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Summary review of cetaceans of the Red Sea

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Abstract

The cetacean fauna of the Red Sea is still poorly known. Direct observations combined with a review of the literature suggest that thirteen species of Cetacea occur in the Red Sea: two mysticetes (*Balaenoptera edeni* and *Megaptera novaeangliae*), and eleven odontocetes (*Delphinus capensis tropicalis, Globicephala macrorhynchus, Grampus griseus, Orcinus orca, Pseudorca crassidens, Sousa plumbea, Stenella attenuata, S. coeruleoalba, S. longirostris, Tursiops aduncus,* and *T. truncatus*). Of these species, only nine are acknowledged as regularly occurring in the region. For three species presumed to have occurred in the Red Sea on the basis of past accounts (*Balaenoptera acutorostrata, Physeter macrocephalus,* and *Steno bredanensis*), we found no clear evidence of their presence in the region and recommend to consider their occurrence doubtful until more knowledge is available. Although Red Sea cetaceans may be considered today among the world's least impacted by man, mainly due to the low human densities along the region's desert coasts, observed increases in activities particularly in the northern portion of the region, such as tourist and coastal development, fishing, shipping, and hydrocarbon extraction, suggest the need for a greater effort at collecting knowledge of the local cetacean populations, their ecological characteristics, potential threats and conservation status.

Introduction

The cetacean fauna of the Red Sea is among the world's least known, and even the species composition in the region is still shrouded in uncertainty. Unlike many other regions of the world's oceans, such as the seas around Europe, North and South America, Eastern Asia and Oceania, until recently cetaceans in the Red Sea have rarely been the subject of direct, targeted ecological investigations. The uneven distribution of cetacean records available from the region can be explained by the main sources of data, i.e., reports from the diving centres along the coasts of Egypt and Israel, and reports from observers aboard vessels crossing longitudinally the Red Sea along its midline. With few exceptions (e.g., Gladstone & Fisher 2000, Notarbartolo di Sciara *et al.* 2009), all the remaining published accounts of cetaceans from the region were based on anecdotal occurrences of animals sighted from passing vessels, stranded, or accidentally captured in fishing gear. There is

much need for a critical reassessment work of the cetacean species occurring in the Red Sea, and even the present review suffers from wide spatial gaps in the available knowledge, considering that large portions of the Red Sea still exist where ecological investigations by cetacean experts have never been made.

The Red Sea is geologically young, created and shaped by a continuing process of rifting, subsidence and pull-apart basin formation, starting roughly 24 million years ago (Bosworth *et al.* 2005). During most of its lifetime it formed a bridge between the Indian Ocean and the Mediterranean. The oceanic connections were at times restricted as evident from evaporitic sediments, although the deeper parts never dried up. Following the Messinian crisis which dried the Mediterranean about 6 million years ago, the connection to the latter through the Gulf of Suez was cut off, not to be renewed until the digging of the Suez Canal (Bosworth *et al.* 2005). Accordingly, the cetacean species composition of the northern Red Sea is different from that of the Mediterranean and other than species with global distribution it presents a selection of Indo-Pacific cetacean species which have adapted to its relatively cool waters. The digging of the canal in principle allowed two-way movement of cetaceans between the two water bodies, as part of the process of Lessepsian migration (Por 1978).

The very low human population density in the Red Sea coastal zone imposed by its desert nature, with a total of approx. 5 million inhabitants (Barale 2007), has contributed until recently to maintain the region in relatively unspoiled conditions. However, the marine environment in the Red Sea has come under increasing human pressures in the past 30 years, due to the natural vulnerability of this semi-enclosed sea, with delicate habitats (coral reef, seagrass and mangroves) being progressively degraded, fish stocks becoming depleted, vulnerable species becoming threatened, and marine areas becoming polluted through oil production and transportation, or locally degraded by human waste in correspondence of the major urban centres (Gladstone *et al.* 1999). The main human pressures on the Red Sea marine environment include maritime traffic, oil-based industrial development, fishing, and tourism.

A regional convention on the "Conservation of the Red Sea and Gulf of Aden Environment", also known as the Jeddah Convention, was signed in 1982 by all the concerned coastal nations to provide a legal framework for cooperation on marine issues in the region, to address pollution problems and conserve marine biodiversity. The Convention's implementation was mandated in 1995 to an intergovernmental organization, the Regional Organization for the Conservation of the Red Sea and Gulf of Aden (PERSGA), which adopted in 1998 a Strategic Action Plan (SAP) for the Red Sea and Gulf of Aden (PERSGA, 1998). Part of the conservation effort in the region is being dedicated to the establishment of MPAs to conserve representative and significant biodiversity while supporting sustainable resource usage and economic development (Chiffings 1995). However, although 75 MPAs have been established or recommended in the region, according to Gladstone *et al.* (2003) few are managed appropriately, and wide gaps still exist within these MPAs in the representation of regionally significant natural habitats.

This document presents a summary of cetacean species the occurrence of which in the Red Sea is confirmed. A more detailed review of the region's cetacean fauna, by the same authors, is in preparation and is expected to be submitted shortly for publication in the refereed literature.

