A note on the occurrence and status of cetaceans in Togo

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ABSTRACT

Eight cetacean species are here reported to occur in Togo's coastal waters and all are newly recorded mammals for the country: Megaptera novaeangliae, Balaenoptera brydei, Balaenoptera cf. bonaerensis, Physeter macrocephalus, Stenella attenuata, Delphinus sp., Globicephala cf. macrorhynchus and Orcinus orca. Much of artisanal fisheries in Togolese waters are dominated by Ghanaian fishermen who have the habit of selling cetacean catches as a food product. Because the landing of cetaceans is illegal in Togo which is actively enforced in the main fishing centres, cetacean landings occur covertly and cannot be monitored, quantified nor sampled. Significant pollution of the marine habitat by heavy metals, possibly affecting cetaceans, consists in phosphorites mining in the coastal basin near Hahotoé and Kpogamé.

KEYWORDS: TOGO, DOLPHINS, WHALES, STRANDINGS, CAPTURES, GULF OF GUINEA

INTRODUCTION

International conventions concerning fauna management and conservation commonly apply the Range State concept, a nation within whose continental and maritime borders a species is habitually distributed. It is also a crude but useful tool for quickly summarizing a taxon's large-scale zoogeographical boundaries, provided range states are known. For many coastal nations in western Africa, however, the cetacean fauna ranging in their waters remain incompletely documented, if not entirely unknown (Perrin and Van Waerebeek, 2007). Literature discussing the mammals of Togo mention West African manatee *Trichechus senegalensis*, but no Cetacea (e.g. Roure, 1966; Wilson and Reeder, 2005). Oddly, until recently the only information on Togo's cetaceans emanated from local, small-scale whale-watching tourism, as exemplified by Emile Tissot and Franck Barbé in '*Togo le Paradis des Baleines*', a VHS video produced by Télévison Togolaise (TVT) showing humpback whales off Lomé in the 1990s. Finally, in 1999-2002, dedicated exploratory surveys documented the Bight of Benin as a nursery ground for an overwintering Southern Hemisphere humpback whale population (Van Waerebeek *et al.*, 2001; Van Waerebeek, 2003).This paper summarizes for the first time the still limited evidence for the species occurrence of dolphins and whales in Togo.

MATERIALS AND METHODS

Study area

Togo (*République Togolaise*) is a West African country bordering the Gulf of Guinea (Figure 1) made up of a 660km long but narrow strip of land located between 06°-11°N and 00°-02° E, bordered by Ghana in the west and Benin in the east. Togo's coastline extends east-west over 50km of mostly sandy beaches facing the Bight of Benin. The 1500 km^2 continental shelf is narrow, on average 12-13 nautical miles wide (Crosnier and Berritt, 1963, 1969). Shared with Benin, a dead coral reef barrier is located on the sandy bottom almost parallel to shore at the 52-56m isobath (Figure 2), while isolated coral formations dot the outer shelf zone up to the shelf break at 100m depth. In the Gulf of Benin, sea surface temperature (SST) normally varies from 25°-29°C but may drop to 20°C during periods of cool upwelling. Two periods of low SST alternate with two periods of high SST, the first low lasting for 2.5-4 months from May-August (as SW mousson winds blow) and a second low in December-January due to upwelling caused by the northern *harmattan* wind, with SST minima of 21.5°C in July and 23.9°C in January. The warm periods, in February-April/May and August-

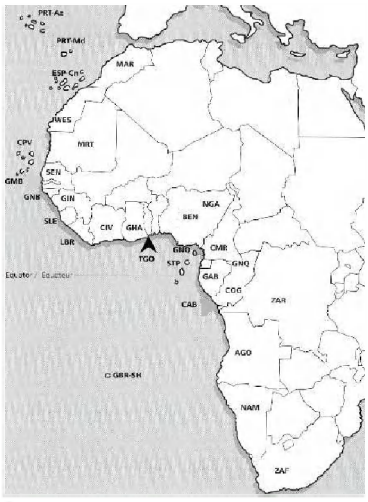

Fig. 1. Togo's coast situated in the Bight of Benin, northern Gulf of Guinea (arrowhead).

