

SC/66b/SM/01 Rev1

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INTERNATIONAL
WHALING COMMISSION

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ABSTRACT

Aquatic bushmeat can be defined as the products derived from wild aquatic megafauna (e.g., marine mammals) that are used for human consumption and other non-food uses (e.g., traditional medicine). It is obtained opportunistically (e.g., from bycatch or strandings) or from illegal or unregulated hunts. Most West African countries have used aquatic mammals as bushmeat. No reports (recent or otherwise) were found for some countries, however one should be cautious in concluding that aquatic bushmeat is not utilized in these locations. Moreover, although aquatic bushmeat is mostly obtained opportunistically and was likely originally taken for local consumption, in several countries directed catches occur, probably at unsustainable levels in some areas (e.g., in Nigeria thousands of small cetaceans are illegally hunted annually).

INTRODUCTION

Aquatic bushmeat can be defined as the products derived from wild aquatic mammals, birds and reptiles that are used for human consumption and other non-food purposes such as traditional medicines. It is obtained opportunistically (e.g., from bycatch or strandings) or from illegal or unregulated hunts. Although in most cases the practice likely began opportunistically for local consumption, in some countries it has evolved to include directed catches and has expanded to probably unsustainable levels.

This activity has previously been referred to as marine bushmeat by the IWC and the scientific community at large (e.g., Alfaro & Van Waerebeek, 2001; Clapham & Van Waerebeek, 2007). A recent document drafted by the Convention on Migratory Species (CMS) (CMS, 2016) introduces the term aquatic bushmeat instead, recognising that the issue extends beyond the marine realm. Accordingly, we adopt this term as river dolphins are also used as bushmeat (e.g., Flores et al., 2008).

We present here a literature review of the utilization of aquatic bushmeat obtained from small cetaceans (dolphins, porpoises and beaked whales) in West Africa. Most countries have utilized such bushmeat, encompassing 22 small cetacean species (Table 1). Of these, one species is listed in the IUCN red list as “vulnerable”, while 12 are listed as “data deficient”, therefore some of these species may actually qualify for a more threatened status. Additionally, many populations are considered threatened, despite the overarching

species being not considered thus. Moreover, the taxonomy of some species remains unclear and more species or populations with a threatened status may arise when the taxonomy of some species, such as *Tursiops*, is revised. All affected species are listed on at least Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) signifying that their status could be compromised by trade of their products. However, as CITES regulates only the international trade and aquatic bushmeat trade is typically domestic, the convention offers little protection in practice. However, most affected species are protected by national and regional regulations and some are included in the appendices of the Convention on Migratory Species (CMS) (Table 2). Additionally, most countries are signatories of international agreements, including RAMSAR, MARPOL, the Abidjan Convention and the Convention of Biological Diversity that provide indirect protection, and the CMS MoU on Western African Aquatic Mammals and the African Convention on the Conservation of Nature and Natural Resources (1968, revised in 2003).

No reports (recent or otherwise) were found for some countries. However, data is likely deficient in these areas due to a lack of research and reporting rather than an absence of bushmeat utilization. One should, therefore, take a precautionary approach and not assume that aquatic bushmeat utilization is absent.

ANGOLA

Brito and Vieira (2009) reviewed captures of small cetaceans in Angola during the 20th century. The authors reported that a mean of 20 individuals were captured annually, although it is not clear whether these captures were intentional or incidental. The meat obtained from these small cetaceans was consumed by the fishermen (Brito and Vieira, 2009). There are no recent reports of dolphin meat consumption in the Namibe Province (Weir *et al.*, 2009) or in Angola in general (Weir *et al.*, 2011).

BENIN

Information on cetaceans in Benin is virtually non-existent; in fact, Sohou *et al.* (2013) is one of the first dedicated articles in the literature. The authors found that at least nine cetacean species occur in Benin waters, some of which are occasionally consumed. For example, a bottlenose dolphin (*Tursiops truncatus*) was captured and consumed in Ayiguinnou in 2001, and a male Cuvier's beaked whale (*Ziphius cavirostris*) was captured in August 2011. It was also butchered and its meat shared among fishermen and locals (Sohou *et al.*, 2013).

