SINGLE SPECIES ACTION PLAN FOR THE ATLANTIC HUMPBACK DOLPHIN (*Sousa teuszii*)

Executive Summary

The Atlantic humpback dolphin (*Sousa teuszii*), or Cameroon dolphin, is listed on Appendices I and II of CMS and has been assessed as Critically Endangered (CR) on the IUCN Red List of Threatened Species. Multiple organisations have repeatedly expressed concern about this species, which is thought to number fewer than 3,000 individuals throughout its range on the Atlantic coast of Africa. Found only in shallow-water habitats between the Non-Self Governing Territory of Western Sahara in the north and Angola in the south, the species and its habitat are threatened by expanding fisheries, coastal construction, and habitat degradation throughout the 19 countries[1] within its range.

At its 12th Conference of Parties in 2017, the CMS adopted Concerted Action 12.3, highlighting the urgency of conservation action for this species. An extension of this Concerted Action, with a mandate to develop an Action Plan, was adopted at the 13th Conference of Parties in February 2020. The Concerted Action foresees the formulation of a feasible Action Plan for a five-year period.

The Action Plan includes background on the species' biology, ecology and conservation status as well as an assessment and ranking of known and suspected threats. This is followed by an inventory of relevant stakeholders, cultural and economic considerations, and an assessment of national as well as international laws and regulations that are already in place and can be used to improve protections.

The most urgent and severe threat is that of bycatch in the gillnet fisheries that are common throughout the species' range. Additional threats of direct hunting, coastal development and habitat degradation also require urgent action. Serious knowledge gaps in basic information including species' distribution, habitat requirements and relative abundance hinder the development and implementation of effective conservation management strategies. However, those responsible for management should not wait until all the knowledge gaps are filled before taking action to reduce known threats, as doing so will benefit many coastal species as well as *Sousa teuszii*. A multi-pronged approach is recommended to simultaneously address knowledge, resource, capacity, and legal gaps that hinder effective conservation of the species, while at the same time implementing and enforcing existing laws and regulations that can mitigate threats to the species.

Key recommended actions that can address multiple threats include:

- **Field-based research** to more accurately define the species' distribution and (relative) abundance, to ensure that conservation efforts are implemented where the species still persists. This research should include boat-based surveys with photo-identification, catch landing site surveys, sampling of habitat parameters, use of passive acoustic monitoring, and interview surveys in coastal communities. All field-based research should involve in-country scientists and promote capacity building in the region.
- The creation of national sighting and stranding networks through **outreach and collaboration with NGOs and focal points in coastal communities** who can be given the tools and resources necessary to collect valuable data and samples and contribute to better understanding of the species' distribution, habitat use, status and threats.
- **Creation of tools and resources for government and industry stakeholders** to better enable them to assess the potential impact of coastal activities and fisheries on *Sousa teuszii* and develop and implement effective management strategies.
- These management strategies can potentially include **improved enforcement of existing regulatory mechanisms**, improvement of laws and regulations that fall short of necessary

[1] The geographical designations employed in this document do not imply the expression of any opinion whatsoever on the part of the CMS Secretariat (or the United Nations Environment Programme) concerning the legal status of any country, territory, or area, or concerning the delimitation of its frontiers or boundaries.

protections, and **the creation and effective management of protected areas that encompass critical habitat for *S. teuszii***.

- **Regional capacity-building for stakeholders**, ranging from coastal community members, to protected area staff, to range-country technicians, scientists and government agencies to promote exchange of knowledge and expertise and enable actors at all levels to engage in conservation management actions.

All of the recommended actions will be most effective if they are implemented through collaboration at multiple levels: 1) collaboration between stakeholders within each range country to maximise the effective use of resources and expertise and ensure that the results of research and awareness-raising activities can support the design and implementation of effective policy and management; and 2) regional collaboration between stakeholders in different *Sousa teuszii* range countries to ensure that knowledge and experience gained in one country can be used to most effectively implement conservation action in another, especially in countries where cross-border populations are suspected to occur (e.g. Congo-Gabon, Benin-Togo, Senegal-Gambia, and Guinea-Guinea-Bissau).

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Abbreviations

AHD: Atlantic humpback dolphin (*Sousa teuszii*)
CCAHD: Consortium for the Conservation of the Atlantic Humpback Dolphin
CMS: Convention on the Conservation of Migratory Species of Wild Animals
IWC: International Whaling Commission
IUCN: International Union for the Conservation of Nature
IUCN CSG: IUCN Species Survival Commission Cetacean Specialist Group

1. Biological Assessment

1.1. Taxonomy

Kingdom: Animalia
Phylum: Chordata
Class: Mammalia
Order: Cetartiodactyla (Cetacea)
Family: Delphinidae
Taxon Name: *Sousa teuszii* (Kükenthal, 1892)
Common Name(s):

- *English:* Atlantic Humpback Dolphin, Atlantic Hump-backed Dolphin, Atlantic Humpbacked Dolphin, Cameroon Dolphin, Cameroon River Dolphin, Teusz's Dolphin
- *French:* Dauphin à bosse de l'Atlantique, Dauphin À Bosse De L'Atlantique, Dauphin Du Cameroun
- *Spanish*: Bufeo Africano, Delfín Blanco Africano, Delfín Jorobado Del Atlántico
- *Portuguese*: golfinho-corcunda-do-Atlântico

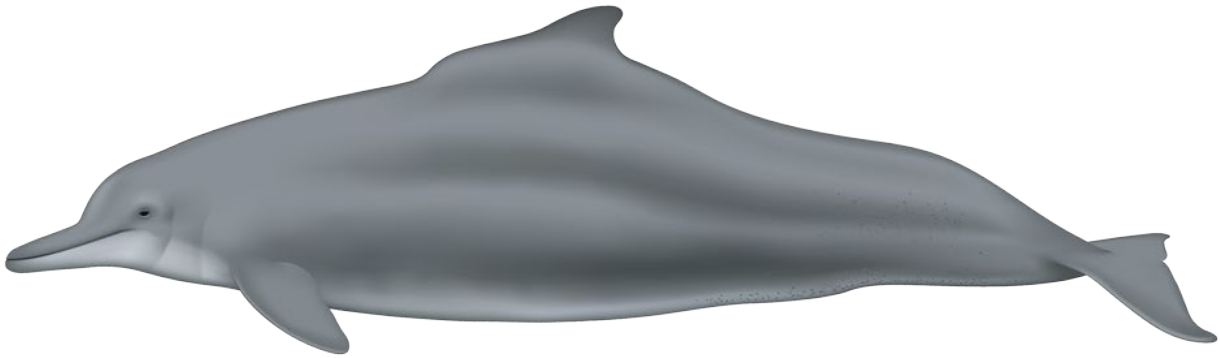

Figure 1 : *Sousa teuszii* adult. Note the distinctive hump under the dorsal fin, from which the species' common name, Atlantic humpback dolphin, is derived. Illustration provided by Uko Gorter.

The species was first described by zoologist Willy Kükenthal, based on a specimen that was collected in the Man O'War Bay in Cameroon by Eduard Tëusz (Kükenthal, 1892). At the time it was described as *Sotalia teuszii,* as the genus name of *Sousa* was only adopted in the 1960s (Fraser and Purves, 1960; Fraser, 1966). The species holotype is held in the British Museum (catalogue number 1893.8.1.1). Mendez et al. (2013) and Jefferson and Rosenbaum (2014) provided thorough reviews of the species' taxonomy. Mendez et al. (2013) used genetic and morphological analyses to conclude that there is "strong and significant genetic and morphologic differentiation between *S. teuszii* and all other sampling units with no evidence of exchange or contact" between *Sousa* specimens from the west coast of Africa and sampled specimens from other populations of the genus *Sousa* in the Indian and Pacific oceans (Mendez *et al*. 2013). *S. teuszii* have wider skulls, shorter rostra ('beaks'), and an average of 30 teeth per row, compared with 33-37 for other *Sousa* species (Jefferson and Rosenbaum 2014, Jefferson and Van Waerebeek, 2004). The cold upwelling of the Benguela oceanographic system is believed to provide the habitat barrier that prevents exchange across the distribution gap between *Sousa plumbea* populations in South Africa and *Sousa teuszii* populations in the southernmost part of the species' range in Angola (Jefferson and Van Waerebeek 2004, Mendez et al. 2013). Although existing genetic and morphological evidence strongly supports the current classification of *S. teuszii* as a separate *Sousa* species and the entire genome of a *S. teuszii* specimen has been described (McGowen et al., 2020), the collection of additional genetic samples from throughout the range of *S. teuszii* has been identified as a priority by scientists working on the taxonomy and genetics of the species (CCAHD, 2020) to further elucidate the taxonomy and population structure of the species.

1.2. Distribution/range

Confirmed presence: Angola; Benin; Cameroon; Republic of Congo; Gabon; Gambia; Guinea; Guinea-Bissau; Mauritania; Nigeria; Senegal; Togo; Non-Self Governing Territory of Western Sahara[2].

Presence unknown in: Ghana, Sierra Leone, Liberia, Côte d'Ivoire, Equatorial Guinea, Democratic Republic of Congo

Atlantic humpback dolphins are confined to shallow water (<30m) habitats on the Atlantic coast of Africa, with their confirmed range extending discontinuously from the Non-Self Governing Territory of Western Sahara in the north to Angola in the south (Van Waerebeek et al., 2004; Weir and Collins, 2015; Collins et al., 2017)(see Figure 2). Sightings are currently confirmed in 13 of the potential 19 range countries within that region. While dedicated cetacean research with a focus on *S. teuszii* has been conducted in some of these range countries (e.g. Maigret, 1980; Van Waerebeek et al., 2003b; Weir, 2009; Collins et al., 2013; Weir, 2015; Leeney et al., 2016; Weir, 2016; Van Waerebeek et al., 2017; Bamy et al., 2021), in many countries evidence for the species' occurrence is limited to opportunistically collected records of sightings, strandings or bycatch. In Ghana, extensive surveys at fish landing sites have revealed records of substantial cetacean bycatch, but no records of *S. teuszii* (Ofori-Danson et al., 2003; Van Waerebeek et al., 2009; Debrah et al., 2010b). However, in the other five countries where the species' presence is unconfirmed, it is unknown whether the lack of records reflects a true absence or the lack of dedicated survey effort (e.g. Collins et al. 2017). The species does not occur in the shallow waters surrounding any of the offshore islands in the region, such as Sao Tome and Principe or Cape Verde (Weir and Collins, 2015). Recent work in Bioko (Equatorial Guinea) also failed to yield any sightings despite extensive search effort in inshore waters (WCS, unpublished data), likely because those areas are separated from the mainland by unsuitable deep-water habitat (Weir and Collins, 2015).

[2] *Western Sahara is listed in the United Nations list of Non-Self-Governing Territories since 1963 under Article 73e of the Charter of the United Nations.*

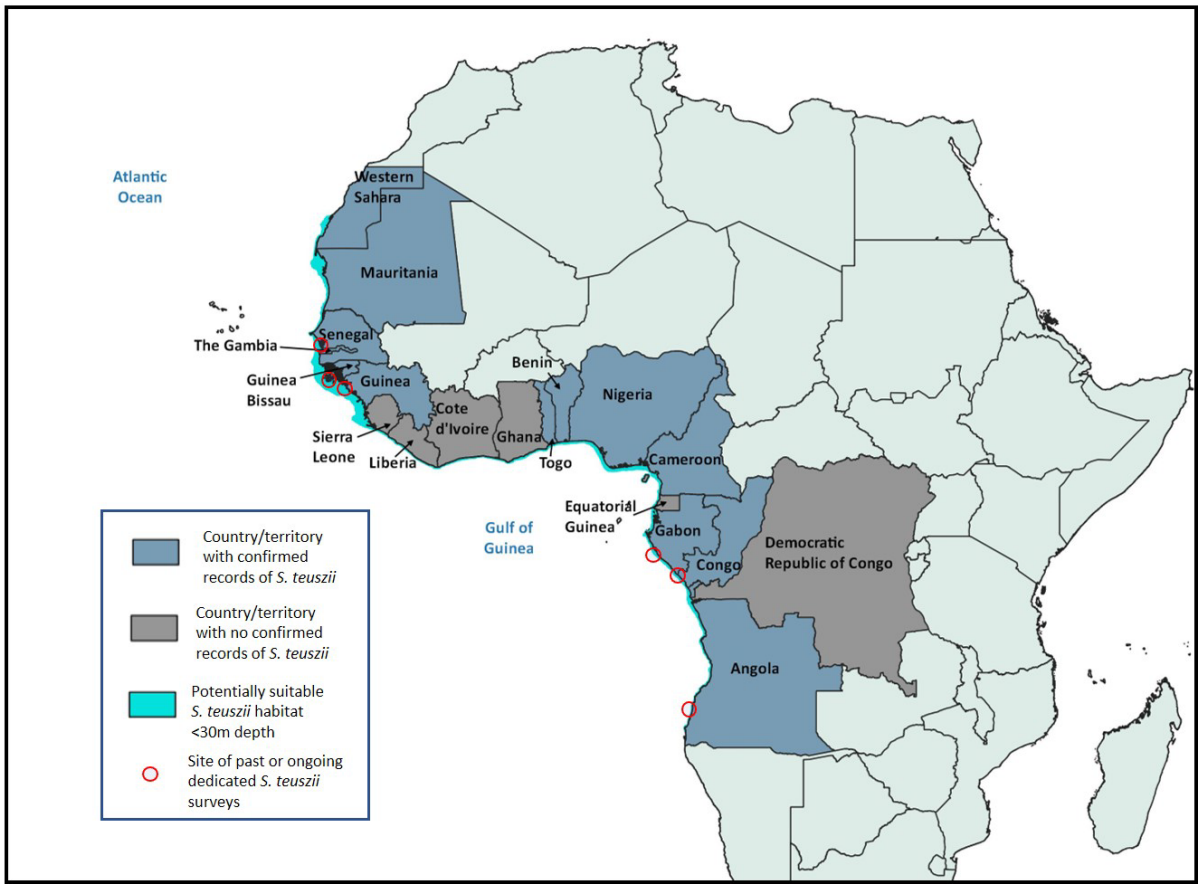

Figure 2: *Sousa teuszii* distribution. Note that the turquoise shading denotes all waters <30m deep within the possible range of the species, rather than habitat where sightings have been confirmed. Countries or territories shaded in blue are those where the species presence has been confirmed, either through anecdotal/opportunistically collected records of sightings, strandings or bycatch. Countries shaded in grey are countries within the species range where no confirmed records exist. Red circles indicate the locations where dedicated *S. teuszii* research has been conducted or is ongoing. It is not known whether the lack of confirmed records in grey-shaded countries reflects a true absence of *S. teuszii*, a lack of survey effort in suitable nearshore habitats, or both.