December reach SST maxima of 29°C and 28.8°C, respectively in April and November (Cuaz, 1960; Boukari, 1966). The subequatorial climate shows two rainy seasons (Eldin, 1971), the main one from March-July (peaking in June) and a short rainy season in September-November (peak in October), the dry seasons peak in December-January and in August.

Data sources

This report is based mainly on strandings and by-catches documented by the authors (aided by Agbo-Zegue members) in the course of dedicated land-based coastal surveys for aquatic mammals and sea turtles, December 2003–November 2004. Opportunistic evidence reported by other observers is also reviewed. Skeletal specimens held by residents of coastal villages were examined *in situ* and photographed or, if allowed (rarely), collected. Information obtained from unstructured interviews and sighting reports by fishermen was screened for relevant recurring statements. Limited but nonetheless useful descriptions of a number of sightings extracted from logbooks were provided by Franck Barbé, skipper and operator of a small sports-fishing/whale-watching enterprise based at Lomé (pers.comms. and emails to KVW, *de dato* 02.08.2001, 08.12.2001, and 15.10.2001). Over a five-year period (1996-2001), Barbé navigated Togo's coastal waters with his motor yacht for an estimated 5000 hrs and logged observations.

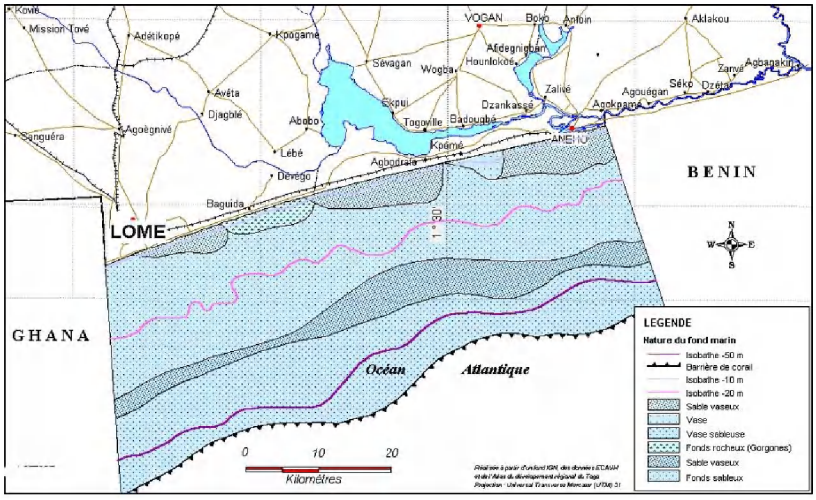

Fig.2. Bathygraphy of Togo's coast.
Indicated are the dead coral barrier reef at 52-56m depth (offshore dented line), 50m isobath (outer curved line), 20m isobath (inner curved line) on a background of variable sea bottom compositions, ranging from mud to sand.

RESULTS

Folk knowledge in coastal Togo

The indigenous coastal inhabitants of Togo, the Ewe people, venerate aquatic mammals and sea turtles guided by animistic and voodoo culture and would not harm them. Such animals captured accidentally, alive, would be released. Skeletal parts of stranded cetaceans traditionally are gathered and conserved with great respect. While this often helped in pin-pointing to specimens, it also acted as a formidable impediment in attempts to acquire specimens to build a scientific reference collection.

Many artisanal fishermen appeared familiar with the seasonal inshore presence of humpback whales and their calves. Killer whales ('*les orques*') are locally considered predators of these whales. Fishermen report several species of dolphins to range and feed in Togolese waters, and some accuse them of predating on net-entangled fish. While present year-round, cetaceans are said to occur in greater numbers in this sector of the Bight of Benin during the months of cool upwelling.

