Introduction

The formation of the IWC's Indian Ocean Sanctuary in 1979 stimulated a flurry of cetacean research in the region during the 1980s. This included the voyage of the RY *Tulip*, the burgeoning of cetacean studies in Sri Lanka, as well as other work which was reported to the IWC scientific review meeting held in Seychelles in February 1987 (Leatherwood and Reeves, 1989; Leatherwood and Donovan, 1991; Whitehead, 1989). However, since then there had been no regional gathering of interested scientists. Key aims of the IOCS in 2009 were therefore to bring together cetacean researchers from across the region and to demonstrate the breadth and quality of cetacean research being carried out within the Indian Ocean Sanctuary.

In the event, the IOCS brought together 60 cetacean scientists from some 22 countries. The Symposium was inaugurated by the then Vice President of the Maldives Dr. Mohamed Waheed Hassan Maniku. A report of the symposium (Sattar *et al*., 2009), including transcripts of opening speeches, abstracts of presentations, a list of participants and other details is available from the website of the Maldivian Marine Research Centre (*http://www.mrc.gov.mv*).

Some 43 presentations were made at the IOCS on a wide variety of topics relating to Indian Ocean cetaceans, under three general headings: regional reports, species reports and conservation and management. Several of those presentations were of works in progress, but just over a third have found their way into this peer-reviewed issue. An award for the best presentation at the IOCS by a coastal country scientist was presented to Muhammad Shoab Kiani (Pakistan), with Kanjana Adulyanukosal (Thailand) receiving a runner-up certificate.

In addition to presenting Indian Ocean research, another aim of the IOCS was to highlight the range of threats being faced by cetaceans within the Sanctuary. Fisheries bycatch emerged as a common problem in many countries, and that is reflected in several of the papers presented here. Other threats identified include ship strikes, oil and gas exploration, as well as pollution and (for coastal species) habitat degradation. The potential economic value of whale and dolphin watching, which is bringing employment and recreation to growing numbers of people around the Indian Ocean was also recognised.

The IOCS participants concluded the symposium with the formulation and adoption of the Lankanfinolhu Declaration[1]. That declaration recognised the continuing contribution of the Indian Ocean Sanctuary to cetacean conservation within the region; noted the need for countries and organisations within the region to address issues of bycatch and directed catches of small cetaceans; to ensure appropriate mitigation when seismic surveys are carried out; and to work towards habitat protection, especially for cetacean hotspots and critical habitats. It also supported the wider adoption of responsible whalewatching guidelines and regulations, and encouraged range states along with the IWC and others to develop a collectively agreed action plan to improve conservation outcomes for Indian Ocean cetaceans.

Other outcomes of the IOCS included: the production of a poster depicting the cetaceans of the tropical Indian Ocean, distributed to participants and to every school in Maldives; a presentation by OBIS-Seamap[2] demonstrating the possibilities and value of data archiving; two public lectures to schoolchildren by Dr. Michel Vély and Dr. Roger Payne; and this peer-reviewed volume.

The first paper in this issue is based on one of the two key note addresses at the IOCS. In his address, Sidney Holt discussed the background to the formation of the IWC's Indian Ocean Sanctuary. Holt was personally involved in the negotiations leading up to the formation of the Indian Ocean Sanctuary and his paper here provides his fascinating perspective on its origins.

In the second keynote address to the IOCS, Roger Payne described the findings of the five-year (2000–05) round-the-world *Voyage of the Odyssey*, which included two years in the Indian Ocean. (His address is not reported here, but details of the *Voyage* are available in: Ocean Alliance, 2009). Their global survey of sperm whales clearly demonstrated that these near-apex predators are concentrating potentially dangerous levels of toxic pesticides and metals. At the same time, the *Voyage of the Odyssey* provided a platform to survey cetaceans, often in areas where relatively little cetacean research has been carried out before. Reports from two such Indian Ocean areas (Sri Lanka and Maldives) are included here.

But the first of the regional reports published here is that of Adulyanukosol, Thaongsukdee and Kittiwattanawong who review cetaceans in Thailand. They look in particular at mass strandings, reporting on a series of five from the Andaman Sea (west) coast of Thailand involving four different species of odontocetes.

From India, Kumarran reviews cetacean records amassed over the past two centuries. Twenty five species of marine cetacean (plus one freshwater dolphin) are noted, with most records being from strandings and fisheries bycatch. There have been relatively few reports of sightings at sea, but most of those are recent, which suggests a hopeful trend towards more research on live cetaceans within India's extensive EEZ. On the other hand, Kumarran notes the real threat of fisheries interactions to small cetaceans and the poor quality of much existing data. Appropriately enough, in the next paper, Sathasivam and Natarajan outline a voluntary, web-based network being developed in India to improve the frequency and accuracy of data collected from cetacean strandings and bycatch.

