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INTERNATIONAL WHALING COMMISSION

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INTRODUCTION

The coasts of Central Africa[1] are extensive and are subject to a wide range of anthropogenic pressures, ranging from large-scale urban development to areas with very few outward signs of human presence. Several regional capitals are located on the coasts, as are major ports, and in these areas coastal development is extensive and human population densities high. The region also hosts some of the least affected coastlines in the world where large tracts of wilderness border extensive beaches and mangroves. Terrestrial wildlife can be abundant in these areas and signs of human activity, including settlements, generally rare.

The region has poor infrastructure in general. Many coasts, even those that are relatively well inhabited, can be difficult to access and are correspondingly challenging for marine mammal survey campaigns, be they boat or beach based. This is particularly true for large expanses of the Congolese, Gabonese and Equatorial Guinea coasts; safe anchorages are few, and infrastructure (roads, fuel depots etc.) that can support marine and coastal work is limited. The effects of this are clear for data collection, and many regions remain 'gap' areas purely because they are hard to access without significant effort and support.

Technical capacity for marine mammal work is in general low, although there are active workers collecting basic data in some areas. Workers are typically associated with government agencies (national parks authorities for instance) or a range of local and international NGOs. Collected data includes sightings records that almost exclusively involve coastal species, or strandings records that involve a range of species, though typically those of inshore species. With the exception of sightings reported by protected species observers on offshore vessels, there have been very few dedicated surveys in offshore waters in general; strandings of offshore species are thus one of the few readily accessible means to confirm the presence of a suite of offshore species that are otherwise inaccessible.

Fisheries

The region is subject to range of fisheries types and fishing methods. Industrial fisheries are ever-present. Small-scale fisheries range in their sophistication and include those that utilize small (<5 m) hand paddled pirogues and simple gears (hook and line or small gillnets) to those that employ relatively large vessels (~10-12 m) and more elaborate gears (extensive gillnets, longlines and traps). Industrial fisheries include vessels that target inshore waters, particularly for shrimp and inshore fishes as well as large pelagic purse seiners. Cetacean bycatches have been recorded in most areas considered here. An absence of records reflects a general paucity of data for some areas, and given the distribution of gillnet fisheries across the region bycatches are suspected for most areas, even when not reported. This includes the problem of hidden bycatch (sensu Van Waerebeek et al., 2004; Leeney et al. 2015). Most marine mammals are protected by law across the region and general prohibitions on the capture of cetaceans has drastic effects on the reporting and discovery of bycatches.

Many of the more sophisticated gillnet fisheries are operated by expatriates, typically of Beninese, Togolese and Nigerian origin. Senegalese and Gambian fishermen also operate on an occasional basis in this region, though are typically associated with a larger 'support vessel' (mothership) that remains outside of territorial waters whilst smaller vessels are deployed to fish inshore. The impacts associated with these fisheries are poorly understood, but include records of bycatches and the secondary use of carcasses.

METHODS

The region of focus for this review includes the coasts of Central Africa, excepting those of Cameroon. Data are informative but generally sparse; records presented were collected sporadically and on a largely *ad hoc* basis across a ~17 year time span although also included are published records and additional reports that predate this period. Most records are not linked to dedicated field effort, though do partly reflect the periods and places focused on for fieldwork. An exception is the Republic of Congo where focused beach-based effort was completed across a seven year time span between 2009 - 2016. In many instances those reporting strandings or other events were engaged in other work. The beaches in Gabon for instance are a useful thoroughfare for researchers accessing

[1] 'Central Africa' as defined by the UN, includes Angola, Cameroon, the Central African Republic, Chad, Gabon, the Democratic Republic of the Congo, the Republic of the Congo, Equatorial Guinea and São Tomé and Príncipe.

coastal forests from a limited number of points of origin. Data quality is thus highly variable. Occasionally researchers had access to fresh captures and strandings that yielded excellent data collection opportunities. Other records are represented by a rough locality and (if lucky) images that serve to both confirm the species and occasionally provide evidence of the reasons for stranding.

RESULTS

A total of 113 records of cetacean strandings, bycatches and other mortalities (killer whale predation events, potential ship strike, direct hunts etc.) are currently available in a database maintained by the primary author. Records by country and species are summarised in Table 1.