Material and methods

The information contained in this review was compiled through an extensive consultation of the published and grey literature. Sources consulted to compile the review included: a) single-species global accounts (Perrin *et al.* 1987, Wilson *et al.* 1987); b) single species regional accounts (Baldwin *et al.* 2004, Smeenk *et al.* 1966); c) regional summaries of cetacean records, specifically from the Red Sea (Notarbartolo di Sciara et al. 2007), but also from the wider Indian Ocean region (Leatherwood 1986, Alling 1986, de Silva 1987, Frazier *et al.* 1987, Gilpatrick *et al.* 1987, Leatherwood *et al.* 1991, Weitkowitz 1992, Baldwin *et al.* 1998, 1999, de Boer *et al.* 2002, Baldwin 2003, Rudolph & Smeenk 2009, Hoyt 2011, Eyre & Frizell 2012); and d) accounts referring to specific areas within the Red Sea region (Rüppel 1845, Anderson 1902, Robineau & Rose 1984, Beadon 1991, Gladstone & Fisher 2000, Notarbartolo di Sciara *et al.* 2009).

This review also includes reports of sighting and strandings which were either recorded by the authors themselves during sea voyages or dedicated surveys and research projects, or collected from verified, reliable sources. Given that the type of information used in the review does not contain any indication of searching

effort, the derived occurrence maps cannot be assimilated to distribution maps for the species they refer to. The locations where such sightings occurred are shown in Figs. 1-6, subdivided by species.

Results: species accounts

Based on our review, thirteen species of Cetacea occur in the Red Sea with different levels of regularity. These include two mysticetes, Bryde's whales *Balaenoptera edeni,* and humpback whales *Megaptera novaeangliae,* and eleven odontocetes: *Delphinus capensis tropicalis, Globicephala macrorhynchus*, *Grampus griseus, Orcinus orca*, *Pseudorca crassidens, Sousa plumbea, Stenella attenuata, S. coeruleoalba, S. longirostris, Tursiops aduncus,* and *T. truncatus* (Table 1).

Three other species, minke whales *Balaenoptera acutorostrata*, sperm whales *Physeter macrocephalus*, and rough-toothed dolphins *Steno bredanensis*, have also been reported to occur in the region, however we were unable to find convincing evidence about their presence.

Mysticetes

Bryde's whale *Balaenoptera edeni* Anderson 1879

Records in the literature include animals stranded in Egypt (Anderson 1902, Anon. 1950) and Yemen (Robineau 1981), and sighted in Saudi Arabia (Gladstone & Fisher 2000). More recent sightings of the species were made reported off Israel in 2006, off Egypt in 2009 and 2012, and off Saudi Arabia in 2011.

Sightings of Bryde's whales in the Red Sea have been uncommon, but spread across the region (including the Gulf of Aqaba), very likely reflecting the presence of observers in concomitance with the animal's occurrence (Fig. 1, left). We tentatively propose that the species be considered regular in the Red Sea.

Humpback whale, *Megaptera novaeangliae* (Borowski, 1781)

The occurrence of humpback whales in the Red Sea has remained uncertain, until Debelius (1998) published photographs of a juvenile encountered near the Dahab Canyon off the Sinai Peninsula in the Gulf of Aqaba, close to the reef, in water of c. 15 m deep.

Since then, eight more sightings were reported between 2006 and 2012, one of them including a mother and calf pair, all seen in the northern part of the region, including the Gulf of Aqaba (five off Egypt and one off Israel). We found no confirmed record of humpback whales elsewhere in the Red Sea (Fig. 1, right).

In is unclear whether the whales sighted in the northern Red Sea belong to the Endangered Arabian Sea subpopulation or to the southwestern Indian Ocean (stock C). Based on the limited information, humpback whales are proposed as rare in the Red Sea, occasionally entering the Bab El Mandeb Strait from the Indian Ocean, and ending up in the northern end of the region.

Odontocetes

Killer whale, *Orcinus orca* (L., 1758)

Although several older accounts point to the presence of killer whales in the Red Sea (Leatherwood 1986, Frazier *et al.* 1987, Gladstone & Fisher 2000), the only documented record concerns the sighting of a group of six, 10 km off the coast of Eritrea, on 6 May 2004 (from the crew of the "Odyssey", posted on the Internet). The rare occurrence of killer whales in the southern Red Sea support the presumption that the species is an occasional visitor from the Gulf of Aden and the wider Indian Ocean.

False killer whale, *Pseudorca crassidens* (Owen, 1846)

Records of false killer whales in several locations of the Red Sea, north to south (including the Gulf of Aqaba), are not rare in the literature (Beadon 1991, Robineau & Rose 1984, Alling 1986, Frazier *et al.* 1987, Weitkowitz 1992). In addition, we report recent sightings from the waters of Egypt, Israel, Sudan, and Saudi Arabia (Fig. 2, left).

Short-finned pilot whale, *Globicephala macrorhynchus* Gray, 1846

Leatherwood *et al.* (1991) reported three sightings of pilot whales in the southern Red Sea in the 1980s. More recent, confirmed records from 2000-01 include one sighting off southern Egypt and two in Eritrean waters (Fig. 2, right). We propose *G. macrorhynchus* to be a rare, occasional species in the Red Sea.

Risso's dolphin, *Grampus griseus* (G. Cuvier, 1812)

Older reports of the species from the Red Sea are not uncommon, and spread throughout the region from Egypt (Weitkowitz 1992, Eyre & Frizell 2012), including Egyptian and Israeli waters well inside the Gulf of Aqaba (Beadon 1991), south to Sudan (Robineau & Rose 1984, Leatherwood 1986, Eyre 1995) and southern Saudi Arabia (Eyre 1995, Eyre & Frizell 2012). In addition, we here report on several sightings made in the northern Red Sea, including the waters of Egypt along the Sinai Peninsula and near Hurghada, the waters off Israel and southern Egypt, as well as Sudanese and Saudi waters spanning most of the region's southern midline (Fig. 3, left). In the northern Red Sea Risso's dolphins are seen primarily in deep waters, however in places where the 100-1000 m isobaths are close to shore, the species was easily accessible. No sightings have been recorded in the shallow Gulf of Suez (Feingold, 2007). Risso's dolphins are clearly a regular cetacean in the Red Sea.

