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NEW RECORDS OF ATLANTIC HUMPBACK DOLPHIN (*SOUSA TEUSZII*) IN GUINEA, NIGERIA, CAMEROON AND TOGO UNDERSCORE PRESSURE FROM FISHERIES AND MARINE BUSHMEAT DEMAND

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RÉSUMÉ.— *De nouvelles données sur le Dauphin à bosse de l'Atlantique (Sousa teuszii) en Guinée, au Nigéria, au Cameroun et au Togo soulignent la pression des pêcheries et de la demande en viande d'origine marine.*— Le Dauphin à bosse de l'Atlantique (*Sousa teuszii*) est une espèce encore mal connue: sa biologie, sa distribution détaillée et l'existence de populations restent encore à préciser. Des suivis de terrain, des enquêtes et des observations opportunistes ont permis d'identifier plusieurs nouveaux spécimens, observés en mer ou retrouvés après leur capture, dans quatre pays, dont le Nigéria et le Togo où la présence de *S. teuszii*, bien que fortement suspectée, n'avait jamais été prouvée. De nouvelles données, provenant des îles Tristao et de l'estuaire du Río Nuñez en Guinée du nord, indiquent que les populations du Río do Jêba- Bijagos (Guinée-Bissau) et Guinée du sud devraient être combinées dans une seule population Guinéenne. La population du golfe de Guinée, qui correspond à la population historique de *S. teuszii*, anciennement appelée « dauphins du Cameroun », s'étend au minimum du Togo au sud du Cameroun. Plusieurs spécimens prouvent que la mortalité de *S. teuszii* causée par des captures accidentelles ou ciblées est significative, répandue et difficilement quantifiable en raison des contrôles sporadiques qui sont réalisés. Ces captures sont préoccupantes en Guinée, au Nigéria et au Cameroun. Les dauphins sont capturés accidentellement dans des filets maillants de pêcheries artisanales littorales, puis consommés comme « viande de brousse marine ». La commercialisation de ce type de viande étant croissante, les captures intentionnelles risquent aussi d'être encouragées. La rareté des observations et la petite taille des groupes dans le golfe de Guinée du nord indiquent des communautés de dauphins qui semblent plutôt en déclin. Des variations de répartition de l'espèce peuvent apparaître *de novo* le long des côtes fortement peuplées par l'Homme, après des décennies de prises accessoires, de compétition pour les ressources alimentaires, et de perte d'habitat suite à un développement côtier irréversible. Nous suggérons que le manque d'effort de suivi n'explique pas entièrement l'absence d'observations de *S. teuszii* sur les 1900 km de littoral allant du Ghana à la Sierra Leone, et particulièrement au Ghana où le suivi des petits cétacés est mieux documenté. La mise en œuvre d'une politique de conservation rigoureuse devient dès lors de plus en plus urgente. De nouvelles Aires Marines Protégées binationales et transfrontalières pourraient avoir des effets positifs et mesurables en termes de conservation en limitant la compétition pour les proies avec les pêcheries, en limitant les captures accidentelles dans les filets et en limitant la destruction des habitats. L'installation d'un groupe de travail *ad hoc*, à l'échelle de la région considérée, est recommandée afin d'identifier des mesures pratiques visant à éviter que le Dauphin à bosse de l'Atlantique, maintenant menacé, ne se dirige vers l'extinction.

SUMMARY.— The Atlantic humpback dolphin's biology, small-scale distribution and population structure are poorly known. Dedicated surveys and incidental observations resulted in new specimens and sighting records in four nations, of which Nigeria and Togo comprise long-suspected but newly documented range states. Multiple records at the Tristao Islands and Río Nuñez Estuary in northern Guinea indicate that the management stocks of Río do Jêba-Bijagos (Guinea-Bissau) and South Guinea should be combined into a single Guineas stock. A Gulf of Guinea stock, the historical 'Cameroon dolphins', extends from Togo to (at least) southern Cameroon. Specimen evidence shows fisheries-caused mortality of *S. teuszii* is significant, widespread, and non-quantifiable at present due to only sporadic monitoring of landings. Of special concern are catches in Guinea, Nigeria and Cameroon. All dolphins were killed in small-scale nearshore fisheries, mostly from incidental gill-net entanglement, and were

locally consumed as marine bushmeat. With increasing commercialization however, intentional captures may be encouraged. Rare sightings of mostly small groups in the northern Gulf of Guinea point to remnant, struggling, dolphin communities. *De novo* distribution gaps may emerge along heavily populated coasts following decades of by-catches, prey competition and habitat loss from irreversible coastal development. We suggest that scarcity of survey effort does not fully explain the absence of *S. teuszii* records over 1900 km of coastlines between Ghana and Sierra Leone, and particularly in Ghana where small cetacean exploitation is extensive. The implementation of a stringent conservation policy becomes increasingly urgent. New binational, border-straddling Marine Protected Areas could have significant conservation effects by limiting prey competition from fisheries and mitigating net entanglements and habitat destruction. The set-up of a regional *ad hoc* task force is strongly recommended to help introduce such practicable measures that could stop the threatened Atlantic humpback dolphin from sliding towards extinction.