English Common Name	**Angola**	**DRC**	**EG**	**Gabon**	**Congo**	**STP**	**Total**
Atlantic humpback dolphin				2	18		20
Atlantic spotted dolphin				2			2
Bottlenose dolphin		2		2	11		15
Bryde's whale				1			1
Cetacean					1		1
Common dolphin				3	4		7
Cuvier's beaked whale				2			2
Dwarf sperm whale						1	1
False killer whale				1		2	3
Humpback whale	1		3	16	9		29
Melon headed whale				1			1
Pantropical spotted dolphin						1	1
Risso's dolphin					1	1	2
Rough toothed dolphin				1			1
Sperm whale			1	4		4	9
Striped dolphin				1		1	2
Unidentified baleen whale				1	2		3
Unidentified dolphin	2			3	2		7
Unidentified whale				6			6
Total	**3**	**2**	**4**	**46**	**48**	**10**	**113**

Table 1: Records of species by country.

Although records are sparse they do confirm that bycatch is the most significant source of cetacean mortality in the Central African region, with bycatch diagnosed (n=41) or suspected (n=6) in 47 of cases (41.6% of all records) where the cause of death could be attributed (see Table 2). When a cause of mortality could be definitively assigned (i.e. removing unknowns from the calculation) bycatches represent 64.4% of the total.

	No Evidence of bycatch		Possible bycatch		Definite bycatch		Unknown		Total	
	Count	*Proportion*	*Count*	*Proportion*	*Count*	*Proportion*	*Count*	*Proportion*		
Angola	1	0.9%			2	1.8%			3	2.7%
DRC					2	1.8%			2	1.8%
Equatorial Guinea	2	1.8%					2	1.8%	4	3.5%
Gabon	15	13.3%	3	2.7%	3	2.7%	25	22.1%	46	40.7%
Republic of Congo	5	4.4%	3	2.7%	31	27.4%	9	8.0%	48	42.5%
São Tomé & Príncipe	3	2.7%			3	2.7%	4	3.5%	10	8.8%
Total	26	23.0%	6	5.3%	41	36.3%	40	35.4%	**113**	**100.0%**

Table 2: Evidence of bycatch by country

Datasets for Gabon and Congo are the largest and are instructive. There are clearly apparent differences in identified levels of bycatch, a difference likely linked to the quality of reporting and scale of effort. Inshore gillnet fisheries efforts are extensive in both states, although the coasts of southern Gabon are marked by the general

absence of inshore artisanal fisheries. In Gabon overt or suspected instances of bycatch are relatively rare, with only six confirmed or suspected instances recorded (5% of the Gabon total). In Congo the instance of overt or suspected bycatch is much higher, with 34 confirmed instances of bycatch, representing 30.1% of the total. Of these many were subsequently used by fishermen and others for secondary benefit, typically food, though other known and suspected uses include use of the meat for bait and trade (as trafficked and marketed wildmeat). Details of secondary uses are provided in Table 3 (see appendix).

Angola

Only three records are available in the database for Angola. This reflects the relatively short period of time the primary author spent working there, and the very limited geographic extent of this work. All data were collected during a handful of short field trips between 2007-2009 which focused exclusively on the Sereia Peninsula (the mouth of the Congo River on the Angolan side) and waters beyond. Of these records two are confirmed bycatch, and both were recorded during interview surveys in fishing villages on the Sereia Peninsula in 2008. Fishers described the occasional accidental capture of dolphins in their nets, stating that if it happened, they rarely caught one but several at once. They also claimed they never set nets that actively targeted dolphins, but captured dolphins were butchered at sea and the meat brought to shore. All respondents agreed that dolphin meat had a good taste.

Tissue from a dolphin captured accidentally was sampled the village of Libi in August 2008. Another dolphin, reported to have stranded, was also sampled in August 2008 at the nearby village of Bocolo. The former was most likely a common dolphin based on an assessment of the maxillae and palatines (see below). The latter was limited to the desiccated meat and ribs of a large dolphin found drying alongside fish on a rack. The size of the ribs discounted smaller species such as *Stenella sp.* or *Delphinus* and the respondents' descriptions suggest it may have been a bottlenose dolphin, or something of a similar size (including perhaps Atlantic humpback dolphin). This included a description of the inshore capture locality and the type of fish being targeted. Collected tissue samples for both remain stranded in Angola given the absence of an appropriate CITES process.

