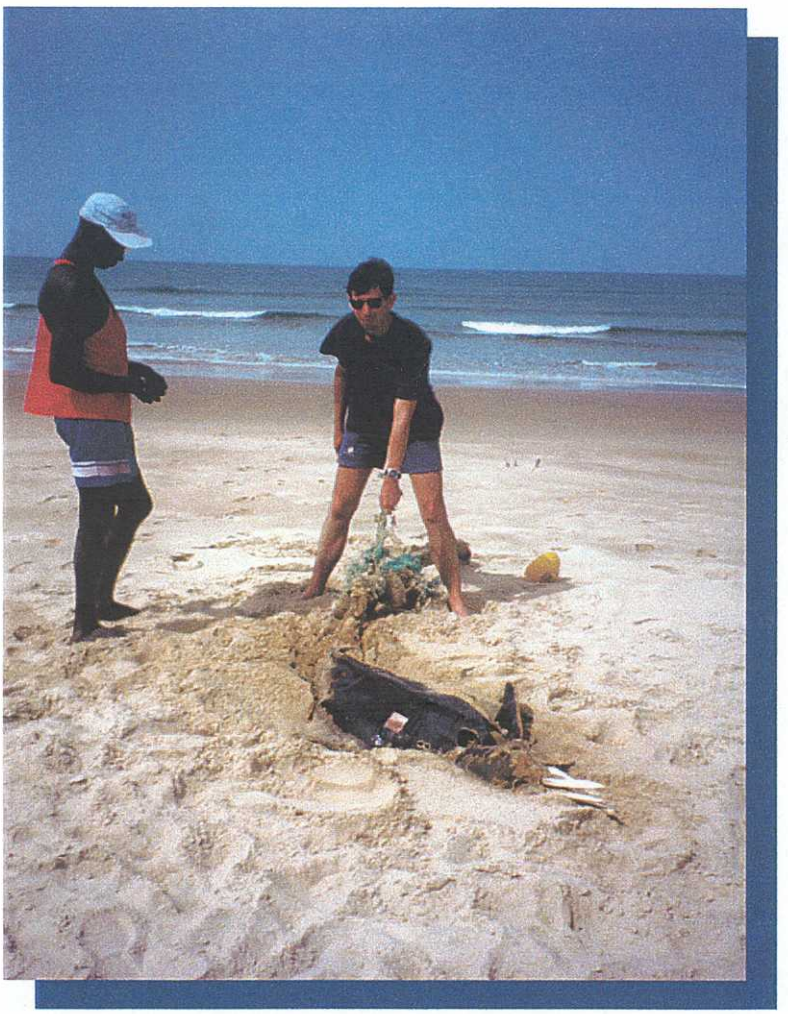
A Survey of the Conservation Status of Cetaceans in Senegal, the Gambia and Guinea-Bissau

WAFCET - I Report



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A SURVEY OF THE CONSERVATION STATUS OF CETACEANS IN SENEGAL, THE GAMBIA AND GUINEA-BISSAU

Final Report WAFCET I Project

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SUMMARY

A survey of the status of cetaceans in Senegal, The Gambia and Guinea-Bissau (Project WAFCET I) was undertaken in 1997-98 sponsored by UNEP/CMS to start a projected long-term international effort to stimulate broad regional involvement in research and conservation of West African cetaceans. Partners included, in Senegal, the Institut Fondamental d'Afrique Noire, Université Cheikh Anta Diop (IFAN-CAD) and the Centre de Recherches Océanographiques de Dakar-Thiaroye (CRODT); in The Gambia, the Department of Parks and Wildlife Management (DPWM); and in Guinea-Bissau the Centro de Investigaçao Pesquero (CIPA) and IUCN-Bissau office; however field activities in Guinea-Bissau were abandonned due to the 1998 war.

The status, distribution and biological characteristics of 24 species of dolphins and whales confirmed to occur in the study area were reviewed. The authors collected new biological voucher material, such as skeletal specimens, soft tissues, samples for genetic studies and photographic evidence of several dozens of individuals of 11 cetacean species. Included are the first recognized specimens of minke whale (*Balaenoptera acutorostrata)* and sei whale (*Balaenoptera borealis)* for Senegal, the first records of Clymene dolphin (*Stenella clymene)* and short-finned pilot whale (*Globicephala macrorhynchus)* for The Gambia and the first Fraser's dolphin (*Lagenodelphis hosei)* for mainland West Africa. Both long-beaked common dolphins (*Delphinus capensis)* and short-beaked common dolphins (*Delphinus delphis)* were shown to occur off Senegal, their intraspecific variability is under study.

A total of 269 historical specimens, most of them skulls, were registered in a comprehensive review and rehabilitation of the IFAN cetacean collection curated at IFAN-CAD (73 specimens) and the Musée de la Mer on Gorée Island (196 specimens): *Balaenoptera acutorostrata* (3), *Balaenoptera borealis* (1), *Balaenoptera* sp. (2), *Delphinus capensis* (83), *Delphinus* cf. *capensis* (17), *Delphinus delphis* (11), *Delphinus* cf. *delphis* (7), *Delphinus* sp. (43), *Globicephala macrorhynchus* (10), *Orcinus orca* (3), *Phocoena phocoena* (10), *Physeter macrocephalus* (2), *Tursiops truncatus* (34), *Sousa teuszii* (15), *Stenella* sp. (4), *Steno bredanensis* (14), *Ziphius cavirostris* (1), and material of unidentified cetaceans (7).

Although no cetacean catch rates could be estimated, both empirical and circumstantial evidence was gathered for dolphin by-catches and direct takes in Senegal and The Gambia. Low to moderate mortality levels in fisheries seem to occur in most of the study area, except Guinea-Bissau for which there is no information. While there were no indications of substantial directed takes, these could occur covertly. Most fishermen are acutely aware of the legal protection of dolphins. Detection avoidance strategies include the hiding of fresh carcasses, burial on the beach or offshore dumping of butchered remains. Cetacean meat is a local commercial commodity and is consumed covertly in several places. Confirmed catches include Atlantic hump-backed dolphin (*Sousa teuszii)*, bottlenose dolphin (*Tursiops truncates)* and a short-finned pilot whale.

Circumstantial evidence from small boat surveys, stranded remains and fisheries monitoring, suggests that the Atlantic hump-backed dolphin has become fairly rare off Senegal and The Gambia. Only in Guinea-Bissau were hump-backed dolphins sighted with any regularity during boat sorties. Also, its range was found to be considerably more limited than previously assumed and does not seem to include true riverine habitat. Where occurring in outer estuaries, these had predominantly marine characteristics. All verifiable dolphin sightings and catches upstream of the estuary of the Gambia and Casamance rivers were identified as *T. truncatus.*

Artisanal fishing effort has dramatically increased over the past decade both in the number of fishermen and the number of boats, and by-catches in artisanal fisheries continue to affect several species, especially bottlenose dolphins living near-shore and Atlantic hump-backed dolphins. Catches, in conjunction with expanding coastal development, may be fracturing the hump-backed dolphin's range. Reproductive isolation would be a serious threat to the species' long-term survival. The Saloum delta (including Siné, Saloum, Diombos and Bandiala), part of which constitutes Senegal's Parc National du Saloum, the adjacent waters of The Gambia's Niumi National Park and the outer estuary of the Gambia river constitute a major refuge area for Atlantic hump-backed dolphins and deserve the highest possible protection. If further work confirms the precarious status of the species, an Appendix I listing on the CMS Convention will be necessary.

