A FIRST CHECKLIST OF CETACEANS OF GHANA, GULF OF GUINEA, AND A SHORE-BASED SURVEY OF INTERACTIONS WITH COASTAL FISHERIES

Koen Van Waerebeek
Peruvian Centre for Cetacean Research (CEPEC)
Jorge Chavez 302, Pucusana, Lima 20, Peru
Kvwaere@mail.cosapidata.com.pe

P.K. Ofori-Danson [1]
Senior Scientific Officer, Water Research Institute, Council for Scientific and Industrial Research, P.O. Box 38, Achimota, Ghana

ABSTRACT

To date, six cetacean species are confirmed to occur in coastal waters off Ghana*:* five odontocetes *Stenella clymene*, *Steno bredanensis*, *Tursiops truncatus*, *Kogia simus*, *Physeter macrocephalus*, and *Megaptera novaeangliae*. A stranded humpback whale calf raised questions about breeding stock. We found no evidence for the presence of the Atlantic hump-backed dolphin *Sousa teuszii* ; either it has become rare or it does not occur off Ghana. Unrestrained coastal development may pose a threat for nearshore species. Regular and year-round by-catches of small cetaceans are documented in artisanal gillnet fisheries from Apam, Jamestown (Accra), Kpone and Winneba. At Apam, drift gillnet fishermen intentionally capture dolphins with sharks and tuna. Annual takes at Apam and Jamestown probably count in the low hundreds, higher than at Kpone and Winneba. Bottlenose dolphins are also known to be taken in semi-industrial purse-seines (Jamestown). Carcasses are not filleted, but hacked into small portions including bone, and retailed locally for food. This explains why beach-combing around fishing villages did not yield any findings of skeletal parts. Field research and monitoring effort should continue.

KEYWORDS: BOTTLE-NOSED DOLPHIN; CLYMENE DOLPHIN; ROUGH-TOOTHED DOLPHIN; DWARF SPERM WHALE; SPERM WHALE; HUMPBACK WHALE; CONSERVATION; INCIDENTAL CATCHES; DIRECTED CATCHES; FISHERIES; GILLNETS.

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INTRODUCTION

Marine resource exploitation in West Africa has been irregular but is increasing with the growth of the population and the socio-economic crisis that is enveloping many African countries: as more food is needed, people are looking to the sea to supply their needs (Maigret, 1994). Problems related to overexploitation are inexorably reflected in recent statistics, e.g. fish supply per capita in sub-Saharan Africa has dropped from 9kg in 1990 to 7kg in 1994 (FAO, 1997). In the zone between Gabon and Guinea-Conakry, important stocks of trigger fishes *Balistes* spp. massively taken by trawling (Ofori-Adu and Koranteng, 1993), have practically disappeared (FAO, 1997). Offshore fish stocks have been heavily exploited since 1984; in one zone total biomass is estimated to have been reduced to 50% (FAO, 1997). In a number of developing nations (reviewed in IWC, 1994), in the search for new species and stocks to exploit, the incidental utilization of by-caught cetaceans as an occasional source of protein has led to the development of directed fisheries of small cetaceans, creating new challenges for management agencies.

Except for a regional review by Maigret (1994) and a recent survey in Senegal and The Gambia (Van Waerebeek *et al*., 1997; Van Waerebeek, 1999), interactions between fisheries and cetaceans off West Africa since 1990 have hardly been explored. No catch estimates (magnitude) or other statistics are available for this extensive region. Paucity of data, including on the distribution and status of whales and dolphins, for the Gulf of Guinea is extreme (see Mitchell, 1975; Northridge, 1984; Ofori-Danson and Odei, 1997). Maigret (1994) investigated but found no by-catch data for Ghana, Togo, Benin, Nigeria, Cameroon, Equatorial Guinea, Sao Tomé and Principe, Gabon and Congo-Brazzaville.