Fisheries and by-catches

Small-scale fisheries are predominant both in numbers of employed fishermen and boats. Fish products are landed at 22 sites along the coast, the most important including the Port de Pêche de Lomé, Kodjoviakopé, Ablogamé, Dévikèmé, Adissem, Agbodrafo and N'lessi (Figure 2). Although fishing effort occurs year-round, a high season is centred around the July-October upwelling period (fisheries for small pelagics) and a low season is prevalent from November-June when SST is highest. The main artisanal fishing arts comprise:

i) Purse-seines (*watsa*), 600-1000m in length, deployed from 18-20m canoes equipped with outboard engines of 20-40 hp. Crew varies from 15-20 people. A fishing sortie lasts usually 24hr, often with two shifts allowing non-stop fishing. Target species include small pelagics like sardines (*Sardinella* spp.), anchovies (*Anchoa encrasicolus*), bonga shads (*Ethmalosa fimbriata)* and carangues *(Caranx* spp.*).*

ii) Line-and-hook fishermen (a*kpom*) set out in small motorized canoes, equipped with ice. A crew of 6-8 fishermen sets out to sea for three days and targets dorades (*Pagellus bagaraveo, Spondyliosoma cautharus*) sea bass (*Epinephelus* spp.), Lutjanidae (e.g. *Lutjanus goreensis*) and other reef fish inhabiting the zone near the fossil coral reef barrier at 50-60m depth.
iii) Beach seines (*yovodo*) of 200-1000m length deployed all along the coast, except around Lomé, aided by non-motorized canoes of 12-18m. The seines are pulled up the beach from both ends and land mainly juvenile sardines, anchovy, bars (*Pseudotolithus* sp.), amongst other species.
iv) Several types of gillnets are used: set-nets (*tonga*), driftnets (*awli*) and wide-mesh shark gillnets (*gbowlédo*). Operated from 6-12m partly motorized canoes, along the coast, gillnets are typically several hundred meters long, 2m deep and have stretched mesh sizes ranging from 40-200mm. They target a wide range of fishes, for example, inshore gillnets take lesser African threadfin (*Galeoides decadactylus*), croakers (*Otolithes* sp.), soles (*Cynoglossus* spp.), while pelagic driftnets target, i.a. sharks, skipjack tuna *(Katsuwomis pelamis*), yellowfin tuna (*Thunnus albacares*), sailfish *(Istiophorus platypterus),* blue marlin (*Makaira nigricans*), swordfish (*Xiphias gladius*) and flying fish (Exocoetidae).

Small pelagic schooling fishes (e.g. *Sardinella*, *Anchoa*, *Caranx*, *E. fimbriata*) are taken when migrating during upwelling periods off Côte d'Ivoire and Ghana where they reproduce. In a 2002 census, of the 407 canoes ('*pirogues*') only 45% were motorized, the others use sails. The artisanal fishery is for some 70% composed by foreign fishers, mainly from Ghana (Adan, Fanti, Gan and Ahlon ethnic groups). The Adan, from west of the Volta Delta comprise the majority at Lomé port, while the Ahlon, an Ewe subgroup, specialise in beach seines and driftnets. Maigret (1994) indicated about 80% of artisanal fishermen in Togo to be Ghanaian. All handling and commercialisation is exclusively done by women fish mongers who exert monopoly control over prices and purchases. As in Ghana, the fish that is not consumed locally is salted, smoked or dried. Cetacean meat is processed the same way. Commerce of such products extends into northern Togo and beyond (Burkina Faso, Niger, Mali). The national industrial fishery is tiny, both fleet-wise (trawlers) and in catches. The Togolese trawler fleet diminished year after year until 1999 when a single 24m (400hp) trawler operated only periodically. The Service des Pêches encouraged a phase-out intending an improved management of scarce fish resources. Fish species landed by trawlers include *Brachydeuterus auritus, Dentex* spp., *Epinephelus* spp, Sciaenidae, Lutjanidae (*Lutjanus goreensis*) among others. A small sports fishery operated from Lomé port and deployed small motorized boats targeting large game fishes including sailfish, blue marlin and other billfishes (Istiophoridae).

SPECIES ACCOUNTS

Minke whale, *Balaenoptera* cf. *bonaerensis*
Specimen: A net-entangled minke whale of a reported 596cm (not examined by the authors) was landed at Lomé port on 8 January 1999 (Figure 3). It was sold locally for human consumption. Voucher evidence consists of only two photographs, one of which clearly shows that throat grooves ended well short of the umbilicus. The dorsal side of the flippers was lightly coloured with some grey streaks, and showed no sharply demarcated, strikingly-white flipper patch as characteristic for the North Atlantic and dwarf minke whales *B. acutorostrata* subspp. The entire ventrum, including the ventral face of the flippers, was of a pure white (Figure 3).
Although the evidence is limited we suggest this small balaenopterid was likely an Antarctic minke whale *B. bonaerensis.*



Fig. 3. By-caught minke whale landed in fresh state at Lomé port, 08.01.1999. It was sold for food.