Dedicated commercial dolphin-watching is firmly established only on the Gambia River; in Senegal's Saloum delta it is practised only incidentally. Although no current problems were noted, for an efficient regulation we recommend that a licensing system and an official code of conduct for tour operators be adopted, as well as an enforcement scheme. It is recommended also that The Gambia government would proceed with the ratification of the CMS Convention at its earliest convenience, as to ensure maximum protection for aquatic mammals and other wildlife in the region. The Tanji Bird Reserve with Bijol Islands and associated inshore waters, as well as the Kiang West National Park on the south bank of the Gambia River, are conservation areas which protect confirmed cetacean habitat.

In November 1997 'Conservation and Research of West African Aquatic Mammals' (COREWAM) was launched, the first NGO of its kind in sub-Saharan West Africa. Principal aims are to stimulate local involvement at grass-roots level in:

(1) the implementation of scientific research of cetaceans and manatees;
(2) promotion of the conservation of aquatic mammals in the West African region;
(3) organization of aquatic environmental education. The scope is long-term and regional via wide membership throughout West Africa.

RESUMÉ

Une vue générale de la situation des cétacés au Sénégal, en Gambie, et en Guinée-Bissau (Projet WAFCET I) a été entreprise en 1997-98 sous l'égide de la PNUE/CMS comme un début d'un effort international à long terme pour réveiller les consciences au niveau de la sous région dans la recherche et la conservation des cétacés en Afrique de l'Ouest. Les organisations gouvernementales et non-gouvernementales mentionnées ci-dessous font partie de ce project: au Sénégal: l'Institut Fondamental d'Afrique Noire, l'Université Cheick Anta DIOP (IFAN-UCAD), en Gambie: Department of Parks and Wildlife Management (DPWM), en Guinée-Bissau: le Centre d'Investigation de la Pêche (CIPA) et le bureau d'UICN à Bissau. Cependant les activités de terrain en Guinée-Bissau furent gênées par la guerre de 1998.

La situation, la distribution et les caractéristiques biologiques de 24 espèces de dauphins et baleines confirmées jusqu'à présent sont revues dans cette étude de terrain. Les auteurs ont collecté du matériel biologique tel que des squelettes, des tissus, des échantillons pour des études génétiques et des photos mettant en évidence des douzaines d'individus de 11 espèces de cétacés. A inclure dans ce cadre les premières reconnaissances du Petit Rorqual, *Balaenoptera acutorostrata* et du Rorqual de Rudolphi, *B. borealis* pour le Sénégal; les premiers enregistrements du Dauphin de Clymene, *Stenella clymene* et le Globicéphale tropical, *Globicephala macrorhynchus* pour la Gambie et le premier Dauphin de Fraser, *Lagenodelphis hosei* pour la sous region continentale de l'Afrique de l'Ouest. Le Dauphin commun à long bec, *Delphinus capensis* et le Dauphin commun à court bec, *D. delphis* présentent au Sénégal une variabilité intaspécifique qui est sous étude.

Un total de 269 spécimens historiques, la plupart avec leurs squelettes, est répertorié dans un registre. Avec la réhabilitation et le nettoiement de la collection des cétacés de l'IFAN-UCAD (73 spécimens) et du Musée de la mer de Gorée (196 spécimens) nous avons recensé: *B. acutorostrata* (3), *B. borealis* (1), *Balaenoptera sp.* (2), *D. capensis* (83), *D. cf. capensis* (17), *D. delphis* (11), *D. cf. delphis* (7), *Delphinus sp.* (43), *G. macrorhynchus* (10), *Orcinus orca* (3), *Phocoena phocoena* (10), *Physeter macrocephalus* (2), *Tursiops truncatus* (34), *Sousa teuszii* (15), *Stenella sp.* (4), *Steno bredanensis* (14), *Ziphius cavirostris* (1) et du matériel de cétacés non identifié (9).

Quoique le taux de prises des cétacés ne puisse être déterminé, des preuves même indirectes sont rassemblées pour des captures et des saisies directes de dauphins au Sénégal et en Gambie. Une mortalité baisse ou modérée semble se dessiner dans la plupart des zones étudiées, exceptée la Guinée-Bissau par manque d'informations. Pendant qu'il n'y a ni indication sur des saisies considérables, celles-ci peuvent se présenter secrètement. La plupart des pêcheurs sont actuellement conscients de la protection légale des dauphins. Les astuces d'éviter les découvertes sont les cachettes des carcasses fraîches et les enfouissements sur la plage des restes d'abats. La chair de cétacés est un produit commercialisé et consommé localement et secrètement sur plusieurs places. Les captures confirmées concernent le Dauphin à bosse de l'Atlantique, *Sousa teuszii*, le Grand dauphin, *T. truncatus* et le Globicéphale tropical.

Les informations indirectes issues des petits bateaux inspectés restent en rade et le contrôle des pêches estiment que le Dauphin à bosse de l'Atlantique est devenu relativement rare au Sénégal et en Gambie. C'est seulement en Guinée-Bissau que ces dauphins ont été aperçus avec quelques régularités durant les sorties de pirogues. Aussi cette espèce paraît considérablement limitée et semble ne pas inclure le vrai habitat riverain. Sa présence est surtout notée à l'extérieur des estuaires, montrant des

prises ou des observations de dauphin en amont dans l'estuaire des fleuves Gambie et Casamance ont été identifiées comme *T. truncatus*.

Les efforts de la pêche artisanale se sont dramatiquement intensifiés par rapport à la dernière décennie aussi bien sur le nombre de pêcheurs que sur le nombre de bateaux ; et les saisies de cette pêche continuent d'affecter plusieurs espèces, spécialement le Grand dauphin *T. truncatus*, et le Dauphin à bosse de l'Atlantique *S. teuszii* vivant près du littoral. Les captures, en conjonction avec l'expansion du développement côtier peuvent causer la disparition du Dauphin à bosse de l'Atlantique. L'isolement reproductif serait une sérieuse menace pour la survie à long terme de cette espèce. Le delta du Sine–Saloum (incluant le Sine, le Saloum, le Diomboss et le Bandiala) dont les parties du Parc National du Saloum, les eaux adjascentes du Parc National du Niumi en Gambie et à l'extérieur de l'estuaire du fleuve Gambie constituent une importante zone de refuge pour le Dauphin à bosse de l'Atlantique et méritent une grande protection autant que possible. Si le travail promu confirme la précarité de la situation de ces espèces et populations, une révision de leur place dans les Appendices de la convention de la CMS sera nécessaire.

Une activité commerciale d'observation de dauphins est sérieusement implantée en Gambie, ce qui n'est pas le cas au Sénégal où ce phénomène est seulement accidentel. Quoiqu'on n'ait pas noté de problème actuel, pour une régulation efficiente, nous recommandons qu'un système de licence et un code officiel de conduite pour les organisateurs de randonnées soient adoptés au mieux comme un schéma de renforcement. Il a été aussi recommandé au Gouvernement Gambien de procéder à la ratification de la Convention de la CMS dans le but d'assurer le maximum de protection des mammifères aquatiques et de la faune de la région. La Réserve d'Oiseaux de Tanji avec les Iles Bijol et ses eaux peu profondes environnantes, et le Kiang West National Parc au sud du fleuve Gambie sont des zones de conservation qui protègent l'habitat des cétacés.

En Novembre 1997, la COREWAM (Conservation et Recherche des Mammifères Aquatiques Ouest Africains) a été lancée, comme la première ONG de ce genre en Afrique Subsaharienne. Les principaux buts visés sont de stimuler l'implantation des locaux à la base pour :

(1) la mise en œuvre de recherches scientifiques sur les cétacés et les lamantins;
(2) la promotion de la conservation des mammifères aquatiques en Afrique de l'Ouest;
(3) l'organisation pour une éducation de l'environnement aquatique.

L'envergure est de long terme et à l'échelle régionale par le biais d'une large adhésion à travers l'Afrique de l'Ouest.