The effective management and conservation of obligate coastal and estuarine marine mammals, such as humpback dolphins (*Sousa* spp.), require a comprehensive understanding of spatial overlap of their habitat with populated areas and of intensive anthropogenic pressures. Knowledge of the primary distribution of the Atlantic humpback dolphin *Sousa teuszii* (Kükenthal, 1892), a middle-sized (adult ca. 270 cm) African delphinid (Van Waerebeek *et al.*, 2004), remains incomplete with new range states still being added. Endemic to the subtropical and tropical eastern Atlantic, *S. teuszii* ranges exclusively in nearshore waters, apparently discontinuously from Dakhla Bay (23°54' N / 15°46' W) in Western Sahara to Tombua in southern Angola (15°47' S / 11°47' E). A CMS/UNEP comprehensive status review (Van Waerebeek *et al.*, 2003, 2004) confirmed nine range states and provisionally identified eight management stocks for practical purposes without claims of distinct biological populations: Dakhla Bay, Banc d'Arguin (Mauritania), Saloum-Niumi (Senegal, The Gambia), Canal do Gêba-Bijagos (Guinea-Bissau), South Guinea (Guinea), Cameroon Estuary (Cameroon), Gabon and Angola. Later field work confirmed *S. teuszii*'s continued presence in Cameroon after 110 yrs without records (Ayissi *et al.*, 2011, 2014) and considerably enhanced information for Gabon, Republic of the Congo (Collins, 2012, 2015; Collins *et al.* 2004, 2010) and Angola (Weir, 2009; Weir *et al.*, 2011). Recent evidence confirmed its presence in Benin (Zwart & Weir, 2014), Togo and Nigeria (this paper), totalling 13 range states. Considering neighbouring distribution areas, *S. teuszii* is likely present in Equatorial Guinea (Río Muni, not offshore Bioko), the Democratic Republic of the Congo (Congo River estuary) and Sierra Leone. Smaller-scale distributional insights remain fragmentary and often dated due to a paucity of survey effort. Also, the historical distribution of *S. teuszii* may remain uncertain considering that the current range may already have been modified by human factors. No robust abundance estimates are available for any stock, at best minima from added group sizes (see Collins, 2015). At least three stocks (i.e. Dakhla Bay, Banc d'Arguin and Angola) presently are very small, perhaps do not exceed a few tens of individuals (Van Waerebeek *et al.*, 2003, 2004; Weir *et al.*, 2011; Collins, 2015; K. Van Waerebeek, unpublished data) and risk extirpation. Circumstantial evidence, including great distance (> 350 km) and lack of records between core areas, suggest that the Dakhla Bay and Banc d'Arguin stocks may be reproductively isolated from each other and from the southern stocks (Van Waerebeek *et al.*, 2003, 2004; Collins, 2015). There is as yet no evidence to support a continuous range along West African coasts and opinions vary on whether their historical distribution was ever continuous (Van Waerebeek *et al.*, 2004; Weir *et al.*, 2011; Jefferson *et al.*, 2008; Collins, 2015). Main question is whether the longest coastline without humpback dolphin records, stretching 1900 km over four nations (Sierra Leone, 402 km; Liberia, 579 km; Côte d'Ivoire, 380 km; Ghana, 539 km) is fully explainable by survey deficiencies, or genuine distribution gaps exist, possibly created by anthropogenic factors. Specifically, the lack of Ghanaian records may result from decades-long dolphin exploitation and *S. teuszii* may either be exceedingly rare or even absent. However, the Volta River delta in eastern Ghana was identified as a potential remnant habitat (Van Waerebeek *et al.*, 2004, 2009, 2014; Debrah *et al.*, 2010; Van Waerebeek & Perrin, 2007). Van Waerebeek (2003) suggested a small Togo stock, its existence

remaining unconfirmed for a decade (Segniagbeto *et al.*, 2014) until recently (see below). In Benin, a single small group ($n = 4$) was sighted west of Cotonou on 03.XI.2013 (Zwart & Weir, 2014), the only evidence of its rare presence (Sohou *et al.*, 2013).

By-catches in small-scale fisheries and suspected deliberate captures, as well as coastal development are considered the principal threats to *S. teuszii*. Its conservation status appears to have significantly deteriorated and the 'Vulnerable' IUCN Red List classification is obsolete (Van Waerebeek, 2003; Van Waerebeek *et al.*, 2003, 2004; Weir *et al.*, 2011; Ayissi *et al.*, 2014). Collins (2015) suggested a 'Critically Endangered' status. Since 2010, *S. teuszii* has been listed on CMS Appendices I and II (Van Waerebeek & Perrin, 2007).

Here we document recent coastal survey effort that resulted in new *S. teuszii* specimen and sighting records in four nations, including two new range states. We evaluate how pervasive fisheries-related mortality and the demand for marine (cetacean) bushmeat have become in the study region and recommend measures.

