Biodiversity and Status of Cetaceans in Benin, West Africa: an Initial Assessment

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Abstract

No published literature is available on the whales and dolphins of Benin. A first insight in the cetacean biodiversity based on stranding, capture and sighting records, as well as a preliminary assessment of status, is provided. Seven species were authenticated: humpback whale *Megaptera novaeangliae*, common bottlenose dolphin *Tursiops truncatus*, Atlantic spotted dolphin *Stenella frontalis*, false killer whale *Pseudorca crassidens*, short-finned pilot whale *Globicephala macrorhynchus*, Cuvier's beaked whale *Ziphius cavirostris* and sperm whale *Physeter macrocephalus*. Two additional taxa were confirmed at genus level, i.e. common dolphin *Delphinus* sp. and minke whale *Balaenoptera* sp. All reported species also occur in Ghana or Togo. Concern is expressed that in Benin, as in some other western African nations, coastal communities increasingly exploit stranded and by-caught cetaceans to supply a thriving, albeit illegal, marine bushmeat trade. Small cetaceans were also taken intentionally in the absence of efficient controls of landings or other management measures. Although presently at subsistence scale, the threat of wider commercialization exists. In view of the limited number of validated species, voucher specimens and scarce biological baseline information, opportunistic sampling must be expanded to include more systematic and dedicated research, in particular, ship-based marine mammal surveys. It is recommended that graduate students at Benin's universities play a central role.

Introduction

The Republic of Benin, in the northern Gulf of Guinea, ranks among western Africa's coastal nations for which knowledge of cetacean biodiversity is minimal (Perrin & Van Waerebeek, 2012). Not a single published paper, and only a few unpublished reports, focus on Benin's cetaceans. Reviews of Benin´s biodiversity either did not discuss whales and dolphins for lack of information (Sinsin & Owolabi, 2000), or provided general species information (Sohou, 2011, 2012). Remarkably, the oldest known record may date from only 20 years ago, namely the weathered skull of an unidentified large whale on the beach of Grand-Popo

(06°16.459' N, 01°49.923' E) reportedly stranded ca. 1993 (Sohou *et al*., 2001).

The first research efforts initiated in 2000-2002 with three sighting surveys to evaluate the presence of humpback whales (*Megaptera novaeangliae*) on Benin`s continental shelf, organised in collaboration with the Centre de Recherches Halieutiques et Océanologiques du Bénin (CRHOB) of CBRST, the Laboratoire d`Ecologie Appliquée de l`Université Nationale du Bénin (FSA/UAC), NGO Nature Tropicale, Direction des Pêches, Centro Peruano de Estudios Cetológicos (CEPEC) and sponsored by the Netherlands Committee-IUCN (Sohou *et al*., 2001; Van Waerebeek *et al*., 2000, 2001a,b, 2002; Van Waerebeek, 2003). Since then, Nature Tropicale (NT) has continued occasional small-scale whale-watching sorties during the southern hemisphere humpback whale calving/breeding season in an attempt to consolidate marine ecotourism and enhance conservation awareness of aquatic mammals among the Beninese public (Nature Tropicale ONG, 2011).

The objective of the present paper is to compile and analyse all data on cetacean biodiversity in Benin, both incidental records and (few) sightings from surveys, and, thus, inform concerned people on one of Benin`s least known marine resources.

Materials and methods

The study area extends over the 125 km of Benin`s coastline (Fig. 1), from Kraké beach (06°22.327' N, 002°42.574' E), district of Sèmè Kpodji in the east (border with Nigeria)