INTRODUCTION

A comprehensive assessment of the conservation status of whales and dolphins of the eastern tropical Atlantic (ETA) off West Africa (WAF) has not been undertaken to date. This is in contrast with comparable tropical regions, such as the eastern tropical Pacific (ETP) (see Smith, 1979; Wade and Gerrodette, 1993; Gerrodette and Palacios, 1996) which have received considerable attention.

Unidentified threats conceivably could have evolved for decades and have caused declines in cetacean populations. The lack of information is partly the result of the absence of local marine mammal specialists and the lack of research resources and infrastructure in the West African states bordering the ETA.

Cetaceans as quintessential migratory mammals represent a global natural heritage and the community of states shares the responsibility for undertaking co-operative action for their conservation. The Bonn Convention on the Conservation of Migratory Species of Wild Animals (CMS), aims at conserving terrestrial, marine and avian migratory species throughout their range. The UNEP/CMS Secretariat in Bonn is charged with assisting and co-ordinating such conservation activities as well as promoting the conclusion of Agreements for migratory species between Range States (CMS, 1997). Population assessment and management of ETA cetaceans, which are long overdue, will require major concerted research efforts by many parties and need to sustained over an extended period of time. The long-term goal of a new initiative called 'West African Cetacean Research and Conservation projects (WAFCET), is to implement a series of projects to significantly increase information and awareness on these species. It also allows West African scientists and wildlife managers to acquire the necessary expertise to assume the primary responsibility for the conservation of cetaceans in their waters. The present UNEP/CMS sponsored project, a 'Preliminary Survey of the Status of Cetaceans in Senegal, The Gambia and Guinea-Bissau' (WAFCET-1) constitutes therefore an auspicious starting point.

Field studies conducted primarily by French scientists since the late 1940s have provided baseline data on cetaceans in Senegal, Mauritania and Côte d'Ivoire. Biologists including Cadenat, Duguy, Dupuy, Fraser, Maigret, van Bree, and more recently Robineau and Vely (summarized in Jefferson *et al.*, 1997) made significant strides in documenting the general distribution of aquatic mammals in these countries. Unfortunately, a truly local tradition in marine mammal research somehow failed to take root. The depressed socio-economic situation affecting most of the region provided a far from ideal setting.

During WAFCET-1 (study area shown in Figs. 1-3) the design of field activities emphasized their exploratory, whence flexible, character. Short-term data collecting efficiency was often sacrificed in favour of the establishment of a cetacean research programme viable for the long-term. The role of the principal investigator (KVW) was that of a co-ordinator, instructor and scientist. WAFCET-1 aimed to create a climate in which research institutions, ministries and individuals would become closely involved in the conservation of aquatic mammals as an integral part of wildlife management.

In 1994 KVW first contacted interested parties in Senegal and The Gambia and in 1995-97 conducted, in collaboration with several of the present authors, two brief feasibility surveys, supported by the King Leopold III Fund for Nature Exploration and Conservation. Preliminary results, presented in September 1997 at the 49th Annual Meeting of the Scientific Committee of the

International Whaling Commission, in Bournemouth, UK (Murphy *et al.*, 1997; Van Waerebeek *et al.* 1997a,b; Van Waerebeek, 1997) led the British NGO Marine Education and Research (MER) and UNEP/CMS to agree on a scheme to implement a project proposal named WAFCET-1. The project focused on three countries, Guinea-Bissau, Senegal and The Gambia (subsequently referred to as GST) and had the following aims:

a) Gain knowledge about cetaceans and their status in West Africa to allow for better management and conservation measures. New data are to be pooled with existing information, re-analysed and published. West African biologists are encouraged to become involved in all stages of the process.

b) Conduct field research and train local biologists in field techniques and interpretation. Improved technical expertise can contribute greatly to the development of effective national policies on marine mammal management and protection.

c) Set up informal or registered cetacean working groups in each of the three GST countries, develop a locally adapted data sampling strategy suitable for the long-term, exchange information and expertise, and create local awareness of the need to improve the conservation of dolphins and whales. The perspective is to establish a future regional agreement on the conservation of cetaceans in the ETA, equivalent to CMS/UNEP's ASCOBANS and ACCOBAMS.

Projects nos. 25 and 39 of the 1994-1998 IUCN/SSC Action Plan for the Conservation of Cetaceans also call for research on the impact of fisheries on coastal cetaceans, especially Atlantic hump-backed dolphins, in West Africa (Reeves and Leatherwood, 1994). The present research covers such intent.

GENERAL METHODOLOGY

1. PORT MONITORING FOR CETACEAN LANDINGS

Emulating a field protocol successfully employed along the Pacific coasts of South America (see e.g. Van Waerebeek *et al.*, 1988; Van Waerebeek and Reyes, 1994) the authors intermittently monitored selected fishing ports and fish landing sites in Senegal and The Gambia over the period October 1997-June 1998, to test whether such effort could yield useful estimates of dolphin by-catches and intentional takes. No monitoring could be initiated in Guinea-Bissau due to the war.

Briefly, one or more observers mingled with the crowds in artisanal fishing ports and visually followed the landing process, vigilant for any sign of cetacean carcasses, meat or other products. Notes were made on numbers and types of boats, as well as fishing methods. While keeping a low profile, either most of the day was spent at the site or, as soon as a daily rhythm was recognized, the time span when fishermen habitually unload catches. Many *ad hoc* port interviews with fishermen, fishmongers and other locals, allowed for crosschecking of individual claims and provided useful information but no rigorous estimates of catch numbers (Northridge, 1996). The best strategy consisted in having local biologists interacting in the local languages. Interviews by KVW often (but not always) elicited responses which were more evasive.

2. BEACH SURVEYS

Remains of cetaceans, beach-cast after fisheries kills and from natural deaths, constitute an important source of information (e.g. Cadenat, 1949; Kuiken, 1994) therefore regular beach surveys were organized. Typically, two observers walked parallel along the shoreline; one scanned the shore at and above the high tide line, the

other below. Although slow and often physically demanding, exploring beaches on foot results in optimum coverage. Smaller bones like vertebrae, chevrons, occipital bones, and partially buried remains (see further) are likely to be overlooked by motorized surveys, which moreover require a costly all-terrain vehicle.

Beach survey effort in hours walked or estimated distance covered is summarized by country. Some shores were walked repeatedly if they yielded more material than others, either due to currents, nearness of fishing ports or some other factor. One well-known area of strandings is the northern shoreline of Cap Vert Peninsula (Maigret, 1979, 1994b; see Fig. 2). The (minimum) number of individuals was tallied based on the number of skulls and partial skulls found. Loose mandibles and postcranial bones were accounted for the neurocrania, unless discrepancies were evident.

On Senegal's Petite Côte (Fig. 1), unprocessed skeletal specimens were temporarily deposited in a rented hut in Djiffer (also spelled Djiffère) for easy access and for local educational purposes. Specimens from the Cap Vert Peninsula (Fig. 2) were kept in Dakar. No new material was deposited at the Institut Fondamental d'Afrique Noire while the historical collection was being rehabilitated (see item 4), but curated privately. Material found in The Gambia (Fig. 1) was conserved at the Department of Parks and Wildlife Management (DPWM) premises at Abuko National Park, near Serrekunda. An unidentified balaenopterid whale from Guinea-Bissau (see Fig. 3) is in the care of the IUCN-Bissau office (Tous *et al.*, 1997).

3. POPULATION IDENTIFICATION

Geographic variation and systematics of lower-level taxa (subspecies, population) have not been investigated in West African cetaceans, except for two studies of morphological variation in harbour porpoises (Fraser, 1958; Smeenk *et al.*, 1992) and a craniometric comparison between bottlenose dolphins from Europe and West Africa (Robineau and Vely, 1997). Unfortunately, many historical specimens of IFAN and other voucher data were lost or misplaced, which diminishes their value for population identification studies. We re-initiated the collection of new skeletal material, especially skulls. Standardized cranial measurements and meristics were taken (see Perrin, 1975) but statistical analysis is postponed until significant samples become available.

