



The Utilization of Aquatic Bushmeat from Small Cetaceans and Manatees in South America and West Africa

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

Keywords: small cetaceans, manatees, hunting, bycatch, food, bait

INTRODUCTION

Products derived from marine mammals, particularly cetaceans, that are used for food, bait or cash have been termed “marine bushmeat” by the scientific community (e.g., Alfaro and Van Waerebeek, 2001; Clapham and Van Waerebeek, 2007). Here, we adopt the term “aquatic bushmeat” as recently defined by the Convention on the Conservation of Migratory Species of Wild Animals (CMS) as the products sourced from wild aquatic megafauna (e.g., marine mammals, including riverine species) that are used for human consumption and other non-food purposes including traditional uses. Aquatic bushmeat is obtained through illegal or unregulated hunts as well as from stranded (dead or alive) and/or bycaught animals (CMS, 2016).

A thorough literature search of published and unpublished materials available online was conducted in English, Spanish, and French. The search included videos, news, and local organization websites. Additionally, the marine mammal community was approached via the mailing list MARMAM. Further information was also obtained by contacting individual authors and organizations.

Our findings suggest that aquatic mammal utilization as bushmeat is still common in many countries in America and Africa, reaching unsustainable levels in some areas. Here we present a brief literature review of the utilization of aquatic bushmeat from small cetaceans (dolphins, porpoises and beaked whales) and manatees in South America and West Africa.

WEST AFRICA

There is no evidence of organized manatee exploitation in **Benin** although killing a manatee is an important event in a fisherman's life (Rihanath Olga and Tchiboza, 2008). Meat and body parts are used, *inter alia*, for food, therapeutic purposes and traditional ceremonies (Tchiboza, 2002; Dossou-Bodjrenou et al., 2004). Information on cetaceans in Benin is virtually non-existent. Sohou et al. (2013) is one of the only dedicated articles in the literature. The authors recorded the existence of at least nine cetacean species, some of which are occasionally consumed (Sohou et al., 2013).

The use of small cetaceans for human consumption and handicraft production in **Cape Verde** dates back several decades (Reiner et al., 1996). Products obtained opportunistically (e.g., from mass strandings) are used for food, handicrafts and decorations (Reiner et al., 1996; Hazevoet et al., 2010; Van Waerebeek et al., Unpublished). 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).

Manatees are widely and illegally hunted by fishermen in **The Gambia** for food and traditional medicine (Powell, 1996; Jallow, 2008). Exploitation of small cetaceans may occur on a minor scale, mainly for food (Murphy et al., 1997; Alfaro and Van Waerebeek, 2001) but also for medicinal uses (Leeney et al., 2015).

Although the general public in **Ghana** did not consider dolphin meat edible until the late 1980s, that is no longer the case (Van Waerebeek and Ofori-Danson, 1999; Alfaro and Van Waerebeek, 2001). In fact, captures of cetaceans in Ghana are currently among the highest in West Africa, both in terms of animals landed and the number of species caught (e.g., Robards and Reeves, 2011). Small cetaceans were originally obtained as bycatch, however, direct catches now occur, at least in Apam, Dixcove, and Axim, where landing rates have greatly increased since the mid-1990s. For example, landings in Apam increased from 1.117 per month in the period 1995–1999, to 5.57 between 2001 and 2003 (Ofori-Danson et al., 2003; Debrah et al., 2010). Further, between January 2013 and February 2014, a minimum of 743 small cetaceans were landed at Dixcove alone, which represents an increase of almost 400% since 2003 (Debrah et al., 2010; Van Waerebeek et al., 2014). The entire animal, bones attached, is hacked into small, individual portions for sale, which explains the lack of bony remains on beaches (Van Waerebeek and Ofori-Danson, 1999). All body parts are used, including the internal organs, both for food and as bait (Ofori-Danson et al., 2003; Weir et al., 2008; Van Waerebeek et al., 2009, 2014; Debrah et al., 2010; Robards and Reeves, 2011;

Weir and Pierce, 2013). Manatees hold different values between communities, some of which hunt them for food (Powell, 1996; Amlalo, 2008) while others kill them for bait (Ofori-Danson et al., 2008).