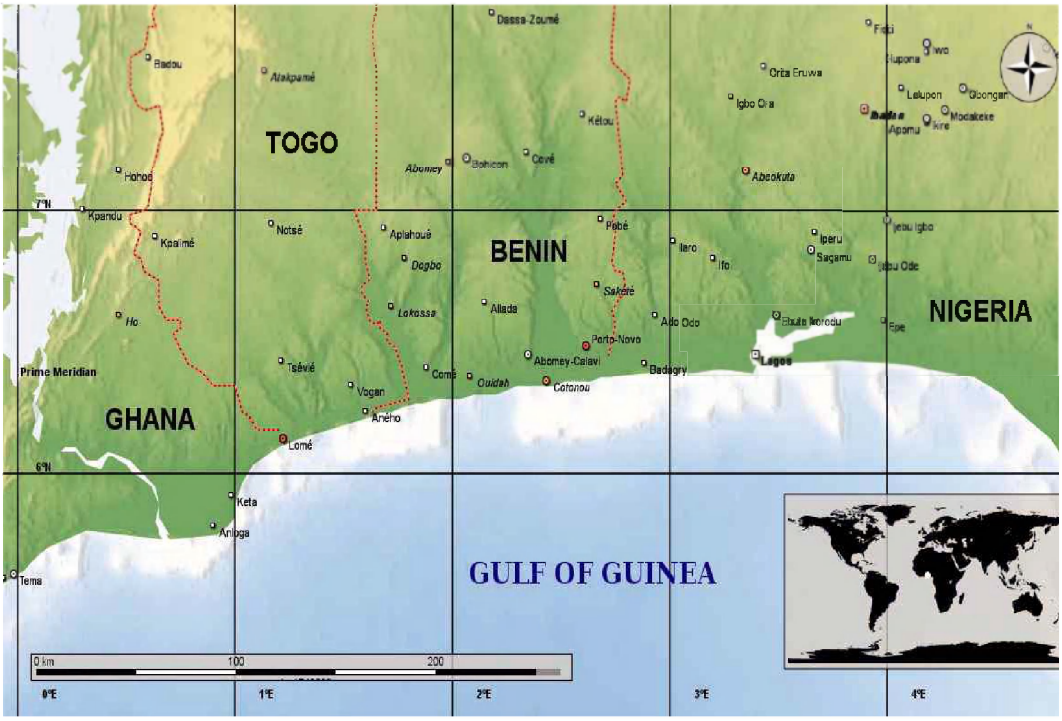

Fig. 1. Coast of Benin as study area, situated in the northern Gulf of Guinea.

to Hilla-Condji (06°13.775' N, 001°37.695' E), district of Grand-Popo in the west (border with Togo) and extending offshore to the edge of the trapezoid-shaped continental shelf, 22–24 km off the west coast (Ouidah) and up to 32 km off Kraké. The shelf covers an area of slightly more than 2,800 km² between the 10–100 m isobaths and 3,100 km² up to the 200 m isobath (Troadec & García, 1979).

Since 2000, volunteer observers (écogardes) received training in basic data collection on sea turtles and aquatic mammals at the Muséum Nature Tropicale (MNT), Cotonou, Benin. The authors, volunteer observers and a few collaborating fishermen opportunistically recorded cetacean strandings and captures. Photographic evidence and some voucher specimens, to support species identifications, were archived at MNT. Seven odontocete sighting records were extracted from the database of three boat-based surveys, which established the viability of humpback whale ecotourism in Benin in 2000–2002. Observer effort (duration and distance) was, respectively, 55 h 48 min for 349.6 nautical miles surveyed during 12–19 October 2000, 53 h 01 min for 318.1 nmiles (6–21 September 2001), and 64 h 41 min for 434.7 nmiles (1–9 October 2002) (Van Waerebeek *et al.*, 2000, 2001a, b; Van Waerebeek, 2003; Tchibozo & Van Waerebeek, 2007). Two small marine biological collections in Cotonou were perused for cetacean specimens.

Results and discussion

Family Delphinidae (Oceanic dolphins)
Common bottlenose dolphin Tursiops truncatus *(Montagu, 1821)*

One confirmed sighting, one probable sighting record and one specimen record exist for Benin. In September 2001, Tchibozo & Van Waerebeek (2007) observed two common bottlenose dolphins interacting with an artisanal purse-seine set in 18 m deep water, some 300 m from shore. The dolphins lept over the float-line in and out of the netted area, clearly in pursuit of captured fish (Table 1). The shallow habitat, small group size and behaviour suggested members of an inshore *T. truncatus* population.

The incomplete mandibles of an old bottlenose dolphin (field N° BE0105), captured and consumed at Ayiguinnou (06°15.716' N, 01°10.477' E) 2–3 years earlier, were donated to MTN by local fishermen on 17 September 2001. The wide diameter of teeth (number in lower left row: 21) also suggest an inshore population.