Collection of soft tissues for molecular genetic studies of cetaceans was introduced in West Africa for the first time. Sampling was limited to stranded and by-caught individuals but plans are to biopsy free-ranging dolphins in the future. As an experiment, some fragments of dried muscle and connective tissue were taken from a few historical specimens in the hope of extracting sufficiently large strands of DNA to compare with fresh samples. Dr. M. Milinkovitch of the Laboratory for Evolutionary Genetics, Free University of Brussels (ULB), provided polyethylene vials prefilled with 20% dimethyl sulfoxide (DMSO) saline solution for unrefrigerated storage of tissues. The vials were distributed to teams in the GST countries. Specimens were double-sampled following a standardized protocol to avoid DNA cross-contamination: (1) a master sample for in-country deposit in reference collection; (2) a subsample to be analysed at ULB or another appropriate laboratory.

4. REGIONAL DATABASE OF CETACEAN RECORDS

Valuable data on cetacean distribution, exploitation and general biology have been gathered in Senegal since the late 1940s. Much of this information is spread around local journals, often published in French, and therefore relatively inaccessable to many scientists. A recent faunistic review for West Africa (Jefferson *et al.*, 1997) is helpful as an introductory tool, but there is need for a comprehensive database containing all published and new cetacean records. A

first part, completed during WAFCET-1, consisted of reviewing and entering all cetacean specimens curated at IFAN-UCAD (Université Cheikh Anta Diop) and IFAN-Musée de la Mer in a single database. Geographic positions of localities mentioned in this report were taken from gazetteers published by the US Defense Mapping Agency (Anonymous, 1968a,b, 1990). Main study sites are illustrated in Figs 1-3.

5. EXCHANGE VISITS OF SCIENTISTS

Cooperation between WAF marine mammal scientists and students was promoted through exchange visits and joint activities. Alpha Jallow (AJ) of The Gambia Department of Parks and Wildlife Management travelled with KVW to Bissau and established personal contacts with fisheries authorities of Guinea-Bissau for the first time. Abdoulaye Djiba (AD) and Edouard Ndiaye (END) joined KVW on various study visits to The Gambia. Biologist Abdellahi Ould Samba Ould (Parc National du Banc d'Arguin, Mauritania) joined on a field sortie in northern Senegal. All long-distance transport was by public transport, except one round trip Banjul-Bissau which was made in an official vehicle from The Gambia.

ANNOTATED SPECIES CHECKLIST

Twenty-four species of cetaceans are confirmed to occur in EEZ waters (Exclusive Economic Zone) of Guinea-Bissau, Senegal and The Gambia. In this section we present new data on the occurrence, biology and status for each species in GST, as well as review and summarize published information pertaining to the WAF region. A standard format of twelve entries (first authenticated records, distribution, stock identity, status, abundance, migrations or local movements, incidental takes, directed catches, other threats, ecology and life history, curated specimens, new records and comments) is followed in order to facilitate comparison between species.

The status accounts follow the current listing by CMS (1997) and the IUCN listing (according to Jefferson *et al.*, 1993). A few species which have been reported from GST countries, but whose occurrence remains unconfirmed, are briefly discussed at the end under a single entry. Records are considered authenticated only when either a convincing morphological description exists or when voucher material (specimen, photos) could be re-examined by the senior author.

It is suspected that a wealth of useful data gathered opportunistically by a variety of field workers remains inaccessible in hand-written notes, unpublished reports and the like. Our emphasis on the many gaps in the species accounts, it is hoped, will encourage colleagues to bring forward such information, as well as unregistered specimens, for study.

ZIPHIIDAE - BEAKED WHALES

Cuvier's beaked whale, Baleine à bec de Cuvier (*Ziphius cavirostris,* Cuvier, 1823)

First authenticated records: Senegal - The calvaria of an adult male (recognizable by its prenarial basin) present in the IFAN-CAD collection was unregistered and had no accompanying data. We assigned it number "SN3". No other cases of Cuvier's beaked whale are known from GST states.

Distribution: Cosmopolitan, in offshore waters. Stranded specimens are reported from Morocco (Aloncle, 1967) and Mauritania (Robineau and Vely, 1998). *Z. cavirostris* strands with some regularity in the Canary Islands (Montero and Martin, 1992; Martin *et al.*, 1992). Haase (1987) sighted a group of five individuals just south of the Cape Verde Islands.

Stock identity: Subspecies or population structure in *Z. cavirostris* has not been investigated anywhere.

Status: Not listed (CMS); insufficiently known (IUCN).

Abundance: No data.

Migrations or local movements: No information available.

Incidental takes: None recorded in the study area, but Cuvier's beaked whales are known by-catch victims elsewhere (Reeves and Leatherwood, 1994).

Directed catches: None recorded.

Other threats: Unknown. Any large-scale squid exploitation should be evaluated for a potential indirect effect through prey competition.

Ecology and life history: No information available for WAF region. *Z. cavirostris* feeds predominantly on cephalopods.

Curated specimens: Calvaria SN3 at IFAN is the only known specimen from GST.

New records and comments: Senegal is a newly recognized range state for *Z. cavirostris*.

Gervais' beaked whale, Baleine à bec de Gervais (*Mesoplodoneuropaeus,* Gervais, 1855)

First authenticated records: Reiner (1980) described the calvaria of a Gervais' beaked whale found at an unspecified location in Guinea-Bissau in 1979. To date the species is unknown in The Gambia and Senegal.

Distribution: One stranding is reported from the Grande Plage, Mauritania (Robineau and Vely, 1998) and several from the Canary Islands (Vonk and Martin, 1988). *M. europaeus* may occur in oceanic waters off most of West Africa considering that the southernmost known stranding is from Ascension Island (07°57'S, 14°22'W) in the tropical central South Atlantic (Mead, 1989).

Stock identity: Nothing is known of the composition of *Mesoplodon* populations (Mead, 1989).

Status: Listed on Appendix II (CMS); insufficiently known (IUCN).

Abundance: No information. Scarce records may reflect inconspicuous behaviour and deep-water habitat rather than low abundance.

Migrations or local movements: No information.

Incidental takes: None recorded. If captured, fisheries caused mortality probably insignificant.

Directed catches: None recorded (see Mead, 1989) and probably nil.

Other threats: Unknown. Large-scale, industrial fisheries for squid could result in competition for prey.

Ecology and life history: *M. europaeus* is a pelagic, deep-diving cetacean, feeding mostly on squid.

Curated specimens: No study specimens are present in WAF collections. The Guinea-Bissau specimen (Reiner, 1980) is deposited in the *Museu do Mar* at Cascais, Portugal (catalogue number M-167-79).

New records and comments: None encountered.

PHOCOENIDAE - PORPOISES

Harbour porpoise, Marsouin commun (*Phocoena phocoena,* Linnaeus, 1758)

First authenticated records: Senegal - A female and male porpoise were taken in nets in June 1949 off Hann, Cap Vert Peninsula (Cadenat, 1949). Porpoises are unknown from The Gambia and Guinea-Bissau.

Distribution: Reported from southern Morocco south to the Cap Vert Peninsula, Senegal (Bayed and Beaubrun, 1987; Smeenk *et al.*, 1992; Robineau and Vely, 1998), and as far south as the environs of Ile de Fadiouth (14°09'N, 16°49'W), Petite

Côte. Off West Africa the harbour porpoise, a small odontocete adapted to cold temperate waters, appears closely associated with the cool Canary Current. It is probably absent south of the Casamance River where the warm Guinea Current predominates.

Stock identity: Fraser (1958) found no significant differences between porpoises from Senegal and those from Britain, but Smeenk *et al.* (1992) pointed out that porpoises from West Africa on average are larger than those from European waters. As yet no definitive answer can be given on population identity.

