

Atlantic Humpback Dolphin (*Sousa teuszii*) 1891-2022

Bibliography

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NCRL subject guide 2022-05

<https://doi.org/10.25923/hthm-zj06>

April 2022



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Background & Scope

The Atlantic humpback dolphin (*Sousa teuszii*) is a coastal species endemic to tropical and subtropical eastern Atlantic nearshore waters of western Africa, ranging from Western Sahara to Angola. This species occurs exclusively in shallow (<30 m) depths, in warm nearshore waters, and in dynamic habitats strongly influenced by tidal patterns (e.g., sandbanks, deltas, estuaries, and mangrove systems). Atlantic humpback dolphin populations are small and fragmented, ranging from the tens to low hundreds of individuals. Available information indicates that the species probably includes fewer than 3,000 individuals.¹

The NOAA Fisheries' Office of Protected Resources initiated a status review for the Atlantic humpback dolphin in December 2021 to determine whether listing the species as threatened or endangered under the [Endangered Species Act](#) (ESA) is warranted.

This bibliography includes all literature, including non-English language articles, published since the species was first described in the late nineteenth century (1891) through April 2022. It is intended as a reference resource for ESA staff of the NOAA Fisheries' Office of Protected Resources when compiling and summarizing any relevant information for this cetacean species.

Articles in this bibliography are categorized into the following sections: Life History and Ecology, Population Abundance and Trends, Threats, Conservation, and General.

Section I – Life History and Ecology

Section one is intended to provide an overview of information on the life history and ecology of the Atlantic humpback dolphin. The research in this area includes literature on lifespan, diet, metabolism, reproduction, genetics, taxonomy, body size, morphology, habitat, migration, acoustics, behavior, and social ecology, distribution and habitat use, population structure, range, and demography.

Section II – Population Abundance and Trends

Section two is intended to provide an overview of the population estimates and abundance of the Atlantic humpback dolphin. Articles focus on observations from various West African nations, as well as trends affecting population size.

Section III – Threats

A threat is defined as any factor that could represent an impediment to a species' recovery. Thus, section three is intended to provide an overview of any existing threats to the Atlantic humpback dolphin. This may include fisheries bycatch and prey depletion, entanglements, vessel strikes, deliberate capture, coastal development, climate change, pollution, and anthropogenic noise.

Section IV – Conservation

Section four is intended to provide an overview of current conservation efforts related to the Atlantic humpback dolphin. Literature focuses on local and international conservation efforts, monitoring, regulatory mechanisms, and coastal zone management.

Section V – General

Section five contains literature that gives a generalized overview on Atlantic humpback dolphins, the genus *Sousa*, and marine mammals, particularly cetaceans, off the coasts of Africa.

¹ NOAA Fisheries (2022) *Atlantic Humpback Dolphin*, <https://www.fisheries.noaa.gov/species/atlantic-humpback-dolphin>

Sources Reviewed

The following databases were used to identify sources: Clarivate Analytics' Web of Science: Science Citation Index Expanded and Social Science Index; Digital Science's Dimensions.ai; Lens.org; ProQuest's Science and Technology collections including Aquatic Science Fisheries Abstracts; Elsevier's Science Direct; JSTOR; EBSCO's Academic Search Complete and Environment Complete; NOAA's Institutional Repository; Elsevier's Science Direct; International Whaling Commission (IWC); IUCN Red List of Threatened Species; Consortium for the Conservation of the Atlantic Humpback Dolphin; Convention on the Conservation of Migratory Species of Wild Animals; and Google Scholar.

Section I: Life History and Ecology

Bamy, I. L., Van Waerebeek, K., Bah, S. S., Dia, M., Kaba, B., Keita, N., & Konate, S. (2010). Species Occurrence of Cetaceans in Guinea, Including Humpback Whales with Southern Hemisphere Seasonality. *Marine Biodiversity Records*, 3, 10. <https://doi.org/10.1017/S1755267210000436>

An initial inventory of the dolphins and whales occurring in Guinea's coastal waters is documented primarily from specimens and photographic evidence obtained from strandings and by-catches. Seven species are fully validated, four odontocetes, *Tursiops truncatus*, *Sousa teuszii*, *Stenella frontalis*, *Kogia breviceps* and three balaenopterid whales: *Balaenoptera brydei*, *Balaenoptera acutorostrata* and *Megaptera novaeangliae*. Another three reported species (*Globicephala macrorhynchus*, *Steno bredanensis* and *Delphinus delphis*) are insufficiently supported but thought to be valid. Small cetaceans landed as by-catch and a stranded whale were used for human consumption, but no evidence of substantial takes, directed or by-catch, was found. However, concern is raised about even minimal takes of the vulnerable Atlantic humpback dolphin. The seasonal presence of three confirmed humpback whales, two strandings (July and September) and a sighting (October), is synchronous with the species' southern hemisphere wintering/breeding season in low latitudes. We hypothesize that these whales may comprise the north-westernmost range of the population that breeds/overwinters in coastal waters of the Bight of Benin, northern Gulf of Guinea.

Beaubrun, P. C. (1990). Un Cétacé Nouveau Pour Les Côtes Sud-Marocaines: *Sousa teuszii* (Kükenthal, 1892). *Mammalia*, 54(1), 162-164. <https://doi.org/10.1515/mamm.1990.54.1.147>

This paper describes two consecutive sightings of a mixed group of bottlenose and Atlantic humpback dolphins in Dakhla Bay, Western Sahara on January 14th and 15th 1989.

Best, P. B. (2007). Atlantic Humpback Dolphin, *Sousa teuszii*. In *Whales and Dolphins of the Southern African Subregion*. P. B. Best (Ed.), (pp. 163 - 166). Cambridge, UK: Cambridge University Press

Although there is some confusion about the number of forms of humpback dolphin that exist and whether they should be assigned specific or subspecific status, most studies seem to show that the dolphins occurring in the Atlantic ocean off West Africa are both geographically isolated and morphologically different from those in the Indo-Pacific region, and this distinction is recognized by assigning them to the species *S. teuszii*.

Cadenat, J. (1956). Un Delphinidae Encore Mal Connu De La Côte Occidentale D'Afrique: *Sotalia teuszii* Kükenthal 1892. *Bulletin de l'Institut Français d'Afrique Noire*, 18, 555-566.

This French language paper describes in more detail the observations and anatomical detail of *Sousa teuszii* observed in Senegal in the 1940s.

Cadenat, J., & Paraiso, F. (1957). Nouvelle Observation De *Sotalia teuszii* (Cétacé, Delphinidé) Sur Les Côtes Du Sénégal. *Bulletin de l'Institut Français d'Afrique Noire*, 19, 324-332.

This French language paper describes specimens of *Sousa teuszii*, which the author then referred to as *Sotalia*. Details on measurements for males and females and other aspects of morphology are described in detail.

Cockcroft, V. G., Leatherwood, S., Goodwin, J., & Porter, L. J. (1997). *The Phylogeny of Humpback Dolphins Genus Sousa: Insights through mtDNA Analyses*. International Whaling Commission, SC/49/SM25. Retrieved from <https://archive.iwc.int>

The humpback dolphin, *Sousa sp.*, is widely distributed in shallow, tropical and warm coastal waters of West Africa, the Indian and western Pacific Oceans. The genus presently includes five nominal species: *S. chinensis* (Osbeck, 1765), *S. plumbea* (G. Cuvier, 1829), *S. lentiginosa* (Owen, 1866), *S. teuszii* (Kükenthal, 1892) and *S. borneensis* (Lydekker, 1901). Views on the status of the genus range from acceptance of all five species to a conservative one species, where even the Atlantic *S. teuszii* is combined with the Indopacific forms in one species, *S. Chinensis* (Ross et al. 1996). Dolphins of the genus are generally referred to as Atlantic or Indopacific humpback dolphins, according to their location. They generally occur in shallow water less than 20 m deep, though this may be several kilometres from shore. The saline and often turbid channels into mangroves and between sandbanks and the seasonal fluctuations in salinity typical of tropical deltas and inshore coastal areas are a prime habitat for humpback dolphins. Throughout their range humpback dolphins occur in low numbers and the published reports of their abundance, occurrence and behaviour are few. The inshore distribution of these dolphins makes them particularly susceptible to the adverse effects of many of man's activities in the coastal zone, particularly those related to fisheries and habitat destruction (Cockcroft, 1990, Cockcroft & Krohn, 1994, Guissarnlo & Cockcroft, in prep.). Ross et al. (1996) examined humpback dolphin morphometry in an effort to resolve the genus taxonomy. Yet, taxonomies based on morphological traits alone may not adequately describe phylogenetic distinctions at subspecies and species levels (Awise, 1989). Molecular genetics is useful in the study of systematics in that it can reveal errors such as the taxonomic recognition of groups showing insufficient evolutionary differentiation, as well as the lack of taxonomic recognition of phylogenetically distinct taxa. In either case, conservation efforts in the absence of genetic data would be errant or misdirected. In this study, evolution of a region of the mtDNA control region is examined to determine the phylogenetic relationships among individuals representing the genus.

Collins, T., Braulik, G. T., & Perrin, W. (2017). *Sousa teuszii* (Errata Version Published in 2018) the IUCN Red List of Threatened Species. <https://doi.org/10.2305/IUCN.UK.2017-3.RLTS.T20425A50372734.en>

Atlantic Humpback Dolphin *Sousa teuszii* has most recently been assessed for The IUCN Red List of Threatened Species in 2017.

Fraser, F. C. (1949). A Specimen of *Sotalia Teuszii* Kükenthal from the Coast of Senegal. *Journal of Mammalogy*, 30(3), 274-276. <https://doi.org/10.2307/1375320>

During the Danish "Atlantide" expedition to West Africa in 1946 a short visit was made to the Institut Français d'Afrique Noire at Dakar. Among other cetacean specimens made available for examination was a dolphin skull from an animal which had been caught at sea in a shark net in 1943. The place of capture was at M'Bour about fifty miles south of Dakar. It was thought that the specimen belonged to the species *Sotalia teuszii* described by Kükenthal but verification had to be deferred until the type specimen in the British Museum could be examined. Notes and measurements were taken and later photographs of the skull were provided by the Institut for comparison with the type. The original specimen was caught in the naval harbour, Cameroons, and is noteworthy not only because it is the only known species of *Sotalia* from African waters but also because the animal was reported to have tubular extensions of the nostrils "like the erected ears of a hippopotamus." In addition the stomach contents - leaves, mangrove fruits, and a little grass-indicated a kind of d not known in any other cetacean.

The Senegal specimen, apart from being the first to be recorded since the type was described over fifty years ago, is also noteworthy because of the evidence it provides of the extension of the range from the type locality to a place some two thousand miles westwards. *S. teuszii* may be expected along this stretch of African coast and to those interested in cetaceans it is very desirable that specimens in the flesh should be obtained so that more may be known of the coloration, form, and internal anatomy of this rare species.

Fraser, F. C. (1973). Record of a Dolphin (*Sousa teuszii*) from the Coast of Mauritania. *Transactions of the New York Academy of Sciences*, 35(2), 132-135. <https://doi.org/10.1111/j.2164-0947.1973.tb01512.x>

A skull of *Sousa* (= *Sotalia*) *teuszii* was collected at Cap Timris, Mauritania, in 1970. This extends the range of the species > 700 miles northward. A description of the skull is given.

Frere, C. H., Hale, P. T., Porter, L., Cockcroft, V. G., & Dalebout, M. L. (2008). Phylogenetic Analysis of Mtdna Sequences Suggests Revision of Humpback Dolphin (*Sousa Spp.*) Taxonomy Is Needed. *Marine and Freshwater Research*, 59(3), 259-268. <https://doi.org/10.1071/mf07120>

Humpback dolphins (*Sousa spp.*) have a wide distribution in the tropical Atlantic and Indo-Pacific Oceans and a confused taxonomy. Morphological assessments suggest three species groupings-*Sousa teuszii* (eastern Atlantic), *Sousa plumbea* (western Indo-Pacific), and *Sousa chinensis* (eastern Indo-Pacific)-but most taxonomies recognise only two species-*S. chinensis* (Indo-Pacific), and *S. teuszii* (Atlantic). To investigate phylogenetic relationships, mitochondrial DNA control region sequences (338 base pairs) from 72 *Sousa* representing three populations in the Indo-Pacific (South Africa: *S. plumbea*, n=23; China: *S. chinensis*, n=19; and Australia: *S. chinensis*, n=28), and *S. teuszii* in the Atlantic (Mauritania, n=2) were generated. All three Indo-Pacific populations formed robust, monophyletic clades with high bootstrap (BS) and Bayesian posterior probability (BPP) scores. Surprisingly, humpback dolphins from South Africa and China formed a strongly-supported clade with the Atlantic *S. teuszii* (BS 63%, BPP 0.92) to the exclusion of animals from Australia. Genetic divergence between animals from China and Australia (D-A = 8.4% +/- 2.47%) was greater than between China and South Africa (D-A = 5.1% +/- 1.80%). These

results strongly suggest that Australian humpback dolphins are not *S. chinensis* but may represent a distinct species in their own right.

Grasley, S. (2011). *Sousa teuszii* Atlantic Humpbacked Dolphin. Retrieved from https://animaldiversity.org/accounts/Sousa_teuszii/

Fact sheet about the Atlantic humpbacked dolphin from Animal Diversity Web.

International Whaling Commission. (2022). Humpback Dolphin. Retrieved from <https://iwc.int/humpback-dolphin>

Fact sheet about Humpback Dolphin (*Sousa spp.*) from the International Whaling Commission.

Jefferson, T. A. (2002). *A Preliminary Analysis of Geographic Variation in Skull Morphology of Humpback Dolphins (Genus Sousa)*. International Whaling Commission SC/54/SM8. Shimonoseki, Japan. Retrieved from <https://archive.iwc.int>

The author measured 181 skulls of humpback dolphins originating from throughout most of the range of *Sousa*. While patterns of skull variation appeared to be largely conservative, there was evidence for three groups: 1) Atlantic Ocean/West Africa, 2) Western Indian Ocean, and 3) Eastern Indian Ocean/Pacific Ocean. These would appear to correspond to the *teuszii*, *plumbea* and *chinensis* forms, respectively. However, no taxonomic revisions are recommended at this time, but the conservative view to two species (*S. teuszii* in W. Africa and *S. chinensis* in the Indo-Pacific) should be followed for the time being. The distinctness of *S. teuszii* is evident, but other taxonomic decisions should await further studies of genetics and morphometrics, currently underway.

Jefferson, T. A., & Curry, B. E. (2015). Humpback Dolphins: A Brief Introduction to the Genus *Sousa*. In *Advances in Marine Biology*. T. A. Jefferson & B. E. Curry (Eds.), (Vol. 72, pp. 1-16) <https://doi.org/10.1016/bs.amb.2015.04.001>

The delphinid genus *Sousa* has recently undergone a major revision, and currently contains four species, the Atlantic humpback (*Sousa teuszii*), Indian Ocean humpback (*Sousa plumbea*), Indo-Pacific humpback (*Sousa chinensis*), and Australian humpback (*Sousa sahalensis*) dolphin. Recent molecular evidence suggests that humpback dolphins in the Bay of Bengal may comprise a fifth species. These moderate-sized dolphin species are found in shallow (<30 m), coastal waters of the eastern Atlantic, Indian, and western Pacific oceans. Abundance and trends have only been studied in a few areas, mostly in eastern Africa, China, and northern Australia. No global, empirically derived abundance estimates exist for any of the four species, but none appear to number more than about 20,000 individuals. Humpback dolphins feed mostly on small fishes, and sometimes shrimps; occur for the most part in small groups (mostly 12 or less); have limited near-shore movements; and in most parts of their range exhibit a fission/fusion type of social organization. Major threats that affect all the species are entanglement in fishing gear, and habitat degradation/destruction from various forms of coastal development. Impacts from vessel traffic (including behavioural disturbance and displacement, as well as mortality and morbidity from collisions with vessels) appear to be significant in most areas. Several other threats are apparently significant only

in particular parts of the range of some species (e.g. high levels of organochlorine contaminants affecting Indo-Pacific humpback dolphins in Hong Kong). Direct hunting only occurs in limited areas and primarily on a small scale. Conservation actions so far have been limited, with most populations receiving little study and almost no management attention. Much more work is needed on humpback dolphin population status, threats, and how the major threats can be reduced or eliminated. Extinction risks for the four species and some populations are preliminarily re-assessed using the IUCN Red List criteria in the current volume. The results suggest that all four species in the genus are threatened at some level (suggested Red List status ranges from Vulnerable for *S. chinensis* and *S. sahalensis* to Critically Endangered for *S. teuszii*).

Jefferson, T. A., & Rosenbaum, H. C. (2014). Taxonomic Revision of the Humpback Dolphins (*Sousa spp.*), and Description of a New Species from Australia. *Marine Mammal Science*, 30(4), 1494-1541. <https://doi.org/10.1111/mmS.12152>

The taxonomy of the humpback dolphin genus *Sousa* has been controversial and unsettled for centuries, but recent work indicates that there are several valid species. A review of multiple lines of evidence from skeletal morphology, external morphology, coloration, molecular genetics, and biogeography, in combination provides strong support for the recognition of four species of *Sousa*. These include *S. teuszii* (Kükenthal, 1892), a species with uniform gray coloration and a prominent dorsal hump, which is found in the Atlantic Ocean off West Africa. The species *S. plumbea* (G. Cuvier, 1829) has similar external appearance to *S. teuszii*, but has a more pointed dorsal fin. It occurs in the Indian Ocean from South Africa to Myanmar (Burma). The original taxon, *S. chinensis* (Osbeck, 1765), is reserved for the species that has a larger dorsal fin with no prominent hump, and largely white adult coloration. It ranges from eastern India to central China and throughout Southeast Asia. Finally, we describe a new species of *Sousa*, the Australian humpback dolphin, which occurs in the waters of the Sahul Shelf from northern Australia to southern New Guinea. It has a lower dorsal fin, more extensive dark color on the body, and a dorsal “cape.” It is separated from the Indo-Pacific humpback dolphin by a wide distributional gap that coincides with Wallace’s Line.

Jefferson, T. A., & Van Waerebeek, K. (2004). Geographic Variation in Skull Morphology of Humpback Dolphins (*Sousa Spp.*). *Aquatic Mammals*, 30(1), 3-17. <https://doi.org/10.1578/am.30.1.2004.3>

The taxonomy and systematic relationships of humpback dolphins (genus *Sousa*) are highly confused. This is largely due to a lack of data and samples from large portions of the range of the genus, and confusing and seemingly contradictory patterns of variation in available external morphometric, skeletal morphometric, and molecular datasets. To help clarify the situation, we measured 222 skulls of humpback dolphins originating from throughout most regions of the range of *Sousa*. While patterns of cranial variation appeared to be relatively conservative, there was evidence for three groups: (1) Atlantic Ocean/ West Africa, (2) Western Indian Ocean, and (3) Eastern Indian Ocean/Pacific Ocean. These would appear to correspond to the *teuszii*, *plumbea*, and *chinensis* forms, respectively. No taxonomic revisions are recommended at this time, and the conservative view of two species (*S. teuszii* in West Africa and *S. chinensis* in the IndoPacific) can be defended for the time being as a pragmatic approach. The distinctness of *S. teuszii* is clearcut, but other taxonomic decisions should await further studies of molecular genetics and morphometrics, currently underway.

Kükenthal, W. (1892). *Sotalia Teuszii* N. Sp. Ein Pflanzenfressender (?) Delphin Aus Kamerun. *Zoologische Jahrbücher Abteilung für Systematick*, 6, 442-446. Retrieved from <https://www.biodiversitylibrary.org/page/10195038>

This is the original German language description of *Sousa teuszii* based on a skull found by Herr Teusz in Cameroon. The paper describes the morphology and measurements of the skull and reports that the dolphin had vegetable matter in its stomach.

Maigret, J. (1980). Donnees Nouvelles Sur L' Ecologie Du *Sousa teuszii* (Cetacea, Delphinidae) De La Cote Ouest Africaine. *Bulletin de l' Institut Francais d' Afrique Noire*, 42A, 619-633.

The species *Sousa teuszii* is common along the Mauritanian coast: Banc D'Arguin and in the Senegal, delta du Saloum. The particularities of the distribution and behaviour are studied. Regular migrations according with the tides are showed up. The population of each area can not be evaluated, but it is very small and probably does not exceed one hundred individuals.

McGowen, M. R., Murphy, K. R., Ndong, I., Potter, C. W., & Keith-Diagne, L. W. (2020). The Complete Mitochondrial Genome of the Critically Endangered Atlantic Humpback Dolphin, *Sousa teuszii* (Kükenthal, 1892). *Mitochondrial DNA. Part B, Resources*, 5(1), 257-259. <https://doi.org/10.1080/23802359.2019.1700196>

The Atlantic humpback dolphin remains an understudied, critically endangered cetacean species. Here, we describe the first complete mitogenome of *Sousa teuszii*, derived from an animal stranded on Île des Oiseaux, Sine Saloum, Senegal. The *S. teuszii* mitogenome is composed of 16,384 base pairs and is 98.1% identical to its closest relative with a mitogenome, *Sousa chinensis*. Phylogenetic analysis confirms its placement with *S. chinensis*, as well as the placement of the genus *Sousa* within subfamily Delphininae.

Mendez, M., Jefferson, T. A., Kolokotronis, S. O., Krutzen, M., Parra, G. J., Collins, T., . . . Rosenbaum, H. C. (2013). Integrating Multiple Lines of Evidence to Better Understand the Evolutionary Divergence of Humpback Dolphins Along Their Entire Distribution Range: A New Dolphin Species in Australian Waters? *Molecular Ecology*, 22(23), 5936-5948. <https://doi.org/10.1111/mec.12535>

The conservation of humpback dolphins, distributed in coastal waters of the Indo-West Pacific and eastern Atlantic Oceans, has been hindered by a lack of understanding about the number of species in the genus (*Sousa*) and their population structure. To address this issue, we present a combined analysis of genetic and morphologic data collected from beach-cast, remote-biopsied and museum specimens from throughout the known *Sousa* range. We extracted genetic sequence data from 235 samples from extant populations and explored the mitochondrial control region and four nuclear introns through phylogenetic, population-level and population aggregation framework. In addition, 180 cranial specimens from the same geographical regions allowed comparisons of 24 morphological characters through multivariate analyses. The genetic and morphological data showed significant and concordant patterns of geographical segregation, which are typical for the kind of demographic isolation displayed by species units, across the *Sousa* genus distribution range. Based on our combined genetic and morphological analyses, there is convincing evidence for at least four species within the genus (*S. teuszii*

in the Atlantic off West Africa, *S. plumbea* in the central and western Indian Ocean, *S. chinensis* in the eastern Indian and West Pacific Oceans, and a new as-yet-unnamed species off northern Australia).

Olakunle, G. W., & Akanbi, W. B. (2015). Occurrence and Species Diversity of Delphinids Off-Lagos Shore, Nigeria. *International Journal of Biological and Chemical Sciences*, 8(6), 2578-2587.
<https://doi.org/10.4314/ijbcS.v8i6.19>

Little has been documented about delphinid communities in the Nigerian coastal waters. This paper gives baseline information about the delphinid community sighted off-shore Lagos, Nigeria. A dedicated survey of the living resources of Nigerian coastal waters (6°08'N and 2°42'W to 6° 13'N and 3° 27'W) took place from the Nigeria/Benin boarder along Badagry area to the western part of Ondo State between 17th march and 6th June 2009 and included systematic visual searching of marine mammals. A total effective effort of 264 hours was logged. The boat moved along designated transect lines at a cruising speed of 9.2 km/h. Sighting rate for delphinids was obtained by processing visual data obtained at Beaufort wind scale of 2.5 to 4 nautical miles in visibility, using Distance 2.2 software. Species were identified through Photo-identification method. Fifteen (15) schools of 746 individual's sightings were made. Four (4) schools of 25 individuals representing 3% of total sightings were classified as "Unidentified", while 11 schools of 721 individuals (97%) were identified and classified into five (5) species. The pantropical spotted dolphin (*Stenella attenuate*) with two (2) schools of 150 individuals, (*Stenella frontalis*) with one (1) school of 54 individuals, bottlenose dolphin (*Tursiops truncatus*) with one (1) school of 32 individuals, Common dolphin (*Delphinus delphis*) with four (4) schools of 452 individuals and (3) schools of Atlantic hump-backed dolphin (*Sousa teuszii*) of 32 individuals. Sighting rate of 5.7×10^{-2} school/hr was estimated for schools while the sighting rate for individuals was estimated at 2.83 individual/hr. The results suggested that the Lagos coast is rich in delphinid biodiversity, which needs to be quantified more accurately during further research.

Parra, G. J., & Jefferson, T. A. (2018). Humpback Dolphins: *Sousa teuszii*, *S. Plumbea*, *S. Chinensis* and *S. Sahulensis*. In *Encyclopedia of Marine Mammals, 3rd Edition*. B. Wursig, J. G. M. Thewissen, & K. M. Kovacs (Eds.), (pp. 483-489) <https://doi.org/10.1016/B978-0-12-804327-1.00153-9>

Humpback dolphins (genus *Sousa*) are medium-sized delphinids found in shallow (<30 m), coastal waters of the eastern Atlantic, Indian, and western Pacific Oceans. The genus is comprised of four species: (1) Atlantic humpback (*Sousa teuszii*), (2) Indian Ocean humpback (*S. plumbea*), (3) Indo-Pacific humpback (*S. chinensis*), and (4) Australian humpback (*S. sahalensis*) dolphins. Information on the ecology, behavior and life history of all humpback dolphins remains scarce. Most study populations to date indicate that all species occur in small numbers, with most populations confirmed or suspected to be declining and threatened. Major threats affecting all species include habitat degradation and loss, and entanglement in fishing gear. Research efforts and conservation actions tailored to each species are needed to assess anthropogenic impacts, and develop strategies to eliminate or mitigate threats.

Parra, G. J., & Ross, G. J. B. (2009). Humpback Dolphins: *S. Chinensis* and *S. teuszii*. In *Encyclopedia of Marine Mammals (Second Edition)*. W. F. Perrin, B. Würsig, & J. G. M. Thewissen (EdS.), (pp. 576-582). London: Academic Press <https://doi.org/10.1016/B978-0-12-373553-9.00134-6>

This chapter discusses the characteristics, taxonomy, distribution, abundance, and ecology of humpback dolphins or *S. chinensis* and *S. teuszii*. Humpback dolphins are medium-sized delphinids found in coastal waters of the eastern Atlantic, Indian, and West Pacific oceans. Genetic and morphological information indicate that they are delphinids (family Delphinidae). Humpback dolphins are characterized by a robust and medium-sized body. The melon is moderate in size, slightly depressed, and in profile slopes gradually to an indistinct junction with the long, narrow rostrum. The broad flippers are rounded at the tip and the flukes are broad and full, with a deep median caudal notch. Dorsal and ventral ridges on the caudal peduncle are well developed in African and Indian Ocean populations. Overall, humpback dolphins reach a maximum total length of 2.6–2.8 m in different parts of their distribution. A few animals exceeding 3.0 m in length have been recorded in the Arabian and Indian regions. Maximum weights of 250–280 kg have been recorded for humpback dolphins in South Africa and Hong Kong. Humpback dolphins swim slowly at about 5 km/h, surfacing briefly at intervals of up to a minute. Socializing in humpback dolphins is characterized by individuals in close proximity showing high levels of physical interaction including body contact and frequent aerial behavior such as leaps and somersaults. Fins and flukes often break the surface of the water.

Pinela, A. M., Borrell, A., Cardona, L., & Aguilar, A. (2010). Stable Isotope Analysis Reveals Habitat Partitioning among Marine Mammals Off the Nw African Coast and Unique Trophic Niches for Two Globally Threatened Species. *Marine Ecology Progress Series*, 416, 295-306. <https://doi.org/10.3354/meps08790>

Stable isotope abundances of carbon ($\delta C-13$) and nitrogen ($\delta N-15$) in the bone of 13 species of marine mammals from the northwest coast of Africa were investigated to assess their positions in the local trophic web and their preferred habitats. Also, samples of primary producers and potential prey species from the study area were collected to characterise the local isotopic landscape. This characterisation indicated that $\delta C-13$ values increased from offshore to nearshore and that $\delta N-15$ was a good proxy for trophic level. Therefore, the most coastal species were *Monachus monachus* and *Sousa teuszii*, whereas the most pelagic were *Physeter macrocephalus* and *Balaenoptera acutorostrata*. $\delta N-15$ values indicated that marine mammals located at the lowest trophic level were *B. acutorostrata*, *Stenella coeruleoalba* and *Delphinus sp.*, and those occupying the highest trophic level were *M. monachus* and *P. macrocephalus*. The trophic level of *Orcinus orca* was similar to that of *M. monachus*, suggesting that *O. orca* preys on fish. Conservation of coastal and threatened species (*M. monachus* and *S. teuszii*) off NW Africa should be a priority because these species, as the main apex predators, cannot be replaced by other marine mammals.