MATERIAL AND METHODS

Capture, specimen and sighting data were collected either through dedicated (Nigeria, Guinea) or opportunistic (Togo, Cameroon) field effort. Atlantic humpback dolphins are unmistakable due to their prominent dorsal hump on which sits a small falcate dorsal fin, their long, well-defined rostrum and an overall greyish, robust body. Skulls were identified according morphological criteria described in Jefferson & Van Waerebeek (2004) and Van Waerebeek *et al.* (2004).

Nigeria. One of us (MU) surveyed Brass and Akassa Islands in Bayelsa State, Niger Delta region, between August 2011 and May 2012 researching fisheries interactions with sea turtles and small cetaceans. Main focus areas included Rotel Fishing settlement (04°19.45' N, 06°14.79' E) and Imbikiri Quarters, Twon Community (04°17.54' N, 06°17.41' E). MU conducted structured interviews of 48 artisanal fishermen and two fish mongers to evaluate general awareness of dolphins, especially humpback dolphins, and gather evidence on cetacean catches. Several other fishermen were informally queried. Main questions asked included: Age group? Besides fishing, what other professional activities do you engage in? Have you sighted dolphins either at sea or from the beach? If so, how frequently? Have you captured dolphins before? Have you encountered an accidentally entangled dolphin in your fishing gear? Do you intentionally hunt dolphins? What do you do with captured dolphins? In case you sold dolphins, at what price? To pique interest and assure they discussed cetaceans (not manatees or large fish), fishermen were shown photographs of Atlantic humpback dolphin, bottlenose dolphin and humpback whale. We made no conclusions about species' presence, as the unreliability of fishers regarding cetacean identifications is well-known (e.g. Moore *et al.*, 2010; Ayissi *et al.*, 2014).

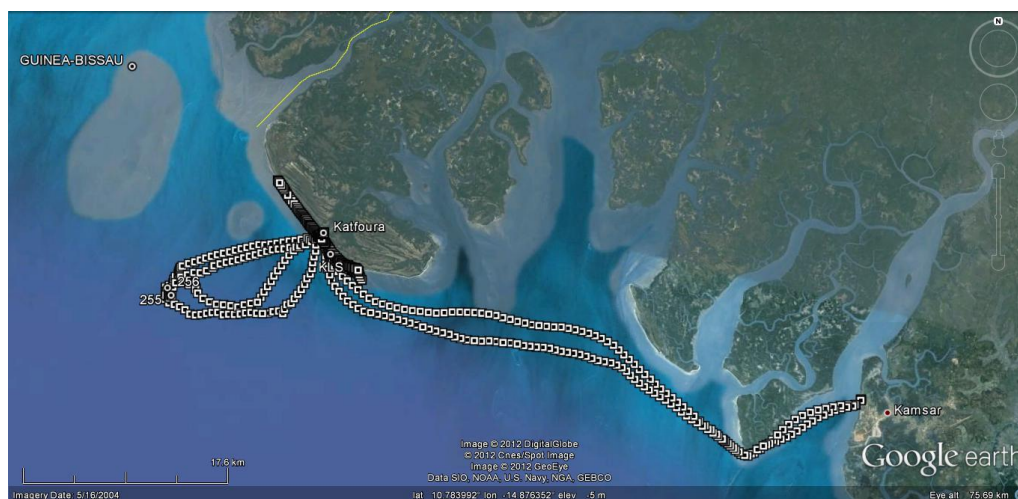


Figure 1.— Map of the Tristao Islands, Guinea, study area, at the Guinea-Bissau border (yellow line). Plotted are canoe survey trackline positions (white squares) between Kamsar and Katfoura, and off Katfoura Island, and shore-based survey area (dark squares). Waypoint 255-256 indicate sighting positions of Atlantic humpback dolphin group on 07.VI.2012.

TABLE I

Summary of coastal survey effort for cetaceans near Tristao Islands, Guinea, by two authors (ILB, KVV), 5-10 June 2012. Beach surveys were on foot. Time is UTC. Also see Fig. 1

DATE	SURVEY EFFORT	FINDINGS
05 June	Small-boat survey (Leg 1): Kamsar to Katfoura (via Nafaya) with pirogue. 08:20-12:45 (265 min); odometer 52.08 km	No cetaceans sighted.
06 June	Beach survey at Katfoura; 07:40-11:00; odometer 12.15 km	No sightings; no skeletal remains found.
06 June	Beach survey for nearshore sightings and cetacean remains: Katfoura direction SE, 12:00-17:00; odometer 12.1 km	Calvaria of juvenile <i>S. teuszii</i> recovered between Katfoura and Nafaya. No sightings
07 June	Small-boat survey (Leg 2) departing Katfoura; 07:30-11:05 (215 min); odometer 34.10 km	Sighting #255 (re-sighting #256): 40 (30-45) <i>S. teuszii</i> .
07 June	Visit of Katchek fishing port (ILB) and interviews of artisanal fishermen	2 skulls of <i>S. teuszii</i> ("by-catches") received from fishermen.
08 June	Small-boat (canoe) survey (Leg 3): Katfoura direction south; 08:05-11:41 (216 min); odometer 33.8 km.	No sightings.
08 June	Beach survey at low tide from Katfoura direction SE; 14:35-17:30; odometer 11.2 km	No cetacean material found; no sightings.
09 June	Small-boat survey (Leg 4): Katfoura to Kamsar, 07:40-12:18 (278 min); odometer 52.3 km	No sightings.