A group of four large and stocky dolphins briefly approached the M/V *Dauphin* in 31 m deep water, in October 2000 (Table 1). Their back-lighted silhouette and size was consistent with bottlenose dolphins, however, unable to confidently exclude *Stenella frontalis,* they were registered as probable-*T. truncatus* (Van Waerebeek *et al.*, 2001). Naturalist Jan Vlaar (28 May 2000, *in litt.* to KVW) and several locals reported seeing dolphins, thought to be *T. truncatus,* from beaches, especially at Grand-Popo, Djegbadji (Sohou *et al.*, 2001) and Sèmè Okoun. Captures of bottlenose dolphins are common in Ghana (Debrah *et al.*, 2010, Van Waerebeek *et al.*, 2009; Ofori-Danson *et al.*, 2003; Van Waerebeek & Ofori-Danson, 1999) and have also been documented in Togo (Seniagbeto & Van Waerebeek, 2010; Segniagbeto *et al.*, in press) and Nigeria (Uwagbae & Van Waerebeek, 2010).

False killer whale Pseudorca crassidens *(Owen, 1846).* The small marine biological collection at the Direction des Pêches, Ministère de l'Agriculture, d'Elevage et de

TABLE 1
Sightings of small odontocetes in Benin waters in 2000-2002.

Species	*Date*	*position*	*Group size best (min-max)*	*Comments*	*Source*
Delphinidae	15/10/2000	06.2061 N 02.39862 E	4 (4-5)	#151000-16. Short-snouted, most probably *T. truncatus* but *Stenella frontalis* not excluded; back-lighting, dark aspect; 31m depth.	unpublished data
Tursiops truncatus	11/09/2001	06.29820 N 02.39322 E	2 (2-2)	#110901-11. Adult dolphins leap over float-line of artisanal purse-seine net, nearshore 18m depth. Vessel: *Dauphin.*	unpublished data
Delphinus sp.	02/10/2002	6.19943 N 2.25781 E	18 (18-20)	#021002-11; 14.9km from shore green water; fast travel and bowride 10min; single, cohesive group, Vessel: *Dauphin.*	Van Waerebeek *et al.* (2002)
Delphinus sp.	03/10/2002	6.23497 N 2.59200 E	12 (11-13)	#031002-14; 25m depth; 13.4km from shore, green water. fast travel and bowriding. Cohesive group, 3 adult/calf pairs. Vessel: *Dauphin.*	Van Waerebeek *et al.* (2002)
Delphinus sp.	07/10/2002	6.20460 N 2.29788 E	25 (23-33)	#071002-20. 24m depth; 14.9km from shore. Vessel: *Sakana.* Travelled jointly with next sighting, but did not mix.	Van Waerebeek *et al.* (2002)
Stenella sp.	07/10/2002	6.20460 N 2.29788 E	3 (3-4)	#071002-20. 24m depth; 14.9km from shore. Smallish, dark stenellids. Vessel: *Sakana.* Travelled jointly with above group, but did not mix. In contrast with common dolphins, these smallish, dark stenellids left as vessel approached (cf. poor views).	Van Waerebeek *et al.* (2002)
Stenella frontalis	08/10/2002	6.15200 N 2.14928 E	10 (8-13)	#081002-23. Heavily spotted adults and unspotted juveniles; depth 230m; 18.5km from shore. Bowride/wake-ride. Vessel: *Sakana*.	Van Waerebeek *et al.* (2002)

Fig. 2. Mummified head of false killer whale, *Pseudorca crassidens,* at the Fisheries Directorate in Cotonou. Photograph by K. Van Waerebeek

Pêche, Cotonou, holds the mummified head of an adult false killer whale *Pseudorca crassidens* (Fig. 2) (Van Waerebeek *et al.*, 2001a, 2009; Tchibozo & Van Waerebeek, 2007). Tooth counts are UL8, UR8, LL10, LR10. The teeth, circular in cross-section, allow a positive differentiation from the killer whale *Orcinus orca,* which has oval teeth. Although circumstances were unclear, the conservator confirmed that without exception all collection specimens originated from Benin, therefore, this *P. crassidens* represents the country's first record. Documented cases in West Africa remain scarce (Jefferson *et al.*, 1997; Weir, 2010; Perrin & Van Waerebeek, 2012), but records of strandings and captures indicate that *P. crassidens* is widely distributed in and contiguous to the Gulf of Guinea. Strandings are known from Assini, Côte d'Ivoire (van Bree, 1972), Cap Esterias, Gabon (Van Waerebeek & De Smet, 1996) while three false killer whales were landed at Apam, Ghana (Van Waerebeek *et al.*, 2009; Debrah *et al.*, 2010).

