The diversity of cetacean species in Indian waters is high, with 25 species recorded so far. Records of cetaceans from India during the last 200 years have provided insights into their spatiotemporal distribution, behaviour, feeding, reproduction, fishery interaction and pollution. The cetacean fauna is dominated by pantropical species, with a relatively high abundance of spinner dolphins, which is similar to other areas studied within the northern Indian Ocean. Historical records were analysed to propose an inventory of cetaceans. Cetacean diversity was highest in the Gulf of Mannar on the southeast coast of India, which

with 14 species recorded from a small area can be considered a ‘hot spot’ for further research. Fishery interactions, domestic consumption, pollution and lack of quality information to inform management are the main threats for successful survival of cetaceans. The status of information regarding cetaceans in India could be classified based on this study as: six species with adequate data; five species where data is restricted to a few geographic locations; four species for which data collection is being initiated; five species with sparse data; and six species which are difficult to observe.

SATHASIVAM, KUMARAN and K.S. NATARAJAN (2012) Obtaining distributional information on Indian Ocean cetaceans: suggestions based on an Indian network experience. *J. CETACEAN RES. MANAGE.* 12(2): 173–175.

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The understanding of the occurrence and distribution of cetaceans in the Indian region is largely based on information that has been incidentally obtained from strandings and bycatches. An attempt was made to compile such data systematically. The resultant database has been made widely accessible by hosting it on the internet. To improve the quality of information collected, identification aids were published on the same website. A stranding booklet was also created, mainly for the use of individuals and organisations with limited access to the internet. The ‘spare capacity’ of individuals and organisations was used to gather information and also to prepare the website and booklets, so that little or no expense was incurred. Recommendations are made regarding the collection of distributional data from the Indian Ocean.

ILANGAKOON, A.D. (2012) A review of cetacean research and conservation in Sri Lanka. *J. CETACEAN RES. MANAGE.* 12(2): 177–183.

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Sri Lanka is a developing island nation in the northern Indian Ocean. Travellers and historians have documented whales in the waters around the island as far back as the 14th century but the first scientific records of live cetaceans from vessel-based research observations were documented only in the early 1980s. Sri Lanka’s waters have high cetacean species richness with 27 species recorded to date and year-round abundance. Small cetaceans are however increasingly threatened due to the developing fisheries industry, with bycatch being a major cause for concern. Other identified threats include increasing shipping traffic and unregulated marine tourism. Cetaceans are protected by national legislation but implementation of the relevant laws and conservation measures is hampered by resource constraints. The prevailing gaps in knowledge are also due to a lack of resources to carry out dedicated long-term research on cetaceans in a developing country with more immediate human development priorities. Therefore strengthened law enforcement and finding adequate resources for sustained systematic research that can inform management decisions are priorities in Sri Lanka.

DE VOS, A., R. CLARK, C. JOHNSON, G. JOHNSON, I. KERR, R. PAYNE and P.T MADSEN (2012) Cetacean sightings and acoustic detections in the offshore waters of Sri Lanka: March–June 2003. J. CETACEAN RES. MANAGE. 12(2): 185–193.

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The Indian Ocean Sanctuary was established in 1979 in an effort to allow exploited stocks of whales to recover from whaling and to facilitate benign research. Further information is required to establish comprehensive management and conservation measures for species within these waters. The current study took place in the offshore waters of Sri Lanka in early 2003. During three research cruises conducted between 29 March and 17 June 2003 the R/V Odyssey covered a total track line of 4,480km around the island resulting in 52 confirmed group sightings of 11 species from three cetacean families. As the tracklines were designed to locate sperm whales (*Physeter macrocephalus*) for tissue sampling, they accounted for the greatest number of sightings. Only two species of balaenopterids, the blue whale (*Balaenoptera musculus*) and the Bryde's whale (*Balaenoptera edeni*), were recorded with the blue whale being the most frequently sighted species. Spinner dolphins (*Stenella longirostris*) were the most dominant species in terms of numbers. Some small odontocetes such as the common bottlenose dolphin (*Tursiops truncatus*), striped dolphin (*Stenella coeruleoalba*) and Fraser's dolphin (*Lagenodelphis hosei*) were observed in mixed-species groups, while one group of melon-headed whales (*Peponocephala electra*) was seen associating with a group of sperm whales. Risso's dolphins (*Grampus griseus*) were frequently sighted throughout the research cruise, with one unusual record of a large mating group. Many sightings were made in the vicinity of the numerous submarine canyons around Sri Lanka's coastline highlighting their potential role in enhancing productivity in the offshore waters. It is concluded that Sri Lankan offshore waters hold a rich, but little surveyed cetacean fauna that warrants further studies and implementation of conservation measures to protect these populations.