A recent report to UNEP (Ofori-Danson and Agbogah, 1995) provided some baseline information from Ghanaian waters. Next, Ofori-Danson and Odei (1997) submitted a document to the IWC Bournemouth meeting which indicated that a dolphin fishery was developing in Ghana. KVW raised some doubts about the species involved and contacted POD. Via the IUCN Cetacean Specialist Group (CSG), and with the support of the Chicago Zoological Society and the Leopold III Fonds voor Natuuronderzoek en -Behoud, a collaborative research effort ensued to re-assess data, expand field collecting and organise future work. Here we report on the initial results of this successful venture.

MATERIAL AND METHODS

In the course of the senior author's study visit to Ghana and Togo in May-June 1998, time was divided between field work and liaising with ministry and university officials concerned with wildlife and fisheries management as to raise awareness about the relevance of aquatic mammal research. In Ghana, four fishing communities were surveyed based on former insights as where dolphins were most likely landed (Ofori-Danson and Odei, 1997): Jamestown (05°33'N, 00°13'W) near Accra; Kpone (05º40'N, 00º05'E), Apam (05°15'N,00°43'W) and Winneba (05°20'N,00°37W). One of us (POD), aided by assistants, continued with several additional monitoring visits to landing sites in 1998. Informal interviews were conducted by POD, if possible in a local language to maximise cooperation. No notes were taken in people's presence.

Dolphins seem to be more often sighted at sea by fishermen than large whales and are rather more familiar animals. They are locally known under various names such as *Atui*, *Ati*, *Adii*, *Adanseke*, *Fumelokloui*, and *Atakpe.* Freshly landed dolphins are quickly sold and processed and only a minimum set of data can be collected, unless the specimens are bought. As a start, assistants were asked to note number and species of cetaceans landed, morphological description, standard length, weight and number of teeth. Further, photographs, heads and skin samples (in 20% DMSO or 70% EtOH) were obtained as voucher specimens and for species identification. Specimens were deposited at the Water Research Institute (WRI) in Accra.

RESULTS AND DISCUSSION

Overview of fisheries in Ghana and Togo

Fishing is perhaps the most important economic activity in Ghana's coastal zone, in terms of number of people involved directly as well as dependent on it. A survey conducted in 1992 estimated the number of canoes operating in the artisanal sector at 8,688, and the average number of fishermen at 97,500. There

are 306 landing sites along the 550km Ghana coastline (Koranteng *et al.*, 1993; Armah *et al*., 1996). Currently, 156 semi-industrial vessels operate in shelf waters from eight landing sites. The estimated number of semi-industrial fishermen is 6,500. The number of industrial trawlers in 1995 was 40 while that of shrimpers 17. The number of industrial fishermen is estimated to be 2,000 (Armah *et al*., 1996). A total of some 8,840 MT of fish (both frozen and cured) were exported from Ghana in 1994 and the fisheries sub-sector accounts for about 3% of Ghana's GDP. Thus, the socio-economic pressures from the fisheries sector are high. At least the demersal fish stocks are overfished, judging from the dwindling size of the species being landed (Armah *et al*., 1996).

Little has been published on Togo fisheries because they are not well-developed, partly due to a narrow continental shelf and partly due to the lack of a maritime tradition. The artisanal fishery is concentrated around the capital Lomé. About 80% of fishermen operating in Togo are Ghanaian (Maigret, 1994). The pirogues use two types of net: (1) *awli* nets that resemble a ring-net without rope and are 400-1,000m long by 30-50m deep, with 25mm mesh; (2) small gillnets or *tonga*, made with 2-5 panels of about 3m in length with mesh size varying from 25mm at the top to 100mm at the bottom (Weigel, 1984; not seen, *in* Maigret, 1994).

Monitoring of ports and fish landing sites

Fish landings are monitored by fisheries inspectors at a selected number of ports, however cetacean catches are not usually noted. From talks with Mrs. Anang, Director of Research and Utilization Branch at the Fisheries Department (Ministry of Agriculture), Tema, it appeared this could be amended fairly easily. Mr.Ofori-Adu (Fisheries Department, Tema) holds unpublished notes of dolphin catches at Apam (pers.comm. to KVW, 8 June 1998). F.X. Bard (pers.comm. to Maigret, 1994) provided an isolated account of an unidentified dolphin caught in Dixcove, western Ghana, in May 1988. Observations made by the authors during an exploratory, shore-based survey are indicated below.

