Conservation of Cetaceans in The Gambia and Senegal, 1999-2001, and Status of the Atlantic Humpback Dolphin

WAFCET- 2 Report

CMS

Convention on the Conservation of Migratory Species of Wild Animals

**We dedicate this report
in remembrance of the more than 1,500 persons
who drowned in the night of 26 September 2002
when the Senegalese ferry *DJOOLA*
disappeared below the waves
off the coast of The Gambia, in Africa's
worst-ever maritime disaster.**

**OBSERVATIONS MADE from the *S/Y DJOOLA*
led to the
discovery of a population of bottlenose dolphins
at carabane island, casamance RIVER,
in the course of CMS/WAFCET-1 project.**

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Cover picture: Atlantic humpback dolphin moving nearshore from Djinack Creek, Senegal, heading south towards Niumi, The Gambia (Photo KVW, 19 Nov. 1999). © Koen Van Waerebeek

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Conservation of Cetaceans in The Gambia and Senegal 1999-2001, and Status of the Atlantic Humpback Dolphin

WAFCET- 2 Report

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2003

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SUMMARY

A second project of the West African Cetacean Research and Conservation Programme (WAFCET-2) was implemented in Senegal and The Gambia, from December 1999 till December 2001. It generally aimed at collecting information on the conservation status of coastal cetaceans, with emphasis on the Atlantic humpback dolphin, and support activities to improve it.

A base for the recently formed ngo COREWAM (Conservation and Research of West African Aquatic Mammals) was made operative near Dakar. Nineteen new cranial specimens, representing six cetacean species, were added to the COREWAM reference collection: short-snouted and long-snouted common dolphins (*n*= 9), bottlenose dolphins (*n*= 3), Atlantic humpback dolphin (*n*= 1), harbour porpoise (*n*= 3), ordinary Bryde's whale (*n*= 1) and incomplete bony remains of unidentified delphinids (*n*= 2). Presently, 34 skeletal voucher specimens are curated. The Gambian cetacean reference collection was enriched with at least a dozen skulls, mostly bottlenose dolphins, conserved at Kiang West National Park.

With support from this project, the Gambian Department of Parks and Wildlife Management implemented an aquatic mammal sightings and by-catch monitoring programme jointly with the Department of Fisheries. Eighteen data collection points were set up on the Atlantic coast and Gambian River shores. No specific cases of by-catch (2001) but more than 200 sighting records were reported. Few of these were sufficiently documented as to allow positive species identification. The majority seem to refer to bottlenose dolphins in the Gambia River. An intensive, one-day training workshop was organized, aimed at instructing fisheries officers who themselves train field observers. Also, a Gambian Aquatic Mammal Working Group was established.

Unquantifiable, but presumed low to moderate, levels of cetacean by-catch, affecting several species (bottlenose dolphin, Atlantic humpback dolphin, common dolphins, harbour porpoise) continue to occur in both The Gambia and Senegal. In addition, unknown numbers are illegally netted or otherwise killed directly for their meat in both countries. Small cetacean meat is consumed locally and likely used also as shark bait. These insights confirm results from earlier surveys (WAFCET-1). Atlantic humpback dolphin was found to be taken, at least occasionally, in Guinea-Conakry and Mauritania. There are no clear indications of a 'marine bushmeat' black market spreading beyond the coastal region, but monitoring should be continued. As before, the illegality of cetacean catches caused the unwanted side-effect that any evidence of catches is concealed or destroyed, which seriously hampers the collection of information and specimens.

An unprecedented case of unauthorized live-capture of bottlenose dolphin was documented in Saloum National Park, Senegal. This episode (4 of 5 died) serves as a warning that the captive display industry may form a formerly unrecognized threat to some aquatic mammal populations in the subregion. The surreptitious nature of the exploitation of small cetaceans is highly obstructive to any attempts at monitoring.

Nine countries, three newly recognized (N), are confirmed range states for *Sousa teuszii*: Morocco (Western Sahara), Mauritania, Senegal, The Gambia, Guinea-Bissau, Guinea-Conakry (N), Cameroon, Gabon (N) and Angola (N). There is some anecdotal indication for Togo and, based on purely geographic considerations, the Democratic Republic of Congo, People's Republic of Congo, Equatorial Guinea and Nigeria are likely range states. *Sousa teuszii* is documented to regularly cross international borders between Senegal and The Gambia and thus technically qualifies as a 'migratory species' under the CMS Convention.

The distribution of *Sousa teuszii* from Dahkla Bay (23°54'N), Morocco, southeast to Tombua (ca.16°S), southern Angola, appears to be 'discontinuous' i.e. with gaps of low to very low density in several areas. Humpback dolphins for instance have not been found in Ghana, possibly the result from the important dolphin fishery there. We propose the preliminary recognition of eight management stocks of *Sousa teuszii*, each stock named for a known core distribution locality in Atlantic Africa. Six stocks are of the 'confirmed-contemporary' type, supported by recent sightings or specimen records: (i) Dahkla Bay, (ii) Banc d'Arguin, (iii) Saloum-Niumi, (iv) Gêba-Bijagos, (v) southern Guinea and (vi) Angola. The Cameroon and Gabon stocks are known from historical records. Additional, unnamed, stocks most probably exist in the equatorial eastern Atlantic. The degree of

polymorphism and genetic isolation between stocks need to be established. Several management stocks may actually form a single population. No biological population status is claimed for the proposed management stocks.

The principal habitat of Atlantic humpback dolphins includes shallow, nearshore waters, outer estuaries of large rivers, sea-arms and wide, outer channels of river deltas, where seawater or brackish water predominate. There is no evidence for occurrence in freshwater (upriver) environments. Bottlenose dolphins, which we know to enter the Casamance and Gambia Rivers, may have been mistaken for humpback dolphins by some observers.

We document the first sightings of Atlantic humpback dolphin in the Senegal's Siné-Saloum delta since 1979. An apparently semi-resident community of some 40 specimens was discovered at the entrance of Djinack Creek, a foraging site. In Guinea-Bissau, based on raw data by Wolff (1998), group size ranged from 1-20 individuals with a mean of 6.50 (SD=6.09; n= 15). A re-interpretation from data by Spaans (1990) from the same area shows a comparable mean of 4.39 individuals SD= 4.19, n= 54, range 1-15, mode 2, median 2.5. These are significantly smaller ($p< 0.001$) than the group size observed in the Saloum delta (mean 22.9; SD= 9.33; n= 8; range 10-37). However, interpretation of what precisely constitutes a group may differ between observers.

Further field work, including region-wide surveys of abundanve, are necessary to establish whether certain stocks of *S. teuszii* should be assigned 'endangered' status. Habitat encroachment, frequent by-catches and some directed take, as well as massive coastal overfishing, are thought to be the main causes for the low population levels in *S. teuszii*.

With scientific stock size estimates lacking, the aggregated body of circumstantial evidence suggests that each of the named stocks may consist of hundreds of individuals rather than thousands.

The long-beaked common dolphin *Delphinus capensis*, a skull of which appropriately picked up during a demonstration beach-combing activity, is a newly reported mammal for The Gambia. A Bryde's whale calf stranded in Senegal was genetically determined as 'ordinary' form *Balaenoptera brydei* Olsen. Reports of mid-sized whales seen in nearshore waters of The Gambia remain unidentified.

Although a novel awareness about aquatic mammal conservation is slowly taking hold in Senegal and The Gambia, this has not yet acquired a mainstream character. Biology students do not consider marine mammal science a feasible career. The Gambia's Department of Parks and Wildlife Management and the Department of Fisheries have an important role to play in order to change attitudes. Principal challenges for COREWAM include maintaining generated momentum, attract follow-up projects, increase sources of documented information, broaden bases of public interest and stimulate region-wide cooperation.

RESUME

Le deuxième projet du Programme de Recherche et de Conservation des Cétacés de l'Afrique de l'Ouest (WAFCET-2) a été mené au Sénégal et en Gambie entre décembre 1999 et décembre 2001, plus quelques activités au début de l'année 2002. Le but général de ce projet était de collecter des informations concernant le statut de protection des cétacés côtiers et de supporter les activités visant à améliorer ce statut. Le siège de la récente ONG COREWAM (Conservation et Etude des Mammifères Aquatiques de L'Afrique de l'Ouest) a été ouvert près de Dakar. Depuis 1999, 19 nouveaux spécimens de crânes appartenant à six espèces de cétacés ont été ajouté à la collection de référence de COREWAM: *Delphinus* spp. (*n*= 9), grands dauphins *Tursiops truncatus* (*n*= 3), dauphin à bosse de l'Atlantique *Sousa teuszii* (*n*= 1), marsouin commun *Phocoena phocoena* (*n*= 3), baleine de Bryde ordinaire *Balaenoptera brydei* (*n*=1) et les restes osseux incomplets de deux delphinidés non identifiés. A l'heure actuelle 34 spécimens-évidences de squelettes sont conservés. La collection de référence pour les cétacés en Gambie a été enrichie d'au moins une douzaine de nouveaux crânes, conservés, à l'heure actuelle, au Parc National Kiang West.

Grâce au support de ce projet, le Département de l'Administration des Parcs et de la Faune Sauvage de la Gambie a exécuté avec le Département des Pêches un programme d'observation des mammifères aquatiques et un suivi des captures accidentelles. Dix-huit sites de collection de données fûrent établis sur la côte Atlantique et les rivages du fleuve Gambie. Aucune capture accidentelle ne fût reportée par les observateurs mais plus de 200 observations fûrent collectées. Malheureusement peu d'entr'elle conduisirent de source sûre à l'identification des espèces. Dans la rivière Gambie apparemment la grande majorité des observations se rapporte au grand dauphin *T. truncatus*.

Un séminaire d'un jour de formation intensive fût organisé pour les officiers du Département des pêches qui eux-mêmes forment des observateurs de terrain. Le premier Groupe de Travail des Mammifères Aquatiques de la Gambie a été établi.

Bien que non-quantifiée la capture accidentelle de cétacés a lieu à un niveau faible à modéré en Gambie et au Sénégal et affecte plusieurs espèces (grand dauphin, dauphin à bosse, dauphin commun et marsouin commun). De plus, dans ces deux pays un certain nombre de cétacés est pêchés illégalement ou tués d'une autre façon pour leur chair. La viande de cétacés est consommée localement et est probablement aussi utilisée comme appât pour les requins. Ces aperçus confirme les résultats d'études antérieures. Le dauphin à bosse de l'Atlantique est confirmé capturé en Guinée-Conakry et Mauritanie. Il ne semble pas qu'il y ait un commerce de 'viande de brousse marine' au-delà de la région côtière, neanmoins un contrôle continu de ce commerce est nécessaire. Comme d'habitude, l'illégalité de la capture de cétacés aboutit à la dissimulation des prises et à la destruction de tous les restes de carcasses, ce qui limite sérieusement la collecte d'informations.

Un cas sans précédent de capture non-autorisée de grands dauphins (pour approvisionner l'industrie de la captivité) est documentée au Parc National du Saloum, Sénégal. Cet épisode nous avertit qu'une nouvelle menace plâne sur les populations de quelques mammifères aquatiques de cette sous-région. La nature subreptice de l'exploitation et de l'utilisation des petits cétacés entrave sérieusement toute tentative de contrôle et de prise d'échantillons opportuniste. Nous avons confirmé qu'au moins neuf pays, dont trois reconnus nouvellement (N) durant cette étude, font partie de l'aire de distribution de *Sousa teuszii*: le Maroc (Sahara de l'Ouest), la Mauritanie, le Sénégal, La Gambie, la Guinée-Bissau, la Guinée-Conakry (N), le Cameroun, le Gabon (N) et l'Angola (N). Des données anecdotiques pour le Togo ainsi que des considérations géographiques pour la République Démocratique du Congo, la République Populaire du Congo, la Guinée Equatoriale et le Nigéria suggèrent que ces pays font aussi partie de cette aire de distribution. *Sousa teuszii* franchit régulièrement les frontières internationales entre le Sénégal et la Gambie et, donc techniquement, remplit les conditions requises pour être considérée comme une 'espèce migratoire' aux yeux de la Convention CMS.

La distribution de *Sousa teuszii* depuis Baie de Dahkla (23°54'N), Maroc, jusqu'à Tombua (ca.16°S), au sud de l'Angola semble discontinue, caractérisée par des intervals de basse à très basse densité dans certaines zones.

Ainsi, les dauphins à bosse n'ont pas été observés au large du Ghana, probablement suite à l'existence de la pêche de dauphins. Nous proposons de reconnaître huit stocks de gestion pour *Sousa teuszii*, chaque stock nommé en fonction de la localité principale de distribution dans l'Atlantique africain. Six stocks appartiennent au type 'confirmé-contemporain', comme le confirment des observations récentes et les registres des spécimens: (i) Dahkla Bay, (ii) Banc d'Arguin, (iii) Saloum-Niumi, (iv) Gêba-Bijagos, (v) Guinée-sud et (vi) l'Angola-sud. De plus, deux stocks, non soutenus par des registres récents sont 'confirmés-historiques': (vii) Cameroun et (viii) Gabon. Un stock hypothétique Togo (type 'non confirmé-contemporain') est à l'étude. Il existent probablement d'autres stocks sans nom dans l'Atlantique est équatorial. Le degré d'isolation entre les stocks doit être établi. Certains d'entr'eux pourraient formé une seule population biologique.

L'habitat principal du dauphin à bosse de l'Atlantique comprend les eaux côtières peu profondes, les estuaires de grands fleuves, des bras de mer, des canaux extérieurs de deltas où l'eau de mer ou les eaux saumâtres prédominent. Il n'y a pas de preuves que cette espèce se présente dans les eaux douces. Il est probable que les grands dauphins qui remontent les fleuves Casamance et Gambie aient été confondus avec des dauphins à bosse.

Nous rapportons les premières observations depuis 1979 de dauphins à bosse de l'Atlantique dans le delta du Siné-Saloum. Une communauté semi-résidante de 25-40 spécimens a été découverte à l'entrée de la crique Djinack qui est utilisée comme site d'alimentation. En se basant sur les données de Wolff (1998), nous estimons qu'en Guinée-Bissau, la taille des groupes varie de 1 à 20 individus avec une moyenne de 6.5 (SD=6.09; n= 15). La ré-interprétation des données de Spaans (1990) concernant la même zone résulte en une moyenne comparable de 4.39 inidividus SD= 4.19, n= 54, étendue 1-15, mode 2, median 2.5. Ces groupes sont significativement plus petits ($p< 0.001$) que ceux observés dans le delta de Saloum (moyenne 22.9; SD= 9.33; n= 8; étendue10-37). Toutefois, les diférentes études peuvent varier dans leur interprétation de ce qui constitue 'un groupe'.

Il faudrait effectuer plus de recherches sur le terrain pour établir si *Sousa teuszii* devrait être considérée comme 'espèce en danger'. En l'absence d'estimations scientifiques d'abondance, les preuves actuelles ne seraient pas incompatibles avec une limite inférieure d'abondance totale s'élevant à quelques milliers d'individus, ce qui en accord avec le principe de précaution justifierait probablement un changement de status UNEP/CMS de conservation à l'Appendice I. La destruction de l'habitat, les captures accidentelles et directes ainsi que la surpêche sont probablement les principales causes des faibles taux de population.

Le dauphin commun à long bec, dont un crâne a été pertinemment collecté lors d'une démonstration de ratissage de plage, représente un nouveau mammifère reporté pour la Gambie. Un juvénile d'une baleine de Bryde, échoué au Sénégal a été identifié génétiquement comme appartenant à la forme 'ordinaire', identifiable comme *Balaenoptera brydei* Olsen. Des rapports de baleines de taille moyenne dans les eaux côtières de La Gambie restent non-identifiés.

Bien qu'au Sénégal et en Gambie certaines personnes prennent peu à peu conscience de l'importance de la conservation des mammifères marins, c'est encore loin d'être un phénomène généralisé. Les étudiants de biologie ne considèrent pas (encore) l'étude des mammifères marins comme une carrière prometteuse. Le Département de l'Administration des Parcs et de la Faune Sauvage de La Gambie et le Département des Pêches ont un rôle important à jouer pour changer ces attitudes. Les défis principaux de COREWAM comprennent: le maintien de l'élan généré, la génération de nouveaux projects, l'augmentation des sources d'informations documentées, l'élargissement des bases d'intérêt public et la stimulation d'une coopération régionale.

INTRODUCTION

Surprisingly, cetacean scientists have gathered more knowledge about the distribution, ecology and status of whales and small cetaceans from such hostile marine environments as the polar seas, than about the natural history of cetaceans in African coastal waters (excluding South Africa). At the same time, the coastal environment in West Africa is undergoing rapid changes with expanding human populations and overfishing, giving rise to multiple threats to the long-term survival of vulnerable marine life forms, including marine mammals (e.g. FAO, 1992; Wade and Samba, 1997; Khan and Mikkola, 2002). To address some of these concerns and contribute with newly gained insights on cetaceans from Atlantic Africa, we here report on findings of the CMS/UNEP sponsored 'West African Cetacean Conservation and Research Project 2' (further abbreviated as WAFCET-2), a follow-up to the 1998-99 WAFCET-1 project implemented in Senegal, The Gambia and Guinea-Bissau (Van Waerebeek *et al.*, 2000a; 2001a; Van Waerebeek, 2001).

The overall goals of the WAFCET-2 conservation project consisted of (i) raising awareness and boosting expertise in aquatic mammal conservation at all levels, from the general public up to government officials; (ii) explorative field research to assess the present conservation status of cetaceans in Senegal and The Gambia; (iii) evaluate the feasibility of future dedicated studies and larger-scale conservation and education initiatives; (iv) promote the establishment of national focal points of expertise for aquatic mammal conservation.

These aims fit within the broader, regional objectives of CMS/UNEP conservation efforts for migratory species and are consistent with recent initiatives for the management and protection of the marine and coastal resources of the Economic Community of West African States (ECOWAS) subregion (Khan and Mikkola, 2002).

More specifically, WAFCET-2 was designed to: (a) assess the status of the Atlantic humpback dolphin *Sousa teuszii* (Kükenthal, 1892) and investigate measures to mitigate threats to its long-term survival; (b) assist in developing basic, autochthonous skills in cetacean field data collection; (c) establish a long-term aquatic mammal information gathering scheme in Senegal and The Gambia; (d) collect new scientific information and specimens; (e) heighten local public awareness of threats to cetaceans and their habitats; and (f) promote international and regional collaboration through establishment of links between interested parties.

Several recent events demonstrate increasing interest for whales and dolphins and their management within the subregion. These include *i.a.* a CMS-sponsored workshop in Conakry on the conservation and management of marine mammals in West Africa in May 2000 (Archer and Van Waerebeek, 2000) and the subsequent establishment of a national coordination/ information centre for cetaceans in Guinea[1]; the implementation of the CMS/ WAFCET-3 project in Ghana and Togo (in progress), and the programme of the Netherlands Committee for IUCN in Benin to study cetacean distribution patterns and help launch commercial whale-watching for humpback whales (Van Waerebeek *et al.*, 2000b, 2001b; Van Waerebeek, 2003a). Humpback whales are studied also off Angola and Gabon (Best *et al.*, 1999; Walsh *et al.*, 2000) and are the target of small-scale whale-watching in Togo and Ghana.