Indo-Pacific humpback dolphin, *Sousa plumbea* (G. Cuvier, 1829)

Indian Ocean humpback dolphins are a well known species from the coastal waters of the Red Sea (Baldwin *et al.* 2004), from well inside the Suez Canal region in the north (de Silva, 1987), to the Gulf of Suez (Beadon 1991), all the way to the southern Red Sea (Leatherwood 1986, Frazier *et al.* 1987), including the Farasan Islands in Saudi Arabia (Gladstone & Fisher 2000), Yemen (Weitkowitz 1992), and even Djibouti (Alling 1986). Our recent reports include the coastal waters of Egypt near Hurghada, Hamata and Shalateen, and the Dahlak Archipelago in Eritrea (Fig. 3, right). It is suggested that *S. plumbea* is widely distributed throughout the Red Sea shallow coastal areas, including the waters inland of coastal reefs; probably absent from, or very rare in, the Gulf of Aqaba.

Common bottlenose dolphin, *Tursiops truncatus* (Montagu 1821)

The presence of *T. truncatus* in the Red Sea has been reported by several authors, however in most past accounts it is not clear whether reports really involved *T. truncatus*, or represented a misidentification of *T. aduncus* (e.g., Alling 1986, Gladstone & Fisher 2000). The difference was clearly emphasized by Beadon (1991), who saw them in the Gulf of Suez and Aqaba and clearly recognised them as a species different from *T. aduncus* on the basis of size (up to >4 m), body shape and colour patterns. Frazier *et al.* (1987) mention Beadon's observations, which they assigned to the subspecies *T. t. gilli*. In addition, we here report on several sightings of *Tursiops* in Egyptian, Saudi and Yemeni waters, that were assigned to *T. truncatus* on the basis of their large size, shape of head, and pigmentation (e.g., without the spots that are typical of *T. aduncus*, see next species). *T. truncatus* appeared to be present in coastal waters, but also not infrequently offshore, in general farther out at sea than the more coastal *T. aduncus* (Fig. 4, left).

Indo-Pacific bottlenose dolphin, *Tursiops aduncus* (Ehrenberg, 1833)

As argued above, due to taxonomic uncertainties surrounding the genus *Tursiops* in the past decades (and, to a minor extent, still persisting today), many of the bottlenose dolphins identified as *T. truncatus* in the older references could have easily been, in reality, *T. aduncus*, a species originally described from the region and widely distributed along the Red Sea coastal area and near offshore reefs (e.g., Gladstone & Fisher 2000). In

our records *Tursiops aduncus* was regularly encountered in the northern Red Sea, including the Gulf of Aqaba and the coast of Egypt all the way south to the border with Sudan (Fig. 4, right). The dearth of sightings in other portions of the Red Sea can be explained, in our opinion, more by the fact that many authors choose to report their sightings as *Tursiops* sp. (e.g., Eyre & Frizell 2012) than to real distributional characteristics of the species.

Pantropical spotted dolphin, *Stenella attenuata* (Gray, 1846)

Frazer *et al.* (1987) describe this species as probably the most common dolphin in the Red Sea, correctly predicting to be likely as abundant in the less well known parts of the Red Sea to the south, as it was reported by Beadon (1991) in the Gulf of Aqaba. Eyre (1995) and Eyre & Frizell (2012) mention spotted dolphin sightings in the northern, central and southern part of the Red Sea. We report frequent sighting of often large schools of *S. attenuata* in the waters of all the countries bordering on the Red Sea, including the Gulf of Aqaba but not the Gulf of Suez (Fig. 5, left). Mixed *S. attenuata/S. longirostris* are not rare.

Spinner dolphin, *Stenella longirostris* (Gray, 1828)

Spinner dolphins have been long known to be frequent in the Red Sea (e.g., Leatherwood 1986, Gladstone & Fisher 2000, Notarbartolo di Sciara *et al.* 2009), as well as in the adjacent waters off Djibouti (Robineau & Rose 1983, 1984). Our reports include abundant sightings from Egyptian waters, including the Gulf of Aqaba (but not the Gulf of Suez), as well as sighting in offshore Saudi, Eritrean and Yemeni waters (Fig. 5, right).

Striped dolphin, *Stenella coeruleoalba* (Meyen, 1833)

Wilson *et al.* (1987), in their worldwide summary for the species, include the Red Sea within *S. coeruleoalba*'s range (Fig. 1, p. 3), however we could find no reference to such occurrence within the source material included in their report. With conclusive evidence of striped dolphins' occurrence in the region missing, the species has often been retained as being possibly present in the Red Sea (e.g., Baldwin *et al.* 1998, Jefferson *et al.* 2008).

We report one sighting of striped dolphins made by two of us (CS and MA) in the offshore waters of southern Egypt in July 1985. Further evidence of the species' occurrence in the region was provided by Hagan (2006), with a photograph of a striped dolphin (labelled "common dolphin") riding the bow wave of her research vessel in the Farasan Islands area (Saudi Arabia). More observations in the southern Red Sea are needed to determine the extent of the occurrence of *S. coeruleoalba* in the region.