1.3. Migration patterns

Like most species within the genus, *S. teuszii*'s restricted nearshore/shallow water habitat make long range migrations of hundreds of kilometres unlikely (Jefferson and Curry, 2015). Furthermore, the species has not been studied enough to document any predictable seasonal migrations or routine movements from one habitat type to another. However, the species' continuous distribution across a range of Central and West African countries includes the documentation of likely cross-boundary movements between Gabon and the Republic of Congo (notably between the Mayumba and Conkouati- Douli National Parks) (Collins et al., 2014; Collins, 2015), and between Senegal and The Gambia, where researchers directly observed a *S. teuszii* group crossing from the Senegalese waters of the Saloum Delta into Gambian waters (Van Waerebeek et al., 2004; Weir, 2016). Documented observations of *S. teuszii* in the Tristao islands in the north of Guinea are also very close to the border with Guinea-Bissau, and trans-boundary movements are considered likely to occur (Bamy et al., 2021)

1.4. Population trends

Although there are no species-wide abundance estimates for *S. teuszii*, the IUCN Red List of Threatened Species considers the species to be in decline (Collins et al. 2017). Wherever the species has been studied, rough estimates of abundance are very low. This is partly due to the species' natural distribution, which is restricted to shallow coastal waters. Collins (2015) provided a review of all the studies that provide any insight into (relative) abundance of the species. This is adapted and updated in Table 1 below. Based on this review, Collins (2015) estimates that fewer than 3000 individuals are likely to remain throughout the species' range, of which half are likely to be breeding adults (following Taylor et al., 2007). Collins et al. (2017) note that ongoing mortality due to fisheries bycatch, direct hunting, and habitat loss and degradation throughout the species' range (see section 2 on threats below) is invariably resulting in further population declines (Collins et al. 2017).

Table 1. Summary of published information on abundance of *S. teuszii* in locations throughout the species' range. Adapted from Collins, 2015. Note that locations are presented from north to south.

Location/putative population (as revised in van Waerebeek et al. 2017)	Estimated population size	Source
Dakhla Bay, Non-Self Governing Territory of Western Sahara	"Miniscule" "Low tens"	Beaubrun (1990) Van Waerebeek et al. (2004)
Banc d'Arguin, Mauritania	"Probably does not exceed 100 animals" "Stock is apparently fairly small"	Maigret (1980) Van Waerebeek et al. (2004)
Saloum-Niumi, Senegal and The Gambia	"Low hundreds, maybe less" Minimum of 103 distinct individuals photo-identified	Maigret (1980), Van Waerebeek et al. (2004), DPN (2014) Weir (2016)
"Guinea's stock": Guinea-Bissau	"Several hundred, maybe more until at least 1998" 'Reasonably widespread' A more recent review of sightings records indicates that *S. teuszii* is still widely distributed in Guinea-Bissau (Leeney et al., 2016), but sightings appear to be declining in regularity (P. Campredon, IUCN country program for Guinea-Bissau, personal communication, 11 May 2015)	Van Waerebeek et al. (2004) Leeny et al. (2016)
'Guinea's stock': Guinea	Eight sightings in the Rio Nuñez Estuary, with a minimum of 47 distinct individuals photo-identified Group of a minimum of 40 individuals encountered in Tristao Islands in 2012.	Weir (2015) Van Warebeek et al. (2017)
Togo	Sightings of small groups reported from shore, near border with Benin.	Segniagbeto et al. (2014), iNauralist

Benin	A group of four individuals observed close to the coast	Zwart and Weir (2014)
Cameroon	'Abundance may be very low' The population was estimated at roughly 50 individuals, with 10-15 individuals observed to the south of the Douala-Edea National Park, and 25-30 individuals observed on the borders of the Campo-Ma'an National Park. The species has also been observed in the Bakassi region, but no population estimates are available.	Ayissi et al (2014)
Gabon	'Low hundreds'	Collins et al. (2013)
Congo	'Low hundreds'	Collins et al. (2013)
Angola	A minimum of 10 individuals photo-identified in Flamingos	Weir (2009)

Efforts are underway to obtain more robust abundance estimates from two of the potentially most numerous populations. Surveys began in the Saloum Delta, Senegal in July 2021 and will continue in 2022 using methods suitable for yielding estimates of relative abundance (e.g. encounter rates) and the establishment of a photo-identification catalogue that can be used to generate mark-recapture abundance estimates over time (CCAHD, unpublished data). Similar surveys to document relative abundance and establish a photo-identification catalogue will commence in the Tristao Islands in Guinea in 2022 (CCAHD, unpublished data).

2. Threats

2.1. Fisheries bycatch

Bycatch in fishing gear, particularly artisanal gillnets, is thought to be the single most significant threat to coastal dolphin populations around the globe (Brownell et al. 2019). It is considered the most prevalent cause of mortality for *S. teuszii* throughout its range (Weir et al., 2021), which is concerning, as it is believed to be the driving force behind the extinction of the Yangtze River dolphin (Turvey et al., 2007) and the near-extinction of the Vaquita in the Gulf of California (Brownell Jr et al., 2019; Gulland et al., 2020). Gillnets are used in all 19 *S. teuszii* range countries (e.g. Ofori-Danson et al., 2003; Thiao et al., 2017) and are the fishing gear of choice for artisanal vessels that operate in estuaries and other shallow water habitats favoured by *S. teuszii*. They are often set in the late afternoon or evening and left to soak unattended overnight (authors' personal observations) so that when fishers haul in their nets in the morning any entangled dolphin will usually have died, although there are instances of animals having been released alive from gillnets and other gear. While gillnet fisheries are likely responsible for the highest levels of bycatch, *S. teuszii* bycatch has also been documented in octopus line (Notarbartolo di Sciara et al., 1998) and observations of the species feeding in the wake of trawlers off Guinea also raise concern for bycatch in trawl fisheries (Weir, 2015). Recently eight *S. teuszii* were entrapped and subsequently released live from a beach seine net in Gabon (CCAHD, 2022).

Fisheries bycatch of *S. teuszii* has been documented in almost every location where the species is known to occur, including the Non-Self Governing Territory of Western Sahara, Mauritania, Senegal, Guinea, Guinea-Bissau, Nigeria, Cameroon, and the Republic of the Congo (e.g. Notarbartolo di Sciara et al. 1998, Van Waerebeek et al., 2004; Collins et al., 2013; Van Waerebeek et al., 2017; Bamy et al., 2021). However, to date there are no robust or quantifiable estimates for *S. teuszii* bycatch anywhere in the species' range. Documentation of bycatch has been fragmented and largely limited to anecdotal reports, sporadic interview surveys, or intermittent inspections of

fish landing sites. Onboard observer programmes are almost impossible to implement in small-scale artisanal fisheries, which use small boats with little space on board for crew members, let alone observers (e.g. Agapito et al., 2019). Furthermore, these fisheries are highly dispersed and widespread in both densely populated and remote areas (Belhabib et al., 2015; Weir et al., 2021). Use of remote electronic monitoring (REM), while successful in some artisanal fisheries (e.g. Bartholomew et al., 2018), is probably still too costly for widespread use in *S. teuszii* range countries, where inconsistent cellular and internet coverage will likely prevent effective implementation. As such, systematic interview surveys using standardised questionnaires, coupled with robust methods to characterise and quantify the fisheries linked to bycatch (e.g. Metcalfe et al., 2016; Alfaro-Shigueto et al., 2018) are the methods most likely to yield data that can be used in bycatch risk assessments (Hines et al., 2020) and to identify 'hotspots' where bycatch mortality is likely to be impacting populations.

2.2. Utilisation of meat for bait, wild meat trade or food

The distinction between bycatch, retention of bycatch for food, bait, or commercial sale, and directed hunting for food, bait or commercial sale is often difficult to make in coastal communities with limited resources, precarious food security, and some awareness that dolphins are protected species. There are published records of the butchering and local consumption of *S. teuszii* and other cetaceans in the majority of countries within the *S. teuszii* range (see Fig. 3) (Murphy et al., 1997; Ofori-Danson et al., 2003; Van Waerebeek et al., 2003a; Van Waerebeek et al., 2004; Bamy et al., 2010; Debrah et al., 2010a; Segniagbeto and Van Waerebeek, 2010; Ayissi et al., 2014; Segniagbeto et al., 2014; Leeney et al., 2015; Van Waerebeek et al., 2017; Ingram et al., 2022). In some communities where consumption, use as bait or trade, may have originated from unintentional bycatch or stranding, targeted hunts may have followed using harpoon lances (Cadenat, 1956) or encircling nets (Collins, 2015) or other means (Ingram et al., 2022). Recent evidence suggests that these practices are ongoing, with evidence of flensed dolphin carcasses in the Tristao islands as recently as 2017 (Bamy et al. 2021) and a video of a coastal community in Nigeria celebrating the killing of a *S. teuszii* specimen circulating on social media as recently as October 2021 (BBC Pidgin English).

Figure 3: Young *Sousa teuszii* entangled in gillnet off the coast of the Republic of Congo (left) and another bycaught individual butchered in preparation for distribution among the local community (right). Photos courtesy of Tim Collins/WCS.

2.3. Habitat loss and degradation

While no formal assessment of the status of *S. teuszii* habitat has been undertaken, the threats presented in various review papers (Weir et al., 2011; Collins, 2015; Collins et al., 2017; CCAHD, 2020; Weir et al., 2021) highlight not only the ongoing expansion of coastal fishing efforts, but also port- and other coastal construction (e.g. PWC, 2018).

Port construction directly impacts *S. teuszii* habitat through dredging and the creation of barriers to longshore movements that are characteristic of the species within their narrow band of shallow-water habitat. Port and coastal construction also has indirect detrimental effects on *S. teuszii* habitat quality through increased vessel traffic, associated underwater noise, the risk of ship strikes and increased urbanisation (including increased fisheries) that typically accompany these projects. At least three ports that have recently undergone or are undergoing expansion are close to the locations of recent sightings of *S. teuszii*. These include Badagry (Nigeria), which is close to where recent sightings of *S. teuszii* have been made near Lagos (CCAHD unpublished data), Kamsar Port (Guinea) within the Río Nuñez Estuary (Weir, 2015), and the deep-sea port of Kribi (Cameroon) (Van Waerebeek et al. 2017).

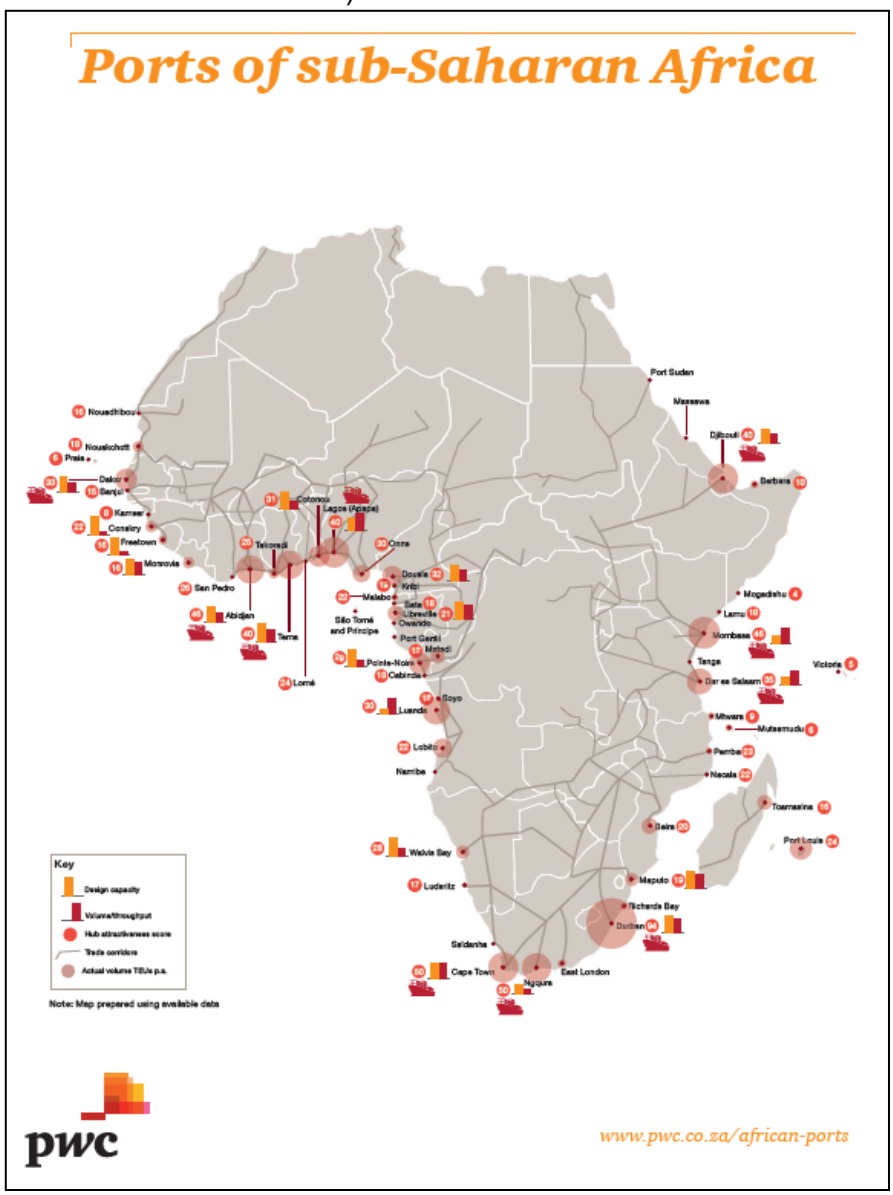

Figure 4: A map featured in the 2018 Price Waterhouse Cooper review of existing port facilities and the potential for expansion throughout sub-Saharan Africa. Notice the concentration of facilities in *S. teuszii* range countries.