A partial rostrum from a suspected common dolphin stranding on the Sereia Peninsula, 2008. The presence of longitudinal palatine grooves and an appropriate toothcount were considered diagnostic.

The dessicated ribs of a large dolphin recorded at Bocolo on the Sereia peninsula in 2008. The size of the ribs and respondents descriptions suggest it was a large dolphin, perhaps a bottlenose.

Democratic Republic of Congo

Only two reports are currently available in the database from Democratic Republic of Congo. Both instances involved bottlenose dolphins and both were recovered dead from coastal gillnets and subsequently butchered. Information recorded during these events suggests that these events are more common that the data suggest. This includes the apparent ease with which animals were processed by local authorities (approvals were sought before they were butchered) and the efficiency with which carcasses were butchered and redistributed. All aspects of the carcass were utilised, including the head and intestinal tract.

The DRC maritime coastline is short (<40 km), and borders Cabinda (Angola) to the north and the Congo River estuary to the south, bordering in turn mainland Angola. Captures are of additional concern given that populations are likely shared with neighbouring states.

Bottlenose dolphin bycatch from the coastal town of Muanda from 2012. The animal was a subadult female (1.14 m).

The same dolphin following butchering, completed in part by researchers.

Equatorial Guinea

A total of four records are available in the database for Equatorial Guinea, although these include only a single recent capture of a humpback whale calf on Annobon, an area with an extensive history of humpback whale hunts.

Equatorial Guinea is one of the smallest states in Africa, yet boasts an extensive coastline and a large EEZ, principally associated with the islands of Bioko (Fernando Po) and Annobon (Pagalu). Data on cetacean bycatches, strandings and other mortalities are very few however, due in part to difficulties conducting fieldwork given years of relative isolation under a restrictive political regime. However some information is available, including records of strandings collected by researchers working with turtle conservation projects on the coasts of the mainland and Bioko Island (WCS and the Drexel University Bioko-Ureca project). Records also include published accounts of aboriginal whaling (Basilio, 1957, 1962; Aguilar, 1985), effectively summarised by Reeves (2002) who states:

"The whale hunt at the island of Pagalu in the Gulf of Guinea is of uncertain origin. It was presumably at least strongly influenced, if not directly introduced, by American (and other?) ship-based whalers in the 18th and 19th centuries (Aguilar, 1985). Successive episodes of commercial whaling in the Gulf of Guinea began in the 18th century and continued through 1959. This whaling centred on Humpback and Sperm Whales initially but came to involve the *Balaenoptera* species, starting in 1910 when modern operations began in the region. The 'aboriginal' whaling recorded by Aguilar (1985) was well established at Pagalu by 1885. Humpback calves were the main targets of this hunt. They were taken from small row boats, presumably using hand harpoons and lances. Aguilar (1985) guessed that the annual catch was three or fewer Humpbacks. He was able to confirm that whales were taken in the 1970s but had no definite information on the fishery post-1975. Recent surveys have shown Humpbacks to be common in the vicinity of Cap Lopez, Gabon, which is presumed to be a part of the same wintering ground that includes Pagalu (Walsh et al., 2000)."

The status of the hunt in the ~40 years between 1975 and 2016 is uncertain. It had however clearly resumed in 2017 and was documented in mobile phone video footage, a Youtube montage and a newspaper report describing the successful hunt.

Of the three other Equatorial Guinea records in the database, two are humpback whales and one a sperm whale. There is no evidence of bycatch or secondary use in three of these cases, but one humpback whale, stranded at Bata (the mainland coast) in August 2010, was rapidly butchered for its meat by an enthusiastic crowd (A. Fallabrino, pers comm). It appears that much of the animal was harvested, including the intestinal tract and pectoral fins, with onlookers collecting meat into a variety of containers (see below). It is worth noting that reported strandings of sub-adult and juvenile humpbacks whales increased in Central Africa in 2010, and is consistent with a similar increase reported in Brazil (Siciliano et al. 2011) and Western Australia (Coughran et al. 2013).

An adult humpback whale is butchered by an enthusiastic crowd in Bata, 2010. Images reveal a large crowd and a festive atmosphere.

All manner of receptacles were used to collect harvested meat, ranging from plastic bags and buckets to the suitcase pictured here.