Indian Ocean common dolphin, *Delphinus capensis tropicalis* Van Bree, 1971

The first record of Indian Ocean dolphins for the Red Sea is given by Rüppell (1842) who speaks of the occurrence of a dolphin characterized by a very long, narrow, beak-like rostrum, said to have about 50 teeth in each lower jaw. In their taxonomic study, Jefferson & Van Waerebeek (2002) included twelve skulls from the Red Sea, but give no detail of collecting localities and dates. In recent years, sightings of common dolphins have been made in the southern half of the Red Sea (Leatherwood 1986, Smeenk *et al.* 1996). Our reports include a number of sightings made in offshore waters of Sudan, Saudi Arabia, Eritrea and Yemen (Fig. 6, left). Indian Ocean common dolphins seem to be a regular species in the Red Sea, but generally limited to the southern part of the region.

Discussion points

- For a number of cetacean species mentioned in the literature as present, or possibly present, in the Red Sea, including the common minke whale *Balaenoptera acutorostrata* (Slijper *et al.* 1964, Leatherwood 1986), the sperm whale *Physeter macrocephalus* (Slijper *et al.* 1964, Yalden *et al.* 1986, Baldwin 2003), and the rough-toothed dolphin *Steno bredanensis* (Frazier *et al.* 1987), we could find

no convincing evidence substantiating such claims, and we recommend further investigations to determine whether these species had indeed occurred in the region in the past.

- A sighting of small whales, possibly *Feresa attenuata* or *Peponocephala electra*, was made by two of us (CS and MA) in 2001 in southern Red Sea waters. However, unambiguous species identification could not be made at the time because of the distance of the sighting.
- The absence from the region of members of the cetacean families Ziphiidae, Physeteridae and Kogiidae is surprising, and investigations on the possible causes of such absence are recommended.
- Red Sea cetaceans are obviously derived from populations originating from the Indian Ocean. A single exception may be provided by *Tursiops truncatus*, in case this species' hypothetical counter-Lessepsian migration from the Mediterranean, as mentioned by Frazier *et al.* (1987), were to be confirmed.
- While the regular species are found throughout the basin, most of the rarer species were recorded from the southern portion of the Red Sea, suggesting that such occurrences involved visitors from the Gulf of Aden and the wider Indian Ocean.
- Conservation concerns, possible measures, and relevant institutional framework (e.g., PERSGA): although Red Sea cetaceans may be considered today among the world's least impacted by man, mostly due to the low human densities along the region's desert coasts, observed increases in activities (e.g., tourist coastal development, shipping, oil extraction) suggest the need for a greater effort at collecting knowledge of the local cetacean populations, their ecological characteristics, potential threats and conservation status.

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Species	Occurrence	Notes
Balaenoptera edeni	**possibly regular**	
Megaptera novaeangliae	rare	
Orcinus orca	rare	Records limited to the southern Red Sea
Pseudorca crassidens	**regular**	
Globicephala macrorhynchus	rare	
Grampus griseus	**regular**	
Tursiops aduncus	**regular**	
Tursiops truncatus	**regular**	
Sousa plumbea	**regular**	
Delphinus capensis tropicalis	**possibly regular**	Records limited to the southern Red Sea
Stenella attenuata	**regular**	
Stenella longirostris	**regular**	
Stenella coeruleoalba	rare	Records limited to the southern Red Sea

Table 1. Cetacean species occurring in the Red Sea.