Some cultures in **Guinea** hunt manatees; their meat is typically consumed within the hunter's family, or shared between fishermen and hunters from the village, and their oil and bones are used for medicinal purposes (Powell, 1996; Keita, 2002; Richard et al., 2008). There is little evidence of small cetaceans being used as bushmeat (Van Waerebeek et al., 2004; Bamy et al., 2010).

Manatee hunting is probably declining in **Guinea-Bissau**, although incidental captures are currently the main threat (Sa et al., 2008). Products are used for food and other purposes (Powell, 1990; Silva et al., 1998; Silva and Araújo, 2001). Bycaught dolphins are also consumed locally and used in traditional ceremonies and for medicinal purposes (Leeney et al., 2015).

Manatees were heavily hunted in **Ivory Coast** in the 1980s and illegal hunting by specialized hunters continues (Powell, 1996; Perrin, 2001; Kouadio, 2008). Some communities hunt manatees for food. For example, the Ahizi consider manatee hunters heroes, although they are allowed to only kill three manatees during their lives. There are no recent reports of small cetaceans being used as bushmeat (Maigret, 1994).

Manatees have been hunted in **Liberia** for many decades, and probably to this day, using harpoons and guns (Robinson, 1971; Wiles and Makor, 2008).

In **Mali** manatees were hunted using a variety of methods for food and medicinal purposes, although hunting is currently uncommon (Powell, 1996; Perrin, 2001; Kienta et al., 2008).

There is little evidence for small cetacean bushmeat in **Mauritania** (Van Waerebeek et al., 2004) and no reports were found of the use of manatees as bushmeat.

Manatees are illegally hunted in **Niger**, along the Niger River, including for traditional ceremonies during the annual Sorko celebration. Their meat and other body parts are sold in markets (Malam Issa, 2008; Abbagana, 2013).

Nigeria appears to be one the largest consumers of small cetacean bushmeat in West Africa, with recent annual catches (both accidental and intentional) estimated at 10,000 dolphins (Lewison and Moore, 2012). Dolphins are captured using nets and, even when found alive, are butchered for human consumption (Uwagbae and Van Waerebeek, 2010). Manatee hunting was intensive in the past (Henshaw and Child, 1972; Sikes, 1974; Maigret, 1994; Angelici et al., 2001) and continues today for consumption and medicinal purposes despite a decline in the manatee population (Adeola, 1992; Maigret, 1994; Perrin, 2001; Oboto, 2002; Fa et al., 2006; Awobamise, 2008).

In **Senegal**, Atlantic humpback dolphins (*Sousa teuszii*) have been consumed opportunistically since the 1990s (Maigret, 1994; Van Waerebeek et al., 2004, 2008). Dolphin meat continues to be illegally traded as food and bait in the cephalopod fishery (Van Waerebeek et al., 1997a; Leeney et al., 2015). Manatees were caught historically (Maigret, 1994; Van Waerebeek et al., 1997a), on a scale that brought the population almost to extinction (Perrin, 2001). When incidental captures occur today, the meat is consumed and the oil used for medicinal purposes (Maigret,

1994; Powell, 1996; Van Waerebeek et al., 1997a; Diop, 2006; Ba et al., 2008).

Manatees have been hunted with nets and harpoons in **Sierra Leone** at least since the 1980s (Reeves et al., 1988), and exploitation likely continues (Siaffa and Jalloh, 2008). Additionally, rice farmers see manatees as pests and use traps to catch them (Reeves et al., 1988). Virtually the entire body is used (Maigret, 1994; Powell, 1996; Perrin, 2001; Siaffa and Jalloh, 2008). There is only little evidence of small cetacean bushmeat (Maigret, 1994).

In **Togo**, manatees are illegally hunted for their meat, which is sold and consumed locally and used in traditional medicine and ceremonies (Segniabeto et al., 2008). Small cetaceans obtained from opportunistic and intentional captures are landed at Lomé harbor, where they are butchered and sent to other localities (Alfaro and Van Waerebeek, 2001; Segniabeto et al., 2014).