Status: WAF not listed (CMS); insufficiently known (IUCN).

Abundance: No data. However reports are rare and far-between, suggesting that the species is not abundant off northern Senegal. Indications are that, locally at least, harbour porpoises are fairly common off Mauritania (Smeenk *et al.*, 1992; Robineau and Vely, 1998).

Migrations or local movements: None documented, but it is reasonable to assume that harbour porpoises move from and to Mauritanian and Senegalese waters.

Incidental takes: Harbour porpoises are rarely reported taken in nets in Senegal (Cadenat, 1949). One animal captured in an unspecified net by fishermen of Fadiouth in January 1999 (Fig. 4) is the only documented catch in recent years.

Directed catches: None recorded. It is unlikely that harbour porpoises could be harpooned (unless netted first), since they are hard to approach.

Other threats: Coastal development and pollution could threaten this inshore dwelling species.

Ecology and life history: Occupies continental shelf (neritic habitat); offshore range unknown but probably limited.

Curated specimens: Skulls from Senegal (n =7) and Mauritania (n =3) are curated in the IFAN collection (Table 1). Robineau and Vely (1998) reported 51 cranial specimens from Mauritania. The skull of the Fadiouth specimen, collected by one of us (END), is in the COREWAM collection (No. 99-43).

New records and comments: The harbour porpoise (No. 99-43) captured by Fadiouth fishermen was utilized for food. None were encountered during preparatory work in 1995-97 (Van Waerebeek *et al.*, 1997b), but field effort in northern Senegal was limited. Fishermen referred to "ngoungueck" (porpoise) for one small dolphin sighting at Mbodiène (14°15'N, 16°52'W), Petite Côte, but claims of species identity by fishermen are difficult to verify.

DELPHINIDAE - OCEANIC DOLPHINS

Atlantic hump-backed dolphin, Dauphin à bosse de l'Atlantique (*Sousa teuszii*, Kükenthal, 1892)

First authenticated records: Senegal - Cadenat (1947) reported on two captured specimens, one from M'Bour (14°24'N, 16°58'W) and a second from the Bandiala (13°38'N,16°36'W). The Gambia - Maigret (1980a) noted the species' presence in the Gambia River without supporting evidence. We earlier documented sighting and first specimen records from The Gambia (Murphy *et al.*, 1997). Many sightings were reported from Guinea-Bissau by Spaans (1990); while Sequeira and Reiner (1992) described a specimen.

Distribution: In coastal waters, discontinuously from Dakhla Bay, Rio de Oro (Beaubrun, 1990) southeast to Douala, Cameroon (Kükenthal, 1892), but its true distribution is insufficiently documented. Van Beneden (1892) reported a 'river dolphin' from Nigeria which may have been *S. teuszii*, as indicated by Pilleri and Gihr (1972). According to Jefferson *et al.* (1993) they are found primarily in estuarine and coastal waters, while some hump-backed dolphins inhabit rivers, such as the Niger,

'but it is not known if there are separate freshwater populations'. If the Casamance and Gambian rivers are any indication (this paper), dolphins found up-river above the estuary may mostly, if not exclusively, be *T. truncatus*. So far, *S. teuszii* has not been encountered in Ghana (Van Waerebeek and Ofori-Danson, 1999).

Stock identity: Scientists debate whether *S. teuszii* is a valid species or a subspecies of the Indo-Pacific *Sousa chinensis* (Osbeck, 1765), however no convincing case has been presented in favour of synonymy. Collection of tissue samples to quantify genetic variability between population centres of *S. teuszii*, as well as with congenerics, should be accorded high priority. A significant sample of skulls is also required.

Status: Appendix II (CMS); insufficiently known (IUCN).

Abundance: Maigret (1980a) estimated the population in the Saloum delta at no more than 100 individuals. The PNBA (Parc National de la Langue de Barbarie) population in northern Senegal is possibly somewhat stronger, yet is also considered small (Maigret, 1980; Robineau and Vely, 1998). In the Rio Grande de Buba (11°32'N, 15°25'W), a fjord-like sea arm rather than a river, a community of at least 20 Atlantic hump-backed dolphins are known to reside (Tous, 1997), also upstream to the confluence of the Rio Sahol (11°39'N, 15°10'W). Effort and observations (both at low and high tide) were concentrated on the confluence of the rivers Buba, Fulacunda and Empada (Table 6; Krömer *et al.*, 1994). Most dolphins were *S. teuszii*, up to 12 individuals per group (typically 2-4) when hunting, but also some mixed schools with *T. truncatus* were reported. Whether both species indeed form mixed schools or simply occur close to each other is unclear.

Migrations or local movements: There is a potential exchange of individuals between known population or subpopulation distribution centres (from north to south): Dakhla bay (Beaubrun, 1990), Banc d'Arguin, Langue de Barbarie, Sine-Saloum delta, NW bank of the Gambia River outer estuary (Murphy *et al.*, 1997; this paper) and Guinea-Bissau archipelago.

Incidental takes: Hump-backed dolphins are commonly by-caught. At least since the 1940s fishermen from the Petite Côte have taken them in nets (particularly shark nets), mostly in or near the Saloum delta (Cadenat, 1947, 1949; Cadenat and Paraiso, 1957; Maigret, 1980a). The most recent interaction in Senegal was recorded in November 1996 when three animals were found together, each with a piece of netting tied around the tailstock on a beach of Sangomar Island (Fig. 5) in the Saloum delta, probably an abandoned take (Van Waerebeek *et al.*, 1997b). In Guinea-Bissau, a 190cm male was by caught in a fishing trap at Canhabaque Island, Bijagós in March 1989 (Sequeira and Reiner, 1992).

Directed catches: Occasional intentional captures are probable.

Other threats: The possible fracturing of the species' habitat range, resulting in reproductively isolated groups, due to coastal development should be monitored.

Ecology and life history: One individual from Canhabaque (11°15'N,15°35'W) had remains from three fish species in its stomach: *Lutjanus goreensis*, *Lethrinus atlanticus* and *Chaetodipterus lippei* (Sequeira and Reiner, 1992).

Curated specimens: Seven skulls and calvariae are kept at IFAN-Gorée (Table 1); one Gambian specimen is in the DPWM collection (Table 4).

New records and comments: One skull was found on a beach at Solifor Point (13°20'N,16°49'W), The Gambia.

Bottlenose dolphin, Grand Dauphin ou Dauphin Souffleur *(Tursiops truncatus,* Montagu, 1821)

First authenticated records: Senegal -

Cadenat (1947) reported frequent freshly caught bottlenose dolphins, as well as their skulls in fishermen's huts from the Petite Côte. The Gambia - Four specimens were captured off Gunjur (13°11'N,16°46'W) in 1951; skeletons are in the US National Museum of Natural History, Washington DC (J.G. Mead, *in litt.* to KVW). Spaans (1990) first documented sightings of *T. truncatus* in neritic waters of Guinea-Bissau.

Distribution: Widely distributed in the study area, both coastal and riverine. Inhabits the Casamance River, especially around Ile de Carabane (Fig. 6), and is found in the Gambia River as high as Mansa Konko (AJ, pers.observation), in most of the Saloum delta as well as around the Arquipelago dos Bijagos (Spaans, 1990). The Casamance and Gambia rivers communities appear to be at least semi-resident.

Stock identity: A preliminary study suggests bottlenose dolphins from Senegal/ Mauritania have a longer rostrum and a narrower neurocranium than a small sample from the Dutch North Sea, which suggests different stocks (Robineau and Vely, 1997). Senegal *T. truncatus* possess large, wide teeth, typical for inshore stocks (Van Waerebeek *et al.*, 1990). All individuals seen in the Gambia River had a very dark colouration, reportedly a reliable field characteristic to distinguish *T. truncatus* from the light-grey coloured *S. teuszii.*

Status: West African population not listed (CMS); insufficiently known (IUCN). Takes in fisheries, evidenced by remains found near fishing villages and oral accounts, are a serious cause of concern.