In addition to coastal construction for ports and other facilities, such as liquified natural gas plants, a number of other human activities can negatively affect nearshore, estuarine, or other shallow-water *S. teuszii* habitats. These can include dredging or sand mining that alter the benthic habitat and increase turbidity, the cutting of mangroves for firewood or construction, and alteration or pollution of water flows into *S. teuszii* habitat through damming of rivers, deforestation, agriculture or mining (Weir et al. 2021). Oil spills present a clear and present danger in many *S. teuszii* range countries, particularly Nigeria, where oil and gas production and transportation form an important part of the national economy. Increased levels of water-borne pollutants, particularly organochlorines, DDT and heavy metals (e.g. Chromium) have been associated with dolphin calf mortality (Wells et al., 2005; Guo et al., 2021) as well as increased suspected susceptibility to infectious disease and reduced reproductive fitness (Parsons, 2004; Van Bressem et al., 2009).

According to the World Database of Protected Areas, WDPA (https://www.protectedplanet.net/en/thematic-areas/wdpa), marine protected areas within the *S. teuszii* range are few (see Figure 5) and none have been designated specifically for the purpose of conserving *S. teuszii*. Although some *S. teuszii* populations are known to occur in protected areas (e.g. the Bank D'Arguin National Park in Mauritania, the Delta Saloum National Park, Sangomar Marine Protected Area and four adjacent marine protected areas in Senegal, various MPAs in Gabon, and Conkouati-Douli National Park in Republic of the Congo), the limited current network of MPAs in the region is unlikely to provide adequate protection to the species. Furthermore, protected areas are only effective if those responsible for managing them have adequate capacity and resources to monitor and enforce regulations that prevent harmful activities.

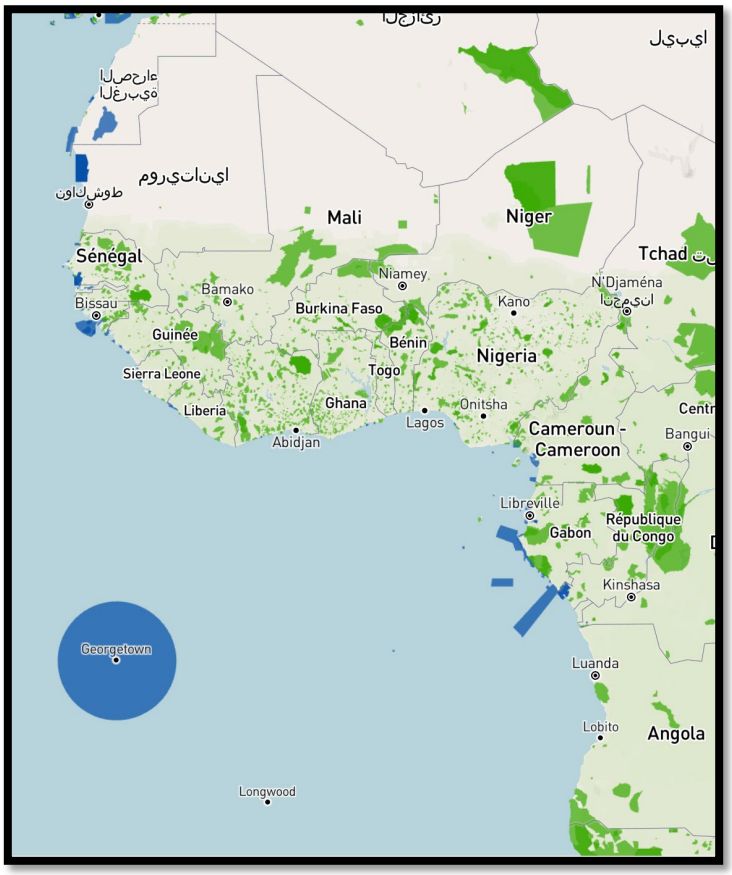

Figure 5: Marine (blue) and terrestrial/coastal (green) protected areas within the *S. teuszii* range (downloaded from the World Database of Protected Areas, WDPA https://www.protectedplanet.net/en/thematic-areas/wdpa). Note the relative paucity of protected areas within the species' range.

2.4. Prey depletion

There is only limited information available on the diet of *S. teuszii*, and as such, it is difficult to accurately determine to what extent species that are important for *S. teuszii* may be in decline due to overfishing, habitat degradation/alteration or other factors. However, one species known to be prey for *S. teuszii*, mullet (*Mugil* spp.) (Cadenat, 1956; Weir, 2016), is also a frequent target of coastal beach seine and gillnet fisheries in the region (Cardiec et al., 2020; Nemba et al., 2020). There are concerns throughout the region that overfishing is leading to a significant decrease in fish biomass, with one study documenting a 50% decline in fish biomass in the Gulf of Guinea between 1977 and 1990 (Brashares et al., 2004), and another documenting a 13-fold decrease in fish biomass in West African waters between 1960 and 2000 (Christensen et al., 2004). Conversely, total artisanal fisheries effort increased 10-fold between 1950 and 2010, whilst industrial fisheries declined, strongly suggesting that fisheries are stressed (Belhabib et al. 2018). Illegal, unreported and unregulated (IUU) fishing by regional and foreign fleets is also well documented along the Atlantic coast of Africa, even in marine protected areas in Gabon and Congo (Collins, 2015; Metcalfe et al., 2022). Brashares et al. (2004) and Ingram et al. (In press) link decreasing fish stocks to an increased demand for 'bushmeat', which could increase the demand for dolphin meat as well as more traditional hunting of terrestrial species.

2.5. Underwater noise

Dolphins rely on echolocation to navigate and find food, and are known to vocalise frequently to maintain social contact (e.g. Herzing, 2014). As such, underwater noise associated with coastal construction (drilling, pile-driving, etc.) and vessel traffic (ranging from small boats with outboard engines to large cargo ships) can interfere with feeding strategies and social cohesion of dolphin groups, and in extreme cases it can cause hearing loss and damage as well as displacement from important habitats (e.g. Weilgart, 2017; Erbe et al., 2019). It is also likely to have adverse effects for prey species (e.g. Weilgart, 2017; Erbe et al., 2019). Seismic surveys for oil and gas are also known to impact cetaceans, potentially displacing them from habitats (CMS, 2017a; Kavanagh et al., 2019). Seismic surveys have been conducted in some shallow-water habitats in *S. teuszii* range countries, where noise may have propagated into areas used by *Sousa teuszii* with unknown impacts in light of their restricted habitat requirements (e.g. Forney et al., 2017).

2.6. Climate change

Habitat parameters preferred by *S. teuszii* have not been well documented beyond the requirement for shallow water (<30m), and areas with mean annual sea surface temperatures above 15ºC (Weir and Collins, 2015; Collins et al., 2017), although there is likely a wide range in water quality parameters given the extensive latitudinal range of the species. *Sousa chinensis* populations have demonstrated preferences for temperatures between 28º and 31ºC, turbidity ranging from 0 - 29 NTU, and salinity ranging from 22-35 PSU, with tidal and seasonal influences on distribution (e.g. Minton et al., 2016; Liu et al., 2021). It is likely that *S. teuszii* are influenced by similar parameters, all of which could be affected by climate change. Changes in water temperature, salinity or turbidity could also affect *S. teuszii* prey, and/or intensify conflicts between humans and dolphins competing for increasingly limited resources. Ocean warming could also lead to the expansion of warm shallow water habitats with associated latitudinal extension of dolphin ranges, leading to a potential overlap with *Sousa plumbea* populations with unknown consequences for competition and hybridisation (Weir et al. 2021).

2.7. Knowledge deficits

Only three *S. teuszii* populations have been studied in the field using photo-identification methods suitable to assess numbers, site fidelity and movements (Weir, 2009; Weir, 2015, 2016). Other studies have focussed on establishing the species occurrence, as well as identifying threats, including bycatch and direct hunting. The latter have been accomplished by monitoring fish landing sites and interviewing fishers (e.g. Ofori-Danson et al., 2003; Bamy et al., 2010; Debrah et al., 2010b; Uwagbae and Van Waerebeek, 2010; Ayissi et al., 2014; Segniagbeto et al., 2014; Leeney et al., 2016; Van Waerebeek et al., 2017). However, these studies do not cover all potential *S. teuszii* range countries, and some are now more than a decade old. In 2020, the Consortium for the Conservation of the Atlantic Humpback Dolphin (CCAHD) undertook a systematic review of knowledge gaps that were hindering effective conservation of the species across its range, and produced the following list, which is not presented in order of priority (Adapted from CCAHD, 2020):

- **Information on the species' spatial and temporal distribution** (presence/absence and relative abundance). The lack of systematic (effort-related) data on when and where the species occurs is a significant hindrance to identifying the areas where conservation efforts and/or threat mitigation are most needed. Existing datasets are limited to relatively small study sites or short temporal timeframes (see section 1.2 above). This information is crucial to be able to identify and protect the habitat that is most important to *S. teuszii*.
- **Information on relative or absolute abundance and/or population trends**. Currently only the most rudimentary estimates of population sizes are available for most areas (e.g. Collins, 2015), and only three studies have provided minimum population size estimates based on the minimum number of individuals that were photo-identified (Weir, 2009; Weir, 2015, 2016). No data are available on trends in abundance over time. While the methods to generate absolute abundance estimates (true population numbers) require repeated surveys, often over a number of years, information on relative abundance (e.g. encounter rates under comparable search effort across seasons or between study sites) can help to reveal hotspots where research and conservation efforts could be focused.
- **Quantitative data on the causes of population decline**. Although bycatch in coastal, small-scale gillnet fisheries is strongly suspected to be the most significant cause of mortality for the species throughout its range, robust data on small scale fishing activity, spatial/temporal overlap of fishing effort with *S. teuszii,* and bycatch records, is lacking to support that assumption in most countries. There is a similar lack of quantitative or geospatially mapped data on hunting, and coastal development, including port construction and activities that generate water-borne pollution. These data are needed urgently to underpin the targeted design of mitigation actions, and support outreach and education work focused on policy and practice to reduce threats.
- **Effective strategies for monitoring and mitigating bycatch in small-scale coastal fisheries**. Although bycatch in small scale fisheries is reasonably assumed to be the most significant cause of population declines throughout the species' range, the scientific community and fisheries managers recognise that there are currently very few truly effective methods available to monitor and reduce bycatch, particularly in small-scale artisanal gillnet fisheries (e.g. Brownell et al. 2019; FAO, 2021). Fishing communities and fisheries/conservation managers throughout the *S. teuszii* range need tools that can reduce bycatch without threatening important sources of food security and income for coastal communities. These tools may involve fishing gear modifications, implementation of time-area restrictions to certain types of fishing or gear, economic incentives, or a combination of strategies that need to be tested for their effectiveness in the context of the fisheries that overlap with *S. teuszii* habitat.
- **Information on site fidelity, population connectivity and movements within and between study populations (including estimates of genetic diversity and health across and within populations**). It is currently unclear whether the 'populations'

identified in different geographic regions (e.g. van Waerebeek et al 2004; 2017) are isolated, or whether some mixing occurs between different regions. Clarifying the amount of connectivity between *S. teuszii* populations in different regions is important to be able to design and implement appropriate conservation actions and maintain genetic diversity.