ILANGAKOON, A.D. and KUMARAN SATHASIVAM (2012) The need for taxonomic investigations on Northern Indian Ocean blue whales (*Balaenoptera musculus*): implications of year-round occurrence off Sri Lanka and India. J. CETACEAN RES. MANAGE. 12(2): 195–202.

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The blue whale (*Balaenoptera musculus*) is one of the most common cetaceans in the waters around Sri Lanka and in a worldwide context one of the highest low-latitude sighting rates for this species has been recorded in these waters. As genetic analyses, acoustic studies and even long-term sighting surveys for blue whales in these waters are limited, the taxonomic status and population affinities of these animals are not definitively known at present. Sighting records of this species were examined from the waters around Sri Lanka and stranding records from the coasts of both Sri Lanka and India in terms of seasonality of occurrence and it was found that the species is clearly present in these waters throughout the year. This, together with secondary data on certain morphological characteristics and behavioural anomalies, indicates that these waters are ecologically important to blue whales in the Northern Indian Ocean and questions are raised regarding the subspecific identity and population affinities of the animals in the region. It is not clear if they belong to either of the two subspecies currently recognised for the Southern Ocean and Indian Ocean region: their

apparently non-migratory nature is akin to the pygmy blue whale *B. m. breviceuda*, while some morphological and behavioural characteristics are indicative of Antarctic blue whales of the subspecies *B. m. intermedia*. This raises the possibility of an entirely different or intermediate subspecies and the need to re-examine *B. m. indica* as a third subspecies in the Northern Indian Ocean. As clarifying their taxonomic status is important in the context of conservation and management, multi-disciplinary studies are urgently needed.

ANDERSON, R.C, TREVOR A. BRANCH, ANOMAALAGIYAWADU, ROBERT BALDWIN and FRANCIS MARSAC (2012) Seasonal distribution, movements and taxonomic status of blue whales (*Balaenoptera musculus*) in the northern Indian Ocean. *J. CETACEAN RES. MANAGE.* 12(2): 203–218.

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There is a distinct population of blue whales, *Balaenoptera musculus*, in the northern Indian Ocean. The taxonomic status of these animals has long been uncertain, with debate over whether this population represents a distinct subspecies, and if so which name should apply. They have most frequently been assigned to *B. musculus breviceuda*, but are currently considered to be *B. m. indica*. The movements of these blue whales within the northern Indian Ocean are poorly understood. This paper reviews catches (n = 1,288), sightings (n = 448, with a minimum of 783 animals), strandings (n = 64) and acoustic detections (n = 6 locations); uses ocean colour data to estimate seasonality of primary productivity in different areas of the northern Indian Ocean; and develops a migration hypothesis. It is suggested that most of these whales feed in the Arabian Sea off the coasts of Somalia and the Arabian peninsula during the period of intense upwelling associated with the southwest monsoon (from about May to October). At the same time some blue whales also feed in the area of upwelling off the southwest coast of India and west coast of Sri Lanka. When the southwest monsoon dies down in about October–November these upwellings cease. The blue whales then disperse more widely to eke out the leaner months of the northeast monsoon (during about December to March) in other localised areas with seasonally high productivity. These include the east coast of Sri Lanka, the waters west of the Maldives, the vicinity of the Indus Canyon (at least historically), and some parts of the southern Indian Ocean. The data are consistent with the hypothesis that at least some of the blue whales that feed off the east coast of Sri Lanka in the northeast monsoon also feed in the Arabian Sea during the southwest monsoon. These whales appear to migrate eastwards past the north of Maldives and south of Sri Lanka in about December–January, returning westwards in about April–May.