CAMEROON

Bycatch of small cetaceans occurs regularly in Cameroon, particularly in the Douala area around the Wouri estuary (Ayissi and Jiofack, 2014). The meat from fresh carcasses and stranded individuals is used for human consumption (Ayissi *et al.*, 2011). Around 100 individuals are bycaught annually, although this total may be underestimated as hunting cetaceans is an illegal activity and fishermen may be afraid to report (Ayissi and Jiofack, 2014). The meat from small cetaceans is processed differently in Cameroon than in neighbouring countries; the bones remain attached to the meat even during the smoking process. As a result, bones are burned down, making it unlikely to find bony remains (i.e., evidence of dolphin captures and use) (Ayissi *et al.*, 2011). Dolphin meat is also used as bait for shark fishery, although the practice may be uncommon (Ayissi *et al.*, 2014).

Most dolphin species are intentionally or accidentally caught in gillnets, including humpback dolphins (*Sousa teuszii*) (Ayissi and Jiofack, 2014), as well as bottlenose and pantropical spotted dolphins (*Stenella attenuata*) (Ayissi *et al.*, 2011).

CAPE VERDE

The use of small cetaceans for human consumption and handicraft production in Cape Verde dates back several decades. Many species are exploited, including bottlenose dolphins and melon headed whale (*Peponocephala electra*) (Reiner *et al.*, 1996). For example, two mass strandings involving over 300 melon headed whales occurred in Boavista Island in November 2007. Some of the individuals were used for human consumption, and the rostra of at least five specimens were cut off to extract their teeth to manufacture jewellery for sale in local markets, such as tourist shops at Sal Rei (Van Waerebeek *et al.*, 2008). This also occurs when short finned pilot whales (*Globicephala macrorhynchus*) strand. Their teeth are extracted to produce souvenirs and their meat used for human consumption (Hazevoet *et al.*, 2010). Bones and skulls of small cetaceans in general are also used as decorations (Brito and Carvalho, 2013). Other species used for human consumption include common dolphins (*Delphinus* spp) (Robards and Reeves, 2011). Recent reports indicate that the use of stranded and bycaught dolphin carcasses still occurs, although there is no current evidence of directed hunt (Brito and Carvalho, 2013).

REPUBLIC OF CONGO

Little information on the use of dolphin carcasses exists for the Republic of Congo, although it is known that stranded and bycaught bottlenose and humpback dolphins in Conkouati-Douli National Park are sometimes butchered. Their meat is salted and sold in local and, occasionally, larger markets (Collins, 2012).

EQUATORIAL GUINEA

No reports, recent or otherwise were found on the use of small cetaceans in Equatorial Guinea.

GABON

Several cetacean species are known to be used for human consumption in Gabon, including common and bottlenose dolphins (Robards and Reeves, 2011) and false killer whale (*Pseudorca crassidens*) (Van Wearebeek *et al.*, 2009).

GHANA

Although up until the late 1980's dolphin meat was not considered edible by the general public in Ghana, that is no longer the case (Van Waerebeek and Ofori-Danson, 1999; Alfaro and Van Waerebeek, 2001). In fact, currently Ghana is one of the countries that captures most cetaceans in West Africa, both in terms of animals landed and the number of species caught (e.g., Robards and Reeves, 2011). Small cetaceans are obtained through directed hunts as well as bycatch. A total of 16 cetacean species are found in Ghanaian waters (Debrah *et al.*, 2010; Robards and Reeves, 2011). The most commonly landed species are Clymene (*Stenella clymene*), pantropical spotted and bottlenose dolphins. Other species include dwarf sperm whale (*Kogia sima*) and other unidentified delphinids (probably *Stenella* sp) (Van Waerebeek and Ofori-Danson, 1999).

The increase in wildlife hunting, both in Ghana and West Africa in general, is believed to be a direct consequence of fish stock declines (see Brashares *et al.*, 2004). Fishermen from Apam, Kpone and Jamestown indicate that all body parts are used, including the internal organs. The entire animal, bones attached, is hacked into small, individual portions and retailed with bones attached, which explains the lack of bony remains on beaches. Annual dolphin captures at each of these ports is estimated in the low hundreds (Van Waerebeek and Ofori-Danson, 1999). These authors recount an anecdote from 1994, when personnel who helped during a necropsy of a bottlenose dolphin later consumed the dolphin meat (Van Waerebeek and Ofori-Danson, 1999).

All fishermen interviewed at Apam confirmed regular catches of dolphins with up to ten animals landed in one day. Captures peak in September-October, probably due to the presence of sardines. Even in Winneba, where fishermen claimed not to land dolphins, a Clymene dolphin was recorded in September 1998 (Van Waerebeek and Ofori-Danson, 1999).