- **Information on life history and reproductive parameters**. Understanding social structure, and particularly reproductive parameters is crucial to understanding the species' conservation needs. Reproductive parameters (e.g. frequency of calving and the age at which animals start to reproduce) are used to calculate population trends and possible trajectories.
- **Data on common diseases and/or contaminant exposure**. Currently there is no information on the diseases or contaminants that may affect *S. teuszii.* These factors are considered likely to play a significant role in population declines of other cetacean species and can be an indicator of the health and integrity of their marine coastal habitats.
- **Data on diet and prey**. Apart from some opportunistic observations of prey captures and stomach content analyses, the species' dietary habits and prey preferences remain poorly understood. Understanding the relationships between *S. teuszii* populations and their prey will yield insights into overlaps with fisheries and/or identify habitats where preferred prey has been documented through fisheries statistics, but dolphins have not yet been documented.
- **Information on potential developments and environmental conditions in *S. teuszii* habitat**. Coastal development projects, including exploration and extraction of oil and gas, and terrestrial activities that affect waterways that enter *S. teuszii* estuarine and shallow-water habitats are increasing at an exponential rate in many, if not all, of the 19 countries within the *S. teuszii* range (e.g. PWC, 2018; Croitoru et al., 2019; Adeola et al., 2022). The lack of quantitative data on the environmental factors that comprise optimal habitats for the species, together with the lack of a cohesive inventory of the current and planned human activities that can impact these habitats, are preventing a robust assessment of risks to the species and the measures required to mitigate these risks.
- **Information on vital physiological statistics** (respiratory rates, heart rates, etc.) under natural circumstances, and in response to boats, nets, capture or external stimuli. In the case of catastrophic population decline, it may become necessary to consider a range of Integrated Conservation Planning options (as defined by IUCN) to protect (a portion of) the last remaining individuals of a species (Taylor et al., 2020). These options could include heightened protection for smaller manageable portions of natural habitat, as well as more drastic translocation efforts to protected habitats. In that scenario, it would be necessary to have data on the species' normal physiological statistics, as well as on their responses to vessels, capture and handling, prior to their population sizes becoming so small that attempting to collect those data is considered unacceptably risky to the future of the species (Rojas-Bracho et al., 2019; Taylor et al., 2020).

2.8 Threat prioritisation / Risk Matrix

The main categories of threats and their severity are summarised in Table 2 below. This risk matrix is colour-coded to indicate the most severe and urgent threats in red, followed by those that are mildly less severe in orange.

Table 2: Risk matrix of threats to *S. teuszii*, based on the severity of each threat and the likelihood that it is present/pervasive in the species' habitats.

Likelihood	**Consequences**				
	Not Significant	**Minor**	**Moderate**	**Major**	**Catastrophic**
Almost Certain				Habitat loss and degradation, including oil spills, coastal construction, etc. Data deficits Resource and capacity deficits	Fisheries bycatch
Likely			Prey depletion Underwater noise	Utilisation of meat for bait, wildmeat trade, or food	
Possible				Climate change	
Unlikely					
Rare/unknown					

3. Additional Human Factors of Importance

3.1. Resource Gaps

Many of the data gaps identified by the CCAHD had also been highlighted by previous *S. teuszii* research and conservation initiatives (Van Waerebeek et al., 2004; Weir et al., 2011; CMS, 2012; Collins, 2015). One of the main reasons it has been difficult to make progress on addressing knowledge gaps is the lack of resources available in *S. teuszii* range countries to conduct research and mobilise stakeholders to assist in data collection. These resource gaps include the following (adapted from CCAHD, 2020):

- **Institutional Commitment**: Many government actors responsible for the management of wildlife, habitats, and coastal or marine development are unaware of *S. teuszii* and the species' conservation needs. Those that are aware may not be prioritising conservation measures that are required to reduce bycatch and other threats to the species. There is an urgent need for greater commitment from government stakeholders to create, monitor, and enforce effective conservation measures.
- **Funding**: Conservation-based research conducted under the auspices of CMS in the early 2000s (Van Waerebeek et al., 2003c; CMS, 2012) identified a number of the priority conservation needs for *S. teuszii*, and repeated recommendations have since been made by CMS (CMS, 2017b), IUCN (Taylor et al., 2020) and IWC (IWC, 2003, 2011b, 2020). To date, a lack of funding has been the greatest barrier to implementing the many recommendations that have been made over the years, including data collection, stakeholder meetings, and mitigation work.

- **Communication materials**: Many stakeholders relevant to marine and coastal conservation efforts are unaware that *S. teuszii* exists, much less that it is a Critically Endangered species that is impacted by fishing, costal development, and many of the human activities under their purview. There is an urgent need for a range of communication materials to raise awareness with different stakeholders ranging from coastal (fishing) communities, schools, government agencies, to industry decision-makers. All possible communication channels (e.g. TV/radio/internet/mobile app/social media) should be evaluated (depending on country-specific circumstances) to disseminate content/knowledge within the local population.
- **Multilingual manuals and guidelines and support networks for data collectors**. While various stranding response, necropsy, cetacean survey and conservation planning manuals are available in French, English, Portuguese and Spanish, they are frequently overwhelming to inexperienced personnel in both length and content. Consequently, it can be difficult for local practitioners on the ground to choose the right tools and extract the practical information that they need, particularly if they have to make rapid decisions in response to a stranding, sighting or other data collection opportunities. There is a need for easily accessible, clearly illustrated, step-by-step guidelines, manuals and data collection forms, produced in the three main range state languages. Additionally, it would be beneficial to have the means to provide real-time advice and support to data collectors and/or stranding responders.

3.2. Capacity Gaps

Addressing knowledge gaps and implementing effective conservation strategies requires capacity at many different levels: fishers and coastal communities who share habitat and resources with the dolphins are well placed to share their traditional knowledge and to collect data on sightings, strandings, and bycatch events. The growing number of environment-focused non-governmental organisations (NGOs) in *S. teuszii* range states, as well as government agencies and industries, also have important roles to play but may lack the necessary motivation, knowledge, experience and tools to engage. The following are a list of capacity gaps that need to be addressed in order to engage in effective *S. teuszii* conservation (adapted from CCAHD, 2020 and CMS, 2012).

- **Lack of effective reporting networks for sightings, bycatch or stranding events,** and individuals or organisations who could coordinate national or state/province-level sighting and reporting schemes. Increased reports of sightings and strandings would help to fill data gaps on the species' distribution, life history and causes of death (in the case of strandings). These networks require focal points with the tools and understanding to collect/solicit, collate and share data. Networks can be coordinated by NGOs or government agencies, who will need training and effective tools, ranging from templates for databases to compile sighting and stranding records, to stranding response kits that will allow trained individuals to collect data and samples from carcasses.
- **Lack of awareness of *S. teuszii* conservation status, threats and management/mitigation options among government agencies / managers responsible for marine / coastal conservation**. Government agencies may not be aware of the distribution or conservation status of *S. teuszii* in their countries, and therefore may not specifically consider the species when approving coastal development plans, creating and maintaining protected areas, designing fisheries policy, or conducting any other kind of coastal zone management activities. They may unintentionally allow activities to occur that are detrimental to the species' continued survival and contravene existing protective legislation. They are also likely to be unaware of the potential mitigation measures that could be implemented to reduce or offset the impacts of coastal activities, or to initiate or support any research or conservation efforts for the species.
- **Need for more trained and supported scientists in *S. teuszii* range states with experience in different elements of *S. teuszii* conservation-based research**,

including photo-identification, sample collection, etc. While there are a number of experienced marine and coastal researchers in the region, many with some experience in cetacean survey methodology, traditionally more emphasis has been placed on turtle research and monitoring in the region than cetacean research. There is a need for more range country scientists specialised in cetacean-specific survey methodology who can collaborate with relevant government agencies to effectively and sustainably monitor populations over time and ensure long-term protection and management. Capacity building should include all aspects of safety associated with boat-based/marine research, including where necessary, boat safety and (self-) rescue skills. For this reason, mentorship, exchange, and training programmes to support scientists in range countries should be a high priority.

- **Need for increased capacity for coastal and marine protected area staff to contribute to scientific understanding of *S. teuszii.*** Where *S. teuszii* populations occur within coastal or marine protected areas, rangers and park managers should be trained in data collection methods, including the documentation and collection of samples from strandings and reliable sightings data. Depending on available resources, sightings data could also be accompanied by effort (e.g. logging of tracks on surveillance missions), and environmental data.

3.3. Traditional knowledge and customs

Coastal communities' perceptions, beliefs and uses of *S. teuszii* have not been systematically evaluated, but a number of publications have included references to the results of interview surveys, which reveal a range of traditions, from direct hunting and capture, to reverence and protection. Segniagbeto et al. (2014) report that the Ewe people in Togo and Benin have a tradition of venerating aquatic mammals, which prevents hunting in some areas. Similarly, the Myèné communities in Gabon regard dolphins as protected 'totems' as part of their traditional animist beliefs (Kema Kema, pers comm). Fishers in Cameroon, SW Nigeria, and the Niger Delta regard dolphins as 'friends' of sailors, who might rescue victims of capsized or sinking vessels at sea (Eniang and Kamla, pers. comm). Some fishing communities in Gabon also associate the presence of dolphins with the presence of Crevalle Jacks (*Caranx hippos)*, and the onset of a productive fishing season. These positive beliefs and perceptions may be useful in garnering local support for the creation of protected areas, no take zones, or other management measures intended to protect dolphin populations (see recommended actions below).

Much more common in the literature, however, are accounts of traditions of hunting, human consumption and use of dolphins as bait for other fisheries. These accounts include the consumption of accidentally caught dolphins in Nigeria (Van Waerebeek et al 2017, Eniang, pers. comm.), including the use of dolphin heads in pepper soup to confer wisdom on the consumer and the consumption of the dolphin bladder to confer a good singing voice on the consumer (Eniang, pers. comm.), the consumption of bycaught dolphins by West African foreign fishers in Gabon (Kema Kema pers. comm.) and Cameroon (Ayissi et al., 2014), the smoking/curing and consumption of *S. teuszii* meat in Conkouati, Congo (Collins et al., 2019) and the use of dolphin meat as bait in shark fisheries in Mayumba, Gabon (Collins et al., 2019). There are also records of dolphin wildmeat consumption in Angola (Collins et al 2019), Mauritania (Van Waerebeek et al., 2003a) and Senegal (Van Waerebeek et al. 2003b; Keith-Diagne and Mullié, unpublished data). While there is some reported direct hunting of dolphins by foreign fishers in Cameroon, other interviewed fishing communities in the same region report an aversion to dolphin meat which they perceive as being too fatty (Kamla, pers. comm.).

3.4. Socio-economic aspects

Twelve of the 19 *S. teuszii* range countries are classified as 'low' on the Human Development Index (HDI) (see https://hdr.undp.org/en/content/human-development-index-hdi). Only one country

(Gabon) falls into the 'high' category, while the remaining five are classified as 'medium'. The coastal populations in these mainly low-income countries rely heavily on artisanal fishing in near shore shallow waters where interactions with *S. teuszii* are most likely to occur. Demand for fisheries products is increasing with the population growth in these countries, as well as with increasing imports to Asia and Europe and illegal, unreported, and unregulated (IUU) fishing (Daniels et al., 2016; Link et al., 2020). This growing demand is leading to an intensification of the fishing effort and hence a greater likelihood of *S. teuszii* bycatch where its range overlaps with fisheries. In some areas, when accidental capture occurs, local fishers do not release the animal because they perceive the capture as a gift of God to compensate for their low monthly income.

Many of these small-scale coastal fisheries are unregulated and catches are unreported, thus falling into the IUU fishing category. Some countries in Africa, including Cameroon, have received a warning "yellow card'' from the European Commission of the European Union for the poor fishery governance that resulted in documented IUU fishing scandals (see for example https://ec.europa.eu/commission/presscorner/detail/en/ip_21_621). The bycatch risk posed by small scale artisanal fisheries may be exacerbated by foreign industrial fisheries operating in the area. In Cameroon, artisanal fishers frequently report that industrial fishing trawlers trespass their authorized zone to fish within the 3nm zone reserved for artisanal fishing; such situations not only create conflicts between industrial and artisanal fishing but also increase the risk of accidental capture of *S. teuszii*. Unfortunately, data on accidental capture by fishing trawlers is scant, if not absent, because of the insufficient surveillance of fishing vessels and the lack of observers on board to document such incidents.

In Cameroon, the marketing of cetacean wild meat is still embryonic if not absent (Ayissi et al. 2011), unlike in Ghana where the market has developed very quickly in few years (Debrah et al., 2010a).

Humpback dolphin meat can be marketed in fresh, smoked or salted forms as highlighted by Collins in 2012 and Van Waerebeek et al. (2017). The unit price for the sale of this meat varies according to the country as mentioned in the table below.

Table 3: Evidence for commercial trade in *S. teuszii* or other dolphin meat in *S. teuszii* range countries.

Country	Local communities	Main activities	Destination	Quantity sold	Cost per unit if it was sold (USD/kg)	Source
Nigeria	Brass Island	Shark hunting	Dolphin used as bait to catch sharks	Undetermined	300-375	Van Waerebeek et al., 2017
Nigeria	Bonny Island	Multifilament artisanal drift net longline fishing, target species Shark, Sail fish and Tuna	Wild meat	3 fishermen, captured 99 dolphins, The weight ranges from (55 - 332kg) recorded from January 2017 to 2018	6kg sold 2,400 naira ($5.5)	Obienu, J., 2018, 2020
Cameroon	Local community of the south coast	fishing	wild meat	Undetermined	0.17-0.83	Ayissi et al. 2011
The Gambia	Gunjur	fishing	wild meat sold	Undetermined	0.13-0.20	Van Waerebeek et al., 2003
The Gambia	Sanyang	fishing	wild meat sold	1 individual	6.70	Van Waerebeek et al., 2003
Gabon	Expatriate (Togolese and Beninois) fishers in Gabon	Fishing	wild meat sold	Undetermined	Undetermined	Kema Kema, unpublished interview results
Gabon	Local communities from Mayumba (no Gabonese)	Shark hunting and fishing	Dolphin used as bait in shark fisheries	Undetermined	Undetermined	Collins et al., 2019
Republic of Congo	Local communities from Conkouati - Douli- National Park	Fishing	wild meat sold smoked or salted	Undetermined	Undetermined	Collins, 2012

4. Policies and Legislation Relevant for Management

4.1. International conservation and legal status of the species

4.1.1. IUCN status

Sousa teuszii was listed as Critically Endangered in 2017 (Collins et al., 2017). The justification for the change from the previous designation of Vulnerable in 2012 to Critically Endangered includes the following text:

> 'The available information, much of it characterized by high levels of uncertainty, suggests that the Atlantic Humpback Dolphin merits classification as Critically Endangered (CR) under criteria A3cd+4cd. For the A criterion, a reduction of more than 80% in the total population over three *S. teuszii* generations (~75 years) is suspected, with declines likely to have begun with the rapid expansion of West African coastal fisheries during the 1980s, and bycatch likely to increase as new areas are targeted and fishery pressures increase. The reduction has not ceased, nor have its causes – nor is there any reason to think they will in the foreseeable future. The inference and suspicion of the large decline in population size are based on the declining quality of the species' habitat (subcriterion c) and its vulnerability to mortality in artisanal fisheries (subcriterion d).'