1. Jamestown (Accra)

POD first witnessed two dolphins landed at Jamestown in February 1994 (reported as *Delphinus delphis* in Ofori-Danson and Odei, 1997). Photographs and a collected skull permitted KVW to re-identify these as bottlenose dolphins *Tursiops truncatus*. The authors checked Jamestown landing site on 30 May 1998 (15:00h) and again the next day at 06:30h. Rough weather had impeded boats to set out to sea and few boats were landing catches. Wooden pirogues based at Jamestown number in the low hundreds. Most are hand-powered but some larger ones are equipped with outboard motors. The majority of pirogues deploy hand-hauled purse-seines, others use gillnets and long-lines. Fishing trips typically last less than 12hrs to avoid the necessity for ice which is either prohibitively expensive or unavailable. On tuesdays no fishing activities take place, in compliance with animist beliefs. During two subsequent checks of Jamestown (12/08/1998, 05/09/1998), POD did not witness any dolphins brought ashore. In the last quarter of 1998, drift gillnet fishermen had migrated to western towns.

One fisherman of Jamestown claimed dolphins are netted regularly; he estimated '4-10 dolphins a week', which would translate in a per annum catch guestimate of low hundreds. Dolphins are said to measure up to 3m, which covers many small delphinids. Some animals are landed alive though battered and are slaughtered on the beach. We surveyed the Jamestown fish market on 31/05/1998 for cetacean meat, reportedly available almost daily, but did not encounter any. The presence of a foreigner (KVW) may have incited vendors to hide dolphin meat.

Jamestown is inconvenient as sampling site for lack of working space (overcrowded) and relative insecurity. The *Ga* fishermen are locally infamous for rowdiness; fights are commonplace and outsiders are unwelcomed with probing questions about intentions. Although accompanied by a local guide, photographing was hardly acceptable.

2. Kpone

Kpone is a small village of artisanal fishermen situated some 7km east of Tema, Ghana's largest industrial port and home to the nation’s foremost commercial tuna fleet. We first surveyed Kpone on 1 June 98. Kpone fishermen utilize man-powered wooden dug-out canoes. The bigger canoes carry outboard motors; these steam to the fishing grounds where they switch to paddles to limit fuel consumption. All fishing trips last less than 24hours since no ice is taken along. Nets seen include purse-seines and multifilament drift gillnets, the latter with one-side mesh size smaller than 10cm. Several fishers told us that the day before (31 May) two small dolphins had been landed. One of us (POD) had received notice from a fisheries observer that a week earlier (~24 May), two larger dolphins had been

taken.
Reportedly dolphins are accidentally entangled in gillnets: Kpone fishermen do not deliberately target marine mammals. One estimate by a local is that 'at least 10 dolphins a month' are openly landed; most are dead, a few moribund. A conservative guestimate would likely approximate some 100 by-caught animals/year at Kpone. No dolphins were landed on three survey days (09/08/98, 25/08/98 and 04/09/98), but fishers gave positive reports of recent instances of catches. Kpone gillnetters in the third and fourth quarter of 1998 moved west to the central region (e.g. Apam), where better catches were had.

3. Winneba
Artisanal fishers of Winneba, a fishing community west of Accra, utilize mostly small dug-out canoes and fish mainly nearshore with small-meshed multifilament gillnets. On 3 June 1998, most fishers were (manually) hauling big beach-seines. Locals denied any takes of dolphins. Beach-combing yielded no cetacean remains. Some fishers referred us to Apam 'if we wished to find dolphins'. However, a clymene dolphin *Stenella clymene* was landed here in September 1998 (see further).

4. Apam
Apam is a sizable artisanal fishing town, bustling with activity, some 70km east of Accra. Many tens of dug-out canoes are hauled on the beach at any one time. All people interviewed confirmed regular catches of dolphins, with landings of up to 10 animals/day interspersed with periods when no cetaceans are captured. One older fisherman indicated that catches of dolphins are particularly high in September-October, related to the seasonal peak presence of sardines (*Sardinella* spp.*)*, which apparently attracts dolphins. Both accidental and directed catches occur. Dolphin carcasses are chopped in small pieces, smoked and consumed locally. A few people eat the meat fresh. Local fishermen of the Akan tribe openly communicated and were considerably more cooperative than their counterparts in Jamestown.