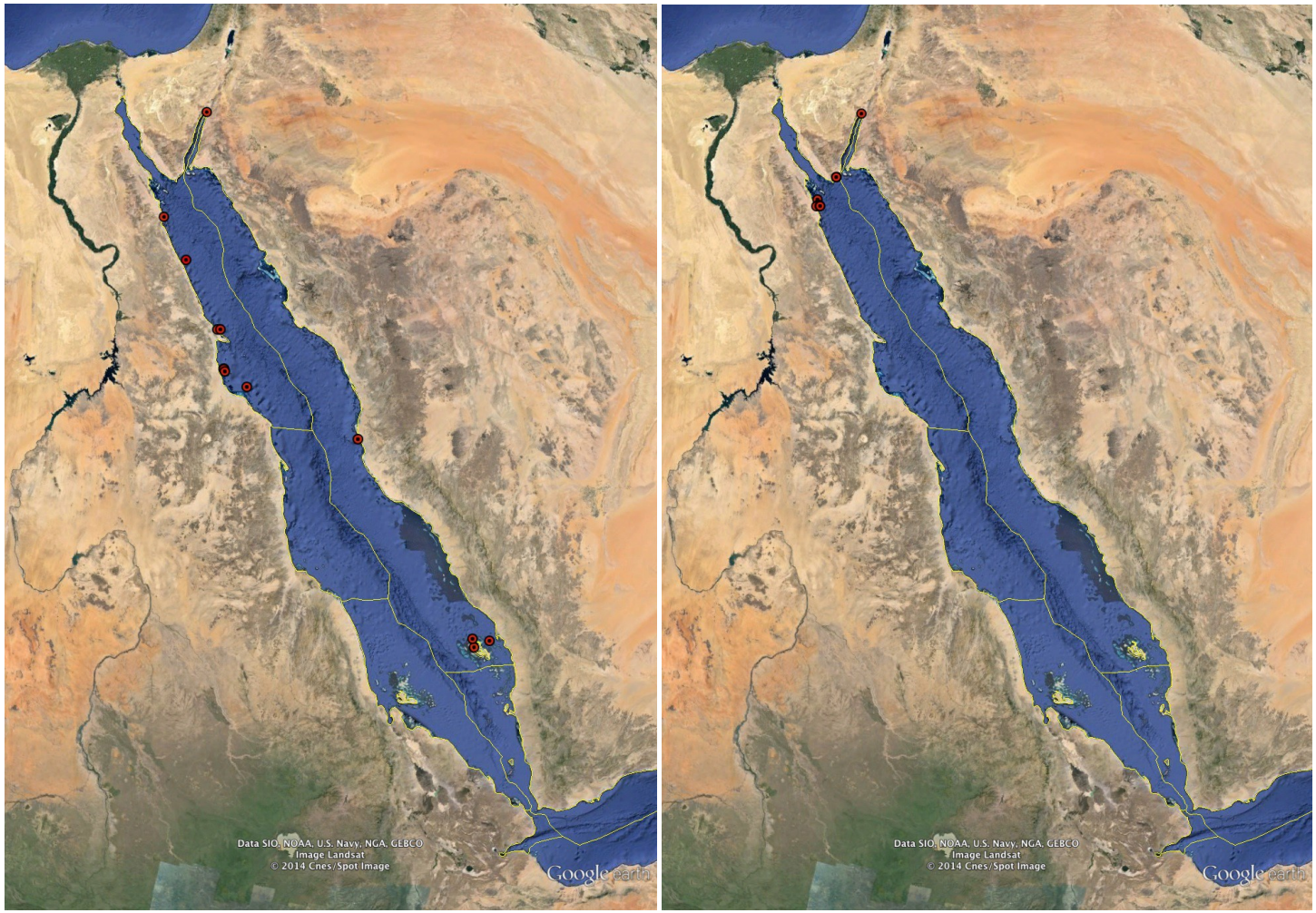

Fig. 1. Recent occurrences of Bryde's whales (left) and humpback whales (right) in the Red Sea.

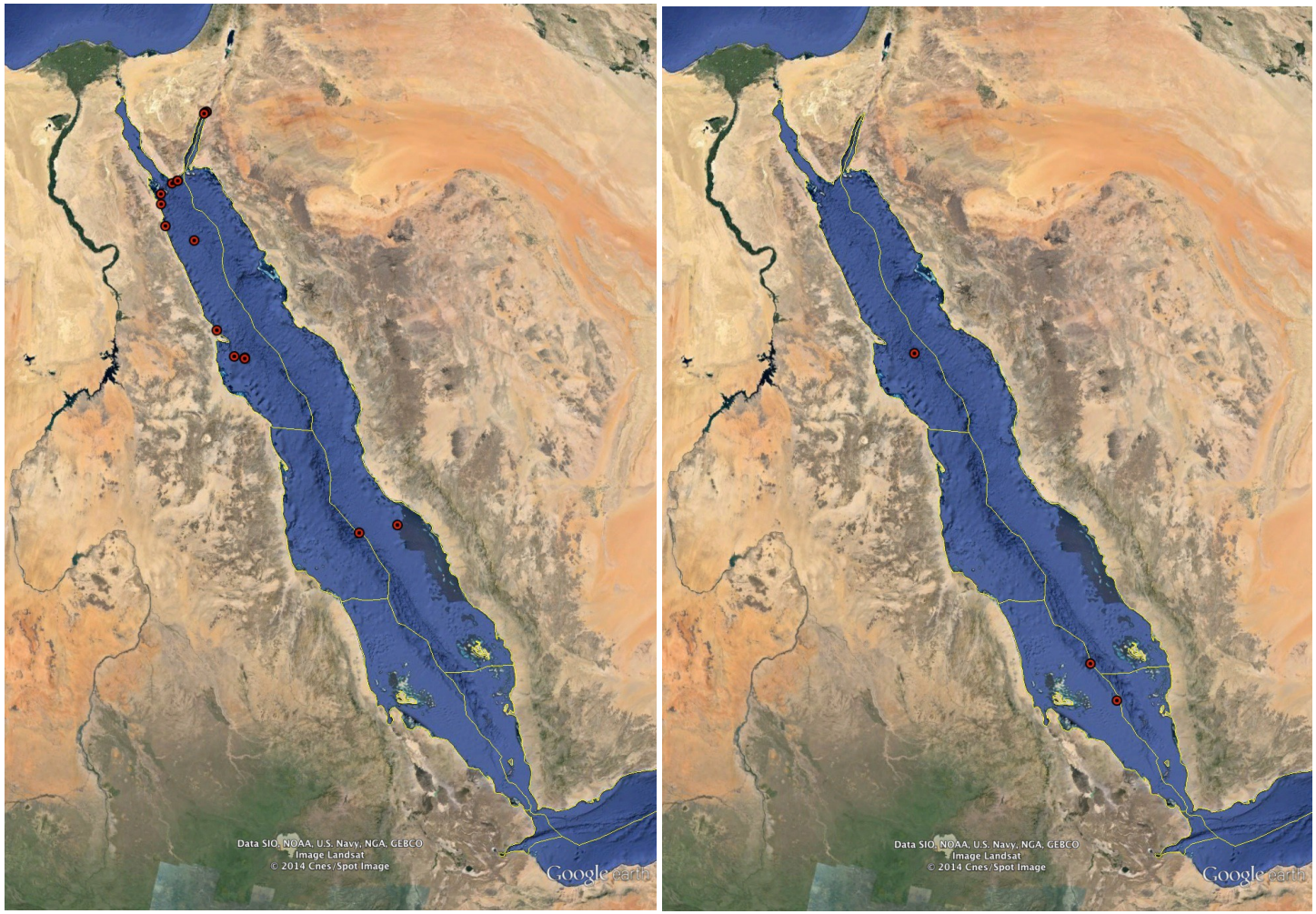

Fig. 2. Recent occurrences of false killer whales (left) and short-finned pilot whales (right) in the Red Sea.