Guinea. Surveying extensive shallow water biotope (Doubouya & Camara, 2009), Bamy (2011) first confirmed the presence of *S. teuszii* in northern Guinea. In 2012 (4-9 June), Bamy and Van Waerebeek undertook a second exploration of the Tristao Islands with a 15hp outboard-powered canoe (mean $v = 10.61 \text{ km h}^{-1}$) and via shore-based observations (Fig. 1; Tab. I). Visual search effort was by naked-eye and 7 x 50 binoculars. Canoe-based effort totalled 974 min (16 h, 14 min), covering 172.28 km of trackline. Two fishermen acted as accessory observers. Water depths were read from a highly detailed old Soviet chart made for the Guinean State (N°34406-G, 15 December 1979, *Département Principal de la Navigation et de l'Océanographie, Ministère de Défense de l'URSS*). Shore-based surveys on foot (675 min; 35.45 km) comprised visual scanning of the inter- and infratidal coastal strip up to 2 km from shore (Tab. 1) and of the high tide line for cetacean remains. Fishermen were systematically queried about dolphin by-catches.

Togo. One of us (GS) and other Agbo-Zegué members (Togolese Society for Nature Conservation) conducted unstructured interviews in July 2013 and October 2014, querying coastal inhabitants without prearranged questions about the presence of dolphins along Togo's 50 km of mostly sandy beaches. Mr. Loïc Henry who operates year-round sports-fishing and (kayak) ecotourism excursions in coastal waters since 2010 also kindly provided significant information.

Cameroon. The Association Camerounaise de Biologie Marine (ACBM) supports a small-scale informal network of observers who gather *in situ* information on captures and strandings of sea turtles and cetaceans, mainly via word-of-mouth from community members and through occasional beach surveys. No effort estimate can be linked to this opportunistic, all-volunteer programme.

RESULTS AND DISCUSSION

GUINEA

Historical data.— Cadenat's (1956) initial report of *S. teuszii* seen south of Conakry in January 1953 provided the rationale for the *South Guinea* management stock (Van Waerebeek *et al.*, 2003, 2004).

Recent sightings.— On 01.IX.2011, Bamy (2011) sighted ca. 25 Atlantic humpback dolphins in shallow waters near the Tristao Islands. On 07.VI.2012 (09:15 UTC) two of the authors (KVV, ILB) observed a large scattered group of ca. 40 (30-45) *S. teuszii* at 10°45.332' N / 15°08.912' W off Katfoura Island, Tristao Islands (Fig. 2A). At 09:40, the group dispersed at 10°45.677' N / 15°09.080' W while individual dolphins actively avoided the canoe as they often do when

approached (e.g. Van Waerebeek *et al.*, 2004; Ayissi *et al.*, 2014). Mean Lower Low Water depth ranged 1-3 m. With high tide at 10:58 and a 5 m mean tidal range, water depth at both locations was estimated as 4.75-6.75 m. Turbidity was high. Multidirectional movements in subgroups of 2-4 individuals with frequent, abrupt speed changes pointed to active foraging in the rising tide, observed also in Senegal's Saloum Delta (Van Waerebeek *et al.*, 2003, 2004). The strong ontogenetic (and possibly sexual) variation in the shape and size of dorsal humps and fins, pointed to a mixed-age group with adults, juveniles and a single calf. The largest individuals showed massive, rectangular dorsal humps (Fig. 2A). In Oct-Nov 2013, Weir (2015) reported five sightings, a minimum of 47 animals, around the Río Nuñez Estuary, SE of the Tristao Islands.



Figure 2.— (A, upper) Adult member of a group of ca. 40 dolphins sighted off Katfoura Island, Tristao, on 07.VI.2012, represents the earliest photographic record of live *S. teuszii* in Guinean waters. (B, lower) Calvaria of a juvenile *S. teuszii* collected at Katfoura Island, Tristao, from a reported by-catch (see text). (Photos: K. Van Waerebeek).

Fishery interactions.— The first Guinean specimen consisted of a gillnet bycatch in Sangaréah Bay on 13.III.2002. Skulls of another two *S. teuszii* were documented at a fishing

village on Tristao (Bamy *et al.*, 2010, 2015). On 06.VI.2012, KVV collected a non-weathered calvaria on the beach between Katfoura and Nafaya fishcamp at 10°47.69' N / 15°01.643' W (Fig. 2B). A fisher from Katfoura donated matching mandibles and confirmed a recent capture. On 07.VI.2012, ILB obtained another two skulls of by-caught *S. teuszii* from fishermen at Kaatchek (10°88.749' N / 15°06.052' W). All three dolphins (skulls deposited at CNSHB) were reportedly eaten locally. Thus, since 2002, evidence exists for six *S. teuszii* captures in Guinea. Bamy (2011) also collected the skull of a *T. truncatus* at Tristao in 2011.

Folk knowledge.— Tristao fishermen referred to the specimens as "pueyegué" (Susu language) and "furian" but it remained unclear whether the names indicate humpback dolphins or generic dolphins.