Dolphins are also landed as bycatch from fisheries that use drift gill-nets targeting sharks and purse seines targeting sardines and anchovies. Directed captures also occur, and the meat is often chopped to pieces and smoked before being sold for human consumption, particularly in western and central communities. In some cases the meat is used as shark bait (Van Waerebeek and Ofori-Danson, 1999; Van Waerebeek *et al.*, 2009; Ofori-Danson *et al.*, 2003; Weir *et al.*, 2008; Van Waerebeek *et al.*, 2009; Debrah *et al.*, 2010; Van Waerebeek *et al.*, 2014).

A study conducted between 1998 and 2000 in several communities along the coast reported evidence of regular dolphin catches in at least eight ports (Jamestown, Tema, Kpone, Apam, Winneba, Shama, Dixcove and Axim), where 58 individuals were landed between 1998 and 2000. The main season reported by these authors differs from that reported previously, being between June and September, which coincides with the herring season. Dolphins are processed rapidly, thus catch estimates are unreliable, being between few hundreds and the low thousands (Ofori-Danson *et al.*, 2003).

Small cetaceans were originally obtained as bycatch in the fishing industry, but are now a secondary target, at least in Apam, Dixcove and Axim. The income from these catches contributes to the economics of the artisanal fishery (Debrah *et al.*, 2010), consequently, intentional dolphin captures greatly increased over the years. A study conducted between October 2001 and October 2003, reported a minimum of 130 small cetaceans landed in Axim (Debrah *et al.*, 2010). While landings in Apam increased from 1.117 per month in the period 1995-1999 (13.4 per year), to 5.57 during 2001-2003, with at least 128 landings during the study period. Dixcove showed the highest capture rate consistent with previous studies (Ofori-Danson *et al.*, 2003), with 564 small cetaceans landed in the same period (~270 per year) (Debrah *et al.*, 2010).

Further, between January 2013 and February 2014, a minimum of 743 small cetaceans were landed at Dixcove. Landings occurred year round, and included adults as well as subadults, juveniles and several calves (Van Waerebeek *et al.*, 2014). This catch rate represents a daily estimate of 2.82 dolphins, which is almost a 400% increase since 2003 (Debrah *et al.*, 2010). The main season was again different to that reported in previous studies, being from November to January (Debrah *et al.*, 2010; Van Waerebeek *et al.*, 2014).

There is currently no legal impediment to sales of dolphin meat, which not only constitutes a conservation threat, but also could impact human health given the levels of platinum group metals (PGMs) found in dolphin meat sampled in Dixcove (Essumang, 2008). Moreover, there is no national management programme in place or abundance estimate for any dolphin species (Debrah *et al.*, 2010; Robards and Reeves, 2011; Weir and Pierce, 2013; Van Waerebeek *et al.*, 2014).

GUINEA

Van Waerebeek *et al.* (2004) and Bamy *et al.* (2010), both provide information about small cetaceans being captured and consumed during 2002. The first was a male Atlantic humpback dolphin landed in March in the Bay of Sangaréah, (north of Conakry); and the second an adult female pygmy sperm whale (*Kogia breviceps*) captured in May off Tanene (landed south of Conakry)

GUINEA-BISSAU

In a study conducted in November 2012 (Leeney *et al.*, 2015) 259 fishermen were interviewed along the coast of Guinea-Bissau. Nearly 42% admitted bycatching a dolphin at least once and 67% said that other fishermen accidentally capture dolphins. Most fishermen agreed that if are found alive, they are usually released, but if they are found dead or die during the process, most dolphins are consumed locally. The price of dolphin meat does not seem to be high enough for fishermen to risk being seen landing a dolphin (Leeney *et al.*, 2015).

Other uses of dolphin carcasses include traditional ceremonies, for example in connection with the *grandesa* ceremony, which marks the progression of individuals through the social ranks of the village, and *fanado* (circumcision). Certain body parts and oil are also used for medicinal purposes. For instance, oil extracted from the head or skin is used to treat broken bones and stomach ache, or is prepared as soup to treat armorodia (weakness and lack of energy) (Leeney *et al.*, 2015).

IVORY COAST

Although marine mammal captures are illegal in the Ivory Coast, Maigret (1994) indicated that dolphins were occasionally consumed.

LIBERIA

No reports, recent or otherwise, were found to substantiate whether small cetaceans are hunted or exploited for food and/or bait in Liberia.

MAURITANIA

Evidence suggests that dolphin meat is consumed in Mauritania, at least occasionally (Van Waerebeek *et al.*, 2004).

NIGERIA

Dolphins of unknown species are regularly captured on Brass Island off the Niger Delta (Uwagbae and Van Waerebeek, 2010). Based on interviews, it is estimated that between two to five individuals are caught every one or two weeks. Dolphins are captured using nets, and (even when found alive) are butchered and their meat used for human consumption (Uwagbae and Van Waerebeek, 2010).