Artisanal purse-seiners fish for sardine (*Sardinella aurita* and *S. maderensis*) and anchovy, embark a numerous crew (needed to haul nets) and fish close to shore; they rarely capture dolphins. In contrast, drift gillnets are deployed from smaller, lighter and faster boats which set farther to sea with a limited crew. The latter target shark species (e.g. *Sphyraena* spp.), tuna and dolphins. Typically, gillnet fishermen set out in the morning, drive offshore during daylight hours to arrive on the fishing grounds in the evening. Nets are soaked all night and recovered in the early morning; boats return to port the next day at 2-5PM. The shark fishery first developed around 1974. Maximum takes of shark occur from 15 July till September, related to major upwelling (Ofori-Adu and Koranteng, 1993).

On 03/06/98 (at 17:00hrs), three gillnet boats landed exclusively skipjack tuna *Katsuwonus pelamis*. On 23/08/98, POD documented the landing of two small cetaceans, one of which a *Kogia simus* of 120cm. Heads were purchased, skin samples and teeth collected. Two so far unidentified delphinids, probably *Stenella* sp., were landed on 29/08/98; a bottlenose dolphin and another delphinid on 24/09/98. Four more bottlenose dolphins were landed on 27/01/1999 (heads collected).
Mr. Botwe Samuel (Department of Fisheries) reported on a 121cm female dolphin, landed on 02/07/99, with 64 and 62 teeth, respectively in upper and lower jaw, although it is unknown how these were counted. Agricultural officer Mr.Quartey, who osten inspects landings, was provided with funds to buy dolphin heads and a compact camera to allow species identification a posteriori.

Strandings of large whales
Strandings of large whales on the Ghanaian coast seem to be infrequent, intervals of 1-5 years have been cited (Irvine, 1947; Ofori- Adu, 1987). Whales are revered and a stranded specimen accordingly is treated as a 'god' by some local coastal communities. Whaling is therefore not practiced (Irvine, 1947). Normally the carcass is left to rot and the bones are later collected and placed under surveillance in shrines. Since the occurrence is rather infrequent, no proper records are kept of stranded animals. Generally whenever a whale is washed ashore a religious ceremony is performed and it is regarded to be a sign of good omen – like signifying a bumper season for the ensuing fishing season (Ofori-Adu, 1987). Usually donations in cash and in kind are made to the chief priest or the chief fisherman by all the fishermen in that locality. A goat and some drinks (*schnapps*) are bought and together with other items the chief priest performs rituals at the site where the carcass lies. After the ceremonies, people are allowed to cut pieces of the dead animal for food; oil is extracted for use in their homes as potent ointment for ailments. Some of the baleen plates are also removed by the chief priest for use generally as precious ornaments in their homes and shrines (Ofori-Adu, 1987). These shrines need be perused for

indications of species.
In recent times, the stranding of a sperm whale and a humpback whale have been registered (see below).

Dolphin exploitation

Utilization

As recently as 1987, Ofori-Adu stated 'apparently one species [of dolphin] is abundant in Ghanaian coastal waters, but unfortunately its flesh is not acceptable for eating by a large section of the general public'. Ofori-Danson and Agbogah (1995) thought that dolphin meat is disliked as food by most Ghanaians. As shown above, this is no longer valid for at least the communities of Apam, Kpone and Jamestown. It would appear that in certain circumstances, probably of necessity, the taste for an unusual food item may be rapidly acquired within the diet of a community. The meat of a bottlenose dolphin carcass bought for research by the Water Research Institute on 05/02/1994 was taken home for food by the personnel that assisted the dissection.
Fishermen from the above-mentioned villages indicated that all parts of the dolphin are utilized, including internal organs. Once sold to women fishmongers, meat is not filleted from the postcranial skeleton as is customary in e.g. Peru, but the whole animal, bones attached, is hacked into small, individual portions, and retailed as such. This helps explain why beach-combing around Ghanaian landing sites did not result in any bony remains: none are thrown away.
In order to sample specimens, whole carcasses will have to be purchased. Middle-sized dolphins are sold for the cedi equivalent of about USD 100, which is high. Indeed, overall fish prices were also considerably higher than e.g. in Senegal and The Gambia (Van Waerebeek, 1999). Only in June-August, when fish landings peak in Ghana, prices go down.