TOGO

Historical data.— Van Waerebeek (2003) first suggested the existence of a small population of *S. teuszii* in western Togo, however photographic evidence remained elusive. A checklist of Togo's cetaceans from strandings and bycatches in 2003-2010 revealed 9 cetacean species, not including *S. teuszii* (Segniabeto & Van Waerebeek, 2010; Segniabeto *et al.*, 2014).

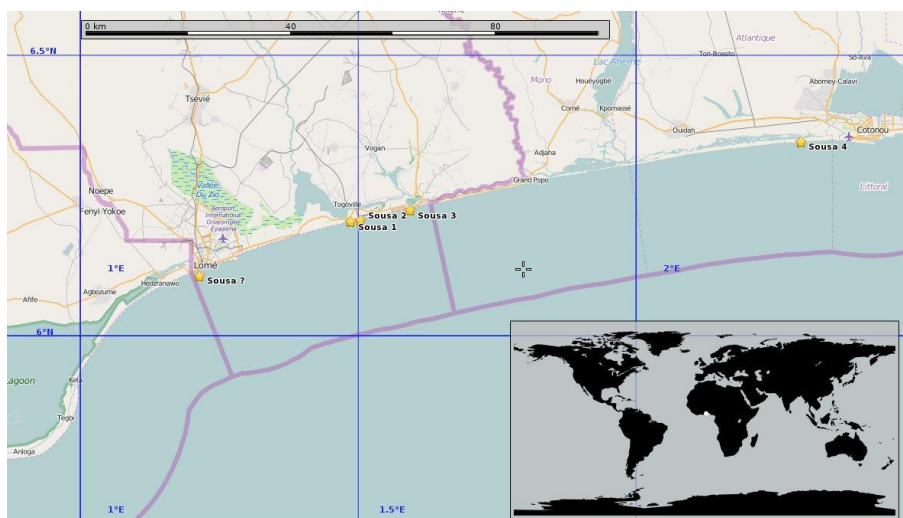


Figure 3.— Map of northern Gulf of Guinea showing Togo (centre), eastern Ghana (left) and western Benin (right). Pink lines indicate international borders. Shown are three confirmed (“Sousa -1, -2, -3”) sightings of *S. teuszii* in Togo’s nearshore waters made by Loïc Henry. An unconfirmed sighting (“Sousa?”) was reported by Lomé fishermen. The only sighting known from Benin is plotted as “Sousa-4” (see text).

Recent sightings.— Mr. Loïc Henry (pers. comms to GS, March 2013 and *in litteris* to KVV, 02.IV.2013, 03.IV.2013) requested us to identify small groups of dolphins (*S. teuszii*) he photographed from shore on at least five occasions: (i) 27.XII.2008 (n = 7), some 30 km [NE] of Lomé at ca. 06.1953° N / 01.4969° E; (ii) 06.IV.2013 (n = 6) Kpémé (06.2253° N / 01.5240° E), Togo’s central coast; (iii) 19.X.2013 (n = 7) at Aného (ca. 06.2204° N / 01.6141° E); (iv) 11.X.2014 (n = 27, several subgroups) at an unspecified locality; (v) 25.III.2015, min. 5 specimens at Goumou-Kopé (06.21288° N / 01.53672° E) (Figs. 3 & 4). The occasional sightings, likely including re-sightings because spatially aggregated, and small group sizes (median = 7) point to low abundance.

Fishery interactions.— Two individuals were incidentally killed in a beach seine set at

Agbodrafo (N06°12.00',E01°28.73') at the eastern coast, on 14 August 2016, the first *S. teuszii* specimen records for Togo (Fig. 5). One of us (GS) seized and buried the carcasses for later retrieval of skeletons.



Figure 4.— A small group of Atlantic humpback dolphins observed from the beach at Goumou-Kopé, eastern coast of Togo, on 25-III-2015. (Photo, © Loïc Henry, OFFAP Togo, Observatoire de la Faune, de la Flore et des Aires Protégées du Togo. Reproduced with permission).



Figure 5.— Two Atlantic humpback dolphins dead after entanglement in a beach seine at Agbodrafo, 14-VIII-2016. (Photo: Gabriel Segniabeto)

Folk knowledge.— While traditional animist beliefs prevalent in Togo regard dolphins protected 'totems' (Segniabeto *et al.*, 2014), evidently these cannot prevent accidental

entanglements. Fishermen described inshore dolphins, either *S. teuszii* and/or inshore *T. truncatus* from beaches around Benin's Mono River estuary (Bouche du Roy) near Grand Popo, west to about Gbetsogbé, 5 km E of Lomé port. In view of *S. teuszii*'s shyness, the lack of sightings in the wider Lomé area is probably linked to heavy vessel traffic and water and noise pollution from port construction work.

NIGERIA

Historical data.— Considering its 850 km coastline, much of it rimmed with creeks and mangrove forests, Nigeria has long been assumed a *S. teuszii* range state (Klinowska, 1991; Maigret, 1994), however reviews failed to pinpoint any specific historical records (Van Waerebeek *et al.*, 2004; Uwagbae & Van Waerebeek, 2010; Collins, 2015).