This report summarizes results from WAFCET-2 project activities in Senegal and The Gambia between November 1999 and December 2001, with some information collected in the first half of 2002. In addition, we comprehensively review the status, distribution and natural history of the Atlantic humpback dolphin, one of only two cetaceans endemic to West Africa[2]. Advancement in the understanding of its biology has been delayed by the scarceness of specimens, lack of local resources and trained cetacean biologists. Further, a number of misconceptions long lingered, such as the suggestion (at discovery) that it might be herbivore, the presumed existence of river (fresh water) populations, an uninterrupted distribution over the entire subregion, implying high abundance, and the unsupported hypothesis of conspecificity with the Indo-Pacific humpback dolphin *Sousa chinensis* (Osbeck, 1765).

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[1] Based at the Centre National des Sciences Halieutiques de Boussoura (CNSHB), Guinée-Conakry (Dr. Idrissa Lamine Bamy, *in litt.* to KVW, 16 June 2001).

[2] The second endemic species is the Heaviside's dolphin, *Cephalorhynchus heavisidii* (Gray, 1828).

GENERAL METHODOLOGY

Overall, the study areas within Senegal and The Gambia and field survey methodologies (monitoring of fish landing sites, ports and beaches) remained largely unmodified from the WAFCET-1 project, so we refer to methods and maps presented in the report (Van Waerebeek *et al.*, 2000a). The senior author in the function of principal investigator (PI) directed field work in November-December 1999 and September-October 2000. Outside these periods, activity levels varied largely according to the fluctuating availability of trained personnel, including the national PI's (among the present co-authors) all of whom continued to perform normal professional duties in addition to WAFCET tasks. Fishing ports and landing sites were monitored by locally based observers or visiting scientists.

Small-boat surveys were conducted in Senegal and The Gambia with the primary aim of locating aggregations of Atlantic humpback dolphins, determining group size and movements and evaluate the optimum location and feasibility for a future in-depth study of behavioural ecology. Although no field research was implemented by the PI in Guinea-Bissau (for budgetary reasons), Prof. W. J. Wolff (Department of Marine Biology, University of Groningen, the Netherlands) contributed unpublished data on dolphin sightings gathered opportunistically during field research on waders in 1992.

Abdellahi Ould Samba Ould Bilal, biologist at the Parc National du Banc d'Arguin (PNBA), Mauritania, who had received field training in marine mammalogy under WAFCET-1, contributed with information on humpback dolphin specimens from Mauritania.

Geographic coordinates for relevant localities (Table 1) were derived from either a hand-held Garmin Global Positioning System (GPS) receiver, or from the 'Official Standard Names Gazetteers' of the US Board of Geographic names (Anonymous, 1968, 1990).

The body condition of stranded and by-caught specimens, relevant in the interpretation of circumstances of death, was rated according to a standardized scale (Geraci and Lounsbury, 1993), summarised as: alive (C1); freshly dead with edible meat (C2), early decomposition (C3); advanced decomposition (C4); bare bones or mummified (C5).

Several new dolphin skulls and other osteological material were added as voucher to cetacean collections in The Gambia and Senegal (see further). Skulls were studied for future morphologic reference with statistically adequate samples. Thirty-nine cranial measurements and meristics (Table 2), modified from Perrin (1975), were taken by the senior author and, for Mauritanian specimens, by Samba Ould-Bilal. A craniometrics and meristics data template is presented as Appendix 1. The degree of fusion among cranial bones was scored following Van Waerebeek (1993).

Table 2. Measurements and meristics of skulls (and abbreviations) used in this study.

condylobasal length	CBL
rostrum length	RL
rostrum width at base	RWB
rostrum width at 60mm	RW60
rostrum width at ¼ length	RW¼L
rostrum width at ½ length	RW½L
rostrum width at ¾ length	RW¾L
premaxillary width at ½ length	PMX½L
tip of rostrum to right external nare	TREN
tip of rostrum to internal nares	TRIN
preorbital width	PREOR
postorbital width	POSTOR
zygomatic width	ZYGW
parietal width	PAR
greatest width of premaxillaries	GWPMX
external nares width	EXNAW
internal nares width	INAW
temporal fossa length	TEFL
temporal fossa width	TEFW
orbital length	ORL
antorbital length	ANTOR
length upper tooth row	LUTR
length lower tooth row	LLTR
ramus length	RAL
ramus height	RAH
number alveoli upper left	UL
number alveoli upper right	UR
number alveoli lower left	LL
number alveoli lower right	LR
tooth width transverse	TOW
bulla length	BUL
bulla width	BUW
periotic length	PERL
height braincase	HBR
length braincase	LBR
maximum width palatine	MWPAL
maximum span of occipital condyles	MOSC
maximum width nasals	MWNAS
width of alveolus	WAL

Tissue samples for molecular genetic studies were stored in either 70% ethanol or in a NaCl-saturated solution of dimethylsulfoxide (DMSO).

For individual photo-identification purposes of Atlantic humpback dolphins, colour slide film (100 ASA) was preferred over black and white, as specified for this technique (Karczmarski *et al.*, 1991; Karczmarski and Cockcroft, 1998).

Below we discuss results for Senegal and The Gambia separately and review the present status of the Atlantic humpback dolphin throughout its range.

SENEGAL

CAPACITY BUILDING IN CETACEAN CONSERVATION

Association COREWAM

The non-governmental not-for-profit organisation 'Conservation and Research of West African Aquatic Mammals' (COREWAM) was founded in Dakar by four of us (Diallo, Djiba, Ndiaye & Van Waerebeek) in November 1997. Aims of the NGO include (i) conduct scientific research on aquatic mammals in West Africa; (ii) promote the conservation of aquatic mammals; (iii) contribute to marine environmental education. COREWAM acquired legal 'Association' status *sensu* Senegalese law on 18 January 1999, with a constitution of 18 articles (Appendix 2). Initially the lack of seed funds impeded NGO start-up, until WAFCET-2 project allowed us to develop the necessary organisational base and infrastructure. Members of the Board of directors Djiba, Ndiaye and Diallo addressed daily matters and Van Waerebeek assumed the role of scientific adviser. The latter periodically coordinated field research *in situ* (10-21 November 1999, 27 November-5 December, 13 September-7 October, 23 October -5 November 2000).

Through a Letter of Agreement (LoA) with UK-based NGO 'Marine Education and Research' (MER), COREWAM agreed to implement the WAFCET-2 project in Senegal. Practical aspects and specifics of institutional development were discussed at Board meetings celebrated in Dakar on 12 November and 1 December 1999.

A modest villa (Cité ISRA villa #276, Thiaroye Azur, Dakar) was rented as office, living quarters and legal residence for COREWAM. In the fenced-off open-air courtyard skeletal specimens could be processed and dried without danger of loss. Quarters were refurbished, lighting, phone and dial-up internet access were installed. The incipient book and reprint library, as well as the cetacean collection were stored in racks. An intensively used second-hand laptop (our only computer) was irreparably damaged due to recurrent power-cuts. An application submitted to the 'Small Grants in Aid of Research' programme of The Society for Marine Mammalogy[3] permitted upgrading to a Pentium III desktop PC in December 2001. A well-timed grant from the Cetacean Society International (CSI) covered miscellaneous expenses of the Association at the project's conclusion.

All relevant papers published in the *Bulletin de l'IFAN* (Dakar), *Notes Africaines* and the *Bulletin de l'Association pour l'avancement des Sciences Naturelles au Sénégal* were photocopied at the IFAN library and added to the COREWAM reprint collection. Other publications, including a few books, were acquired and reprints were requested to researchers worldwide.

Much as under WAFCET-1 (Van Waerebeek *et al.*, 2000a), the absence of full-time personnel led to intermittent field coverage. The short-term nature of the project was unable to entice suitably qualified candidates to divert from more promising, commercial careers in fisheries-related jobs. With some 55,000 fishermen and 15% of the Senegalese work force engaged in fisheries (Diakhate, 1984; Deme, 1997), high demand for well-trained marine scientists is reflected in salaries, a situation prevalent in much of West Africa. One of us (Ndiaye) who acquired considerable expertise with cetaceans during WAFCET-1 could only occasionally participate in field work. A scheme was worked out in which four of us contributed with part-time duties, including field trips. Djiba acted as treasurer and custodian of the COREWAM office.

The COREWAM Cetacean Reference Collection (CRC), Dakar, consists of skulls, postcranial material and tissue samples for molecular genetics research preserved in ethanol

[3] Approved in June 2001, see S. Swartz in Marine Mammal Society Newsletter 9(2):7.

and DMSO. Nineteen new osteological specimens, representing six cetacean species, were added since 1999 (Table 3): short-beaked and long-beaked common dolphins (*n*= 9), bottlenose dolphins (*n*= 3), Atlantic humpback dolphin (*n*= 1), harbour porpoise (*n*= 3), ordinary Bryde's whale (*n*= 1) and incomplete bony remains of unidentified delphinids (*n*= 2). Presently 41 skeletal specimens, or other voucher material, are curated at CRC (Table 3).

Collaboration with other institutions

Direction des Parcs Nationaux du Sénégal

Several meetings at the Dakar headquarters resulted in an agreement for close collaboration in aquatic mammal conservation and field studies between the Direction des Parcs Nationaux du Sénégal and COREWAM, formalized in a *Protocole d'Accord.* Director, lieutenant-colonel Demba Mamadou BA, issued permits to conduct cetacean research in the Parc National du Siné-Saloum (PNdS). WAFCET-2 granted a hand-held GPS (Garmin 12XL) and wide-angle binoculars (8x40 Minolta) to PNdS personnel stationed in Bakedadji, as to facilitate the monitoring of dolphins and surveillance of creeks and mangrove forest. Field trips emphasized small boat surveys, collection of stranded specimens and hands-on training, activities to which PNdS personnel of Bakedadji greatly contributed. In particular Col. Jacques Rigoulot, Lt Bourama Mandiang, Boubakar Ndiaye, Ibrahim Sarr (Colly) and Effolenuny Manga (at Djinack-Barra) need be mentioned. The chief officer at Karang PNdS station was briefed on research plans in the Senegal-The Gambia border area.

CRODT

The president of COREWAM (Mamadou Diallo), a senior fisheries officer at the Centre de Recherche Océanographique de Dakar-Thiaroye (CRODT) facilitated collaboration with that institution. On 6 October 2000, KVW and Diallo met with director Dr. Assane Samba at headquarters in order to introduce COREWAM and discuss its goals and planned activities. Dr. Samba welcomed initiatives and acknowledged the need for up-to-date information on aquatic mammals; he cited the special expertise of CRODT in issues of artisanal fisheries and offered logistics support, including the use of a 4WD vehicle for a field mission to the Saloum delta.

Gestion de la Faune et des Eaux Continentales

Ndiaye and KVW briefed officials of the ministerial directorate Gestion de la Faune et des Eaux Continentales (Direction des Eaux, Forêts, Chasse et de la Conservation des Sols) on the goals of COREWAM and issues of cetacean management. The directorate acts as Senegal's Focal Point for the CITES convention, as well as management authority for artisanal fisheries in continental waters. High-seas and foreign fisheries are regulated by the Ministère des Pêches (Fisheries Ministry). Anticipated restructuring might re-unite all fisheries management under a single ministerial mandate. Mr. Idrissa Mbaye (conseiller au Directeur) and Mr. Cheikh Daouda Diallo expressed their interest in information on cetacean distribution in West Africa. They stressed the utility of summaries in French of mostly English-language documents.

Wetlands International

On 3 December 1999, two of us (Djiba & Van Waerebeek) met with representatives of Wetlands International at their Regional Office for West Africa, located in Yoff. Djiba briefed on COREWAM's history, work plan and objectives. Issues of general mutual interest were discussed. Wetlands International given its continental focus, expressed interest primarily for two near-shore living aquatic mammal species, the Atlantic humpback dolphin and the West African manatee *Trichechus senegalensis* (see Dodman, 1999). Wetlands officers Tim Dodman, Abdoulaye Ndiaye and co-ordinator Colonel Seydina Issa Sylla confirmed intent for cooperation and information sharing. As an initial step publications were exchanged.

FENAGIE/Pêche

On 19 September 2000, Djiba and KVW visited Takha Samb and Samba Gueye, senior administrators of *FENAGIE/Pêche* at Quai de Pêche, Hann plage. It is Senegal's largest, nation-wide fisheries workers association, and represents 2,140 member GIE (Groupements d'Intérêt Economique) overseeing *ca* 45,000 individuals, including fishermen and women (60%) working in retail and processing of fish products (Wade and Samba, 1997). Mutual interests were discussed, while we emphasized the utility of opportunistic data on by-catches. Highly simplified cetacean data forms were supplied but have not resulted in any specific information, most probably because

documenting cetacean takes is perceived counter to fishermen's interests. No new requests were made.

Others

Existing links (see Van Waerebeek *et al.*, 2000a) with the Institut Fondamental d'Afrique Noire (IFAN) and the Centre National de Formation de Techniciens de Pêches Maritimes (CNFTPM) in Thiaroye, were reinforced. Diallo and Djiba provided material for an introductory course on marine mammals which now forms integral part of the CNFTPM curriculum, for the instruction of present and future fisheries technicians.

Djiba established professional consultant links with two ministers of the new government (Mr. Oumar Sarr, Ministre des Pêches; Mr. Landing Savane, Ministre de l'Industrie, des Mines et de l'Artisanat), both assuming responsibilities in fisheries management issues. These and other contacts hopefully will lead to enhanced attention for issues such as fisheries interactions with aquatic mammals.

CERES/Locustox, a regional research centre of ecotoxicology and environmental contaminants and specialised in the use and abuse of pesticides, based in Dakar since 1989, contacted COREWAM expressing interest in its aims. When fresh blubber samples become available, organochlorines and heavy metal may be examined at Ceres/Locustox laboratories.

Dolphin and whale-watching tourism

Tourism, and especially coastal areas tourism and ecotourism, is the largest and fastest growing industry in the world (Miller, 1990). Unlike in The Gambia, focussed commercial dolphin-watching hardly exists, despite some 300,000 tourists visiting Senegal each year and total tourist receipts of *ca.* USD 160 million. Overall tourism is dominated by tourists from France (57%), Italy (7%) and Germany (6%) (Hoyt, 2001). Hoyt (2001) qualifies the Senegal whale/dolphin-watching tourism expenditures as 'minimal', however this may be underestimated due to lack of data.

Boat tours, especially these excursioning in the Siné-Saloum delta, announce dolphin sightings and at least one company advertises its ability to find dolphins. Ferry passengers traveling between Ziguinchor and Dakar used to see a resident community of bottlenose dolphins in the lower Casamance River, but with the sinking of the ferry *Djoola* this option is closed. Regular, dedicated dolphin watch tours are not yet available and no communities in Senegal are supported by dolphin-watching. Considering that the potential for reliable dolphin encounters is good, organized dolphin-watching could be further developed. Several dolphin species are sighted year-round, including: (i) bottlenose dolphins near Carabane island, lower Casamance River (Van Waerebeek *et al.*, 1997, 2000a); (ii) Atlantic humpback dolphins in the outer Djinack bolon (also spelled 'Ginack') and Bandiala (Maigret, 1980; this paper); (iii) delphinids seen north of the Casamance estuary include bottlenose dolphin, long-beaked common dolphin and Atlantic spotted dolphin (Van Waerebeek *et al.*, 1997).

FIELD RESEARCH

An updated, annotated list of cetaceans from Senegal and The Gambia was presented recently (Van Waerebeek *et al.*, 2000a). Information and insights that have emerged since 1999 are reported below.

Beach surveys

Miscellaneous beach-combing effort yielded voucher material from six species (see Table 3). The Bryde's whale specimen (CRC No. 2000-52) represent the first record of this species in Senegal since 1955.

From 2-4 February 2001, Djiba surveyed parts of the northern Senegalese coast, specifically the fishing communities at Kayar, Mboro-sur-Mer, Fass Boye, Lompoul, Taré and Saint-Louis (GPS positions: Table 1); and Kafountine (Casamance) from 20-22 April 2001. Although fishermen claimed there were no catches of small cetaceans, evidence from similar situations elsewhere suggests that catches may nevertheless occur. Fishers would not report on an illegal activity, even if catches were purely accidental. Regular sightings were cited of whales ('baleines') and strandings of dolphins in May-June, but were not documented.

Atlantic humpback dolphin

On 19 November 1999, Effolenuny Manga, head of Djinack-Barra field station, guided Djiba, KVW and Ndiaye to a stranded Atlantic humpback dolphin carcass on Ile L'Eba (13°35'N, 16°33'W), the extreme northwest shore of the Djinack Creek entrance (area where humpback dolphins are most regularly sighted; see below and Table 4). Incomplete and in advanced decomposition (C4), its

standard length and gender could not be determined, however lack of vertebral ankylosis indicated it was physically immature.[4] No clues were found as to the possible cause of mortality, nor any signs of human utilization. The skull, some vertebrae, ribs and tissue samples were deposited in the CRC collection (KVW-3045; Table 3). Given the rarity of unprocessed cranial measurements of Atlantic humpback dolphin in the published literature, we here present data for six skulls of Senegal (Table 5), curated at the IFAN Institute, and five skulls from Mauritania (Table 6) collected by one of us (A.Samba Ould Bilal). Although 'cranially immature' according to the criterion of distal rostral fusion in delphinids, the skulls may have been from sexually adult specimens.[3] Cranial information was compared in a study of geographic variation in skull morphology of 222 humpback dolphins world-wide (Jefferson and Van Waerebeek, in press).

Bottlenose dolphin

Remains of at least six bottlenose dolphins *Tursiops truncatus* were found during WAFCET-2, three in the Saloum delta and three in the Casamance (Table 3), as detailed below. Another reported 'large dolphin' carcass was not examined and remained un-identified, but chances are it was also a bottlenose dolphin.

On a beach survey of the north and west shores of Djinack island on 19 November 1999, KVW and Djiba encountered the carcass of a bottlenose dolphin (minimum SL= 270cm) that washed ashore at 13°34'47''N, 16°32'35''W, a short walk across the border into The Gambia's Niumi National Park. To avoid losing the specimen, a brief field necropsy was performed; bones were salvaged and taken to base camp at Bakedadji, then transferred to CRC (N° KVW-3046). Neither its sex nor cause of death could be determined due to advanced decomposition (C4). Muscle tissue was sampled for molecular genetics studies. Manga had first noticed the stranded carcass, then still fresh, near Hotel Madiyana (Senegal territory) on 7 November 1999. The date of initial stranding is estimated between 1-6 November 1999. The specimen was seen also by Barnett near the Madiyana settlement in The Gambia (see Figure 1) around that date.

KVW-3046 may have died from a fisheries interaction, or not, but abundant muscle tissue present suggests the dolphin had not been utilized, or only partially. Manga confirmed occasional by-catches and in 1998 had witnessed an unidentified dolphin captured in the PNdS park; it was cut-up by the fishermen for consumption.

On 28 October 2000, we obtained the nearly complete skeleton of an adult bottlenose dolphin (CRC, N° 2000-55) via Manga who reported it stranded at an undetermined beach in PNdS 'some months' earlier.

On 20 April 2000, Sassy Ndiaye and Jacques Peeters (Parcs Nationaux du Sénégal) found another bottlenose dolphin carcass (C4) stranded on Ile aux Oiseaux, Saloum delta. Body length was reported as 338cm and the collectors originally referred it to *S. teuszii,* however that species is not known to exceed 261cm in standard body length (this paper; *contra* 248cm *in* Ross *et al.,* 1994). Length possibly was measured over body curvature thus overestimating standard length, but even then it is too large for *S. teuszii*. Eventually *T. truncatus* was confirmed from two photographs, courtesy of J. Peeters; which *i.a.* illustrate the absence of a dorsal hump.