Abundance: Cadenat (1949) stated that 'it is the most common species in Senegal, at least it is the most frequently observed'. Although no abundance estimates are available, new sighting and specimen records during WAFCET-1 confirm that *T. truncatus* is the most common cetacean in Gambian waters. Skipper Mr. Mervyn Baldwin (pers. comm.) guiding dolphin-watching trips estimates the presence of some five identifiable groups occupying the Gambia River estuary, totalling at least 120 animals. Baldwin believes he can recognize several dolphins individually by their scars and behaviour.

Migrations or local movements: In the lower Gambia River, influenced by a strong tidal effect, upstream/ downstream movements seem synchronized with the tide, but bottlenose dolphins are present year-round. In the hypersaline Saloum delta, during the rainy season (July-September) when salinity drops and shrimps are abundant, *T. truncatus* is sighted as far inland as the salt creeks near Foundiougne (Van Waerebeek *et al.*, 1997b). Locals described dolphins forming herds to trap fish against mudbanks, behaviour known from bottlenose dolphins in creeks of Georgia, NW Atlantic (Hoese, 1971). Maigret (1980) however reports *Sousa teuszii* from Foundiougne (14°08'N, 16°28'W) and it needs to be clarified whether both or one dolphin species occur there. The seasonality of dolphin occurrence in the Saloum delta is the opposite of that in the upper Gambia River where bottlenose dolphins penetrate farther upstream in the dry season, apparently in pursuit of marine fish species.

Incidental takes: By-catches in shark and seine nets occur with some frequency in Senegal and The Gambia, at least since the 1940s (Cadenat, 1947, 1959; Cadenat *et al.*, 1959). Such catches continue today (cf. country accounts).

Directed catches: Cadenat (1947) implied that many of the catches were intentional. Dolphin meat clearly is appreciated in some villages in Senegal and The Gambia. Four specimens were live-captured off Gunjur, The Gambia, in 1951. Interviews during this study suggested that entangled dolphins, even if alive, are not released, so *T. truncatus* must be considered a target species. There is no good data for Guinea-Bissau.

Other threats: Commercial dolphin-

watching on the Gambia River is low-intensity and conducted mostly responsibly whence is no cause for immediate concern. The leading company has been setting a worthy example with high standards of conduct. However, legal measures should anticipate an inevitable increase in the number of dolphin-watching platforms and a concomitant higher potential for harassment.

Ecology and life history: In the Gambia River, mean group size was 12.1 (SD= 9.13, range 2-40, n=52). It ranged from 1-25 (n=13) in the coastal area of Guinea-Bissau where bottlenose dolphins concentrated in turbid waters in the Canal do Gêba (Spaans, 1990).

Curated specimens: The IFAN collection houses 34 *T. truncatus* specimens, mostly skulls (Table 1). Five cranial specimens are at DPWM, Abuko (Table 4).

New records and comments: The many sightings in the Gambia River, both at Kiang West National Park, where they enter Jali Bolon for a distance of ca.2km (PFM, pers. observation) and in the estuary (Table 5), demonstrate that *T. truncatus* is fairly common. Small groups are also seen in coastal waters, for instance off Bijilo Island, The Gambia (Fig. 7). A resident or semi-resident community, probably a few dozen animals, inhabits the lower Casamance River (Fig. 6; Van Waerebeek *et al.*, 1997b).

Long-snouted common dolphin, Dauphin commun (*Delphinus capensis,* Gray, 1828) and **Short-snouted common dolphin, Dauphin commun** (*Delphinus delphis,* Linnaeus, 1758)

First authenticated records: Senegal - Cadenat (1947) mentioned abundant skulls with some 50 teeth per tooth row found near settlements which Cadenat (1949) referred to *Delphinus delphis*. Cadenat (1959a) discussed the natural history of common dolphins from WAF, especially from Senegal. Surprisingly, so far no common dolphins are reported from Gambian or Guinea-Bissau waters.

Distribution: Common dolphins are widely distributed from Madeira to the Cape Province, South Africa. Van Waerebeek (1997) concluded, based on identifiable skulls, that *D. delphis* and *D. capensis* occur sympatrically along the Atlantic coasts of central Africa, at least from Mayoumba (03°25'S), southern Gabon, to Porto Amboim (10°44'S), Angola, and also that both species occur off Senegal. This is confirmed by further examinations of *Delphinus* skulls (see below).

Stock identity: Heyning and Perrin (1994) re-described *D. capensis* Gray, 1828 from California and recognized long-beaked and short-beaked common dolphins as separate species. Evidence from the Southeast Pacific (Peru) supports this distinction (Van Waerebeek *et al.*, 1994; CEPEC, unpublished data). The stock structure from WAF *Delphinus* is under study.

Status: WAF populations not listed (CMS); insufficiently known (IUCN).

Abundance: Common dolphins were 'very abundant' off Senegal, if by-catches and strandings are any indication (Cadenat, 1959a). Their present status is unknown.

Migrations or local movements: Common dolphins have been observed throughout the year off Senegal except for March and April (Cadenat, 1959a) but otherwise no information is available. *D. capensis* off Peru and northern Chile is largely confined to the upwelling-modified habitat of the cold coastal Peru Current (CEPEC, unpublished data); similarly, we hypothesize that its occurrence off Senegal and Mauritania may be associated with the Canary Current. Future data should test this.

Incidental takes: Frequently captured on the Senegal coast, some in seine nets set for clupeids (Cadenat, 1959a).

Directed catches: Common dolphins were harpooned by Sérères and Niominkas of the Petite Côte and Siné-Saloum delta

(Cadenat, 1947). One example is of some 50 common dolphins captured in the Baie de Hann (14°43'N,17°25'W) near Dakar, in the summer of 1945 (Cadenat, 1949). No recent directed takes have come to our attention, but could easily happen unreported.

Other threats: None reported.

Ecology and life history: Aspects of growth, feeding, reproduction and morphology were discussed by Cadenat (1959a).

Curated specimens: Skulls of *Delphinus* spp. make up 60% of specimens in the IFAN collection.

New records and comments: Several new beach-cast specimens were added to the COREWAM collection (Table 5).

Rough-toothed dolphin, Dauphin à dents rugeuses, Sténo (*Steno bredanensis,* Lesson, 1828)

First authenticated records: A mass stranding occurred at Cambérène (14°46'N,17°26'W) and Yoff (14°45'N, 17°28'W), northern shore of the Cap Vert Peninsula, on 29 May 1948 (Cadenat, 1949). *S. bredanensis* has not been reported from The Gambia or Guinea-Bissau.

Distribution: Ranges in oceanic waters in the tropics and subtropics. Off WAF, *S. bredanensis* is confirmed from Mauritania (Duguy, 1976) and Ghana (Van Waerebeek and Ofori-Danson, 1999; unpublished data).

Stock identity: No subspecies or stocks have been defined, worldwide.

Status: Unlisted (CMS); insufficiently known (IUCN).

Abundance: No information.

Migrations or local movements: No information.

Incidental takes: None recorded.

Directed catches: None recorded.

Other threats: At species level, no immediate conservation problems are reported (Reeves and Leatherwood, 1994).

Ecology and life history: Rough-toothed dolphin has mass-stranded on the Cap Vert Peninsula. Of 28 animals 25 were male; the three females were pregnant, with foetuses 60-87cm long (Cadenat, 1949), suggesting reproductive seasonality and sexual segregation.

Curated specimens: Of the eight skulls at IFAN (Table 1), four derive from the Cambérène stranding event. Photos of freshly stranded rough-toothed dolphins are published in Cadenat (1949, 1956).