Short-finned pilot whale Globicephala macrorhynchus *Gray, 1846.* One short-finned pilot whale was landed by artisanal fishermen at Ekpè (06°21.9306' N,

Fig. 3. Short-finned pilot whale, *Globicephala macrorhynchus* landed at Ekpè in 2011, to be sold as marine bushmeat. Photograph by K. Joma, Nature Tropicale

02°32.4834' E) on 24 April 2011 (Fig. 3). The animal was destined for marine bushmeat but skeletal remains were buried by MNT volunteers for later retrieval. This specimen represents the first authenticated record of *G. macrorhynchus* in Benin, however, the species is not uncommon in the subregion. In Ghana, short-finned pilot whales account for 9.4% of cetacean landings (Van Waerebeek *et al.*, 2009; Debrah *et al.*, 2010).

Common dolphins Delphinus *sp. Linnaeus, 1758.* Three small groups, an estimated 12-25 common dolphins in total, were sighted in October 2002, two individuals of which briefly played in the bow wave (Table 1, Fig. 4). Rostra were intermediate in length and while some features, including colouration, suggested short-beaked common dolphins, intraspecific variation in the external morphology of common dolphins in West Africa has not been studied statistically. Hence, it was premature to assign these dolphins to any of the two recognised species *D. delphis* or *D. capensis*

Fig. 4. Common dolphin, *Delphinus* sp. sighted on 7 October 2002 (Table 1, record #071002-20). Photograph by K. Van Waerebeek.

Fig. 5. Severed head of a young male Cuvier's beaked whale, *Ziphius cavirostris*, at Togbin in 2011 (see text). Photograph by C.-Y. Fai, Nature Tropicale.

(Heyning & Perrin, 1994; Jefferson & Van Waerebeek, 2002).

Atlantic spotted dolphin Stenella frontalis *(Cuvier, 1829).* On 8 October 2002 a small group (n = 10) of both heavily spotted adult Atlantic spotted dolphins and barely spotted immature animals approached M/V *Sakana*, 18.5 km offshore in 230 m deep water (Table 1). The adults' large, robust bodies and their heavy spotting were consistent with the coastal form of *Stenella frontalis* (Perrin, 2009).

Family Ziphiidae (Beaked whales)

Cuvier's beaked whale. Ziphius cavirostris *Cuvier, 1823.* In the morning (09:00 h) of 14 August 2011, locals of Fidjrossè, Togbin (06°27.635', N 002°23.492' E), Département du Littoral, witnessed three small whales swimming close to shore. Fishermen returning from nocturnal fishing operations alerted associates onshore and jointly managed to drive one animal into shallow water. By attaching a rope around the tailstock the shore-based crew, aided by onlookers, pulled the ca. 4 m long whale towards the beach (Fig. 5). The male

Fig. 6. Marine bushmeat obtained from a Cuvier's beaked whale at Togbin, gathered at one site before equitable distribution among locals. Photograph by C.-Y. Fai, Nature Tropicale.

Cuvier's beaked whale was swiftly exsanguinated, decapitated and sectioned in chunks with machetes and knives. Fishermen and locals shared the meat (Fig. 6). None seemed aware or concerned of the protected status of cetaceans, although the local press raised the issue (Fraternité, 2011).

The anogenital region of the Cuvier's beaked whale was covered in bite marks and scars presumably by cookie-cutter sharks

(*Isistius* spp.) *Z. cavirostris* being a deep-water, oceanic species (Heyning, 1989; Baird *et al.*, 2006), the reason for these beaked whales venturing into shallow, coastal habitat is unknown. In the Gulf of Guinea, only one other specimen of *Z. cavirostris* is documented, a juvenile captured off Axim, Ghana, in 1994 (Van Waerebeek *et al.*, 2009). Beyond that, the geographically nearest records are two sightings off Angola (Weir, 2006).

Family Physeteridae (Sperm whales)

Sperm whale Physeter macrocephalus *Linnaeus, 1758.* On 19 April 2010 the MNT museum was alerted by the Service Environnement du Port Autonome de Cotonou that a small sperm whale had stranded on a beach within the port's security zone. One of the authors (JDB) and agents of the Direction Générale des Forêts et Ressources Naturelles from Ministère de l'Environnement et de la Protection de la Nature documented the event (Fig. 7). The carcass was buried *in situ* without biological sampling. Body length was reported as 367 cm, however, sperm whale neonates measure from 395– 420 cm (Best *et al.*, 1984; Clarke *et al.*, 1964, 2011). Either body length was not measured in the standard way, or it was a near-term foetus.