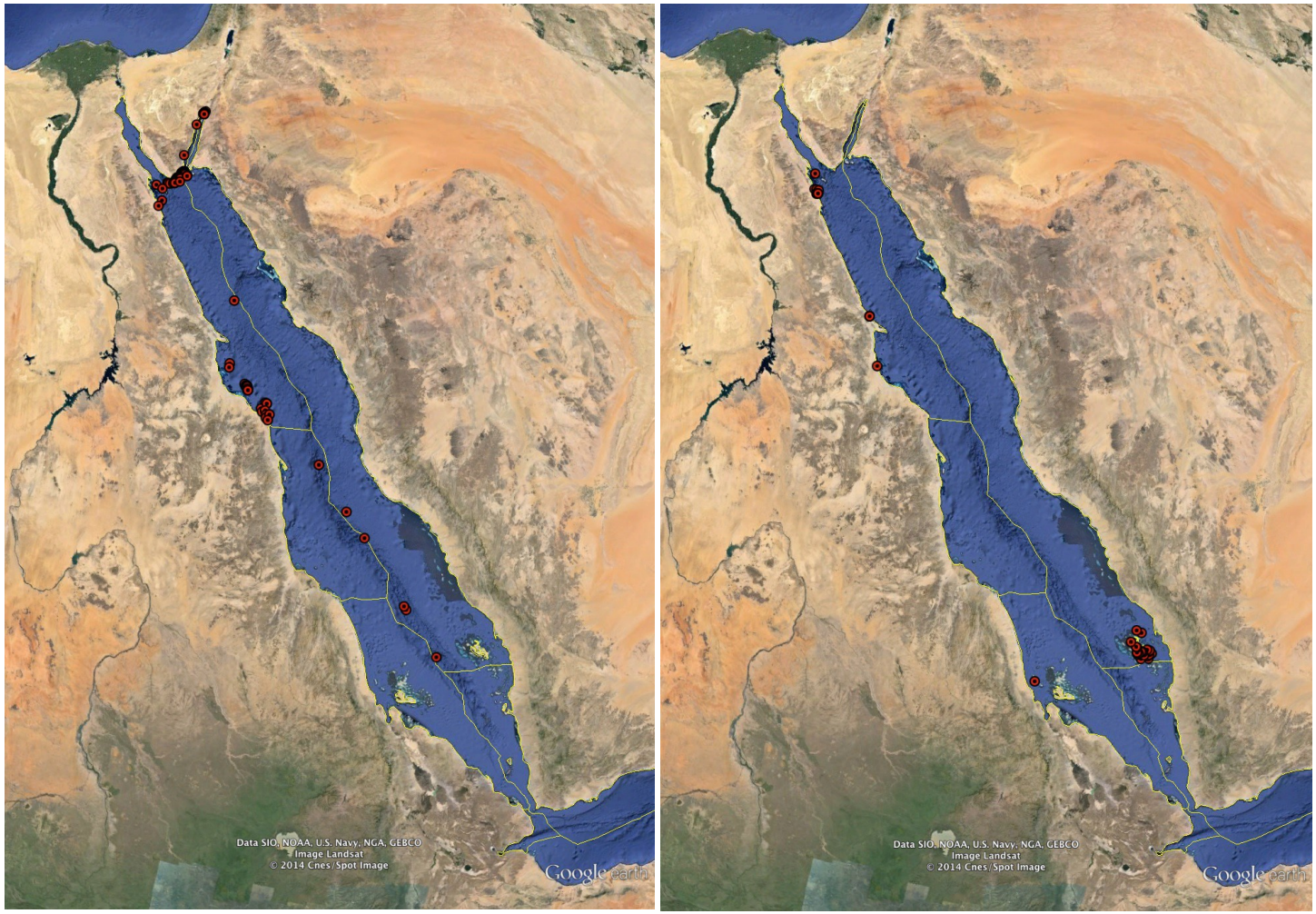

Fig. 3. Recent occurrences of Risso's dolphins (left) and Indian Ocean humpback dolphins (right) in the Red Sea.