Robineau, D., & Vely, M. (1998). Les Cétacés Des Côtes De Mauritanie (Afrique Du Nord-Ouest). Particularités Et Variations Spatio-Temporelles De Répartition : Rôle Des Facteurs Océanographiques. *Revue d'Ecologie (La Terre et la Vie)*, 53, 123-152. Retrieved from <http://documents.irevues.inist.fr/handle/2042/54889>

Le bilan faunistique établi dans ce travail se fonde surtout sur des données d'échouages (n = 239) et des observations (n = 82) originales collectées principalement en 1994 et 1995. Vingt et une espèces de

cetaces ont été identifiées le long des côtes mauritaniennes. L'espèce la plus commune est *Tursiops truncatus* (39,3 % des échouages, 81,7 % des observations). *Delphinus delphis* et *Phocoena phocoena* sont des espèces communes dans les échouages (elles représentent respectivement 21,7 % et 21,3 % des échouages), mais sont exceptionnellement observées dans les eaux proches du littoral. *Sousa teuszii* (6,2 % des échouages et 18,3 % des observations) ne se rencontre guère que dans la zone du banc d'Arguin. La présence d'espèces fréquentant normalement les eaux tempérées et froides de l'Atlantique nord, comme *Phocoena phocoena* et *Globicephala melas*, s'explique par l'existence, pendant une grande partie de l'année, d'un upwelling côtier qui génère des eaux relativement froides. Ces eaux pourraient aussi jouer le rôle d'une sorte de barrière thermique dissuadant les petits cétacés océaniques tropicaux du genre *Stenella* (presqu'absents dans les échouages) de s'approcher de la zone côtière. La répartition spatio-temporelle des espèces côtières est mise en rapport avec les variations des facteurs océanographiques locaux et l'abondance saisonnière des proies.

Rosenbaum, H. C., Glaberman, S., Jefferson, T., Collins, T., Minton, G., Peddemors, V., & Baldwin, R. (2002). *Phylogenetic Relationships and Population Structure among Humpback Dolphins Based on mtDNA Variation*. International Whaling Commission SC/54/SM34. Retrieved from <https://archive.iwc.int>

The taxonomy, systematic relationships, and population structure of humpback dolphins (genus *Sousa*) have been controversial. Various nominal species have been described or subsumed. Recent reports have suggested the division of *Sousa* into one to three distinct species or sub-species. However, many of these analyses have not been conducted in a proper systematics framework, did not include all representative putative taxa or were lacking specimens from parts of their geographic range, and have not been published in peer-reviewed journals (typically necessary for revising taxonomy). In order to address relationships and taxonomic status among *Sousa* species, we present a preliminary genetic analysis of humpback dolphins primarily from Southeast Asia, the coast of Oman, and South Africa. A total of 110 samples were sequenced for 501 bp of mtDNA control region and significant population structuring at the regional level was revealed. Population aggregation and phylogenetic analyses of mtDNA control region lineages and a subset of lineages analyzed for a 358 bp fragment of Cytochrome B revealed a series of complex relationships among humpback dolphins in the Indian and Pacific Oceans. These preliminary data are a critical first step to better understanding the taxonomy and systematics in the genus *Sousa*. Additional molecular character data from other mitochondrial and nuclear genes will be essential for resolving relationship and taxonomic status for humpback dolphins.

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* (Kükenthal, 1892). In *Handbook of Marine Mammals*. S. H. Ridgeway & Harrison, Richard (Eds.), (Vol. 5 - The First Book of Dolphins, pp. 23-42)

The genus *Sousa* presently includes five nominal species: *S. chinensis* (Osbeck, 1765), *S. plumbea* (G. Cuvier, 1829), *S. lentigenosa* (Owen, 1866), *S. teuszii* (Kükenthal, 1892) and *S. borneensis* (Lydekker, 1901). Their relationships are poorly understood, primarily due to limited material and data, particularly for the genotype *S. chinensis*, of which the holotype has been destroyed. Views on their status range from acceptance of all five species (Pilleri and Gahr, 1972) to a conservative two species, where the Atlantic *S. teuszii* is distinguished from the Indopacific forms combined in *S. chinensis* (Mitchell, 1975; Rice, 1977).

Ross, G. J. B., Heinsohn, G. E., Cockcroft, V. G., Parsons, E. C. M., Porter, L., Preen, A., & Leatherwood, S. (1995). *Review of the Taxonomic Status of Humpback Dolphins, Genus Sousa*. Paper presented at the Workshop on the Biology and Conservation of Small Cetaceans and Dugongs of Southeast Asia, Dumaguete, Philippines.

The present paper reviews the external and skeletal morphology of *Sousa*, based primarily on the large samples of South African and Australian material now available, and some new data from populations in the Arabian Gulf and at Hong Kong. The emphasis has been placed on variation within and between the populations as indicators of genetic interchange between populations or the lack of such interchange. We propose that the small differences observed in these limited samples do not provide sufficient evidence to support the presence of more than one species, under the name *Sousa chinensis* (Osbeck, 1765). Although this single species could be subdivided into three or more subspecies, we believe that this would be premature on our present level of knowledge. In resolving this situation, further morphological studies on the West African and southern Chinese populations, presently underway, will be most helpful. In particular, data on *Sousa* are needed urgently on a specimen-by-specimen basis, from the South-East Asian region, especially for the populations around the southern islands and Papua New Guinea, in order to resolve their taxonomic and conservation status, as there is every possibility that this region supports a unique taxon of *Sousa* in the southern region.

Sequeira, M., & Reiner, F. (1992). First Record of an Atlantic Humpback Dolphin, *Sousa teuszii* Kükenenthal, 1892 (Cetacea ; Delphinidae) in Guinea-Bissau. *Mammalia*, 56(2), 311-313.
<https://doi.org/10.1515/mamm-1992-0222>

The Atlantic humpback dolphin, *Sousa teuszii*, is generally known to be confined to coastal waters of tropical West Africa, especially along the coast of southern Senegal and northwestern Mauritania. The type specimen was collected in the harbour of Douala in Cameroon, and almost every new occurrence registered after that date has extended the range known for this species. Fourteen specimens have been described by Cadenat, Fraser, Dekeyser, and van Bree and Duguay, and a continuous range from the south of Morocco to Angola was postulated.

Sub-Committee on Small Cetaceans. (2011). Report of the Sub-Committee on Small Cetaceans. *Journal of Cetacean Research & Management*, 12, 272-295. Retrieved from
<https://journal.iwc.int/index.php/jcrm>

The article presents the Report of the Sub-Committee on Small Cetaceans about its agendas and other issues discussed at the International Whaling Commission (IWC) Scientific Committee Annual Meeting held in Agadir, Morocco from May 30 to June 11, 2010. The status of small cetaceans in Northwestern Africa and the Eastern Tropical Atlantic (ETA) is tackled. Information on different dolphin and whale species such as the Atlantic humpback dolphin or *Sousa teuszii*, common bottlenose dolphin or *Tursiops truncatus* and long-finned pilot whale or *Globicephala melas* are provided including their taxonomy and population structure, abundance and distribution and life history and ecology.

Van Beneden, P. J. (1892). Un Cétacé Fluviale D’Afrique. *Bulletins de l'Académie royale des sciences, des lettres et des beaux-arts de Belgique*, 3, 350-355. Retrieved from <https://www.biodiversitylibrary.org/bibliography/5550>

This early description of the first *Sousa teuszii* specimen made known in Europe describes it as a riverine species, and repeats the observation that it was found with vegetable matter in its stomach and therefore might be vegetarian. It examines the skull from Cameroon and compares it to other known river dolphin species

Van Bree, P. J. H., & Duguay, R. (1965). Sur Un Crane De *Sotalia Teuszii* Kükenthal, 1892 (Cetacea, Delphinidae). *Zeitschrift für Säugetierkunde : im Auftrage der Deutschen Gesellschaft für Säugetierkunde e.V.*, 30, 311-314. Retrieved from <https://www.biodiversitylibrary.org/part/191071>

Au cours d'une récente reorganisation de la collection des Mammifères du Muséum d'Histoire Naturelle de la Rochelle, les auteurs de cette note ont trouvé un crâne de Dauphin, en bon état de conservation, portant les indications suivantes: «Dakar, (Mr Papot, 1925) M. 564». Étant donné que ce crâne possédait 29-30 dents à la mâchoire supérieure, 28-28 à la mâchoire inférieure et que les os pterygoïdes étaient nettement séparés l'un de l'autre, nous avons conclu que l'individu appartenait au genre *Sotalia* Gray, 1866. Jusqu'à présent, on ne connaît qu'une espèce ouest-africaine de ce genre: *Sotalia teuszii* Kükenthal, 1892. Une étude de la bibliographie concernant ce sujet (Kükenthal, 1892; Fraser, 1949; Cadenat, 1956; Cadenat & Paraiso, 1957 et Cadenat, 1959) nous a montré que ce crâne appartenait effectivement à un individu de cette espèce.

Van Waerebeek, K., Barnett, L., Camara, A., Cham, A., Diallo, M., Djiba, A., . . . Bamy, I. L. (2004). Distribution, Status, and Biology of the Atlantic Humpback Dolphin, *Sousa teuszii* (Kükenthal, 1892). *Aquatic Mammals*, 30(1), 56-83. <https://doi.org/10.1578/AM.30.1.2004.56>

The distribution, status, and biology of the Atlantic humpback dolphin (*Sousa teuszii*) is critically reviewed, and results of recent research are discussed. The species' known distribution limits are, in the north, Dahkla Bay (23 degree 50'N), Western Sahara, and in the south, Tombua (15 degree 47'S), southern Angola. Its habitat is predominantly inshore coastal and estuarine, over soft-sediment bottoms. There is no evidence that it might occur beyond the brackish waters of estuaries into a riverine, fresh-water habitat. There are no records for the Senegal, Casamance, and Niger Rivers. A total of eight stocks are provisionally discerned for management purposes. Six of these are confirmed-contemporary (based on recent records), including Dahkla Bay, Banc d'Arguin, Saloum-Niumi, Canal do Geba-Bijagos, South Guinea, and Angola. Two stocks, the Cameroon Estuary and Gabon, are historical, and new fieldwork needs to confirm their current presence. No inference is made on degree of reproductive isolation and biological population status of any named stock. The potential existence of a western Togo stock is currently under study. Nine coastal states, including Morocco (Western Sahara), Mauritania, Senegal, The Gambia, Guinea-Bissau, Guinea-Conakry, Cameroon, Gabon, and Angola are confirmed range states. While historically distribution may have been quasi-continuous over the species' range, indications of contemporary distribution gaps are emerging. Ongoing monitoring of cetacean takes in coastal fisheries off western Ghana, and experimental whale-watching sorties in Benin have not yielded a single record. The species has either become rare through human-related pressures or, less

likely, it never lived there. For most other areas there is little, if any, information due to the lack of research. No abundance estimates are available for any stock. The smallest extant stock may be the northernmost, Dahkla Bay. The aggregated number of individuals seen in four sightings was 28 individuals. The healthiest known stock seems to be Canal do Geba-Bijagos (in Guinea-Bissau), which may number at least several hundred, if not more. How extensively humpback dolphins range in-between core areas is unclear, but only a few individuals have been encountered. There is no evidence for seasonality in presence, nor for seasonal movements. Regular cross-border movements between the Saloum Delta (Senegal) and Niimi National Park (The Gambia) technically qualifies *S. teuszii* as a "migratory species" under the Conservation of Migratory Species (CMS) Convention. Fisheries-related mortality is thought to be significantly higher than the few recorded takes suggest because it is very rarely reported. Combined with habitat encroachment, such losses may threaten the long-term survival of some stocks.

Van Waerebeek, K., Ofori-Danson, P. K., & Debrah, J. (2009). The Cetaceans of Ghana, a Validated Faunal Checklist. *West African Journal of Applied Ecology*, 15(1), 61-90.
<https://doi.org/10.4314/wajae.v15i1.49428>

The cetaceans of Ghana and the Gulf of Guinea have, until recently, remained unstudied. Periodical monitoring of artisanal fisheries for bycatches in seven Ghanaian artisanal fishing ports and landing sites over 1996-2004 has provided photographic and specimen evidence to validate occurrence of 18 species (17 odontocetes, 1 mysticete) in a tropical, predominantly pelagic cetacean fauna. At least nine species and subspecies had not previously been documented for Ghana (with asterisk), and four species are authenticated for the first time in the Gulf of Guinea (double asterisk), i.e. *Tursiops truncatus*, *Stenella clymene*, *S. longirostris longirostris**, *S. attenuata*, *S. frontalis*, *Delphinus capensis capensis**, *Lagenodelphis hosei*, *Steno bredanensis*, *Grampus griseus*, *Peponocephala electra**, *Feresa attenuata****, *Globicephala macrorhynchus*, *Orcinus orca**, *Pseudorca crassidens**, *Kogia sima***, *Physeter macrocephalus**, *Ziphius cavirostris*** and *Megaptera novaeangliae*. Also, the limited published information on distribution, natural history and conservation status is critically reviewed for each taxon. Indications are that most species encountered off Ghana may be widely distributed in the Gulf of Guinea, most notably the long-beaked common dolphin. The vulnerable Atlantic humpback dolphin, *Sousa teuszii*, remains unrecorded in Ghana and neighbouring nations despite apparently suitable coastal habitat. It is suggested that localized extinction may be blamed, possibly the result of accumulative bycatches and disturbance. A number of other cetacean species not yet encountered could occasionally occur in Ghana's waters, e.g. *Balaenoptera brydei*, *Mesoplodon densirostris*, *Kogia breviceps*, *Stenella coeruleoalba* and *Delphinus delphis*.

Weir, C. R. (2009). Distribution, Behaviour and Photo-Identification of Atlantic Humpback Dolphins *Sousa teuszii* off Flamingos, Angola. *African Journal of Marine Science*, 31(3), 319-331.
<https://doi.org/10.2989/ajms.2009.31.3.5.993>

Atlantic humpback dolphins *Sousa teuszii* are a priority for research due to their restricted geographic range, narrow ecological niche and the paucity of existing information. The distribution and behaviour of *S. teuszii* off Flamingos, southern Angola, was investigated during summer and winter 2008 using boat- and shore-based surveys. In all, 71 *S. teuszii* sightings were recorded, ranging from one to eight animals. *Sousa teuszii* inhabited shallow, nearshore waters throughout the region, with the exception of southern areas adjacent to fishing villages. Small bays, sheltered waters behind reef-breaks and areas off dry river

mouths were used for foraging/feeding behaviour, whereas most travelling occurred along exposed coast. Ten individual *S. teuszii* were photo-identified. Multiple resightings (and absence of unmarked animals) indicate that all individuals present at the time of the surveys were photocaptured, exhibited high site fidelity and had year-round occurrence. Association indices of 0.77–1.0 indicated strong social affiliation between eight individuals, particularly in winter. Off Flamingos, *S. teuszii* occurs in small numbers and exhibits high site fidelity to a relatively small stretch of nearshore habitat, making the species vulnerable to local extirpation. Wider-scale surveys and development of a management plan are crucial to ensuring the long-term conservation of *S. teuszii* off Flamingos.

Weir, C. R. (2010). First Description of Atlantic Humpback Dolphin *Sousa teuszii* Whistles, Recorded Off Angola. *Bioacoustics-the International Journal of Animal Sound and Its Recording*, 19(3), 211-224. <https://doi.org/10.1080/09524622.2010.9753625>

The Atlantic humpback dolphin *Sousa teuszii* is endemic to the west coast of Africa and is poorly studied. During January 2008, 2.7 hr of acoustic recordings were made during 11 *S. teuszii* encounters in the Namibe province of Angola. Echolocation click trains were audible in most recordings. A total of 298 individual dolphin whistles were recorded, of which 86 were of sufficient signal to noise ratio for the measurement of 10 fundamental frequency variables. *Sousa teuszii* whistles occurred in the 2.5 to 23.4 kHz fundamental frequency range and were relatively simple in structure, with 85% having a single inflection point. The fundamental frequency was relatively low, with mean minimum and maximum frequencies of 4.8 and 8.2 kHz respectively. Harmonics occurred in 92% of whistles, sometimes extending beyond the 44 kHz recording range. The most frequently recorded contour categories were convex and concave, and very few whistles exhibited complex modulation. The whistles produced by *S. teuszii* are broadly comparable with those published for the Indo-Pacific humpback dolphin *S. chinensis*. Future studies should consider context-specific use of whistle types, and should include comparisons with *S. teuszii* groups in other geographic locations to ensure the full species' whistle repertoire is adequately characterised.

Weir, C. R., & Collins, T. (2015). A Review of the Geographical Distribution and Habitat of the Atlantic Humpback Dolphin (*Sousa teuszii*). In *Advances in Marine Biology*. (2015/11/12 ed., Vol. 72, pp. 79-117) <https://doi.org/10.1016/bs.amb.2015.08.001>

Understanding of the distributional ecology of the Atlantic humpback dolphin (*Sousa teuszii*) has been hampered by a lack of systematic and consistent sampling effort. The only comprehensive species distribution review was published in 2004; since then a considerable amount of novel information has emerged. We compiled 853 sighting, capture and specimen records of the species, and produced global and regional distribution maps. Of the 830 records where year was available, 63.1% dated from ≥ 2005 and confirm a contemporary occurrence in six marine ecoregions and 11 countries: Western Sahara, Mauritania, Senegal, Gambia, Guinea-Bissau, Guinea, Benin, Cameroon, Gabon, Congo Republic and Angola. Additionally, Togo is a recently confirmed range state. Group sizes ranged from 1 to 45 animals, with small groups of 1 to 10 animals comprising 65% of the sightings. Similarities were noted in the regions inhabited by Atlantic humpback dolphins across their range, particularly an occurrence in relatively shallow (predominantly ≤ 20 m) depths, in warm waters (average SSTs of 15.8-31.8 degrees C) and in dynamic habitat strongly influenced by tidal patterns. These conditions occur in various habitats occupied by the species, including estuarine systems, open coasts, archipelagos, tidal mud-flats and sheltered bays. Sightings were recorded at distances of 13 m to 12.8 km (mean of 573 m) from land,

indicating that the species occurs several kilometres from shore when suitable shallow habitat is present. The Atlantic humpback dolphin may be a 'nearshore' species based on oceanographic definitions incorporating water depth, wave action and sedimentation rather than on spatial distance from the coast.

Weir, C. R., & Wang, J. Y. (2016). Vertebral Column Anomalies in Indo-Pacific and Atlantic Humpback Dolphins *Sousa Spp.* *Diseases of Aquatic Organisms*, 120(3), 179-187.
<https://doi.org/10.3354/dao03026>

Conspicuous vertebral column abnormalities in humpback dolphins (genus *Sousa*) were documented for the first time during 3 photo-identification field studies of small populations in Taiwan, Senegal and Angola. Seven Taiwanese humpback dolphins *S. chinensis taiwanensis* with vertebral column anomalies (lordosis, kyphosis or scoliosis) were identified, along with 2 possible cases of vertebral osteomyelitis. There was evidence from several individuals photographed over consecutive years that the anomalies became more pronounced with age. Three Atlantic humpback dolphins *S. teuszii* were observed with axial deviations of the vertebral column (lordosis and kyphosis). Another possible case was identified in a calf, and 2 further animals were photographed with dorsal indents potentially indicative of anomalies. Vertebral column anomalies of humpback dolphins were predominantly evident in the lumbo-caudal region, but one Atlantic humpback dolphin had an anomaly in the cervico-thoracic region. Lordosis and kyphosis occurred simultaneously in several individuals. Apart from the described anomalies, all dolphins appeared in good health and were not obviously underweight or noticeably compromised in swim speed. This study presents the first descriptions of vertebral column anomalies in the genus *Sousa*. The causative factors for the anomalies were unknown in every case and are potentially diverse. Whether these anomalies result in reduced fitness of individuals or populations merits attention, as both the Taiwanese and Atlantic humpback dolphin are species of high conservation concern.

Section II: Population Abundance and Trends

Ayissi, I., Ajonina, G. N., & Angoni, H. (2014). Status of Large Marine Flagship Faunal Diversity within Cameroon Estuaries of Central African Coast. In *The Land/Ocean Interactions in the Coastal Zone of West and Central Africa*. (pp. 97-107) https://doi.org/10.1007/978-3-319-06388-1_9

An assessment of the status of large marine flagship faunal species along Cameroon estuaries within the Central African coast was carried out through several surveys, interviews, literature reviews and experience to compile species checklists, causes of their presence (migration, reproduction, feeding, etc.), the conservation status and different threats to species. Results showed that four species of sea turtles were identified and common along Cameroon estuaries: *Dermochelys coriacea*, *Lepidochelys olivacea*, *Chelonia mydas* and *Eretmochelys imbricata* for nesting and feeding activities. Eight cetaceans (*Sousa teuszii*, *Delphinus capensis*, *Delphinus sp.*, *Tursiops truncatus*, *Stenella attenuata* or *S. frontalis*, *S. coeruleoalba*, *Megaptera novaeangliae*, *Physeter macrocephalus*) and one sirenian species (*Trichechus senegalensis*) were found to be common, seasonal or rare. We recorded up to 61 waterbird species represented by 17 families from monthly counts within 20 km of the Sanaga River estuary and associated rivers and lakes in the Douala-Edea Wildlife Reserve between March 1999 and December 2012. The families of Ardeidae, Scolopacidae, Charadriidae and Alcedinidae were top with 12, 10, 8 and 7 species, respectively. Twenty-two (36.1 %) of the 61 species appeared to be resident, while 21(34.4 %) and 16(29.5 %) were seasonal and occasional visitors, respectively. Of particular significance is the high abundance of African Skimmers, Grey Pranticoles, Open-billed Storks and Common green shanks with monthly numbers of up to 811, 583, 336 and 189, respectively. In spite of the existing laws and conservation policies on these threatened species in Cameroon, most are facing many threats. By-catches in gillnets and other fishing gears and the potential for increasing direct takes may be the most severe threats and causes of significant mortality rates. Other threats of varying magnitude of concern include the following: habitat encroachment through coastal development (e.g. port and road construction), over-fishing, chemical and acoustic pollution, ship collisions and ghost nets. The almost complete lack of scientific data on the biology, distribution, stock structure and abundance of sea turtles and cetaceans in Cameroon waters makes it difficult to properly assess the impact of these threats, let alone address them. An acceleration of research is urged with the involvement of national Universities and Research Institutes. More faunal surveys are needed to unveil the potentials of the area and the need for the establishment of important relationships between species abundance, site temporal conditions (sandbank dynamics) and socio-economic activities with a view to identifying sustainable wetlands ecosystem utilization options.

Ayissi, I., Segniagbeto, G. H., & Van Waerebeek, K. (2014). Rediscovery of Cameroon Dolphin, the Gulf of Guinea Population of *Sousa teuszii* (Kükenthal, 1892). *ISRN Biodiversity*, 2014, 1-6. <https://doi.org/10.1155/2014/819827>

Since the 1892 discovery of the Atlantic humpback dolphin *Sousa teuszii* (Delphinidae), a species endemic to coastal western Africa, from a skull collected in Cameroon, not a single record has been documented from the country or neighbouring countries. Increasing concern about the continued existence of the Gulf of Guinea population of *S. teuszii* or “Cameroon dolphin” prompted an exploratory survey in May 2011. Shore-based effort, on foot (30.52 km; 784 min), yielded no observations. Small boat-based surveys (259.1 km; 1008 min) resulted in a single documented sighting of ca. 10 (8–12) Cameroon dolphins in shallow water off an open sandy shore near Bouandjo in Cameroon's South Region. The combination of a low encounter rate of 3.86 individuals (100 km)⁻¹ suggesting low

abundance and evidence of both fisheries-caused mortality and of habitat encroachment raises concerns about the Cameroon dolphin's long-term conservation prospect. Our results add to indications concerning several other *S. teuszii* populations that the IUCN status designation of the species as “Vulnerable” may understate its threat level.

Bamy, I., Djiba, A., & Van Waerebeek, K. (2021). Recent Survey for Delphinids at Tristao Islands, Guinea, Reinforces Concern for Bycatches and Marine Bushmeat Use. *Preprints*.
<https://doi.org/10.20944/preprints202104.0094.v1>

Small-boat and shore-based surveys in 2017 confirm that Atlantic humpback (*Sousa teuszii*) and common bottlenose dolphins (*Tursiops truncatus*) are resident in shallow neritic waters surrounding the protected MPA Tristao Islands in northern Guinea. Inshore-type *T. truncatus* were encountered also between Conakry and Kayar. First documented in 2012, dolphin bycatches in local fisheries continue to occur. The frequency of beach-cast remains suggests a significant conservation issue. Both multi- and monofilament gillnets are widely deployed, but it remains unclear which gear is the main cause of mortality. Forensic evidence shows that captured dolphins are often utilized for local consumption. Marine bushmeat of cetaceans is documented in many coastal nations in West and Central Africa. In Tristao Islands their use is synchronous with and thought related to declining fish stocks. Significant anthropogenic mortality relative to their low abundance, besides suspected pressures such as prey competition with fisheries and habitat deterioration from coastal development, raise concern for the future of coastal dolphins, in particular endangered *S. teuszii*, even in this formally protected MPA. Conservation measures need to be re-evaluated for improved efficiency while surveys to monitor trends should be annual.

Bamy, I. L., Van Waerebeek, K., Bah, S. S., Dia, M., Kaba, B., Keita, N., . . . Tall, H. (2006). *The Cetaceans of Guinea, a First Check-List of Documented Species*. International Whaling Commission, SC/58/O15. St.Kitts. Retrieved from <https://archive.iwc.int/>

A CMS workshop on West African Cetacea (Conakry, May 2000), called for i.a. ‘carrying out .. inventory of cetacean species; collection, treatment and compilation of data for each state.’ The present paper is a preliminary faunal checklist of cetaceans occurring in Guinea’s EEZ. Information was gleaned from strandings, bycatches, scientific and opportunistic sightings and a literature review. Ten species are included for which supporting voucher material and data were available for examination. These are, three baleen whales: *Balaenoptera brydei*, *Balaenoptera acutorostrata* and *Megaptera novaeangliae*; and seven species of odontocetes: *Kogia breviceps*, *Tursiops truncatus*, *Sousa teuszii*, *Stenella frontalis*, *Delphinus delphis*, *Steno bredanensis* and *Globicephala macrorhynchus*. Another two species, *Physeter macrocephalus* and *Stenella attenuata* were sighted off Guinea but no photographic evidence was obtained. The current account is thought to reflect an incomplete picture of Guinea’s cetacean biodiversity. Future surveys are expected to update and investigate spatial and temporal distribution patterns for each species along Guinea’s coast. A few bycatches landed by artisanal fishers were utilised locally, but there are no signs of any substantial captures. Nonetheless, monitoring should be continued. The set-up of a national reference collection and database is recommended. The population identities of the encountered Atlantic humpback dolphin, minke whale and humpback whale are of particular interest.