Fig. 7. Neonate/foetus of sperm whale, *Physeter macrocephalus* found stranded near Cotonou port Photograph by K. Joma, Nature Tropicale.

Historically the hunting of sperm whales occurred year-round on the Atlantic 'coast of Africa' sperm whaling ground between latitudes 03°-23° S (Townsend, 1935; Weir, 2010). Five authenticated specimens (Benin, 1; Ghana, 2; Togo, 2) (Ofori-Danson *et al.*, 2003; Van Waerebeek *et al.*, 2009; Segniagbeto & Van Waerebeek, 2010; Segniagbeto *et al.*, in press), suggest that this stock extends into the northern Gulf of Guinea, and that it also breeds there.

Family Balaenopteridae (rorquals)

Humpback whale Megaptera novaeangliae *(Borowski, 1781).* An adult humpback whale, stranded on the beach of Kraké-Iro (06°22.327' N, 002°42.574' E), 2 km from the Benin-Nigeria border, on 24 October 2007. Locals fiercely competed for access to the carcass and its meat. MNT volunteers managed to collect only a minor fraction of the skull, deposited at the museum, everything else was cut up. On 11 July 2009, volunteers from Sèmè Kraké reported that another, apparently adult, humpback whale had stranded dead on the beach of Kraké-Iro. Again local youngsters rushed to carve out chunks of meat despite the decomposed state (code 3–4) of the carcass (Fig. 8).

Humpback whale strandings, including calves, have also been documented in Togo, Ghana and Côte d'Ivoire (Segniagbeto & Van Waerebeek, 2010; Van Waerebeek *et al.*, 2009; Tchibozo & Van Waerebeek, 2007). The suspected principal mortality causes are anthropogenic and include ship collisions and net-entanglements.

Fig. 8. Humpback whale, *Megaptera novaeangliae* stranded on Sèmè Kraké beach, in 2009, causes a frenzy among local youths despite the carcass' advanced state of decomposition. Photograph by D.-B. Bosajos, Nature Tropicale.

Three boat-based surveys to evaluate the feasibility of whale-watching tourism in Benin, in October 2000, September 2001 and October 2002, recorded, respectively, 40, 26 and 42 humpback whales (Sohou *et al.*, 2001; Van Waerebeek *et al.*, 2000, 2001a,b; Van Waerebeek, 2007; Tchibozo & Van Waerebeek, 2007). This species is seasonally present off Benin and Togo from early August till mid-November (occasionally early December), indicating a wintering ground of a Southern Hemisphere population, earlier referred to as the Bight of Benin substock (Van Waerebeek, 2003; Van Waerebeek *et al.*, 2001a,b).

Other nations that border the northern Gulf of Guinea, i.e. Côte d`Ivoire, Ghana, Togo, Nigeria, Cameroon and Equatorial Guinea are also confirmed range states (Van Waerebeek *et al.*, 2001, 2009; Picanço *et al.*, 2009; Segniagbeto *et al.*, 2011; Ayissi *et al.*, 2011). Neonates commonly observed in Benin and Togo (Van Waerebeek *et al.*, 2000, 2001a,b; Segniagbeto and Van Waerebeek, 2010; Segniagbeto *et al.*, in press) and a live-stranded neonate in Ghana (Van Waerebeek *et al.*, 2010) imply parturition in these waters. Humpback whales in the northern Gulf of Guinea are now thought to form part of a very wide-ranging population with wintering grounds from Angolan coastal waters (Weir, 2010) north and west to the wide continental shelf between Conakry, Guinea and Cap Vert Peninsula, Senegal (Bamy *et al.*, 2010; Van Waerebeek *et al.*, 2012).

Minke whale, unidentified form (Balaenoptera sp.). A team of Nature Tropicale ONG collected the incomplete calvaria of a small balaenopterid whale on 5 November 2008 from the beach at 'l'embouchure de la Bouche du Roy', Grand-Popo (06°16.673' N, 001°48.701' E). The whale had stranded some 3 weeks earlier, from an unknown cause. The specimen, examined by KVW, was cranially adult as evidenced by moderately advanced synostosis of cranial sutures and good overall ossification. Maxillae, praemaxillae, nasal bones and mandibula were missing.