Sightings: None reported.

Bryde's whale, *Balaenoptera brydei*
Specimens: Two specimens of Bryde's whale are recognized from Togo. A lumbar vertebra examined (but not collected) at Kotokoukondji (TG004, 13 November 2002) was identified as from a Bryde's whale based on the large-sized vertebra in which the spinous process was strongly caudally inclined (circa 52° from vertical). This characteristic

(see Lönnberg, 1931; Omura *et al.*, 1981) stands in contrast with the almost vertical position of spinous processes in the sei whale *Balaenoptera borealis* (Miller, 1924; Perrin *et al.*, 1996) and moderately inclined processes in other large balaenopterids.

A second specimen (TG006) consists of the left mandible and baleen plates examined and photographed at Baguida beach (06°09'34.2"N,01°19'40.1"E) on 13 November 2002. These originated from a whale reported stranded some five years earlier. The strongly curved mandibular ramus bears a prominent coronoid process and is markedly wide, almost rounded in cross-section, as in Bryde's whale (Omura, 1959; Omura *et al.*, 1981). The blackish baleen plates show coarse bristles, cream-grey in colour (Omura, 1962). The occipital area of the calvaria is also morphologically consistent with *B. brydei*.
Sightings: None reported.

Humpback whale *Megaptera novaeangliae*

Specimens: A humpback whale that stranded on the beach of Baguida (06°09'34.2"N, 01°19'40.1"E) on 28 October 2002 was butchered *in situ*. Its meat was eaten locally and the oil harvested for use in traditional pharmaceuticals. A moribund or freshly dead neonate (Figure 4) stranded at Lomé (06°07'44.1"N, 01°15'44.1"E) on 22 August 2005 and showed some rope marks on its tail stock which may have been inflicted peri-mortem or post-mortem. Another neonate washed ashore in advanced decomposition at Kpogan in October 2009 (photo in authors' archives).



Fig. 4. Calf humpback whale stranded at Lomé on 22.08.2005

Incidental sightings: Whale-watching skipper F. Barbé and fishermen reported the seasonal presence of humpback whales in coastal waters from August till early December, coinciding with the period established from scientific observations in the adjacent waters of Benin, as well as in concordance with records in Ghana (Van Waerebeek *et al.*, 2001, 2009). In Togo, shore-based sightings are reported from Adissem (06°11'44.0"N, 01°27'12.6"E), N'lessi (06°13'26.7"N,01°35'03.8"E) and Payemé (06°14'02.5"N, 01°37'37.7"E).
Observations by Barbé are summarized as follows. The average total number of humpback whales seen during a whale-watching season in Togo (sum of estimated group sizes) was 250-300 animals, of which 20-30 neonates, but may include resightings. The first humpback whales, mostly solitary animals, appeared off Lomé from mid-August with the earliest encounter on 9 August 1996. The whale encounter rate decreased from around mid-November with the last sightings of the season recorded in early December. No humpback whales were sighted in Togo's coastal waters outside this period despite year-round observer effort during sports fishing trips. Mother/calf pairs are not encountered until several weeks into the season and 'active surface groups' are most prominent in September. The highest whale encounter rate off Lomé typically occurred between mid-September and mid-October. Cows with calves often avoided and acted defensively against pursuing adults, presumably males. In November, humpback whales were often seen 'resting', i.e. drifting almost motionless in the upper water column, a behaviour well-known and exploited by the operator to allow swimmers/snorkelers approach the whales. As the frequency of resting peaks it seems predictive for the imminent departure of humpback whales from Togo's waters.