Djiba when monitoring the fishery operations at the landing site of Kafountine, Casamance, from 22-23 April 2001, collected three skulls of bottlenose dolphin, almost certainly all from captures (Table 3). A fourth skull (not seen by KVW) as well as the lower jaw of an unidentified balaenopterid whale could not be collected from Kafountine.

A hitherto unexpected threat to Senegal's bottlenose dolphin stock are live-capture attempts by the captive-display industry. In May 2003 five bottlenose dolphins were illegally captured by Spanish nationals in the Siné-Saloum Park; four dolphins died and only one (juvenile) could be successfully released by park rangers (J. Peeters, Parcs Nationaux, pers.comm. to KVW). It is unclear whether earlier, unreported capture attempts may have killed additional animals.

Harbour porpoise

In 1999-2001, three instances of captures of harbour porpoise *Phocoena phocoena* were documented from the Petite Côte (Table 3).

[4] Unlike most delphinids, in humpback dolphins (*Sousa* spp.) cranial sutures including the premaxillary-maxillary suture fuse either late in life, or not at all (Jefferson and Van Waerebeek, in press).

Two skulls were collected by Ndiaye. A *ca.* 150cm (SL) harbour porpoise of unknown sex was taken in an semi-artisanal purse-seine net (*senne tournante*) off Fadiouth, the port where its meat was sold on 10 February 1999. The head and a tissue sample were collected on 11 February 1999. Photographs of the fresh head and tongue are in our files, one of which has been published (Van Waerebeek *et al.,* 2000a). The second harbour porpoise was evidenced by a decomposed head picked up from the mud-flats surrounding Fadiouth-Pikine village on 4 May 2000, the circumstances of which point to a locally butchered capture. Ndiaye, native from Fadiouth fishing community, confirms the long-honoured custom of (mostly Christian) Fadiouthiens to eagerly consume the flesh of dolphins and porpoises (see discussion in Van Waerebeek *et al.,* 2000a).

Decomposed remains of a third harbour porpoise (juvenile) were found at Tidine in March 2001; its buried skeleton is still to be exhumed. Harbour porpoises have been captured in Senegal with some regularity for many decades (e.g. Fraser, 1958). Cadenat (1956a) reported that several harbour porpoises had been taken off Hann, near Dakar, and Bathurst (the former name for Banjul), The Gambia. If correct, Banjul (at 13°27'S) would be the southernmost known range for harbour porpoises in the NE Atlantic Ocean, but there is no voucher material. A vague reference to a case in Guinea, in March (Cadenat, 1957) is unsupported and not credible.

Common dolphins

Two calvariae[5] of long-beaked common dolphins *Delphinus capensis* (N° 2000-53, 2000-54), victims of fisheries interactions, were retrieved from beach debris and fish offal at Joal, Senegal's major artisanal fishing port. Members of the Joal-based ngo *Boks Xalaat* (whom signed an agreement of collaboration with COREWAM) collected the skulls from landed dolphins without however noting the date. Two skulls of short-beaked common dolphin *D. delphis* (END-021, END-024; Table 3) were added to the CRC collection, material that had been collected during 1997-98 beach surveys.

From 15 December 2000 till 18 March 2001, remains of another five common dolphins (not yet examined by KVW) were collected at the coastal villages of Palmarin-Ngallou, Fadiouth and Joal (Table 3). Found in the immediate environs of fish landing sites, all were derived beyond any reasonable doubt from dolphins taken in fisheries.

A total of 161 *D. capensis* and *D. delphis* skeletal specimens (mostly skulls), many collected 40-50 years ago by French biologist J. Cadenat, are at the IFAN collections in Dakar and Ile de Gorée (Van Waerebeek *et* al., 2000a), but many are broken, incomplete or in bad state. Many jaws have been separated from their corresponding calvariae. Shreds of dry connective and muscle tissue may serve for molecular genetics population studies. In April 2000, Insa Cassens attempted DNA extractions from 10 samples (some from the historical collection, some more recent ones) at the Laboratory of Evolutionary Genetics, Department of Molecular Biology, Free University of Brussels. At least for some, the agarose gel check indicated that small quantities of DNA, albeit very degraded, had been succesfully extracted. First amplifications of a small mitochondrial fragment failed to give results. A purification method needs to be implemented to separate DNA from humic acids known to accumulate by the decay process in ancient and/or not well-preserved tissues and suggested to inhibit the enzyme in PCR reactions. In addition, other primers to amplify shorter fragments (around 150-200bp), taking into account the possibly advanced degradation of the DNA, need be tested (I. Cassens, pers. comm. to KVW). A *Delphinus* taxonomic analysis, an extension of an earlier paper (Van Waerebeek, 1997), is due at regional scale.

Bryde's whale

A calf rorqual live-stranded at Ngazobil (14°11.477'N, 16°52.025'W), just north of Joal, on 4 May 2000. Mr. Abdou Basse, a COREWAM collaborator and chief of the Poste de Contrôle des Pêches Maritimes at Joal port took some body measurements and made a sketch. Summing three axial measurements taken suggests an approximate body length of about 520cm. Mr. Basse reported the moribund

[5] Plural form of the feminine Latin word *calvaria (-ae)* meaning the neurocranial part of the skull or a skull without mandibles (Engelbregt, 1882; Kokke-Smits and Osse, 1968). The oft used but grammatically erroneous *calvarium* (-a) is to be avoided as a bastardized form in liturgical (medieval) Latin. While usage of the latter is allowed in American English (Guralnik, 1970), it is not recognized in most other languages (see Hentschel and Wagner, 1976; Geerts and Heestermans, 1995) i.e. it lacks universality, the very reason for using Latin in science.

whale was killed, flensed and eaten by locals. It had shown several wounds, from which he deduced that before stranding people had tried to capture it. This could not be ascertained, but it seems plausible. Djiba collected a small tissue sample at the moment the fresh head was buried on the beach. On 20 September 2000, KVW and Djiba revisited the site, unearthed the skull and transferred it for deposit at CRC (N° 2000-52). Small size, a complete separation between cranial bones and the high degree of sponginess agrees with early juvenile status (Fig. 11). The skull will be reassembled for comparative study at a later date.

Luis Pastene reported *(in litt.* to KVW, 15 Jan. 2001) that a mtDNA sequence of specimen N° 2000-52 matches with reference sequences of the ordinary type Bryde's whale. This species, *Balaenoptera brydei* Olsen, 1913, was described from a specimen caught off Durban, South Africa. Before this case, only one (possibly two) other Bryde's whale specimen(s) were confirmed from Senegal. The first, a 445cm calf Bryde's whale stranded alive on a Dakar beach in March 1955 (photos in Cadenat, 1955, clearly show the diagnostic three rostral ridges) and a juvenile skull (unnumbered, without catalogue data) at IFAN-CAD collection, probably derived from the former as IFAN personnel collected the head (Cadenat, 1955). Both confirmed Bryde's whales were unweaned calves; weaning occurs 'usually at about 7.1m in length' (Lockyer, 1990). One or more of several unidentified rorquals stranded on the Senegalese coast may have been Bryde's whale (Van Waerebeek *et al.,* 2000a).

Notarbartolo di Sciara *et al.* (1998) found a 4m long, newborn Bryde's whale stranded on 14 January 1996 just north of Dahkla, Western Sahara, at about 23°40'N. Neonate length for the species is reported as 3.95-4.15m (Lockyer, 1990). Little is known about the distribution, stock boundaries and biology of Bryde's whales in the eastern North Atlantic (Jonsgård, 1966; Gambell, 1977; Lockyer, 1990; Kato, 2002). Due to this lack of data, Bryde's whales are assigned to a single North Atlantic management stock by the International Whaling Commission (Donovan, 1991), which most likely is an overly simplistic model of biological populations.

Small boat surveys

Earlier results from Maigret (1980) and recent findings at the Parc National du delta du Siné-Saloum (Van Waerebeek *et al.*, 2000a) suggested that the park is the most important habitat for Atlantic humpback dolphins in Senegal. Therefore, small boat survey effort was focussed in that area. PNdS rangers stationed at Bakedadji (13°38'51"N, 16°29'36"W) assisted with logistics. A community of Atlantic humpback dolphins commonly forage with rising tide near the mouth of the Djinack bolon[6]. Narratives of selected small boat sorties are as follows. Our platform, a 4m fibreglass PNdS skiff powered by a 25hp outboard motor (max. speed 17km/h) was capable of moving over sandbanks with barely 30cm water and, when stranded, could easily be pulled free.

Narrative boat survey 1

Observers included Colly, Djiba, KVW, Ndiaye and Manza. Slip at 07:24h on 19 November 1999 with rising tide. Stop Djinack-Barra (08:07h); slip (08:20h) direction west towards the sea. No sightings were made inside mangrove creeks. We came across a loose group of an estimated 26 (min/max 22-32) Atlantic humpback dolphins near the entrance of Djinack bolon at 13°35'53"N, 16°32'56"W. The dolphins, dispersed in small subgroups over an area of several 100s of meters, were foraging, as evidenced by multi-directional movements with frequent speed bursts. A subgroup of *ca.*12 large individuals sped alongside the skiff (v=15km/h) for several minutes. All dolphins, including large adults, were coloured light grey on the back and flanks and whitish underneath; many showed dark specks on the tailstock but not on the back. A surfacing behaviour with frequent sideway lunges was noted. All animals, except for one larger calf accompanying an adult, had pronounced humps mid-dorsally, comparable to *S. plumbea* but very distinct from Indo-Pacific humpback dolphins *S. chinensis* from east Asia (see Jefferson, 2000). The dolphins showed surprisingly few scars, nicks or other skin blemishes and no pox 'tattoo' marks, predicting limited prospects for photo-identification purposes. Last contact occurred at 13°35'29"N, 16°33'41"W, some 200m from Ile l'Eba, north of Djinack creek. This is the first documented sighting (photographs Figure 4) of *S. teuszii* in Senegal since the 1979 observations by Maigret (1980).

After retrieving a carcass on Ile L'Eba (10:20h), we headed north along the island and searched for one hour before returning to Djinack bolon, now

[6] Also spelled *bolong* : local name (Wolof) for saline or brackish water creek. Bolongs are typically bordered with mangrove trees.

with falling tide: the humpback dolphins had disappeared. Return to Bakedadji at 16:00h via Djinack-Barra; as usual no dolphins were sighted inside the smaller creeks.

Narrative boat survey 2
Observers: AD, Colly, END, KVW. Slip from Bakedadji base at 08:00h of 20 November 1999, with high and falling tide. Clear sky, good visibility, wind 1 Beaufort, later 2-3Bf. Landing at Djinack-Barra from 08:45h - 09:04h. No dolphins seen inside secondary creeks. At 09:14h traversing entrance to Djinack Creek but no dolphins encountered (falling tide). Locals claim the dolphins approach the bolon entrance from the sea always with incoming tide, which agrees with our own observations and with Maigret (1980).

Turning north, in shallow water 1.5km off Ile l'Eba, a widely scattered group of *ca.* 30 individuals (range 25-40) humpback dolphins were encountered at 13°37'02"N, 16°35'07"W moving multi-directionally in subgroups of 2-5 animals. The dolphins were far more difficult to approach than the day before and several smaller (presumably younger) individuals actively avoided the boat when we tried to close in. One individual showed whitish scar tissue at the tip of its dorsal fin, the only individual noted with a mark obvious enough for photo-identification. No dolphins were seen off the eastern shore of Ile aux Oiseaux. At 11:01h, with falling tide, we approached the entrance to the wide Bandiala channel (13°39'40"N, 16°33'52"W), then headed towards Ile Marabou where we waited for the tide to rise (slip 14:09h), then headed out the Bandiala. Dolphins have been reported in Moudjieven canal (13°39'56"N, 16°33'23"W).

Navigation among sandbanks with falling tide implicates high risks of grounding (one boat was seen stranded). Humpback dolphins must cope with the same hazard which, we suggest, is one reason why they approach shallows only when the tide is rising. Easier access to prey or greater availability might be another reason. At 14:47h we entered the Ngass bolon (at 13°37'38"N, 16°34'57"W) and returned via the maze of secondary creeks to Bakedadji (arrival 16:30h).

Narrative boat survey 3
Departure from Bakedadji on 28 October 2000 with observers Diallo, Djiba, Ndiaye and KVW. Near the entrance of Djinack bolon (arriving from Djinack-Barra) we encountered two subgroups, one of *ca.* 7 (range 6-8) humpback dolphins with one calf at 13°35.80'N, 16°33.04'W (10:52h) and another subgroup of *ca.* 30 individuals (range 26-34) with several juveniles and at least two mother/calf pairs at 13°34.59'N,16°32.51'W (11:41h). We followed the larger subgroup for 15minutes which moved parallel but at a variable distance from shore (30-600m) towards Niumi National Park. The group crossed the political border between Senegal and The Gambia, which they are reported to do almost daily, which may qualify the species as 'migratory' under the CMS Convention. The dolphins foraged in a tidal rip area. Heading north we entered the Bandiala bolong in direction of Misirah (11:13h - 14:00h) with falling tide; no more dolphins were sighted. Return to Bakedadji. Trip log was 42.1km; survey on effort for 4h 09min.

Narrative boat survey 4
Observers: Djiba and Malang Sarr set out in a large dug-out canoe for a day trip from and to Misirah on 19 March 1999. In the mouth of the Bandiala at 13°37'59.9"N,16°35'37.5"W a small group of humpback dolphins was encountered. Two dolphins were thought to be *T. truncatus*. A sortie on 20 March 1999 did not result in any cetacean sightings.

When interviewed on 17 Nov. 1999 by KVW, Mamadou Faye, director of the *Centre de Pêche de Misirah* (Saloum delta), confirmed the regular presence of dolphins in the wider bolons surrounding Misirah. Faye declared to be unaware of any recent catches. Sighting forms were hand-delivered to Faye in December 1999 but none have been returned; unless compensated with rewards such voluntary reporting schemes have shown little promise. Misirah fishermen believe dolphins follow and prey on bonga fish *Ethmalosa fimbriata* for the occurrence and movements of bonga are said to coincide with dolphin sightings.

Group size of *S. teuszii* sightings in the Saloum delta for the period 1999-2000 ranged from 10–37 individuals (median=23; *n*=8) (Table 4). When feeding, small subgroups of 2-5 individuals were at times scattered over a larger area but individuals still behaved in unison as a single group; for instance all individuals left an area almost simultaneously (Table 4). Our sighting records and effort cover only the cooler, dry season months of October through February, but according to credible local residents the species is seen in the area year-round. In the past the species was reported in the Saloum from January through April with fewer records in May-June (Cadenat, 1956b; Maigret, 1980). There was an apparent lack of sightings from July to December and combined with capture records on the Petite Côte from June-August, Maigret (1980) wondered whether northward migration (to Banc d'Arguin, Mauritania) was to blame. However the current pooled dataset does not back up this hypothesis, and the lack of surveying in the rainy season could easily explain the absence of records.

THE GAMBIA

INTRODUCTION

Only a few papers discuss the cetaceans of The Gambia, their interactions with fisheries and legal status (Maigret, 1994; Murphy *et al.*, 1997; Van Waerebeek *et al.*, 2000a). Although no capture rates have been estimated, local fisheries seem to cause low to moderate levels of dolphin mortality, and cetacean meat is readily consumed in fishers' communities. Till date there was no firm evidence of direct takes. Interactions with industrial (foreign) fishing fleets are not recorded, but dolphin by-catches are the norm in trawl, purse-seine and other fisheries. Nevertheless, cetaceans and manatees have been fully protected by Gambian national legislation since 1977. Small-scale but successful commercial bottlenose dolphin-watching ventures operate from Banjul, catering mostly to foreigners.

KVW visited The Gambia from 21-26 November 1999, primarily to tend to organisational matters with the project's principal counterpart institution, the Department of Parks and Wildlife Management (DPWM) and to coordinate with officers of the Department of Fisheries (DoF). The principal investigators who make up The Gambia Cetacean Working Group (GAMCET) included, at DPWM, Mr. Alpha Jallow (manager of Kiang West National Park), Dr. Linda Barnett and Dr. Almamy Camara (Chief DPWM), and at the Department of Fisheries (DoF) senior officer Mrs. Anna Cham. The study period officially started on 1st December 1999. However after preparing a strategy for the project, the country PI's first went out into the field mid-December and initial records date from the end of December 1999.

New equipment, including a hand-held Global Positioning System (GPS, Garmin 12XL), a compact Ricoh camera and wide-angle binoculars were hand-delivered on behalf of KVW by Mr. Jan Tavernier in January 2000, while on mission to The Gambia for the Royal Belgian Institute for Natural Sciences.

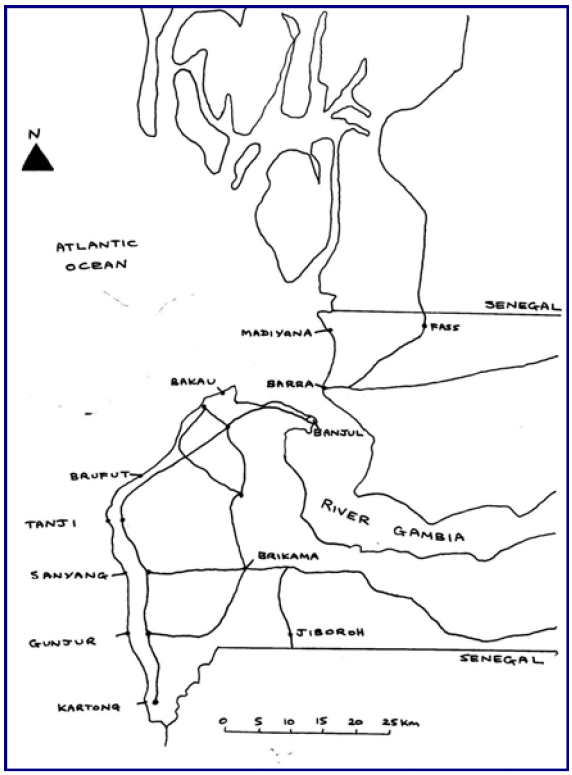

Figure 1. The study area in coastal The Gambia. Niumi National Park stretches north of Barra to the border with Senegal's Saloum delta. The Gambia's capital Banjul (at 13°27'S, 16°35'W) separates the outer estuary of the Gambia from its inner estuary, dominated by a tidal regime.

CAPACITY BUILDING IN CETACEAN CONSERVATION

Dept. of Parks & Wildlife Management

Following up on WAFCET-1, the DPWM agreed to co-implement the present project. As in Senegal, no full-time biologist was available and project responsibilities were shared by several DPWM scientists and assistants. A planning meeting to discuss the practicalities of a cetacean programme was convened at DPWM headquarters in the Abuko National Park on 24 November 1999. Attending were Camara, Barnett, Cham, Jallow and KVW. The latter summarized the aims of WAFCET-2, suggested methodologies and provided copies of various documents. A draft Letter of Agreement of 22 November 1999 between MER and DPWM was endorsed. DPWM would administer daily issues while KVW ensured technical support. Other issues, including the distribution of WAFCET reports, were discussed. Consensus existed that publication of reports by the CMS Secretariat

would ensure these to be readily obtainable by any interested party. KVW invited co-authors to comment on the advanced draft WAFCET-1 report. Further, the meeting discussed implications for newly recognized Range States of North Atlantic minke whale following publication of a paper, partly resulting from WAFCET-1 work, confirming minke whale occurrence off Morocco (Western Sahara), Mauritania, Senegal and (inferred) The Gambia (Van Waerebeek *et al.*, 1999).