New records and comments: No recent records are identified. *S. bredanensis* skulls are similar in general morphology to these of *Sousa* spp. and can easily be confused. Fewer and wider alveoli (larger teeth) and a straight cylindrical ridge on either side of the ventral aspect of the frontale in *S. bredanensis* (see Van Waerebeek *et al.*, 1999) permit correct identification.

Fraser's dolphin, Dauphin de Fraser (*Lagenodelphis hosei,* Fraser, 1956)

First authenticated records: Senegal - The carcass of an adult Fraser's dolphin (KVW-3032) was collected on the southern tip of Sangomar island (13°50'N,16°46'W), Saloum delta (Fig. 1), on 17 November 1997. This is the only record of *Lagenodelphis hosei* known from the West African mainland.

Distribution: Fraser's dolphins live in tropical and subtropical oceanic waters in the world oceans. Several sightings and specimens have recently been reported from the Canary Islands (Vonk and Martin, 1990; Michel André, personal communication).

Stock identity: No biological stocks have been defined for this species.

Status: Unlisted (CMS); Insufficiently known (IUCN).

Abundance: Unknown. It may be more abundant offshore than stranding data suggest.

Migrations or local movements: No information.

Incidental takes: Specimen KVW-3032 (Fig. 8) possibly was a net entanglement victim. Offshore purse-seine fisheries may cause some mortality.

Directed catches: No information available.

Other threats: None identified. Coastal development is unlikely to be a direct problem.

Ecology and life history: No information available.

Curated specimens: The skull (Fig. 8) and partial postcranial skeleton of KVW-3032 are deposited in the COREWAM collection; other parts were accidentally destroyed in the fire that ravaged Djiffer.

New records and comments: See above.

Pygmy killer whale, Orque pigmée (*Feresa attenuata,* Gray, 1875)

First authenticated records: A pygmy killer whale of unknown sex was captured off Yenn (14°38'N, 17°11'W), Senegal, in April 1958 (Cadenat, 1958). Fraser (1960) described its skeletal morphology in detail. No records are known for The Gambia or for Guinea-Bissau.

Distribution: Worldwide in tropical and subtropical waters. Since the Yenn animal no other specimens have been found in Senegal. Martín *et al.* (1992) reported the species for the Canary Islands.

Stock identity: No subspecies or stock structure is recognized.

Status: Unlisted (CMS); unknown (IUCN).

Abundance: No data, but this species is not common anywhere in the world.

Migrations or local movements: No data. The 1958 record likely is linked to the spring incursion of warm water (Guinea Current) off the Cap Vert Peninsula.

Incidental takes: The Yenn pygmy killer was 'captured' by unknown means (Cadenat, 1958); it may have been a by-catch or a directed take.

Directed catches: No definite cases are known.

Other threats: None have been identified. Degradation of coastal zones is unlikely to affect this species.

Ecology and life history: *F. attenuata* is a pelagic delphinid. No specific information is available for the study area.

Curated specimens: None available in WAF collections. The Yenn specimen was sent on loan to F.C. Fraser at the BM(NH) in London for a comparative study (Fraser, 1960) and apparently was not returned.

New records and comments: None encountered.

Melon-headed whale, Péponocéphale (*Peponocephala electra,* Gray, 1846)

First authenticated records: Senegal - A skull was retrieved at Niodor (13°52'N, 16°44'W), Saloum delta in 1966 (van Bree and Cadenat, 1968). Guinea Bissau - A skull was found stranded in dos Bijagós Archipelago at about 11°N (Duguy and van Bree, 1977). Not yet reported from The Gambia.

Distribution: P. electra is further confirmed from Mauritania (Robineau and Vely, 1998), the Cape Verde Islands (Reiner *et al.*, 1996) and the central equatorial Atlantic (Goodwin, 1945); it probably occurs throughout the region in tropical and subtropical oceanic waters. It has so far not shown up in dolphin catch records from Ghana (Van Waerebeek and Ofori-Danson, 1999; unpublished data).

Stock identity: No biological stocks have been identified worldwide.

Status: Unlisted (CMS); insufficiently known (IUCN).

Abundance: No regional information available, however it is nowhere abundant.

Migrations or local movements: No information. Far offshore movements are expected.

Incidental takes: The Niodor skull was found on a refuse heap near the fishing village (van Bree and Cadenat, 1968). Presumably the dolphin had been captured and was used for food. Due to its pelagic habitat, frequent interactions with artisanal fisheries are unlikely.

Directed catches: None confirmed, but see incidental takes.

Other threats: Unknown. Degradation of coastal habitat may not have any direct detrimental effect, but overfishing might.

Ecology and life history: A pelagic species but no regional-specific information nor fresh specimens are available.

Curated specimens: No specimens present in GST collections. The Niodor skull is not at IFAN and is almost certainly still in the Zoologisch Museum Amsterdam (ZMA).

New records and comments: None encountered.

Risso's dolphin, Dauphin de Risso (*Grampus griseus,* Cuvier, 1812)

First authenticated records: Guinea-Bissau - Six Risso's dolphins were sighted from a yacht off Ihla das Galinhas Island (11°28'N,15°41'W) on 13 January 1998 by Mr. Gordon D'Arcy, an experienced naturalist (pers. comm. to P.F. Murphy). No Risso's dolphin specimens have so far been encountered in GST countries.

Distribution: A widely distributed species in tropical to warm-temperate seas. Geographically nearest specimen record is from south of Nouakchott, Mauritania (Duguy, 1976; Robineau and Vely, 1998).

Stock identity: Population structure in the world oceans has not yet been investigated.

Status: WAF population(s) unlisted (CMS); insufficiently known (IUCN).

Abundance: No information available.

Migrations or local movements: No data. Risso's dolphins typically inhabit offshore waters, but occasionally approach the coast and become entangled in gillnets, as is the case off Ghana (Van Waerebeek, Ofori-Danson and Debrah, unpubl. data).

Incidental takes: None recorded.

Directed catches: None recorded.

Other threats: Unknown. A known predator of squid, any major squid fishery could compete with *G. griseus*.

Ecology and life history: No information pertaining to the study region.

Curated specimens: None available in GST countries.

New records and comments: A first credible sighting record from Guinea-Bissau (see above).

Short-finned pilot whale, Globicéphale tropicale (*Globicephala macrorhynchus,* Gray, 1846)

First authenticated records: Senegal - On 20 May 1943, a group of 151 individuals including all ages and both sexes stranded themselves en masse on a beach at Yoff (Cadenat, 1947). The Gambia - A carcass washed ashore near Saniang Point (13°16N,16°49W) in early January 1998 (this paper); the skeleton and other material (Table 4) were retrieved for the DPWM collection. Guinea-Bissau - A group of 3-4 animals was sighted off Cabo Roxo (12°18'N,16°43'W) by Gordon d'Arcy, an experienced naturalist, on 9 January 1998 (this paper; pers. comm. to P.F. Murphy).

Distribution: Generally found in deep offshore habitat and near volcanic islands with a steep shelf-break, but occasionally may appear closer to shore.

Stock identity: Has not been investigated. The affinity of short-finned pilot whales in GST with the population residing off the Canary Islands needs to be established. Long-finned pilot whale *Globicephala melas,* a cold-water species, has not been found south of Mauritania (Nores and Pérez, 1988; this paper).

Status: Not listed (CMS); insufficiently known (IUCN).

Abundance: No information for GST. Fairly abundant off the Canary Islands (Heimlich-Boran and Heimlich-Boran, 1990; Martin *et al.*, 1992).

Migrations or local movements: No data.

Incidental takes: None documented, but in other regions juvenile pilot whales in particular are prone to entanglement in drift gillnets.