SOUTH AMERICA

In **Argentina**, bycaught porpoise and dolphin species were used for human consumption in the past (Crespo et al., 1994; Goodall et al., 1994; Ott et al., 2002; Robards and Reeves, 2011).

In **Bolivia**, botos are accidentally caught in fishing nets; their meat is used as bait or consumed by indigenous groups, and their oil used as medicine (Aliaga-Rossel, 2002; Trujillo et al., 2010, 2013; Robards and Reeves, 2011). No reports of manatee bushmeat were found.

Small cetaceans obtained opportunistically off the Atlantic coast of **Brazil** are used for food, bait, medicine and handicrafts (Siciliano, 1994; Ott et al., 2002; Alves and Rosa, 2008; Tosi et al., 2009; Oliveira de Meirelles et al., 2010; Trujillo et al., 2010). In the Brazilian Amazon River basin botos (*Inia* spp.) are illegally hunted for their meat to use as bait for fishing the scavenger catfish (*Calophysus macropterus*) known as *piracatinga* in Brazil, *mota* in Colombia, *simi* in Peru and *mapurite* in Venezuela (Flores et al., 2008; Gómez et al., 2008; Trujillo et al., 2010; Pinto de Sá Alves et al., 2012). The effect of these hunts is unknown as there are no available abundance estimates for river dolphins in their distribution range (Botero-Arias et al., 2014; Salinas et al., 2014). Evidence, however, suggests that some boto populations may be impacted; for example, da Silva et al. (2011) found a 10% annual reduction of boto abundance in a well-studied population, since 2000. It is estimated that 1650 dolphins are caught annually near Tefé alone (in Central Amazon), but a large number of other towns and villages in the Amazon target *piracatinga* using dolphin products as bait (da Silva and Martin, 2007; da Silva et al., 2011).

The West Indian (*Trichechus manatus*) and the Amazonian manatees (*Trichechus inunguis*) are present in Brazil (UNEP, 2010). They were hunted historically for their skin for making leather products (Domning, 1982). Today manatees are harvested for food and other uses (Lima et al., 1992; UNEP, 2010; Gómez et al., 2012; Franzini et al., 2013). At least 32 manatee hunters were active in 2014 (de Souza et al., 2014).

Over 7600 dolphins were killed for bait in the *centolla* King crab (*Lithodes santolla*) fishery in southern **Chile** between

1976 and 1979. Laws were adopted to protect dolphins but enforcement was poor (Cárdenas et al., 1987; Aguayo et al., 1998; Altieri and Rojas, 1999). The decline of crab abundance, the use alternative baits and other factors greatly reduced illegal hunts in the 1990s (Lescrauwaet and Gibbons, 1994; Van Waerebeek et al., 1997b). Small cetaceans were also killed in central Chile (Van Waerebeek et al., 1999) in the 1970s for bait in the longline fishery (Aguayo et al., 1998) and, although recent reports are scarce, in 2014 local fishermen were arrested for fileting a dolphin. Dolphins caught intentionally in Northern Chile in the 1970s–1980s were used for food and bait (see Aguayo et al., 1998).

In the **Colombian** Amazon, boto, and, rarely, tucuxi (*Sotalia fluviatilis*) dolphins have been hunted since the late 1980s at least (Beltrán and Trujillo, 1992). Body parts are used as aphrodisiacs and amulets, and their oil for medicinal uses (see Trujillo et al., 2010). However, the main use of botos is as bait to fish “*mota*” (Trujillo et al., 2011; Salinas et al., 2014). On the Pacific coast, hunts for dolphins for bait became common by 1990 (Vidal et al., 1994; Ávila et al., 2008). Mother-calf pairs were frequently targeted (Ávila et al., 2008). Evidence suggests directed hunts still occur (Flórez-González and Capella, 2010). West Indian manatees were heavily exploited in the 18th and 19th Centuries (Mancera Rodríguez and Reyes García, 2008), with bombs and nets used (Lima et al., 1992). Although directed hunts are uncommon, manatees are still targeted for food, for their leather to make whips, and for other purposes (Romero and Creswell, 2005; Arévalo-González et al., 2010; Cruz-Antía and Gómez, 2011; UNEP, 2010; Fundación Natütama, 2013; Kiszka, 2014).