Busnel, R. G. (1973). Symbiotic Relationship between Man and Dolphins*. *Transactions of the New York Academy of Sciences*, 35(2 Series II), 112-131. <https://doi.org/10.1111/j.2164-0947.1973.tb01511.x>

Reports on symbiotic relationships between men and dolphins are sporadic and usually anecdotal. Among the latter, ancient Greek and Latin authors are the most frequently quoted, but their stories are not very convincing. I should like to cite a text that is not well known by cetologists and to present some evidence that supports the truth of the story. The author was Pliny the Elder (A.D. 32-79), and it concerns a regularly occurring relationship between fishermen and wild dolphins. The interesting part of the text is extracted from his book "Natural History" vol. IX, verses 9 and 10. This is an English version of E. Saint Denis'. French translation¹⁵ of the original Latin: There is, in the province of Narbonne, in the territory of Nimes, a pond named Latera where the dolphins and men are associated together for fishing. At a certain fixed time of the year, at an ebb tide, a huge school of mullet leave the pond for the sea through a narrow pass. Consequently, it is impossible to stretch out nets, because they cannot withstand this heavy mass of fish, even though the fish are not clever and can be ambushed at this time. Apparently rational, the fish head out further thus escaping to a nearby abyss to the only place where the nets can be easily extended. As soon as the fishermen have observed this situation, and there are a lot of people who know the time and are keen on this sort of thing, all those present on the beaches call for "Simon", They call him vigorously, and loudly, asking for his support for this great event. The dolphins respond quickly, if there is an off.shore wind to carry the voices. If the wind is on-shore, the response is delayed. In any case, the dolphins rush to give help. They arrange themselves in a battle line which is distributed forward toward the place where the action is concentrated; they block the access to the deep waters and drive the disturbed fish toward the shallow waters. Then, the fishermen, using pitchforks, surround the fish with their nets. Meanwhile, some of the rapid mullet jump over the nets, but the dolphins capture the fish and kill them; the dolphins are content to delay eating until final victory is attained. While the battle is in progress, the dolphins take pleasure in pursuing the fish forcibly into the nets and this pursuit does not permit the escape of the opponents. The dolphins pass smoothly among the boats, the nets and the swimmers in such a way that no exit passage is opened to allow the fish freedom. If, in some cases the dolphins wish to jump, no great effort is required to escape even if the nets are now let down for them. When the capture is complete, the fishermen sort the fish to share their catch. Desiring reward for their labors, the dolphins wait for one more day, not only for more fish, but also for bread soaked with wine.

Cadenat, J. (1947). Observations De Cetaces Au Senegal. *Notes Africaines*, 34, 20-23.

This French language paper describes sightings of cetaceans, turtles and manatees in Senegal.

Cadenat, J. (1949). Notes Sur Les Cétacés Observés Sur Les Côtes Du Sénégal De 1941 À 1948. *Bulletin de l'Institut Français d'Afrique Noire*, 11, 1-15.

This French language paper describes observations of cetaceans in Senegal between 1941-48

Cadenat, J. (1957). Observations De Cétacés, Siréniens, Chéloniens Et Sauriens En 1955-1956. *Bulletin de l' Institut Francais d' Afrique Noire*, 19, 1358-1375.

This French language paper reviews sightings of multiple taxa in Senegal.

Collins, T., Boumba, R., Thonio, J., Parnell, R., Vanleeuwe, H., Ngouessono, S., & Rosenbaum, H. (2010). *The Atlantic Humpback Dolphin (Sousa teuszii) in Gabon and Congo: Cause for Optimism or Concern?* Retrieved from <https://archive.iwc.int>

The Atlantic humpback dolphin is regionally endemic to tropical and sub-tropical waters of western Africa. The available evidence suggests that their distribution is patchy, with small subpopulations distributed between Western Sahara and Angola, each separated from the next by areas of low or no density. However there has been little to no assessment of any kind in large areas of their potential range. For conservation and management purposes Van Waerebeek et al. (2004) identified eight biogeographical management stocks ranging from Western Sahara to Angola. These included a historical Gabon stock associated with the Estuaire de Gabon (Komo Estuary). The same authors also suspected distribution in other areas where there were no records due to a lack of observer effort. This included the Republic of Congo (hereafter Congo). Thorough reviews of the available information are available elsewhere. The purpose of this document is to provide an update to Collins et al. (2004) by providing a brief review of more recent information from Gabon and Congo and to place these findings into the wider context of general concern and information needs for this species.

Collins, T., Ngouessono, S., & Rosenbaum, H. C. (2004). *A Note on Recent Surveys for Atlantic Humpback Dolphins, Sousa teuszii (Kükenthal, 1892) in the Coastal Waters of Gabon*. International Whaling Commission SC/56/SM23. Retrieved from <https://archive.iwc.int>

A new research and conservation initiative on Atlantic humpback dolphins off the coast of Gabon was started in 2002. Following recommendations made at the meeting of the International Whaling Commission's Scientific Committee in 2002, opportunistic surveys for Atlantic humpback dolphins (*Sousa teuszii*) on the coast of Gabon were completed. Three new sightings are reported and additional incidental data compiled. Plans for further work in 2004 are described.

de Boer, M. N. (2010). Cetacean Distribution and Relative Abundance in Offshore Gabonese Waters. *Journal of the Marine Biological Association of the United Kingdom*, 90(8), 1613-1621. <https://doi.org/10.1017/s0025315410001165>

Information on cetaceans off Gabon in tropical West Africa is summarized from boat-based surveys carried out between 7 March and 7 August 2009. Thirteen cetacean species were positively identified comprising two baleen whale species, one sperm whale species and ten species of delphinid. Bryde's whale (*Balaenoptera brydei*) and humpback whale (*Megaptera novaeangliae*) were the most frequently encountered species. Cetaceans were found throughout a range of sea surface temperature between 20.5°C and 27.5°C and a wide range of depths with the majority of effort and sightings occurring seaward of the shelf break. Of particular interest from the study were the following: (1) Gabonese waters have a broad cetacean diversity, especially with a large and diversified delphinid community in the northern part of the study area; (2) the variations in oceanographic conditions within Gabonese

waters are likely to result in a temporal variation in species composition; (3) the sightings of Atlantic spotted dolphin (*Stenella frontalis*) are the first at-sea sightings confirmed for these waters, although not unexpected given their distribution and abundant presence in surrounding waters; and (4) the poorly known Clymene dolphin (*Stenella clymene*) was sighted on four occasions in deep oceanic waters and was the most abundant cetacean. These are the first confirmed records of Clymene dolphins in Gabonese waters.

Duguy, R. (1976). Contribution a L'etude Des Mammiferes Marins De La Cote Nord-Ouest Afrique. *Revue des Travaux de l'Institut des Pêches Maritimes*, 39, 321-332. Retrieved from <https://archimer.ifremer.fr/doc/00000/2022/>

About twenty species of marine mammals are actually known for the fauna of the north-west african coast (Rio de Oro, Mauritanie, Senegal). This large number of species seems to be related to cold waters areas connected with « upwelling» effect. New data, recently collected, mainly during summer cruise (1973) of the « Thalassa », supply new information about the distribution of some species. *Sousa teuszii* shows a northern limit of its range at about 20° N (Bane d'Arguin) and *Stenella longirostris* at about 16° 15' N. The Common Porpoise (*Phocoena phocoena*) seems to be more frequent in Mauritanian waters than in Moroccan ones, and *Orcinus orca* is commonly observed between Cap Blanc and Cap Timiris. In July and september newborn pups of the Monk seal (*Monachus monachus*) were found at the Rio de Oro colony. Estimation of the local population there is about fifty, this number showing a certain steadiness for many years.

Dupuy, A. R. (1983). Données Complémentaires Concernant Le Statut Des Mammifères Marins Du Sénégal. *Bulletin de l'Institut Français d'Afrique Noire*, 45, 380-391.

Depuis les publications de Dupuy & MAIGRET dans la serie « 1 Mammiferes marins des cotes du Senegal» (1971 a 1985) et la synthese de MAIGRET sur les Mammiferes marins dans les Parcs nationaux du Senegal (1982), rien de nouveau n'a ete publie sur ce sujet. Les observations s'etant accumulees entre temps, il nous a semble necessaire de poursuivre l'effort de connaissance entreprise, en rendant compte dans cet article des donnees nouvelles. Par souci d'information, il y a lieu de souligner ici qu'en mai 1982, le Senegal a adhere a la C.B.I. (1) devenant ainsi le premier Etat africain membre de cette commission. Il est egalement bon de souligner que c'est le vote semalgais qui, lors de la conference internationale de Brighton, (Aout 1982) a permis l'adoption de l'interdiction pendant dix ans de la chasse aux grands cetaces.

Fulling, G., Foster, J., Fertl, D., & Fagin, T. (2008). *Pilot Survey of Coastal Small Cetaceans in the Waters of Guinea-Bissau*.

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the treaty organization that governs international trade in wildlife species, requires an exporting country to provide a “non-detriment finding” (NDF) to support wildlife captures and trade involving certain species (including many cetaceans). An NDF is supposed to be based on scientific studies of the abundance and status of the wild stock from which exported animals were taken, as well as a scientific assessment that shows that removing the animals will not cause the stock's depletion. The IUCN Cetacean Specialist Group also notes that appropriate population assessments should precede any considerations for

livecaptures of dolphins for captive purposes. The live-capture trade of bottlenose dolphins (*Tursiops truncatus*) is shifting to developing nations, including those in West Africa. Currently, there is sparse published information on cetaceans found in the waters off Guinea-Bissau. The bottlenose dolphin and the Atlantic humpback dolphin (*Sousa teuszii*) are resident to the coastal waters of this country. As noted by Van Waerebeek et al. (2008), no population assessment of bottlenose dolphins has ever been made for Guinea-Bissau. The purpose of the current survey was to collect distributional information to address concerns that insufficient data exist on the size and status of bottlenose dolphins occurring in the coastal waters of Guinea-Bissau.

Jefferson, T. A., Curry, B. E., Leatherwood, S., & Powell, J. A. (1997). Dolphins and Porpoises of West Africa: A Review of Records (Cetacea: Delphinidae, Phocoenidae). *Mammalia*, 61, 87-108. <https://doi.org/10.1515/mamm.1997.61.1.87>

This review includes a summary of records of multiple species from the region from Gibraltar to Congo, as well as an identification key for those species. Une recherche bibliographique a permis de dénombrier dix-neuf espèces de dauphins et marsouins (Cetacea: Delphinidae et Phocoenidae) dans les eaux de l'Afrique de l'Ouest (depuis le Détroit de Gibraltar jusqu'au fleuve Congo). De plus, deux espèces vivant dans des eaux froides et tempérées atteignent leur limite sud de répartition à la frontière nord de cette zone. La distribution de chaque espèce en Afrique de l'Ouest est passée en revue. Une clé d'identification des dauphins et marsouins de l'Afrique de l'Ouest, basée sur la morphologie externe, est proposée en vue de faciliter la détermination.

Kükenthal, W. (1891). Porpoises in African Rivers. *Nature*, 44, 175. <https://doi.org/10.1038/044175a0>

In reference to Mr. Sclater's letter in NATURE of June 11 (p. 124), the following may be interesting to your readers: The skull of a Delphinoid Cetacean from Cameroon has lately come into my hands, through the kindness of Prof. Pechne J. Loesche. The sender, Mr. Edward Teusz, gave the following information concerning it. The animal to which it belonged was caught in Kriegschiff Bay, after very heavy rains, and was being devoured by sharks. The contents of the stomach consisted of grass, weeds, and mangrove fruits. None of the natives had ever seen the animal before. In preparing the skull, Mr. Edward Teusz noticed that the nostrils projected above the surface of the forehead. I am preparing for publication a detailed description of the skull, and must here confine myself to remarking that, though the animal belongs to the genus *Sotalia*, it differs in several essential points from all the species of that genus hitherto described. I have no doubt that it is a new species. There are twenty-seven teeth on each side in each jaw. Their form, in that they are not pointed, but worn down, indicates, as also do the contents of the stomach, that the animal is herbivorous. It therefore seems certain that it is a fresh-water animal. It is well known that other *Sotalia* live in river.

Leeney, R. H., Weir, C. R., Campredon, P., Regalla, A., & Foster, J. (2016). Occurrence of Atlantic Humpback (*Sousa teuszii*) and Bottlenose (*Tursiops truncatus*) Dolphins in the Coastal Waters of Guinea-Bissau, with an Updated Cetacean Species Checklist. *Journal of the Marine Biological Association of the United Kingdom*, 96(4), 933-941. <https://doi.org/10.1017/s0025315415000661>

There is a paucity of information on the cetacean fauna of Guinea-Bissau in West Africa. We compiled records published in the literature and novel unpublished sighting data (2008-2014) to examine the occurrence and distribution of cetacean species. At least 10 species were verified to occur in Guinea-Bissau waters, of which eight were documented from a small number of sightings, whaling captures or skeletal remains. By far the most frequently recorded species were the common bottlenose dolphin (*Tursiops truncatus*) (N = 146) and the Atlantic humpback dolphin (*Sousa teuszii*) (N = 110). These two species were sympatric in distribution, both being found throughout coastal waters from the northern regions of Canal de Jeta and Rio Mansoa south to the Rio Cacine and around the Arquipelago dos Bijagos. However, differences were apparent in their finer-scale distribution and in the distance of sightings from shore, with bottlenose dolphin sightings generally occurring further from shore (and especially in the region of the Canal do Geba) than Atlantic humpback dolphins. Sightings indicate that both species likely inhabit Guinea-Bissau waters throughout the year. Dedicated systematic cetacean survey work is urgently needed in coastal Bissau-Guinean waters in order to ascertain the abundance, spatio-temporal distribution, population structure and causes of mortality of bottlenose and Atlantic humpback dolphins, particularly given the Vulnerable conservation status of the latter species. Clarification of the status of cetaceans in offshore waters requires survey effort throughout the Guinea-Bissau EEZ.

Liu, M., Lin, M., Dong, L., Xue, T., Zhang, P., Tang, X., & Li, S. (2020). Group Sizes of Indo-Pacific Humpback Dolphins in Waters Southwest of Hainan Island, China: Insights into Rare Records of Large Groups. *Aquatic Mammals*, 46(3), 259-265. <https://doi.org/10.1578/AM.46.3.2020.259>

Group size is important to both communication and social dynamics for many marine mammal species. Thus, group size estimation is essential to the research of marine mammal behavior. Humpback dolphins (*Soma spp.*) are small odontocetes widely distributed in the western Pacific, Indian, and eastern Atlantic Oceans. Recent taxonomic revision shows the existence of at least four species in the genus *Soma*: Indo-Pacific humpback dolphin (*S. chinensis*), Australian humpback dolphin (*S. sahalensis*), Indian Ocean humpback dolphin (*S. plumbea*), and Atlantic humpback dolphin (*S. teuszii*). Here, Liu et al present baseline data on group size estimates of humpback dolphins around the SW Hainan Island and potential factors that might influence the group size estimation of these animals.

Maigret, J. (1980). Les Mammifères Marins Des Côtes De Mauritanie État Des Observations En 1960. *Bulletin Scientifique de l'IMROP*, 9, 130-152. Retrieved from <http://hdl.handle.net/1834/5605>

La campagne de sensibilisation du public a été poursuivie et quelques échouages ou observations ont été signalées.

Maigret, J. (1986). Les Cétacés Sur Les Cotes Ouest-Africaines: Encore Quelques Énigmes! *Notes Africaines*, 189, 20-24.

Après douze années passées sur les côtes nord-ouest africaines et de nombreuses publications relatant les observations ou les échouages de Mammifères marins rencontrés durant cette période, nous avons été amenés à nous poser un certain nombre de questions sur la répartition des différentes espèces. Les auteurs donnent, généralement avec assurance, une aire de répartition à chaque espèce. Si cela est vérifié la plupart du temps, il s'avère, en particulier pour les Cétacés, animaux rapides et difficiles à observer, que l'on ait quelques surprises! La lecture d'un ouvrage de B. HEUVELMANS, *Le Grand Serpent de mer, le problème zoologique et sa solution* (1965), nous a incité à poursuivre cette réflexion et à nous interroger sur les connaissances que nous pouvions avoir des Cétacés d'une région telle que l'Afrique de l'Ouest, qui est pourtant relativement fréquentée par les navires de toutes sortes: pêche, commerce, plaisance! Les quelques exemples qui suivent vont nous montrer qu'elles sont relativement fragmentaires.

Maigret, J., Trotignon, J., & Duguay, R. (1976). Observations De Cétacés Sur Les Côtes De Mauritanie (1971-1975). *Journal du Conseil International pour l' Exploration de la Mer, Comité de Mammifères Marins*, 4, 7. Retrieved from <https://www.ices.dk>

During the years 1971 to 1975, ten species of Cetacea have been recorded along the coasts of Mauritanie: *Sousa teuszii*, *Steno bredanensis*, *Stenella longirostris*, *Delphinus delphis*, *Tursiops truncatus*, *Globicephala melaena*, *Orcinus orca*, *Grampus griseus*, *Phocoena phocoena*, and, *Balaenoptera physalus*. The northern limit of range seems to be about 20°N for *S. teuszii* and 16°15'N for *S. longirostris*. It is to be noticed the particularly large specimens of *P. phocoena* found in this area, and frequent sightings of *O. orca*. The main feature of this fauna is a mixing of tropical and tempered ones to be related to cold waters areas connected with "upwelling" effect.

Moore, A. (2018). The Future of Atlantic Humpbacked Dolphins *Sousa teuszii* in Dakhla Bay, Atlantic Sahara. *Go-South Bulletin*, 15, 166-171. Retrieved from <https://go-south.grepom.org/gsb/>

In 2017 the Atlantic Humpbacked Dolphin was upgraded to 'Critically Endangered' by the International Union for Nature Conservation (IUCN). Recent declines have been confirmed or suspected for all populations throughout its west African range between Dakhla Bay in Atlantic Sahara (Figure 1) and Angola, with estimates of the total population of below 3,000 individuals.

Murphy, P., Van Waerebeek, K., & Jallow, A. (1997). *Cetaceans in Gambian Coastal Waters*. International Whaling Commission SC/49/SM 11. Retrieved from <https://archive.iwc.int>

This paper presents an overview of the current state of knowledge of cetaceans within Gambian coastal waters. Existing records including unpublished data have been reviewed and additional information has been gathered from stranded specimens and observations of live animals. The Atlantic humpbacked dolphin (*Sousa teuszii*) and the bottle-nosed dolphin (*Tursiops truncatus*) are both resident within Gambian waters. The clymene dolphin (*Stenella clymene*) has been recorded from skeletal remains, and at least two strandings of large cetaceans have occurred over the last decade. There is little hard data

existing on the abundance and distribution of cetaceans within Gambian waters and therefore a considerable need for the establishment of a research programme.

Notarbartolo-Di-Sciara, G., Politi, E., Bayed, A., Beaubrun, P. C., & Knowlton, A. (1998). *A Winter Cetacean Survey Off Southern Morocco, with a Special Emphasis on Right Whales*. International Whaling Commission SC/49/O 3. Retrieved from <https://archive.iwc.int>

Between 20 January and 14 February 1996, a 20km auxiliary ketch investigated the coastal waters of Southern Morocco, a former wintering ground for right whales (*Eubalaena glacialis*). The aims were to: verify if right whales could still be found in the area; evaluate the environmental conditions of the region and assess its suitability as a right whale habitat; investigate the status of other cetaceans living in the area; and establish a long-term cetacean sighting and stranding reporting mechanism in cooperation with the local authorities. A 750km survey yielded no cetacean sightings except inside Dakhla Bay, where communities of bottlenose dolphins (*Tursiops truncatus*) and Atlantic hump-backed dolphins (*Sousa teuszii*) were found to coexist. Local knowledge of a regular, predictable presence of large whales in the coastal zone was lacking. The hypothesis that the area still serves as a winter concentration site for the remnants of an eastern North Atlantic right whale population, although not falsified by this study, seems rather unlikely. The dearth of cetaceans in the shelf waters of Southern Morocco, as well as the possible over-exploitation of the fishing resources in the region, may be cause for concern and warrants further investigation. Finally, with the objective of increasing baseline information on the local cetacean fauna, and particularly concerning the possibility that right whales may be sighted in the future, a procedure was established for the long-term routine reporting of cetacean sightings and strandings by the Royal Navy of Morocco to the Groupe d'Etudes des Cetaces et Pinnipedes du Maroc, Rabat.

Perrin, W. F., & Van Waerebeek, K. (2012). *The Small-Cetacean Fauna of the West Coast of Africa and Macaronesia: Diversity and Distribution*. Conservation of Migratory Species UNEP/CMS-WATCH-Inf.06. Retrieved from <https://www.cms.int/en/document/small-cetacean-fauna-west-coast-africa-and-macaronesia>

This review is an attempt to summarize the existing information in the literature on distribution of small cetaceans in the region, by species and by country. A constraint on the time available for preparation has limited the scope of the review; it is not exhaustive, and records not noted here undoubtedly exist, especially for Macaronesia. The summary tables given here can serve as a basis for further review. The tables and list of references consulted are available from the authors as electronic files. The area covered includes the entire west coast of Africa from Morocco to South Africa (Atlantic coast) and the archipelagos of Macaronesia (Canary Islands, Madeira, Azores and Cape Verde Islands). Little is known about the distribution of most small cetaceans along the west coast of Africa; roughly 25-30 species are thought to occur there, depending on the source consulted. The smallcetacean fauna of most of Macaronesia is better known, as there have been a number of cetological surveys, stranding programs, and reviews initiated there in recent years. Records of a total of 31 species were found in the present review. The records on which the table is based are of varying reliability. Some are confirmed by specimens, photographs, or the opinion of an on-site expert; many others are not. Unless it could be determined from data or photographs in the reference that the record was likely erroneous, it was included. The aim was to develop an overall picture of diversity and distribution. Before a definitive checklist can be developed for a country, the putative records should each be closely checked for likely

validity. The tables are organized with countries and territories arranged roughly from north to south and the small-cetaceans grouped into 1) north-temperate, 2) tropical, 3) south-temperate, 4) antitropical, and 5) cosmopolitan species.

Segniagbeto, G. H., & Waerebeek, K. V. (2010). *A Note on the Occurrence and Status of Cetaceans in Togo*. International Whaling Commission SC/62/SM11. Agadir, Morocco. Retrieved from <https://archive.iwc.int>

Eight cetacean species are here reported to occur in Togo's coastal waters and all are newly recorded mammals for the country: *Megaptera novaeangliae*, *Balaenoptera brydei*, *Balaenoptera cf. bonaerensis*, *Physeter macrocephalus*, *Stenella attenuata*, *Delphinus sp.*, *Globicephala cf. macrorhynchus* and *Orcinus orca*. Much of artisanal fisheries in Togolese waters are dominated by Ghanaian fishermen who have the habit of selling cetacean catches as a food product. Because the landing of cetaceans is illegal in Togo which is actively enforced in the main fishing centres, cetacean landings occur covertly and cannot be monitored, quantified nor sampled. Significant pollution of the marine habitat by heavy metals, possibly affecting cetaceans, consists in phosphorites mining in the coastal basin near Hahotoé and Kpogamé.

Solarin, B. B. (2010). *Status of Small Cetaceans in Nigeria*. International Whaling Commission SC/62/SM12. Retrieved from <https://archive.iwc.int>

Widespread distribution and occurrence of the two major cetaceans (whale and dolphins) have been observed in the Nigerian coastal waters. They have been frequently sighted by small scale artisanal and industrial fishermen, marine mammals observers (MMO) and other scientists from their various crafts or platforms (canoes or vessels) in the near shore coastal waters or deep sea (> 2500m). In one of the few quantitative reports, 277 sightings were recorded between November 2007 and December 2009 and comprised of 187 (68%) for whales and 88 (32%) for dolphins. The herds included both adult and young calves. The movements were sometimes associated or identified with various activities including breathing/blowing of water, feeding (mainly at night), bow riding and others. There was no record of directed catch and were rarely caught or entangled in the nets. The physico-chemical parameters were within tolerable limits to support the survival of cetaceans and other living organism. However in a trawl fishing survey conducted in 2009, large volume of non biodegradable solid waste was observed up to 100m depth. Conservation of the resources and the maintenance of biological diversity are paramount and activities on ecosystem approach to fisheries (EAF) involving all stakeholders have commenced. It is also very important to promote regional and international collaboration and cooperation in order to address issues such as poaching and illegal, unregulated and unreported (IUU) fishing.

Uwagbae, M., & Van Waerebeek, K. (2010). *Initial Evidence of Dolphin Takes in the Niger Delta Region and a Review of Nigerian Cetaceans*. International Whaling Commission SC/62/SM1. Agadir, Morocco. Retrieved from <https://archive.iwc.int>

An interview survey among artisanal fishermen from Brass Island, Niger Delta, in 2008-2009 revealed, for the first time, regular takes of delphinids in Nigerian coastal waters. Three fishermen at Imbikiri, Brass Island, were identified as dedicated 'dolphin hunters'. Evidence is difficult to obtain but one video footage authenticated the landing of a live common bottlenose dolphin. Fraser's dolphin is suggested to occur offshore (probable sighting) but no other documented sightings of odontocetes are published,

despite the massive exploration effort for hydrocarbons. A cowneonate pair of humpback whales was sighted in western Nigeria, at the Togo border, on 9 September 2001 during a survey of the austral population that breeds in the Bight of Benin. In view of the abysmal state of knowledge, as to add to the inventory and zoogeography of Nigeria's cetaceans even baseline coastal surveys could yield significant insights. Particularly pressing is an in-depth assessment of the contemporary and historical presence (or absence), of the vulnerable Atlantic humpback dolphin *Sousa teuszii* and an estimate of the extent and composition of dolphin takes.

Van Waerebeek, K., Ndiaye, E., Djiba, A., & Diallo, M. (2000). *A Survey of the Conservation Status of Cetaceans in Senegal, the Gambia and Guinea-Bissau, Wafcet-I Report*. Conservation of Migratory Species UNEP/CMS Secretariat WAF CET-I Report. Bonn, Germany. Retrieved from <https://www.cms.int/en/document/wafcet-1-%E2%80%9D-survey-conservation-status-cetaceans-senegal-gambia-and-guinea-bissau%E2%80%9D>

A survey of the status of cetaceans in Senegal, The Gambia and Guinea-Bissau (Project WAF CET I) was undertaken in 1997-98 sponsored by UNEP/CMS to start a projected long-term international effort to stimulate broad regional involvement in research and conservation of West African cetaceans. Partners included, in Senegal, the Institut Fondamental d'Afrique Noire, Universite Cheikh Anta Diop (IFAN-CAD) and the Centre de Recherches Oceanographiques de Dakar-Thiaroye (CRODT); in The Gambia, the Department of Parks and Wildlife Management (DPWM); and in Guinea-Bissau the Centro de Investigac;ao Pesquero (CIPA) and IUCN-Bissau office; however field activities in Guinea-Bissau were abandoned due to the 1998 war. The status, distribution and biological characteristics of 24 species of dolphins and whales confirmed to occur in the study area were reviewed. The authors collected new biological voucher material, such as skeletal specimens, soft tissues, samples for genetic studies and photographic evidence of several dozens of individuals of 11 cetacean species. Included are the first recognized specimens of minke whale (*Balaenoptera acutorostrata*) and sei whale (*Balaenoptera borealis*) for Senegal, the first records of Clymene dolphin (*Stenella clymene*) and short-finned pilot whale (*Globicephala macrorhynchus*) for The Gambia and the first Fraser's dolphin (*Lagenodelphis hosei*) for mainland West Africa. Both long-beaked common dolphins (*Delphinus capensis*) and short-beaked common dolphins (*Delphinus delphis*) were shown to occur off Senegal, their intraspecific variability is under study. A total of 269 historical specimens, most of them skulls, were registered in a comprehensive review and rehabilitation of the IFAN cetacean collection curated at IFAN-CAD (73 specimens) and the Musee de la Mer on Goree Island (196 specimens): *Balaenoptera acutorostrata* (3), *Balaenoptera borealis* (1), *Balaenoptera sp.* (2), *Delphinus capensis* (83), *Delphinus d. capensis* (17), *Delphinus delphis* (11), *Delphinus d. delphis* (7), *Delphinus sp.* (43), *Globicephala macrorhynchus* (10), *Orcinus orca* (3), *Phocoena phocoena* (10), *Physeter macrocephalus* (2), *Tursiops truncatus* (34), *Sousa teuszii* (15), *Stenella sp.* (4), *Steno bredanensis* (14), *Ziphius cavirostris* (1), and material of unidentified cetaceans (7). Although no cetacean catch rates could be estimated, both empirical and circumstantial evidence was gathered for dolphin by-catches and direct takes in Senegal and The Gambia. Low to moderate mortality levels in fisheries seem to occur in most of the study area, except Guinea-Bissau for which there is no information. While there were no indications of substantial directed takes, these could occur covertly. Most fishermen are acutely aware of the legal protection of dolphins. Detection avoidance strategies include the hiding of fresh carcasses, burial on the beach or offshore dumping of butchered remains. Cetacean meat is a local commercial commodity and is consumed covertly in several places. Confirmed catches include Atlantic hump-backed dolphin (*Sousa teuszii*), bottlenose dolphin (*Tursiops truncates*) and a short-finned pilot whale. Circumstantial evidence from small boat surveys, stranded remains and fisheries monitoring, suggests that the Atlantic hump-backed dolphin has become

fairly rare off Senegal and The Gambia. Only in Guinea-Bissau were hump-backed dolphins sighted with any regularity during boat sorties. Also, its range was found to be considerably more limited than previously assumed and does not seem to include true riverine habitat. Where occurring in outer estuaries, these had predominantly marine characteristics. All verifiable dolphin sightings and catches upstream of the estuary of the Gambia and Casamance rivers were identified as *T. truncatus*. Artisanal fishing effort has dramatically increased over the past decade both in the number of fishermen and the number of boats, and by-catches in artisanal fisheries continue to affect several species, especially bottlenose dolphins living near-shore and Atlantic hump-backed dolphins. Catches, in conjunction with expanding coastal development, may be fracturing the hump-backed dolphin's range. Reproductive isolation would be a serious threat to the species' long-term survival. The Saloum delta (including Sine, Saloum, Diombos and Bandiala), part of which constitutes Senegal's Parc National du Saloum, the adjacent waters of The Gambia's Niomi National Park and the outer estuary of the Gambia river constitute a major refuge area for Atlantic hump-backed dolphins and deserve the highest possible protection. If further work confirms the precarious status of the species, an Appendix I listing on the CMS Convention will be necessary. Dedicated commercial dolphin-watching is firmly established only on the Gambia River; in Senegal's Saloum delta it is practised only incidentally. Although no current problems were noted, for an efficient regulation we recommend that a licensing system and an official code of conduct for tour operators be adopted, as well as an enforcement scheme. It is recommended also that The Gambia government would proceed with the ratification of the CMS Convention at its earliest convenience, as to ensure maximum protection for aquatic mammals and other wildlife in the region. The Tanji Bird Reserve with Bijol Islands and associated inshore waters, as well as the Kiang West National Park on the south bank of the Gambia River, are conservation areas which protect confirmed cetacean habitat.