4.1.2. CITES Appendices

All species of the genus Sousa have been listed on Appendix I of the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES) since 1979. Listing on Appendix I is defined as follows by CITES (taken from the CITES Website on 15 February, 2022: https://cites.org/eng/app/index.php):

> Appendix I lists species that are the most endangered among CITES-listed animals and plants (see Article II, paragraph 1 of the Convention). They are threatened with extinction and CITES prohibits international trade in specimens of these species except when the purpose of the import is not commercial (see Article III), for instance for scientific research. In these exceptional cases, trade may take place provided it is authorized by the granting of both an import permit and an export permit (or re-export certificate). Article VII of the Convention provides for a number of exemptions to this general prohibition.

4.1.3. CMS Appendices

Sousa teuszii was listed on CMS Appendix II in 1991 and in 2007 was also added to Appendix I. The additional Appendix I listing was justified in large part by the extensive evidence produced through the two CMS-supported West African Cetacean Research and Conservation Programme (WAFCET) projects conducted during the late 1990s to collect information on *S. teuszii* and other cetacean species and to stimulate regional involvement in conservation efforts (Van Waerebeek et al., 2003b; Van Waerebeek et al., 2003c). Inclusion on CMS Appendix I is defined as follows (taken from the CMS Website on 15 February, 2002): https://www.cms.int/en/species/appendix-i-ii-cms#:~:text=Appendix%20I%20comprises%20migratory%20species,the%20near%20future%E2%80%9D%20(Res.) :

> Appendix I comprises migratory species that have been assessed as being in danger of extinction throughout all or a significant portion of their range. The Conference of the Parties has further interpreted the term "endangered" as meaning "facing a very high risk of extinction in the wild in the near future" (Res. 11.33 paragraph 1). Res. 11.33 also defines a general correspondence between the term 'endangered' as defined within CMS and the IUCN Red List Criteria (Version 3.1).

Parties that are a Range State to a migratory species listed in Appendix I shall endeavour to strictly protect them by: prohibiting the taking of such species, with very restricted scope for exceptions; conserving and where appropriate restoring their habitats; preventing, removing or mitigating obstacles to their migration and controlling other factors that might endanger them.

The following table adapted from Weir et al. (2021) includes a chronological list of milestones in conservation of *S. teuszii*, many of which have been catalysed and supported by the CMS.

Table 4: *S. teuszii* conservation milestones (adapted from Weir, C. R., G. Minton, and T. J. Q. Collins. 2021. Conservation of Africa's Most Imperiled Cetacean, the Atlantic Humpback Dolphin (*Sousa teuszii*), The Encyclopedia of Conservation: Reference Module in Earth Systems and Environmental Sciences. Elsevier. p. 1-12.)

Year	Milestone
1892	Species first described by Kükenthal from a carcass collected by Eduard Tëusz in Cameroon
1979	*Sousa* genus listed on Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES) Appendix I
1991	Listed on the Convention on Migratory Species (CMS) Appendix II
1994	Listed as 'Insufficiently Known' on the IUCN Red List
1996	Listed as 'Data Deficient' on the IUCN Red List
1997-1998	West African Cetacean Research and Conservation Programme (WAFCET) project 1: investigation into the status of cetaceans in Senegal, The Gambia and Guinea-Bissau. Run by COREWAM and funded by UNEP/CMS (report available here)
1999-2001	WAFCET project 2: conservation of cetaceans in The Gambia and Senegal 1999-2001, and status of the Atlantic humpback dolphin. Run by COREWAM and funded by UNEP/CMS, with emphasis on the *S. teuszii* (report available here)
2000	CMS workshop in Conakry, Guinea, on the *Conservation and management of small cetaceans of the coast of Africa* (report available here)
2002	International Whaling Commission (IWC) Scientific Committee's Small Cetacean Subcommittee focuses on *Sousa* species, catalysing a genus-wide review
2004	Based on WAFCET-1 and 2, publication of the first extensive species review highlighting threats, data gaps and conservation concerns (Van Waerebeek et al., 2004)
2007	CMS WATCH (Western African Talks on Cetaceans and their Habitats) meeting in Tenerife, to consider a *Memorandum of Understanding Concerning the Conservation of the Manatee and Small Cetaceans of Western Africa and Macaronesia*
2007	*S. teuszii* Listed on CMS Appendix I
2008	CMS WATCH II meeting held in Lomé, Togo. Final negotiation and signing of the *Memorandum of Understanding Concerning the Conservation of the Manatee and Small Cetaceans of Western Africa and Macaronesia*, including a Small Cetacean Action Plan adopted in Annex II of the MoU
2008	*S. teuszii* listed as 'Vulnerable' on the IUCN Red List of Threatened Species
2010	International Whaling Commission (IWC) Scientific Committee focuses on African cetaceans, with a wide range of recommendations specific to *S. teuszii* (IWC, 2011a)
2011	Collaborative paper published highlighting shared and increasing concerns over species status and recommendations for action (Weir et al., 2011)
2012	*S. teuszii* listed as 'Vulnerable' on the IUCN Red List (Reeves et al., 2012)
2012	CMS published Technical Series No. 26 'Conserving cetaceans and manatees in the western African region' (CMS 2012, available here)
2017	CMS Concerted Action (CA) adopted for the species (available here)
2017	*S. teuszii* listed as 'Critically Endangered' on the IUCN Red List (Collins, 2015; Collins et al., 2017 – available here
2018	*S. teuszii* identified during an IUCN workshop as one of the seven small cetacean species most in need of urgent conservation intervention and Integrated Conservation Planning (Taylor et al., 2020 – available here)
2019	Meeting at the World Marine Mammal Conference in Barcelona led to the formation of the Consortium for the Conservation of the Atlantic Humpback Dolphin (CCAHD)
2020	CMS Concerted Action extended to 2023 allow more time for implementation (available here)
2020	Formation of the Consortium for the Conservation of the Atlantic Humpback Dolphin (CCAHD)

2021	Petition to list *S. teuszii* as Endangered under the US Endangered Species Act (90-day finding determined the petition merited review – review still underway as of March 2022 – available here).

4.2. Relevant IGOs/RIEOs by Country

All *S. teuszii* range countries are Parties to the Convention on Biological Diversity, CITES, and the Abidjan Convention (note that the Non-Self Governing Territory of Western Sahara is not a country, and as such cannot accede to any convention). Most countries are also Signatories/Parties to a number of other relevant treaties and conventions, including the International Whaling Commission (IWC), the Convention on Migratory Species (CMS), and the CMS West African Aquatic Mammals MoU. See Table 5 for more details.

Table 5: *S. teuszii* range countries and their status in relation to international and regional conservation treaties relevant to cetacean conservation.

Country/Territory	Abidjan Convention	International Whaling Commission (IWC)	Convention on Migratory Species (CMS)	CMS Western African Aquatic Mammals MoU	Convention on Biological Diversity (CBD)	CITES
Angola	yes	no	yes	yes	yes	yes
Benin	yes	yes	yes	yes	yes	yes
Cameroon	yes	yes	yes	no	yes	yes
Cote D'Ivoire	yes	yes	yes	yes	yes	yes
Democratic Republic of the Congo	yes	no	yes	no	yes	yes
Equatorial Guinea	yes	no	yes	yes	yes	yes
Gabon	yes	yes	yes	yes	yes	yes
Ghana	yes	yes	yes	yes	yes	yes
Guinea	yes	yes	yes	yes	yes	yes
Guineau-Bissau	yes	yes	yes	yes	yes	yes
Liberia	yes	no	yes	yes	yes	yes
Mauritania	yes	yes	yes	yes	yes	yes
Nigeria	yes	no	yes	no	yes	yes
Republic of Congo	yes	yes	yes	yes	yes	yes
Senegal	yes	yes	yes	no	yes	yes
Sierra Leone	yes	no	no	no	yes	yes
The Gambia	yes	yes	yes	no	yes	yes
Togo	yes	yes	yes	yes	yes	yes

Western Sahara[3], Non-Self Governing Territory of	Not applicable	N/A	N/A	N/A	N/A	N/A

4.3. Relevant organizations operating in the area by country

A list of organisations and stakeholders involved in *S. teuszii* research and conservation can be found in Annex 3 (available here), which is kept separate to allow updates as and when required. This includes all partners of the Consortium for the Conservation of the Atlantic Humpback Dolphin (CCAHD), and a number of other recognised actors including government agencies, NGOs and academic institutions.

4.4. National legislation relevant to the species

In reviewing relevant legislation for 17 confirmed and potential range States, four primary issues were identified.

First, the majority of States do not specifically list the Atlantic humpback dolphin as a "protected" species but instead only include it within general categories such as "marine mammals," "aquatic animals," or "Family *Delphinidae*." Thus, protections are not tailored to the particular circumstances or threats facing the Atlantic humpback dolphin.

Second, approximately one third of the States predicate inclusion within these general categories on a further official designation of the species as e.g., "endangered," "vulnerable," or "rare." However, with few exceptions, either no such designations were located in the State's legal provisions, or the existing designations did not extend to the Atlantic humpback dolphin (specifically or generally).

Third, in those instances where a species is protected under both the fisheries and wildlife laws, it was occasionally unclear which penalty applied and which governmental authority had primary jurisdiction.

Fourth and finally, while a few States require the immediate release of protected aquatic animals, only one State included specific protections against bycatch of such species. This issue is of great significance because bycatch is one of the primary threats to the Atlantic humpback dolphin.

In addition to the above-described primary issues, there are two secondary issues of note. First, in several cases, the level of penalties was not set sufficiently high to foster deterrence. The best penalty schemes applied large penalties paired with ancillary sanctions, including license/permit suspension and doubled fines for recidivism. Second, some States define "protected species" as including species listed under international treaties. Nevertheless, even for States where such listings are supposed to be automatically included within domestic legislation, most legal commentators agree that it is best practice to pass specific, domestic legislation protecting these internationally designated species.

Details are provided in Annex 2: Overview of relevant national legislation by country (available here), which is kept separate to allow updates as and when required.

[3] Western Sahara is listed in the United Nations list of Non-Self-Governing Territories since 1963 under Article 73e of the Charter of the United Nations.

4.5. Relevance of US Marine Mammal Protection Act (MMPA) Import ruling

The US Marine Mammal Protection Act (MMPA) (US Department of Commerce, 1972) was enacted in 1972. In 2016, the US governmental agency primarily responsible for administering the MMPA published the MMPA Imports Rule implementing a key MMPA provision protecting marine mammals from bycatch in foreign fisheries. The MMPA Imports Rule:

> …. establishes conditions for evaluating a harvesting nation's regulatory program to address incidental and measures to address intentional mortality and serious injury of marine mammals in fisheries that export fish and fish products to the United States. Under this rule, fish and fish products from fisheries identified by the Assistant Administrator in the List of Foreign Fisheries can only be imported into the United States if the harvesting nation has applied for and received a comparability finding from NMFS. The rule establishes procedures that a harvesting nation must follow and conditions to meet, to receive a comparability finding for a fishery. The rule also establishes provisions for intermediary nations to ensure that intermediary nations do not import, and re-export to the United States, fish or fish products subject to an import prohibition. Agency actions and recommendations under this rule will be in accordance with U.S. obligations under applicable international law, including, among others, the World Trade Organization (WTO) Agreement. (NOAA, 2016)

A number of *S. teuszii range* countries are included on the US List of Foreign Fisheries as having fisheries that export to the US, with particular fisheries that are associated with marine mammal bycatch. *Sousa teuszii* is listed as a possible bycatch species for some of these fisheries, although these listings may not be based on robust data that actually analyse the fisheries in relation to their overlap with *S. teuszii* habitat. This ruling may help to provide external motivation for *S. teuszii* range countries with fisheries exports to the US to invest more in the accurate assessment of marine mammal populations in their waters, and the possible impacts of fisheris on these poulatins.

5. Framework for Action

5.1. Goal

To promote the long-term sustainability of Atlantic humpback dolphin *(Sousa teuszii*) populations and their habitats by reducing the negative effects of human activities through research, awareness, capacity-building and action.

5.2. Objectives, Actions and Results

The tables below align the threats and gaps described in Section 2 with objectives and recommended priority actions to address these threats. The majority of these recommended actions draw from previous threat assessments (e.g. CMS, 2012; Weir and Collins, 2020), especially those most recently compiled through a systematic assessment of short- and medium-term priority actions undertaken by the Consortium for the Conservation of the Atlantic humpback dolphin in 2020 (CCAHD, 2020). Threat rankings correspond to the categories in Table 2 above. All of the recommended actions will be most effective if they are implemented through collaboration at multiple levels: 1) collaboration between stakeholders within each range country to maximise the effective use of resources and expertise, and ensure that the results of research and awareness-raising activities can support the design and implementation of effective policy and management; and 2) regional collaboration between stakeholders in different *Sousa teuszii* range countries to ensure that knowledge and experience gained in one country can be used to most effectively implement conservation action in another, especially in countries where cross-border populations are suspected to occur (e.g. Congo-Gabon, Senegal-Gambia, and Guinea-Guinea-Bissau).