In **Ecuador**, indigenous Amazonian tribes, such as the Siona, traditionally exploited Amazonian manatees for subsistence (Timm et al., 1986) and non-food uses. Recent reports suggest hunting still occurs (Denkinger, 2010; Brice, 2014). No reports of small cetacean bushmeat were found.

Native Americans in **French Guiana** historically hunted West Indian manatees for private consumption or for religious traditions (Spiegelberger, 2002), although the practice is now uncommon (Romero and Creswell, 2005; UNEP, 2010). Dolphins were occasionally harpooned for fish bait in the past (Vidal et al., 1994).

In **Guyana** there is probably no organized hunting of West Indian manatees, although they may be taken opportunistically (UNEP, 2010). No reports of small cetacean bushmeat were found.

The greatest exploitation of small cetaceans in South America occurs in **Peru**, where they have been intentionally and incidentally caught in fishing nets for several decades: an estimated 10,000 dolphins were landed annually in the 1980s (Read et al., 1988; Van Waerebeek and Reyes, 1990, 1994a). Harpooning was once opportunistic (Read et al., 1988), but became common toward the 1990s. Some fishermen also used dynamite to provoke dolphin “stampedes” into set gillnets (Van Waerebeek and Reyes, 1990). Dolphin meat was sold in local food markets, but most animals were shipped to Lima (Read et al., 1988).

Although hunting and trading of small cetaceans was banned in Peru in 1990, captures continued (Van Waerebeek et al., 1999, 2002; Majluf et al., 2002; Reyes et al., 2002; García-Godos,

TABLE 1 | Small cetacean and manatee species that are or have been used as bushmeat in South America and West Africa.

Scientific name	Name	IUCN red list	CITES	CMS
CETACEANS				
<i>Cephalorhynchus commersonii</i>	Commerson's dolphins	DD	II	
<i>Cephalorhynchus eutropia</i>	Chilean dolphin	NT	II	
<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>Inia boliviensis</i>	Boto	DD	II	II
<i>Inia geoffrensis</i>	Boto	DD	II	II
<i>Kogia breviceps</i>	Pygmy sperm whale	DD	II	
<i>Kogia sima</i>	Dwarf sperm whale	DD	II	
<i>Lagenodelphis hosei</i>	Fraser's dolphin	LC	II	
<i>Lagenorhynchus australis</i>	Peale's dolphin	DD	II	II
<i>Lagenorhynchus obscurus</i>	Dusky dolphin	DD	II	II
<i>Lissodelphis peronii</i>	Southern right whale dolphins	DD	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>Phocoena dioptrica</i>	Spectacle porpoise	DD	II	
<i>Phocoena spinipinnis</i>	Burmeister's porpoise	DD	II	II
<i>Pontoporia blainvillei</i>	Franciscana	VU	II	II
<i>Pseudorca crassidens</i>	False killer whale	DD	II	
<i>Sotalia fluviatilis</i>	Tucuxi	DD	I	II
<i>Sotalia guianensis</i>	Guiana dolphin	DD	I	II
<i>Stenella attenuata</i>	Spotted dolphin	NT	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	
SIRENIA				
<i>Trichechus inunguis</i>	Amazonian manatee	VU	I	II
<i>Trichechus manatus</i>	West Indian manatee	VU	I	I/II
<i>Trichechus senegalensis</i>	West African manatee	VU	I	I/II

VU, Vulnerable; DD, Data Deficient; NT, Near Threatened; LC, Least Concern; IUCN, International Union for Conservation of Nature; CMS, Convention on Migratory Species; CITES, Convention on International Trade of Endangered Species.