. Greatest width across zygomatic processes of squamosals measured 93.5 cm. The axial distance from the occipital condyli to anterior apex of vomer measured 168 cm. This condylovomeral length would only be slightly shorter (guessed at <20 cm) than the condylobasal length (CBL), distance from the occipital condyli to the anterior apex of the missing (prae) maxillae.

As pointed out by Jefferson *et al.* (2008), balaenopterid whales with adult CBL <200 cm include only the two minke whale species (Antarctic minke whale *B. bonaerensis* Burmeister, 1867, common minke whale *B. acutorostrata* Lacépède, 1804) and Omura's whale *Balaenoptera omurai* Wada, Oishi & Yamada, 2003. However, Omura's whale is not known to occur in the Atlantic Ocean.

Shape and size of the occipital bone, synvertex, frontal bones and squamosals of the Grand-Popo specimen are consistent with minke whales. An elaborate comparative osteologic and genetics analysis that might elucidate the minke whale species involved, is pending. A net-entangled Antarctic minke whale was landed at Lomé port, Togo, in 1999 (Segniagbeto & Van Waerebeek, 2010; Segniagbeto *et al.*, 2012), merely 60 km west of Grand-Popo.

Incertae sedis

The vertebral column of a small, physically immature delphinid in the collection of the Direction des Pêches had no associated data, and it was not studied in any detail. Short vertebral corpora and general morphology of vertebrae suggested a *Stenella* sp. A decomposed whale was reported stranded at Hocognon Codji (06°20.285' N, 002°12.874' E) on 10 September 2001 but was washed out to sea again when KVW checked the site a week later. On 19 September 2001, locals at Sèmè Okoun, near the Nigerian border, showed the authors a fractured whale rib taken from an unidentified whale stranded in 1998.

Cetacean biodiversity

The opportunistic collection of data on the cetacean fauna of Benin started as recently as 2000, so the current knowledge of cetacean biodiversity in Benin remains poor (Sohou, 2011, 2012). The only dedicated cetological research consisted of three short surveys for humpback whales in 2000-2012 (Sohou *et al.*, 2001; Van Waerebeek *et al.*, 2000, 2001a,b). All seven species (six odontocetes and the humpback whale) here described for Benin are also documented from Ghana where landings have been more intensively surveyed (Ofori-Danson *et al.*, 2003; Van Waerebeek & Ofori-Danson, 1999; Debrah *et al.*, 2010). With comparable coastal habitat, an additional 5-10 species were expected to be distributed off Benin. However, unlike in Ghana, upwellings occur rarely and are weak (FCWC, 2012) and abundances could be lower for cetaceans that feed in Benin's waters.

As in Ghana and Togo (Van Waerebeek *et al.*, 2004; Segniagbeto *et al.*, 2012), the Atlantic humpback dolphin *Sousa teuszii* neither was found in Benin. Klinowska (1991) cited Dahomey, Benin's precolonial kingdom name, among the range states, however, without providing voucher data. One hypothesis proposes that humpback dolphins may have practically disappeared in these nations due to unsustainable level of by-catches and deterioration of nearshore habitat, perhaps in combination with other anthropogenic factors (Van Waerebeek *et al.*, 2004). In the alternate, less plausible, hypothesis these coastlines never formed part of the species' native range. If local extirpation would be confirmed, it would not bode well for Atlantic humpback dolphin in other range states, where coastal development is occurring at a high pace.

Conservation and management

Marine mammals are protected in Benin under national legislation (Law N°.93-011 of 3 August 1993) that regulates hunting and ecotourism in the country. Benin has also ratified several international conventions, which extend varying levels of protection to cetaceans, including the Convention on Biological Diversity (CBD; 30.06.1994), CITES (28.05.1984), the Convention on Migratory Species (CMS; 01.04.1986) and

the International Convention for the Regulation of Whaling (26.04.2002), ensuring voting rights at the International Whaling Commision (IWC). Further, Benin is signatory to the CMS Memorandum of Understanding concerning the Conservation of the Manatee and Small Cetaceans of Western Africa and Macaronesia (WAAM; 03.10.2008).