Industrial fisheries

No verifiable information is published on dolphin by-catches in the commercial tuna fishery. The Ghana Agro-Food Company Ltd. prints banners on tuna cans ('Sankofa tuna chunks in brine') sold on the domestic market, claiming that their product is 'dolphin friendly'. Ofori-Adu (1987) stated that 'a few porpoises are occasionally landed by purse-seiners which happen to catch the species by chance during the *Sardinella* seasons'. Ofori-Danson and Agbogah (1995) added that 'one major threat may emanate from increases in their [dolphins'] entanglement particularly in purse-seine nets'. Initial attempts by Ofori-Danson and Agbogah (1995) to evaluate the magnitude of dolphin mortality from large-scale fishing operations proved futile because fishermen failed to report by-catches. Unless there is a firm policy and training programme that would allow an observer programme on industrial purse-seiners, incertitude about the level of by-catches will persist.

Legal status of cetaceans

Depending on the interpretation of 'wildlife', whether it includes cetaceans, they are -or not- protected in Ghana by domestic legislation. The management of wildlife falls under the Ghana National Wildlife Conservation Policy of 1971 (Ofori-Danson and Odei, 1997) and is the responsibility of the Ghana Wildlife Department, part of the Forestry Commission within the Ministry of Lands and Forestry. If dolphins and whales are rather considered aquatic resources, and thus the domain of the Ministry of Fisheries, no specific management and conservation measures are in place. However, Ghana has recently become party to the Bonn Convention on the Conservation of Migratory Species of Wild Animals (CMS/UNEP), which addresses conservation of cetaceans at a regional level. Nonetheless, frequent by-catches, and the development of a directed dolphin fishery at Apam, calls for dedicated management measures.

PRELIMINARY CHECKLIST OF CETACEANS FROM GHANA

The distribution of cetaceans in the Gulf of Guinea is poorly understood. In anticipation of a general review, we here discuss the six species which currently are confirmed from Ghana's coastal waters. Accounts will be upgraded as available samples are being processed in the months ahead. Also, whale shrines along the coast will be perused, for skeletal material may yield valuable information.

Bottlenose dolphin *Tursiops truncatus*

To date we can confirm four records (five specimens captured) of *T. truncatus* for Ghana.
POD encountered two bottlenosed dolphins landed together by a purse-seiner at the Jamestown beach

on 5 February 1994. One, a 300cm physically adult male of 265kg was bought for necropsy at the Water Research Institute. Material kept: skull, scapulae, atlas/axis, two other vertebrae, hyale, sternum (partial), 1 rib, 1 humerus/ulna, several teeth. The female measured 295cm and weighed 280kg. The animals were previously reported as *Delphinus delphis* (Ofori-Danson and Odei, 1997). Specimen and photos deposited at Water Research Institute (WRI), C.S.I.R., Achimota. Tissue collected in DMSO. A male of 255cm and another of 315cm were disembarked at Senya Beraku and Tema respectively (Ofori-Danson and Odei, 1997).
A calvaria kindly showed to us by Mr. Ofori-Adu was identified as a bottlenosed dolphin. The specimen was dredged by a fishing boat in shelf waters off Ghana; exact locality and date unknown, and is deposited at the Research and Utilization Branch, Fisheries Department, Ministry of Agriculture, Tema.

Clymene dolphin *Stenella clymene*.
Dr. Chris Gordon directed our attention to a complete mounted dolphin skeleton kept in the collections of the Zoology Department, University of Ghana, Accra. KVW identified it as a physically mature clymene dolphin. The animal had stranded near Keta (05'55'N,00°59'E), a fishing town, in May 1956; it had possibly been by-caught. Teeth: upper left 41, lower left 42. This is the second record, and the first specimen record, of *Stenella clymene* for the Gulf of Guinea. A group was photographed at 02°10'N, 02°30'W (in Leatherwood *et al*., 1976) and erroneously identified as *S. longirostris* (Perrin *et al*., 1981).