Van Waerebeek, K. a. O.-D., P.K. (1999). *A First Checklist of Cetaceans of Ghana, Gulf of Guinea, and a Shore-Based Survey of Interactions with Coastal Fisheries*. International Whaling Commission SC/51/SM35. Retrieved from <https://archive.iwc.int>

To date, six cetacean species are confirmed to occur in coastal waters off Ghana: five odontocetes *Stenella clymene*, *Steno bredanensis*, *Tursiops truncatus*, *Kogia simus*, *Physeter macrocephalus*, and *Megaptera novaeangliae*. A stranded humpback whale calf raised questions about breeding stock. We found no evidence for the presence of the Atlantic hump-backed dolphin *Sousa teuszii*; either it has become rare or it does not occur off Ghana. Unrestrained coastal development may pose a threat for nearshore species. Regular and year-round bycatches of small cetaceans are documented in artisanal gillnet fisheries from Apam, Jamestown (Accra), Kpone and Winneba. At Apam, drift gillnet fishermen intentionally capture dolphins with sharks and tuna. Annual takes at Apam and Jamestown probably count in the low hundreds, higher than at Kpone and Winneba. Bottlenose dolphins are also known to be taken in semi-industrial purse-seines (Jamestown). Carcasses are not filleted, but hacked into small portions including bone, and retailed locally for food. This explains why beach-combing around fishing villages did not yield any findings of skeletal parts. Field research and monitoring effort should continue.

Weir, C. (2016). *A Survey of the Atlantic Humpback Dolphin (Sousa teuszii) in the Saloum Delta Biosphere Reserve, Senegal, 21 October to 7 November 2015*. Retrieved from https://rsis.ramsar.org/RISapp/files/47454946/documents/SN2328_lit160923.pdf

Cetacean research in West Africa (Mauritania to Nigeria) is still in its infancy with relatively little scientific survey work being carried out in the region. Senegal has one of the better documented cetacean faunas, due predominantly to the work of French scientists such as Cadenat, Dupuy and Maigret who published information on stranded and captured specimens (and some sightings) in the 1950s to the 1970s. However, recent information remains scarce. At least 13 delphinid species have been recorded from Senegalese waters (Table 1), with several additional species (e.g. false killer whale *Pseudorca crassidens*, Risso's dolphin *Grampus griseus*, and pantropical spotted dolphin *Stenella attenuata*) also expected to occur but currently unconfirmed. Of the species listed in Table 1, most inhabit deep, oceanic waters far from the coast. The killer whale (*Orcinus orca*), the bottlenose dolphin (*Tursiops truncatus*) and the common dolphin (*Delphinus sp.*) are more cosmopolitan in their habitat requirements and can occur from the coast to oceanic waters. However, one species, the Atlantic humpback dolphin (*Sousa teuszii*), inhabits only nearshore waters in water depths typically less than 20 m. This species therefore has a restricted habitat requirement and its overall abundance across its geographic range seems to be low. These factors, together with evidence of mortality of the species in artisanal fisheries, have led to increasing concern over the conservation status of *Sousa teuszii*. It is currently listed as 'vulnerable' by the International Union for Conservation of Nature (IUCN), although this status is currently under review by the IUCN Cetacean Specialist Group and may soon be revised. Senegal has an important history with regard to *Sousa teuszii*. The type specimen for the species originated from Cameroon in 1892, with only the skull being described. Over 50 years passed before the next record of the species, when the skull was acquired of a dolphin caught in nets off M'bour in Senegal during 1943. The vast majority of subsequent records of the species were from bycatch and captured specimens landed at Joal and M'Bour, including the first full fresh specimen of the species in 1955 which was described by Cadenat (1956). A number of skulls from these early specimens are stored at the IFAN museum in Dakar. The first extensive information on at-sea sightings of *Sousa teuszii* anywhere in its range also originated from Senegal, with sightings particularly concentrated around the Saloum Delta, where Cadenat (1959) considered it to be abundant. Dupuy (1983) and Maigret (1980) also reported a regular occurrence of the species in the Saloum Delta. In an overview of incidental records from the Saloum Delta, Maigret (1980) published the first consideration of the ecology of *Sousa teuszii*, including group size, behaviour, population size and movements. He guessed that there were no more than 100 individuals inhabiting the Saloum Delta. In a recent compilation of all available published and unpublished records, Weir and Collins (2015) located 76 by-catch, capture, specimen and sighting records (those with a specific position, date and group size) for Senegalese waters, of which the clear majority originated from the southern portion of the Saloum Delta from Île des Oiseaux to Djinack. Despite the relatively extensive history of *Sousa teuszii* records in Senegal, there has never been a systematic scientific sighting survey of the species in the region. Consequently, knowledge of the distribution and ecology of the species in the Saloum Delta has been limited to interpretation of the infrequent opportunistic records. This report describes the results of a baseline scientific study carried out in the Saloum Delta Biosphere Reserve (SDBR) during October and November 2015 to assess the occurrence of dolphin species in the region. The study was sponsored and carried out by Sylvatrop Consulting, in partnership with the Direction des Parcs Nationaux (DPN) and the Direction des Aires Marines Communautaire Protégées (DAMCP).

Weir, C. R. (2008). Occurrence and Distribution of Cetaceans Off Northern Angola, 2004/05. *Journal of Cetacean Research and Management*, 9(3), 225-239. Retrieved from <https://journal.iwc.int/index.php/jcrm>

The occurrence and distribution of cetacean species off northern Angola was examined using dedicated survey data and incidental sighting records. Dedicated surveys for cetaceans were carried out during two geophysical seismic surveys off northern Angola between August 2004 and September 2005. A total of 3,268hr of survey effort data were collected, resulting in 779 on-effort cetacean sightings. There were 263 sightings reported off-effort and incidentally from other platforms and sports fishermen. With 21 cetacean species confirmed, the cetacean community off northern Angola is diverse and primarily tropical in characteristic, comprising four species of baleen whale, two sperm whale species, at least two beaked whale species, and 13 species of delphinid. Humpback and sperm whales were the most frequently recorded cetaceans. The occurrence of humpback whales was significantly higher within neritic waters, and during the winter and spring months in association with seasonal occupancy of their West African breeding grounds. Sperm whales were recorded in water depths exceeding 1,000m and demonstrated significant seasonality, with peak occurrence during the summer and autumn. Atlantic spotted dolphins and common dolphins (*Delphinus sp.*) were the most numerous delphinids recorded, with spotted dolphins showing a significant seasonal peak during the spring and summer, and common dolphin in the winter. Other species recorded included fin whale, sei whale, Bryde's whale, dwarf sperm whale, Cuvier's and Mesoplodon beaked whales, killer whale, short-finned pilot whale, false killer whale, melon-headed whale, Atlantic humpback dolphin, rough-toothed dolphin, Risso's dolphin, bottlenose dolphin, Pantropical spotted dolphin, spinner dolphin, Clymene dolphin and striped dolphin. Further research is required to document the cetacean community in Angola, particularly given the unknown threat from fishery bycatch and the increasing level of oil and gas exploration in the region.

Weir, C. R. (2010). Cetaceans Observed in the Coastal Waters of Namibe Province, Angola, During Summer and Winter 2008. *Marine Biodiversity Records*, 3, 7. <https://doi.org/10.1017/S1755267210000230>

Little marine mammal research has been carried out along the West African coastline, and the cetacean fauna is consequently poorly documented. Namibe Province in southern Angola was the site of several historical whaling stations, but current knowledge of the occurrence of large whales and odontocete species is lacking. A dedicated cetacean study was carried out off Flamingos, Namibe Province during the austral summer and winter of 2008. A total of 1161.2 km (96.5 hours) of boat-based search effort, 531.8 km (49.2 hours) of vehicle-based search effort and 46.6 hours of fixed-site survey effort was collected, during which 148 cetacean sightings were recorded. The 143 positively-identified sightings comprised Atlantic humpback dolphin *Sousa teuszii* (N = 71), bottlenose dolphin *Tursiops truncatus* (N = 24), Bryde's whale *Balaenoptera cf. brydei* (N = 37) and humpback whale *Megaptera novaeangliae* (N = 11). The Atlantic humpback dolphin occurred similarly in both summer and winter and occupied a strictly nearshore habitat usually within 300 m of the coast. Both the absolute number of sightings and the sighting rate of bottlenose dolphins were higher during the winter than the summer. Bryde's whale was present only during the summer survey. While present during both survey periods, humpback whales were more numerous during the winter. The dataset increases knowledge of the cetaceans occurring off southern Angola. However, further survey work is required to clarify the distribution, ecology and potential threats to cetacean species in the region.

Weir, C. R. (2010). A Review of Cetacean Occurrence in West African Waters from the Gulf of Guinea to Angola. *Mammal Review*, 40(1), 2-39. <https://doi.org/10.1111/j.1365-2907.2009.00153.x>

The cetacean fauna of the west coast of Africa is poorly described. Therefore, literature on the occurrence of cetacean species in the waters of 13 potential West African range states from the Gulf of Guinea to Angola was reviewed, including sighting, stranding, capture, bycatch and whaling records. At least 28 species of cetacean were documented in the study region, comprising seven baleen whale species and 21 species of toothed whale (including at least 17 delphinid species). Cetaceans could be broadly split into seven ecological categories, based on their distribution. A warm temperate/tropical deep-water cetacean community dominated the study area. Cooler water from the Benguela Current influenced southern Angola ($\leq 16^{\circ}\text{S}$ latitude) and at least three cetacean species occurred predominantly in this region. Only three or fewer species were confirmed in the waters of Togo, Nigeria, Cameroon and the Democratic Republic of Congo. Seventeen or more species were documented in Ghana, Gabon and Angola, where dedicated cetacean research projects have been initiated in recent years. Angola had the most diverse documented cetacean community: 28 confirmed species. The humpback whale *Megaptera novaeangliae* was the most widely recorded species, and was documented in 11 (85%) countries. Sperm whales *Physeter macrocephalus*, Bryde's whales *Balaenoptera cf. brydej*, bottlenose dolphins *Tursiops truncatus* and Atlantic spotted dolphins *Stenella frontalis* were recorded in over half of the countries.

Weir, C. R. (2015). Photo-Identification and Habitat Use of Atlantic Humpback Dolphins *Sousa teuszii* around the Rio Nunez Estuary in Guinea, West Africa. *African Journal of Marine Science*, 37(3), 325-334. <https://doi.org/10.2989/1814232x.2015.1069757>

Ecological data for the Atlantic humpback dolphin *Sousa teuszii* are scant. Six on-effort *Sousa teuszii* sightings were recorded during 817.6 km of boat-based effort in the Rio Nunez region of Guinea during October and November 2013. Two incidental sightings were also reported. Groups comprised 1-25 animals. Photo-identification produced a minimum population estimate of 47 animals. Most sightings ($n = 5$) were located close (< 1 km) to shore along a 5.7 km stretch of coast on the west side of Ile de Taidi, primarily over shallow, sand-mud habitat. Two very distinctive individuals were present in all four Taidi photo-identification encounters, suggesting high site fidelity and stable associations. Two sightings occurred in the outer Rio Nunez Estuary much farther from the coast (5-12 km) but in relatively shallow water (≤ 15 m) over sand-mud sediment. Focal follows ($n = 5$: 0.2-3.8 h duration) produced 9.02 h of behavioural data. Travel (51%), foraging (39%) and feeding (9.2%) dominated, with Taidi dolphins spending more time foraging and feeding than the outer estuary groups. Three individuals had linear-severed dorsal fins consistent with injuries from fishing line. Some management implications of variation in habitat, site fidelity and movements of *Sousa teuszii* groups are discussed.

Weir, C. R. (2016). Atlantic Humpback Dolphins *Sousa teuszii* in the Saloum Delta (Senegal): Distribution, Relative Abundance and Photo-Identification. *African Journal of Marine Science*, 38(3), 385-394. <https://doi.org/10.2989/1814232x.2016.1216893>

During October and November 2015, the first systematic survey of *Sousa teuszii* was carried out in the Saloum Delta (Senegal, West Africa), comprising 1 617.5 km of boat-based survey coverage. Thirty sightings were recorded in the Saloum and Diomboss rivers, and along the southern coastline. Dolphins were also observed entering the Bandiala and Djinack channels, and travelling across the border into Gambia. The initial sighting locations were 0.043-1.192 km from shore, and tracked dolphins did not

move more than 2.082 km from shore. Groups comprised 1-29 animals (mean 9.3 animals), and at least three neonate calves were observed during November. The overall relative abundance was 0.018 sight. km⁻¹ and 0.175 ind. km⁻¹. Sightings were concentrated in the Diomboss where relative abundance reached 0.037 sight. km⁻¹ and 0.331 ind. km⁻¹. Non-intensive photo-identification produced a minimum population size of 103 animals, the highest recorded for *S. teuszii* anywhere in its range. Photo-identification also confirmed a movement of individuals between different parts of the Saloum Delta. Combined travel-forage dominated the behaviour. Dolphins were photographed capturing mullet (*Mugil sp.*) on three occasions. The distribution, population size and movements of *S. teuszii* are discussed in relation to management.

Weir, C. R. (2019). The Cetaceans (Whales and Dolphins) of Angola. In *Biodiversity of Angola: Science & Conservation: A Modern Synthesis*. B. J. Huntley, V. Russo, F. Lages, & N. Ferrand (Eds.), (pp. 445-470): Springer International Publishing https://doi.org/10.1007/978-3-030-03083-4_16

The history of whale and dolphin (cetacean) research in Angolan waters is scant. Prior to the 2000s it primarily consisted of information from historical (1700s to the 1920s) and modern (1920s-1970s) whaling catches, from which baleen whales and the sperm whale were confirmed. Very few species were added to Angola's cetacean checklist between the whaling era and the 2000s. However, observations since 2003 have confirmed Angola as a range state for at least 28 species, comprising seven baleen whales, two sperm whale species, at least two beaked whales, and at least 17 delphinids. There is potential for approximately seven more species to be identified in the region based on their known worldwide distributions. Angola has one of the most diverse cetacean faunas in Africa, and indeed worldwide, due to its varied seabed topography and transitional ocean climate which supports both (sub)tropical species and those associated with the Benguela Current. While no cetacean species are truly endemic to Angola, the country is one of few confirmed range states for the Critically Endangered Atlantic humpback dolphin and the Benguela-endemic Heaviside's dolphin. Those species, together with endangered baleen whales and breeding populations of sperm and humpback whales, are highlighted as conservation priorities.

Zwart, S. J., & Weir, C. R. (2014). Filling in the Gaps: First Record of *Sousa teuszii* in Benin (Gulf of Guinea: Africa). *Marine Biodiversity Records*, 7, 4. <https://doi.org/10.1017/S1755267214000578>

A sighting of four Atlantic humpback dolphins (*Sousa teuszii*) was recorded and photographed close to the Benin coast on 3 November 2013. This is the first record of the species for Benin, and also represents the first verified record within a 3,065 km stretch of coast extending from Sierra Leone to Nigeria (encompassing the entire northern coast of the Gulf of Guinea). The sighting supports the possibility that some other potential range states may have remained unconfirmed to date due to a paucity of field research in suitable nearshore habitat rather than an absence of the species.

Section III: Threats

Alfaro Shigueto, J., & Van Waerebeek, K. (2001). *Drowning in a Sea of Silence: The Bushmeat Concept as Applied to Marine Wildlife*. Paper presented at the Symposium. Zoos & Aquariums: Committing to Conservation. November 28 through December 2, 2001., Cocoa Beach, Florida.
<https://doi.org/10.13140/RG.2.1.4673.6407>

This review shows that cetaceans are used for bushmeat in South America and at least five West African countries – Ghana, Mauritania, Senegal, The Gambia and Togo.

Alter, S. E. (2010). Top Ten Percent of Cetaceans Affected by Climate Driven Shifts in Human Behavior. *Whalewatcher*, 39(2: Climate Change & Cetaceans), 18-19. Retrieved from
<https://www.acsonline.org/whalewatcher>

Graphic showing twelve cetacean species affected by climate change as well as where they are located geographically.

Balinga, M. P. B., & Dyc, C. (2018). *An Overview of the Illegal Harvest of Aquatic Endangered, Threatened or Protected (ETP) Species in West Africa*. United States Agency for International Development, Retrieved from https://pdf.usaid.gov/pdf_docs/PA00WMJQ.pdf

An assessment of existing knowledge and gaps with respect to threatened aquatic wildlife species including birds, mammals, reptiles and cetaceans that are harvested for use and trade in West Africa. It provides the context and weaknesses of current management tools, identifies priority species based on IUCN Red List, CITES appendices and CMS appendices. The study highlights drivers of threats and identifies priority interventions for addressing these threats.

Brownell Jr, R. L., Reeves, R. R., Read, A. J., Smith, B. D., Thomas, P. O., Ralls, K., . . . Wang, J. Y. (2019). Bycatch in Gillnet Fisheries Threatens Critically Endangered Small Cetaceans and Other Aquatic Megafauna. *Endangered Species Research*, 40, 285-296. <https://doi.org/10.3354/esr00994>

The conservation status of small cetaceans has significantly worsened since the 1980s, when the baiji was the only species of small cetacean listed as Endangered by IUCN. Now the baiji is almost certainly extinct and 13 other species, subspecies, or populations (hereafter units-to-serve or units) of small cetaceans are listed as Critically Endangered (CR) on the IUCN Red List. Bycatch is the main threat to 11 of the CR units. Entanglement in gillnets contributed to the extinction of the baiji and is responsible for the imminent extinction of the vaquita. Unfortunately, there is no simple technical solution to the problem of bycatch of small cetaceans. If the 8 CR units with 100 or fewer remaining individuals are to be saved, conservation zones must be established where gillnets are eliminated and bans on their use are strictly enforced. Recent experience with the vaquita in Mexico demonstrates that enforcement of such conservation zones can be very difficult. Ineffective enforcement is also a problem for at least 4 of the other CR units. Time is very short and, unless major efforts are made now to address the bycatch problem, the prospects for CR small cetaceans and other at-risk aquatic megafauna are grim. The ultimate long-term solution to the bycatch problem is the development of efficient, inexpensive, alternative fishing gear that can replace gillnets without jeopardizing the livelihoods of fishermen. Good

fishery governance and the direct involvement of fishing communities are also essential to the successful conservation of most threatened populations of small cetaceans.

Clapham, P., & Van Waerebeek, K. (2007). Bushmeat and Bycatch: The Sum of the Parts. *Molecular Ecology*, 16(13), 2607-2609. <https://doi.org/10.1111/j.1365-294X.2007.03378.x>

In many developing countries, the killing of wild animals for commercial purposes (the bushmeat trade) is a significant factor in the reduction of biodiversity, and probably represents a major threat to the survival of many more populations than we know. This includes marine species such as cetaceans, sea turtles and sirenians (marine bushmeat), which are often neglected in the discussion of this issue. Estimating the impact of the bushmeat trade anywhere is problematic because even the most thorough visual surveys of meat markets cannot easily translate an observed quantity of butchered products into the number of animals killed. In this issue of *Molecular Ecology*, Baker et al. provide a powerful new tool for such assessments: molecular identification of commercially available products from a depleted population of minke whales in South Korea is combined with genotyping and novel capture recapture methods to estimate not only the number of individuals taken, but also the persistence of the resulting products in the marketplace.

Cosentino, A. M., & Fisher, S. (2016). The Utilization of Aquatic Bushmeat from Small Cetaceans and Manatees in South America and West Africa. *Frontiers in Marine Science*, 3, 163. <https://doi.org/10.3389/fmars.2016.00163>

Aquatic bushmeat can be defined as the products derived from wild aquatic megafauna (e.g. marine mammals) that are used for human consumption and non-food purposes, including traditional medicine. It is obtained through illegal or unregulated hunts as well as from stranded (dead or alive) and bycaught animals. In most South American and West African countries aquatic mammals are or have been taken for bushmeat, including 33 small cetaceans and all three manatee species. Of these, two cetacean species are listed in the IUCN red list as “near threatened”, and one as “vulnerable”, as are all manatee species. Additionally, 22 cetacean species are listed as “data deficient”, hence some of these species may also be at risk. No reports (recent or otherwise) were found for some countries, however caution is needed in concluding that aquatic bushmeat is not utilized in these nations. Moreover, although aquatic bushmeat is mostly obtained opportunistically and was likely originally taken only for local consumption, directed catches occur in most countries and may have reached unsustainable levels in some areas. For example, in Peru and Nigeria, thousands of small cetaceans are illegally hunted annually. Reliable, recent data and a better overall understanding of the drivers of aquatic bushmeat will be essential in the development of effective mitigation measures.

Davidson, A., Boyer, A., Kimd, H., Pompa-Mansillaa, S., Hamilton, M., Costaf, D., . . . Brown, J. H. (2012). Drivers and Hotspots of Extinction Risk in Marine Mammals. *PNAS*, 109(9), 3395 -3400. <https://doi.org/10.1073/pnas.1121469109>

The world’s oceans are undergoing profound changes as a result of human activities. However, the consequences of escalating human impacts on marine mammal biodiversity remain poorly understood. The International Union for the Conservation of Nature (IUCN) identifies 25% of marine mammals as at risk of extinction, but the conservation status of nearly 40% of marine mammals remains unknown due

to insufficient data. Predictive models of extinction risk are crucial to informing present and future conservation needs, yet such models have not been developed for marine mammals. In this paper, we: (i) used powerful machinelearning and spatial-modeling approaches to understand the intrinsic and extrinsic drivers of marine mammal extinction risk; (ii) used this information to predict risk across all marine mammals, including IUCN “Data Deficient” species; and (iii) conducted a spatially explicit assessment of these results to understand how risk is distributed across the world’s oceans. Rate of offspring production was the most important predictor of risk. Additional predictors included taxonomic group, small geographic range area, and small social group size. Although the interaction of both intrinsic and extrinsic variables was important in predicting risk, overall, intrinsic traits were more important than extrinsic variables. In addition to the 32 species already on the IUCN Red List, our model identified 15 more species, suggesting that 37% of all marine mammals are at risk of extinction. Most at-risk species occur in coastal areas and in productive regions of the high seas. We identify 13 global hotspots of risk and show how they overlap with human impacts and Marine Protected Areas.

de Boer, M. N., Saulino, J. T., Van Waerebeek, K., & Aarts, G. (2016). Under Pressure: Cetaceans and Fisheries Co-Occurrence Off the Coasts of Ghana and Côte D'ivoire (Gulf of Guinea). *Frontiers in Marine Science*, 3. <https://doi.org/10.3389/fmars.2016.00178>

Within the Gulf of Guinea high levels of fisheries-related cetacean mortality (bycatch and direct-capture) has been documented. For locally rare species such removals could potentially lead to significant population level effects. However, information on the cetacean abundance and distribution is scarce. Similarly, it remains largely unreported where fishing fleets operate offshore. A cetacean survey took place during geophysical surveys (2013–2014) along the coasts of Ghana and Côte d'Ivoire. This provided a unique opportunity to study both offshore cetacean and fishing communities. Due to large group-sizes, melon-headed whales were the most abundant (0.34 animals km⁻¹) followed by Fraser's dolphins and short-finned pilot whales. Range state records were confirmed for melon-headed whale and Fraser's dolphin in Ivoirian waters and ten further species represented first at-sea sightings. The artisanal fishing canoe was most abundant (92% of all vessels) and recorded up to 99.5 km from the Ghanaian coast. Asian trawlers operated over shelf areas and tuna purse-seine vessels in deep oceanic and slope waters. Fraser's dolphins, melon-headed whales, pantropical spotted dolphins, bottlenose dolphins, and pilot whales were recorded in areas with the highest fishing densities. Melon-headed whales, pilot whales, and rough-toothed dolphins were observed in vicinity of trawlers; bottlenose dolphins, pantropical spotted dolphins, and pilot whales in vicinity of canoes. Some notable differences were found in the species composition between the present surveys and port-based surveys of landed cetaceans (bycatch/direct-captures). These may be explained by (1) feeding strategies (nocturnal vs. diurnal; surface vs. deep water); (2) different attractions to vessels/fishing gear; (3) variable body sizes; and (4) difficulty to positively identify species. Despite these differences, both cetaceans and fishing vessels predominantly occurred in shelf and slope waters (< 1000 m depth contour), making fishery-related mortality likely. The poor knowledge on population trends of cetaceans in this unique upwelling region, together with a high demand for cetacean products for human consumption (as “marine bushmeat”) may lead to a potential decline of some species that may go unnoticed. These new insights can provide a foundation for the urgently required risk assessments of cetacean mortality in fisheries within the northern Gulf of Guinea.

Debrah, J., Ofori-Danson, P. K., & Van Waerebeek, K. (2010). *An Update on the Catch Composition and Other Aspects of Cetacean Exploitation in Ghana*. International Whaling Commission SC/62/SM10. Agadir, Morocco. <https://doi.org/10.13140/RG.2.1.4537.9928>

Photographs of 231 landed specimens (212 identifiable) were analysed to determine species composition of cetacean take in Ghana's artisanal fisheries in 1995-2010, the most comprehensive sample documented in West Africa. The three most commonly landed species are: 24.5% Clymene dolphin (*Stenella clymene*), 13.2% pantropical spotted dolphin (*Stenella attenuata*), 12.3% common bottlenose dolphin (*Tursiops truncatus*). Also regularly caught are: 10.4% melon-headed whale (*Peponocephala electra*), 9.4% short-finned pilot whale (*Globicephala macrorhynchus*), 9.4% long-beaked common dolphin (*Delphinus capensis*). Occasionally landed are: 6.1% rough-toothed dolphin (*Steno bredanensis*), 4.7% Risso's dolphin (*Grampus griseus*), 3.1% kogiids (including *Kogia sima*) and 2.8% spinner dolphin (*Stenella longirostris*). Rarely (<2%) landed are: Atlantic spotted dolphin (*Stenella frontalis*), Fraser's dolphin (*Lagenodelphis hosei*), false killer whale (*Pseudorca crassidens*) and pygmy killer whale (*Feresa attenuata*). One small sperm whale was recorded taken offshore. Catch rate estimators, cetaceans landed per month (cpm) and cetaceans landed per day (cpd) were derived for 3 ports, but the national situation is unknown. At Axim, in 23 months, 130 cetaceans were observed landed (mean 5.65 \pm SE 1.19 cpm); prorated per annum, 67.8 \pm SE 14.28. During high-intensity surveying Jan-Nov 2003, 52 cetaceans were recorded in 192 days, with mean daily landings 0.271 cpd, prorated per annum 99.0. Reported landings at Axim in Aug-Dec 2007 were limited (0.087 cpd), prorated per annum 31.8 cetaceans, however a negative sampling bias was indicated making this cpd questionable. At Apam in 1995-99 mean monthly landings were a very low 1.117 (\pm SE 0.23 cpm); prorated per annum 13.40 (\pm SE 2.76) cetaceans. In Oct 2001-Oct 2003, 128 cetaceans were observed, ie mean monthly landings 5.57 \pm SE 1.29 cpm (n= 23, range 1-25), prorated per annum 66.84 (\pm SE 15.48). Intensive surveying in Jan-Nov 2003 saw 87 cetaceans landed on 267days, or 0.362 cpd; prorated per annum 132.22. The cpm in 2001-03 increased very significantly compared to 1995-99. Highest catches occurred at Dixcove: in 25 months (Oct 2001-Oct 2003) 564 cetaceans were observed, mean monthly landings 22.56 \pm SE 3.26 cpm (n=25, range 6-69), prorated per annum 270.72 \pm SE 39.12 cetacean. Mean daily landings rate 0.74 cpd. In 2009-10, daily landings became the norm with frequent multiple landings; highest one-day catch >20 dolphins. In April 2010, of 9 cetaceans landed in 7 days, 3 were butchered before a team could document them, supporting caveat that observed landings underestimate true landings. An intensive biological sampling programme and nation-wide recording of cetacean captures are needed immediately, to guide the formulation and implementation of effective management and conservation measures.