For each threat/gap, a number of objectives and corresponding actions are prioritized (Essential, high, medium, low) and assigned a desired timescale as follows:

- Immediate: to be completed with the next year
- Short: to be completed within 3 years
- Medium: to be completed within the next 5 years
- Long: to be completed within the next 10 years
- Ongoing: currently being implemented and should continue
- Completed: completed during preparation of the Action Plan

Table 6: Objectives, Actions and Results: Note that there is considerable repetition, as some actions address multiple threats/gaps. The actions are referred to only briefly in the tables below. The text in Annex 1 provides more detailed justifications and descriptions for each activity along with its corresponding Action number in the table below. Note also that all recommended actions should take into account the welfare and safety of humans, as well as dolphins. To avoid repetition and wordiness we have not specified any health and safety measures associated with these recommendations. However, best practice should be followed in all cases to prevent disease transmission, accident or injury wherever relevant.

Threat 1. Fisheries bycatch (Risk ranking: Catastrophic)			
Result	**Action**	**Priority (Essential, high, medium, low)**	**Timescale**
Objective 1.1: Improve knowledge of where *S. teuszii* bycatch is occurring, and what types of fisheries/fishing gear is responsible so that appropriate mitigation measures can be designed and implemented.			
1.1.1 *S. teuszii* bycatch hotspots are mapped in order to know where to target mitigation efforts	1.1.1.1 Conduct Local Ecological Knowledge (LEK) surveys in coastal communities in as many *S. teuszii* range countries (confirmed and unconfirmed) as possible (Annex 1, Sec 1.3).	Essential	Immediate - Short
	1.1.1.2 Catalyse and support the formation of stranding/bycatch reporting networks (Annex 1, Sec 3.6).	High	Short
	1.1.1.3 Conduct training for stranding responders to be able to identify signs of fisheries interactions (Annex 1, Sec 3.5)	High	Short-medium
	1.1.1.4 Conduct Bycatch Risk Assessments (e.g. Hines et al 2021) in all those locations where sufficient information is available on fishing effort and *S. teuszii* distribution (Annex 1, Sec 1.7).	High	Short
1.1.2 Fisheries and fishing gears most often involved in *S. teuszii* bycatch are identified and described.	1.1.2.1 Conduct LEK surveys in coastal communities in as many *S. teuszii* range countries (confirmed and unconfirmed) as possible. (Annex 1, Sec 1.3).	Essential	Immediate - Short
	1.1.2.2 Include observations and documentation of active fishing effort in protocols for boat-based surveys (Annex 1, Sec 1.1 and 1.2).	High	Immediate-short
Objective 1.2: Develop and test viable bycatch reduction methods			
1.2.1 Viable bycatch reduction methods are tested and available for use in similar	1.2.1.1 Identify fishing communities willing to collaborate with research teams to develop and trial reduction methods – could include time-	High	Immediate-short

Threat 1. Fisheries bycatch (Risk ranking: Catastrophic)			
Result	**Action**	**Priority (Essential, high, medium, low)**	**Timescale**
fisheries in the *S. teuszii* range.	area closures, alternatives to gillnets, etc. (Annex 1, Sec 1.8)		
	1.2.2.2 Design and conduct scientifically robust trials to determine whether measures reduce bycatch without negatively impacting target catch. (Annex 1, Sec 1.8).	High	Short-medium
Objective 1.3: Implement effective bycatch reduction policies			
1.3.1 Bycatch-associated gears are no longer used in core areas of *S. teuszii* habitat.	1.3.1.1 Engage relevant government stakeholders responsible for fisheries and wildlife management to raise awareness of importance of addressing *S. teuszii* bycatch and of options for mitigation, including regulatory and policy instruments. (Annex 1, Sec. 3.4, Sec. 3.9).	Essential	Immediate-short
	1.3.1.2 Engage relevant IGO stakeholders responsible for fisheries and wildlife management (e.g. FAO, RFMOs, IWC, IUCN etc.) to raise awareness of importance of addressing *S. teuszii* bycatch and of options for mitigation. (Annex 1, Sec. 3.4).	Essential	Immediate-Short
	1.3.1.3 Create protected areas and/or implement time area closures to reduce or eliminate bycatch-causing fishing gears in core *S. teuszii* habitat. (Annex 1, Sec. 4.4).	High	Medium-long
	1.3.3.4 Legally mandate and enforce the use of more selective fishing gears that will not cause bycatch in core *S. teuszii* habitat. (Annex 1, Section 3.9, 4.3, 4.4)	High	Medium-long
	1.3.3.5 Engage the help of NGOs and other local stakeholders to encourage coastal communities to comply with gear regulations.	High	Immediate-short

Threat 2. Utilization of meat for bait, wild meat trade, or food (Risk ranking: major)			
Result	**Action**	**Priority**	**Timescale**
Objective 2.1: Reduce the number of unintentionally killed *S. teuszii* and other cetacean carcasses that can be used for any commercial purposes			
2.1.1 Bycatch of *S. teuszii* is reduced so that fewer carcasses are available for bait, trade, or food	2.1.1.1 See matrix for Threat 1 above	Essential	Medium-long
2.1.2 Other threats are removed from core *S. teuszii* habitats	2.1.2.1 Create/sustain marine protected areas where all potentially threatening human activity and coastal development are prohibited through e.g. the implementation of strong management plans that directly address threats to the *S. teuszii* in a specific protected area. (Annex 1, Sec 3.9, Sec. 4.4)	High	Medium-long
	2.1.2.2 Ensure effective Environmental and Social Impact Assessment processes, accompanied by mitigation and monitoring plans, are in place that take *S. teuszii* threats and habitat requirements into account. (Annex 1, Sec. 2.4)	High	Medium-Long
Objective 2.2: Stop direct hunting of *S. teuszii* in those communities where it occurs or is developing			
2.2.1 Coastal communities have knowledge and motivation a to stop hunting	2.2.1.1 Conduct community workshops to raise awareness of *S. teuszii* as an intelligent mammal, protected under law and Critically Endangered. Include relevant government stakeholders who can explain existing legal protections and involve communities in monitoring and enforcement of protections. (Annex 1, Sec 2.1 and 3.2)	High	Short-medium
	2.2.1.2 Create a sense of community stewardship through identifying and training coastal community focal points for sighting and stranding networks – including incentives like phone credit, certificates of recognition, and support for eco-tourism ventures. (Annex 1, Sec 3.6)	High	Short-medium
2.2.2 Government agencies responsible for design, implementation and enforcement of legal protections for *S. teuszii* have the knowledge and resources required to work effectively	2.2.2.1 Ensure that relevant national and regional government agencies have the capacity, equipment and funds to allow them to allocate resources where they are needed for effective planning, design, implementation, and enforcement of protection measures. (Annex 1, Sec 3.4, Sec. 3.9)	High	Short-medium
	2.2.2.2 Support training for local government agents and work with them to design programs for monitoring and enforcement (Annex 1, Sec. 3.5)	High	Short-medium

Threat 3. Habitat loss and degradation (including underwater noise from shipping and construction) (Risk ranking: major)			
Result	**Action**	**Priority**	**Timescale**
Objective 3.1: Identify core *S. teuszii* habitats that need to be protected from destruction or degradation			
3.1.1 *S. teuszii* habitats are mapped and characterised throughout possible range.	3.1.1.1 Conduct Local Ecological Knowledge (LEK) interviews, fish landing site surveys and use citizen science apps to gather and report knowledge from local communities about the presence/absence of *S. teuszii*. (Annex 1, Sec 1.3)	Essential	Immediate-short
	3.1.1.2 Conduct boat-based surveys to map *S. teuszii* distribution, and characteristics of preferred habitat that need to be maintained. (Annex 1, Sec 1.1 and Sec 1.2)	Essential	Immediate-short
	3.1.1.3 Conduct passive acoustic surveys to detect presence/absence of *S. teuszii*. (Annex 1, Sec 1.6)	High	Short-medium
	3.1.1.4 Undertake habitat suitability analysis in areas of known, unknown, and possible former *S. teuszii* distribution to identify areas where research should be conducted and/or habitats should be restored.	Medium	Medium-long
Objective 3.2: Identify and assess the threat severity of ongoing and planned activities/developments that will likely lead to *S. teuszii* habitat loss and degradation			
3.2.1 An inventory of coastal projects is available to stakeholders involved in *S. teuszii* conservation and management	3.2.1.1 Conduct an inventory of coastal development projects and compile them in a database, noting where Environmental and Social Impact Assessments have been conducted. (Annex 1, Sec 1.4)	High	Short-medium
Objective 3.3: Halt or mitigate the impacts of human activities likely to lead to S. teuszii habitat loss or degradation			
3.3.1 Government agencies responsible for assessing and approving new developments take *S. teuszii* habitat requirements and potential impacts into account.	3.3.1.1 Engage relevant government agencies and industry stakeholders responsible for coastal and marine development activities especially those who need to meet lenders requirements for Critical Habitat assessments (under the IFC framework)) to raise awareness of the impact these activities can have on *S. teuszii*. (Annex 1, Sec 3.4)	High	Short-medium
	3.3.1.2 Draft guidelines on best practice in relation to *S. teuszii* needs, to assist those drafting and evaluating Environmental Impact Assessments. (Annex 1, Sec 2.4)	High	Short-medium
3.3.2 Core *S. teuszii* habitat is protected from any activities that will lead to loss or degradation.	3.3.2.1 Designate protected areas where human activities that would lead to habitat loss or degradation are not permitted, for example through the implementation of strong management plans that directly address threats to the *S. teuszii* in a specific protected area (Annex 1, Sec 3.9, Sec 4.4)	High	Medium-long
	3.3.2.2 Support those responsible for managing protected areas to make sure	High	Short-medium

Threat 3. Habitat loss and degradation (including underwater noise from shipping and construction) (Risk ranking: major)			
Result	**Action**	**Priority**	**Timescale**
	they have the knowledge and resources to effectively protect *Sousa* habitat (Annex 1, Sec 3.4, Sec 3.5)		

Threat 4. Data deficits (Risk Ranking – major)			
Result	**Action**	**Priority**	**Timescale**
Objective 4.1: Improve knowledge of the species' spatial and temporal distribution			
4.1.1 *S. teuszii* habitats are mapped and characterised throughout possible range.	4.1.1.1 Conduct Local Ecological Knowledge (LEK) interviews, landing site surveys and use citizen science apps to harvest knowledge from local communities about the presence/absence of *S. teuszii*. (Annex 1, Sec 1.3)	Essential	Immediate-short
	4.1.1.2 Conduct boat-based surveys to map *S. teuszii* distribution, and characteristics of preferred habitat that need to be maintained. (Annex 1, Sec 1.1 and Sec 1.2)	Essential	Immediate-short
	4.1.1.3 Conduct passive acoustic surveys to detect presence/absence of *S. teuszii*. (Annex 1, Sec 1.6)	High	Short-medium
	4.1.1.4 Undertake habitat suitability analysis in areas of known, unknown, and possible former *S. teuszii* distribution to identify areas where research should be conducted and/or habitats should be restored.	Medium	Medium-long
Objective 4.2: Understand the species' relative or absolute abundance and/or population trends.			
4.2.1 Relative abundance data is available for a number of *S. teuszii* habitats to allow identification of hotspots and potential trends over time.	4.2.1.1 Conduct boat surveys in a manner that allows comparison of survey effort and encounter rates between regions, seasons and/or years. (Annex 1, Sec 1.1 and Sec 1.2)	High	Immediate-short
	4.2.1.2 Conduct LEK interview surveys with fishers with a wide age range and breadth of experience to provide perspective on whether populations have increased, decreased, or remained stable over time. (Annex 1, Sec 1.3)	High	Immediate-short
4.2.2 Absolute abundance data is available for as many *S. teuszii* populations as possible	4.2.2.1 Conduct vessel-based surveys that allow photo-identification of individual dolphins and the establishment of photo-identification catalogues for populations so that mark-recapture models can be used to estimate population size. (Annex 1, Sec 1.1 and Sec 1.2)	High	Immediate-short
Objective 4.3: Better understand issues of site fidelity, population connectivity and movements within and between populations			
4.3.1 Individuals in key locations are identified photographically allowing analysis of movements within and between study sites	4.3.1.1 Conduct vessel-based surveys that allow photo-identification of individual dolphins and the establishment of photo-identification catalogues for populations so they can be recognized over time either within the same study site or between two adjacent (cross-border)	High	Short-medium