A 216cm female clymene dolphin was captured off Winneba on 23 September 1998. The number of visible, sharply-pointed, teeth in the fresh head was 38-39 (UL/LL). Two photographs show the tripartite body colouration, including the white belly. The black eye-patch, grey eye-to-flipper stripe, the characteristic dark stripe on the central part of the upper beak ending in a black rostrum tip and fine blackish lip patches are clearly visible (see e.g. Perrin *et al.*, 1981).

Rough-toothed dolphin *Steno bredanensis*
Two rough-toothed dolphins were landed at Apam, captured in nets, probably gillnets. Date uncertain, either on 29 August or 24 September 1998. Photograph available showing characteristic conical, tapering shape of the head and large flippers. Two sightings of *S. bredanensis* in 1972 have been reported from Ghana by C.W. Oliver (pers.comm. *in* Jefferson *et al*., 1997) but were not authenticated.

Dwarf sperm whale *Kogia simus*.
A 120cm *Kogia* sp. was landed at Apam on 23 August 1998, as evidenced by a photograph of the head in the flesh. POD counted nine pairs of teeth in the lower jaw and five pairs of teeth in the upper jaw, which identifies it as a *Kogia simus.* Only this *Kogia* species is known to bear teeth in the upper jaw (see Caldwell and Caldwell, 1989); *K. breviceps* moreover has more (10-16) pairs of teeth in the lower jaw. The skull is deposited at the Water Research Institute.

Sperm whale *Physeter macrocephalus*
A sperm whale of undetermined sex and of an estimated 8-9m length (estimated from photos) stranded at Osu beach, Accra, in July 1994. No specimens were collected. Two photographs of the animal are deposited at the Water Research Institute.

Humpback whale *Megaptera novaeangliae*
Two photographs provided by an officer from the Ghana Wildlife Department stationed at Ada (05º48'S, 00º38'E), near the Volta river estuary, show the complete fresh carcass of a calf humpback whale on a beach. It is unknown whether it was stranded or captured. Further information is being sought, especially also with reference to the date.

Unidentified cetaceans or unauthenticated records

1) Apart from the species documented above, the pantropical spotted dolphin, *Stenella attenuata* and the killer whale *Orcinus orca* have been reported from Ghana by C.W. Oliver (pers.comm. *in* Jefferson *et al*., 1997), but were not authenticated.

2) Lumbar vertebra, immature (unfused epiphyses), of a large unidentified whale. Collection (no number) of the Zoology Department, University of Ghana, Legon.

3) Ofori-Adu (1987) recalls seeing a stranded whale at Sekondi beach-Akuburam, near the lighthouse of

the Sekondi-Takoradi beach road on 19 November 1975. A large crowd impeded to take any records of the stranded whale whose total length was estimated to be over 15m.

4) Ofori-Adu (1987) sighted a whale (at ~10:00hrs) during a trawling survey cruise (R/V *Kakadiamaa*) for demersal fishes off the Saltpond oil rig in March 1985. The whale kept on surfacing and re-surfacing for about 45min all along swimming towards the research vessel until it finally left.

CONCLUSION

To date six cetacean species, all first records, are confirmed to occur in Ghana's coastal waters*:* five odontocetes *Tursiops truncatus*, *Stenella clymene*, *Steno bredanensis*, *Kogia simus*, *Physeter macrocephalus*, and the humpback whale *Megaptera novaeangliae*. Other warm-water species are expected to be added in the near future with advancing field work. The findings of two clymene dolphin specimens in Ghana (this paper) and a recent record of the species for The Gambia (Van Waerebeek, 1999) supports the argument of Robineau *et al.* (1994) that apparent unequal distribution in the western and eastern parts of the tropical north Atlantic may be an artifact of poor sampling in African waters. Although Ghana, through geographical extrapolation, can be expected to be part of the range of the Atlantic hump-backed dolphin *Sousa teuszii* (see Maigret, 1980; Jefferson *et al.*, 1997), we did not encounter the species. Search effort, admittedly, was insufficient for a definitive answer. It is conceivable also that a local *S. teuszii* population may have been drastically reduced before field research started.