Dutton, I. (2010). Climate Change Demands a New Approach to Whale Conservation. *Whalewatcher*, 39(2: Climate Change & Cetaceans), 2-4. Retrieved from <https://www.acsonline.org/whalewatcher>

Ian M. Dutton is President and CEO of the Alaska SeaLife Center and Chairman of the North Pacific Research Board. Ian is actively engaged in several national and international initiatives to promote better understanding of climate change processes and to build the capacity that will be needed to help human and natural systems adapt to change. He has worked for more than 25 years on marine conservation and education programs in the Asia-Pacific region with The Nature Conservancy, University of Rhode Island, Southern Cross University and the Great Barrier Reef Marine Park Authority. Ian holds a Ph.D. in environmental monitoring from the University of Queensland. As editor of this special issue of

Whalewatcher that focuses on climate change and cetaceans, he discusses approaching whale conservation differently to address the threat of climate change.

Jefferson, T. A. (2019). Endangered Odontocetes and the Social Connection: Selected Examples of Species at Risk. In *Ethology and Behavioral Ecology of Odontocetes*. (pp. 465-481)
https://doi.org/10.1007/978-3-030-16663-2_22

Despite centuries of whaling focused mostly on mysticete species, eight of the ten most endangered species of cetaceans in the world today are odontocetes. These species have certain features of their ecology in common, such as coastal habitats and usually ranges in developing countries, but also have some shared behavioral and social traits, such as strong susceptibility to entanglement in fishing nets and acoustic disturbance. I use four species of small cetaceans as case studies to examine the elements that have caused their predicaments. It is likely that the vaquita (*Phocoena sinus*) will soon become the second species of cetacean to go extinct in modern times, and the Atlantic humpback dolphin (*Sousa teuszii*) appears to be the next most endangered species. Several other cetacean species are facing similar levels of risk—despite some having misleading status assessments. There is a need to learn from our past mistakes to provide better protection to those species at risk and thereby avoid future extinctions.

Jefferson, T. A., Hung, S. K., & Lam, P. K. S. (2006). Strandings, Mortality and Morbidity of Indo-Pacific Humpback Dolphins in Hong Kong, with Emphasis on the Role of Organochlorine Contaminants. *Journal of Cetacean Research and Management*, 8(2), 181–193. Retrieved from
<https://journal.iwc.int/index.php/jcrm/index>

Factors related to mortality and disease in Indo-Pacific humpback dolphins (*Sousa chinensis*) from Hong Kong waters were investigated by detailed examination of dolphin specimens found stranded from 1995-2004. In total, 86 specimens were necropsied, but many of these were too badly decomposed to provide much information. Skin and blubber biopsies were also collected from six identified living individuals and concentrations of organochlorines (DDTs, PCBs and HCHs) were determined from blubber samples of stranded and biopsied dolphins. A large proportion of the strandings (53.2%) were young-of-the-year. The most commonly diagnosed causes of death were net entanglement and vessel collision. The pesticide DDT showed the highest concentrations and the ratio of DDT to its breakdown products (and other information) suggests that there may be a recent or nearby source of DDT into the dolphins' ecosystem. Concentrations of both DDTs and PCBs showed a pattern of increasing with age in males. In females, they increased until sexual maturity, then decreased, and finally increased again in late life. This is consistent with a hypothesised transfer of pollutants from mother to offspring during gestation and lactation. Inter-laboratory differences and effects of decomposition of specimens are two potential biases that may significantly affect the quality of the present data. In order to resolve the potential problems associated with these issues, a long-term biopsy collection programme has recently been initiated.

Karczmarski, L., Huang, S.-L., & Chan, S. C. Y. (2017). Threshold of Long-Term Survival of a Coastal Delphinid in Anthropogenically Degraded Environment: Indo-Pacific Humpback Dolphins in Pearl River Delta. *Scientific Reports*, 7(1), 42900-42900. <https://doi.org/10.1038/srep42900>

Defining demographic and ecological threshold of population persistence can assist in informing conservation management. We undertook such analyses for the Indo-Pacific humpback dolphin (*Sousa chinensis*) in the Pearl River Delta (PRD) region, southeast China. We use adult survival estimates for assessments of population status and annual rate of change. Our estimates indicate that, given a stationary population structure and minimal risk scenario, ~2000 individuals (minimum viable population in carrying capacity, MVPk) can maintain the population persistence across 40 generations. However, under the current population trend (~2.5% decline/annum), the population is fast approaching its viability threshold and may soon face effects of demographic stochasticity. The population demographic trajectory and the minimum area of critical habitat (MACH) that could prevent stochastic extinction are both highly sensitive to fluctuations in adult survival. For a hypothetical stationary population, MACH should approximate 3000-km². However, this estimate increases four-fold with a 5% increase of adult mortality and exceeds the size of PRD when calculated for the current population status. On the other hand, cumulatively all current MPAs within PRD fail to secure the minimum habitat requirement to accommodate sufficiently viable population size. Our findings indicate that the PRD population is deemed to become extinct unless effective conservation measures can rapidly reverse the current population trend.

Kelsey, E. (2010). The Biggest Threat of All. *Whalewatcher*, 39(2: Climate Change & Cetaceans), 20-21. Retrieved from <https://www.acsonline.org/whalewatcher>

Unlike the Gulf oil spill, "ocean change" is hard to see. Its effects on whales are invisible to the vast majority of us. Yet the impacts we collectively cause are dramatic: skinny gray whales in the Baja birthing lagoons (Barrell, 2010; Nichols, 2007), right whales unable to find enough zooplankton ("Climate Change Effects," 2010); mass strandings along the coast of Australia (AFP/Economic Times, 2009). Tragically, the same ships that spew CO₂ into the atmosphere creating climate change have also made the oceans 1000 times noisier than they were 40 years ago, when many of the whales living today were youngsters or teenagers. "Blue whales have lost 90% of their opportunities to communicate," says Christopher Clark (Imogene P. Johnson Director, Bioacoustics Research Program, Cornell University). "Most of that loss comes from shipping because 97-98% of all commercial goods travels on the backs of ships."

Kühn, S., Rebolledo, E. L. B., & van Franeker, J. A. (2015). Deleterious Effects of Litter on Marine Life. In *Marine Anthropogenic Litter*. (pp. 75-116): Springer International Publishing https://doi.org/10.1007/978-3-319-16510-3_4

In this review we report new findings concerning interaction between marine debris and wildlife. Deleterious effects and consequences of entanglement, consumption and smothering are highlighted and discussed. The number of species known to have been affected by either entanglement or ingestion of plastic debris has doubled since 1997, from 267 to 557 species among all groups of wildlife. For marine turtles the number of affected species increased from 86 to 100 % (now 7 of 7 species), for marine mammals from 43 to 66 % (now 81 of 123 species) and for seabirds from 44 to 50 % of species (now 203 of 406 species). Strong increases in records were also listed for fish and invertebrates, groups

that were previously not considered in detail. In future records of interactions between marine debris and wildlife we recommend to focus on standardized data on frequency of occurrence and quantities of debris ingested. In combination with dedicated impact studies in the wild or experiments, this will allow more detailed assessments of the deleterious effects of marine debris on individuals and populations.

Leeney, R. H., Dia, I. M., & Dia, M. (2015). Food, Pharmacy, Friend? Bycatch, Direct Take and Consumption of Dolphins in West Africa. *Human Ecology*, 43(1), 105-118.
<https://doi.org/10.1007/s10745-015-9727-3>

The extent to which bycatch in artisanal fisheries impacts cetacean populations in West Africa is poorly understood. Between 2007 and 2012, 474 interviews were carried out in The Gambia, Senegal and Guinea-Bissau to collect local fishers' knowledge on rates of bycatch, local uses for bycaught animals and any cultural significance attached to cetaceans. At least a quarter of respondents in each country stated that they had accidentally caught a dolphin at least once, and greater proportions of interviewees stated that other fishers sometimes caught dolphins. Bycaught animals were usually distributed amongst the community as food, but the meat and oil of dolphins were also used to treat various ailments. There did not appear to be a sizeable market for the sale of dolphin meat. The continued depletion of fish stocks in this region may place more pressure on coastal communities to rely on cetaceans as a food source.

Lent, R. J. (2010). *Final Environmental Assessment, Regulatory Impact Review, and Regulatory Flexibility Act Analysis for a Final Rule to Establish Identification and Certification Procedures for Nations under the High Seas Driftnet Fishing Moratorium Protection Act*. National Oceanic and Atmospheric Administration Silver Spring, MD. Retrieved from
<https://repository.library.noaa.gov/view/noaa/4047>

The Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006, which was signed into law in January 2007, amends the High Seas Driftnet Fishing Moratorium Protection Act (Moratorium Protection Act) to require actions be taken by the United States to address illegal, unreported, or unregulated (IUU) fishing and the bycatch of protected living marine resources (PLMRs). Specifically, the Moratorium Protection Act requires the Secretary of Commerce to identify in a biennial report to Congress those foreign nations whose vessels are engaged in IUU fishing or fishing activities that result in bycatch of PLMRs. The Moratorium Protection Act also requires the establishment of procedures to certify whether nations identified in the biennial report are taking appropriate corrective actions to address IUU fishing or bycatch of PLMRs by fishing vessels of that nation. Identified nations that do not receive a positive certification from the Secretary of Commerce could be subject to measures under the High Seas Driftnet Fisheries Enforcement Act (16 U.S.C. 1826a), such as the denial of port privileges, prohibition on the importation of certain fish or fish products into the United States, or other measures. This action would establish procedures for the Secretary of Commerce to certify nations whose vessels are engaged in IUU fishing activity or PLMR bycatch. Background information on the issues and a description of the alternatives being considered for this rulemaking are described in this environmental assessment.

Li, S. (2020). Humpback Dolphins at Risk of Extinction. *Science*, 367(6484), 1313-1314.
<https://doi.org/10.1126/science.abb5744>

The humpback dolphin genus (*Sousa spp.*) has recently been revised to contain four species: *S. teuszii*, *S. plumbea*, *S. chinensis*, and *S. sahalensis*. All four species are listed on Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). *S. chinensis* and *S. sahalensis* are classified as Vulnerable on the International Union for Conservation (IUCN) Red List, *S. plumbea* is Endangered, and *S. teuszii* is Critically Endangered. The humpback dolphins and their habitats—shallow, coastal waters of the eastern Atlantic, Indian, and western Pacific oceans—are threatened by fishing, vessel traffic, habitat degradation and destruction, environmental contaminants, and prey depletion, putting the humpback dolphins at risk of extinction. Interventions at the national and international levels are urgently needed.

Maigret, J. (1994). Marine Mammals and the Fisheries Along the West African Coast. In *Special Issue: Gillnets and Cetaceans*. W. F. Perrin, G. P. Donovan, & J. Barlow (Eds.), (Vol. 15, pp. 307-316): International Whaling Commission Retrieved from <https://iwc.int/pubpre1999>

There are no studies of the relationship between cetaceans and fisheries for West Africa. The widely dispersed unloading centres along the coast make such study difficult. The artisanal fisheries which use a wide variety of gear, do not appear to have any major impact on cetacean populations. This report provides a preliminary review of West African fisheries with particular attention to the problem of catches of marine mammals. The five identified artisanal gillnet fisheries do not often catch cetaceans. Foreign industrial fisheries are more likely to have an impact on cetacean populations.

Moore, S. E. (2010). Whales Facing Climate Change in the Pacific Arctic. *Whalewatcher*, 39(2: Climate Change & Cetaceans), 7-11. Retrieved from <https://www.acsonline.org/whalewatcher>

Global climate change is shifting the state of the world ocean toward a future of reduced sea ice cover, increased acidity, higher sea levels and a loss of marine biodiversity and ecosystem function (PCC 2007). The impact of these changes on marine mammals will vary with the resilience imparted each species through its natural history (Moore 2008a). For example, loss of sea ice will have an immediate negative impact on walrus and seals, which rely on it as a platform for resting and rearing pups, while impacts to cetaceans are less certain and more likely mediated through shifts in ocean productivity and predator-prey dynamics (Kovacs and Lydersen 2008; Moore and Huntington 2008). In addition to primary (habitat loss) and secondary (changes to the food web) challenges that climate change imparts to marine mammals, tertiary impacts resulting from climate-related shifts in human behaviors and economic activities also must be considered (Alter et al. 2010).

Pikesley, S. K., Agamboue, P. D., Bayet, J. P., Bibang, J. N., Bonguno, E. A., Boussamba, F., . . . Nelms, S. (2018). A Novel Approach to Estimate the Distribution, Density and at-Sea Risks of a Centrally-Placed Mobile Marine Vertebrate. *Biological Conservation*, 221, 246-256.
<https://doi.org/10.1016/j.biocon.2018.03.011>

Formulating management strategies for mobile marine species is challenging, as knowledge is required of distribution, density, and overlap with putative threats. As a step towards assimilating knowledge,

ecological niche models may identify likely suitable habitats for species, but lack the ability to enumerate species densities. Traditionally, this has been catered for by sightings-based distance sampling methods that may have practical and logistical limitations. Here we describe a novel method to estimate at-sea distribution and densities of a marine vertebrate, using historic aerial surveys of Gabonese leatherback turtle (*Dermochelys coriacea*) nesting beaches and satellite telemetry data of females at sea. We contextualise modelled patterns of distribution with putative threat layers of boat traffic, including fishing vessels and large ship movements, using Vessel Monitoring System (VMS) and Automatic Identification System (AIS) data. We identify key at-sea areas in which protection for inter-nesting leatherback turtles could be considered within the coastal zone of Gabonese Exclusive Economic Zone (EEZ). Our approach offers a holistic technique that merges multiple datasets and methodologies to build a deeper and insightful knowledge base with which to manage known activities at sea. As such, the methodologies presented in this study could be applied to other species of sea turtles for cumulative assessments; and with adaptation, may have utility in defining critical habitats for other central-place foragers such as pinnipeds, or sea bird species. Although our analysis focuses on a single species, we suggest that putative threats identified within this study (fisheries, seismic activity, general shipping) likely apply to other mobile marine vertebrates of conservation concern within Gabonese and central African coastal waters, such as olive ridley sea turtles (*Lepidochelys olivacea*), humpback dolphins (*Sousa teuszii*) and humpback whales (*Megaptera novaeangliae*).

Reeves, R. R., Smith, B. D., Crespo, E. A., & Notarbartolo di Sciara, G. (2003). *Dolphins, Whales and Porpoises : 2002-2010 Conservation Action Plan for the World's Cetaceans*. IUCN/SSC Cetacean Specialist Group Gland, Switzerland. <https://doi.org/10.2305/IUCN.CH.2003.SSC-AP.2.en>

Consistent evaluation and new recommendations for action are required of protective measures to address threats that were unrecognised or non-existent until recently. Global warming, noise pollution and reduced availability of prey are now of great concern. The all too familiar threats of accidental killing in fishing gear and exposure to toxic chemicals remain almost intractable. This Action Plan reviews threats and offers possible solutions. It also contains a thorough review of the status of species and a list of 57 recommended research projects and education initiatives.

Rossi, D., & Dutton, I. (2010). Recent Research: Overview of Research on the Impact of Climate Change on Cetaceans. *Whalewatcher*, 39(2: Climate Change & Cetaceans), 34-37. Retrieved from <https://www.acsonline.org/whalewatcher>

One of the joys of the digital age is the vast reservoir of information that one can so very easily jump into from almost anywhere on the planet. However, upon taking that plunge many of us soon become frustrated - the reservoir soon expands into a sea, navigation aids are inadequate or fail, resources are used up without achieving results, etc. For example, if one googles "whales and climate change" the search yields about 9.3 million results. "Cetaceans and climate change" yields a much more manageable 115,000 results, while "ocean acidification and whales" only 67,500! But which of those 'hits' are really what you need to know, which are reliable, and how does one know that other than by literally wading or swimming through screen after screen of in-cresingly more obscure research? This review of recent research into the impacts of climate change on cetaceans was undertaken to give Whalewatcher readers a quick overview of salient recent research that has been peer-reviewed and published within the last five years. It is intended to complement information presented in other papers in this special edition. All papers reviewed below are accessible online, although because of copyright limitations, the public

may need access to a University or public library to be able to download a hard copy of the full article. During analysis of this specialized literature, two key points were observed. Firstly, there are still vast gaps in our knowledge of many species and how they use habitats and so it is very difficult to make accurate assessments of their vulnerability to change and hence generate realistic options for adaptation and management. Secondly, it is increasingly evident that long-term programs of study on particular species or habitats are critical in order to document the initial and evolving effects of climate change.

Sanderson, C. E., & Alexander, K. A. (2020). Uncharted Waters: Climate Change Likely to Intensify Infectious Disease Outbreaks Causing Mass Mortality Events in Marine Mammals. *Global Change Biology*, 26(8), 4284-4301. <https://doi.org/10.1111/gcb.15163>

Infectious disease emergence has increased significantly over the last 30 years, with mass mortality events (MMEs) associated with epizootics becoming increasingly common. Factors influencing these events have been widely studied in terrestrial systems, but remain relatively unexplored in marine mammals. Infectious disease-induced MMEs (ID MMEs) have not been reported ubiquitously among marine mammal species, indicating that intrinsic (host) and/or extrinsic (environmental) ecological factors may influence this heterogeneity. We assess the occurrence of ID MMEs (1955-2018) across extant marine mammals ($n = 129$) in relation to key life-history characteristics (sociality, trophic level, habitat breadth) and environmental variables (season, sea surface temperature [SST] anomalies, El Niño occurrence). Our results show that ID MMEs have been reported in 14% of marine mammal species (95% CI 9%-21%), with 72% ($n = 36$; 95% CI 56%-84%) of these events caused predominantly by viruses, primarily morbillivirus and influenza A. Bacterial pathogens caused 25% (95% CI 14%-41%) of MMEs, with only one being the result of a protozoan pathogen. Overall, virus-induced MMEs involved a greater number of fatalities per event compared to other pathogens. No association was detected between the occurrence of ID MMEs and host characteristics, such as sociality or trophic level, but ID MMEs did occur more frequently in semiaquatic species (pinnipeds) compared to obligate ocean dwellers (cetaceans; $\chi^2(2) = 9.6$, $p = .002$). In contrast, extrinsic factors significantly influenced ID MMEs, with seasonality linked to frequency ($\chi^2(2) = 19.85$, $p = .0002$) and severity of these events, and global yearly SST anomalies positively correlated with their temporal occurrence ($Z = 3.43$, $p = 2.7e-04$). No significant association was identified between El Niño and ID MME occurrence ($Z = 0.28$, $p = .81$). With climate change forecasted to increase SSTs and the frequency of extreme seasonal weather events, epizootics causing MMEs are likely to intensify with significant consequences for marine mammal survival.

Van Waerebeek, K. (2003). The Atlantic Humpback Dolphin: In Retreat? *CMS Bulletin*, 17, 10-11. Retrieved from <https://www.cms.int/en>

The Atlantic humpback dolphin (*Sousa teuszii*) is the only small cetacean endemic to (sub)tropical eastern Atlantic inshore waters off West Africa. Described in 1892 from a shark-damaged carcass retrieved in Cameroon, second and third specimens were collected in Senegal in 1925 and 1943. Since then, this dolphin has been found in another six countries. *S. teuszii* used to be referred to as the Cameroon river dolphin, a misnomer as it occupies no true riverine habitat. Suggestions of conspecificity with the Indo-Pacific humpback dolphin from east Africa (nominal *S. plumbea*) are unsupported. Moreover populations are separated both geographically and ecologically by the cold water barrier the coastal Benguela Current forms.

Van Waerebeek, K., Baker, A. N., Félix, F., Gedamke, J., Iñiguez, M., Sanino, G. P., . . . Wang, Y. (2007). Vessel Collisions with Small Cetaceans Worldwide and with Large Whales in the Southern Hemisphere, an Initial Assessment. *Latin American Journal of Aquatic Mammals*, 6(1), 43-69. <https://doi.org/10.5597/lajam00109>

Collisions with vessels are a well-documented conservation problem for some populations of large whales (LW) in the Northern Hemisphere. Less attention has been given to incidents in the Southern Hemisphere or to small cetaceans (SC) worldwide, therefore an experimental database was compiled (N=256; 119 LW, 137 SC) to allow a rapid assessment. Confirmed collision records were identified for 25 species (7 LW, 18 SC) and unconfirmed but probable records for 10 other species (2 LW, 8 SC). Among LW, ship-caused mortality and traumatic injuries seem to affect primarily southern right (56 reported cases), humpback (15) and Bryde's whales (13), but also sperm (8), blue (5), sei (4) and fin whales (2) are involved, and probably Antarctic minke and dwarf minke whales. Southern right whale populations off South Africa and off eastern South America (Brazil, Uruguay and Argentina) suffer significant mortality. Incidence and potential population impact vary widely among the 26 small cetacean species for which collision records exist. Vessel strikes in at least two populations each of the Indo-Pacific humpback dolphin (Xiamen and Hong Kong/Pearl River, possibly western Taiwan), Irrawaddy dolphin (Mahakam River, Chilika Lagoon, possibly Laos) and finless porpoise (Yangtze River, Hong Kong) may directly compromise long-term survival. Annual vessel-caused mortality (min. 2.9% of population) for Irrawaddy dolphins in the Mahakam River may not be sustainable. The quasi-extinction of the baiji warns for a potential similar fate for the Yangtze River finless porpoise and Ganges river dolphin. Two calves of the endangered Hector's dolphin are known killed by boats. All highly impacted species have a neritic, estuarine or fluvial habitat, areas where vessel traffic is concentrated. Species that may receive a moderate impact from collisions but which may be sustainable at species level (because many strikes are nonlethal), include common bottlenose dolphins, killer whales, short-finned pilot whales and pygmy sperm whales. Almost 2% of common bottlenose dolphins in the Gulf of Guayaquil showed propeller-inflicted injuries and scars. Propeller guards should be made compulsory for all boat-based cetacean tourism, as habituation to boat traffic seems a contributing factor in accidents. Low impact occurs in 15 small cetacean species with only few reported vessel strikes. However, vast underreporting is thought to be the norm and there is a need for a global, standardised database.

Van Waerebeek, K., Uwagbae, M., Segniagbeto, G., Bamy, I. L., & Ayissi, I. (2015). New Records of Atlantic Humpback Dolphin in Guinea, Nigeria, Cameroon and Togo Underscore Fisheries Pressure and Generalized Marine Bushmeat Demand. *bioRxiv*, 035337. <https://doi.org/10.1101/035337>

In northern Guinea, we sighted two groups of *Sousa teuszii* (n=25; n=40 dolphins) off the Tristao Islands during exploratory small-boat surveys in 2011–12. Based on these and recent (2013) observations in the contiguous Río Nuñez estuary, we propose a single 'Guineas stock', combining the former 'Rio do Jêba-Bijagos' and South Guinea stocks. Significant mortality of *S. teuszii* from fisheries interactions is widely recognised however not quantifiable as monitoring effort is sporadic. In Guinea, catches were documented in 2002 (n=1) and in 2011–12 (n=5). Landed specimens were recorded in Cameroon (n=2) and Nigeria (n=2). All individuals were killed in small-scale coastal fisheries, presumably as accidental net entanglements, though directed takes cannot be excluded. All landed dolphins were butchered for human consumption (marine bushmeat). Nigerian fishers indicated also an alternative use as shark bait. If local markets in cetacean bushmeat and bait develop, as in Ghana, that will exacerbate pressures by

encouraging directed takes. Catch records in Nigeria and sightings in Togo authenticate both nations as (long-suspected) range states for *S. teuszii*, a belated documenting of the primary, historical distribution. The Gulf of Guinea stock ('Cameroon dolphins') extends at least from Togo to southern Cameroon, and probably into Equatorial Guinea. However, rare sightings of small groups point to remnant, not thriving, dolphin communities. We anticipate de novo distribution gaps emerging and consolidating, following decades of fisheries interactions and creeping encroachment on once pristine coastal habitat. Developed coastlines in Ghana and Côte d'Ivoire devoid of records may already constitute such gaps. As the lack or scarcity of records warn about formidable challenges to the long-term survival of *S. teuszii*, innovative, workable protection measures are needed, soonest. We recommend the implementation of several new border-straddling marine protected areas (cf. Saloum Delta-Niumi National Park Complex) which could bring forth a major conservation effect. Binational involvement bears obvious advantages, from sharing responsibilities and allowing for larger protected areas. Suggested dolphin sanctuary examples could include MPAs straddling borders between Cameroon/Equatorial Guinea and Guinea-Bissau/Guinea-Conakry.

Van Waerebeek, K., Uwagbae, M., Segniagbeto, G., Bamy, I. L., & Ayissi, I. (2017). New Records of Atlantic Humpback Dolphin (*Sousa teuszii*) in Guinea, Nigeria, Cameroon and Togo Underscore Pressure from Fisheries and Marine Bushmeat Demand. *Revue D Ecologie-La Terre Et La Vie*, 72(2), 192-205. Retrieved from <https://hal.archives-ouvertes.fr/hal-03532834/document>

The Atlantic humpback dolphin's biology, small-scale distribution and population structure are poorly known. Dedicated surveys and incidental observations resulted in new specimens and sighting records in four nations, of which Nigeria and Togo comprise long-suspected but newly documented range states. Multiple records at the Tristao Islands and Rio Nufiez Estuary in northern Guinea indicate that the management stocks of Rio do Jeba-Bijagos (Guinea-Bissau) and South Guinea should be combined into a single Guineas stock. A Gulf of Guinea stock, the historical 'Cameroon dolphins', extends from Togo to (at least) southern Cameroon. Specimen evidence shows fisheries- caused mortality of *S. teuszii* is significant, widespread, and non- quantifiable at present due to only sporadic monitoring of landings. Of special concern are catches in Guinea, Nigeria and Cameroon. All dolphins were killed in small-scale nearshore fisheries, mostly from incidental gill- net entanglement, and werelocally consumed as marine bushmeat. With increasing commercialization however, intentional captures may be encouraged. Rare sightings of mostly small groups in the northern Gulf of Guinea point to remnant, struggling, dolphin communities. De novo distribution gaps may emerge along heavily populated coasts following decades of by-catches, prey competition and habitat loss from irreversible coastal development. We suggest that scarcity of survey effort does not fully explain the absence of *S. teuszii* records over 1900 km of coastlines between Ghana and Sierra Leone, and particularly in Ghana where small cetacean exploitation is extensive. The implementation of a stringent conservation policy becomes increasingly urgent. New binational, border-straddling Marine Protected Areas could have significant conservation effects by limiting prey competition from fisheries and mitigating net entanglements and habitat destruction. The set-up of a regional ad hoc task force is strongly recommended to help introduce such practicable measures that could stop the threatened Atlantic humpback dolphin from sliding towards extinction.

Weir, C. R., & Pierce, G. J. (2013). A Review of the Human Activities Impacting Cetaceans in the Eastern Tropical Atlantic. *Mammal Review*, 43(4), 258-274. <https://doi.org/10.1111/j.1365-2907.2012.00222.x>

The eastern tropical Atlantic (ETA), extending from Mauritania south to Angola, is inhabited by at least 34 cetacean species. Knowledge of cetaceans and the human activities affecting them in the ETA is scant. Available literature was reviewed over three eras of ETA cetacean research: the whaling era (1700s–1950s); the stranding and specimen era (1950s–70s); and the modern field research era (1980s–present). Eight human activities were documented to impact ETA cetacean species: directed takes (whaling and small cetaceans); by-catch or entanglement in fishing gear; the ETA tuna purse seine fishery; overfishing; habitat loss and degradation; vessel strikes; marine ecotourism; and live captures for display. Climate change may represent a future threat. Directed takes of small cetaceans were documented in 12 ETA countries, and incidental by-catch (especially in gillnets) in at least nine countries. Additionally, unknown levels of cetacean mortality occur in ETA tuna purse seine fisheries. The use of cetaceans as ‘bushmeat’ was documented in 15 countries and involved at least 23 species. Little information could be found on cetacean mortality in Liberia, Benin, Cameroon, Equatorial Guinea, Sao Tome and Principe or the Democratic Republic of the Congo. Human activities were most frequently and widely reported to impact on common bottlenose dolphins *Tursiops truncatus* and Atlantic humpback dolphins *Sousa teuszii*, which are particularly vulnerable to anthropogenic interactions due to their nearshore occurrence. The lack of information on the scale of impacts and on cetacean abundance and population structure in the ETA currently hinders assessments of the sustainability of mortality levels.