Recent sightings.— Olakunle and Akanbi (2014) reported three sightings of *S. teuszii* in western Nigeria, totalling 33 individuals, but unfortunately did not document these with positions, circumstances or photos. The general lack of records in Nigeria can be attributed to scarce scientific observer effort. Uwagbae & Van Waerebeek (2010) found photographic evidence for only two cetacean species (*T. truncatus* and humpback whale, *Megaptera novaeangliae*) besides a credible account of an offshore sighting of Fraser's dolphin, *Lagenodelphis hosei*.

Fisheries interactions.— Two dolphins killed in artisanal gillnets off Brass Island are the first authenticated records of *S. teuszii* in Nigeria. An adult female was landed at the Rotel fishing settlement (04°19.45' N / 06°14.79' E), Brass Island, in November 2011 (Fig. 6B) and a second (juvenile) animal, also taken by local fishermen was landed at Imbikiri quarters (04°17.54' N / 06°17.41' E), Twon Community, Brass Island, in February 2012 (Fig. 6A). Both animals were butchered for marine bushmeat. Moore *et al.* (2010) and Solarin (2010) suggested that small cetaceans were rarely caught in artisanal and industrial fishing gear in Nigerian coastal waters. Uwagbae & Van Waerebeek (2010) countered that captures likely occur with some frequency but failed to be reported, further corroborated by the above evidence. Year-round monitoring will be required to gather statistics that reflect real mortality levels.

Folk knowledge.— The 50 interviewees comprised all active fishermen's age classes: 21-30 years old (10 %), 31-40 yrs (54 %), 41-50 yrs (30 %) and >50 yrs (6 %). Of these, 66 % indicated their professional activities included also 'shark hunting', 14 % were also 'shrimp fishing' and 20 % also engaged in subsistence farming. All respondents had sighted dolphins either at sea or from the beach. When at sea, 96 % sighted dolphins 'once in a while' and 4 % sighted them 'very often' (almost every fishing trip). Most fishermen (94 %) admitted to capture a dolphin at least once, while 6 % denied this. On the question whether they had encountered an accidentally entangled dolphin in their fishing gear, 58 % replied 'occasionally' and 42 % said 'never'. When queried whether they had intentionally captured dolphins, 58 % confirmed, 36 % denied and 6 % were 'not sure', meaning they tried but had given up when the hunt proved too difficult. Asked what they did with captured dolphins, 92 % of respondents said it was used as bait to catch sharks, and 8 % used or sold them for food. The retail value (in official rate USD; about double of informal rates) of dolphins ranged widely, depending both on the dolphin size and on the location. On Brass Island, younger, smaller dolphins (1.2 – 1.8 m) would sell between \$312 – \$375, while larger dolphins (2.0 – 2.5 m) would sell between \$563 – \$625. On Akassa Island the smaller and larger dolphins would fetch, respectively, \$300 – \$312 and \$312 – \$375. The demand and price for dolphin meat is higher on Brass Island because it is more populated than Akassa, comprising more commercial fishermen. Also Brass Island hosts far more economic activities, including the multinational Agip Oil & Gas operating a large crude oil exporting terminal. A Brass Liquefied Natural Gas Plant is under construction. The cost of living is higher than on Akassa Island which lacks the presence of any major commercial activities. Asked when hunting of dolphins started, the unanimous reply was that it was an old tradition, implying that cetacean bushmeat may be far more prevalent and 'traditional' than thought. The usage as shark bait is a comparatively recent development with the

massive export of shark fins to Asian markets.



Figure 6.— Atlantic humpback dolphins captured in artisanal coastal fisheries.
(A, top) Juvenile landed at Imbikiri quarters, Brass Island, Nigeria, February 2012;
(B, middle) Adult specimen at Rotel fishing settlement, Nigeria, in November 2011. (Photos: Michael Uwagbae).
(C, bottom) Freshly captured specimen at Londji landing site, Cameroon. (Photo: Isidore Ayissi).

CAMEROON

Historical data.— The holotype skull of *Sousa teuszii* (Kükenthal, 1892) was retrieved from a bycaught animal at Man O'War Bay in 1892. 'Cameroon dolphin', a name applied decades before the currently prevalent Atlantic humpback dolphin (Culik, 2004), was proposed to refer to the *Gulf of Guinea* management stock, formerly *Cameroon Estuary* stock (Van Waerebeek *et al.*, 2004; Ayissi *et al.*, 2014).

Recent sightings.— On 17.V.2011, we observed a group of ca. 10 (8-12) *S. teuszii* near Bouandjo in Cameroon's South Region (Ayissi *et al.*, 2011, 2014) over 259.1 km of visual survey effort in nearshore waters (0.039 individuals km⁻¹). A 30.52 km shore-based survey did not yield sightings or beach-cast specimens. New effort in the same area in 2016 (KVV & IA, unpublished data) did not result in further sightings.