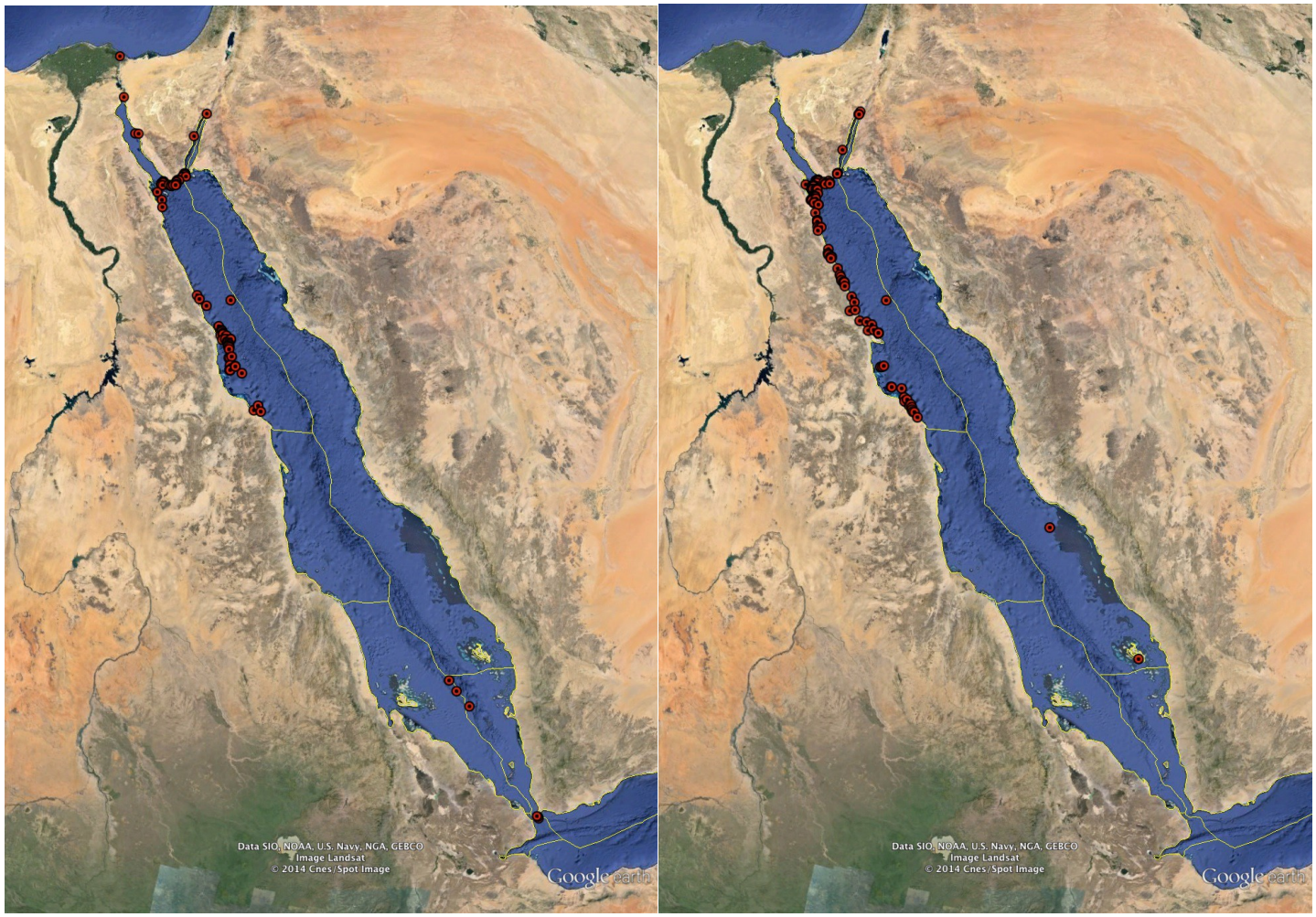

Fig. 4. Recent occurrences of common (left) and Indo-Pacific bottlenose dolphins (right) in the Red Sea.