Department of Fisheries

A planning meeting scheduled at DoF headquarters in Banjul on 25 November 1999 was attended by three senior Fisheries Officers, Mr. Momodou Suwareh, Mr. Amadou Saine and Mr. Asbern Mendy, as well as three of the authors (Cham, Jallow, KVW). Priorly, the DoF deputy vice-director was briefed on core issues. KVW expanded on the CMS/WAFCET cetacean programme and solicited the collaboration of DoF to collect data on cetaceans and other aquatic mammals in The Gambia.

DoF officers informed of continuing paucity of information on cetacean-fisheries interactions despite efforts during WAFCET-1 to train observers. Only four completed sighting sheets had been received from onboard observers and descriptions of sightings were too vague to be of any use. Low reporting motivation is due largely because most observers participate only in a single fishing voyage of a few weeks. Appropriate training of observers is uneconomic and progressive expertise-building nonexistent. DoF observers stationed at fish landing sites typically serve much longer contract periods, consequently would benefit more from training. The meeting concluded that an intensive marine mammal briefing session for training staff (senior officers), instead of primary observers, would be most time-effective. A summary of information will then be passed on to field workers during the standard training procedures. KVW agreed to prepare a one-day workshop. Officers suggested highly simplified sighting forms; it was concluded that any format would do as long it included location, date, description and number of animals.

Mrs. Cham, who moved from DPWM to DoF department during the project, agreed to act as co-ordinator for aquatic mammals issues at DoF.

Data Collection Workshop

On 28 September 2000, KVW and the GAMCET group, in coordination with DoF and DPWM, jointly organized a one-day workshop (Appendix 3) at the conference room of DoF headquarters, Marina Parade, Banjul (Fig.2). Emulating the CMS Guinee-Conakry marine mammal workshop of May 2000 (Archer and Van Waerebeek, 2000) and in order to guarantee a fluent interaction with the lecturer (KVW) attendance was limited to a selected group of ten DPWM and DoF officers and chief fisheries observers.

Figure 2. Cetacean data collection workshop held at the Banjul headquarters of The Gambia's Fisheries Department, on 28 September 2000. (Photo: KVW).

The DoF vice-director in his opening speech warmly welcomed participants, most particularly foreigners Djiba and KVW, after which he proceeded to formally open the workshop. KVW presented a 'Briefing on Data Collection Methods in Whale and Dolphin Field Research' and each participant received a copy of the 50 pages draft course featuring highly itemized definitions and procedures as to permit relevant sections to be readily inserted into the present observers training manual. Audiovisual material (video, slides) of confirmed and expected whale and dolphin species from Gambian waters, as well as aspects of marine mammal biology, illustrated new concepts on mammals unfamiliar to most Gambians. Comments and questions feed-back will permit KVW to improve on the briefings. The workshop was considered a good precedent for further joint activities on aquatic management issues between DoF and DPWM. Participants included: Linda Barnett (DPWM), Anna M. Cham (DoF), Abdoulaye Djiba (IFAN, University of Dakar, Senegal), Famara Drammeh (DPWM, Abuko), Junkuy Jadama (Dumbuto, Kiang West National Park), Alpha

Jallow (KWNP), Babauding Kanip (DoF, Tanji Fisheries Centre), Mustapha Touray (DoF, Sanyang Village), Ousainou Touray (DPWM, Abuko) and KVW.

The Gambia Cetacean Reference Collection

A Gambian cetacean reference collection (GARC) was initiated under WAFCET-1 at DPWM headquarters in Abuko National Park (Van Waerebeek *et al.*, 2000a). Due to space shortages, GARC was moved to the new educational centre at Kiang West National Park in the course of 2000. Alpha Jallow is the current collection curator.

Two calvariae of bottlenose dolphin that stranded on the Atlantic coast south of the Gambia River estuary and two common dolphin skulls, including the first confirmed long-beaked common dolphin (*Delphinus capensis*) for The Gambia, were added to GARC cetacean reference collection (Fig.4) which consists of 22 specimens (Table 7), representing five species of the family *Delphinidae*, bottlenose dolphin (*Tursiops truncatus*), Atlantic humpback dolphin (*Sousa teuszii*), Clymene dolphin (*Stenella clymene*), long-beaked common dolphin (*D. capensis*), short-finned pilot whale (*Globicephala macrorhynchus*), and an unidentified small whale (miscellaneous postcranial bones). Adult common dolphins can be identified (long-beaked or short-beaked) by examining the shape of the palatine bones (Van Waerebeek, 1997), however juveniles are much harder to tell apart. A further study of morphological variation may yield additional discriminating features.

Figure 3. The Gambia cetacean reference collection (GARC) curated at Kiang West National Park by Manager Mr. Alpha Jallow (Photo: KVW).

Dolphin watching operations

Commercial dolphin watching started in The Gambia in 1995 and is growing steadily. In 1998 some 84,000 foreign tourists arrived in The Gambia (+9.09% on previous year), a considerable number for a very small country of *ca* 10,000 km^2 (Hoyt, 2001). Total tourist receipts topped USD32 million. In 1998 an estimated 1,000 tourists (probably a conservative estimate) took a dolphin-watching boat trip, the highest number of any West African country. Direct expenditures amounted to about USD 30,000 and total expenditures to USD 105,000 (Hoyt, 2001). Dolphin watchers are mainly foreigners and a few local people, due to high cost when compared to mean Gambian income. According to general tourism figures for the country, most of the visitors are from the United Kingdom (67%), Germany (8%) and Sweden (7%). In 1998, three operators, employing four boats ranging from a 22m (72ft) motor cruiser to a small outboard-powered rigid-hull skiff, were offering daily, dolphin watch tours on a nearly year-round basis. Prices varied depending of the operator and the season but about USD30 was common. There is considerable potential, some of it now being realized, for long-term dolphin tourism. The Gambia probably provides the most accessible gateway to watch the rare Atlantic humpback dolphins occurring in nearshore waters of the Niumi National Park (Saloum-Niumi population). Moreover, there is potential for whale-watching since unidentified small to medium-sized whales, probably minke or Bryde's whale (or both), are regularly reported by fishermen as close as 10km west of Sanyang Point (Van Waerebeek *et al.*, 2000a).

In early 2000 three companies ('Gambia River Excursions', 'Gambia Tours' and 'Pleasure Sports Ltd') offering boat trips were approached by Barnett to investigate whether dolphins were sighted during their journeys, and indeed whether they still offered dolphin-watch trips for tourists. 'Gambia River Excursions' operates trips from Banjul to Lamin Lodge (southern Gambia shore) and Banjul to Denton Bridge, mostly navigating through creeks or otherwise shallow water. The operators informed Barnett that no dolphins have been sighted on these trips. Gambia Tours offers a trip entitled "Looking for Dolphins" and operates tours out of Banjul port to Dog Island and James Island on a boat called *Joveantonia.* A folder was left with the crew of the boat so that they could record daily sightings. The *Joveantonia* trips were claimed to result in bottlenose dolphin observations on 90% of days, including some at Albreda. The large majority of observations

were identified as bottlenose dolphins, but operators reported also some humpback dolphins on trips to Dog Island and James Island, i.e. in the inner estuary but still largely in saline water. Earlier work has confirmed only bottlenose dolphins upstream of the outer estuary of the Gambia River (Van Waerebeek *et al.*, 2000a); so it would be useful to seek reports supported by evidence. *Pleasure Sports Ltd* which in the past provided sighting records (Van Waerebeek *et al.*, 2000a), were running few dolphin-watching trips at the time of the present survey. On a chartered survey demonstration trip with M/V *Lady Jaserine* (skipper/owner, Mr. M. Baldwin) on 2 October 2000, several individuals out of a large group of bottlenose dolphins confidently approached the boat and rode the bow, very different from the evasiveness seen in some coastal bottlenose dolphin communities subject to frequent boat harassment, e.g. off Tenerife (KVW, personal observations) and in north-central Chile (Sanino and Yañez, 2000). As in 1997-98, nothing indicated that The Gambia's dolphin-watching tourism is exerting any noticeable impact on the bottlenose dolphin population. Nonetheless, monitoring needs to be continued.

FIELD RESEARCH

Beach Surveys

One of the authors (Barnett) opportunistically inspected seashores of Djinack and Bijol Island in December 1999 and January-March 2000, without finding cetacean specimens. For training purposes, a beach survey was organised on 3 October 2000 along the shores of Tanji sea-bird reserve. One of us (KVW) demonstrated search techniques for stranded cetacean and sea turtle material. Cham, Ida Sillah (of DoF), Famara Drammeh (of DPWM) and KVW departed (10:39h) on foot from the Brufut fish landing site (13°23'04"N, 16°46'32"W) towards destination Tanji fishing community (13°21'37"N, 016°47'53"W). Remains from three cetaceans were collected :

- one calvaria (condition C5) from an adult long-beaked common dolphin *Delphinus capensis* in Tanji bird reserve at 13°21'37"N, 16°47'53'W, near sea turtle nesting site. This specimen, in good condition, represents the first confirmed record of *D. capensis* for The Gambia (Fig.4) and fittingly demonstrated the value of beach surveys;
- two juvenile (cf. detached epiphyses) lumbar vertebrae (C5) from an unidentified small delphinid found meters from each other at 13°22'55"N, 16°46'56"W;
- one physically mature vertebra (C5) from an unidentified small delphinid, found just south of Brufut (13°22'55"N, 16°46'56"W).

6.2 km of beach SW of Leybato Point (endpoint 13°26'31"N, 16°43'33'W) were combed on 23 November 2000 but no remains were found. Two calvariae recently added to the collection had stranded on the Atlantic coast south of the Gambia estuary and were subsequently identified by KVW as *T. truncatus*.

A bloated carcass of a 3.2m long bottlenose dolphin that washed up at Tanji mid-July 2001 was photographed and buried by L. Barnett and aides for later retrieval of bones. The cause of death could not be determined.

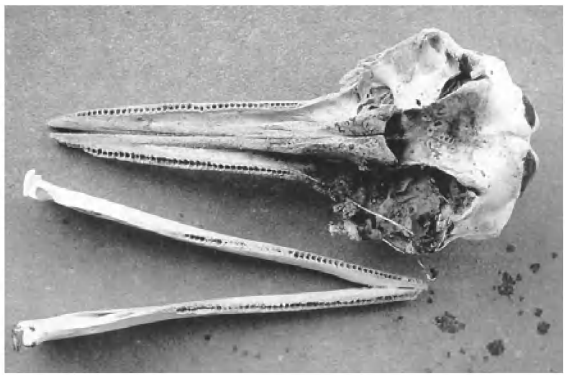

Figure 4. A skull picked up at the beach of Tanji bird reserve is the first record of the long-beaked common dolphin *Delphinus capensis* for The Gambia (*legit* KVW, October 2000).

National observer network

By mid-January 2000, with 18 cetacean data collection points set up, covering the Atlantic coastline and sites along the River Gambia (Figures 1, 2), the first reports of sightings and strandings were received. The sites that were monitored by selected local observers (names in parenthesis) are:

South Coast: Banjul, Bakau in Kanifing Municipality (Jabis, M. Kallo, Ousainou Touray, Jerreh Njie), Brufut (Lamin Manneh, Modou Job, Buba Manjang, M.L.Fye, Modou Fye, M.Lamin Fye, Janko Bojang), Tanji Bird Reserve (Lamin Saidy, Buba Manjang, Jerreh Njie, Lamin Bojang, L.Manneh, Famara Saine), Tujering, Sanyang (Momadu Job, Mr. Parr, Saidy Dibbah, Wuyeh Manneh, Modou Senghore, Jerreh

Nduce, Babau Joof), Gunjur (Bakary Sarr, Lamin Sarr, Yusu Jammeh, Aroley Jabang, Hassan Poye, Musa Jammeh, Alie Kolley, Elliman Jammeh, Lamin Touray, Allaghie Sass, Buba Chorr, Barrama Sarr, Momadu Sarr, Ebrima Puye, Mahamid Nduce, Baka Sarr, Mamadi Sarr), and Kartong (Western Division).

North Bank Division: Barra (Sonko Faye, Mbakeh Manneh, Sheelagh Fowler), Jinack (Craig Emms, Bakary Dorboe, Foddy Trawally, M.L. Denton) and Albreda.

Lower River Division: Bintang, Kemoto (Babading Barrow, Momadu Saineh, Momadu Manjang, Jerreh Fadera, Konaij Jassy Marong), Tankular (Omar Njie, Ousainou Njie, Lamin Saidy, Lamin Drammeh, Momadu Manjang), Jali Bolon (Lamin Saidy, Wandifa Janyang), Tobab Kolong at Kiang West District (Bakary Jammeh, Alasan Gaye, Lamin Saidy), Tendaba (Abdoulie Manneh, Junkung Sadane, Wandifa Sanyang, Bakary Jammeh, Lamin Saidy) and Yelitenda (Kiang West Central).

At first call at each of the sites one local observer was assigned responsibility for a folder containing photocopies of data sheets (one simplified from a standard provided by KVW and one highly simplified and produced by Cham for those observers that cannot read or write), drawings of whales and dolphins and a pen and a pencil. In many cases the person was a DoF worker, but also included a village chief, employees of a private company (Madiyana Camp on Djinack island) and DPWM employees. As many people of the port area as possible, including the heads of the fisher's associations, fishermen, DPWM employees and dolphin-watchers were informed of the aims of the project, were shown how to identify the dolphin and whale species likely to be encountered and how to fill in data forms. The person responsible for the folder was encouraged to inform other fishermen, fish processors, marketers and people who frequent the beach. The PIs visited the sites twice a month (Djinack and Barra on a monthly basis) and typically sat with the site coordinator to discuss his recordings and these of local observers.

Kartung residents reported regular sightings from the beach of a 'whale with a dorsal fin' in the period December 1999 till May 2000. Lamin Djeteh (pers.comm. to KVW, 26 Sept 2000) believed it to be always the same animal that remained in the vicinity. Fishermen reported regular presence of dolphins in the set-net fishing areas (*ca.* 8-10 nmiles offshore).

More than 230 dolphin sightings were reported during the study period, both from the Gambia estuary and Atlantic waters, but none were authenticated by accurate descriptions of features observed (despite our insistence on the importance of the latter). Sightings were relatively rare during the dry season months of December and January, for unknown reason, but possibly due to reduced effort. As with all laymen sighting schemes, improperly documented species 'identifications' are almost useless. Observers reported a variety of dolphins seen mostly from land-based vantage points, including expected species (bottlenose dolphin, Atlantic humpback dolphin) but also a range of other species, both possible and unlikely ones (common dolphin, rough-toothed dolphin, pantropical spotted dolphin, pygmy sperm whale, sperm whale). It was decided not to speculate about these records for now, but try to interprete some of them at a later stage provided authenticated records from these same sites become available, possibly permitting some likelihood statements. Nonetheless, little doubt exist that several cetacean species were seen, including whales, which is promising for future efforts. As some observers gain experience, field identifications hopefully will become more reliable.

It appeared that a majority of the observers understood the methods of completing forms.

Figure 5. Juvenile bottlenose dolphin netted intentionally by fishermen from Gunjur, The Gambia, in September 2000. Its meat was about to be sold for human consumption at Gunjur landing beach (Photo: KVW), when a DoF officer intervened and confiscated the illegal catch.

The highly simplified form has helped in this regard. It was felt important to assess the results at least once a month. At Albreda no contact person could be identified, but observations

from dolphin-watching trips also helped to cover this part of the river.

By-catches and directed takes

When covertly monitoring the fish landing site of Gunjur on 26 September 2000 we observed, by chance, the butchering of a freshly landed female bottlenose dolphin (juvenile, SL 165cm; Fig.5). The fisher initially claimed that the dolphin died entangled accidentally nearshore off Kafountine, Casamance, in a gillnet set for bonga fish. The reported location (off Senegal) was not very convincing. The fisherman seemed to believe that Gambian dolphin protection legislation would not apply in Senegalese waters, and thus would escape any fines. Also, the absence of any netmarks indicated that death after struggle from entanglement was practically impossible. Only after exhaustive questioning by DoF officer Cham did the fisher admit to have intentionally set the gillnet around a school of some twenty dolphins; all allegedly escaped except the young dolphin which was hauled in alive and killed onboard. Photographs, skin sample and the head were taken. Two further observations indicate that landings of cetaceans and utilisation for food are not uncommon at Gunjur: (i) dolphin meat had a publicly known, set price of 2-3 dalasi/kg (0.13-0.20 USD/kg); (ii) the dolphin was swiftly and expertly butchered, clearly a routine task. Gunjur has earlier been named in connection with bottlenose dolphin captures: the US National History Museum (Washington D.C.) holds six specimens originating from catches 2-4nm off Gunjur both in 1951 and 1997 (Van Waerebeek *et al.*, 2000). Three other specimens, from takes '3 miles off Gunjur' sometime in the early 1950s, are kept at London's (ex-) British Museum, and were collected by Martin Routh (male BM 1952.7.30.5; male BM 1952.7.30.3; female BM 1952.7.30.6).

While inspecting the Sanyang landing beach, a local youngster who had noted the Gunjur dolphin head in the jeep, volunteered that captured dolphins were also sold at Sanyang, a complete animal selling for about 100 dalasi (USD 6.70), which agreed well with the price information from Gunjur. Some 50-60 pirogues based at Sanyang utilize mostly set gillnets (both multi- and monofilament gillnets were seen).

Interviews with chief and senior fishermen during visits to the ports of Bakau, Banjul, Brufut and Tanji, guided by Cham, on 27 September 2000 further confirmed that captured dolphins are landed at least 'occasionally'. Here also dolphin meat was reported to be sold and consumed locally.

Small boat surveys

The feasibility of an offshore survey to identify reported whale sightings was considered but cost was incompatible with budget. On 2 October 2000, the GAMCET group in cooperation with boat owner Mr. Baldwin set out on the 18m M/V *Lady Jacerine* for a demonstration dolphin survey in the outer estuary of the Gambia River. Basic notions of survey methodology were explained. Slip from Banjul at 10:00h with rising tide (low tide at river mouth ca. 09:00h).

Figure 6. Foraging bottlenose dolphins in the outer estuary of the Gambia River, 2 October 2000, approach and inspect a commercial dolphin-watching boat (Photo: KVW).

Sighting 1: *T. truncatus* group consisting of an estimated 9 dolphins (range 8-12) seen from 11:05-11:15h, at 13°32'12"N, 16°34'56"W. Mostly adults without calves swimming fastly and bow-riding for brief moments.

Sighting 2: *T. truncatus* group consisting of an estimated 34 dolphins (range 30-38) seen at 11:22h, 13°32'41"N, 16°35'28"W. Mostly adults with two or three small juveniles and one neonate. Dolphins milling and thought to be feeding; made several long dives after several large individuals fluked up simultaneously seemingly starting deep vertical dives. Three full breaches were also seen. Hardly any skin marks were visible, most animals were very darkly pigmented, a few somewhat lighter. At 12:00h dolphins stopped milling, regrouped at 13°32'02"N, 16°35'10"W and traveled slowly towards the river mouth (Fig. 6), then

moved into river with rising tide following the deep shipping lane; speed 6.6km/h, heading 182°. At 12:33h, position 13°30'48"N, 16°34'45"W, we last sighted the group then heading southeast (upriver) in tight formation. Photographs were taken (Fig. 6).