The most commonly affected species are the bottlenose dolphins, followed by Clymene, rough-toothed (*Steno bredanensis*) and pantropical spotted dolphins (Uwagbae and Van Waerebeek, 2010; Lewison, 2012). Other species include Atlantic spotted (*Stenella frontalis*) and spinner dolphins (*Stenella longirostris*), *Kogia* spp, Atlantic humpback, striped (*Stenella coeruleoalba*) and Fraser's dolphins (*Lagenodelphis hosei*), Gervais' beaked whale (*Mesoplodon europaeus*), Risso's dolphins (*Grampus griseus*), killer whale (*Orcinus orca*), pygmy killer whale (*Feresa attenuata*), and common dolphins (Lewison, 2012). Most cetaceans are caught in gillnets (Uwagbae and Van Waerebeek, 2010; Lewison, 2012).

A more recent study reports only incidental catches, although the fate of the animal continues to be local consumption and trade. The annual catch estimate is around 10,000 dolphins, although these numbers may be either over or underestimated as they are based on interviews (Lewison, 2012).

SENEGAL

The occasional captures of Atlantic humpback dolphins for human consumption have been reported for many decades in Senegal (see Van Waerebeek *et al.* 2004 and Van Waerebeek *et al.*, 2008). Earlier studies (e.g.,

Maigret 1994) reported an average of two or three dolphins caught per month in purse seines, with an estimate of no more than 100 dolphins caught annually in the artisanal fishery, most of which were butchered and consumed by fishermen. Species affected include bottlenose, common and *Stenella* dolphins (Maigret, 1994).

Since dolphins were protected in 1987, landings have not been made openly but dolphin meat has continued to be traded (Van Waerebeek *et al.*, 1998; Alfaro and Van Waerebeek, 2001). Bycaught individuals are used as bait in the cephalopod fishery in central Senegal (from ports Joal-Fadiouth and Palmarin) and for human consumption in South of Senegal (Sine-Saloum Delta) (Van Waerebeek *et al.*, 1998; Leeney *et al.*, 2015).

SIERRA LEONE

Maigret (1994) made reference to the local consumption of entangled 'porpoises' that were found dead, although it seemed to be an infrequent event (once or twice per year).

THE GAMBIA

Murphy *et al.* (1997) as well as Alfaro and Van Waerebeek (2001) suggested that the exploitation of small cetaceans in The Gambia occurs on a minor scale, and it is intended mainly for human consumption, although neither provided further details.

In a study conducted in September and November 2007 a total of 79 fishermen were interviewed, 32% of whom admitted to have bycaught a dolphin at least once, while 57% said that they know of other fishers who capture dolphins accidentally. Additionally, 59% had consumed dolphin meat at least once. Dolphin meat is also used to treat polio, and bone pain as well as other illnesses, while the oil is used to treat rheumatism or couli (the Wolof name for a dermatological condition) (Leeney *et al.*, 2015).

TOGO

Alfaro and Van Waerebeek (2001) mentioned evidence of the use of dolphin meat for human consumption in Togo, although no details were provided. Segniagbeto *et al.* (2014) reported a pygmy sperm whale landed at Agblogamé, near Lomé, on March 2012, that was probably captured in a drift gillnet, and was retained for human consumption. This also constituted the first record of the species in the Gulf of Guinea (in fact, there are no records of live *Kogia* sp in the area). Small cetaceans are reportedly landed at Lomé harbour where they are butchered and sent to other localities, such as Katanga (Segniagbeto *et al.*, 2014).

Table 1: Small cetacean species that are or have been used as bushmeat in West Africa, and their protection status on the Red list of International Union for Conservation of Nature (IUCN), and the appendices of the Convention on Migratory Species (CMS) and the Convention on International Trade of Endangered Species (CITES). VU = Vulnerable, DD = Data Deficient, NT = Near Threatened, LC = Least Concern.