The stranding of a calf humpback whale invites speculation about a potential nursery area in Ghana coastal waters. The specimen's affinity with the historically exploited stock of humpback whales off Gabon (Budker, 1953) opens interesting research perspectives.

Back in the 1960s and 70s, off Ivory Coast, dolphins of the genera *Tursiops*, *Stenella*, *Delphinus* and *Steno* were reported captured in nets at unknown levels (Cadenat, 1959; R.L. Brownell *in* Mitchell, 1975). Dolphins were caught incidentally in a driftnet fishery for tunas, swordfish and sharks since 1983 (Maigret, 1994). With marine mammal takes prohibited in Ivory Coast, animals were not declared but promptly eaten by fishermen; offal and other remains were routinely buried on the beach (Maigret, 1994). Consumption of cetacean meat is well-documented in Senegal (reviewed in Van Waerebeek, 1999). Farther south, in Gabon, a live-stranded false killer whale *Pseudorca crassidens* was killed and eaten in 1992 (Van Waerebeek and De Smet, 1996). Along with information presented here, the combined body of evidence suggests that the utilization of stranded and captured cetaceans as food is the norm in West Africa.

Annual takes at Apam and Jamestown probably count, at each port, in the low hundreds, higher than at Kpone and Winneba. Possibly then the main threat to small cetacean populations of Ghana consists of unknown total levels of incidental captures in a variety of fisheries and the potential for an expansion of a so far localized (Apam, Jamestown) but unregulated directed dolphin fishery. The latter may be stimulated by the decline of local commercial fish stocks. Although many coastal communities of the Gulf of Guinea traditionally worship marine mammals (Maigret, 1994), pressure from rapid population growth creates immediate food needs. Indications from this survey suggest that such pressure is indeed overriding any religious-inspired reluctance to consume cetacean meat. A similar effect was noticed in Senegal and The Gambia (Van Waerebeek, 1999). Unfortunately, we lack even basic information on the species' natural history, including rough distribution patterns, species/stock composition, movements, ecology, and recruitment rates, let alone abundance estimates. There is a great need for continued field research, monitoring, professional training and awareness building.

Unrestrained coastal 'development' may pose an additional threat for nearshore species. Countries like The Gambia, Senegal, Ivory Coast and Cameroon already derive substantial income from the coastal tourism industry (Folorunsho and Awosika, 1996), and this is only the beginning. In Ghana the coastal zone is the fastest growing area in terms of urbanisation and industrialisation (Armah *et al*., 1996). Although pollution was not thought to be a problem in the region until recently (Maigret, 1994), large ports (e.g. Tema, Accra, Abidjan, Lagos) and associated heavy industries are mushrooming and generate substantial environmental disturbance. Pollution monitoring, moreover, is non-existent.

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REFERENCES

Armah, A.K., Darpaah, G.A. and Wiafe, G. 1996. Managing the Coast of Ghana: problems and options. *In*: (eds. S.M. Evans, C.J. Vanderpuye and A.K. Armah). *The coastal zone of Africa: problems and management*. Penshaw Press. 246pp.

Budker, P. 1953. Les campagnes baleinières 1949-1952 au Gabon (Note préliminaire). *Mammalia* 17 (3): 129-148.

Cadenat, J. 1959. Rapport sur les petits cétacés ouest-africains. Résultats des recherches entreprises sur ces animaux jusqu'au mois de mars 1959. *Bull. IFAN* 21 A: 1367-1409.

Caldwell, D.K. and Caldwell, M.C. 1989. Pygmy sperm whale *Kogia breviceps* (de Blainville, 1838): dwarf sperm whale *Kogia simus* Owen, 1866. Pp. 235-260. *In*: (eds. S.H. Ridgway and R. Harrison). *Handbook of Marine Mammals.* Academic Press. 442pp.

FAO, 1997. *El Estado Mundial de la Pesca y la Acuicultura 1996*. Departamento de Pesca de la FAO, Roma. 125pp.