[1] *http://www.mrc.gov.mv/index.php/news_events/iocs_closing/*

[2] *http://seamap.env.duke.edu*

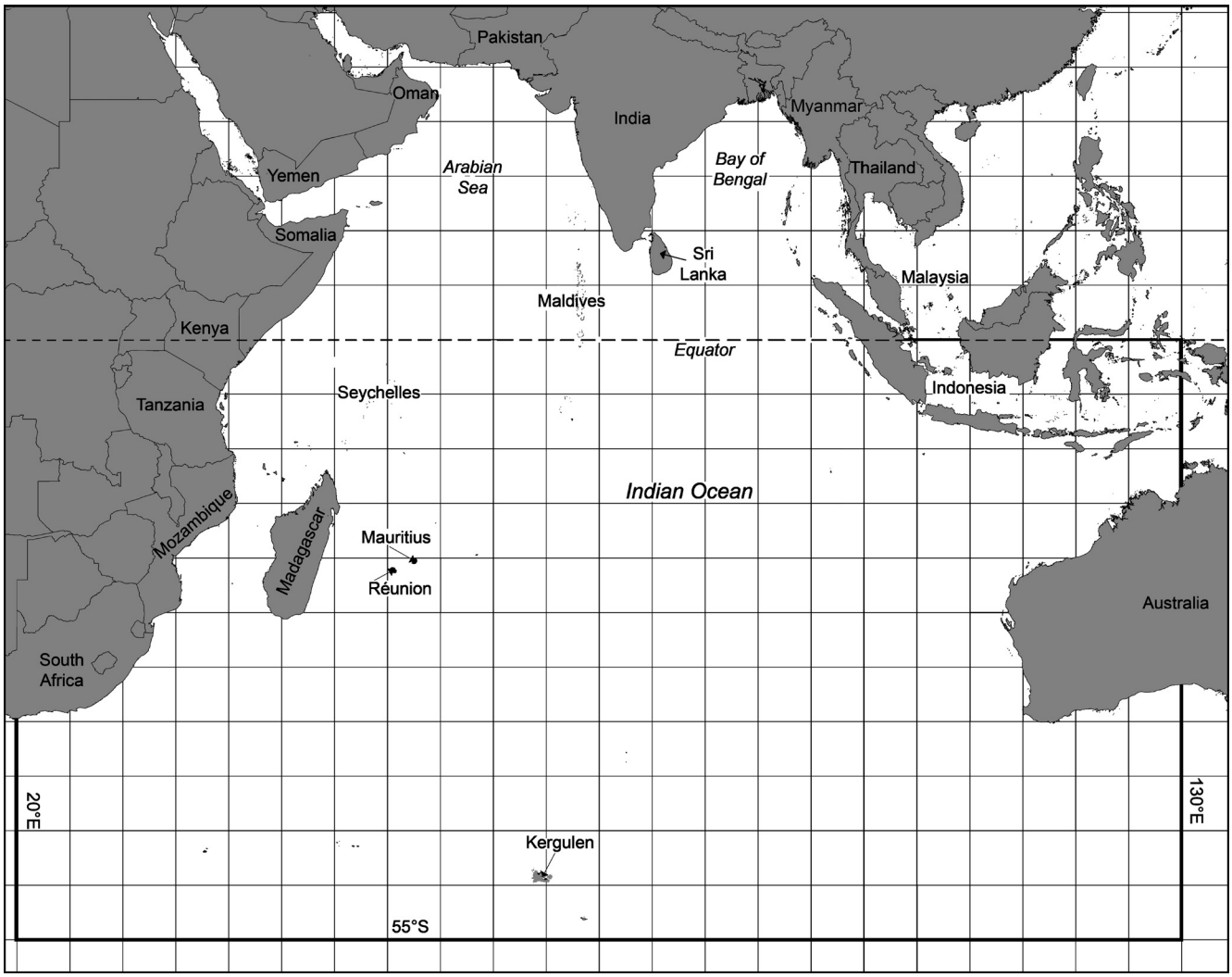

Fig.1. Map of the Indian Ocean showing extent of the Indian Ocean Sanctuary. This encompasses all Northern Hemisphere waters from the coast of Africa to 100°E, including the Red Sea and the Gulf, and Southern Hemisphere waters from 20°E to 130°E, with the southern boundary set at 55°S.

From Sri Lanka, Ilangakoon provides a review of information on and threats to cetaceans around this island nation. She notes that, with 27 species recorded to date (although there are still some unresolved taxonomic issues), Sri Lankan waters are home to a rich diversity of cetaceans. However, small cetaceans are particularly impacted as fisheries bycatch. There are also potential threats to larger cetaceans from shipping and a growing but currently unregulated whale watching industry. Still in Sri Lanka, De Vos *et al*. summarize the observations of the *Voyage of the Odyssey* in 2003. There were sightings of 11 different species, with sperm whales (*Physeter macrocephalus*) being the most frequently sighted and spinner dolphins (*Stenella longirostris*) being the most abundant. Canyons along the continental shelf edge were found to hold especially high concentrations of cetaceans.