Threat 4. Data deficits (Risk Ranking – major)			
Result	**Action**	**Priority**	**Timescale**
	study sites. (Annex 1, Sec 1.1 and Sec 1.2)		
	4.3.1.2 Facilitate comparison of photo-identification catalogues between study sites through collaboration and through standardization of catalogue formats.	High	Short-medium
4.3.2 Genetic samples are available from multiple *S. teuszii* populations allowing analysis of population connectivity and/or 'stock' identity, as well as evaluating genetic diversity to understand populations that might require conservation prioritization due to low diversity.	4.3.2.1 Catalyse and support the formation of stranding/bycatch reporting networks. (Annex 1, Sec 3.6)	High	Short-medium
	4.3.2.2 Conduct training for stranding responders to be able to collect and store genetic samples (Annex 1, Sec 3.5)	High	Short-medium
	4.3.2.3 Supply stranding response manuals and stranding response kits to stranding responders (Annex 1, Sec 2.2, Sec 2.3)	High	Short-medium
	4.3.2.4 Conduct biopsy sampling of live dolphins ONLY in populations where a thorough risk assessment has been conducted to ensure that it would not put dolphins at risk and where trained personnel and appropriate equipment are available (genetic material could eventually be used for individual recognition and identification of sampled individuals at a later date – e.g. if they are stranded).. (Annex 1, Sec 4.1)	Medium	Medium-long
Objective 4.4: Better understand issues related to diet, health, physiology and life history parameters in order to better model potential impacts of threats and population trajectories, as well as to prepare for the possibility of managed care if it were ever required to rehabilitate injured animals or as a last resort for populations whose natural habitat is drastically compromised.			
4.4.1 *S. teuszii* prey species are identified in order to better understand overlap with fisheries and potential impacts of habitat or climate change	4.4.1.1 Boat surveys include careful observation of feeding *S. teuszii* to photograph and identify prey where possible (e.g. Weir, 2016). (Annex 1, Sec 1.1 and Sec 1.2)	Medium	Medium
	4.4.1.2 Stranding responders are trained to collect stomach contents from specimens and to collaborate with fisheries ID experts to identify otoliths and/or squid beaks or other prey remains. (Annex 1, Sec 2.2, Sec 2.3)	Medium	Medium
	4.4.1.3 Supply stranding response manuals and stranding response kits to stranding responders. (Annex 1, Sec 2.2, Sec 2.3)	High	Short
	4.4.1.4 Conduct biopsy sampling ONLY in populations where a thorough risk assessment has been conducted to ensure that it would not put dolphins at risk, and where trained personnel and	Low	Long

Threat 4. Data deficits (Risk Ranking – major)			
Result	**Action**	**Priority**	**Timescale**
	appropriate equipment are available, in order to identify prey species from stable isotope analysis. (Annex 1, Sec 4.1)		
4.4.2 Pathology or other threats to *S. teuszii* health are assessed and described	4.4.2.1 Boat surveys include efforts to obtain high-resolution images that would allow detection of external signs of pathology, non-lethal predation or human-induced scarring. (Annex 1, Sec 1.1 and Sec 1.2)	High	Immediate
	4.4.2.2 Water sampling is conducted in core *S. teuszii* habitats to detect contaminant levels and/or water-borne pathogens. (Annex 1, Sec 1.1 and Sec 1.2)	Medium	Medium-long
	4.4.2.3 Stranding responders are trained and supported to document and collect samples needed to diagnose cause of mortality and/or sub-lethal pathology/disease. (Annex 1, Sec 2.2, Sec 2.3)	High	Short-medium
	4.4.2.4 Supply stranding response manuals and stranding response kits to stranding responders. (Annex 1, Sec 2.2, Sec 2.3)	High	Medium
4.4.3 Basic data on life history and reproductive parameters is available	4.4.3.1 Boat surveys include photo-identification protocols and the establishment of photo-identification catalogues allows individuals to be monitored over time, potentially providing information on when females begin to reproduce and calving intervals. (Annex 1, Sec 1.1 and Sec 1.2)	Medium	Medium-long
	4.4.3.2 Necropsies performed on *S. teuszii* include collection of teeth to allow aging by growth layer groups, and more advanced examination of reproductive organs to determine sexual maturity and (for females) number of parturitions. (Annex 1, Sec 2.2, Sec 2.3)	Medium	Medium-long
4.4.4 Basic data on physiological statistics and responses is available	4.4.4.1 Opportunistically collect data on vital statistics (respiratory rates, heart rates) from live stranded or entrapped individuals, where collecting such data does not put an individual at further risk.	Medium	Medium-long

Threat 5. Resource and Capacity deficits (Risk ranking: major)			
Result	**Action**	**Priority**	**Timescale**
Objective 5.1: Mobilise and create resources to support *S. teuszii* conservation			
5.1.1 Funding is available to support the range of activities recommended in this Action Plan	5.1.1.1 Create a shared platform that can raise awareness of the urgent need for *S. teuszii* conservation and raise funds to support research and conservation actions. (Annex 1, Sec. 3.3)	Essential	Immediate-short
	5.1.1.2 Create a platform that can receive and administer funds, ensuring that funding gets to practitioners on the	Essential	Immediate-short

Threat 5. Resource and Capacity deficits (Risk ranking: major)			
Result	**Action**	**Priority**	**Timescale**
	ground in range countries to implement effective research and conservation.		
	5.1.1.3 Support range country NGOs and other range country stakeholders in funding applications.	Essential	Immediate-short
	5.1.1.4 Support range countries in designing sustainable funding mechanisms, including, where possible, the use of penalties or fines for infractions of laws protecting *S. teuszii* for conservation actions. (Annex 1, Sec 3.9)	High	Medium-long
5.1.2 Communication and outreach materials area available for a range of different stakeholder groups	5.1.2.1 Create outreach and communication tools for schools, coastal communities, government and industry stakeholders, and potential funders. (Annex 1, Sec 2.1, Sec 3.3)	Essential	Immediate-short
	5.1.2.2 Disseminate outreach and communication tools through a centralized website, social media, , electronic press, documentaries and story-telling, community radio, community workshops, government engagements etc. (Annex 1, Sec 3.3)	Essential	Short
5.1.3 Resources are available to support research practitioners/data collectors	5.1.3.1 Create easy-to-follow, illustrated data collection manuals, datasheet and database templates, survey protocols, equipment lists and specifications, smartphone apps (e.g., SIREN[4]), and other tools to support data collectors. (Annex 1, Sec 2.2)	High	Short
	5.1.3.2 Create and distribute stranding kits for stranding responders to facilitate data collection from carcasses. (Annex 1, Sec 2.3)	High	Short
	5.1.3.3 Create an equipment 'library' where expensive items of equipment, such as good quality cameras for photo-ID, water parameter meters, etc. can be loaned to research groups.	Medium	Short-long
Objective 5.2: Support capacity building for a wide range of stakeholders			
5.2.1 International collaboration and networking facilitates sharing of information and resources	5.2.1.1 Create and/or maintain a regional/international platform to foster information and resource sharing with and between all stakeholders concerned with *S. teuszii* conservation. (Annex 1, Sec 3.3)	Essential	Immediate
5.2.2 Coastal Communities are empowered and have the knowledge and resources required to participate in *S. teuszii* research and conservation	5.2.2.1 Conduct community workshops; identify and train coastal community focal points for stranding and reporting networks, promote the use of citizen science smartphone apps, where appropriate, and engage coastal communities in developing and trialling	Essential	Immediate

[4] https://www.ammco.org/telecharger_siren

Threat 5. Resource and Capacity deficits (Risk ranking: major)			
Result	**Action**	**Priority**	**Timescale**
	threat/bycatch mitigation methods. (Annex 1, Sec 3.2)		
	5.2.2.2 Support local communities and provide them with the tools necessary to engage in conservation advocacy.	High	Short-medium
5.2.3 Range country scientists, NGOs and other data collectors are trained and supported	5.2.3.1 Identify and support range-country candidates for training and mentoring to develop higher-level research skills, ideally with the framework of working toward higher degrees (MSc/PhD). (Annex 1, Sec 3.7, 3.8).	Essential	Immediate
	5.2.3.2 Identify and support range country academic and research entities that can foster capacity building for range country scientists.	High	Short-medium
	5.2.3.3 Organize regional workshops and meetings for training and information exchange.	High	Short-medium
5.2.4 Relevant government agencies have the knowledge, tools and resources required to implement effective *S. teuszii* conservation policies	5.2.4.1 Conduct government stakeholder engagement meetings – both within individual range countries to promote cross-agency collaboration, and, if possible, in regional contexts to promote cross-border/international exchange of experience and knowledge. (Annex 1, Sec 3.4, and Annex 2).	Essential	Immediate

Threat 6. Prey depletion (Risk ranking: moderate)			
Result	**Action**	**Priority**	**Timescale**
Objective 6.1: Accurately describe *S. teuszii* prey species and assess their overlap with artisanal/commercial fisheries (either as target fish or bycatch in fisheries)			
6.1.1 *S. teuszii* prey species are accurately identified	6.1.1.1 Boat surveys include careful observation of feeding *S. teuszii* to photograph and identify prey where possible (e.g. Weir, 2016). (Annex 1, Sec 1.1, 1.2).	Medium	Immediate-short
	6.1.1.2 Stranding responders are trained to collect stomach contents from specimens and collaborate with fisheries ID experts to identify otoliths and/or squid beaks or other prey remains. (Annex 1, Sec 3.5)	Medium	Medium
	6.1.1.3 Supply stranding response manuals and stranding response and sample collection kits to stranding responders. (Annex 1, Sec 2.2, Sec 2.3)	High	Short-medium
6.1.2 Both target and bycatch products in coastal fisheries are assessed and overlap with *S. teuszii* prey identified.	6.1.2.1 Conduct Local Ecological Knowledge (LEK) interviews and fish landing site inspections to describe composition of catches in *S. teuszii* habitat and assess overlap with *S. teuszii* prey species (Annex 1, Sec 1.3)	High	Immediate-short
Objective 6.2: Assess whether overfishing or climate change could lead to significant depletion of key prey species in the short, medium or long term			
6.2.1 Key prey species' population/stock trends are modelled	6.2.1.1 Conduct modelling exercises on known prey species based on available fisheries data	Medium	Short-medium

Threat 7. Climate change (Risk ranking: Potentially major, but uncertain)			
Result	**Action**	**Priority**	**Timescale**
Objective 7.1: Describe *S. teuszii* preferred habitat parameters that are likely to be influenced by climate change (e.g. temperature, salinity, turbidity, pH).			
7.1.1 *S. teuszii* preferred habitat parameters are accurately described in as many populations as possible	7.1.1.1 Boat survey protocols include water sampling of temperature, salinity, turbidity, pH, etc. using multimeters, CTD's etc. and analyses of collected data include habitat modelling (potentially through international collaborations and training workshops to build local capacity for modelling work). (Annex 1, Sec 1.2, 1.3)	Medium	Immediate-short
	7.1.1.2 Conduct literature searches to determine whether other coastal studies (fisheries, EIAs etc) have described habitat parameters in known *S. teuszii* habitats.	Medium	Short-medium
Objective 7.2: Model the likely impacts of climate change on *S. teuszii* preferred habitats			
7.2.1 Projected impacts of climate change on known and predicted *S. teuszii* habitats are modelled.	7.2.1.1 Conduct a modelling exercise using all available data on precited climate-related changes to *S. teuszii* habitat with a focus on the parameters found to be significant predictors of suitability.	High	Short-medium

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ANNEX 1

DETAILED RECOMMENDED ACTIONS

The majority of these recommended actions draw from previous threat assessments e.g. [1,2], especially those most recently compiled through a systematic assessment of short- and medium-term priority actions undertaken by the Consortium for the Conservation of the Atlantic Humpback Dolphin in 2020 [3]. This analysis was based on a thorough review of past studies and literature and the status of current knowledge and conservation efforts in the region. The activities are listed here under three main categories corresponding to actions to address: 1) knowledge gaps, 2) resource gaps, and 3) capacity gaps. Note that in many instances, if designed carefully, one activity can address several gaps at the same time.

1. Actions to address knowledge gaps

1.1 Boat-based surveys in the Senegal-Gambia region to document distribution and relative abundance, focusing on the expansion of photo-identification catalogues for mark-recapture analysis and mapping individual movements/ranges. These surveys should be conducted in a systematic effort-related manner that facilitates mapping of relative abundance (e.g. encounter rates per unit of sampling effort) between different habitats, seasons and years. Knowledge gained form these surveys will build on that of previous surveys e.g. [4,5]. Surveys should include local scientists to promote capacity building, as well as environmental sampling to support habitat modelling. Surveys encompassing these methods commenced in the Saloum Delta of Senegal in July 2021 and included a Gambian partner who is currently fund-raising to be able to conduct surveys in Gambian waters.

1.2 Extend field surveys to other range states where populations are known to persist, also with a focus on documenting distribution, relative abundance, and starting/expanding photo-identification catalogues. Guinea and Guinea-Bissau were ranked as two of the highest priority locations for future survey work following Senegal and The Gambia. Dedicated boat surveys to include photo-identification have commenced in the Tristao Islands in Guinea in April 2022. This area, close to the border with Guinea-Bissau, will build on previous surveys e.g. [6,7]. Mauritania, The Gambia, Nigeria, Cameroon, Gabon and the Republic of Congo are sites where the species is known to occur and would be of interest for more detailed field surveys. However, it was emphasised that at this stage ***all potential and confirmed range states require dedicated vessel surveys*** in shallow-water coastal habitats to determine whether *S. teuszii* are present, and if so, in what kinds of numbers.

1.3 Design and initiate Local Ecological Knowledge (LEK) interview surveys throughout the *S. teuszii* range to assess current distribution (presence/absence and possibly relative abundance) and characterise fisheries and threats (e.g. bycatch, hunting) to the *S. teuszii*. Multiple knowledge gaps related to distribution, relative abundance and threats can potentially be addressed using a single, carefully designed interview. Building on previous interview survey work conducted at fish landing sites throughout West Africa [7,8,]e.g. [9], new surveys are recommended to take place in several phases, starting with identifying the questions that need to be answered and drafting the questionnaire, a pilot study to test the questionnaire in at least two locations, at least one where *S. teuszii* are relatively well known and fairly common and another where information is lacking. Following the pilot study, the questionnaire would be refined and extended using the same methodology to as many range states as possible, keeping in mind the geographic priorities identified. Interview surveys will feature in a CCAHD project in Guinea commencing in 2022, and a separate CCAHD project will fund the development of a standard questionnaire to be trialled and implemented in Congo, Gabon, Cameroon, Senegal, Gambia and Liberia).