Weir, C. R., Van Waerebeek, K., Jefferson, T. A., & Collins, T. (2011). West Africa's Atlantic Humpback Dolphin (*Sousa teuszii*): Endemic, Enigmatic and Soon Endangered? *African Zoology*, 46(1), 1-17. <https://doi.org/10.3377/004.046.0101>

Atlantic humpback dolphins (*Sousa teuszii*) are endemic to nearshore West African waters between Western Sahara and Angola. They are considered Vulnerable by the International Union for Conservation of Nature based on restricted geographic range, low abundance and apparent decline in recent decades. We review the human activities most likely to affect the species and consider appropriate conservation actions. Bycatch (incidental capture) in gillnets is the greatest immediate threat. Deaths from entanglement have been documented in Mauritania, Senegal, Guinea-Bissau, Guinea and the Republic of the Congo. In Namibe Province, Angola, 4.8 artisanal fishing boats and two gillnets per km were observed in some areas within 1 km of the coast and gillnets are deployed regularly inside bays used by dolphins. Other concerns include the 'marine bushmeat' trade, habitat loss/degradation, overfishing, marine pollution, anthropogenic sound and climate change. Conservation challenges include a paucity of scientific data on the species, and widespread human poverty within most range states, resulting in high dependence on artisanal fisheries. Recommended conservation and research priorities include: (1) distribution and abundance surveys in known and potential range states, (2) bycatch monitoring programmes, (3) education/awareness schemes, and (4) protection of core areas via reduction/elimination of nearshore gillnetting.

Wells, R. S. (2010). Feeling the Heat: Potential Climate Change Impacts on Bottlenose Dolphins. *Whalewatcher*, 39(2: Climate Change & Cetaceans), 12-17. Retrieved from <https://www.acsonline.org/whalewatcher>

The concept of global climate change means that there will be ramifications for life throughout the world from changes associated with global warming. Among the predicted large-scale impacts of global climate change are increases in sea surface temperature and sea level, decreases in sea ice cover, and changes in salinity, alkalinity, wave climate, ocean circulation, and primary productivity. Some of these are being demonstrated first and most dramatically at the poles, but environmental changes associated with climate change should be expected for most of the marine mammal species around the world. Exactly when these environmental changes may become detectable in different habitats outside of polar regions, how severe they will become, and how the marine mammals will respond to them is unknown.

Whitehead, H. (2010). Climate Change Effects on the Diversity of Whales and Dolphins. *Whalewatcher*, 39(2: Climate Change & Cetaceans), 5-6. Retrieved from <https://www.acsonline.org/whalewatcher>

As whale watchers, we value the diversity of the cetaceans that we see - "I saw a humpback, AND two beaked whales AND a school of right whale dolphins." Climate change is changing the ocean, changing its nature and processes and the habitat that it provides for whales and dolphins. How will these changes affect the diversity of whales and dolphins?

Young, N. M., & Ludicello, S. (2007). *Worldwide Bycatch of Cetaceans : An Evaluation of the Most Significant Threats to Cetaceans, the Affected Species and the Geographic Areas of High Risk and the Recommended Actions from Various Independent Institutions*. National Oceanic and Atmospheric Administration Retrieved from <https://repository.library.noaa.gov/view/noaa/4048>

Humans have exploited cetaceans (whales, dolphins, and porpoises) since primitive whaling activities began in Japan and Scandinavia many centuries ago. The U.S. Ocean Commission in 2005 judged incidental catch in fisheries the "biggest threat to marine mammals worldwide . . . [killing] hundreds of thousands of them each year." Fishing gear, especially gillnets, indiscriminately catches an undetermined number of marine species, including dolphins and porpoises. Still, progress on quantifying the scale of this mortality, identifying the magnitude of this threat, and mitigating or reducing the mortality has been slow, sporadic, and limited to a few specific fisheries or circumstances. Cetaceans are "migratory." They spend several months each year traveling from one area to another, often covering vast distances in search of food, a particular climate, or a safe breeding ground. From a conservation and management perspective migratory species are exposed to an array of threats because they do not confine themselves to one location. Moreover, because they periodically cross through a number of jurisdictions, the level of protection afforded to cetaceans fluctuates according to their geographical location. Inevitably, migrating animals will pass through jurisdictions where cetacean conservation is less of a priority than in other areas. The protection of small cetaceans has largely been left to the domestic regimes of coastal states, and a number of nations have enacted legislation to protect dolphins and porpoises—particularly Australia, New Zealand, the United Kingdom, and the U.S. With bycatch a serious and widespread threat to cetaceans, there is an urgent need to better document the extent of this threat, assess cetacean populations, develop alternative fishing gear and practices and, at the same

time, institute effective regional agreements that call for mitigation measures ranging from temporal and spatial closures to deterrents. There is also the need to foster greater engagement by inter-governmental bodies (e.g. Food and Agriculture Organization of the United Nations (FAO), the United Nations, and the International Union for the Conservation of Nature (IUCN)) as well as international regional fishery management bodies. Because it requires a country to outline specific measures to address bycatch, the FAO's International Plan of Action model and resolutions adopted through regional fishery management organizations may provide useful mechanisms to address interactions between cetaceans and fisheries. Finally technology transfer is necessary to develop the scientific infrastructure necessary to monitor cetacean populations, fisheries, and any accompanying bycatch. There are other recognized threats to cetaceans including toxic pollution, acoustic pollution, ship strikes, environmental change, global warming, and habitat degradation. The occurrence and effects of these threats are even more poorly documented than bycatch. With provisions in U.S. law and international attention turning toward cetacean bycatch, it is appropriate that the focus of this report is the assessment and mitigation of global cetacean bycatch. Any efforts to better document and mitigate bycatch will have collateral benefit to address other threats to cetaceans. Therefore, this report will evaluate the magnitude of the bycatch problem, the affected species and the geographic areas of high risk, and the recommended actions from various independent institutions. The report will describe the tools afforded through the MMPA and international agreements relevant to marine mammal conservation and bycatch; identify gaps in conservation and management efforts related to cetacean bycatch and identify opportunities for international action, cooperative research, and information exchange. The final element will prioritize and recommend strategic actions that NMFS' Office of International Affairs can undertake to address the international cetacean bycatch threat.

Section IV: Conservation

Campredon, P., & Cuq, F. (2001). Artisanal Fishing and Coastal Conservation in West Africa. *Journal of Coastal Conservation*, 7(1), 91-100. <https://doi.org/10.1007/BF02742471>

Artisanal fishing is an activity which has long occupied an important place on the West African coast. In less than 20 years, the increasingly widespread use of motors in fishing boats and cold storage facilities both on board and on land have enabled fishermen to master the constraints of space and time. Furthermore, globalization has created a demand for new products, thus influencing the behaviour of fishermen and consequently the status of some fish, turtle and marine mammal species. Development policies for artisanal fishing do not adequately reflect the importance of these changes. They tend to use inappropriate scales of reference, be it spatially (national borders take precedence over ecosystems) or temporally (the long-term consequences of development plans are seldom considered). Some international conservation organizations are testing promising new approaches to managing resources more sustainably and restoring degraded ecosystems, and their recent experiences can serve as useful examples to others. It is recommended to grant special rights of access to resident fishermen. In defending 'their' resources, they will also protect the ecological functions of the area. Close collaboration with administrations and development assistance agencies is needed to assess consequences of political decisions on the use of resources. The important role of marine protected areas as a tool for fishing management should be better documented and strengthened. These areas should not be considered as isolated units but rather as vital parts of a comprehensive system for improved coastal zone management. Consistent with the ecosystem approach, fishermen and their communities, being the main users of coastal resources, should also play a major role in the design and implementation of any fishing management actions.

Chen, L., Caballero, S., Zhou, K., & Yang, G. (2010). Molecular Phylogenetics and Population Structure of *Sousa chinensis* in Chinese Waters Inferred from Mitochondrial Control Region Sequences. *Biochemical Systematics and Ecology*, 38(5), 897-905. <https://doi.org/10.1016/j.bse.2010.09.009>

Phylogenetic analyses of the genus *Sousa* were carried out across their geographic range and focused especially on the genetic variation patterns and population structure of *Sousa chinensis* in Chinese waters. The analyses were based on 287-bp of the mitochondrial control region from 122 Indo-Pacific humpback dolphins (*Sousa chinensis*) and two Atlantic humpback dolphins (*Sousa teuszii*). All specimens from China grouped together in a well-supported clade with high bootstrap (BS) and Bayesian posterior probability values (EPP), strongly suggesting that only one species of *Sousa* exists in China. Six haplotypes were identified in 65 individuals from Xiamen and Pearl River Estuary in China. The extremely low level of detected mtDNA genetic diversity strongly suggests a high priority in conservation of *Sousa*. The highly significant genetic differentiation between the two populations in Xiamen and Pearl River Estuary supports the designation of these two populations as separate management units (MUs) when designing management programs for this species.

Collins, T. (2012). *Progress Report for Atlantic Humpback Dolphin Work in Gabon and Congo Funded by the Iwc Small Cetacean Conservation Research Fund*. International Whaling Commission SC/64/SM22. Cambridge, UK. Retrieved from <https://archive.iwc.int>

The Atlantic humpback dolphin (*Sousa teuszii*) is endemic to tropical and sub-tropical near-shore waters of western Africa. Given an obligate shallow-water niche and an apparent preference for sheltered coastal areas, it is probable that the species has never been very common. Although there are no published estimates of its abundance, available evidence suggests a precipitous decline in numbers, a patchy distribution of subpopulations and many documented threats. Directed catches by fishermen, fisheries competition, habitat loss and disturbance are factors believed to be responsible for the species' decline. Evidence presented at the 2010 meeting of the IWC provides strong support for this hypothesis; the species had either not been encountered in recent surveys or encounter rates were much reduced. Given a general absence of effective monitoring and law enforcement in most areas, long-term, rangewide prospects for the species are grim.

Collins, T. (2014). *Progress on Atlantic Humpback Dolphin Conservation and Research Efforts in Congo and Gabon*. International Whaling Commission SC/65a/SM16 Rev:24. Retrieved from <https://archive.iwc.int>

The Atlantic humpback dolphin (*Sousa teuszii*) is endemic to tropical and sub-tropical near-shore waters of western Africa. Given an obligate shallow-water niche and an apparent preference for sheltered coastal areas, it is probable that the species has never been very common. Although there are no published estimates of its abundance, available evidence suggests a precipitous decline in numbers, a patchy distribution of subpopulations and many documented threats. Directed catches by fishermen, fisheries competition, habitat loss and disturbance are factors believed to be responsible for the species' decline. Evidence presented at the 2010 meeting of the IWC provides strong support for this hypothesis; the species had either not been encountered in recent surveys or encounter rates were much reduced. Given a general absence of effective monitoring and law enforcement in most areas, long-term, rangewide prospects for the species are grim.

Collins, T. (2015). Re-Assessment of the Conservation Status of the Atlantic Humpback Dolphin, *Sousa teuszii* (Kükenthal, 1892), Using the IUCN Red List Criteria. In *Advances in Marine Biology*. T. A. Jefferson & B. E. Curry (Eds.), (2015/11/12 ed., Vol. 72, pp. 47-77). Oxford: Academic Press <https://doi.org/10.1016/bS.amb.2015.09.001>

The Atlantic humpback dolphin (*Sousa teuszii*) is an obligate shallow water dolphin that is endemic to the western coasts of Africa, ranging from Western Sahara to Angola. The species occurs exclusively in a limited number of near-shore habitats, a tendency that routinely exposes it to a suite of lethal and deleterious anthropogenic threats. These include habitat degradation, accidental capture in artisanal fishing nets, and hunting for use as food and bait. The species also competes with rapidly expanding human populations for coastal resources in some of the poorest countries on Earth. Data for most aspects of the species' ecology are sparse, but *S. teuszii* is considered by most qualified observers to be rare and greatly threatened. A lack of appropriate survey data precludes a quantitative assessment of population trends and status. Most populations for which any data are available are considered to be extremely small, numbering in the tens or low hundreds of individuals. The available published estimates suggest that the total population likely falls below 3000 individuals. Declines in abundance

have been observed or are suspected for each population and will continue, given projected expansions of identified threats that affect most of the species' known range, and a corresponding lack of appropriate management actions. The apparent scale of threats, the presumed isolation of most populations, and a lack of directed conservation efforts in most areas suggest that the species qualifies for a listing of Critically Endangered (under criteria A3cd) on the IUCN Red List.

Consortium for the Conservation of the Atlantic Humpback Dolphin. (2021). *2021 Progress Report of the Consortium for the Conservation of the Atlantic Humpback Dolphin*. Consortium for the Conservation of the Atlantic Humpback Dolphin, Retrieved from https://www.Sousateuszii.org/wp-content/uploads/2022/02/2021-Progress-report-of-the-Consortium-for-the-Conservation-of-the-Atlantic-Humpback-Dolphin_Final-English.pdf

The Consortium for the Conservation of the Atlantic Humpback Dolphin (CCAHD) is an informal network of scientists and other stakeholders collaborating with the shared mission of 'working towards the longterm sustainability of Critically Endangered Atlantic humpback dolphin (*Sousa teuszii*/AHD) populations and their habitats through research, awareness, capacity-building and action'. The consortium aims to help implement recommendations made by the Convention on Migratory Species, the International Whaling Commission's Scientific Committee, and the IUCN SSC Cetacean Specialist Group. This report is intended to provide a brief overview of activities conducted over the course of the 2021 calendar year.

Consortium for the Conservation of the Atlantic Humpback Dolphin. (2021). *Sousa teuszii* Infographic. *The Consortium for the Conservation of the Atlantic Humpback Dolphin*. Retrieved from https://www.Sousateuszii.org/wp-content/uploads/2021/06/CCAHD_h_dolph_english_infog_052521.pdf

Poster by the Consortium for the Conservation of the Atlantic Humpback Dolphin showcasing the Atlantic humpback dolphin as a critically endangered species.

Convention on the Conservation of Migratory Species of Wild Animals. (2008). *Memorandum of Understanding Concerning the Conservation of the Manatee and Small Cetaceans of Western Africa and Macaronesia*. Conservation of Migratory Species Bonn, Germany. Retrieved from <https://IUCN-csg.org/wp-content/uploads/2010/03/TRE146853.pdf>

Under the CMS, a small cetacean-specific Memorandum of Understanding (MoU) was concluded between western African states and Macaronesia (Azores, Canary Islands, Cap Verde and Madeira). The Memorandum of Understanding Concerning the Conservation of the Manatee and Small Cetaceans of Western Africa and Macaronesia was concluded on 8 October 2008 and encompasses 16 African states and Portugal. Notably, the MoU was also signed by the three land-locked states Mali, Niger, and Chad, which is particularly important for the African manatee (*Trichechus senegalensis*) whose habitat stretches across the waterways of these countries.

Convention on the Conservation of Migratory Species of Wild Animals. (2012). *Conserving Cetaceans and Manatees in the Western African Region - Ts No. 26*. Convention on Migratory Species, TS No. 26. Bonn, Germany. Retrieved from <https://www.cms.int/en/publication/conserving-cetaceans-and-manatees-western-african-region-ts-no-26>

This review is an attempt to summarize the existing information in the literature on distribution of small cetaceans in the region, by species and by country. A constraint on the time available for preparation has limited the scope of the review; it is not exhaustive, and records not noted here undoubtedly exist, especially for Macaronesia. The summary tables given here can serve as a basis for further review. The tables and list of references consulted are available from the authors as electronic files. The area covered includes the entire west coast of Africa from Morocco to South Africa (Atlantic coast) and the archipelagos of Macaronesia (Canary Islands, Madeira, Azores and Cape Verde Islands). Little is known about the distribution of most small cetaceans along the west coast of Africa; roughly 25-30 species are thought to occur there, depending on the source consulted. The small cetacean fauna of most of Macaronesia is better known, as there have been a number of cetological surveys, stranding programs, and reviews initiated there in recent years. Records of a total of 31 species were found in the present review.

Convention on the Conservation of Migratory Species of Wild Animals. (2016). *Proposal for Inclusion of Species on the Appendices of the Convention of Migratory Species of Wild Animals - Pakistan*. Conservation of Migratory Species, COP311/18. Retrieved from <https://www.cms.int/en/document/atlantic-humpbacked-dolphin-Sousa-teuszii>

Proposal: Inclusion of *Sousa teuszii* in Appendix II; Proponent: Pakistan

Convention on the Conservation of Migratory Species of Wild Animals. (2016). *Proposal for Inclusion of Species on the Appendices of the Convention of the Conservation of Migratory Species of Wild Animals - Senegal*. Conservation of Migratory Species, COP9I/3. Retrieved from <https://www.cms.int/en/document/atlantic-humpback-dolphin-Sousa-teuszii>

The Atlantic humpback dolphin is a small delphinid regionally endemic to the tropical and subtropical eastern Atlantic nearshore waters of West Africa. Its status was recently and comprehensively reviewed as part of the CMS/UNEP Wafcet-2 project. *S. teuszii* was described in 1892 from a carcass found in Cameroon. Second and third specimens were collected respectively in 1925 and 1943 in Senegal. Next it was sighted south of Conakry, Guinea, in 1953. Over the next half-century it was encountered in Dakhla Bay (Rio de Oro/Western Sahara), Banc d'Arguin (Mauritania), SinéSaloum delta (Senegal), Niimi National Park (The Gambia), Canal do Gêba-Bijagos (GuineaBissau), southern Guinea, Gabon Estuary and finally in southern Angola, but it has never been considered a common species. Some authors have argued for a largely discontinuous distribution, while others indicated a more or less continuous coastal range from Dakhla Bay or Senegal to Cameroon which is possible but theoretical. The information on the presence or absence of Atlantic humpback dolphins is incomplete due to a paucity of field survey effort. While a quasicontinuous distribution may have existed historically, indications of contemporary distribution gaps are emerging, presumably the result of sustained bycatches and creeping human encroachment on once desolated coasts.

Convention on the Conservation of Migratory Species of Wild Animals. (2017). *Concerted Action for the Atlantic Humpback Dolphin (Sousa teuszii)*. Convention on Migratory Species, UNEP/CMS/Concerted Action 12.3. Retrieved from <https://www.cms.int/en/document/concerted-action-atlantic-humpback-dolphin-Sousa-teuszii>

Adopted by the Conference of the Parties at its 12th Meeting (Manila, October 2017). Proponents: Dr. G. Notarbartolo di Sciara, Appointed Councillor for Aquatic Mammals, in collaboration with the CMS Secretariat Dr. Koen Van Waerebeek (species expert and member of the Aquatic Mammals Working Group), Conservation and Research of West African Aquatic Mammals (COREWAM), Accra, Ghana and Dakar, Senegal Whale and Dolphin Conservation (WDC), UK.

Convention on the Conservation of Migratory Species of Wild Animals. (2017). *Proposal for a Concerted Action for the Atlantic Humpback Dolphin (Sousa teuszii) Already Listed on Appendix I and II of the Convention*. Convention on Migratory Species, UNEP/CMS/COP12/Doc.26.2.3/Rev.1. Retrieved from <https://www.cms.int/en/document/proposal-concerted-action-atlantic-humpback-dolphin-souza-teuszii>

The Appointed Councillor for Aquatic Mammals, together with two NGOs: Conservation and Research of West African Aquatic Mammals (COREWAM) and Whale and Dolphin Conservation (WDC), have submitted the attached proposal for a Concerted Action for the Atlantic Humpback Dolphin (*Sousa teuszii*) in accordance with the process elaborated in paragraph 4 and Annex 3 of Resolution 11.13.

Convention on the Conservation of Migratory Species of Wild Animals. (2020). *Concerted Action for the Atlantic Humpback Dolphin (Sousa teuszii)*. UNEP/CMS/Concerted Action 12.3 (Rev.COP13). Retrieved from https://www.cms.int/sites/default/files/document/cms_cop13_ca.12.3_rev.cop13_e.pdf

The Concerted Action for the Atlantic Humpback Dolphin was first adopted at the 12th Meeting of the Conference of the Parties (UNEP/CMS/COP12/Concerted Action 12.3). A report on implementation was submitted to the 13th Meeting of the Conference of the Parties (COP13) UNEP/CMS/COP13/Doc.28.1.3) together with a proposal for extension and revision (UNEP/CMS/COP13/Doc.28.1.3/Add.2), which was approved by the Parties.

Convention on the Conservation of Migratory Species of Wild Animals. (2020). *Concerted Action for the Atlantic Humpback Dolphin (Sousa teuszii), Proposed Activities for 2020 - 2023 Updating Unep/Cms/Concerted Action 12.3*. Convention on Migratory Species, UNEP/CMS/COP13/Doc.28.1.3/Add.2. Retrieved from <https://www.cms.int/en/document/concerted-action-atlantic-humpback-dolphin-Sousa-teuszii-proposed-activities-2020-2023>

13th Meeting of the Conference of the Parties, Gandhinagar, India, 17 - 22 February 2020

Convention on the Conservation of Migratory Species of Wild Animals. (2021). *Action Plan for the Conservation of Small Cetaceans of Western Africa and Macaronesia*. Retrieved from <https://www.Sousateuszii.org/wp-content/uploads/2021/01/CMS-Action-Plan-for-the-Conservation-of-Small-Cetaceans-of-Western-Africa-and-Macaronesia.pdf>

Small cetaceans are defined as all species of toothed whales (Odontoceti), with the exception of the sperm whale (*Physeter macrocephalus*). They are an important component of the marine biological diversity of the western African and Macaronesian region. Over one third of the world's known species of small cetaceans are found in this region. The conservation situation of small cetaceans in western Africa is not well known, in contrast to other regions of the world. Scientists have gathered more knowledge about the distribution, ecology and status of cetaceans in such hostile marine environments as the polar seas than about cetaceans in African coastal waters (excluding South Africa and parts of Macaronesia). At the same time, the coastal environment in western Africa and Macaronesia is undergoing rapid changes, with expanding human populations and overexploitation of resources, giving rise to multiple threats to the long-term survival of vulnerable marine life forms, including marine mammals. Small cetaceans around the world have suffered major declines from direct and indirect killing. Dolphins and porpoises may have only one calf every few years, and in some species, a number of adults are non-breeding members of the herd. Unrestricted hunting has the potential to endanger many species, and international controls are needed. Small cetaceans are migratory mammals, represent a global natural heritage and are valued as a significant component of the world's biodiversity. Some indigenous people of the African countries of the range even hold them sacred. Therefore, the conservation of these species is a shared responsibility, and knowledge about small cetaceans must be improved. It is incumbent on us to maintain the diversity, range and healthy numbers of these small cetaceans and prevent their decline to endangered status or extinction. This imperative comes, at least in part, from the recognition that these animals play a role in the ecosystem within which they exist, and that this function must be maintained. Intact, healthy ecosystems benefit us all. This Action Plan seeks to balance the interests of local communities and fishermen and the socio-economic development of the region, with the need to reduce or eliminate threats to cetaceans and their habitats in order to ensure their conservation.

Convention on the Conservation of Migratory Species of Wild Animals. (2021). *Spotlight on the Critically Endangered Atlantic Humpback Dolphins in Africa*. Retrieved from <https://www.cms.int/en/news/spotlight-critically-endangered-atlantic-humpback-dolphins-africa>

A collaborative effort between scientists and conservation organisations around the world, including CMS, has resulted in the launch of a new trilingual website that highlights the plight of Atlantic humpback dolphins and provides resources to support a broad range of stakeholders in an effort to protect the species. Atlantic humpback dolphins (*Sousa teuszii*) are considered Critically Endangered on the IUCN Red List of Threatened Species and are in danger of sliding toward extinction without urgent conservation intervention. They have been listed on CMS Appendix II since 1991, and additionally on Appendix I since 2009. In 2017, Parties to CMS endorsed a Concerted Action for the Species, which was renewed at COP13 in 2020.

Curtin, P., & Papworth, S. (2018). Increased Information and Marketing to Specific Individuals Could Shift Conservation Support to Less Popular Species. *Marine Policy*, 88, 101-107.
<https://doi.org/10.1016/j.marpol.2017.11.006>

Flagship species are widely used in conservation to raise awareness and funds, and recent observational research suggests that less popular species can be marketed to increase support for their conservation. Using two species groups, sharks and dolphins, this paper experimentally investigates whether stated conservation preferences can shift from more charismatic species to those not typically considered as flagship species. Although universal appeal is considered a desirable trait for flagship species, there are individual differences in preferences for species. Therefore, this paper also investigates the role of individual demographic and attitudinal differences on choices, as these may impact the success of conservation marketing. Using discrete choice experiments, six forced choice sets of two species were presented to 168 participants, with species shown and the amount of information presented about each one varied. Demographic differences between participants was found to affect donating behavior: individuals with more positive attitudes to sharks were more likely to donate to shark conservation, as are individuals with a biology background. However, it was found that individual choices can also be shifted through the provision of additional information. Participants chose to conserve species with more information, whether the two species in the choice set were both sharks, both dolphins, or a shark and a dolphin. When equal amounts of information were provided about two species, potential donors preferred the more endangered species. This research suggests that by selecting appropriate populations to target for marketing, even less charismatic species can be used as flagship species and attract potential donors.

International Whaling Commission. (2011). *Report of the 62nd Meeting of the Scientific Committee of the International Whaling Commission – Annex L Small Cetacean Subcommittee*. International Whaling Commission, Retrieved from <https://archive.iwc.int>

Annex L (pp. 44-52) of this report summarises the documents presented to the IWC Scientific Committee in 2010, the year that the Small Cetacean subcommittee focused on the North/West African Cetaceans.

International Whaling Commission. (2020). *Report of the Scientific Committee of the International Whaling Commission - 16.1.6 Atlantic Humpback Dolphin (Sousa teuszii)*. International Whaling Commission, SC68B. Retrieved from <https://iwc.int/available-now-report-of-the-2020-virtual-meeting>

Although the conservation status of the critically endangered Atlantic humpback dolphin (*Sousa teuszii*) has been of increasing concern for two decades (SC/68B/SM/07), little progress has been made towards improving this status. A Concerted Action (CA) for the species was adopted by the Convention on Migratory Species (CMS) in 2017 and renewed in 2020, but implementation has stalled thus far due to a lack of funding. A Workshop on Ex Situ Options for Cetacean Conservation was held in late 2018 that also included discussion of the Atlantic humpback dolphin with recommended actions to improve conservation status. An IWC Africa-Focused *Sousa* Task Team was established in early 2020, with the purpose of reviewing previous IWC recommendations for *S. teuszii* and *S. plumbea* and providing a framework for the Committee to move recommendations forward. The various initiatives overlap in scope, and the authors of SC/68B/SM/07 suggest that wherever possible, co-ordination should be sought to maximise efficiency. The paper further highlights two priority targets that would benefit from

immediate funding and could be achieved within a short period, namely: (1) supporting implementation of the CMS CA; and (2) beginning to address knowledge gaps with a *S. teuszii* field survey in Senegal/Gambia, considered a *S. teuszii* stronghold. The latter could be used to establish a standardised and comprehensive framework for assessments elsewhere in the species' range.

IUCN - SSC Cetacean Specialist Group. (2021). Atlantic Humpback Dolphins. Retrieved from <https://IUCN-csg.org/atlantic-humpback-dolphins/>

Endemic to Central and West Africa, the Atlantic humpback dolphin (*Sousa teuszii*, from here on referred to as AHD) is one of the least understood of the dolphin species. Despite the dependence of AHD on nearshore habitats that bring them into close contact with human activities throughout the range, a lack of targeted field research has hampered the collection of information on all aspects of the species ecology, including a lack of data on their distribution, population size, ecology, behaviour, life history, threats and mortality. The species' range extends from Western Sahara in the north to Angola in the South, with presence confirmed in 13 of the 19 countries within that range. In many of these countries evidence is limited to a handful of historical, anecdotal, stranding or bycatch records, and where no records exist, it is unknown whether this reflects a true gap in distribution, or a lack of survey effort. Systematic surveys for AHD have been limited to Angola, Congo, Gabon, Cameroon, Senegal, and Guinea. Most of these studies have been limited in time and scope, ranging from a few days to a few weeks. Based on this scant evidence, as well as a review of published estimates of abundance in each state, it has been estimated that fewer than 3,000 individuals remain throughout the species' entire range of which half are likely to be breeding adults. As with other coastal small cetaceans, bycatch in artisanal gillnets is thought to pose the most significant threat to AHD, while coastal development, habitat degradation, and directed hunts/aquatic bushmeat are also likely to play roles in population declines. These documented threats, low abundance, and likely declines led to an uplisting of the species from Vulnerable in 2012 to Critically Endangered in 2017.