A successful humpback whale hunt in November 2017. Here the harpooner hammers the top of a harpoon further into the calf.

The harpooner just prior to launching another harpoon into the calf. Images are stills captured from mobile phone video footage.

Gabon

Records for Gabon are the second most abundant in the database (n = 46) representing 40.7% of the total for the region. However only four of these were subsequently utilised by people for either food or other purposes (such as bait). The earliest record of secondary use was reported by Van Waerebeek and De Smet (1996) who described the live stranding, in July 1992, of a juvenile false killer whale at Cap Esterias, north of the capital Libreville. The animal was attended to for much of a day, before being refloated alive in the afternoon. It then apparently restranded a few hours later when it was killed and butchered for consumption (see image below).

A common dolphin was recorded captured by Beninese fishermen offshore of the town of Mayumba, southern Gabon, in 2005. The Beninese fishing communities of Gabon tend to be well resourced and equipped, using motorised pirogues and extensive gillnets, occasionally exceeding 2km in length. Common dolphins are frequently encountered off Mayumba, and although the catch was presumed accidental, we assume that captures are not uncommon, although cannot be confirmed.

A juvenile melon headed whale was also reported stranded in Mayumba National Park (southern Gabon) in 2011. No necropsy was performed but the melon of the carcass bore signs of butchery with a knife, likely post-mortem. The purpose is unknown, but its use for bait is suspected.

Also recorded is the mass stranding of a group of 30 Atlantic spotted dolphins in Port Gentil in 2012. The cause of the stranding was never confirmed although one had a distinct wound on its back that observers suspected to have been caused by a lance. Two others had rope attached, and it was presumed that this served to attach the dolphins to fishing boats. Twenty animals were refloated alive, with five later discovered dead on beaches.

An image of a stranded False killer whale published by Van Waerebeek and de Smet (1996)

A common dolphin captured accidentally in a gillnet by Beninese fisherman operating from the southern Gabonese town of Mayumba in 2005. The fishermen were reluctant about letting researchers assess the carcass, although several images, the skull and a sample were eventually secured. The carcass was completely utilised, with bones going to dogs, and little else wasted.

A juvenile melon headed whale recorded stranded in Mayumba NP in September 2011 (reported by S. Riettman during hippo research). The considerable wound to the melon was likely incurred post-mortem with a knife, suggesting secondary use, perhaps for bait.

Republic of Congo

Records for Congo are the most abundant in the database (n = 48), representing 42.5% of the total for the region. Of these 34 records are either confirmed (n=31) or suspected (n=3) bycatch. Secondary use of the animals was recorded in 30 of these records, or 88.2% of cases and the vast majority of these were either Atlantic humpback dolphins (n=18) or bottlenose dolphins (n= 7). Work completed in Conkouati Douli National Park provided some indication of the scale of bycatch. A programme of intensive monitoring, enforcement, and cooperative (incentivized) reporting, identified 19 dolphin bycatches across all artisanal landing sites (n=14) on a 60-km stretch of protected beach over 5 years of focal work. Of these, 10 were S. teuszii, and the testimony of fishermen showed that all were caught in gillnets less than 1 km from shore (Collins et al., 2013).

A bottlenose dolphin captured in a small coastal artisanal gillnet at the coastal village of Kondi, within Conkouati Douli National Park.

The animal was butchered and distributed by the fisherman who caught it. Those standing by include villagers and merchants who were subsequently stopped at the park control post attempting to transport smoked dolphin meat to Pointe Noire, the main coastal city.

The butchered carcass of a female Atlantic humpback dolphin captured in a coastal gillnet at the Conkouati lagoon mouth in December, 2011. The animal had been dismembered just before the arrival of researchers, and this animal later spurred the development of an incentivised reporting scheme.

The reassembled pelvis of the same dolphin, clearly showing mammary and genital slits. The meat was later distributed, but the head recovered for morphometric analysis.

The flensed carcass of a bottlenose dolphin encounters at Tchibota, Conkouati Douli National Park, in August 2008. Although impossible to confirm, researchers suspected that fishermen offshore captured and then flensed it before throwing the carcass back into the sea.

The carcass has been efficiently flensed with a knife. It is unlikely to have been the work of a coastal fisherman as some of the animal remains unutilised.