A collision incident linked to defensive-aggressive behaviour occurred when Barbé's motor yacht approached a group of five humpback whales at high speed. A large individual interposed itself between the vessel and the group, moved purposefully towards and under the boat, and lash out violently with its tail at the stern and propeller. The boat then withdrew. Barbé also reported humpback whales with large scars, according to him from collisions with vessels and their propellers. He also encountered whales entangled in drift gillnets and witnessed interactions with purse-seiners that exploited the whales as natural fish-aggregating devices as they deployed purse-seines near them.

On 23 August 1997, F. Barbé (*in litt.*, email to KVW, 13/10/2001) observed for 15-20min two virtually motionless adult humpback whales while his boat's engine was switched off. Sea conditions (windstill, flat sea, blue water of high transparency) were optimal. At 09:00h the yacht drifted above the two animals which positioned tightly belly-to-belly, their axis slightly inclined from horizontal with their heads some 5m below the surface. The most active individual, presumed to be a male, positioned belly-up below the other whale with belly-down, presumed female. Their flippers moved slowly as to maintain posture. Behaviour, consistent with copulation, lasted for 5-7min duration. After surfacing the whales remained 1-2 min largely immobile before slowly moving away. It was observed only once over a 5-year period.

Sperm whale *Physeter macrocephalus*

Specimens : Two specimens are known. The authors examined the weathered calvaria (state 5) of a mid-sized sperm whale (TG003, 12 Nov 2002) on Adisssen beach (06°11'44.0"N,01°27'12.6" E). Local residents indicated the stranding dated from circa ten years ago. The skull, re-examined on 29.04.2010, had severely eroded. This suggests that skeletal specimens, if unprotected, will eventually weather away in 1-2 decades.

Remains of a second sperm whale specimen (TG011, examined 29.04.2010) consisted of the left mandible, 1 tooth, 1 rib and a few caudal vertebrae at the residence of fishermen from Agbodrafo and near-by Kpeme (06°12'22.4"N, 01°29' 51.9" E). Reportedly this specimen stranded in March 2010.

Incidental sighting: On 13 June 1997, during a sports fishing sortie targeting blue marlin, a small group of three sperm whales encountered 20 nmiles south of Lomé consisted of a larger animal and a mid-sized individual accompanied by a small calf (F. Barbé, *in litt.* to KVW). The motor yacht followed the group at a distance (considered safe) of 800m, when the largest individual U-turned and, subsurface, headed to the vessel at high speed in an apparent attempt to ram it. An emergency avoidance manoeuvre allowed the boat to avoid collision.

Short-finned pilot whale, *Globicephala cf. macrorhynchus*

Specimen: No specimen records are documented for Togo.

Incidental sightings: Barbé reported *baleines pilotes* (pilot whales) chasing through, and probably feeding on, schools of '*bonites*' (Scombridae) but at other times an association with blue marlin was also noted. Although the pilot whale species was not specified, in this case the short-finned pilot whale can be safely inferred as it is the only *Globicephala* species found in the Gulf of Guinea, is frequently captured and landed in neighbouring Ghana (Ofori-Danson *et al.*, 2003; Van Waerebeek *et al.*, 2009; Debrah *et al.*, 2010) and is generally confined to the tropics. Off Lomé, pilot whales were most commonly sighted near the continental slope during periods of high SST (>28°), i.e. from mid-February till the first week of June. Group sizes were of 10-40 animals.

Pantropical spotted dolphin, *Stenella attenuata*

Specimen: The skull of a pantropical spotted dolphin (Figure 5) taken by artisanal fishermen at an unspecified distance from shore was collected by GS at Gbetsogbe on 2 July 2003. The skull (TG008) is voucher specimen in the Agbo-Zegue collection.

Sightings: None are documented. However a few fishermen who had attended an introductory training later classified 19% of dolphin groups encountered as 'spotted dolphins'. The authors suspect most were *S. attenuata*, considering this species is the second most commonly (13.2%) caught cetacean in Ghana, while Atlantic spotted dolphins *Stenella frontalis* are only rarely landed, ie 0.5% (Van Waerebeek *et al.*, 2009; Debrah *et al.*, 2010). Interesting is the good similarity between relative sighting frequency and catch composition data.



Fig.5 Skull of pantropical spotted dolphin, Gbetsogbe, 02.07.2003.

Common dolphin, *Delphinus* sp.