IUCN – SSC Cetacean Specialist Group. (2014). Enforcement Paying Off for the Atlantic Humpback Dolphin of Western Africa. Retrieved from <https://IUCN-csg.org/enforcement-paying-off-for-the-atlantic-humpback-dolphin-of-western-africa/>

Like many threatened species, the vulnerable Atlantic humpback dolphin (*Sousa teuszii*) is under pressure from anthropogenic activities. Industrial and commercial scale fishing forces locally-based artisanal fishers to within 200 metres of the beach – using their nets in critical habitat for this poorly understood marine mammal. In a recent field report to SOS Save our Species, who funded the work, Tim Collins from the Wildlife Conservation Society (WCS) and IUCN CSG Member, reports on the impact of routine and frequent surveillance patrols in the waters of Conkouati-Douli National Park (CDNP), in the Republic of Congo – one of two project sites- to deter and intercept the trawlers that are deemed the root cause of the problem.

Karczmarski, L. (2000). Conservation and Management of Humpback Dolphins: The South African Perspective. *Oryx*, 34(3), 207-216. <https://doi.org/10.1046/j.1365-3008.2000.00120.x>

Population biology and socio-ecology of Indo-Pacific humpback dolphins *Sousa chinensis* were investigated during a 3-year study period in the Algoa Bay region, South Africa. The dolphins inhabit a

narrow strip of coastal waters, mostly less than 15 m deep. Groups are small (mean = 7 animals) and their daily activities concentrate around shallow rocky reefs—the primary feeding grounds. Dependence on these restricted, shallow-water habitats is evident throughout the year. Site fidelity is generally weak and is subject to seasonal migration, although female site fidelity seems to be related to reproductive stage. Births occur predominantly in summer. The social system is highly fluid, structured to some degree by sex and age, ‘matesearching’ behaviour being the most likely male reproductive strategy. The dolphins inhabiting Algoa Bay are part of a substantially larger population that uses a considerable length of the coastal zone. Estimated population parameters are generally low, as are modelled population growth rates, and an increase in the population size seems unlikely. Humpback dolphins appear to be vulnerable to negative environmental pressure and the alteration/destruction of inshore habitats is probably among the greatest threats to them. Conservation of this species should be given high priority and be seen as an important part of integrated coastal zone management. Establishment of multiple-use management areas with controlled ecotourism and several priority sites declared as strict reserves seems to be the most effective conservation approach. In order to be successful, conservation and management policies need to recognize the needs and lifestyles of the local inhabitants.

Lent, R. J. (2010). *Final Environmental Assessment, Regulatory Impact Review, and Regulatory Flexibility Act Analysis for a Final Rule to Establish Identification and Certification Procedures for Nations under the High Seas Driftnet Fishing Moratorium Protection Act*. National Oceanic and Atmospheric Administration Silver Spring, MD. Retrieved from <https://repository.library.noaa.gov/view/noaa/4047>

The Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006, which was signed into law in January 2007, amends the High Seas Driftnet Fishing Moratorium Protection Act (Moratorium Protection Act) to require actions be taken by the United States to address illegal, unreported, or unregulated (IUU) fishing and the bycatch of protected living marine resources (PLMRs). Specifically, the Moratorium Protection Act requires the Secretary of Commerce to identify in a biennial report to Congress those foreign nations whose vessels are engaged in IUU fishing or fishing activities that result in bycatch of PLMRs. The Moratorium Protection Act also requires the establishment of procedures to certify whether nations identified in the biennial report are taking appropriate corrective actions to address IUU fishing or bycatch of PLMRs by fishing vessels of that nation. Identified nations that do not receive a positive certification from the Secretary of Commerce could be subject to measures under the High Seas Driftnet Fisheries Enforcement Act (16 U.S.C. 1826a), such as the denial of port privileges, prohibition on the importation of certain fish or fish products into the United States, or other measures. This action would establish procedures for the Secretary of Commerce to certify nations whose vessels are engaged in IUU fishing activity or PLMR bycatch. Background information on the issues and a description of the alternatives being considered for this rulemaking are described in this environmental assessment.

Minton, G., Kema, J. R. K., Todd, A., Korte, L., Maganga, P. B., Mouelet, J. R. M., . . . Nguele, G. K. (2017). Multi-Stakeholder Collaboration Yields Valuable Data for Cetacean Conservation in Gamba, Gabon. *African Journal of Marine Science*, 39(4), 423-433. <https://doi.org/10.2989/1814232x.2017.1398106>

Private industry, the Government of Gabon and two international NGOs collaborated to conduct marine surveys off the coast of Gabon, Central Africa. Surveys addressed multiple objectives of surveillance and

monitoring, the documentation of the distribution of and threats to the marine megafauna, and capacity-building among government agents and local early-career scientists. During 22 days of survey effort over a two-year period, observers documented humpback whales *Megaptera novaeangliae*, bottlenose dolphins *Tursiops truncatus*, Atlantic humpback dolphins *Sousa teuszii* and common dolphins *Delphinus delphis*. Humpback whale presence was limited to the months of July to November. Bottlenose dolphins were present year-round and photo-identification of individuals indicated a closed, resident population, with an abundance estimate of 118 (CV = 21.6%, 95% CI 78-180). Small open-decked fishing vessels with gillnets were observed concentrated around river mouths within 2 km of shore, while commercial trawlers were at least 10 km offshore; all were confirmed to be registered and legal. Observations of marine turtles, flocks of marine birds, and floating logs and other debris were sparse. This multi-stakeholder collaboration to conduct a marine survey can serve as an effective model by which funding and logistic support from private industry paired with technical expertise from NGOs and academic institutions can benefit marine and coastal conservation.

Minton, G., Weir, C., & Collins, T. (2020). *Short- and Medium-Term Priority Actions to Conserve the Atlantic Humpback Dolphin *Sousa teuszii*. Report of the Consortium for the Conservation of the Atlantic Humpback Dolphin*. Retrieved from <https://www.sousateuszii.org/wp-content/uploads/2021/02/CCAHD-Priorities-for-Sousa-teuszii-FINAL.pdf>

The report is the result of extensive expert discussion on the current short- and medium-term priority data gaps and actions required to optimize the long-term conservation and sustainability of the species. It summarizes the outputs of 12 working groups that met virtually between September and November 2020. Each group focused on a specific topic (e.g. capacity-building, genetics, population monitoring, bycatch). The report incorporates feedback from an extensive review process including all CCAHD associates and other parties within the species' range states. A number of priority actions are highlighted to address the data, resource, and capacity gaps of most relevance to conserving Atlantic humpback dolphins. The report will serve as a roadmap to guide future conservation efforts for the species, through the allocation of funding to where it is most urgently needed to achieve maximum conservation outputs. High emphasis is placed on coordinating collaborative work between a wide range of national and international partners to ensure long-term legacies in capacity-building and outreach, and in achieving transboundary effort across range states.

National Oceanic and Atmospheric Administration. (2021). *Endangered and Threatened Wildlife; 90-Day Finding on a Petition to List the Atlantic Humpback Dolphin as Threatened or Endangered under the Endangered Species Act*. Federal Register Retrieved from <https://www.federalregister.gov/documents/2021/12/02/2021-26225/endangered-and-threatened-wildlife-90-day-finding-on-a-petition-to-list-the-atlantic-humpback>

We, NMFS, announce a 90-day finding on a petition to list the Atlantic humpback dolphin (*Sousa teuszii*) as threatened or endangered under the Endangered Species Act (ESA). We find that the petition presents substantial scientific or commercial information indicating that the petitioned action may be warranted. Therefore, we are initiating a status review of the species to determine whether listing under the ESA is warranted. To ensure this status review is comprehensive, we are soliciting scientific and commercial information regarding this species.

Parra, G. J., & Jefferson, T. A. (2018). Humpback Dolphins: *Sousa teuszii*, *S. Plumbea*, *S. Chinensis* and *S. Sahulensis*. In *Encyclopedia of Marine Mammals, 3rd Edition*. B. Wursig, J. G. M. Thewissen, & K. M. Kovacs (Eds.), (pp. 483-489) <https://doi.org/10.1016/B978-0-12-804327-1.00153-9>

Humpback dolphins (genus *Sousa*) are medium-sized delphinids found in shallow (<30 m), coastal waters of the eastern Atlantic, Indian, and western Pacific Oceans. The genus is comprised of four species: (1) Atlantic humpback (*Sousa teuszii*), (2) Indian Ocean humpback (*S. plumbea*), (3) Indo-Pacific humpback (*S. chinensis*), and (4) Australian humpback (*S. sahalensis*) dolphins. Information on the ecology, behavior and life history of all humpback dolphins remains scarce. Most study populations to date indicate that all species occur in small numbers, with most populations confirmed or suspected to be declining and threatened. Major threats affecting all species include habitat degradation and loss, and entanglement in fishing gear. Research efforts and conservation actions tailored to each species are needed to assess anthropogenic impacts, and develop strategies to eliminate or mitigate threats.

Plön, S., Atkins, S., Cockcroft, V., Conry, D., Dines, S., Elwen, S., . . . Vermeulen, E. (2021). Science Alone Won't Do It! South Africa's Endangered Humpback Dolphins *Sousa Plumbea* Face Complex Conservation Challenges. *Frontiers in Marine Science*, 8. <https://doi.org/10.3389/fmars.2021.642226>

The Indian Ocean humpback dolphin (*Sousa plumbea*) is “endangered” with likely less than 500 animals remaining in South African waters. Established in 2016, the *Sousa* Consortium is a formalised network of scientists and conservationists to combine knowledge and research efforts, and make coordinated decisions with the aim of conserving the species. The first collaborative project collated available photoidentification data in an attempt to refine a national population estimate and investigate movements between research sites. This work was able to identify 250 uniquely marked individuals, with the population divided into the south-coast (Agulhas bioregion) and east-coast (Natal bioregion) populations. Environmental factors almost certainly play a role in the declining numbers of the species in South African waters. However, individual threats and solutions are challenging to identify as the South African marine environment is undergoing significant natural and anthropogenic changes with major shifts in the distribution and numbers of some prey, competitor and predator species. Therefore, we believe that a continued investigation of potential contributing factors and their interaction will take too long, inevitably resulting in another case of documenting extinction. With this in mind, we present the results of a SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis in an effort to help us identify the next steps to take toward the conservation of humpback dolphins in South African waters. We unanimously conclude that no single cause for the rapid decline of humpback dolphins in South African waters can be identified, and that the cumulative effects of multiple stressors, which are difficult to pinpoint and mitigate, are impacting population numbers. While highlighting the need for continued research, we suggest a shift toward more action-focused conservation efforts, the first concrete steps being the development of a Conservation Management Plan with input from other stakeholders.

Reeves, R. R., Perrin, W. F., Taylor, B. L., Baker, C. S., & Mesnick, S. L. (2004). *Report of the Workshop on Shortcomings of Cetacean Taxonomy in Relation to Needs of Conservation and Management, April 30-May 2, 2004, La Jolla, California*. (NOAA-TM-NMFS-SWFSC-363). La Jolla, CA: National Oceanic and Atmospheric Administration Retrieved from <https://repository.library.noaa.gov/view/noaa/3474>

The workshop took place at the Southwest Fisheries Science Center and the Scripps Institution of Oceanography, La Jolla, California, from April 30 to May 2, 2004, following a two-day open symposium, "Cetacean Systematics: Approaches in Genetics, Morphology, and Behavior." Participation in the workshop was by invitation and included 48 participants from 6 countries. The three-day workshop was convened jointly by Perrin, Taylor and Baker, with help from a steering committee that also included Brownell, Dizon, Jefferson, LeDuc, Mesnick, Morin, Reeves, and Waples, and a local organizing committee chaired by Mesnick. Taylor chaired the plenary sessions. Understanding the structure of cetacean populations at the species, subspecies, and evolutionarily significant unit (ESU) levels is pivotal to conservation at global and regional levels. For example, consideration of whether to add the "southern resident" killer whales of the eastern North Pacific to the U.S. Endangered Species List hinged on poorly understood evolutionary relationships between this population and killer whales globally (LJ/04/KW10). In the absence of a fundamental understanding and agreement on the number of species and subspecies of killer whales, consensus could not be reached on whether this whale population was significant to the taxon to which it belongs. That example raises a series of questions: What data are sufficient or necessary to define species and subspecies? Must taxonomic decisions be based on skull morphology, or are genetic differences sufficient? If genetic data are sufficient, what standards apply for the different levels of differentiation? If morphology is required, how can one overcome the frequent difficulty of gaining access to adequate samples of mature specimens? A related problem is that of identifying market samples (e.g., whale meat) or stranded cetaceans. Being able to identify such specimens can lead to important conservation benefits, sometimes exposing problems related to bycatch or directed catch. At a minimum, researchers should be able to assign an uncertain specimen to a species, if not (ideally) to a subspecies or regional population. The development of an agreed molecular species taxonomy is a feasible and necessary first step. A validated ("ground-truthed") database at the species level would form the basis for future development below the species level, eventually permitting assignment of specimens to their geographical origins. The main purpose of the conference (including symposium and workshop) was to address those and related questions by bringing together experts from the fields of morphological, behavioral, and molecular systematics and related fields. The workshop itself was organized around specific tasks and proposals.

Rose, N., Uhlemann, S., & Jefferson, T. A. (2021). *Petition to List the Atlantic Humpback Dolphin (Sousa teuszii) under the Endangered Species Act*. Retrieved from https://media.fisheries.noaa.gov/2021-09/Atlantic-Humpback-Dolphin-ESA-Petition-2021-09-08_508-Compliant.pdf

The Atlantic humpback dolphin (*Sousa teuszii*) is the most endangered of the four species of coastal humpback dolphins in the genus *Sousa*, which are all recognized by the International Union for Conservation of Nature (IUCN) as threatened by human activities. The species is found only along the western African coast, ranging through at least 13 countries from Western Sahara south to Angola. These dolphins occur exclusively in relatively shallow waters and are most common in estuarine environments close to shore. They feed on a wide variety of nearshore fish species, with mullet being the most commonly reported prey item. Eleven management stocks have been identified, mostly from

apparent gaps in distribution, but there have been no studies of geographic variation in morphology or genetics to further clarify stock structure of the species. Most known populations appear to number in the tens to low hundreds. It is thought that the entire species consists of no more than 3,000 individuals and is declining in numbers. The IUCN Red List currently classifies this species as Critically Endangered, the most dire threat category for an extant species. Such a listing indicates “an extremely high risk of extinction in the wild.” Bycatch in fisheries, deliberate capture, depletion of prey by fisheries, coastal development, and anthropogenic noise are considered to be the major threats to the species, with fisheries impacts (especially bycatch in local gillnet fisheries) undoubtedly the most severe. There seems to be little commercial, recreational, or scientific utilization of the species, but a market for its meat is apparently growing, as part of the African ‘marine wildmeat’ trade. Disease and predation have been very poorly studied, though spinal pathology has been noted in Atlantic humpback dolphins. Large sharks and killer whales are likely the only natural predators. Regulatory mechanisms and conservation measures needed to protect this species are currently woefully inadequate. Although marine protected areas do exist in some range countries, the effectiveness of their management is variable and few laws or regulations exist specifically to conserve the Atlantic humpback dolphin. There are no natural factors known to be threatening the species’ survival prospects; all known threats are anthropogenic. The Atlantic humpback dolphin is one of the least-known species of dolphins or porpoises in the world. The dearth of knowledge on most aspects of the species’ biology and ecology represents a serious impediment to developing effective conservation measures. The petitioners request that the National Marine Fisheries Service list the Atlantic humpback dolphin as “endangered” or “threatened” under the Endangered Species Act (ESA). Listing under the ESA would significantly improve the species’ survival prospects, by increasing global awareness of the species, assisting research efforts, helping to stimulate funding for important science, and providing financial and legal/political assistance to local and international conservation efforts.

Taylor, B. L., Abel, G., & Miller, P. (2020). *Ex Situ Options for Cetacean Conservation*. Paper presented at the IUCN Report of the 2018 workshop, Nuremberg, Germany.
<https://doi.org/10.2305/IUCN.CH.2020.SSC-OP.66.en>

China’s Yangtze river dolphin (*Lipotes vexillifer*), also known as the baiji, was declared likely to be extinct in 2006, due to threats in the wild such as habitat loss, entanglement in fishing gear and ship strikes, which were not effectively dealt with using the management tools available prior to that time. Mexico’s vaquita (*Phocoena sinus*), a porpoise found only in the Upper Gulf of California, will become extinct in the near future if the illegal fishery to obtain fish swim bladders for illicit international markets is not eliminated very soon. Biologists have found that they can’t even ‘buy time’ for the vaquita by taking individuals into a protected captive (ex situ) environment because there is simply not enough information on how to handle and care for the species. In both of these cases, it took only a short time for the population to decrease from hundreds to tens of animals. This highlights the urgency of gaining information and taking action to anticipate and prevent such rapid declines in other threatened species and populations of small cetaceans. To prevent more extinctions, we must learn from these losses and work harder (and faster) – we need to ensure not only that the causes of decline are clearly understood and actions are in place to mitigate them, but also that the conservation toolbox is ready and that the ground has been prepared – politically, culturally, scientifically, and logistically – for actions that may be needed in the future. A workshop, “Ex situ Options for Cetacean Conservation” (ESOCC) was held in Nuremberg, Germany, 14-18 December 2018, to start those preparations.

Trew, B. T., Grantham, H. S., Barrientos, C., Collins, T., Doherty, P. D., Formia, A., . . . Metcalfe, K. (2019). Using Cumulative Impact Mapping to Prioritize Marine Conservation Efforts in Equatorial Guinea. *Frontiers in Marine Science*, 6(2). <https://doi.org/10.3389/fmars.2019.00717>

Marine biodiversity is under extreme pressure from anthropogenic activity globally, leading to calls to protect at least 10% of the world's oceans within marine protected areas (MPAs) and other effective area-based conservation measures by 2020. Fulfilling such commitments, however, requires a detailed understanding of the distribution of potentially detrimental human activities, and their predicted impacts. One such approach that is being increasingly used to strengthen our understanding of human impacts is cumulative impact mapping; as it can help identify economic sectors with the greatest potential impact on species and ecosystems in order to prioritise conservation management strategies, providing clear direction for intervention. In this paper, we present the first local cumulative utilisation impact mapping exercise for the Bioko-Corisco-Continental area of Equatorial Guinea's Exclusive Economic Zone – situated in the Gulf of Guinea one of the most important and least studied marine regions in the Eastern Central Atlantic. This study examines the potential impact of ten direct anthropogenic activities on a suite of key marine megafauna species and reveals that the most suitable habitats for these species, located on the continental shelf, are subject to the highest threat scores. However, in some coastal areas, the persistence of highly suitable habitat subject to lower threat scores suggests that there are still several strategic areas that are less impacted by human activity that may be suitable sites for protected area expansion. Highlighting both the areas with potentially the highest impact, and those with lower impact levels, as well as particularly damaging activities can inform the direction of future conservation initiatives in the region.

Van Waerebeek, K., Barnett, L., Camara, A., Cham, A., Diallo, M. A., Djiba, A., . . . Bamy, I. L. (2003). *Conservation of Cetaceans in the Gambia and Senegal, 1999-2001, and Status of the Atlantic Humpback Dolphin*. WAF CET- 2 Report. Bonn, Germany. <https://doi.org/10.13140/RG.2.1.3917.9602>

A second project of the West African Cetacean Research and Conservation Programme (WAF CET-2) was implemented in Senegal and The Gambia, from December 1999 till December 2001. It generally aimed at collecting information on the conservation status of coastal cetaceans, with emphasis on the Atlantic humpback dolphin, and support activities to improve it. A base for the recently formed ngo COREWAM (Conservation and Research of West African Aquatic Mammals) was made operative near Dakar. Nineteen new cranial specimens, representing six cetacean species, were added to the COREWAM reference collection: short-snouted and long-snouted common dolphins (n= 9), bottlenose dolphins (n= 3), Atlantic humpback dolphin (n= 1), harbour porpoise (n= 3), ordinary Bryde's whale (n= 1) and incomplete bony remains of unidentified delphinids (n= 2). Presently, 34 skeletal voucher specimens are curated. The Gambian cetacean reference collection was enriched with at least a dozen skulls, mostly bottlenose dolphins, conserved at Kiang West National Park. With support from this project, the Gambian Department of Parks and Wildlife Management implemented an aquatic mammal sightings and by-catch monitoring programme jointly with the Department of Fisheries. Eighteen data collection points were set up on the Atlantic coast and Gambian River shores. No specific cases of by-catch (2001) but more than 200 sighting records were reported. Few of these were sufficiently documented as to allow positive species identification. The majority seem to refer to bottlenose dolphins in the Gambia River. An intensive, one-day training workshop was organized, aimed at instructing fisheries officers who themselves train field observers. Also, a Gambian Aquatic Mammal Working Group was established. Unquantifiable, but presumed low to moderate, levels of cetacean by-catch, affecting several species

(bottlenose dolphin, Atlantic humpback dolphin, common dolphins, harbour porpoise) continue to occur in both The Gambia and Senegal. In addition, unknown numbers are illegally netted or otherwise killed directly for their meat in both countries. Small cetacean meat is consumed locally and likely used also as shark bait. These insights confirm results from earlier surveys (WAF CET-1). Atlantic humpback dolphin was found to be taken, at least occasionally, in Guinea-Conakry and Mauritania. There are no clear indications of a 'marine bushmeat' black market spreading beyond the coastal region, but monitoring should be continued. As before, the illegality of cetacean catches caused the unwanted sideeffect that any evidence of catches is concealed or destroyed, which seriously hampers the collection of information and specimens. An unprecedented case of unauthorized livecapture of bottlenose dolphin was documented in Saloum National Park, Senegal. This episode (4 of 5 died) serves as a warning that the captive display industry may form a formerly unrecognized threat to some aquatic mammal populations in the subregion. The surreptitious nature of the exploitation of small cetaceans is highly obstructive to any attempts at monitoring. Nine countries, three newly recognized (N), are confirmed range states for *Sousa teuszii*: Morocco (Western Sahara), Mauritania, Senegal, The Gambia, Guinea-Bissau, Guinea-Conakry (N), Cameroon, Gabon (N) and Angola (N). There is some anecdotal indication for Togo and, based on purely geographic considerations, the Democratic Republic of Congo, People's Republic of Congo, Equatorial Guinea and Nigeria are likely range states. *Sousa teuszii* is documented to regularly cross international borders between Senegal and The Gambia and thus technically qualifies as a 'migratory species' under the CMS Convention. The distribution of *Sousa teuszii* from Dahkla Bay (23°54'N), Morocco, southeast to Tombua (ca.16°S), southern Angola, appears to be 'discontinuous' i.e. with gaps of low to very low density in several areas. Humpback dolphins for instance have not been found in Ghana, possibly the result from the important dolphin fishery there. We propose the preliminary recognition of eight management stocks of *Sousa teuszii*, each stock named for a known core distribution locality in Atlantic Africa. Six stocks are of the 'confirmed-contemporary' type, supported by recent sightings or specimen records: (i) Dahkla Bay, (ii) Banc d'Arguin, (iii) Saloum-Niumi, (iv) Gêba-Bijagos, (v) southern Guinea and (vi) Angola. The Cameroon and Gabon stocks are known from historical records. Additional, unnamed, stocks most probably exist in the equatorial eastern Atlantic. The degree of polymorphism and genetic isolation between stocks need to be established. Several management stocks may actually form a single population. No biological population status is claimed for the proposed management stocks. The principal habitat of Atlantic humpback dolphins includes shallow, nearshore waters, outer estuaries of large rivers, sea-arms and wide, outer channels of river deltas, where seawater or brackish water predominate. There is no evidence for occurrence in freshwater (upriver) environments. Bottlenose dolphins, which we know to enter the Casamance and Gambia Rivers, may have been mistaken for humpback dolphins by some observers. We document the first sightings of Atlantic humpback dolphin in the Senegal's Siné- Saloum delta since 1979. An apparently semiresident community of some 40 specimens was discovered at the entrance of Djinack Creek, a foraging site. In Guinea-Bissau, based on raw data by Wolff (1998), group size ranged from 1- 20 individuals with a mean of 6.50 (SD=6.09; n= 15). A re-interpretation from data by Spaans (1990) from the same area shows a comparable mean of 4.39 individuals SD= 4.19, n= 54, range 1-15, mode 2, median 2.5. These are significantly smaller ($p < 0.001$) than the group size observed in the Saloum delta (mean 22.9; SD= 9.33; n= 8; range 10-37). However, interpretation of what precisely constitutes a group may differ between observers. Further field work, including region-wide surveys of abundance, are necessary to establish whether certain stocks of *S. teuszii* should be assigned 'endangered' status. Habitat encroachment, frequent by-catches and some directed take, as well as massive coastal overfishing, are thought to be the main causes for the low population levels in *S. teuszii*. With scientific stock size estimates lacking, the aggregated body of circumstantial evidence suggests that each of the named stocks may consist of hundreds of individuals rather than thousands. The long-beaked common dolphin *Delphinus capensis*, a skull of which appropriately picked up during a demonstration beach-

combing activity, is a newly reported mammal for The Gambia. A Bryde's whale calf stranded in Senegal was genetically determined as 'ordinary' form *Balaenoptera brydei*. Reports of mid-sized whales seen in nearshore waters of The Gambia remain unidentified. Although a novel awareness about aquatic mammal conservation is slowly taking hold in Senegal and The Gambia, this has not yet acquired a mainstream character. Biology students do not consider marine mammal science a feasible career. The Gambia's Department of Parks and Wildlife Management and the Department of Fisheries have an important role to play in order to change attitudes. Principal challenges for COREWAM include maintaining generated momentum, attract follow-up projects, increase sources of documented information, broaden bases of public interest and stimulate region-wide cooperation.

Van Waerebeek, K., & Perrin, W. (2007). *Conservation Status of the Atlantic Humpback Dolphin, a Compromised Future?* Paper presented at the 14th Meeting of the CMS Scientific Council, Bonn, Germany. <https://doi.org/10.13140/RG.2.1.2801.2888>

Of all cetaceans occurring in tropical and subtropical waters of West African, the Atlantic humpback dolphin is the only endemic species. It is also the cetacean that lives nearest to shore year-round, often just beyond the surf, and thus comes in closest contact with humans and their activities. It is also one of the species that displays the greatest wariness towards humans. If approached, it will flee even small boats, evidencing its great sensitivity to the lightest of disturbances. Recognizing this especially vulnerable situation, the species has since 1991 been assigned to CMS Appendix II. Since then coastal development and degradation has continued to increase region-wide (e.g. Khan and Mikkola, 2002) and pressure on the dolphin's habitat can only have risen. Moreover, despite improved search effort, sightings remain scarce. One of the aims of the CMS/UNEP-sponsored WAF CET-2 project, implemented in Senegal and The Gambia (and to a lesser degree in Guinea-Bissau), consisted of comprehensively evaluating the current status of the Atlantic humpback dolphin.