Within the wider northern Indian Ocean, but particularly around Sri Lanka, there is growing interest in the local population of blue whale, which is likely a distinct subspecies, *Balaenoptera musculus indica*. Illangakoon and Sathasivam review blue whale records from Sri Lanka and India, confirming their year-round presence and highlighting the need for further taxonomic studies. Taking a broader view, Anderson *et al*. compiled blue whale catch, sighting, stranding and acoustic data from right across the northern Indian Ocean. They demonstrate that these whales track seasonally shifting peaks in productivity, driven by seasonally shifting monsoon currents. While there is still much to be learnt, Anderson *et al*. successfully predicted and located a previously unknown concentration of blue whales off the south coast of Sri Lanka, which has kick-started significant whale-watching activity there.

From the Maldives, Anderson, Sattar and Adam review information on cetacean sightings and strandings. Recent research has brought the number of species recorded to 23, with the spinner dolphin being the most abundant, as is the case in much of the rest of the tropical Indian Ocean. What is unusual in the Maldives, however, is that the traditional pole and line technique for catching tuna continues to dominate the fisheries sector, and most forms of net fishing (including gillnetting and purse seining) are banned. As a result there is negligible bycatch of cetaceans, and the Maldives is in effect a sanctuary within the Sanctuary. Perhaps as a result of this, Clark *et al*. (who present observations from two visits of the *Voyage of the Odyssey* in 2003–04) recorded cetacean acoustic detections 2.5 times

higher in the Maldives than at other sites visited in the Indian and Pacific Oceans. They also report sightings, with 16 species being recorded during their 72 days at sea in Maldivian waters.

Continuing westwards, Gore *et al*. report on a cetacean research and conservation programme launched in Pakistan in 2004. During boat-based and shore surveys, 11 species were identified. Bottlenose dolphin (*Tursiops* sp.), Indo-pacific humpback dolphin (*Sousa chinensis*) and finless porpoise (*Neophocaena phocaenoides*) occur in good numbers inshore, while spinner dolphin is abundant further offshore. Work with fisher communities identified entanglement in fishing gear and opportunistic exploitation (for food, bait and medicine) as threats to small cetaceans.

From Tanzania, Amir *et al*. review data collected over 10 years, mostly from strandings and incidental fisheries bycatch, together with some dedicated boat-based surveys and incidental sightings. Specimens of 13 different cetacean species were recorded; over 90% were from gillnet bycatch, the remainder being from strandings. From these data, and sightings, Indo-pacific bottlenose dolphin (*Tursiops aduncus*), spinner dolphin and Indo-pacific humpback dolphin were recorded year-round, while humpback whales (*Megaptera novaeangliae*) were only observed during the austral winter, July to November.

Also in the southwest Indian Ocean, humpback whales are the subject of the next paper, by Dulau-Drouot. From boat-based surveys around the island of Réunion she records 724 sightings of humpback whales, with 312 individuals being photo-identified. Most were recorded during July–September, with numbers increasing in recent years. This is consistent with the assessment of the IWC Scientific Committee that Breeding Stock C is recovering from commercial whaling (IWC, 2010) and may be re-occupying it former range.

While most papers in this volume report on surveys of whole animals, the penultimate paper by Plön *et al*. reports on organ weights, from presumed healthy dolphins accidentally entangled in shark nets off South Africa. Three species were studied: Indo-pacific humpback dolphin, Indo-pacific bottlenose dolphin and long-beaked common dolphin (*Delphinus capensis*). The data obtained not only provide a baseline for future pathological examinations, but also illuminate the differing life histories and ecologies of these species.

The final paper in this issue, like the first, covers the entire width of the Indian Ocean Sanctuary. Eyre and Frizell report on a voyage right across the Indian Ocean from Western Australia to the Red Sea. One hundred and fifty six sightings were recorded within the Indian Ocean Sanctuary, with sperm whales being the most frequently sighted and spinner dolphins being the most abundant. This survey highlighted the NW Indian Ocean around the Horn of Africa and the Gulf of Aden as being an area of particular importance for cetaceans. Unfortunately, since that voyage was completed in 1995, this is also an area where such studies are currently restricted by the very real danger of piracy. With the exception of this one area, cetacean research is flourishing across the Indian Ocean, as the papers here demonstrate. Long may it continue.

R. CHARLES ANDERSON
Guest editor

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Fig. 2. Participants at the Indian Ocean Cetacean Symposium, Paradise Island Resort, Lankanfinolhu Island, Maldives, July 2009.

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