São Tomé and Príncipe

A total of ten records are available in the database for São Tomé and Príncipe (STP). As with other sites, records are generally limited to periods when other field effort was underway, typically that associated with cetacean or turtle survey work. Although records for STP are few, there are clear indications that cetacean bycatch is increasingly consumed for meat. Data from questionnaires (N = 98) with fishermen in 2012 and 2016 (Carvalho et al, unpublished data) indicated that in some communities on the north and west coast of the island of São Tomé there is an intentional dolphin harpoon capture for direct consumption and the sale of meat. Some fishermen bring dolphins caught accidentally in nets home to eat, others don't.

The stranded carcass of a striped dolphin recorded from Santana, Sao Tome, in 2012.

The animal was fresh, but had been butchered prior to the arrival of researchers.

A pantropical spotted dolphin captured in the Porto Alegre region, on the south coast of São Tomé, in 2013. The animal was caught in a net, the animal was brought onshore by the fishermen, and butchered for consumption

A juvenile sperm whale that stranded alive on Micondó beach, São Tomé, in 2013. It was killed by villagers and the meat divided into pieces for distribution and consumption in villages.

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	No evidence of use		*Non-targeted deliberate*		*Non-targeted salvage*		*Targeted acquisition*		*Unknown if used*		*Total*	
	Count	Proportion	Count	Proportion	Count	Proportion	Count	Proportion	Count	Proportion		
Angola	1	0.9%			2	1.8%					3	2.7%
Humpback whale	1	0.9%									1	0.9%
Unidentified dolphin					2	1.8%					2	1.8%
Democratic Republic of Congo					2	1.8%					2	1.8%
Bottlenose dolphin					2	1.8%					2	1.8%
Equatorial Guinea	2	1.8%	1	0.9%			1	0.9%			4	3.5%
Humpback whale	1	0.9%	1	0.9%			1	0.9%			3	2.7%
Sperm whale	1	0.9%									1	0.9%
Gabon	28	24.8%			4	3.5%			14	12.4%	46	40.7%
Atlantic humpback dolphin									2	1.8%	2	1.8%
Atlantic spotted dolphin	1	0.9%			1	0.9%					2	1.8%
Bottlenose dolphin									2	1.8%	2	1.8%
Bryde's whale	1	0.9%									1	0.9%
Common dolphin	1	0.9%			1	0.9%			1	0.9%	3	2.7%
Cuvier's beaked whale									2	1.8%	2	1.8%
False killer whale					1	0.9%					1	0.9%
Humpback whale	16	14.2%									16	14.2%
Melon headed whale					1	0.9%					1	0.9%
Rough toothed dolphin									1	0.9%	1	0.9%
Sperm whale	3	2.7%							1	0.9%	4	3.5%
Striped dolphin	1	0.9%									1	0.9%
Unidentified baleen whale									1	0.9%	1	0.9%
Unidentified dolphin	1	0.9%							2	1.8%	3	2.7%
Unidentified whale	4	3.5%							2	1.8%	6	5.3%
Republic of Congo	12	10.6%	2	1.8%	29	25.7%			5	4.4%	48	42.5%
Atlantic humpback dolphin					18	15.9%					18	15.9%
Bottlenose dolphin	3	2.7%	1	0.9%	6	5.3%			1	0.9%	11	9.7%
Cetacean									1	0.9%	1	0.9%
Common dolphin					3	2.7%			1	0.9%	4	3.5%

Humpback whale	7	6.2%	1	0.9%					1	0.9%	9	8.0%
Risso's dolphin					1	0.9%					1	0.9%
Unidentified baleen whale	1	0.9%							1	0.9%	2	1.8%
Unidentified dolphin	1	0.9%			1	0.9%					2	1.8%
São Tomé and Príncipe	5	4.4%	1	0.9%	2	1.8%			2	1.8%	10	8.8%
Dwarf sperm whale	1	0.9%									1	0.9%
False killer whale	2	1.8%									2	1.8%
Pantropical spotted dolphin					1	0.9%					1	0.9%
Risso's dolphin	1	0.9%									1	0.9%
Sperm whale	1	0.9%			1	0.9%			2	1.8%	4	3.5%
Striped dolphin			1	0.9%							1	0.9%
Total	**48**	**42.5%**	**4**	**3.5%**	**39**	**34.5%**	**1**	**0.9%**	**21**	**18.6%**	**113**	**100.0%**