Weir, C. R. (2011). *Ecology and Conservation of Cetaceans in the Waters between Angola and the Gulf of Guinea, with Focus on the Atlantic Humpback Dolphin (Sousa teuszii)*. (Doctor of Philosophy), University of Aberdeen, Retrieved from <https://ethos.bl.uk/OrderDetails.do?uin=uk.bl.ethos.542663> Lens.org database. Retrieved from <https://ethos.bl.uk/OrderDetails.do?uin=uk.bl.ethos.542663>

The cetacean communities inhabiting eastern tropical Atlantic (ETA) waters along the west coast of Africa are amongst the most poorly studied worldwide. This thesis aimed to: (1) provide baseline information on the distribution and relative status of cetacean species occurring in the waters between Angola and the Gulf of Guinea (7°N to 17°S latitude and 8°W to 14°E longitude); and (2) provide guidance towards their long-term conservation. A review of existing published cetacean records revealed that seven baleen whale species and 22 species of toothed whale had been documented between Côte d'Ivoire and Angola up until 2010. Prior to 2000, whaling records and anecdotal accounts of strandings, captures and sightings provided most information on species occurrence. The majority of species documented to date are either cosmopolitan or (sub)tropical oceanic species, forming a cetacean community similar to those recorded in deep, tropical waters worldwide. Three species were associated with the cool Benguela Current system in southern Angola. Species richness was highest in Ghana (n = 19), Gabon (n = 20) and Angola (n = 28), where dedicated cetacean research projects began during the last decade. Part one of this thesis examined the tropical oceanic cetacean community in the waters between Togo and Angola (6°N to 11°S latitude). A total of 5905 hr of cetacean survey effort was

collected from platforms of opportunity between 2004 and 2009. A total of 3,314 on-effort and incidental cetacean sightings, comprising 22 species, was recorded. Humpback whales *Megaptera novaeangliae* (n = 399) and sperm whales (*Physeter macrocephalus*) (n = 441) were the most frequently-sighted cetaceans, with short-finned pilot whales (*Globicephala macrorhynchus*) (n = 143) and Atlantic spotted dolphins (*Stenella frontalis*) (n = 106) the most frequently-sighted delphinids. The occurrence of *P. macrocephalus* varied significantly with oceanographic region, water depth and month. The occurrence of *M. novaeangliae* varied significantly with water depth and month. Five species, Bryde's whale (*Balaenoptera brydei*), *M. novaeangliae*, killer whale (*Orcinus orca*), common bottlenose dolphin (*Tursiops truncatus*) and common dolphin (*Delphinus sp.*), occurred in both neritic and oceanic waters. The remaining species were exclusively oceanic. With the exception of *M. novaeangliae* (which occurred during winter and spring), all species appeared to be resident within the study area throughout the year. There were 65 confirmed instances of interspecific association, 55% of which involved mixed-species groups of *G. macrorhynchus* and *T. truncatus*.

Weir, C. R., Leeney, R. H., & Collins, T. (2020). *Reinvigorating Conservation Efforts for the Atlantic Humpback Dolphin (Sousa teuszii): A Brief Progress Report*. International Whaling Commission SC/68B/SM/07. Retrieved from <https://archive.iwc.int>

The Atlantic humpback dolphin (*Sousa teuszii*) is endemic to nearshore, tropical waters along the west coast of Africa in the eastern Atlantic Ocean, with a contemporary occurrence documented in 12 range states. Its conservation status has been of significant concern for several decades, with its nearshore habitat preference overlapping extensively with anthropogenic pressures including fishing, habitat degradation and loss, and hunting. The limited available data suggest that bycatch in fishing gear and deliberate hunting are significant causes of mortality in some areas. In recent years, the Atlantic humpback dolphin has been relisted to the Convention on Migratory Species (CMS) Appendix I and to Critically Endangered on the IUCN Red List to reflect the increasing concerns over its status. Nevertheless, very little has been achieved to date with regard to progressing effective conservation and management measures for the species. This document briefly summarises several recent initiatives to drive progress, and makes recommendations towards prioritising where conservation efforts should focus in the short-term for *S. teuszii*.

Weir, C. R., Minton, G., & Collins, T. J. Q. (2021). Conservation of Africa's Most Imperiled Cetacean, the Atlantic Humpback Dolphin (*Sousa teuszii*). In *Earth Systems and Environmental Sciences*. Elsevier <https://doi.org/10.1016/B978-0-12-821139-7.00128-8>

The Atlantic humpback dolphin has been listed by the IUCN as Critically Endangered since 2017, and is Africa's most imperiled cetacean species. Occurring only along the Atlantic coast of Africa, its restricted geographic range, reliance on nearshore habitat, and naturally low abundance make it highly vulnerable to human activities. Known immediate threats include bycatch in fisheries, especially gillnets, and deliberate hunting for fishing bait and human consumption. The scale of those mortalities remains unknown, but they are suspected to be widespread. Other potential threats include habitat loss and degradation, pollution and prey depletion. Conservation management strategies are hindered by significant data deficits, lack of funding, and numerous anthropogenic factors including high levels of human poverty across the countries where the species occurs, and lack of local scientists, resources, and political will. Although the deteriorating status of the Atlantic humpback dolphin has been recognized for decades, those concerns have not yet translated into tangible management actions to stabilize or

increase populations. Some Atlantic humpback dolphin populations may still have long-term viability, if habitat protection and targeted threat management are implemented. As a minimum, it is recommended that management should incorporate the development of a collaborative and transboundary species action plan, mitigation of bycatch (such as subsidies for gillnet removal), designation of managed protected areas where threats are removed, robust population assessments, increased awareness and capacity-building, and preparation for informed discussion regarding the viability of future ex situ management options. Without immediate action, the outlook for the Atlantic humpback dolphin is poor.

Weir, C. R., Van Waerebeek, K., Jefferson, T. A., & Collins, T. (2010). *Challenges and Priorities for the Conservation of the Vulnerable Atlantic Humpback Dolphin (Sousa teuszii), with a Case Study from Namibe Province, Angola*. International Whaling Commission SC/62/SM6. Agadir, Morocco. Retrieved from <https://archive.iwc.int>

Atlantic humpback dolphins (*Sousa teuszii*) are endemic to tropical coastal waters between Western Sahara and Angola, West Africa. They are classified as Vulnerable by the IUCN due to their restricted geographic range, low abundance and declining status. Seventy-one Atlantic humpback dolphin sightings were recorded along 55km of coast in Namibe Province, Angola, during two three-week periods in the summer and winter of 2008. Photo-identification documented 10 individuals, indicating low abundance of the Angola Management Stock. Most sightings (n=46, 65%) occurred in a restricted niche within 300m of shore rendering dolphins highly susceptible to anthropogenic impacts. Nearshore (<1km from the coast) anthropogenic activity was highest (4.8 fishing boats and 2.0 gillnets per km in sector 10) in the southernmost sectors of the study area where no dolphins were sighted. In Namibe Province, as throughout their range, bycatch (incidental capture) in gillnets is the greatest likely cause of mortality, with directed capture, habitat degradation and over-fishing also potential impacts. Other threats include marine pollution, climate change and anthropogenic sound. Low abundance, fragmentation of populations and low genetic variation may increase the vulnerability of the species to stochastic processes. Conservation challenges include a paucity of biological data, absence of education programmes, and widespread poverty amongst coastal communities which rely heavily on artisanal fisheries for subsistence. Recommended priorities for Atlantic humpback dolphin conservation include: (i) distribution and abundance surveys; (ii) bycatch monitoring programmes; (iii) awareness schemes; (iv) protected areas where healthy populations remain; and (iv) reduction/elimination of nearshore gillnet use within core habitat.

Section V: General

Cadenat, J. (1959). Rapport Sur Les Petits Cétacés Ouest-Africains. Résultats Des Recherches Entreprises Sur Ces Animaux Jusqu'au Mois De Mars 1959. *Bulletin de l'Institut Français d'Afrique Noire*, 21, 1367-1409.

Both the original French and an English translation of this report is available. In 1958, with the intention of increasing our knowledge of West African small cetaceans (especially odontocetes and in particular delphinids), the Marine Biology Section of IFAN attempted a special survey with the assistance and efficiency of the Fisheries Services of the governments of Senegal and the Ivory Coast. Parallel to this, a research campaign was undertaken with the fishermen, village chiefs and members of the educational community of the coastal areas. In spite of the difficulties encountered and so many diverse sources of information such as methods of observation or capture, the research has been fruitful. The results gained, in spite of their importance, nevertheless emphasise the fact that there is an enormous amount of work remaining to be carried out to adequately inventory the cetological fauna of these coasts and find out about their biology. Recalling each of the species having already given rise to publications, we have gathered together all the references on all observations made since then which remained unpublished until now.

Chan, S. C. Y., & Karczmarski, L. (2017). Indo-Pacific Humpback Dolphins (*Sousa chinensis*) in Hong Kong: Modelling Demographic Parameters with Mark-Recapture Techniques. *PLoS One*, 12(3), e0174029. <https://doi.org/10.1371/journal.pone.0174029>

Indo-Pacific humpback dolphins (*Sousa chinensis*) inhabiting Hong Kong waters are thought to be among the world's most anthropogenically impacted coastal delphinids. We have conducted a 5-year (2010-2014) photo-ID study and performed the first in this region comprehensive mark-recapture analysis applying a suite of open population models and robust design models. Cormack-Jolly-Seber (CJS) models suggested a significant transient effect and seasonal variation in apparent survival probabilities as result of a fluid movement beyond the study area. Given the spatial restrictions of our study, limited by an administrative border, if emigration was to be considered negligible the estimated survival rate of adults was 0.980. Super-population estimates indicated that at least 368 dolphins used Hong Kong waters as part of their range. Closed robust design models suggested an influx of dolphins from winter to summer and increased site fidelity in summer; and outflux, although less prominent, during summer-winter intervals. Abundance estimates in summer (N = 144-231) were higher than that in winter (N = 87-111), corresponding to the availability of prey resources which in Hong Kong waters peaks during summer months. We point out that the current population monitoring strategy used by the Hong Kong authorities is ill-suited for a timely detection of a population change and should be revised.

Dupuy, A. R., & Maigret, J. (1976). Les Mammifères Marins Des Cotes Du Senegal. 1. Bilan Des Observations Signalees Entre 1960 Et 1976. *Bulletin de l'Institut Français d'Afrique Noire*, 38, 921-928.

This catalogues marine mammal strandings in Senegal between 1960 and 1976.

Dupuy, A. R., & Maigret, J. (1979). Les Mammifères Marins Des Côtes Du Sénégal. 3. Observations Signalées En 1978. *Bulletin de l'Institut Français d'Afrique Noire*, 41, 429-439.

This catalogue marine mammal strandings in Senegal from 1978.

Dupuy, A. R., & Maigret, J. (1982). Les Mammifères Marins Des Côtes Du Sénégal. 5. Observations Signalées En 1980-1981. *Bulletin de l'Institut Français d'Afrique Noire*, 44, 213-218.

This reviews sightings of marine mammals in Senegal.

Elwen, S. H., Findlay, K. P., Kiszka, J., & Weir, C. R. (2011). Cetacean Research in the Southern African Subregion: A Review of Previous Studies and Current Knowledge. *African Journal of Marine Science*, 33(3), 469-493. <https://doi.org/10.2989/1814232x.2011.637614>

Cetacean research, in terms of the number of papers, and areas for which data are available, has expanded considerably in the southern African subregion in the past decade, especially in the South-West Indian Ocean. We review cetacean research within this subregion from the 1800s to the present to provide an overview of findings, investigate trends and identify knowledge gaps. Data are presented separately for large whales (those subject to commercial whaling) and smaller cetaceans, and are separated by era and ocean basin. Over 550 peer-reviewed papers and books were identified relating to research on cetaceans within the subregion. More than half (284) have been produced since 1990 and 193 relate specifically to South African waters. The most-studied species are those that are most accessible due to their coastal distributions (southern right whale *Eubalaena australis*: 45 papers, humpback whale *Megaptera novaeangliae*: 31 papers, killer whales *Orcinus orca*: 27 papers, Indo-Pacific bottlenose dolphin *Tursiops aduncus*: 30 papers, Indo-Pacific humpback dolphin *Sousa chinensis* (*plumbea* form): 25 papers) and/or were hunted commercially (sperm whale *Physeter macrocephalus*: 25 papers). Identified conservation concerns vary throughout the subregion, but include bycatch and directed hunts, oil and gas development, ecotourism activities, shifts in prey resources, and noise and chemical pollution. The inshore stocks of Bryde's whales *Balaenoptera edeni*, the Indo-Pacific humpback dolphin and the Atlantic humpback dolphin *S. teuszii* were identified as the populations of highest conservation concern, although there are considerable knowledge gaps relating to deep-water species and almost no data (even on species occurrence) are available for several areas and countries.

Hazevoet, C. (1999). Whales and Dolphins (Mammalia, Cetacea) in the Collections of the Museu Bocage, Past and Present. *Arquivos do Museu Bocage (Nova Série)*, 3, 337-356.

The history of natural history collections in Lisbon goes back to 1772, when the Real Museu e Jardim Botânico da Ajuda was founded. During the late 15th century several expeditions were sent to the overseas Portuguese territories in Africa and South America and these amassed large numbers of zoological, botanical and mineralogical specimens, which were placed in the museum of Ajuda. A thorough account of these remarkable expeditions was presented. In 1808, during the French invasion of Portugal, large parts (c. 2000 animal and c. 3000 plant specimens) of the Ajuda collection were confiscated and taken to Paris, where they were studied by members of the thriving French scientific community of that time (cf. Havy, 1908). Some years before, parts of the Ajuda collections had already been moved to the University of Coimbra. In 1836, what remained at Ajuda was transferred to the

Museu da Academia Real das Ciências de Lisboa. In 1858, the collections of the Museu da Academia das Ciências were incorporated in the zoology department of the Museu Nacional de Lisboa. During the second half of the 19th century the zoology department of the Museu Nacional became one of the classical examples of its kind in Europe. Large collections were assembled from Portugal and its overseas territories, particularly those in Africa. This was largely due to the unrelenting efforts of José Vicente Barbosa du Bocage (1823-1907), a scholarly worker and the foremost Portuguese zoologist of his time. In 1905, the zoology department was named the Museu Bocage in his honour. From the 1910s onwards, with the heydays of collecting behind, the museum entered a more contemplative period. The Museu Nacional de História Natural was founded in 1919 and the Museu Bocage became part of it. On 18 March 1978, the most tragic of events took place when a fire destroyed most of the zoological collections. Ever since, the Museu Bocage has struggled to get on its feet again, working hard on assembling new and representative collections and presenting both permanent and temporal exhibitions for the general public. Currently, an exhibition on Cetacea and the marine environment is under construction and to commemorate that event a volume on marine mammals has recently been published.

International Whaling Commission. (2002). *Report of the 54th Meeting of the Scientific Committee of the International Whaling Commission – Annex K Small Cetacean Subcommittee*. International Whaling Commission, Retrieved from <https://archive.iwc.int>

This report summarises the documents presented to the IWC Scientific Committee in 2002, the year that the Small Cetacean subcommittee focused on the genus *Sousa*.

Jefferson, T., Hung, S. K., Robertson, K. M., & Archer, F. I. (2011). Life History of the Indo-Pacific Humpback Dolphin in the Pearl River Estuary, Southern China. *Marine Mammal Science*, 28(1), 84-104. <https://doi.org/10.1111/j.1748-7692.2010.00462.x>

We studied life history characteristics of the Hong Kong/Pearl River Estuary population of Indo-Pacific humpback dolphins (*Sousa chinensis*), based on data from 120 specimens stranded between 1995 and 2009, 40 individuals biopsied at sea, and a long-term (14+ yr) photo-identification study. Ages were determined for 112 specimens by thin-sectioning teeth and counting growth layer groups. Estimated length at birth was 101 cm. Longevity was at least 38 yr, and there was little difference in growth patterns of males and females. Growth was described by a Bayesian two-phase Gompertz model; asymptotic length was reached at 249 cm. The tooth pulp cavity filled at an average of 18.5 yr of age. Physical maturity was reached at between 14 and 17 yr of age, apparently a few years after attainment of sexual maturity. Maximum lengths and weights of about 268 cm and 240 kg were attained. Females appear to lose all their spots by 30 yr, although males may retain some spotting throughout life. Calving occurred throughout the year, with a broad peak from March to June. Of 60 females monitored at sea for >14 yr of the study, none were documented to have more than three calves, suggestive of low reproductive output or low calf survival.

Ketten, D. R., Cramer, S., & Arruda, J. (2007). *A Manual for the Removal, Fixation and Preservation of Cetacean Ears - a Manual for the Removal, Fixation and Preservation of Cetacean Ears*. Woods Hole Oceanographic Institution WHOI-2012-01. <https://doi.org/10.1575/1912/5276>

This chapter is intended as an instructional guide for the removal, fixation and preservation of auditory system tissues of marine mammals. Each section describes procedures for a major ear type for marine mammals. The main intention is to provide both inexperienced and seasoned stranding responders with sufficient instructions to locate, document and remove all structures related to the ears and hearing in order to optimize the fixation and preservation of these tissues for later, more extensive examination. It is strongly recommended that examination be performed collaboratively with auditory system experts, but careful documentation and preservation are the critical first steps that will allow accurate diagnoses.

Mitchell, E. (1975). Hump-Backed Dolphin (*Sousa, Spp.*). In *Porpoise, Dolphin and Small Whale Fisheries of the World: Status and Problems*. E. Mitchell (Ed.), (Vol. IUCM Monograph 3, pp. 62). Morges, Switzerland: International Union for the Conservation of Nature

Two nominal species (*Sousa chinensis* and *Sousa teuszii*) are distributed in the Indo-Pacific and eastern tropical Atlantic respectively. In the Atlantic, a few specimens have been captured and utilized along the coast of Africa. Recently, several have been caught in shark nets off South Africa. In the Indo-Pacific area, specimens are sometimes caught off Kuwait, and the oil is used to oil the decks and hulls of dhows. In the Arabian Gulf, one specimen was caught by a fisherman in 1967. In Australia individuals have been captured alive for display.

Moore, J. E. (2015). *Intrinsic Growth (R_{max}) and Generation Time (T) Estimates for the Cetacean Genera *Sousa*, *Orcaella*, and *Neophocaena*, in Support of IUCN Red List Assessments*. (NOAA-TM-NMFS-SWFSC-550). National Oceanic and Atmospheric Administration: National Marine Fisheries Service <https://doi.org/10.7289/V5/TM-SWFSC-550>

A workshop was held May 20 – 21, 2015, in San Diego, California, USA, titled: “Workshop to Assess/Re-Assess IUCN Red Listings for Indo-Pacific Species of Coastal Marine Small Cetaceans.” Species included were *Orcaella brevirostris*, *O. heinsohni*, *Neophocaena asiaeorientalis*, and two of the three Indo-Pacific *Sousa* species: *S. chinensis* and *S. plumbea*. *Sousa sahalensis* and *Neophocaena phocaenoides* were not assessed, largely for lack of information about these species. Red List assessments require estimates of generation time for a pristine population, i.e., one with stable age structure and abundance at carrying capacity such that the annual per-capita population growth rate is $\lambda = \exp(r) = 1$. Let this generation time be denoted T_0 . Estimating T_0 for the above species is the primary goal of this analysis. Additionally, this analysis provides point estimates of the anthropogenic mortality rate required to reduce a population by 30%, 50%, or 80% over three generations ($3T_0$). These reductions warrant Vulnerable, Endangered, or Critically Endangered status, respectively, under the Red List criterion A; IUCN 2012.

Parra, G. J., & Jefferson, T. A. (2018). Humpback Dolphins: *Sousa teuszii*, *S. Plumbea*, *S. Chinensis* and *S. Sahulensis*. In *Encyclopedia of Marine Mammals, 3rd Edition*. B. Wursig, J. G. M. Thewissen, & K. M. Kovacs (Eds.), (pp. 483-489) <https://doi.org/10.1016/B978-0-12-804327-1.00153-9>

Humpback dolphins (genus *Sousa*) are medium-sized delphinids found in shallow (<30 m), coastal waters of the eastern Atlantic, Indian, and western Pacific Oceans. The genus is comprised of four species: (1) Atlantic humpback (*Sousa teuszii*), (2) Indian Ocean humpback (*S. plumbea*), (3) Indo-Pacific humpback (*S. chinensis*), and (4) Australian humpback (*S. sahalensis*) dolphins. Information on the ecology, behavior and life history of all humpback dolphins remains scarce. Most study populations to date indicate that all species occur in small numbers, with most populations confirmed or suspected to be declining and threatened. Major threats affecting all species include habitat degradation and loss, and entanglement in fishing gear. Research efforts and conservation actions tailored to each species are needed to assess anthropogenic impacts, and develop strategies to eliminate or mitigate threats.

Segniagbeto, G. H., Van Waerebeek, K., Bowessidjaou, J. E., Ketoh, K., Kpatcha, T. K., Okoumassou, K., & Ahoedo, K. (2014). Annotated Checklist and Fisheries Interactions of Cetaceans in Togo, with Evidence of Antarctic Minke Whale in the Gulf of Guinea. *Integrative Zoology*, 9(1), 1-13. <https://doi.org/10.1111/1749-4877.12011>

Based on strandings and captures, 9 cetacean species, including 6 odontocetes and 3 mysticetes, are documented (photos and specimens) in Togo's coastal waters (newly-recorded species marked with an asterisk): Antarctic minke whale (*Balaenoptera bonaerensis**), Bryde's whale (*Balaenoptera brydei* or *B. edeni*), humpback whale (*Megaptera novaeangliae*), sperm whale (*Physeter macrocephalus*), pygmy sperm whale (*Kogia breviceps**), short-finned pilot whale (*Globicephala macrorhynchus**), pantropical spotted dolphin (*Stenella attenuata**), common bottlenose dolphin (*Tursiops truncatus*) and common dolphin *Delphinus sp.* An anecdotal sighting record for killer whale (*Orcinus orca*) is considered reliable. The lack of *Sousa teuszii* records in Togo is consistent with its apparent contemporaneous absence in Ghana. The *B. bonaerensis* specimen, entangled in a purse seine set on small pelagics, is a first record for the Gulf of Guinea. The occurrence of this Southern Ocean species north of the equator underscores the severe gaps in our understanding of cetacean distribution off western Africa. The majority of artisanal fishermen operating in Togolese coastal waters are of Ghanaian origin and are thought to promote trade and consumption of cetacean bushmeat. Because captures are illegal, enforced with some success in the main fishing centers, covert landings of cetaceans are exceedingly difficult to monitor, quantify or sample. Concern is expressed about pollution of Togo's coastal waters with heavy metals due to phosphorite mining and export from the coastal basin near Hahotie and Kpogame.

Van Bresseem, M.F., Flach, L., Reyes, J. C., Echegaray, M., de Oliveira Santos, M. C., Vididi, F. A., . . . Van Waerebeek, K. (2015). Epidemiological Characteristics of Skin Disorders in Cetaceans from South American Waters. *Latin American Journal of Aquatic Mammals*, 10(1), 20-32. <https://doi.org/10.5597/lajam190>

We document the macroscopic phenotypic characteristics (relative size, location, pattern, colour, extension), prevalence and evolution of five types of skin disorders of unknown aetiology, including 'green-brown plaques' (GBP), 'orange patches' (OPA), 'cutaneous nodules' (NOD), 'pale dermatitis' (PAD) and 'expansive annular lesions' (EAL) in five odontocete species (n = 559 individuals) from the Southeast Pacific (n = 230) and Southwest Atlantic (n = 329) oceans. GBP affected two likely-adult

Sotalia guianensis traveling side-by-side in a freshwater area of the Cananea Estuary in August 2009. Low salinity is suggested as predisposing factor. OPA were distinguished in three of 209 (1.4%) free-ranging *S. guianensis* in Sepetiba Bay, Brazil, during winter months of 2005-2008. Epibiont diatoms are suspected aetiological agents. NOD were chronically present in one male adult *Orcinus orca* observed off the coast of southern Brazil in 2007-2010. PAD was seen in free-ranging individuals and carcasses of *Tursiops truncatus*, *S. guianensis* and *Pseudorca crassidens* from both the Atlantic and Pacific Oceans in 1992 and in 2004-2009. Prevalence was 1% in 103 *S. guianensis* from Paranagua Estuary (Brazil), 2.3% in 222 *S. guianensis* from Sepetiba Bay and 6.9% in 87 inshore *T. truncatus* from Paracas Bay, Peru. Although in some cases the lesions covered up to 35-40% of the visible body surface and ulcers may occur there was no evidence of mortality and, in time-series of six individuals, PAD eventually healed. In six *T. truncatus* and five *S. guianensis* acutely affected, PAD was associated with minor cutaneous injuries and scars, including tooth rakes, suggesting infection routes for opportunistic pathogens. EAL were noted in a *Cephalorhynchus eutropia* calf from Palena province, Chile, in 2003 and in a *P. crassidens* calf washed ashore dead in southern Brazil in 2009. The *C. eutropia* calf disappeared, and probably died, two weeks after first observation. Prevalence of EAL was 6.7% in 15 *C. eutropia* in 2002-2004. These data suggest that EAL are potentially lethal in calves. PAD and EAL were primarily seen in cetaceans inhabiting biologically or chemically contaminated nearshore waters. In view of their emergence and occasional severity these disorders should be the subject of systematic monitoring.

Van Waerebeek, K., Diallo, M., Bjiba, A., & Ndiaye, E. (1997). *Cetacean Research in Senegal 1995-97, an Overview*. International Whaling Commission SC/49/SM10. Retrieved from <https://archive.iwc.int>

Historically, Senegal is the West-African nation with the best kept faunistical records for cetaceans. We found verifiable evidence for at least 18 species, but limited life history data. Quantified information on interactions with soaring coastal fisheries is wanting. Here we present preliminary results of recent field work in central and central-south Senegal, which aim was to help design a long-term research plan with Senegalese scientists, offer training and reinstate data collecting. With limited monitoring we encountered evidence of dolphin bycatches but no widespread directed dolphin fishery. However the presence of tell-tale conditions including spreading acceptance for consumption of dolphin meat and indications of overexploitation of some fish stocks are known warning signs. Future efforts should cover larger areas and generally be more intensive. Three carcasses of Atlantic humpbacked dolphin *Sousa teuszii* found on Sangomar island had rope tied around the tailstock. Fishermen at Djifer and Joal-Fadiouth confirmed regular incidental takes and landings. In the Sine-Saloum delta, inshore *S. teuszii* and *T. truncatus* are probably the most affected species. Senegal's EEZ waters support large industrial fisheries which may constitute an additional source of by-caught small cetaceans. We here document 21 new specimen records and a series of sightings. Dolphins occurring in the Casamance river and upstream in the salt-water canals of the Saloum delta are identified as *T. truncatus*.

Watkins, W. A., Daher, M. A., & Haley, N. J. (1990). *Documentation for the Cetacea Database of Marine Mammal Literature References*. Woods Hole Oceanographic Institution <https://doi.org/10.1575/1912/1009>

This documentation for the CETACEA database of marine mammal literature references updates and expands the original work by Watkins, Bird, Moore, and Tyack 1988 (Reference Database Marine Mammal Literature, Technical Report WHOI-88-2). The CETACEA database is a comprehensive index of

literature references used to file, store, search, retrieve, and format the data on marine animals. Organization of the references is complementary to features developed by William E. Schevill for his library of older cetacean literature, having direct association of species with over 300 indexed subjects, and with observation dates, locations, etc. This documentation describes the operation of the database (3600 records), including indexing, sorting, and retrieval information developed through continued use of these systems. SPECIES and SUBJECT HEADING lists with their codes have been updated. Other databases have also developed around these indexing and sorting strategies to complement the CETACEA database, including databases of animal sounds for both the recording data and the acoustic spectral information stored in libraries of digital sound cuts.

Watkins, W. A., Fristrup, K. M., Daher, M. A., & Howald, T. J. (1992). *Sound Database of Marine Animal Vocalizations : Structure and Operations*. Woods Hole Oceanographic Institution
<https://doi.org/10.1575/1912/854>

This 1992 manual revises the description of the SOUND database system, and incorporates current formats for data sorting and indexing, for database structure, and for conducting data searches. Details of the operation of database associated programming are given for retrieval of selected digital sound files and for interactive display of text data along with waveform, FFT spectra, and RID spectral decomposition analyses. Other operations include concurrent playback of sound files and export of data for other uses. ' The Marine Animal SOUND Database system provides convenient access and rapid analysis and display of acoustic data in the WHOI collection of recordings from marine species. The organization of the database structures follows that developed for convenient indexing and retrieval of data in our CETACEA dataQase of literature references. In addition, acoustic sequences from the various animal repertoires were digitized to provide a representative selection of sounds associated with the behaviors of the different animal species and sounds from a number of other non-biological sources. These digital sound files were organized and accessed directly from within the text databases. The objective of this program has been the development of basic tools for the study of marine animal sounds, for accessing, analyzing, and comparing the acoustic patterns. This has included work on characterization of sound features for statistical comparison, and automatic recognition and diagnosis of marine animal vocalizations. The SOUND databases have fulfilled these objectives of providing convenient means of relating the sounds to text data, sorting and retrieving them, allowing immediate analysis and playback of sequences of these sounds. This has opened the way for comprehensive, quantitative analyses and statistical comparisons of marine animal sounds.