Fisheries interactions.— One individual was captured at Campo, southern Cameroon, in 2012 (Ayissi *et al.*, 2014). An adult specimen landed at Londji fish landing site near Kribi (02°56.1' N / 09°54.6' E) on 22.III.2014 (Fig. 6C) was reportedly accidentally entangled in an artisanal gillnet in the Douala-Edea Fauna Reserve. No samples are available, as dolphins were butchered before researchers could reach the landing sites.

DISTRIBUTION AND POPULATION STRUCTURE

Large-ship survey effort off NW Africa, covering 13 694 km in coastal, but not inshore waters (i.e. < 20 m depth) in 2011-2013 (Djiba *et al.*, 2015) yielded 270 primary sightings of 14 cetacean species but not a single humpback dolphin. This result is consistent with well-documented *S. teuszii* encounters, confirming that the species is limited to shallow neritic waters (Van Waerebeek *et al.*, 2004; Collins *et al.*, 2010; Weir *et al.*, 2011 and references therein; this paper).

Intraspecific morphological variation and population genetics has hardly been studied, and small-scale distributional insights are incomplete due to limited research (Van Waerebeek & Perrin, 2007; Collins, 2015). If the lack of records from Sierra Leone to Ghana reflects an ecology-based distribution gap (e.g. seasonal upwelling) then some population differentiation should exist between NW African and Gulf of Guinea stocks. Alternatively, if the low-density zone is caused by high anthropogenic mortality and disturbance, no measurable population structure would be expected.

Two provisional stocks were proposed for the Guineas (Van Waerebeek *et al.* 2004): the *South Guinea* stock, centred around Conakry, and the *Canal do Geba-Bijagos* stock in Guinea-Bissau.

Multiple records from the Tristao Islands in 2011-2012 (see above) as well as recent sightings in the Río Nuñez Estuary (Weir, 2015) are contiguous to the *Canal do Geba-Bijagos* stock, Guinea-Bissau. With relation to Sangaréah Bay, the northernmost locality record for the *South Guinea* stock (Van Waerebeek *et al.*, 2004; Bamy *et al.*, 2010), spatial separation is < 150 km of relatively undeveloped coastline of mangroves and open sandy beaches, good habitat, hence a single *Guineas* management unit is proposed. Humpback dolphins in Cameroon, Nigeria, Benin and Togo comprise a *Gulf of Guinea* stock, the historical 'Cameroon dolphins' (Culik, 2004; Ayissi *et al.*, 2014); their southern extension being unclear. Again, these stock definitions are meant to serve practical management purposes amongst range states, until intraspecific genetic variation data become available.

FISHERIES IMPACT

The widespread consumption and trade in bushmeat (wild meat) in western Africa embodies a complex and almost intractable conservation problem (e.g. Bowen-Jones & Pendry, 1999; Brashares *et al.*, 2004; Ntiamoa-Baidu, 1997). The cultural and socio-economic drivers for the utilisation of cetaceans, manatees and sea turtles for human consumption bear many similarities to the terrestrial sourced bushmeat, which led to the introduction of the marine bushmeat concept

(Alfaro & Van Waerebeek, 2001; Clapham & Van Waerebeek, 2007). In western Africa, cetacean bushmeat has been documented in an increasing number of countries, e.g. Mauritania, Senegal, The Gambia (Murphy *et al.*, 1997; Van Waerebeek *et al.*, 2000, 2003, 2004; Leeney *et al.*, 2015), Guinea (Bamy *et al.*, 2010, 2015, this paper), Ghana (Van Waerebeek & Ofori-Danson, 1999; Ofori-Danson *et al.*, 2003; Debrah *et al.*, 2010; Van Waerebeek *et al.*, 2009, 2014), Togo (Segniagbeto *et al.*, 2010, 2014), Benin (Sohou *et al.*, 2013), Nigeria (Uwagbae & Van Waerebeek, 2010; this paper), Cameroon (Ayissi *et al.*, 2011; 2014), Gabon and the Republic of the Congo (Van Waerebeek & De Smet, 1996; Collins, 2012, 2015; Collins *et al.*, 2004, 2010). An additional challenge is the demand for dolphin parts for use as bait in longline fisheries targeting sharks. In Ghana, dolphin meat commands comparable price levels as billfishes, albacore or yellowfin tuna, and despite many conservation efforts (Ofori-Danson *et al.*, 2003) dolphin landings have only just started to become slightly stigmatized (K. Van Waerebeek, pers. obs.).