Specimen: The beach-worn calvaria (TG005) of a common dolphin kept by a resident at Kotokoukondji was briefly examined by the authors on 13 November 2003. Deep palatal grooves were conspicuously present, however no cranial measurements could be taken and species status remained unclear. However, long-beaked common dolphins *Delphinus capensis* are regularly captured in Ghana (Van Waerebeek *et al.*, 2009).

Incidental sightings: F. Barbé reported sightings of indeterminate common dolphins (*Delphinus* sp.) off Lomé during whale-watching sorties.

Killer whale, *Orcinus orca*

Specimen: No specimens are known. The closest known specimen locality is a skull from the Ghanaian coast, curated at the University of Ghana (Van Waerebeek *et al.*, 2009).

Incidental sightings: F. Barbé (e-mail to KVW, 8 december 2001) encountered killer whales several times in Togolese waters. On 30 June 1998, on a fishing excursion targeting wahoo, sailfish and yellowfin tuna, a small group of 4 orcas was sighted. It consisted of 1 male (< dorsal fin size), 2 females/juveniles and a calf. The boat followed the orcas with whale-watching intentions when the animals slowed down and split up in two groups. The calf remained stationary at

a distance while the other killer whales approached and surrounded the boat, perceived as threatening, which prompted the skipper to speedily leave the area. Barbé witnessed no cases of predation in Togolese waters but recorded a pod of killer whales attacking humpback whales off Sao Tomé and Principe on 30 November 2001.

Unidentified cetaceans

(a) A large whale stranded on the beach in front of l'Hôtel de la Paix, Lomé, in 1974, but there are no remaining skeletal parts nor any photographs (Amegomé Kokou, Lomé, pers.comm. to GS). Another whale, entangled in a purse-seine net set off Djékè in August 1998 and taken to the Lomé port was confiscated by the Administration des Pêches. A third whale live-stranded near Lomé Rivages, a few km SW of the Port Autonome de Lomé, in October 1999. Personnel from the Direction de l'Elevage et de la Pêche reportedly pushed the whale back into the sea.

(b) F. Barbé sighted delphinids year-round and often in large groups (>100 individuals) but he suggested that densities were lowest from mid-July till mid-October during cool upwellling. He confidently identified dolphins to genus level only and thus recorded common dolphins (*Delphinus* sp.), bottlenose dolphins (*Tursiops* sp.), spotted dolphins (*Stenella attenuata* and/or *S. frontalis*) and pilot whales (*Globicephala* sp.). A number of fishermen from N'lessi who had received basic training in species recognition, reported 42 sightings between 1 July and 30 September 2003, allocated to three morphological groups: 'spotted dolphins' (19%, group sizes 30-90), 'long-snouted dolphins' (33.3%, 50-150) and 'round-headed dolphins' (47.6%, 8-100). All were sighted in water 60m deep, or less.
(c) A worn, small baleen plate (80x32mm), yellowish-gray in colour and lacking whalebone hair, was obtained at Lomé's Marché des Fétishes, Akodésséwa, in September 2008. It remains to be positively identified.

Exploitation and conservation measures

Graphic or material evidence of landings is scarce and exceedingly difficult to obtain in Togo because of fishermen's fear of fines and prosecution. Fisheries officers conduct regular inspections. Nonetheless, at the Lomé fishing harbour, cetaceans are reported landed either covertly or taken, often butchered, to smaller or more remote landing sites (e.g. Katanga). Four cases of incidental takes were reported from N'lessi (Aneho), eastern Togo, in 2003 but none of the animals were seen landed. As in Ghana (Debrah *et al*., 2010), also in Togo it is often admitted that captures of small cetaceans are on the increase hand in hand with the over-exploitation and decline of traditional fish stocks. Ghanaian fishermen are routinely blamed, not surprisingly considering the customary dolphin exploitation in their ports (Ofori-Danson *et al.*, 2003; Van Waerebeek e*t al.*, 2009; Debrah *et al.*, 2010). Also, Ghanaians constitute the large majority of artisanal fishers operating in Togo. A few remains are dumped at sea while most carcasses are sectioned in pieces and landed covertly as to avoid confiscation and fines. Large whales, presumably humpback whales, occasionally entangle in coastal driftnets which are often destroyed.