International Whaling Commission. 1994. Report of the Workshop on mortality of cetaceans in passive fishing nets and traps. *Rep. Int. Whal. Commn.* (Special Issue 15): 629pp.

Irvine, F.R. 1947. *The Fish and Fisheries of the Gold Coast*. Her Majesty Service, Gold Coast.

Jefferson, T.A., Curry, B.E., Leatherwood, S., and Powell, J.A. 1997. Dolphins and porpoises of West Africa: a review of records (Cetacea: Delphinidae, Phocoenidae). *Mammalia* 61: 87-108.

Koranteng, K.A., Nmashie, O.O. and Baddoo, A.N.A. 1993. Ghana Canoe Frame Survey (1992). Pub. Fisheries Department, Ministry of Food and Agriculture, Ghana. 48pp.

Leatherwood, S., Caldwell, D.K., and Winn, H.E. 1976. Whales, dolphins and porpoises of the western North Atlantic. A guide to their identification. *NOAA Tech. Report NMFS Circ.* 396. 176pp.

Maigret, J. 1981. Données nouvelles sur l'écologie du *Sousa teuszii* (Cetacea, Delphinidae) de la côte ouest africaine. *Bull. IFAN* 42 A : 619-33.

Maigret, J. 1994. Marine Mammals and Fisheries along the West African Coast. *Rep. Int. Whal. Commn.* (Special Issue 15): 307-328.

Mitchell, E. 1975. *Porpoise, dolphin and small whale fisheries of the world*. IUCN Monograph no. 3: 1-129.

Northridge, S.P. 1984. World review of interactions between marine mammals and fisheries. *FAO Fisheries Technical paper* 251, 190pp.

Ofori-Adu, D.W. 1987. On some marine mammals likely to be found in the Ghanaian coastal waters. Fishery Research Unit Information Report. No. 20. 19pp.

Ofori-Adu, D.W. and Koranteng, K.A. 1993. Occurrence of demersal fish species off Winneba and Saltpond. Their abundance and distribution in relation to the marine environment. *Mar. Fish. Res. Reports* 9: 1-88.

Ofori-Danson, P.K. and Agbogah, K. 1995. Survey of aquatic mammals of Ghana. A report presented to the Oceans and Coastal Areas, Programme Activity Centre (OCA/PAC) of the United Nations Environment Programme. Institute of Aquatic Research, Technical Report No.143.

Ofori-Danson, P.K. and Odei, M.A. 1997. Preliminary observations of the common dolphin, *Delphinus delphis*, (Order: Cetacea; fam: Delphinidae) in the Ghanaian coastal waters. Document SC/49/SM3 presented to IWC Scientific Committe meeting, Bournemouth.

Perrin, W.F., Mitchell, E.D., Mead, J.G., Caldwell, D.K. and van Bree, P.J.H. 1981. *Stenella clymene*, a rediscovered tropical dolphin of the Atlantic. *J. Mamm*. 62(3): 583-598.

Robineau, D., Vely, M. and Maigret, J. 1994. *Stenella clymene* (Cetacea, Delphinidae) from the coast of West Africa. *J. Mammalogy* 75(3): 766-767.

Van Waerebeek, K. 1999. A first survey of the present conservation status of cetaceans in Senegal, The Gambia and Guinea-Bissau. Final report to CMS/UNEP Secretariat, Bonn, March 1999; Marine Conservation and Research (MER), Bristol, UK. 65pp

Van Waerebeek, K. and De Smet, W.M.A. 1996. A second confirmed record of the false killer whale *Pseudorca crassidens* (Owen, 1846) (Cetacea, Delphinidae) from West Africa. *Mammalia* 60 (2): 319-322.

Van Waerebeek, K., Diallo, M., Djiba, A., Ndiaye, P. and Ndiaye, E. Cetacean research in Senegal 1995-97, an overview. Paper SC/49/SM10 presented to IWC SC Meeting, Bournemouth. 6pp.

Weigel, J.Y. 1984. Le secteur de la pêche, situation actuelle et perspective. Doc. polygr. Lomé Togo. [In French].