ANDERSON R.C., S. A. SATTAR and M.S.ADAM (2012) Cetaceans in the Maldives: a review. *J. CETACEAN RES. MANAGE.* 12(2): 219–225.

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The cetaceans of the Maldives were poorly known until relatively recently, but have received increased attention over the past decade. Twenty three species of cetacean have now been recorded. A number of sightings surveys, and one acoustic survey, have been completed. The species most frequently seen is the spinner dolphin (*Stenella longirostris*). A national system for reporting cetacean strandings has been in place since 2000, although some earlier

strandings were also reported; approximately 160 strandings of 16 species have been recorded to date. The species most commonly reported stranding is the sperm whale (*Physeter macrocephalus*). Ambergris has been exported from the Maldives since ancient times; recent export statistics are reviewed. All cetaceans are protected by law within Maldivian waters. More significantly, most forms of net-fishing, including gill-netting and purse-seining are banned in the Maldives to protect the traditional pole and line tuna fishery. Cetacean-watching is becoming increasingly popular, with spinner dolphins being the main attraction, although other species are also sought after on specialist trips.

CLARK, REBECCA A., CHRISTOPHER M. JOHNSON, GENEVIEVE JOHNSON, ROGER PAYNE, IAIN KERR, R. CHARLES ANDERSON, SHAHAAMA A. SATTAR, CELINE A. J. GODARD and PETER T. MADSEN (2012) Cetacean sightings and acoustic detections in the offshore waters of the Maldives during the northeast monsoon seasons of 2003 and 2004. J. CETACEAN RES. MANAGE. 12(2): 227–234.

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Despite its central position in the Indian Ocean Sanctuary, little is known about the offshore cetacean fauna of the Maldives. Here we report survey results gathered by the R/V Odyssey in the Maldives during the 2003 and 2004 northeast monsoon seasons, and provide data on cetaceans from visual and acoustic observations. The survey was conducted over a period of 72 days and covered 10,915 track line kilometres. The main aim of the survey was to collect biopsy samples from sperm whales (*Physeter macrocephalus*) as part of a global survey of ocean pollutants. Totals of 157 sightings and 1,461 acoustic detections of 16 identified cetacean species were recorded. Risso's dolphin (*Grampus griseus*), pantropical spotted dolphin (*Stenella attenuata*), spinner dolphin (*Stenella longirostris*) and sperm whale were the most commonly sighted species. Sperm whales and pantropical spotted dolphins were particularly abundant in the southern Maldives. The cetacean acoustic detection rate was 2.5 times higher than in the eastern Indian Ocean and Western tropical Pacific, while the non-physeterid sighting rate was 1.7 times higher than the Eastern tropical Pacific and 6.7 times higher than the eastern Indian Ocean based on other research conducted by the R/V Odyssey using the same methodology. It is concluded that the Maldives has a diverse and seemingly abundant cetacean community.

GORE, M.A., M.S. KIANI, E. AHMAD, B. HUSSAIN, R.F. ORMOND, J. SIDDIQUI, U. WAQAS and R. CULLOCH (2012) Occurrence of whales and dolphins in Pakistan with reference to fishers' knowledge and impacts. J. CETACEAN RES. MANAGE. 12(2): 235–247.

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This paper reports the findings of a project (Cetacean Conservation Pakistan) launched in 2004 with a view to: (a) undertaking quantitative surveys to determine the variety and abundance of species present; (b) working with local fisher communities to collate local knowledge and promote public awareness; and (c) promoting a marine cetacean conservation strategy and measures. Boat-based surveys for live animals and shore surveys for beachcast specimens have confirmed the presence of twelve species of whale and dolphin. Among these bottlenose dolphins (*Tursiops* sp.) occur both inshore along the coasts of Sindh and