Despite the wide-spread utilisation, aquatic mammals are legally protected in Togo under Article 13, Chapter 2 of the marine fisheries (Pêche Maritime) law N°98-012, emitted on 11 June 1998: *"Il est interdit de tuer, blesser ou poursuivre des mammifères ou autres animaux protégés sur toute l'étendue des eaux sous jurisdiction togolaise"*. In addition, article 62 of environmental law N° 2008-005 from 30 May 2008, stipulates that « *les espèces animales et végétales endémiques, rares ou menacées d'extinction ainsi que leur milieux naturels font l'objet d'une protection renforcée*». While the pursuit, harm or killing of 'mammals' in coastal waters is prohibited, there is currently no taxonomic list of the species covered, partly due to the lack of biological data. Furthermore, how precisely these laws should be interpreted and implemented, for instance with respect to accidental by-catches, has not been stipulated. International conventions relevant to cetacean conservation and management signed and ratified by Togo include the African Convention on the Conservation of Nature and Natural Resources (1968), CMS– the Convention on Migratory Species (1996), CBD- the Convention on Biological Diversity (1992), CITES Convention (1973), MARPOL (1973), Abidjan Convention (1981) and the International Convention on the Regulation of Whaling (IWC). Despite this impressive array of legal instruments, as in other West African countries, they have not proven to translate into reduced fisheries-caused cetacean mortality. New, improved and more specific measures may help focus attention on the many cetacean species involved and ensure a long-term perspective. As community backing is essential, local stakeholders should directly partake in management discussions and decisions.

DISCUSSION

Eight cetacean species are here reported to occur in Togo's waters and all are newly documented mammals for the country: humpback whale[1], Bryde's whale, minke whale, sperm whale, common dolphin (*Delphinus sp.)*, pantropical spotted dolphin, short-finned pilot whale and killer whale. However, several more tropical delphinids are expected to inhabit Togolese waters in view of the 16 species of small cetaceans that are known for neighbouring Ghana (Ofori-Danson *et al.*, 2003; Van Waerebeek *et al*., 2009).

1 although it was first reported in a non-scientific context by E. Tissot and F. Barbier (see Introduction).

The decline in fish catches and concomitant smaller mean size of landed fishes (FAO, 1995) leads to the exploitation of non-traditional marine resources, including small cetaceans and sea turtles. The poverty among many artisanal fishermen further contributes to this phenomenon. A similar evolution was documented in other developing countries (e.g. Peru, Colombia, Ghana, Sri Lanka, Philippines). While Togo is signatory and hosted the 2008 agreement meeting, the CMS Memorandum of Understanding on the Conservation of the Manatee and Small Cetaceans in West Africa and Macaronesia, remains to be ratified. At the national level, more investigative monitoring is necessary while resources to assess aquatic mammal biology in Togo should be expanded. Broad collaboration between government personnel, local scientists and NGOs competent in field sampling programmes will be essential for success.

A significant threat to Togo's marine habitat consists in phosphorites mining in the coastal basin near Hahotoé and Kpogamé (Gnandi and Tobschall, 1999). The ore is transported to Kpémé beach where it is enriched and purified with sea water. The processing site is located some 40m from the shoreline where phosphorite tailings (about 40% of the primary ore) are discarded into the adjacent sea. The exploitation of the ore, executed by the Office Togolais des Phosphates (OTP), produces about 3.5million tons of commercial phosphate annually. The pollution of marine sediments by trace elements (e.g. Cr, Zn, Ni, Cu, Sr) and especially of toxic cadmium is of great concern. Strategies should be explored, then implemented, for the phosphate extraction process to limit its effluent of phosphate-rich mud. Fishermen report much reduced fish catches when approaching the site of the effluent (Gnandi and Tobschall, 1999). Via coastal and tidal currents the contamination may threaten much of Togo's coastal ecosystem. Biomagnification processes (Cox, 1997) may cause marine mammal populations to become affected. Realistic conservation strategies require integration and managers should seek the support of local fishers' communities who completely depend on healthy marine biological resources and their habitats. Community-based conservation has long been recognized as an essential part of a sustainable development of the community itself.

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