Mr. Baldwin guesses the resident bottlenose dolphin community utilizing the Gambia estuary as home-range at some 120 individuals. He recognizes several individuals from marks. A dedicated capture-recapture photo ID study with a dolphin-watching boat as platform would conceivably be the most cost-efficient method to obtain a scientific population estimate.

In 1999, according to Baldwin, more than a third of bottlenose dolphins were affected by 'creamy-white skin lesions' on their backs and dorsal fins. Subsequently, sightings became rare and 'a large part of the community disappeared from the estuary for several months, presumably had moved out to sea'. When the dolphins reappeared in the estuary in the usual numbers, skin lesions had cleared. No cases of diseased skin were registered in 2000. Extended permanence in freshwater or brackish water (below 2% salinity) can lead to skin problems in marine dolphins and has been suggested as a contributing factor in the incidence of infectious dermal diseases (Sweeney and Ridgway, 1975; Wilson *et al.*, 1999).

KVW did not sight any dolphins during the 30min ferry crossing between Barra and Banjul across the Gambia estuary on 21 and 27 November 2000. Locals report occasional sightings from the ferry, but reportedly fewer dolphins are seen compared to years ago.

The Gambia Ratification of CMS Convention

With reference to the present UNEP/CMS project, DPWM Chief Dr. Camara requested an update on the state of affairs pertaining to the instrument of ratification of the CMS Convention, first prepared in May 1996 by the Solicitor General and Legal Secretary for the Department of State for Justice. On 14 December 2000, Lt.Col. (ret.) Yahya A.J.J. Jammeh, President of The Gambia, signed the instruments for ratification of the CMS Convention. The ratification was rightfully hailed as a major accomplishment by DPWM staff who had long and vigorously advocated with State House to strengthen The Gambia's wildlife conservation policies through CMS.

STATUS OF THE ATLANTIC HUMPBACK DOLPHIN

INTRODUCTION

The Atlantic humpback dolphin *Sousa teuszii* (Kükenthal, 1892) is a small delphinid regionally endemic to the tropical and subtropical eastern Atlantic nearshore waters of West Africa, an area concordant with the FAO fishing area 'n° 34' (see Northridge, 1984). *S. teuszii* was described in 1892 by German zoology professor Willy Kükenthal of Jena, reportedly based on a shark-damaged carcass found floating in the Bay of Warships in the present-day Cameroon Estuary. A description in French and some additional information was published simultaneously by professor Pieter Joseph Van Beneden (1892), who referred to Kükenthal as his source. The type specimen is presently at the Natural History Museum, London (BMNH 1893.8.1.1) where it was recently examined (Jefferson and Van Waerebeek, in press). A second specimen was collected in 1925 at the port of Dakar, Senegal, by Mr. Papot (van Bree and Duguy, 1965)[7], but remained largely forgotten. The species was re-discovered in Senegal in 1943 (Fraser, 1949; Cadenat, 1956b) and then sighted south of Conakry (Guinea) in January 1953 (Cadenat, 1956b). Over the next half-century it was documented in at least five other West African nations as detailed below, but has never been considered very common. Earlier names included 'Cameroon (or Camerun) River dolphin' and 'Dauphin de rivière' (Mörzer Bruyns, 1971; Dupuy, 1983); however considering *S. teuszii* is not known to occupy true riverine habitat (see further), these are misnomers. The Imragen people of Mauritania call the humpback dolphin *owdenne* distinguishing it from the bottlenose dolphin *ajanna* (Maigret, 1980). Hindered by a scarcity of reliable data and specimens[8] and lack of clarity of taxonomy, the biology of *S. teuszii* has only rarely been the subject of a dedicated

[7] Mr. Olivier Van Canneyt, curator at the Centre de Recherche sur les Mammifères Marins (CRMM), Institut de la Mer et du Littoral, Port des Minimes, La Rochelle (France), kindly confirmed details (in Email, 13 March 2002) as listed in Table 7. Specimen is received in loan from the Muséum d'Histoire Naturelle de La Rochelle.

[8] In period 1892-2002, only 41 specimens of *Sousa teuszii* have been reliably documented for all of West Africa (Table 8), for some of which no voucher material could be located.

review (e.g. Klinowska, 1991; Jefferson *et al.*, 1993) and has otherwise been discussed in conjunction with other nominal species of the genus *Sousa* (e.g. Ross *et al.*, 1994; Ross, 2002).

The Atlantic humpback dolphin is listed on Appendix I of CITES as '*Sousa* spp.'. The IUCN Cetacean Specialist Group has long accorded it a high priority for studies in view of its restricted range, narrow ecological niche and presumed low population size (Perrin, 1988; Reeves and Leatherwood, 1994; Reeves *et al.*, 2003). In 1991 *S. teuszii* was included on Appendix II of the Convention of the Conservation of Migratory Species of Wild Animals (CMS, 1991) following a proposal by Pakistan. New insights emerging from the WAFCET-1 project (Van Waerebeek *et al.*, 2000a, 2001a) further warned about the high vulnerability of *S. teuszii* and the danger that, if pressures are not controlled, one or more populations may become endangered. This led the authors to critically review all available information and update with own, unpublished data, as given below. A precursor of this chapter was presented to the 2002 Scientific Committee Annual Meeting of the International Whaling Commission (Van Waerebeek *et al.*, 2002).

TAXONOMY

Genus: *Sousa* Gray, 1866: 213. Type species *Steno* (*Sousa*) *lentiginosus* Gray

Species: *Sousa teuszii* (Kükenthal, 1892)
Atlantic humpback dolphin, Teusz's dolphin
Dauphin à bosse de l'Atlantique (recomm.); Dauphin du Cameroun (French)
Delfín jorobado del Atlántico (Spanish)

Synonymy:

Sotalia tëuszii Kükenthal, 1892: 442. Skull holotype originally deposited in the Jena Natural History Museum, Germany, by prof. Pechuel-Lösche after it was collected by Eduard Tëusz in the Bay of Warships, Cameroon. The holotype is now at the British Museum (Natural History)[9] under catalogue number 1893.8.1.1 (Pilleri and Gihr, 1972; Jefferson and Van Waerebeek, in press).

Sotalia Teuszii Van Beneden, 1892:351. Alternate spelling for *Sotalia tëuszii* Kükenthal. This paper was published the same year as, and may actually have been available before, Kükenthal's formal description, however P.J. Van Beneden referred due credit for the discovery to Kükenthal.

Sotalia tëuszii Fraser, 1949: 274.

Sotalia teüszii Cadenat, 1956b: 555.

Sotalia tëuszii Cadenat and Paraiso, 1957.

Sotalia teuszi {sic} Scheffer and Rice, 1963:7. Unwarranted renaming of *Sotalia tëuszii* Kükenthal.

Sotalia teuszii van Bree and Duguy, 1965.

Sotalia teuszi {sic} Hershkovitz, 1966:25. Unwarranted renaming of *Sotalia tëuszii* Kükenthal.

Sotalia teuszi {sic} Marcuzzi and Pilleri, 1971: 120. Unwarranted renaming of *Sotalia tëuszii* Kükenthal.

Sousa teuszi {sic} Rice, 1998:103. Possibly a misprint considering that *S. teuszii* is used on p.102.

The taxonomy of the genus *Sousa* remains not fully resolved, partly for lack of well-documented series of specimens (see also Ross, 2002). Briefly, several theories compete in how three geographic units and nominal species (i.e. West African *S. teuszii*, Indian Ocean *S. plumbea* and Indo-Pacific *S. chinensis*) are assigned taxonomic levels. Pilleri and Gihr (1972) supported recognition of *S. plumbea* but added two other nominal species (*S. lentiginosa* and *S. borneensis*), both of highly dubious validity due to sympatry. A widely shared view proposes a bispecific genus with *S. teuszii* and *S. chinensis* as valid species, the latter combining all Indo-Pacific populations (Jefferson and Karczmarski, 2001; Mitchell, 1975; Rice, 1977). Rice (1977) suggested *S. teuszii* could perhaps be regarded as a subspecies of *S. chinensis*. Ross (1984) however supported the separation between *S. chinensis* and *S. plumbea*, but proposed *S. teuszii* as a subspecies of *S. plumbea*. Ross (2002) changed his mind and argued for a 'single, variable species for which the name *S. chinensis* has priority', citing recent morphological studies, 'supported somewhat equivocally by genetic analyses.'

In our view, three main allopatric geographic units identifiable with the three nominal species as cited above (see also Jefferson and Van Waerebeek, in press; Ross *et al.*, 1994; Rice, 1998; Zhou *et al.* 1980;) reflect the most plausible status and coincides with a practical nomenclatural null-hypothesis.

Considering that the *plumbea* form, covering humpback dolphins from the western Indian Ocean, is a *nomen conservandum* either as species or subspecies, the epithet should not be

[9] Presently named the Natural History Museum, London

brought into disuse now. A recent multivariate analysis of geographic variation in cranial morphology in the genus *Sousa* (Jefferson and Van Waerebeek, in press) supports the view of *S. teuszii* as a good species and indicates *S. plumbea* to be distinct from *S. chinensis*, without offering a final verdict on taxonomic status.

Only preliminary molecular genetic studies have been reported on: *S. teuszii* was missing from a study of phylogenetic cytochrome b sequences among delphinids (LeDuc *et al.*, 1999). Cockcroft *et al.* (1997) included tissue samples of two *S. teuszii* skulls from London's Natural History Museum, however these yielded no amplifiable mtDNA. Results by Rosenbaum *et al.* (2002) neither were conclusive.

DISTRIBUTION

The Atlantic humpback dolphin is one of only two cetaceans[10] endemic to the West African subregion. A few authors have argued for a largely discontinuous distribution (Maigret, 1980; Ross *et al.*, 1994) while most suggest a more or less continuous coastal range from Morocco or Senegal to Cameroon (Dupuy, 1983; Hershkovitz, 1966; Klinowska, 1991; Marcuzzi and Pilleri, 1971; Mörzer Bruyns, 1971; Pilleri and Gihr, 1972; Rice, 1977, 1998; Ross, 2002; Scheffer and Rice, 1963). Some stated *S. teuszii* occurs as far south as Angola, but without hard evidence (Evans, 1987; Jefferson *et al.*, 1993; Mitchell, 1975).

We here critically review distribution, indicators of relative population size and fishery interaction for all known and potential range states in western Africa. Table 8 lists 40 documented[11] specimen records since the species description in 1892. The Atlantic humpback dolphin is spatially separated from Indian Ocean *S. plumbea* populations by a *ca.* 2,200 km stretch of coast off southwestern Africa, washed by the Benguela Current. Due to its low sea temperatures, that stretch of barren coast may act as an ecological barrier, as first suggested by Dutch naturalist-captain Mörzer Bruyns (1971). The western limit of *S. plumbea* was uncertain till recently (Ross, 1984) and except for a vagrant specimen found at Muizenberg (34°07'S,18°28'W), South Africa, no records existed west of the Gouritz River mouth at 21°53'E. Findlay *et al.* (1992) identified three sightings beyond this point, the westernmost off De Hoop at 20°30'E. Recent observations have established False Bay (18°30'E), near Cape Town, as the western range limit of *S. plumbea* (Ross, 2002; Vic Peddemors, pers. comm.).

Discussing the extra-limital record of a humpback dolphin off Israel's Mediterranean coast, Kerem *et al.* (2001) state 'one cannot completely exclude the identification of the West African humpback dolphin (*Sousa teuszii*), although the fact that it has never been reported from the western Mediterranean [...] makes this possibility highly unlikely'. However, Indian Ocean humpback dolphins inhabiting the Red Sea have long been known to penetrate into the Suez Canal and were sighted near both Port Said and Port Suez (Mörzer Bruyns, 1960; Hershkovitz, 1966; Marcuzzi and Pilleri, 1971; Beadon, 1991). The humpback dolphin seen off Israel represents a likely example of 'Lessepsian migration' from the Red Sea via the Suez Canal towards the Mediterranean Sea, and is most probably a *Sousa plumbea.*

Morocco, including Western Sahara

Distribution : Beaubrun (1990) first reported a *S. teuszii* sighting from Western Sahara (Rio de Oro), in Dahkla Bay at 23°54'30"N, 15°46'30"W: on 14-15 January 1989, a small group of three mixed with three *T. truncatus*. *Sousa* was identified from their '... *morphologie tout à fait particulière de leur nageoire dorsale*'. Perhaps a resident community, these humpback dolphins seem confined to the shallows of the extreme northern end of Dahkla Bay (Beaubrun, 1990; Notarbartolo-di-Sciara *et al.*, 1998). From four sightings in January 1996, mean group size was determined as 6.9 individuals (Notarbartolo-di-Sciara *et al.*, 1998). The northern bight of Dahkla Bay, at 23°50'N, is the northernmost (known) distribution limit for the species (*contra* 20°N cited by Klinowska, 1991). Presumed additional records from Western Sahara attributed to Martin *et al.* (1992) and cited by Powell *et al.* (1996) and Jefferson *et al.* (1997) refer to the same sighting by Beaubrun (1990).

Stock size: The Dahkla Bay stock (Fig. 7a) appears to be very small (Notarbartolo di Sciara

[10] The other endemic species is the Heaviside's dolphin *Cephalorhynchus heavisidii.*

[11] A few reports not properly documented with respect to identification, locality or circumstances were not included.

et al., 1998), perhaps a few dozens of animals, and may be a remnant of a once stronger northern foothold.

Fishery interaction: Suspected. A single stranded fresh specimen was examined (Notarbartolo di Sciara *et al.*, 1998) but was not collected (Abdellatif Bayed, *in litt.* to KVW, 5 Oct 2001) and the cause of its death is unknown.

Canary and Cape Verde Archipelagos

There are no records of Atlantic humpback dolphins from the Canary islands (see Vonk and Martell, 1988; Martín *et al.*, 1992), not surprisingly since the mostly rocky archipelago surrounded by deep oceanic waters offers no suitable habitat. However Reiner *et al.* (1996), who reviewed the cetaceans from the Cape Verde Archipelago, listed *S. teuszii* among a batch of species for which 'some of them are likely to occur also in the Cape Verde Archipelago'. This is highly unlikely (see also Hazevoet and Wenzel, 2000) given 620km of deep water separating the Cape Verde Archipelago from the African continent while *S. teuszii* has only been found in shallow, neritic waters with mostly sandy or muddy bottoms (Maigret, 1980; this paper).

Mauritania

Distribution: Busnel (1973) first reported *S. teuszii* from Cap Timiris, Parc National du Banc d'Arguin (PNBA), in 1972-73 when he observed one individual among a group of 10-15 bottlenose dolphins interacting with beach-seining Imragen fishermen (Busnel, 1973: figs. 4 & 10; Leatherwood *et al.*, 1983: p.189). Dorsal fins and backs visible in photographs from an Imragen-dolphin interaction event in an indeterminate winter but estimated early 1970s (Cousteau and Diolé, 1974) show only bottlenose dolphins. The first humpback dolphin specimen known from Mauritania is a 'stranded animal, female; picture from Mr.James, 1967' (Busnel, 1973; his fig.6&7). A more or less fresh carcass is shown being filleted. Presumably it was this specimen Fraser (1973) discussed in some detail. However, the first specimen collected was a damaged skull picked up from a beach near Cap Timiris by Busnel in 1970 (Fraser, 1973).

Banc d'Arguin (Fig. 7a) is the main area of regular occurrence of *S. teuszii* in Mauritania (Duguy, 1976; Maigret *et al.*, 1976; Maigret, 1980; Robineau and Vely, 1998). Maigret (1980) identified, based on 18 sightings made in 1972-80, two hotspots of occurrence in the PNBA park, namely the baie d'Arguin in the north, and the shallow waters off Iwick in the south. Robineau and Vely (1998) reported 15 strandings and 15 sightings, respectively 12 and 10 of these within the boundaries of PNBA. Strandings occurred on the southern tip of Arguin island (n= 1), on the Iwick peninsula (n= 2), on Tidra island and facing Thila peninsula (n= 3), and along the shorelines of Cap Timiris (n= 6). Sightings were made inside the Arguin bay (n= 2), north of Cape Tagarit (n= 1), west of Tidra island (n= 1) and off Cape Timiris (n= 5). Interestingly, no records are on hand for Baie du Lévrier and Cap Blanc, located just north of the PNBA. Along la Grande Plage south of Nouamghar five sightings are reported (but not authenticated) and only one stranded specimen is on record south of Nouakchott (Robineau and Vely, 1998).

Stock size: The Banc d'Arguin management stock is fairly small and Maigret (1980) thought it did not exceed 100 animals in 1980; the largest group counting 20 individuals. No scientific assessments have been made but prof. Alex Aguilar of the Universidad de Barcelona (pers. comm. to KVW), who carried out field work on monk seals in the area, suggested a minimum population size of high hundreds, maybe as high as a thousand or more, which however appears highly unlikely. Apart from photos near Cap Timiris as mentioned above, the only other photographic evidence is a surfacing of five humpback dolphins on Banc d'Arguin (*in* Maigret, 1990).

Fishery interaction: One of us (Samba Ould Bilal) collected five new specimens (Table 6 & 8). Specimen BLM16/95 was confirmed by-caught. This supports the suspicion, raised by high numbers of stranded delphinids, that by-catch may be a significant cause of *Sousa* mortality in Mauritania. Nieri *et al.* (1999) documented mass mortality of Atlantic spotted dolphins *Stenella frontalis* and one *T. truncatus* as a result of purse-seine fisheries off la Grande Plage. In their original report, Nieri *et al.* (1996) indicated that one male *S. teuszii* was among the dolphins found in the western lagoon of Cap Timiris, but it is unclear why this was not repeated in the published paper (Nieri *et al.*, 1999). One of us (Samba Ould Bilal) is able to

confirm the contention by Nieri *et al.* (1996, 1999) that some Mauritanians consume dolphin meat at least occasionally.

Senegal

Distribution: Senegal is the species range state for which most information is available (Fraser, 1949; Cadenat, 1956b; Cadenat and Paraiso, 1957; van Bree and Duguy, 1965; Maigret, 1980; Van Waerebeek *et al.*, 1997, 2000a, 2001a, this paper). *S. teuszii* appears most common in the southern part of the Siné-Saloum delta which makes up a large part of the 180,000 hectare Siné-Saloum biosphere reserve and consists of a swampy delta with *Avicennia* spp. mangrove, lagoons, dunes, sand banks and sandy islands.

Dupuy (1983) suggested that Atlantic humpback dolphins frequent the lower third part of the Casamance, Gambia and Senegal Rivers but this has not been confirmed. There is a single sighting '*signalé avec certitude*' from the outer estuary of the Casamance River and another probable sighting near the Presqu'ile aux Oiseaux, just north of the Casamance estuary, which is coastal habitat (Dupuy and Maigret, 1979; Maigret, 1980). We found an apparently semi-resident community of bottlenose dolphins, but no Atlantic humpback dolphins, in the lower stretch of the Casamance River near Carabane Island, between Ziguinchor and the river mouth, based on sightings made from the ill-fated *Djoola* ferry (Van Waerebeek *et al.*, 1997, 2000, 2001). Unpublished observations from 1984-1986 had also revealed nothing but bottlenose dolphins[12].