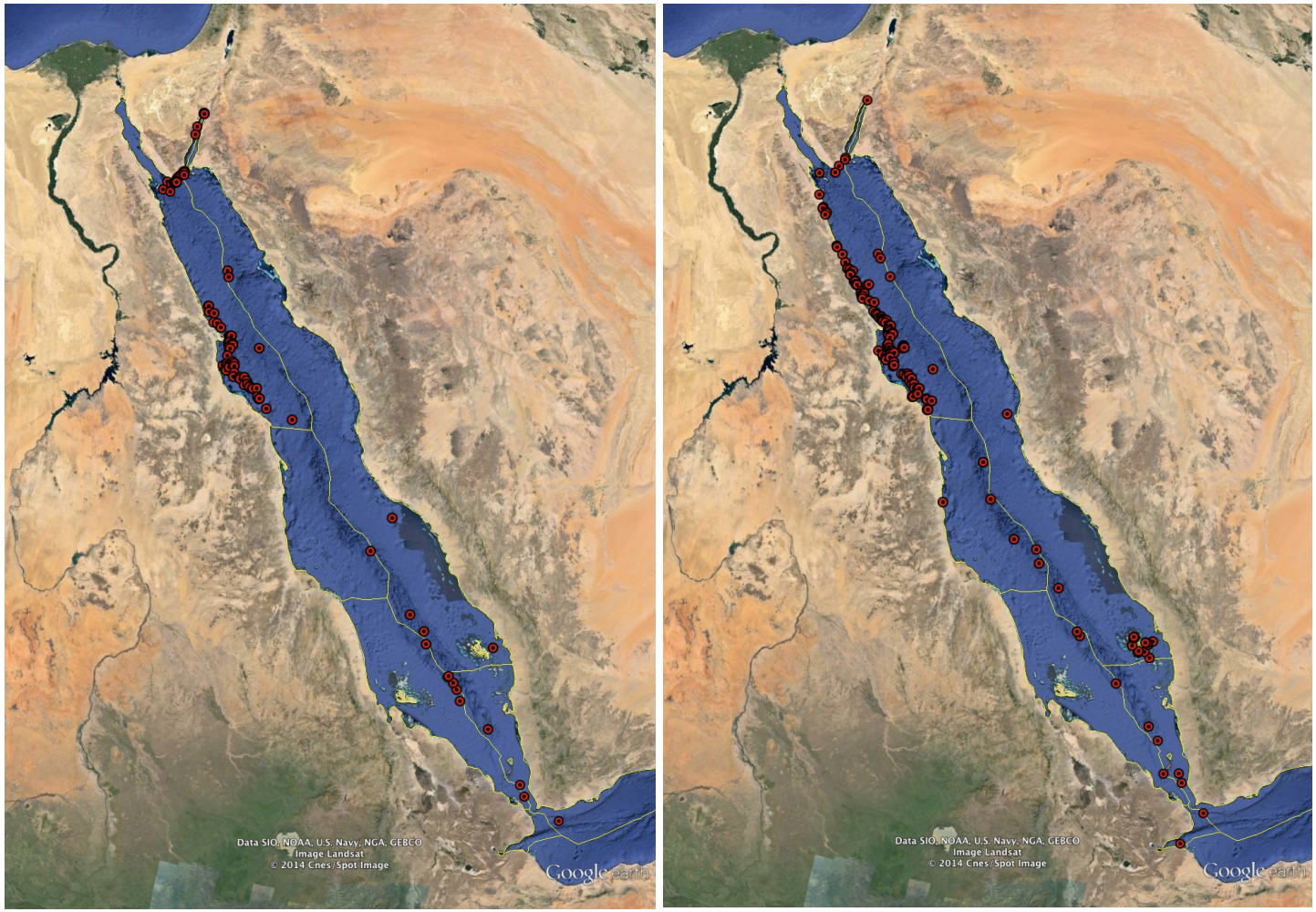

Fig. 5. Recent occurrences of pantropical spotted (left) and spinner dolphins (right) in the Red Sea.

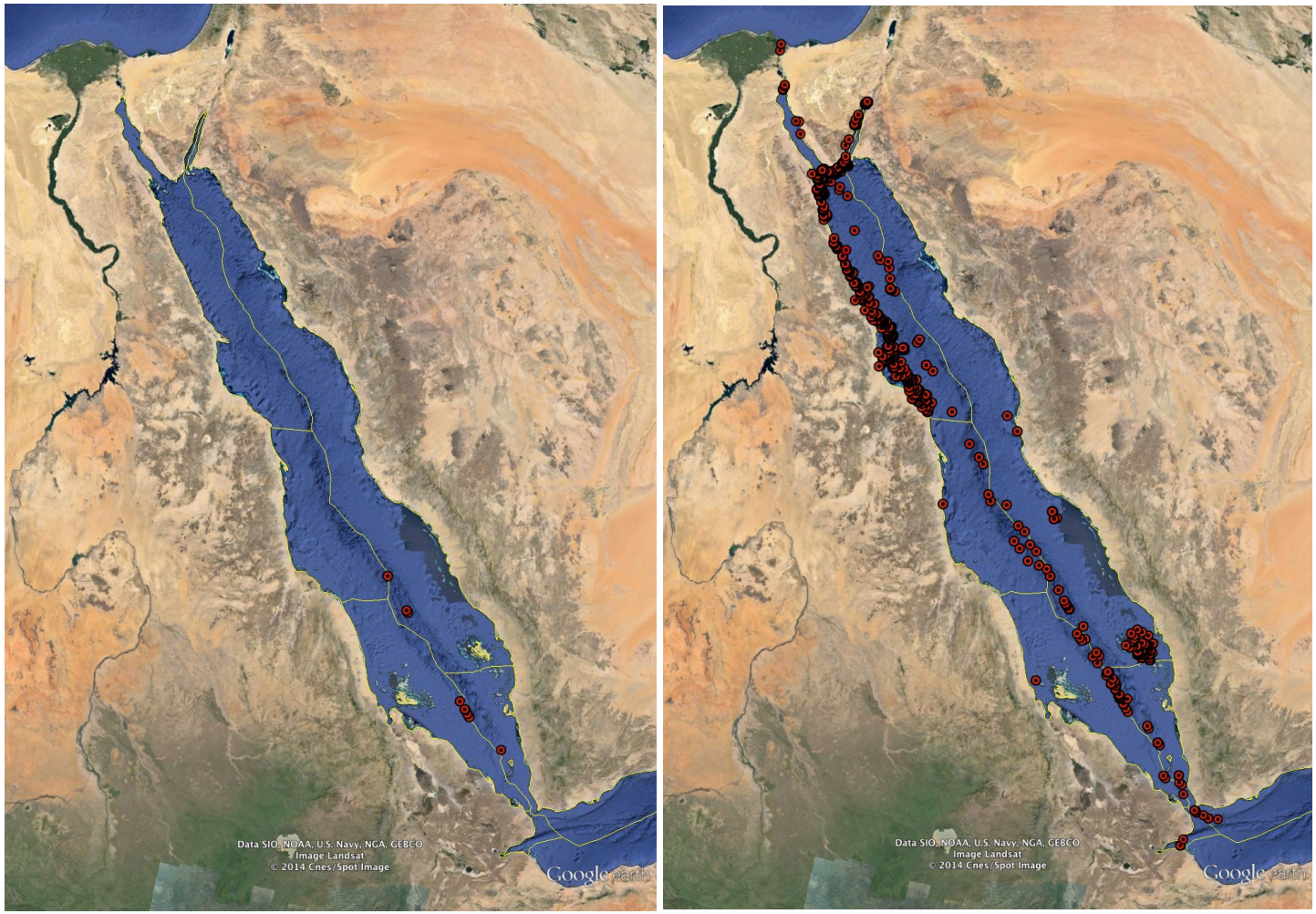

Fig. 6. Recent occurrences of Indo-Pacific common dolphins in the Red Sea (left). To the right, all cetacean sightings.