1.4 Generate an inventory of current and planned coastal development projects in *S. teuszii* range countries and their potential impact on the species. A first phase of the inventory could involve a questionnaire the CCAHD network of range-state partners and use CMS, IUCN and IWC contacts to identify appropriate government contacts. A funded consultancy might yield a higher quality inventory more quickly. Ideally data on current and planned developments would be stored in a central online database accessible by CCAHD members. Analysis of potential impacts should include explicit consideration of the progressive loss of *S. teuszii* habitats to coastal development, the role that lenders play in this loss, and the inadequacy of current EIA standards.

1.5 Collection of *S. teuszii* tissue samples for genetic analysis: Collection of genetic samples will necessitate coordination and capacity building for scientists in range states, who should also be trained in analyses whenever appropriate and possible. Wherever possible, genetics labs in range state countries should be involved in analyses to help build local capacity and ownership. Analyses conducted on new samples, as well as the few existing samples available from museum collections and other sources can be used to clarify the taxonomic status of *S. teuszii* within the genus of *Sousa* and to generate mitochondrial genomes for all currently available *S. teuszii* samples, while collection of new samples will help to clarify potential relationships and/or the degrees of isolation of sampled populations.

1.6 Conduct passive acoustic studies that deploy F-PODs and SoundTraps in (potential) *S. teuszii* habitat. Passive acoustic methods have proven effective for documenting and monitoring the distribution of other threatened small cetacean populations over time, with particular success for Critically Endangered vaquita (*Phocoena sinus*) in the Upper Gulf of California [10] and Endangered Baltic harbour porpoises (*P. phocoena*)[11]. Under the right conditions, this method can be used to collect data continuously over a wide geographical range and over extended periods of time. Methods deployed should also focus on employing/training community members and/or park rangers to **conduct concurrent visual observations** to facilitate distinction of *S. teuszii* vocalisations from other species, and to understand how often/likely they are to be vocalising when present. Alternatively, mobile acoustic studies could involve deployments of F-PODs and SoundTraps from a vessel with both bottlenose dolphins and *S. teuszii* in at least one site where both species are known to occur - for example, Angola, Congo, Gabon and Guinea-Bissau.

1.7 Conduct a bycatch rapid assessment in the Conkouati-Douli National Park, Congo and the rest of the Congolese coastline using data available from past cetacean and fisheries work. The Republic of Congo was identified as one of the countries where a rapid bycatch assessment following methods such as those used by Hines et al. [12] might be most effective, based on the research already conducted on coastal artisanal fisheries [13], and the confirmed presence of *S. teuszii* in the areas where these fisheries operate [14]. However, similar assessments could and should be conducted in other areas where data is available on both fisheries effort and *S. teuszii* distribution, and where such data is not yet available, boat-based surveys and interview surveys should be conducted to collect the data needed to accurately assess bycatch risk.

1.8 Conduct trials with fishing communities on the effectiveness of alternatives to gillnets and/or other means to reduce bycatch without reducing target catch (e.g. traps, handlining, pole and rod, time area closures). Gillnets are thought to responsible for the decline of a number of threatened coastal cetacean species and populations [15]. More selective gears may yield equivalent target catch in better condition, but trials are required to determine their effectiveness in each site where they are promoted [16,17]

2. Actions to address resource gaps

2.1 Design awareness raising materials for coastal communities as well as government and industry stakeholders: While funding from the IUCN Species Survival Commission allowed the CCAHD to design a map-based infographic and standard power-point presentations for use with government and industry stakeholders (Figure 6), there is an urgent need for a wider range of materials that can be used with multiple categories of stakeholders to raise awareness of *S. teuszii* and the threats they face. Materials should include resources for schools and children, as well as posters and social media resources to encourage coastal communities/fishers to report sightings, strandings and bycatch. Materials should also be designed in a manner that they can easily be translated into local languages as well as English, French and Portuguese. In each case, range country partners should help to evaluate the communication channels and tools that would be most effectively reach each target audience in each relevant range state.

Figure 6: Infographic developed to help inform government and industry stakeholders about the conservation status and needs of Atlantic humpback dolphins. This infographic is available in English, French and Portuguese, and can be downloaded from the CCAHD website: https://www.sousateuszii.org/resources/

2.2 Develop manuals and support materials for data collectors including species identification guides, fact sheets, tiered stranding response guidance, tiered protocols for sample collection from live strandings and bycaught or stranded carcasses, sighting reporting forms etc. The manuals and support materials should be illustrated and presented as simply and clearly as possible. They should also be available in at least the three most prominent languages for *S. teuszii* range states: English, French and Portuguese (and ideally Spanish).

2.3 Assemble and distribute stranding response/sampling kits to stranding networks as they are being formed. Lack of equipment for the collection and storage of samples is currently a hindrance to the collection of samples from dead animals, and is needed

alongside sampling protocols and training. Stranding response kits in sturdy toolboxes, including tape measures, knives, scalpels, gloves, sample vials, ethanol, tweezers, cleaning supplies, etc. should be made available to a network of trained stranding responders in as many *S. teuszii* range countries as possible, bearing in mind that training for basic sample collection need not be overly complicated (see section on capacity building below).

2.4 Produce best practice guidelines for the evaluation of coastal development projects that include: 1) an overview of the potential impacts of coastal development activities on *S. teuszii*; 2) the minimum requirements for the collection and analysis of baseline data that should be available for Environmental Impact Assessments; and 3) information on how potential impacts can be mitigated. These best practice guidelines could help to guide government agencies responsible for evaluating and approving coastal development projects, and could also encourage industries, particularly those with international 'green credentials' to better incorporate *S. teuszii* conservation needs into their planning.

3. Actions to address capacity gaps

3.1 Promote regional collaboration and exchange through networking across borders, and between different categories of relevant stakeholders. Implementation of almost all of the other actions recommended in this Action Plan will be made much more effective if the results of each activity can be shared, amplified, and where appropriate, replicated throughout the *S. teuszii* range. A shared platform for collaboration can offer a means to disseminate information and resources. The CCAHD has attempted to create such a platform through its website, email group, and collaborative projects. However, this consortium could be expanded and/or complemented by sub-groups focusing on smaller regions within the *S. teuszii* range, specific stakeholder groups, and/or additional themes to complement existing working groups. Furthermore, face-to-face meetings between members of the consortium (or sub-groups thereof) would allow the forging of stronger working relationships and more effective collaboration.

3.2 Conduct community-based workshops to promote awareness of the species and its conservation needs, and the role of community members in reporting dolphins and mitigating threats. Numerous studies have demonstrated the value and importance of involving local communities, particularly fishers, in data collection and conservation efforts e.g. [18,19]. These workshops should include use of the resources mentioned above. These workshops should be held after LEK interviews, in order not to influence interview results, but can also serve as the first step to forming effective reporting networks. *S. teuszii* and/or conservation-themed T-shirts, caps, re-usable cloth bags, notebooks, and similar (environmentally and ethically responsibly produced) products could potentially be used as incentives for participation in workshop activities, interviews and/or reporting networks, as these items are highly appreciated in many communities in the region.

3.3 Maintain a trilingual *S. teuszii* focused website to serve as a centralized resource where information and resources (such as identification guides and sampling protocols) can be downloaded by a broad range of stakeholders, including local communities, schools, governments, NGOs and industries. The CCAHD website (https://www.sousateuszii.org/) developed in 2021 could serve as a resource to reinforce the CMS Concerted Action Plan.

3.4 In-person and virtual engagements with policy makers by range-state partners with, where appropriate, support from international organisations and partners to raise awareness of *S. teuszii* conservation status and threats, and provide advice on how best to mitigate the potential threats. This will rely heavily on range state partners, and the development of appropriate communication tools translated into the appropriate language and including relevant detail for the country in question. Three of these types

of engagements were hosted in Gabon, Cameroon and Senegal in 2021 using funding provided form the IUCN SSC EDGE grants (see https://www.sousateuszii.org/projects/government-stakeholder-engagement-meetings-in-sousa-teuszii-range-countries/ for more details). However, there is an urgent need to expand these engagements to other *S. teuszii* range countries and to follow up on the three meetings that were held to include more stakeholders and explore concrete management and mitigation plans.

3.5 Offer training for park rangers and fisheries agencies, and leaders of fishing communities: These actors are regularly in coastal settings with opportunities to report and collect data. Although there are few designated marine protected areas (MPAs) within the *S. teuszii* range, several countries without any MPAs do have coastal protected areas (See Figure 5). Park rangers in these coastal areas, fisheries officers responsible for monitoring ports and harbours and fish landing sites, and respected local leaders in fishing communities will be well placed to document *S. teuszii* sightings, strandings or incidents of bycatch.

3.6 Create national stranding and reporting networks, including training of coordinators/focal points. Opportunistic sightings reported by members of the public as well as strandings and bycatch records can provide a valuable indication of the presence of *S. teuszii* and may yield insight into previously undocumented locations and/or highlight potential bycatch or other threat hotspots where conservation interventions are urgently required. Cameroon and Senegal, for example, already have effective reporting networks in place that were initially driven by manatee and sea turtle conservation work, but now include greater focus on cetaceans. In other countries, more support may be needed to identify focal points and ensure they have the tools and support they need to elicit, collate, and effectively archive records. Incentives can be offered to community reporting focal points -such as phone credit, T-shirts, caps, colouring books for children, etc.

3.7 Identify and support individual scientists, academic institutions and laboratories that can advance cetacean research in *S. teuszii* range states. It is essential that local capacity is developed for long-term cetacean research and monitoring activities, and that local scientists (e.g. from NGOs, governmental agencies, or universities) receive as much support as possible from more experienced colleagues from both within and outside the region. Support can be provided through buddy/mentor systems, similar to that set up for manatee researchers in the region in from 2008 onward, and is also in place through the Conservation and Research of West African Aquatic Mammals (COREWAM) network e.g. [20]. Marine mammal science at universities in the region could be supported by the offering of guest lectures (in person or virtual) by CCAHD members. This has been happening in Senegal, where a CCAHD scientist has been lecturing at the Université Cheikh Anta Diop since 2018.

3.8 Organisation of regional hands-on training workshops to include field techniques like distribution surveys, photo-identification, stranding response, sample collection from carcasses etc. Although all fieldwork organised under the auspices of the CCAHD and its partners should include local scientists and local capacity building as an aim, a regional hands-on training workshop, held in a location where *S. teuszii* were almost certain to be encountered, could be a highly effective means of giving scientists from throughout the region practical experience of boat-based fieldwork (including photo-identification, habitat parameter sampling, acoustic deployments, etc), interviewing techniques, and/or stranding response and carcass sampling.

3.9 Provide support to range countries to strengthen legal and policy regimes in where current mechanisms are insufficient to provide adequate protections for the AHD, and/or provide support to countries where current legal mechanism should be sufficient, but are not being implemented or enforced to provide needed protections. Measures to be designed, implemented and/or enforced could include prohibitions against the take of

AHDs, creation of no-take areas for fisheries, time-area closures for fisheries and/or gear restrictions as well as more stringent requirements for environmental impact assessments and mitigation measures in relation to coastal development or extractive activities that could impact *S. teuszii* habitat. This action could also include the design of sustainable funding mechanism using penalties or fines levied from infractions to support conservation measures.

4 Longer term activities

In addition to the short- to medium-term priorities listed above, the CCAHD has also identified some longer-term priorities for funding and action. The recommended longer-term activities include:

4.1 Biopsy sampling of *S. teuszii*: Biopsy sampling during field surveys could provide samples for genetic analysis, as well as other analyses into contaminant loads (through blubber analysis) and diet (through stable isotope analyses). Genetic samples can provide insight into the sex of identified individuals as well as kinship/relationships between sampled animals. Biopsying is considered an 'invasive' technique and *is not recommended without detailed consideration of animal welfare*, including some considerations more specific to *S. teuszii* than to many other delphinids (for example, their Critically Endangered status and the sensitivity of the species to disturbance). Consequently, a risk assessment and adoption of best practice protocols would be necessary and follow-up studies would be recommended to ensure that biopsied individuals do not suffer any negative effects. Additionally, permitting for biopsy campaigns may be complicated and time consuming in *S. teuszii* range states. It is considered prudent to collect more baseline data on the populations to be sampled through non-invasive techniques before embarking on biopsy sampling.

4.2 Implementation of trials for alternative fishing gears and practices in Conkouati-Douli National Park, Congo. Following the planned stakeholder re-engagement and recommended rapid bycatch risk assessment (for which partial funding is already available), the IWC BMI Expert Panel could collaborate with local partners to conduct controlled trials of gear and practices to reduce bycatch. These will be evaluated, and if successful, considered for replication in other locations in the *S. teuszii* range. Trials to reduce bycatch should also include identification of sustainable financing mechanisms and market-based incentive schemes that reduce reliance on one-off grants and external sources of funding.

4.3 Work with Government stakeholders to design, implement and sustain marine protected areas or other management measures that can eliminate or significantly reduce threats in *S. teuszii* core habitats. Eliminating or reducing threats is, of course, the ultimate goal of all of the above actions. Although MPAs are perceived as one of the most effective ways to safeguard dolphin habitat and eliminate threats, without effective management and enforcement, the designation of an MPA on paper can be less effective than other more targeted management measures that eliminate or reduce specific threats. However, management measures that are well-designed, with government buy-in and sustained funding for surveillance, enforcement and scientific monitoring, can be effective at reducing threats and protecting species.