Maigret (1980) informed that *S. teuszii* has never been observed in the delta of the Senegal River (which forms the border with Mauritania), despite high observer effort and concludes that it is absent there. This agrees with work done on the river by one of us (Ndiaye). A few isolated reports exist of captured specimens at ports (Dakar, Yène Kao, M'Bour) along the Petite Côte, north of the Saloum delta, but these dolphins may have been captured further south.

No reliable records exist of Atlantic humpback dolphins from Senegal's exposed, sandy coastline north of Dakar, but relative lack of search effort could partly be blamed.

Stock size: The Siné-Saloum delta is the only area in Senegal where humpback dolphins can be reliably sighted (Fig. 7a); yet Maigret (1980) guessed this stock ('Saloum-Niumi', see below) at no more than 100 animals. Group size in the Saloum Delta for the period 1999-2000 ranged from 10–37 individuals (median 23; n = 8; see Table 4). Significantly, in small boat surveys not more than one group a day was encountered and multiple sightings near the mouth of Djinack Creek probably involve a single community (Fig. 9). Our observations cover the cool, dry season from November through February, but inhabitants of Djinack and park rangers claim the species is present year-round. In the absence of scientific abundance data, our best guess from relative encounter rates for the Saloum-Niumi would not exceed a few hundred individuals, and possibly less.

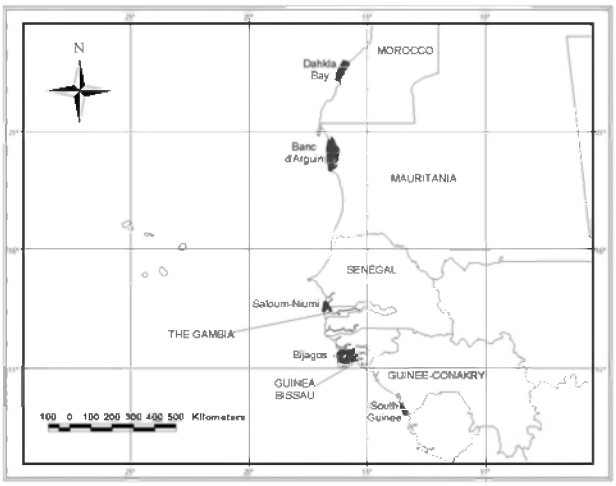

Figure 7a. Distribution centres of the five proposed management stocks of *Sousa teuszii* in northwestern Africa (Van Waerebeek *et al.*, 2002): Dahkla Bay, Banc d'Arguin, Saloum-Niumi, Gêba-Bijagos and southern Guinea. Occurrence in-between core habitats is poorly documented but probably very low, except in Guinea-Bissau and Guinea where several hundreds animals may occur and distribution could be quasi-continuous.

Fishery interaction : Fishers communities of Joal and Fadiouth, located at the northern edge of the Saloum Delta, have long been known to harpoon cetaceans for food (e.g. Cadenat, 1956a; Van Waerebeek *et al.*, 1997) and this would logically include *S. teuszii*. By-catches in shark gillnets are also well-documented (Cadenat, 1957; and see Table 8). In November 1996, we found three carcasses together with rope knotted around tailstocks on a remote beach of Sangomar Island (Van Waerebeek *et*

[12] Source: Cornelius J. Hazevoet, *in litt.* to KVW, 19 August 1997; cited *in* Van Waerebeek *et al.*, 1997.

al., 1997; 2000a). Apparently abandoned on the beach their meat untouched, carcasses may have been offered to the '*esprits*' of the island in an animist-religious ritual widely observed among Saloum Delta fishermen.

In the few weeks before a visit on 2 June 1997, fishermen from Fadiouth, home village for one author (E. Ndiaye), reportedly captured a humpback dolphin, sold the meat and discarded butcher remains offshore as to avoid detection. By-catches in artisanal gillnet fisheries as well as habitat degradation and overfishing, are thought to be the main threats to the Saloum-Niumi stock in Senegal (Van Waerebeek *et al.*, 2000a; this paper).

The Gambia

Distribution: The presence of *S. teuszii* in the mouth of the Gambia River, and south of the capital Banjul, has been mentioned without further authentication (Dupuy, 1983; Maigret, 1980; Murphy *et al.*, 1997). All confirmed sightings are situated in estuarine waters between the north bank of the Gambia River mouth and the Saloum Delta and especially in The Gambia's Niumi National Park (Table 4). Humpback dolphins apparently move around in this 15 km long coastal stretch. One group was observed crossing the international border at Niumi into Senegal (this paper) and another passing from Barra Point to Buniada Point (Murphy *et al.*, 1997). To date, none has been reliably reported from upriver Gambia (confusion with bottlenose dolphins is problematic), or even from the brackish inner Gambia estuary which they may penetrate with rising tide. It is likely that some movement occurs between the outer Gambia estuary and the exposed Atlantic coast of southern The Gambia. A skull (PFM005) was retrieved at Sanyang Point, *ca.* 30km south of the Gambia River mouth. It still stands as the only known *S. teuszii* specimen from The Gambia (Murphy *et al.*, 1997; Van Waerebeek *et al.*, 2000a).

Stock size: No estimate is available, but *S. teuszii* dolphins seen in The Gambia share range with the community found in Senegal's adjacent Saloum Delta, and we propose the name 'Saloum-Niumi' stock (Fig. 7a).

Fishery interaction: Information exists for one possible case of directed take in The Gambia (Murphy *et al.*, 1997). Bottlenose dolphins are known to be incidentally captured by fishermen (Van Waerebeek *et al.*, 2000) and we infer, from sympatry, that the same applies to Atlantic humpback dolphins.

Guinea-Bissau

Distribution: Spaans (1990) during field studies on birds, recorded 56 *S. teuszii* sightings over a 8-week period in the Canal do Gêba and the Arquipélago dos Bijagos. From a frequency histogram (Spaans, 1990; his figure 4) we derived group size statistics: mean= 4.4 individuals; SD 4.19 and range 1-15 (n= 54; mode= 2; median= 2.5). Bottlenose dolphins were also present in the area, but none mixed with Atlantic humpback dolphins. The latter were observed mainly in the more sheltered areas, in turbid as well as clear water. The only specimen of Guinea-Bissau was collected at Canhabaque island in March 1989 (Sequeira and Reiner, 1992). Additional sightings are listed in Table 9 (from Wolff, 1993) and in Van Waerebeek *et al.* (2000a) but no further specimens were found.

Stock size: The large number of opportunistic sightings suggest that the still relatively undisturbed waters with extensive mangrove habitat of Guinea-Bissau may support one of the larger extant populations of *S. teuszii*. Powell *et al.* (1997) indicated that '*Sousa* appear to be relatively common in the shallow waters around the Bijagos archipelago'.

We propose the name 'Gêba-Bijagos' management stock, referring to the areas of apparently commonest occurrence (Fig. 7a). If the still pristine environment of the Bijagos Archipelago would be contaminated by activities related to a projected large ship-dismantling industry[13], the disturbance and contamination could pose a very serious threat to this dolphin stock.

Fishery interaction: None documented, largely due to lack of monitoring effort. Few fisheries observers are active in Guinea-Bissau and, understandably, there is no autochthonous cetacean research in the country (see Van Waerebeek *et al.*, 2000a). However, fishing operations have sharply risen over the past decades (e.g. Stegemann and de Braconier, 1994) and the incidence of by-catches is likely to have increased in proportion.

Guinea-Conakry

Distribution: French biologist Jean Cadenat

[13] C. Veter in Greenpeace magazine 15(58), 2003

(1956b) reported [our translation]: '…the characteristic shape of the dorsal fin of this species and its colour pattern […] make me think today that the delphinids which showed exactly these characteristics, and which I could observe in January 1953 in the silt-laden inshore waters of French Guinée, south of Conakry, must also belong to the species *Sotalia teüszii*.' Cadenat is one of a handful of biologists to have examined specimens in the flesh (in Senegal), therefore his account is definitely credible. No further sightings are reported from Guinea, although its coast features plenty of appropriate habitat, including shallow coastal waters (0-40m) on an up to 200km wide continental shelf (Chavance *et al.*, 1998) and extensive mangrove intertidal areas around four river mouths (Rio Komponi, Rio Nuñez, Fatala and Konkouré). That the Guinea stock of Atlantic humpback dolphins is extant is evidenced by a specimen captured on 13 February 2002 in the Bay of Sangaréah, just north of Conakry (Table 8). In early 2001, the Centre National des Sciences Halieutiques de Boussoura (CNSHB) was designated by Guinée's Ministry of Fisheries and Agriculture to gather data on cetaceans. Samples, skeletal material and photographs are deposited there.

Stock size : Unknown. A single specimen recorded to date is indicative of the absence of monitoring and research effort, however this is now changing. Human encroachment on the coastal environment is growing, especially around Conakry.

Fisheries interactions: The only specimen known from Guinea, a 222cm male of 220kg (see above) was killed in fisheries (Fig. 10) , and was eaten by the local population, as confirmed by one of us (I. Bamy). Fisheries develop fastly and in 1995 some 75,300 MT (69% artisanal by 2,300 pirogues) were fished (Chavance *et al.*, 1998).

Sierra Leone, Liberia and Ivory Coast

Distribution: Northridge (1984), in an otherwise well-researched review, equivocally affirmed that Cadenat (1956b, 1957, 1959) 'records a number of individuals from the coasts of Senegal and the Ivory Coast'. A careful reading of these papers reveal that all Atlantic humpback dolphins referred to were taken in Senegal. Klinowska (1991) reviewing *S. teuszii* designated Sierra Leone, Liberia and Ivory Coast as known countries of origin, which is speculative in the absence of documentation. We know of no marine mammal research in Sierra Leone and Liberia. Despite some research effort in Ivory Coast half a century ago (e.g. Cadenat, 1959; Cadenat and Lassarat, 1959) there was no evidence of presence of humpback dolphins. Nonetheless, any conclusions are decidedly premature.

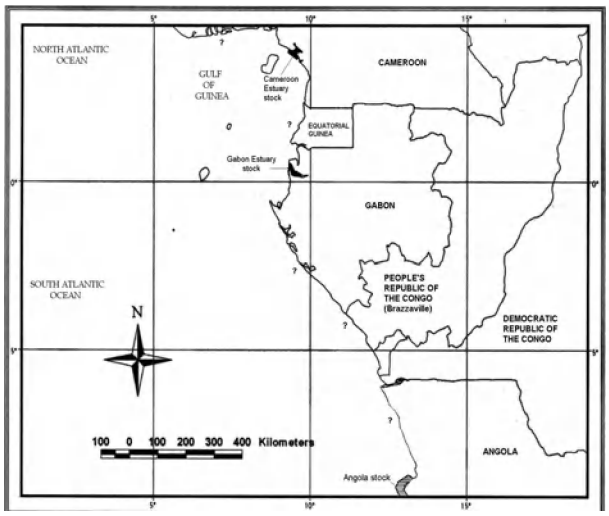

Figure 7b. Known occurrence of Angola, Gabon and Cameroon Estuary stocks of the Atlantic humpback dolphin in Central West Africa. True distribution is expected to be much wider.

Ghana and Togo

Distribution: Klinowska (1991) cited *S. teuszii* for both Ghana and Togo, without supporting evidence. Van Waerebeek and Ofori-Danson (1999) and Debrah (2000) monitored small-scale fisheries for captures of cetaceans in coastal waters of mostly western Ghana (ports of Axim, Dixcove and Apam) and while identifying more than ten species of small cetaceans, they did not encounter *S. teuszii*. Follow-up field research in 2001-02 as part of the UNEP/CMS WAFCET-3 Project in the same areas [14], co-ordinated by KVW, has not led to any specimens nor scientific sightings (unpublished data). However, at least three Togolese senior fishermen from the Lomé environs, interviewed 'blind' from each other by biologist Gabriel Segniagbeto and KVW pointed to *Sousa* (called '*kposso*' by one) in a

[14] National principal investigators are, for Ghana, Dr. P.K. Ofori-Danson (Department of Oceanography and Fisheries, University of Ghana, Legon) and, for Togo, Mr. K. Okoumassou (Ministère de l'Environnement et des Ressources Forestières, Lomé).

dolphin guidebook shown to them. The fishers stressed quieter behaviour in the *kposso,* compared with a sturdier and more aggressive kind of dolphin ('*giga*' almost certainly *T. truncatus*) that regularly steals fish from gillnets (Van Waerebeek and G. Segniagbeto, unpublished data). Bottlenose dolphins have been seen to move from one set drift gillnet to another in nearshore waters off Cotonou, Benin, evidently to raid captured fish. Interestingly, Lomé's location in western Togo is only some 90km east of Ada, Ghana, where the Volta estuary meets the ocean and sandbanks form a dynamic, neritic habitat reminiscent of areas where humpback dolphins have been preferentially encountered in other countries (e.g. Siné-Saloum delta in Senegal).

Benin

The Atlantic humpback dolphin has been cited, unauthenticated, for 'Dahomey' i.e. present-day Benin (Klinowska, 1991). Brief cetacean surveys in Beninese coastal waters in October 2000, September 2001 and October 2002, and the perusal of two biological collections in Cotonou has so far failed to demonstrate the presence of *S. teuszii* (Van Waerebeek *et al.*, 2001b; Van Waerebeek, 2002). Sinsin and Owolabi (2000) in a Benin biodiversity review did not list the species. However a conclusive answer on its presence or status in Benin is premature.

Nigeria

According to some authors (Jefferson *et al.*, 1993; Powell *et al.*, 1997) Atlantic humpback dolphins inhabit Rivers 'such as the Niger'. Maigret (1994) in his overview states [under Nigeria] that fishing occurs in the area where both humpback dolphin and the manatee live and both are probably caught in nets. Klinowska (1991) and Rice (1998) also cite Nigeria as range state for the species. While recognizing the likelihood of the claims, they are unfortunately not supported by material evidence. The present authors could identify only a very dubious reference by Danham and Clapperton from 19th century Nigeria, as reported by M. Aucapitain (1859; not seen but cited literally in Pilleri and Gihr, 1972 as follows): [p.239] *'Dans ce même bassin hydrographique du Niger, encore si peu etudié, existent des Cétacés, animaux marins, excepté un genre; il me semble donc fort possible, que dans une faune aussi singulière que celle de l'Afrique centrale, il puisse se rencontrer des espèces jusqu'a présent regardées comme exclusivement marines.*' This description is so exceedingly vague as to leave open any aquatic mammal including the West African manatee *Trichechus senegalensis*, which range of greatest abundance is precisely the Niger River and its tributaries (Nishiwaki *et al.*, 1982); the fact that Aucapitain does not explicitly name the hard-to-miss Niger manatees adds to our scepticism. Van Beneden (1892), while he believed in the existence of some sort of River dolphin in Africa, had earlier pointed to the caveat that material evidence is lacking: '*Ce n'est pas le premier Dauphin fluviatile d'Afrique; Danham et Claperton [sic] en ont signalé un dans le bassin du Niger, dont M Aucapitaine a fait mention dans la Revue zoologique de 1859, mais dont rien n'a été conservé*'. Van Beneden (1892) added that another report by Aucapitain of 'a cetacean' from lake Tradé was probably 'du *Manatus vogelii*, un Sirénien', which confirms that Aucapitain counted manatees among the Cetacea. Vogel (1856) and Shaw (1857; not seen, *in* Mulder Bosgoed, 1874) apparently started the myth of a fluviatile cetacean in the Benué River (the main eastern tributary of the Niger River), by calling the *Manatus* 'a kind of whale', but the general misclassification of manatees as cetaceans predates even those authors (see Kneeland, 1851).

We conclude that to date no verifiable records exist of *S. teuszii* from Nigeria, although it is likely that they inhabit the larger mangrove channels of the outer Niger delta, or did so in the past. This area has since been disturbed by massive industrial operations connected to oil exploration and development. It is highly doubtful that any humpback dolphins ever resided in true fluviatile environment of the Niger and its tributaries.

Cameroon

Distribution: In 1892 the German naturalist professor Willy Kükenthal described a new dolphin species *Sotalia teuszii* from the Man of War bay, (present-day Douala), Cameroon, about which he wondered whether it was herbivore. His correspondence with the Flemish marine mammalogist Pieter J.H. Van Beneden illustrates the confused circumstances of the finding as well as the several instances of

specimens changing hands, where the possibility of a mismatch between a dolphin skull and a manatee stomach is easily imagined: '*Au fond de la baie Man of Wars, après une forte pluie d'orage, un Dauphin, entrainé par le courant, devient la proie de Requins, et le directeur des plantations au Kameroun, M. Tëusz, témoin de cette scène, parvient heureusement à sauver ce qui reste du cadavre; les viscères sont perdus, à l'exception de l'estomac, mais le contenu de celui-ci consistant en graminées en herbes et surtout en fruits en partie digérés, indique que c'est un dauphin à régime végétal. La tète, que M. Tëusz a fait préparer sur les lieux, est heureusement tombée entre les mains d'un naturaliste distingué, le professeur Willy Kükenthal, de Jena, qui, après lui avoir donné le nom de Sotalia Teuszii et envoyé une note au rédacteur du Zoologischen Jahrbucher, a bien voulu m'en envoyer la photographie, avec l'autorisation de la publier* (Van Beneden, 1892).'

Stock size: Unknown. No cetacean surveys have been organised in Cameroon. Since the 1892 discovery of the species' holotype no other specimens nor sightings have been reported, and the obvious question begs, whether it still occurs there. We propose the name Cameroon Estuary (Fig. 7b) for this historical management stock.

Fishery interaction: None documented.

Equatorial Guinea

No sighting or specimen records of humpback dolphin are published for either the mainland Río Muni nor Bioko (Fernando Póo) and Pagalu islands. The offshore islands are most likely not part of *S. teuszii* distribution but Río Muni is potential range. Little, if any, marine mammal information is published from these areas beyond some descriptions of aboriginal whaling activities for humpback and Bryde's whales off Pagalu (see Aguilar, 1985).

São Tomé and Príncipe

No records of Atlantic humpback dolphin exist for the Democratic Republic of São Tomé and Principe, and it seems unlikely that an inshore species like *S. teuszii* would have crossed into this oceanic archipelago. São Tomé and Principe is not a party to CMS, CITES, Ramsar or the Convention on Biological Diversity (CBD).

Gabon

There is scant information on small cetaceans occurring along the 885km coastline of Gabon (see Fraser, 1950; Van Waerebeek and De Smet, 1996) and no published records of Atlantic humpback dolphins. However, H. Rosenbaum (*in litt.* to KVW, 31 Jan. 2002) informed us of one skeletal *Sousa* specimen (AMNH 120268) in the Mammal Department collections of the American Museum of Natural History, New York. The specimen originates from Kango (00°15' N, 10°11'E) which is at the eastern end of the Gabon estuary. We propose to provisionally name this the 'Gabon management stock' (Fig. 7b). The only field notes available from the Maclatchy-Malbrant expedition are typed lists of specimens received by the AMNH. Maclatchy and Malbrant were probably working for some other agency with an agreement to send specimens to the AMNH. During the 2nd World War there were very few field expeditions but the museum continued to receive material from Army tropical medicine personnel.

Unfortunately, no field journals or published accounts of the expedition are available (H. Rosenbaum, *in litt.*).