Balochistan, and offshore in parts of Balochistan; these two populations possibly representing different sub-species. Indo-Pacific humpback dolphins (*Sousa chinensis*) are common inshore around the mouth of the Indus Delta and in large sheltered bays in Balochistan, where finless porpoise (*Neophocaena phocaenoides*) also occur. Spinner dolphins (*Stenella longirostris*) were observed in very large schools (up to 2,000) around the shelf edge in eastern Balochistan, as were Risso's dolphins (*Grampus griseus*) in smaller numbers. Common dolphins (*Delphinus capensis*) were recorded even further offshore. There were two sightings of humpback whales (*Megaptera novaeangliae*), and one of a killer whale (*Orcinus orca*). Bryde's whales (*Balaenoptera edeni*), sperm whales (*Physeter macrocephalus*) and Cuvier's beaked whales (*Ziphius cavirostris*) were recorded only during beach surveys, while skeletal remains in institutions also supported the occurrence of blue whales (*Balaenoptera musculus*). Work with local fisher communities supported this picture of species distribution and provided information on threats to local cetaceans. These are principally occasional entanglement in fishing gear and opportunistic exploitation for use as food, as bait, as medicine or for other purposes. The project incorporated policy development and the preparation of a marine cetacean biodiversity action plan that included the listing of species in provincial conservation legislation, the designation of a marine protected area in Balochistan, the establishment of a national whale and dolphin conservation society, and trials of whale and dolphin watching as a means of raising public awareness and providing alternative economic value.

AMIR, O.A, PER BERGGREN and NARRIMAN S. JIDDAWI (2012) Recent records of marine mammals in Tanzanian waters. J. CETACEAN RES. MANAGE. 12(2): 249–253.

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Marine mammal species diversity off Zanzibar and Tanzania, East Africa, has been recorded by the Marine Mammal Education and Research Group at the Institute of Marine Sciences, Zanzibar, Tanzania since 1998. The data presented in this report reflect the efforts of 10 years collection of information from marine mammals stranded and incidentally caught in Tanzanian waters. Additional information from dedicated surveys of cetaceans (whales and dolphins) and incidental sightings reported by the general public are also provided. From 1992 through 2008 a total of 235 specimens of 13 cetacean species and the dugong were recorded. 214 (90.7%) records referred to specimens from bycatch in drift and bottom-set gillnets and 22 (9.3%) referred to specimens from strandings. Based on incidental catch and sightings records, Indo-Pacific bottlenose, spinner and Indo-Pacific humpback dolphins, observed year-round, and humpback whales, observed seasonally during July to November, were the most common species in Tanzanian coastal waters.

DULAU-DROUOT, VIOLAINE, JACQUES FAYAN, LAURENT MOUYSSSET and VIRGINIE BOUCAUD (2012) Occurrence and residency patterns of humpback whales off Réunion Island during 2004–10. J. CETACEAN RES. MANAGE. 12(2): 255–263.

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Dedicated humpback whale surveys were conducted around Réunion Island during 2004–10. Boat-based surveys were conducted from June to October, in the main objective of collecting photo-identification data. For 2004–10, a total of 501 survey trips, representing 1,530 hours

of on searching effort, and 724 humpback whale sightings were achieved. Although effort had a significant influence on the number of sightings, sighting rate was shown to increase significantly from 2007 onwards, with a peak in 2008. Seasonal variations were observed, with significantly higher numbers of sightings occurring in July–September. Larger number of whales, together with increased survey effort, led to larger datasets collected in 2008–10, allowing further investigation of residency pattern. Within-year recaptures from fluke photographs showed that a relatively large proportion (30%) of the identified whales was recaptured on more than one day around the island. Maximum recapture interval reached 64 days, with a mean ranging 22–29 days for 2008–10. Mean residency, estimated from expected lagged identification rate, was 25 days. Mothers with a calf were shown to reside around the island for longer period of time than other individuals. A seasonal pattern of residency was demonstrated, with single capture individuals occurring early in the season, mainly as singleton or pairs, while individuals showing higher recapture interval were present around the island from August to October. Between-year recaptures were reported for 2009–10, with five individuals re-sighted on consecutive years. The fluke catalogue for Réunion includes 312 distinct individuals identified during 2004–10 surveys, together with 21 additional whales captured opportunistically since 2001. The increasing trend in the number of whales, the high residency time observed for 2008–10 and the recent occurrence of inter-annual recaptures suggest that Réunion Island has become an important migratory site for humpback whales within the south-western Indian Ocean (Breeding Stock C). The species might expand its spatial range by occupying new breeding sites (or re-occupying old ones) within the south-western Indian ocean, as a result of population growth.