Scientific name	Name	IUCN red list	CITES	CMS
<i>Delphinus capensis</i>	Long-beaked common dolphin	DD	II	-
<i>Delphinus delphis</i>	Short-beaked common dolphins	LC	II	-
<i>Feresa attenuata</i>	Pygmy killer whale	DD	II	-
<i>Globicephala macrorhynchus</i>	Short-finned pilot whales	DD	II	-
<i>Globicephala melas</i>	Long-finned pilot whales	DD	II	-
<i>Grampus griseus</i>	Risso's dolphins	LC	II	-
<i>Kogia breviceps</i>	Pygmy sperm whale	DD	II	-
<i>Kogia simus</i>	Dwarf sperm whale	DD	II	-
<i>Lagenodelphis hosei</i>	Fraser's dolphin	LC	II	-
<i>Mesoplodon europaeus</i>	Gervais' beaked whale	DD	II	-
<i>Orcinus orca</i>	Killer whale	DD	II	-
<i>Peponocephala electra</i>	Melon-headed whale	LC	II	-
<i>Pseudorca crassidens</i>	False killer whale	DD	II	-
<i>Sousa teuszii</i>	Atlantic humpback dolphin	VU	I	I/II
<i>Stenella attenuata</i>	Pantropical spotted dolphin	LC	II	II
<i>Stenella clymene</i>	Clymene dolphin	DD	II	-
<i>Stenella coeruleoalba</i>	Striped dolphin	LC	II	-
<i>Stenella frontalis</i>	Atlantic spotted dolphins	DD	II	-
<i>Stenella longirostris</i>	Spinner dolphin	DD	II	-
<i>Steno bredanensis</i>	Rough-toothed dolphins	LC	II	-
<i>Tursiops truncatus</i>	Bottlenose dolphin	LC	II	-
<i>Ziphius cavirostris</i>	Cuvier's beaked whale	LC	II	-

Table 2: non-exhaustive list, per country, of local, regional and international agreements [it works as a catch-all] that protect cetaceans in Latin America, as well as dates of adherence to the Convention on Migratory Species (CMS), Convention on International Trade of Endangered Species (CITES) and International Whaling Commission (IWC).

COUNTRY	CMS	CITES	IWC	LEGISLATION
ANGOLA	2006	2013	-	2004 - Aquatic Biological Resources Law 6-A/04 (cetaceans are protected under article 71) Included in Appendix I of the Hunting Law (fully protected)
BENIN	1986	1984	2002	1993 - Law No. 93-011 of 3 August - Regulates hunting and ecotourism.
CAMEROON	1983	1981	2005	1994 - Law No. 94/01 of 20 January 1995 - Decree No. 95/466/PM of 20 July
CAPE VERDE	2006	2005	-	2002 - Decree 7/2002 - Conservation and protection measures for fauna and flora species. 2015 - Resolution No. 50/2015 National Plan for Cetacean Conservation.
REPUBLIC OF CONGO	2000	1983	2008	<i>Signatory of international agreements</i>
EQUATORIAL GUINEA	2010	1992	-	<i>Signatory of international agreements</i>
GABON	2008	1989	2002	<i>Signatory of international agreements</i>
GHANA	1988	1975	2009	1971 - Wildlife Conservation Regulations LI. 685 - Provides protection for cetaceans, however, there are no explicit instructions concerning its use when bycaught. 2010 - Fisheries Regulations L.I. 1968, Art. 17: fishing of marine mammals is prohibited without written approval from Fisheries Commission.
GUINEA	1993	1981	2000	1985 - Ordinance 038/PRG/85 marine fisheries (Art. 34: it is prohibited to hunt and catch marine mammals).
GUINEA-BISSAU	1995	1990	2007	2008 - CMS MoU on Western African Aquatic Mammals.
IVORY COAST	2003	1994	2004	<i>Signatory of international agreements</i>
LIBERIA	2004	1981	-	<i>Signatory of international agreements</i>
MAURITANIA	1998	1998	2003	<i>Signatory of international agreements</i>
NIGERIA	1987	1974	-	1985 - 'Endangered Species (Control of International Trade and Traffic) Act'
SENEGAL	1988	1977	1982	1987 - Decree No. 87-1044 - Definition of protected animals prohibits the capture, catch and selling of any cetacean species

				2015 - Law 2015-18 marine fisheries management - Prohibits cetacean takes.
SIERRA LEONE	Non-party	1994	-	1994 - Fisheries (Management and Development) Decree - prohibits cetacean takes.
THE GAMBIA	2001	1977	2005	<i>Signatory of international agreements</i>
TOGO	1996	1978	2005	1998 – Law 98-012, Art 13, Chapter 2 – prohibits to kill, injure or hunt mammals or other protected animals in the waters under Togolese jurisdiction. 2008 - Environmental Law 2008-005 Art 62: Endemic animal and plant species, rare or endangered species and their natural habitats are subject to a higher level of protection.

ACKNOWLEDGEMENTS

MC would like to thank the Animal Welfare Institute for providing financial support to develop this manuscript, and to attend the IWC meeting.

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