All Atlantic humpback dolphin specimens reported here, both freshly dead and cranial material, were encountered in a context of artisanal fisheries, confirming the latter as the main threat (see Van Waerebeek *et al.*, 2004; Van Waerebeek & Perrin, 2007; Weir & Pierce, 2013; Weir *et al.*, 2011; Ayissi *et al.*, 2014). Entanglement (by-catch) in both gill-nets and a beach seine were confirmed, while it could not be determined whether some may have been taken intentionally. When queried, locals admitted that dolphins were butchered and fully utilised. Hunting of dolphins occurs in at least Ghana, Nigeria, Cameroon and Guinea. Countries with known landings of *S. teuszii* include Mauritania, Senegal, The Gambia, Guinea, Togo, Nigeria, Cameroon, Gabon and the Republic of the Congo. Interview data should be critically interpreted as few fishermen will self-incriminate, for hunting of cetaceans is illegal in West African countries. In Ghana, captures may have contributed to the species' local decline (Van Waerebeek *et al.*, 2004, 2009). Along the Togo and Benin coastline, dolphins enjoy protection against hunting thanks to veneration of aquatic mammals among the dominant Ewe people (Segniagbeto *et al.*, 2014), which may help explain why low numbers are still present. However the scale of small-cetacean exploitation as prevalent in Ghana warns against complacency. Many 100s of dolphins per annum of 14 different species are landed in several ports on a daily basis and are commercially traded for their meat (e.g. Ofori-Danson *et al.*, 2003; Debrah *et al.*, 2010; Van Waerebeek *et al.*, 2009, 2014). A management programme is lacking and catch statistics are collected only occasionally, in an academic context. *Sousa teuszii* possibly was depleted by dolphin exploitation before port monitoring effort even started. Some hope remains that rare reports of dolphins nearshore the Volta River Delta in Ghana would prove to be a remnant *S. teuszii* community (Van Waerebeek *et al.*, 2004).

Nigeria, Togo, Benin and the Republic of the Congo have been confirmed as range states only in the past few years, by itself not necessarily a reassuring conservation message. Suggestions of a range without distribution gaps (e.g. title of Zwart & Weir, 2014 paper: "Filling in the gaps ..."), while unsupported, also seem overly optimistic and may compromise difficult conservation efforts that attempt to rally public awareness concerning a threatened marine mammal. Occasional or rare sightings of small groups (see above) point to residual, struggling, *S. teuszii* stocks. Any misunderstandings among fisheries managers and the general public may grant licence to an already pervasive complacency in aquatic mammal management policies. Anticipated are *de novo* distribution gaps emerging following decades of fisheries interactions and coastal encroachment reducing *S. teuszii*'s historical range. Irreversibly developed coastlines in Ghana and Côte d'Ivoire, particularly near the larger cities and ports, may already constitute such gaps.

GENERAL DISCUSSION

Newly recognized range states are named for *S. teuszii* as field workers initiate monitoring of poorly studied coastlines, such as in the northern Gulf of Guinea, essentially a belated documenting of the primary range. While a continuous distribution from Western Sahara through the Gulf of Guinea south to Angola, as often illustrated in marine mammal guides (e.g. Jefferson *et*

al., 2008; Shirihai & Jarrett, 2006; Reeves *et al.*, 2002), may or may not have existed for most of the Holocene interglacial (since 11 700 BP) along formerly pristine shores, recent research is rather pointing to coastal areas of variable lengths with scarce or no records (Ayissi *et al.*, 2014; Van Waerebeek *et al.*, 2004; Van Waerebeek & Perrin, 2007; this paper). The few surveys that provided density estimators of *S. teuszii* (reviewed by Collins, 2015) found low to very low abundance, with the possible exception of the Guineas stock (Bamy, 2011; Weir, 2015; this paper). A similar decline of inshore ecotype common bottlenose dolphin (*T. truncatus*) is warned for, due to the same causes.

Sousa teuszii specimen records in Nigeria, Togo, Cameroon and Guinea underscore the frequent captures in small-scale fisheries, in parallel with a region-wide generalisation of demand for cetacean bushmeat, likely related to diminished fish landings as was demonstrated for terrestrial bushmeat in Ghana (Brashares *et al.*, 2004). Significant mortality (relative to low abundance), prey competition from inshore fisheries, habitat loss and related disturbance from accelerating and irreversible coastal development jointly pose the most formidable challenges to the long-term survival of *S. teuszii*. The implementation of practicable conservation measures become increasingly urgent with concerted action needed nationally and regionally. For instance, several new binational, border-straddling Marine Protected Areas (MPAs) similar to the Saloum-Niumi complex uniting Senegal's Saloum Delta National Park with The Gambia's Niumi National Park could have measurable conservation effects by limiting fishing, net entanglements and mitigating habitat destruction. MPAs, such as the Tristao Islands in Guinea, often require an access permit for non-residents, providing a certain level of protection from disturbance. As small MPA networks (White *et al.*, 2005), binational involvement has obvious benefits, allowing for a larger total protected area with increased ecological effectiveness, the potential for coordinated planning where social and environmental dimensions may become intertwined. Border-straddling MPAs incorporate an extra incentive to reduce human transiting as this is also a key interest shared by authorities guarding national borders. Specific proposals that may deserve special attention include sanctuaries straddling Cameroon/Equatorial Guinea and Guinea-Bissau/Guinea-Conakry, amongst others. The necessary engagement by national, regional and intergovernmental partners, as well as local communities, will require wide consultation within a multidisciplinary forum. We recommend a follow-up symposium to the CMS/UNEP coordinated 'Western African Talks on Cetaceans and their Habitats' in 2007 (WATCH, Tenerife; UNEP/CMS, 2012) with the authority to set up a regional *ad hoc* task force to define a set of practical measures to stop the Atlantic humpback dolphin from sliding towards extinction. Whether or not this species has a future will, inevitably, be decided in Africa.

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