PLÖN, S., K.H. ALBRECHT, G. CLIFF and P.W. FRONEMAN (2012) Organ weights of three dolphin species (*Sousa chinensis*, *Tursiops aduncus* and *Delphinus capensis*) from South Africa: implications for ecological adaptation? J. CETACEAN RES. MANAGE. 12(2): 265–276.

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Data from bycaught, but otherwise presumed healthy individuals can contribute important biological data on species of cetaceans that are otherwise lacking. This study utilises data collected from systematic necropsies performed between October 1970 and May 2010 on 142 Indo-Pacific humpback dolphins (*Sousa chinensis*), 607 Indo-Pacific bottlenose dolphins (*Tursiops aduncus*), and 640 long-beaked common dolphins (*Delphinus capensis*) incidentally caught and drowned in the shark nets off KwaZulu-Natal, South Africa. The aim of this analysis was to: (1) determine average absolute and relative organ weights for the three taxa as baseline values for later pathological examinations; and (2) examine potential correlations with the physiology and ecology in the three genera. Body length-weight relationships were described for the three species, indicating that *S. chinensis* is more robust than *T. aduncus*, with *D. capensis* being the smallest species out of the three taxa. Organ weights, as a percentage of total body weight were examined for the three delphinids. Organs examined included heart, lungs and trachea, liver, kidneys, spleen, and testes. Relative heart, liver and kidney weights were significantly larger in the small-bodied, fast-swimming *D. capensis*, than in the slower, more coastal *S. chinensis* and *T. aduncus*, possibly reflecting differences in activity patterns between the three species. Relative lung and trachea weights were not significantly different in the three species. Combined testes weight, as a percentage of total body weight, in combination with information on group size and sexual dimorphism suggested a monogamous or extreme polygynous (harem) mating system in *S. chinensis*,

frequent copulations in *T. aduncus*, and sperm competition in *D. capensis*. The results of the present study suggest that the relative sizes of the major organs in the three genera are a reflection of the differing life histories and ecologies of the species examined.

EYRE, ELIZABETH J. and JOHN FRIZELL (2012) A note on observations of cetaceans in the Indian Ocean Sanctuary, Australia to Israel, April 1995. J. CETACEAN RES. MANAGE. 12(2): 277–285.

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A forty-day voyage from Hobart (Australia) to Haifa (Israel) included a visual and acoustic census for cetaceans in the Indian Ocean Sanctuary. One hundred and sixty-three sightings were made, 156 occurring within the Sanctuary. Twelve species were identified. Sperm whales (*Physeter macrocephalus*) were encountered most frequently (51% of identified encounters), whilst spinner dolphins (*Stenella longirostris*) were numerically dominant. Other species identified included bottlenose dolphins (*Tursiops* spp.), short-beaked common dolphin (*Delphinus delphis*), pan-tropical spotted dolphin (*Stenella attenuata*), rough-toothed dolphin (*Steno bredanensis*), Risso's dolphin (*Grampus griseus*), killer whale (*Orcinus orca*), short-finned pilot whale (*Globicephala macrorhynchus*), false killer whale (*Pseudorca crassidens*), Bryde's whale (*Balaenoptera edeni*) and Cuvier's beaked whale (*Ziphius cavirostris*). The most sightings occurred WNW of the Seychelles, east of Somalia, and in the Gulf of Aden and Red Sea. Half of the sperm whale sightings were to the east of Ras Hafun (Somalia), and included adults, subadults and at least one calf. Thirteen hours were spent listening for cetaceans using a towed array whilst the ship was underway. Cetaceans were detected at 78% of the listening stations, with a possible four species recorded (sperm whale, spinner dolphin, pilot whale, bottlenose dolphin). The survey shows the value of platforms of opportunity for studying the pelagic communities of cetaceans in the Indian Ocean Sanctuary. It highlights the need for further research in the northwestern sector where anthropogenic threats are varied and increasing.

SPONSORS

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