Marine artisanal fishermen operate from 80 fishing-villages distributed over four coastal departments of Benin (FCWC, 2012). The most recent figures (albeit dating from 1999) indicated 4345 artisanal fishermen including 2234 Beninese (51.4%), 1993 Ghanaians (46%), 115 Togolese (2.54%) and three Nigerians (0.06%). Fishing arts include gillnets, purse-seines, beach seines, and hook and line. The fishing fleet was comprised of 816 operational canoes, 46% of which are powered by outboard engines, according to the 1999 socio-economic survey (FCWC, 2012). Artisanal fishermen in Benin widely complain about a reduction in fish catches, which is supported by a decrease in artisanal fisheries CPUE of 0.128 t/day-sortie in 1998 to 0.091 t in 2010 (CRHOB, Cotonou, unpublished data). Fishery exploitation is carried out under rather confused circumstances, which results in an unregulated evolution of the production due to an ineffective and approximate follow-up. There is lack of knowledge concerning fishing grounds, a deficient socio-professional organization and stock management linked to a fragmentary state of fisheries science (FCWC, 2012).

As in parts of Togo and eastern Ghana (Debrah *et al.*, 2010; Segniagbeto & Van Waerebeek, 2010; Segniagbeto *et al.*, in press; Van Waerebeek *et al.*, 2009), dolphins still enjoy a certain level of protection among some Beninese coastal communities, e.g. at Sèmè and Hillacondji. Followers of voodoo regard cetaceans as sacred animals ('totems') not to be hunted nor hurt (Sohou *et al.*, 2001). However, the authors' findings suggest that traditional beliefs are slowly eroding and stranded and by-caught cetaceans are nowadays more likely considered a source of marine bushmeat (Clapham & Van Waerebeek, 2007). Fishermen also increasingly resort to opportunistic direct takes of small cetaceans. A comparable phenomenon has been reported in neighbouring countries and may occur at regional, western African level (Ofori-Danson *et al.*, 2003; Bamy *et al.*, 2009; Debrah *et al.*, 2010; Segniagbeto, *et al.*, 2012; Uwagbae & Van Waerebeek, 2010).

In 2001, the Cotonou port, Ayiguinnou and Agoué were known sites of dolphin trade and consumption, but others have followed. Embracing traditional values with respect to marine mammals may continue to provide a powerful autochthonous protection against out-of-control demand for marine bushmeat. Since a few years virtually all cetacean specimens beached on Benin's shores, from alive to slightly decomposed, have been butchered for consumption. As exemplified by the Cuvier's beaked whale case, some 'live-strandings' may in fact involve actions akin to a drive-fishery. The true extent of the exploitation will not be revealed until an effective national monitoring and reporting system can be implemented.

Population identification and abundance estimation constitute two essential information categories required for status assessments. It is recommended that faculties of biology and veterinary sciences at Benin's universities guide a few graduate students

towards field research in marine mammalogy while the Government of Benin could aid with research and study grants. Marine mammal expertise is applicable nationally in issues pertaining to marine resource management and conservation, marine protected areas (MPAs), assessment of fisheries interactions, ecotourism and seismic surveys, among others. Ship-based research will be vital, if not (costly) dedicated surveys, then from platforms-of-opportunity such as coast guard and whale-watching vessels. A long-term, year-round programme from opportunity vessels would generate significant relative abundance data, allowing first assessments of seasonal and interannual abundance and distribution fluctuations. Copies of raw sighting data and digital images/ video collected by marine mammal observers on geophysical seismic vessels exploring for hydrocarbons in Benin's EEZ should be put at disposal for independent analysis.

Completing the inventory of Benin's cetaceans and mapping spatial and temporal distributions should feature prominently in any follow-up work. Enhanced knowledge can underpin actions to improve awareness concerning the conservation needs of cetaceans at the community, national and regional levels. UNEP/CMS made headway in 2007 and 2008 by organizing the Western African Talks on Cetaceans and Their Habitats (WATCH symposia) which led to the signature of the WAAM memorandum (CMS, 2008), but since then progress in national and regional conservation policies has been relatively feeble. Implementation of WAAM recommendations is all the more urgent in view of increasing exploitation of West African cetaceans without efficacious management. Finally, Benin's Direction du Tourisme is recommended to evaluate the further development of responsible marine ecotourism including whale-watching. Countries such as South Africa and Mozambique (Hoyt, 2001) earn appreciable foreign currency from marine wildlife tourism.

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