People's Republic of Congo

The People's Republic of Congo (often referred to as Congo-Brazzaville) with its 169km of coastline is not a known, but a likely, range state for *S. teuszii*. It needs to be stressed that its small cetacean fauna has not been studied. Congo-Brazzaville has ratified all the major relevant environmental conventions, including CMS, CITES, Ramsar and CBD and theoretically any humpback dolphins found would enjoy legal protection under CMS.

Democratic Republic of Congo

No humpback dolphins have been reported from its small coastal zone (37km of the Democratic Republic of the Congo), nor from the Congo River. However the Parc national des Mangroves at the estuary of the Congo River presents suitable habitat and surveys are needed. The Democratic Republic of the Congo is Party to CMS, CITES, Ramsar and is a signatory of CBD.

Angola (including Cabinda)

Distribution: Jefferson *et al.* (1993) suggested that *S. teuszii* may possibly occur to northern

Angola, while Rice (1998), apparently in reference to this marine mammal guide, admonished 'published assertions that it ranges to Angola are purely conjectural'. However, Vic Cockcroft[15] (*in litt.* to KVW, 24 August 1999) received numerous reports from divers on oil rigs and pilots flying the area, that humpback dolphins occur off northern Angola and Cabinda. John Hatton reported a group of *Sousa* from about 150km north of Luanda while flying an aerial survey off the northern Angolan coast in the early 1990s. While there are no supporting photos, it needs mentioning that Dr. Hatton was familiar with the externally similar *Sousa plumbea* from Mozambique. Cockcroft himself searched two weeks off Luanda and south in the Kwanza (Coanza) River without coming upon any humpback dolphins; no specimens were present in the Luanda museum[16]. Cockcroft spoke to many fishermen both commercial and artisanal and none could identify humpback dolphins.

Jefferson *et al.* (1993) were proven right when V. Cockcroft recently provided KVW with a photograph taken by Alex Vogel (Fig.8) showing humpback dolphins off southern Angola. Mr. Vogel says that while paddling the coast of southern Angola in February 1997 between the towns of Namibe and Tombua, at about 16°S, he daily saw small groups of 4-5 *Sousa*. It is possible that they are summer visitors-only to an area which lies just north of the influence zone (Namibia) of the cold Benguela Current, where no humpback dolphins seem to occur.

Stock size : No information but groups seen have all been small. The status of the 'Angola stock' (Fig. 7b) can now be updated from 'unconfirmed-contemporary' (Van Waerebeek, 2003b) to confirmed. Of environmental conventions, Angola has ratified only the World Heritage Convention and UNCLOS. Signatory status of CMS and CITES is currently in process (Fretey, 2001).

Fishery interaction: None reported.

[15] Centre for Dolphin Studies, P.O. Box 1856, Plettenberg Bay. 6600, South Africa

[16] Considering absence in the Casamance, Senegal and Gambia Rivers, *S. teuszii* is unlikely to be found in

Figure 8. Small group of humpback dolphins seen nearshore off southern Angola by Alex Vogel in February 1997. This photograph is the first hard evidence that *Sousa teuszii* occurs in Angolan waters (Photo: A. Vogel, courtesy Vic Cockcroft).

STATUS

Stock structure

Available specimens and datasets documenting morphological variation and molecular genetics are insufficient to start assessing biological stock composition in the Atlantic humpback dolphin. However, for practical management purposes we provisionally propose six (confirmed-contemporary) stocks based on sightings or recent specimens clustered around a core habitat: *i.e.* (from north to south) Dahkla Bay, Banc d'Arguin, Saloum-Niumi, Gêba-Bijagos, south Guinea and Angola. Circumstantial and historical evidence suggests the existence of at least another three management stocks which we here refer to as Cameroon Estuary, Gabon (confirmed-historical) and Togo (unconfirmed-contemporary) stocks.

From these nine proposed management stocks, the northernmost four appear sufficiently geographically, and perhaps ecologically, isolated from each other to allow only limited genetic exchange, although this may be a recent phenomenon, the result of local reductions or even extinction of communities as a result of expanding human pressure, in particular fisheries. Gêba-Bijagos and south Guinea may constitute either two or a single, larger stock.

A lack of sightings for named Togo, Cameroon and Gabon stocks impedes any guesses on their status. Ongoing fisheries monitoring in western Ghana (Van Waerebeek and Ofori-Danson, 1999, unpublished data; Debrah, 2000) where many hundreds of

dolphins are killed in coastal fisheries each year, offers a strong argument to believe that Atlantic humpback dolphins are very rare or absent, west of Ghana's largest industrial port Tema (05º38'N,00º01'E). This relative distribution gap could extend to the west into much of Ivory Coast. The Togo stock is defined in the belief that circumstantial evidence of sightings and fishermen's reports is reliable.

In summary, fully confirmed range states of *S. teuszii* presently include nine West African maritime countries: Morocco (Western Sahara), Mauritania, Senegal, The Gambia, Guinea-Bissau, Guinea-Conakry, Cameroon, Gabon and Angola. Anecdotal evidence points to recent occurrence off Togo. Increased search effort will, no doubt, result in further locality discoveries, but may also establish areas where the species is definitely not present or has disappeared in recent times.

No karyotype of *S. teuszii* is described and mtDNA studies are preliminary and inconclusive for lack of representative samples (Rosenbaum *et al.*, 2002; Cockcroft *et al.*, 1997; LeDuc *et al.*, 1999). Analysis of nuclear DNA has not been undertaken.

Abundance

No abundance estimates are available for any named stock of *S. teuszii* and line transect surveys are needed everywhere. Below we compile the relative appreciation of abundance that have been formulated at some point, in the belief that informed guesses are often still better than nothing. Generally, abundance appears low compared with that of the more widely distributed oceanic delphinids.

The northernmost, Dahkla Bay community seems small by any definition (see Notarbartolo di Sciara *et al.*, 1998), possibly not exceeding a few tens of animals. In four sightings, the pooled total estimated number observed was 28 dolphins, and some of these may have been re-sightings (Notarbartolo di Sciara *et al.*, 1998). The Banc d'Arguin stock has been suggested not to exceed more than 100 individuals (Maigret, 1980). A more recent guess suggested stock size between high hundreds to low thousands (Alex Aguilar, pers. comm.), but the authors believe this to be overly optimistic.

Mitchell (1975) summarized opinion as 'it seems that in coastal waters of southern Senegal it is rather common'. In 1980, Maigret quoted a guestimate of not more than 100 animals for the Saloum Delta. From our own observations at the Saloum-Niumi stock, abundance would probably not exceed low hundreds; the largest (feeding) aggregation seen counted *ca.* 40 animals. The estimated cumulative number of animals seen in 13 sightings (period 1996-2001) was 269 dolphins.

From Spaans (1990) and later sightings (Table 9) it follows that, at least till 1998, the species was not uncommon in the waters of Canal do Gêba and Bijagos archipelago in Guinea-Bissau. Earlier Powell *et al.* (1996) concluded similarly. An informed guess would suggest a stock of perhaps a few hundreds. Over 31 sightings in the period 1992-1998 an estimated cumulative number of 205 humpback dolphins were sighted.

We express considerable concern about the proposal for a heavy industry park based on scrap metal processing from obsolete and contaminated large ships, to be dismantled on beaches of the pristine Bijagos Archipelago. Such a proposal has already been filed by Spanish sea transport companies with the Bissau government. Bijagos is a 1996 UNESCO Biosphere Reserve, one of the richest in biodiversity in West Africa. The shipping disturbance, with the inevitable release of highly contaminated residues in the marine environment, could destroy much of this unique Reserve.

Figure 9. Atlantic humpback dolphin of the Saloum-Niumi stock photographed when crossing the international border between Senegal and The Gambia. Crossings are regular, perhaps diurnal, thus *S. teuszii* technically can be considered 'migratory' *sensu* CMS Convention (Photo: KVW; 19 November 1999).

No relative density estimates of humpback dolphins are available from Guinea (Conakry), and the same is true from further south and east. Off Angola only small groups of less than 10

individuals were reported.

Recognizing the relevance of the Precautionary Principle, in the absence of abundance estimates, decisions relating to managing human impacts should be guided by a worst-case scenario. In the case of *S. teuszii*, a gradual fragmentation of its distribution range into relatively isolated reproductive units (see also Reeves *et al.,* 2003) could ultimately lead to local extinctions. Local extinction may already have started in western Ghana, and perhaps northern Senegal.

The conservation status of *S. teuszii* is assigned to CMS Appendix II [17], IUCN 'insufficiently known' and CITES Appendix I. We strongly recommend granting *S. teuszii* the maximum possible legal protection considering its many unknown biological parameters, uncertain and probably discontinuous distribution, important incidental mortality in fisheries throughout its range and its likelihood to suffer most directly from coastal habitat degradation. The short-term prospects for a range-wide monitoring of population abundance and status are low, while the evidence suggests that *S. teuszii* is a dolphin species already subject to serious, multi-faceted and probably increasing pressures in the foreseeable future, the long-term impact of which does not bode well.

HABITAT AND ECOLOGY

Habitat

Atlantic humpback dolphins use predominantly tropical coastal and estuarine habitat with soft-sediment bottoms. Groups move often very near to shore, in Niumi Park within 100-200m from the beach (Fig. 9). A young female was taken (alive) in a beach-seine near Joal in 1955 (Table 8). While associated salinity levels are unavailable, tolerance seems high and includes both brackish water of estuaries and highly saline water such as found in the Siné-Saloum Delta in dry season, result of high evaporation. *S. teuszii* has repeatedly been suggested to also occupy riverine, fresh-water habitat (Van Beneden, 1892; Dupuy, 1983; Jefferson *et al.*, 1993; Klinowska, 1991) but to date that hypothesis remains unauthenticated. Even if individuals were to be occasionally sighted upstream from the estuary, these dolphins could temporarily move in phase with tidal sea-water intrusion, and could not be considered riverine. Senegal's Saloum and Bandiala in dry season are non-functional 'rivers' that capture barely any freshwater run-off, but show dynamics as of large tidal creeks. Others are broad estuaries with massive tidal saltwater penetration like the Gambia River and Gabon Estuary. Claims of sightings in the Niger (Klinowska, 1991), Senegal and Casamance Rivers are unsupported. Bottlenose dolphins, which are documented in the Casamance and Gambia Rivers, but also in brackish environment, were likely mistaken for Atlantic humpback dolphins.

Migratory movements and seasonality

Maigret (1980) suggested a possible seasonal movement between Banc d'Arguin (Mauritania) and Senegal's Saloum delta. However, there are no indications of seasonality in occurrence in either area, nor any observations that point to long-distance and seasonal migration. Some level of seasonal movement around one particular core area seems more probable. Some level of exchange may occur but the lack of sightings in intermediary locations, the absence of specimens in northern Senegal (north of Dakar) and the paucity of records in southern Mauritania suggest movements between 'home ranges' of these stocks to be minimal.

Cross-border movements between Senegal's Saloum Delta and the Gambia River estuary' north bank (part of which forms Gambia's Niumi national Park) were observed directly, whence the Saloum-Niumi is considered a single population. Therefore, *S. teuszii* is tecnically a 'migratory species' under CMS/UNEP terminology. Recent and published observations (Table 4; Cadenat, 1959) show a presence from October till March, published information documents a sighting in April (Cadenat, 1959) and a capture off Joal in August, i.e. in rainy season (Maigret, 1977). Locals confirm year-round presence.

Some exchange between the Saloum-Niumi and Canal do Gêba-Bijagos stocks is probable, considering the relatively limited distance (about 280 km) that separates both.

Feeding ecology

Limited qualitative and no quantitative data are available on the feeding ecology of *S. teuszii*. The stomach of a 248cm adult male landed at Joal, Senegal, contained remains of various

[17] As last amended by the CMS Conference of the Parties in 1999, effective from 14 February 2000.

fishes including one specimen of grunt *Pristipoma jubelini* (Pomadasyidae; carpe blanche) (Cadenat and Paraiso, 1957). These same authors state (p.331) that for three humpback dolphins whose stomachs were not empty, all firmly indicated an icthyophage diet. Other prey species reported from Senegal are bongo fish *Ethmalosa fimbriata* and mullet *Mugil* spp. (Cadenat, 1956b; Maigret, 1980), both of which are abundant nearshore. One humpback dolphin among a pod of bottlenose dolphins was photographed while herding mullet against gillnets set by Imragen fishermen in Mauritania (Busnel, 1973).

The suggestion of a possible herbivore diet in Cameroon (Kükenthal, 1892) is the result of a misinterpretation of observations. Considering the plants mentioned were mangrove and the description of morphological traits of an examined carcass is attributable to a manatee and not a dolphin, we agree with Cadenat and Paraiso (1957) that the stomach contents of a West African manatee may have been confused for that of a dolphin. It is less likely that the plant remains were secondary from stomachs of ingested herbivore prey species or plants swallowed by accident as suggested by some authors (Mitchell, 1974; Leatherwood *et al.*, 1983).

Social organisation and behaviour

In Guinea-Bissau, based on raw data by Wolff (1998), group size ranged from 1-20 individuals with a mean of 6.50 (SD=6.09; n= 15). Information by Spaans (1990) from the same area shows a comparable mean of 4.39 individuals (SD= 4.19, n= 54, range 1-15, mode 2, median 2.5). These are significantly smaller ($p< 0.001$) than the group size observed in the Saloum delta (mean 22.9; SD= 9.33; n= 8; range 10-37); even allowing for a somewhat different interpretation of what constitutes 'a group', it doubtfully would explain all the variance. The number of preferential feeding areas seem limited in the Saloum delta (Djinack bolon, Bandiala and Sangomar Point) maybe leading to a high degree of site fidelity, whereas in Guinea-Bissau, home ranges may be wider and more good foraging localities may exist permitting small groups to scatter more widely. In Senegal, the species is restricted to the main, wide channels which directly connect to the sea and has not been seen in the narrower secondary or tertiary creeks (own observations; Maigret, 1980).

Atlantic humpback dolphins, while sharing much of the same habitat with inshore-type bottlenose dolphins, only rarely mingle with them. In Guinea-Bissau no mixed groups were noted by Spaans (1990). Only in one case, in November 1992, a group of ten *S. teuszii* was encountered swimming alongside five *T. truncatus* (Table 9). From the Saloum-Niumi stock, no mixed-group sightings are known. Off Mauritania, some humpback dolphins very occasionally join bottlenose dolphins when herding mullet against Imragen nets (Busnel, 1973).

In most surfacings only the back and dorsal fin are exposed; the head is rarely seen (personal observations; Maigret, 1980). Aerial display is not common and Spaans (1990) reported that almost all groups seen in Guinea-Bissau were quietly swimming and surfacing regularly. Maigret (1980) reported only two instances where animals swum fast at the surface and jumped completely above the surface, in a half-spinning way. Van Waerebeek described in field notes the same observed behaviour as a 'side-lunge'. Spaans (1990) never saw humpback dolphins bowride and in only four cases they jumped out of the water. On one occasion (20 Nov 1999), off Djinack Island, several individuals of a 30-strong group jumped clear off the surface (Table 4). The day before, some 12 large individuals had chased and porpoised alongside our dinghy at high speed (see narrative), however this was highly unusual, the typical reaction was active boat avoidance, quite the opposite of bottlenose dolphins.

LIFE HISTORY

Reproduction and growth

Little data on reproduction and growth are available partly because Atlantic humpback dolphins, just like *S. plumbea* (Barros and Cockcroft, 1991), rarely strand. Size and age at attainment of sexual maturity are unknown. Perrin and Reilly (1984; based on Allen, 1977, not seen) report 200cm (n =3) as average length of sexually mature males. Nothing is known about the females.

In the Saloum delta, births were thought to happen in March and April (Maigret, 1980). No neonates have been examined, but length at birth is presumably very similar to the 100cm cited for humpback dolphins from South Africa

(Ross, 1979). No growth and tooth GLG-based age determination studies have been carried out.

Mortality and predators

No predators are known for *S. teuszii*. In comparison, shark predation is important in humpback dolphins from Natal, South Africa, and Queensland, Australia, evidenced by abundant shark-induced scars and wounds (e.g. in 36% of *Sousa* in Moreton Bay), which happen to be useful in matrix photo-identification (Corkeron *et al.*, 1987; Cockcroft, 1991; Karczmarski and Cockcroft, 1998). In the Saloum Delta, we found humpback dolphins to be surprisingly free of scars, notches or other marks, suggesting low levels of predation and no harassment from boats. With one exception, we were unable to identify individuals based on dorsal fin pattern (Defran *et al.*, 1990); admittedly close encounters were few and the 210mm camera lens available proved inadequate for photo-ID of *S.teuszii* (300mm minimum is required).

No live-strandings of *S. teuszii* are reported, and generally strandings are rare. Shallow-water species like the Atlantic humpback dolphin are thought to be well-adapted to avoid, potentially lethal, strandings. All specimens of documented origin were derived either from confirmed catches or were beach-cast in circumstances where cause of death was likely fisheries related.

Parasites and Pathology

Nothing has been published on parasites, pathologies or congenital deformities in *S. teuszii*. In a sample of six skulls from Senegal, all were found negative when checked for characteristic osseous lesions, especially of the pterygoids, indicative of *Crassicauda* nematode infestation (e.g. Raga *et al.*, 1982).

MORPHOLOGY

Little has been published on individual, sexual and developmental morphological variation in *S. teuszii* as only a handful of specimens, and even fewer fresh ones, have become accessible for study (Table 8). No descriptions of soft tissues, organs nor histology are on hand. The largest specimens in a small sample (n= 8) measured 261cm (KVW-3018) and 235cm for males and females respectively. Highest recorded body mass is 166kg for an adult male that measured 248cm.

A characterization of individual variation in cranial measurements and tooth counts is presented in Tables 5 & 6, documenting 11 skulls from Saloum-Niumi and Banc d'Arguin stocks. Other cranial material examined by KVW was either too damaged or juvenile. It should be noted that, unlike in most other delphinids, the premaxillaries and maxillaries do not regularly fuse apically even in older specimens which exhibit fusion in other bones.

Jefferson and Van Waerebeek (in press) studied intraspecific variation in cranial morphometrics of *Sousa* spp. world-wide. A PCA multivariate (Principal Component) Analysis of craniometrics allowed good separation between *S. teuszii* and *S. plumbea*, supporting specific differentiation.

Morphological differences between Atlantic humpback dolphins and other *Sousa* spp. consist mainly of: 52-53 vertebrae in *S. teuszii* (Cadenat, 1956b, 1957) i.e. higher compared to *Sousa chinensis* (49-52, Ross *et al.*, 1994); significantly lower tooth counts (27-31 in this study), a shorter mandibular symphysis and a shorter, broader cranium in *S. teuszii* (Pilleri and Gihr, 1972; Ross, 2001; Jefferson and Van Waerebeek, in press). External measurements are available for only two individuals, a subadult and one juvenile from Senegal (Table 10).

Kasuya (1973), in a systematic study of toothed whales, described the morphology of the tympano-periotic bone in one specimen. The skull of *S. teuszii* can be distinguished from the very similar skull of the rough-toothed dolphin *Steno bredanensis*, also common in West-African seas, by the absence of a prominent cylindrical ridge on the ventrolateral aspect of the frontal bone and a higher tooth count (>26 per tooth row), but the identification of beach-worn specimens can be tricky (see Van Waerebeek *et al.*, 1999).