2007; Mangel et al., 2010; Mangel, 2012) and by 1993 the annual estimated catch was 15,000–20,000 dolphins, exceeding the previous, legal, hunt (Van Waerebeek and Reyes, 1994b). In the late 1990s, dolphin products started to also be used as shark bait (Van Waerebeek et al., 1999). The annual catch estimate increased in the 2000s as products from harpooned and bycaught dolphins were also sold in local food markets and consumed onboard fishing vessels or at home. The use as bait has rapidly expanded and incidental and directed catches still occur (Tzika et al., 2010), as well as butchering of live stranded animals (García-Godos and Cardich, 2010).

Amazonian manatees are hunted in Peru to this day despite legal protection. Currently, however, they are mainly bycaught. Their meat is consumed (Reeves et al., 1996; Hidalgo Taricuarima, 2010) and skin, fat, and bones are occasionally used for medicinal purposes (Reeves et al., 1996; Elcacho Rovira, 2013; Silva et al., 2014). They are also captured alive to be “grown” for consumption, kept as pets, or even to be displayed in restaurants (Perea-Sicchar et al., 2011).

In **Venezuela**, the use of dolphins for bait and food has increased significantly since the 1970s (Vidal et al., 1994), with the Government even considering their commercial exploitation

for food in the 1990s (Romero et al., 1997). Current removals (intentional and incidental) are estimated at 1000 animals annually (Robards and Reeves, 2011). Body parts are also used by some indigenous communities for religious events and medicinal purposes (Romero et al., 1997; Trujillo et al., 2010). West Indian manatees have been exploited for food, fuel, medicine, leather and cooking oil (PNUMA, 1995), since pre-Columbian times (Mondolfi, 1974; Romero and Creswell, 2005; UNEP, 2010) and manatee meat was found in markets until relatively recently (O'Shea et al., 1988). Some animals are also live captured for public display (UNEP, 2010).

CONCLUSIONS

In most South American and West African countries aquatic mammals are or have been used as bushmeat, encompassing at least 33 small cetaceans and all manatee species. Although in most cases the practice likely began opportunistically for local consumption, in some countries it has evolved to include directed catches and may have expanded to unsustainable levels.

Of the 33 small cetacean species recorded in this study, two are listed in the International Union for Conservation of Nature (IUCN) red list as “near threatened” and two as “vulnerable,” as are all manatee species. Additionally, 22 cetacean species are listed as “data deficient,” therefore some may also be at risk. Moreover, many populations are considered threatened, while the species is not. All these species are listed on the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) appendices signifying that their status could be compromised by trade of their products. However, as CITES regulates only international trade and aquatic bushmeat trade is typically domestic, the treaty offers little protection. Additionally, some species are included in the appendices of the Convention

on the Conservation of Migratory Species of Wild Animals (CMS; **Table 1**) and most countries have domestic regulations that provide partial or full protection.

No recent information was found of the use of aquatic mammals for bushmeat in Uruguay, the Island of Saint Helena and São Tomé and Príncipe, after Robards and Reeves (2011). No reports were found for Suriname and Burkina Faso. The absence of information on aquatic bushmeat (recent or otherwise) is probably due to a lack of research and reporting rather than the non-existence of such use. A precautionary approach is recommended, and the absence of evidence should not be interpreted as evidence of absence. Moreover, despite legal protection, the use of small cetaceans and manatees for aquatic bushmeat appears to be growing.

Marine mammals are especially susceptible to exploitation due to low reproductive rates and the many other threats they face, including noise pollution and climate change (Perrin et al., 2009). An increase in knowledge and better understanding of the aquatic bushmeat issue is needed in order to implement local and international management programs for the effective monitoring and mitigation of unsustainable and illegal hunting and use of aquatic mammals. The work of the IWC Scientific Committee's Marine Bushmeat Intersessional Working Group, including holding dedicated regional workshops and formal liaison with other international bodies, such as CMS and the Convention on Biological Diversity (International Whaling Commission, 2016), is expected to provide a helpful contribution.

AUTHOR CONTRIBUTIONS

AC was responsible for researching related literature and preparing a first draft. SF was responsible for the general idea and from the first draft on, she contributed to editing.

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