From recent observations in the Saloum delta, all dolphins, including large adults, were coloured light grey on the back and sides and whitish underneath; many showed spotting on the tailstock. The fresh Guinea specimen (Fig. 10) showed some flecks also below the anterior edge of the dorsal fin. Evans (1987) states that 'as with previous [*Sousa*] species, pale cream young darken as grow older', however this seems inferred and not supported by

observations. All animals, except for one larger calf (with standard colouration) accompanying an adult, had a pronounced mid-dorsal hump (see Fig. 9), like *S. plumbea* and very distinct from the essentially hump-less Chinese humpback dolphin *Sousa chinensis* (see Jefferson, 2000).

EXPLOITATION

Incidental takes

The majority of *S. teuszii* specimens archived in collections are derived from captured dolphins (Table 8). The only known specimen record from Morocco was a carcass found entangled in an octopus line in 1996. Imraguen fishermen of Mauritania were photographed in 1967 (Busnel, 1973) butchering an animal said 'stranded', however it was most probably a dolphin entangled in their net by accident. An adult killed in a gillnet at Ile Arguin in 1995 was also eaten by fishermen (Table 8). At least five individuals from Senegal have been derived from bycatches in shark gillnets in the period 1955-56, and another one in 1943 (Cadenat, 1947, 1956a,b, 1957; Cadenat and Paraiso, 1957).

On 22 November 1996, when two of the authors (KVW, END) and Pape Dione surveyed shores of uninhabited Sangomar Island, three carcasses were found within 25m of each other. Rope was very tightly knotted around the tailstock of two animals, suggesting fishermen had pulled the dolphins. The carcasses were abandoned on the island without being put to use, according to well-informed locals presumably for animist-religious reasons related to Sangomar Island (Van Waerebeek *et al.*, 1997).

The only two specimens on record from Guinea-Bissau and Guinea-Conakry had died from fisheries activities, respectively in a fishing trap in 1989 (Sequeira and Reiner, 1992), and net entanglement. The true extent of incidental mortality may be considerably higher than these few examples suggest, in view of a region-wide situation in which cetacean by-catches are not, or rarely, reported . The authors believe that fisheries by-catches are the most important threat to the populations' long-term survival and, unfortunately, also the hardest to address.

Directed takes

Where they are locally common there is potential for fishery for human consumption (Klinowska, 1991). Indeed, the species' range coincides with areas characterised socio-economically by poverty, fast human population growth and protein deficit.

Figure 10. A net-entangled Atlantic humpback dolphin landed in the Bay of Sangaréah, Mansabo, Guinea-Conakry, some day in March 2002, is examined before being butchered for its flesh (Photo: Dr. Idrissa Bamy).

Human consumption of dolphin meat, including of Atlantic humpback dolphin, confirmed from Mauritania, Senegal, The Gambia and Guinea-Conakry, is suspected to occur throughout its range. Socio-economic and conservation implications are similar to these of bushmeat, for in effect dolphin meat is but a marine variety of bushmeat. The Senegalese fishing communities of Joal and Fadiouth, and some others along the Petite Côte, have long been known to harpoon dolphins with regularity (Cadenat, 1947, 1956a,b; Van Waerebeek *et al.*, 1997) including Atlantic humpback dolphins from the Saloum-Niumi stock. The earliest reported include one animal harpooned at the mouth of the Bandiala in the summer of 1942 and another caught off M'Bour in the rainy season of 1943 (Cadenat, 1947). Nowadays the illegality of the practice encourages fishermen to hide any evidence of captures, which they do with great efficiency. Therefore no catch estimates exist. Butcher remains are either discarded at sea, used as bait or buried on the beach (Van Waerebeek *et al.*, 1997, 2000a). There are no indications that marine protected areas (e.g. Saloum National Park) have any significant positive impact on *S. teuszii*

populations because there is little effective enforcement on the water due to budgetary restraints.

A 191cm female was taken alive in a beach-seine near Joal, Senegal, in August 1955 but was not returned (Table 8); the animal presumably was killed and used as food. No other live-captures are known (Mitchell, 1974; this paper). Mörzer Bruyns (1971) mentioned, without adding details, that 'a living dolphin was recently obtained', perhaps referring to the Cadenat case. World-wide, few humpback dolphins have been kept in captivity (Ross *et al.*, 1994) and none were *S. teuszii*.

CONCLUSIONS

- Non-quantified, but presumably low to moderate, levels of cetacean by-catch, affecting several species of dolphins (bottlenose, Atlantic humpback, common dolphins) and harbour porpoises are confirmed from both The Gambia and Senegal. In addition unknown numbers are illegally killed, netted or harpooned, in both countries. Small cetacean meat is consumed locally and most probably still used as bait in shark longline fisheries. These insights add to results from earlier surveys (Van Waerebeek *et al.*, 2000a, 2001a). The surreptitious nature of the exploitation of small cetaceans continues to be highly obstructive to any attempts of monitoring and opportunistic scientific sampling of specimens.

- A first case of unauthorized live-capture of *T. truncatus*, aimed at supplying the captive industry, is documented in a National Park (Saloum) in Senegal. It serves as a warning for a formerly unrecognised threat to some aquatic mammal populations in the subregion.

- The Atlantic humpback dolphin has been documented to regularly cross the international border between Senegal and The Gambia and thus technically qualifies as a 'migratory species' under the CMS Convention. We anticipate other border crossings will be reported with increasing study effort.

- The distribution of *Sousa teuszii* along West African coasts, from Dahkla Bay (Western Sahara) southeast to southern Angola appears to be locally or partially discontinuous, suggested by markedly heterogeneous relative densities. A number of, presumably semi-isolated, communities are separated by apparent distribution 'gaps' of either absence or, at least, very low density. The degree of reproductive isolation among communities will benefit from future molecular genetic studies.

- Based on our findings we propose the preliminary recognition of eight management stocks of *Sousa teuszii*, each stock linked to a known core distribution locality in Atlantic Africa. Six stocks are of the 'confirmed-contemporary' type and are supported by recent sighting or specimen records: (i) Dahkla Bay, (ii) Banc d'Arguin, (iii) Saloum-Niumi, (iv) Gêba-Bijagos, (v) southern Guinea and (vi) Angola. An additional two stocks, for which no recent records are registered, are 'confirmed-historic' : (vii) Cameroon Estuary and (viii) Gabon. One hypothetical Togo management stock, (unconfirmed-contemporary) is currently under study. Additional, unnamed, stocks are thought to exist in the equatorial eastern Atlantic. No biological population status is presently claimed for any of these stocks.

- The southern distribution range limit for *S. teuszii* is now set at about 16°S, off southern Angola.

- The principal habitat of Atlantic humpback dolphins includes nearshore waters, the outer estuaries of large rivers, sea-arms and wide creeks and outer channels of river deltas, where seawater water predominates. Suggestions of occurrence upriver in freshwater environments, even occasional, remain unsupported. Bottlenose dolphins which penetrate high upriver may have been mistaken for humpback dolphins.

- The community of Atlantic humpback dolphins which regularly forage at the entrance of Djinack Creek (Saloum-Niumi stock) would be ideally suited for an in-depth study of the species' behavioural ecology. Access is relatively straightforward and potentially predictable due to apparent semi-residency.

- To date nine African countries are confirmed range states for *Sousa teuszii*: Morocco (Western Sahara), Mauritania, Senegal, The Gambia, Guinea-Bissau, Guinea-Conakry, Cameroon, Gabon and Angola. Anecdotal

fisher's indications point to occurrence off Togo, but scientific authentication is still required. The Democratic Republic of Congo, People's Republic of Congo, Equatorial Guinea and Nigeria also are likely range states.

- Region-wide evaluation of abundance is needed to establish whether some stocks of *S. teuszii* are threatened or even endangered. With scientific stock size estimates lacking, the aggregated body of circumstantial evidence suggests that each of the named stocks may consist of hundreds of individuals rather than thousands.

- The long-beaked common dolphin *Delphinus capensis* is a newly confirmed species for The Gambia. Also presented were the first authenticated records of *S. teuszii* for Angola, and the first specimen record for Guinea.

Figure 11. A calf of an ordinary Bryde's whale *Balaenoptera brydei* live-stranded at Ngazobil, just north of Joal, Senegal, on 4 May 2000. Cause of death is unknown. Here the skull was re-assembled (Photo: KVW).

- A new awareness about the need of effective conservation of aquatic mammals seems to be taking hold in Senegal and The Gambia, without yet acquiring a mainstream character. COREWAM is playing a crucial role.

- Understandably, marine mammalogy continues to be viewed by most West Africans as largely irrelevant to the many pressing socio-economic needs of African peoples. Nonetheless, ecotourism in the form of dolphin watching and photo-safaris is thought of as promising and could become an important foreign-currency earner in the future. A good knowledge of cetaceans and their distributions will be essential. While local biology students may soon consider marine mammalogy a feasible career choice, a process which consolidated in South America during the 1980s, it is currently still viewed as a temporal, project-dependent occupation.

- The principal challenges for the new NGO COREWAM include maintaining the present momentum, attract follow-up projects, increase sources of reliable information on fisheries interactions, stimulate region-wide cooperation and broaden bases of public interest.

- Although Marine Protected Areas (MPA) may help maintain relatively healthy fish stocks, very few fishermen recognize them as intangible areas, and will happily operate inside. Law enforcement in MPAs is generally so weak that the net positive effect on small cetacean populations is most likely negligible.

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Appendix 1

Delphinidae SKULL MEASUREMENTS AND MERISTICS (version 1.2)
WAFCET PROJECTS (CMS/UNEP) - CEPEC

Species:		Catalogus no:	
Sex: SL:		Collection:	
Locality:		Researcher/date:	
Details:			
Condylobasal length		Orbit length	
Rostrum length		Antorbital process length	
Rostrum width at base		Length upper tooth row	
Rostrum width at 6cm		length lower tooth row	
Rostrum width at 1/4 length		Ramus length	
Rostrum width at 1/2 length		Ramus height	
Rostrum width at 3/4 length		UL number alveoli	
Premx width at 1/2 length		UR number alveoli	
Tip rostrum to ext. nares		LL number alveoli	
Tip rostrum to int. nares		LR number alveoli	
Preorbital width		Tooth width (max.transv)	
Postorbital width		Bulla length	
Zygomatic width		Bulla width	
Parietal width		Periotic length	
Greatest width prmx		Height braincase	
External nares width		Length braincase	
Internal nares width		Height crest	
Maximum width palatines		Max. width nasals	
Width palatines pteryg. apex		Span occip. condyli	
Temporal fossa length		Alveolus diameter	
Temporal fossa width			

Cranial maturity:	*Degree of fusion (0-1-2)*
Physical maturity:	premax.-maxillary :
Sexual maturity:	mandibular symphysis :
	pterygoid-basioccipital :
	frontale-occipitale:
Pathology	zygomatic :
Crassicauda lesions:	pterygoid-palatine:
Exostosis:	lacrimale:
Other data:	Palatines: lanceolate / pseudo / trapezoid Temp.fossa : winged / non-winged Pterygoid : keeled / rounded / intermediate

Appendix 2

STATUTS D'ASSOCIATION
COREWAM

TITRE PREMIER : OBJET ET COMPOSITION

Article premier :
Il est créé, à Dakar conformément aux dispositions du code des Obligations Civiles et Commerciales, une association dénommée **Conservation and Research of West African Aquatic Mammals (COREWAM)**. La durée de l'association est illimitée et son siège installé à Dakar, 276 Cité ISRA Thiaroye Azur, Km 16 Boulevard du Centenaire de la Commune de Dakar. Ce siège peut être transféré en tout lieu au Sénégal par décision de l'Assemblée Générale (AG) sur proposition du Comité Directeur.

Article 2 :
L'association a pour but :

- de mener des études scientifiques sur les mammifères aquatiques ;
- de promouvoir la conservation et la préservation des mammifères aquatiques ;
- de participer à l'éducation environnementale dans le domaine aquatique.

Article 3 :
L'association est ouverte à tous, dans le respect des convictions individuelles, dans l'indépendance à l'égard des partis politiques.

Article 4 :
Peuvent être membres actifs de l'association, après vote unanime du Comité Directeur, toutes les personnes qui acceptent de se conformer aux présents statuts et ayant des connaissances en biologie marine et montrant un intérêt spécifique pour les mammifères aquatiques.

Article 5 :
La qualité de membre se perd :

- par décès,
- par démission dûment notifiée par écrit,
- par radiation prononcée par le conseil, pour non-paiement de la cotisation ou pour motif grave (membre intéressé ayant été préalablement appelé à fournir des explications).

TITRE II : ADMINISTRATION ET FONCTIONNEMENT

Article 6 :
L'association est administrée par un Comité Directeur élu en AG des membres actifs pour une durée de 3 ans renouvelable au tiers chaque année. Les membres sortants du Comité Directeur sont rééligibles et doivent être âgés d'au moins 21 ans. Les procurations écrites sont recevables. Le Comité Directeur se réunit une fois par trimestre. Il est tenu un procès verbal de réunion. Les PV sont signés par le Président et le Secrétaire Général.

Article 7 :
Le Comité Directeur élit en son sein un Bureau qui peut être composé comme suit :

- un Président
- un Vice Président
- un Secrétaire Général
- un Trésorier Général
- un Conseiller Scientifique

Article 8 :
Le Bureau est élu pour un an, ses membres sont rééligibles. En cas de vacances, il est pourvu provisoirement au remplacement du membre démissionnaire ou décédé par un des membres du Bureau. Le remplacement définitif a lieu à la plus proche AG. Les fonctions de membre du Bureau sont gratuites.
Le Bureau se réunit au moins une fois par mois sur convocation de son Président. Il sera obligatoirement réuni si un tiers (1/3) au moins de ses membres en fait la demande par écrit au Président. Il est tenu un procès verbal de réunion. Les PV sont signés par le Président et le Secrétaire Général.
Les membres associés participent à toutes les activités (excursions, conférences, etc), reçoivent toutes informations relatives à l'association mais n'assistent pas aux délibérations du Comité Directeur.
Article 9 :
L'AG comprend tous les membres actifs de l'Association. Elle se réunit en session ordinaire, une fois par an, sur convocation du Comité Directeur, et en session extraordinaire chaque fois que les 2/3 des membres actifs en expriment le désir. Son ordre du jour est fixé par le Comité Directeur. L'AG délibère sur les rapports relatifs à la gestion et sur la situation financière de l'Association. Elle approuve les comptes de l'exercice clos, vote le budget de direction. Elle peut désigner une Commission Générale de Contrôle composée de trois membres chargés de procéder à la vérification des comptes de l'exercice clos. Ce sont les Commissaires aux comptes.
Les délibérations sont prises à la majorité de voix des membres actifs présents à l'AG, chaque membre étant inscrit à une voix. Le vote par procuration écrite est recevable. Pour la validation des délibérations, la présence du 1/3 des membres actifs est nécessaire. Si le quorum n'est pas atteint, une deuxième assemblée est convoquée dans un intervalle de quinze (15) jours au moins, laquelle délibère valablement quel que soit le nombre des membres. En cas de partage égal, la voix du Président est prépondérante.
Article 10 :
Le Président dirige les réunions du Comité Directeur et de l'AG. Il assure l'exécution des dispositions des statuts de l'Association et ordonne toutes les dépenses autorisées par le Comité Directeur. En cas d'urgence, le Président peut autoriser les dépenses mais il doit en référer immédiatement au Comité Directeur.
Le Vice Président occupe les fonctions de Président en cas d'empêchement de ce dernier.
Le Secrétaire Général coordonne et contrôle les activités. Il présente un rapport à l'AG. Il est chargé de l'application des décisions du Comité Directeur et de l'AG.
Le Conseiller Scientifique donne des orientations dans les délibérations à caractère scientifique et technique.
Le Trésorier Général est chargé de tout ce qui concerne la comptabilité et les finances de l'Association. Il règle les dépenses ordonnées par le Président. Les comptes sont tenus par le Trésorier selon les règles de la comptabilité. Les fonds de l'Association doivent être placés dans un compte avec une double signature du Président et du Trésorier.

TITRE III : LES RESSOURCES

Article 11 :
Les ressources de l'Association proviennent :
- produit de la vente des cartes de membre
- produit des cotisations
- des libéralités des membres.

TITRE IV : MODIFICATION DES STATUTS

Article 12 :
Les statuts ne peuvent être modifiés que sur proposition du Comité Directeur ou des deux tiers (2/3) des membres qui composent l'AG. Le texte de modification doit être communiqué aux membres de l'AG, au moins quinze (15) jours avant la date de la réunion. L'AG ne délibère valablement qu'en présence des deux tiers (2/3) des membres. Si ce quorum n'est pas atteint, une deuxième assemblée sera convoquée dans un délai de quinze jours. La convocation reproduit l'ordre du jour en indiquant la date et le compte rendu de la première réunion. Dans tous les cas, les statuts ne peuvent être modifiés qu'à la majorité des trois quarts (3/4) des membres présents.

TITRE V : DISSOLUTION

Article 13 :
Les présents statuts ne peuvent être modifiés que par l'AG à la majorité des trois quarts (3/4) des membres présents.
Article 14 :
La dissolution est prononcée suite à une AG extraordinaire expressément convoquée à cet effet et réunissant au moins les trois quarts (3/4) de ses membres. La décision est prise à la majorité absolue des votants. Si le quorum n'est pas atteint au cours de la première réunion, l'AG extraordinaire est à nouveau convoquée dans un délai d'un mois et ses décisions exécutoires quel que soit le nombre de présents.
Article 15 :
Les délibérations de l'AG prévues aux articles 12 et 13 et 14 portant modification des statuts et dissolution, sont immédiatement adressées au Ministre de l'Intérieur en trois exemplaires.
Article 16 :
Les modifications survenues dans l'administration de l'Association et celles qui seraient apportées aux statuts, seront dans un délai de trois mois, portées à la connaissance du Ministre de l'Intérieur s/c du Ministre de tutelle.
Les modifications survenues sont consignées sur le registre des délibérations qui devra être présenté aux autorités administratives ou judiciaires chaque fois que celles-ci le demandent.
Article 17 :
En cas de dissolution, le reliquat de l'actif sera dévolu à une association de même nature.
Article 18 :
Les dispositions des présents statuts soumises aux formalités de déclaration, de publication et complétées par un règlement intérieur conformément à la loi, ont été adoptées par AG réunie le 19 novembre 1997.

Appendix 3

Briefing on Data Collection Methods in Whale and Dolphin Field Research

28 September 2000
Department of Fisheries, Marina Parade,
Banjul, The Gambia

PROGRAMME

I. Opening of the meeting.

II. Brief overview of the Order *Cetacea* as aquatic mammals.

III. Dolphins and Whales from The Gambia and other West African waters: how to recognize them, their distribution and biological notes.

- Presentation of slides: views of free-ranging animals, by-caught and stranded specimens.
- Questions and discussion.

[B R E A K]

IV. Standard Protocol for Postmortem Examination

1. Collection and storage of samples
2. Sampling Equipment
3. Gross postmortem examination
4. Sightings forms

- Presentation of slides: examples from the field (South America)
- Questions and discussion.

[B R E A K]

V. Criteria for the diagnosis of fisheries kills of cetaceans

1. Types of fisheries kills
2. Estimating fisheries kills
3. Observer coverage
4. How to identify a by-catch

- Questions and discussion.

VI. Presentation of video.

VII. Round-table discussion towards set-up of an Action Plan for continued cetacean research and conservation activities in The Gambia.

VIII. Closure of the meeting.