Directed catches: The Saniang Point pilot whale showed a large wound on the head and one on the flank, possibly inflicted by lance or harpoon strikes. An adult male (KVW-3027) hauled onshore in the harbour of Dakar on 11 October 1997 was also wounded and its flukes had been severed (Fig. 9).

Other threats: None identified. Unregulated growth in recreational whale-watching off the Canary Islands led to serious harassment of the resident population of short-finned pilot whales. In 1995, the Canary Islands Autonomous Government installed strict regulations (Montero *et al.*, 1997).

Ecology and life history: In one group (Senegal), females were pregnant with foetuses of between 54-145cm long, suggesting the absence of a narrow reproductive season (Cadenat, 1947). Fraser (1950) published a photo of an 51cm foetus. The community inhabiting the waters off Tenerife, Canary Islands, is the only one in the region whose behavioural ecology has been studied (see Heimlich-Boran and Heimlich-Boran, 1990; Martin *et al.*, 1992).

Curated specimens: Six skulls, from northern and central Senegal, are at IFAN (Table 1); one skeleton is at DPWM. Fraser (1950) studied cranial morphology of *G. macrorhynchus* from Senegal in some detail, based on specimens curated at the BM(NH).

New records and comments: From photos (COREWAM), the relative length of the right flipper in KVW-3027 is estimated at 16-17% of standard length (more than 5m), which identifies it as a short-finned pilot whale. This male showed a squarish head (Fig. 9) as in the southern form from Japan (Kasuya *et al.*, 1988). The Gambian specimen was positively identified from the skull: the premaxillaries widen towards the distal tip and fully cover the maxillaries in the anterior rostrum half (van Bree, 1971).

Killer whale, Orque épaulard (*Orcinus orca,* Linnaeus, 1758)

First authenticated records: Senegal - A 398cm female was taken near Hann (14°43'N,17°26'W); the larger accompanying male escaped (Cadenat, 1947, 1949). Killer whales have not been encountered in The Gambia and Guinea-Bissau, most likely because of limited survey effort.

Distribution: Widely distributed in WAF waters (reviewed by Hammond and Lockyer, 1988; Maigret, 1990) as in all world oceans. A killer whale has been reported twice in the Senegal River (J. Maigret, *in* Hammond and Lockyer, 1988), presumably in the estuary.

Stock identity: Not determined, but by default identifiable with eastern North Atlantic population.

Status: Eastern North Atlantic and North Pacific populations on Appendix II (CMS); insufficiently known (IUCN).

Abundance: No density estimates, however judging from sightings and strandings (Maigret, 1990) it is not a rare species in Senegal.

Migrations or local movements: Cadenat (1959a) reports observations in March from Guinea, in May off Dakar and in October off Kayar (14°55'N,17°07'W). His conclusion that killer whales are absent in the summer, however, is premature; data are insufficient to demonstrate seasonality or migrations.

Incidental takes: None reported.

Directed catches: A juvenile female was captured in a seine net off Hann, Senegal, in February 1942 and a second one near Cambérène in May 1948 (Cadenat, 1949). Another animal was harpooned off Dakar (Dupuy, 1974). The purpose of these captures is unclear, unless for food.

Other threats: No information available.

Ecology and life history: No information specific for WAF region.

Curated specimens: Two skulls, with minimal voucher data, almost certainly identifiable with records described above, are at IFAN (Table 1). None are present in other GST collections.

New records and comments: No new records during this study.

Atlantic spotted dolphin, Dauphin tacheté de l'Atlantique (*Stenella frontalis,* Cuvier, 1829)

First authenticated records: Senegal - Adult skull as species holotype (no. A-3035) at the Paris Muséum National d'Histoire Naturelle and mounted skin (no.25 of the Catalogue de la Galérie de Zoologie) originated from the Cape Vert Peninsula, Senegal (Cuvier, 1829) [not Cape Verde Islands; Perrin *et al.*, 1987].

Distribution: Tropical, subtropical and warm temperate Atlantic (Perrin *et al.*, 1987). Specimens of Atlantic spotted dolphin are well documented from Equatorial Guinea (Fraser, 1950) and Côte D'Ivoire (Cadenat and Lassarat, 1959).

Stock identity: No populations or subspecies have been formally recognized but significant geographic variation exists in spotting, size and craniometrics (Perrin *et al.*, 1987).

Status: Not listed (CMS); insufficiently known (IUCN).

Abundance: No data available, but the only record suggests either that it is not abundant, or that it has an offshore distribution.

Migrations or local movements: No data.

Incidental takes: Not recorded, but may fall victim to purse-seine nets. At time of 1995 sighting (see below) an aggregation of 19 large fishing vessels (estim. >300MT), mostly purse-seiners and some trawlers were counted operating in the area. It should be questioned what levels of dolphin by-catches these cause.

Directed catches: None recorded.

Other threats: No information.

Ecology and life history: No data.

Curated specimens: See above.

New records and comments: A group of four, including one neonate, took over the M/V *Joola* at great speed and rode the bow for several minutes northwest of the Casamance river mouth on 17 September 1995 (KVW, personal observations). Beak tips were prominently white (very unlike *Tursiops*) and no spotting was noted but at 18:21h sunlight was low. A tripartite pattern with dark dorsal cape, grey upper flanks and a white belly further indicated *S. frontalis*.

Striped dolphin, Dauphin bleu et blanc (*Stenella coeruleoalba,* Meyen, 1833)

First authenticated records: Senegal - In 1882, a skull from an unspecified site in Senegal was added to the collections of the Muséum National d'Histoire Naturelle, Paris, as "MNHN 1882-303, don Barrot à Gervais" (Daniel Robineau, 22 August 2000, *in litt.* to KVW). This specimen is also mentioned by Wilson *et al.* (1987). Cadenat (1949) examined (unpublished) photos of a dolphin harpooned north of the Cap Vert Peninsula at 15°00'N, 017°00'W in October 1942 and assigned it to *Prodelphinus euphrosyne* (synonym of *Stenella coeruleoalba*). This dolphin bore 42 teeth in the right mandible. Marchessaux (1980) reported on an offshore specimen from north of the Cape Verde Islands, also from October 1942, but referred to another location 18°00'N, 024°00'W. It is unclear whether the same dates are merely coincidental, equivocal (one of them) or even may concern a single individual.

Distribution: Cosmopolitan in temperate, offshore waters. Dupuy (1983) reported *Stenella euphrosine* (Gray, 1846) from large groups off the Casamance but failed to add specific sighting information.

Stock identity: MtDNA differentiation suggests NE Atlantic striped dolphins form a separate population from the Mediterranean population (García-Martínez *et al.*, 1999).

Status: WAF populations not listed on Appendix II (CMS); insufficiently known (IUCN).

Abundance: No data available, but lack of further specimen records is in agreement with the species' pelagic occurrence.

Migrations or local movements: No data.

Incidental takes: Not recorded, but may fall victim to purse-seine sets for tuna.

Directed catches: None recorded. Its pelagic distribution enables it to avoid artisanal fisheries, but there may be a conflict with offshore large-scale fisheries.

Other threats: No information.

Ecology and life history: No data specific for this area.

Curated specimens: See first authenticated records. None present in WAF collections.

New records and comments: Species not encountered during the present project period.

Pantropical spinner dolphin, Dauphin longirostre *(Stenella longirostris,* Gray, 1828*)*

First authenticated records: Senegal - Cadenat and Doutre (1959) presented external and osteological characteristics of four spinner dolphins harpooned off Dakar (at 14°35'N, 17°48'W) on 15 September 1958 in water of 29°C SST. Species not yet recorded from The Gambia and Guinea-Bissau.

Distribution: Oceanic tropical and subtropical seas, in all oceans.

Stock identity: Has not been studied in the ETA.

Status: Populations from the Atlantic Ocean not listed (CMS); insufficiently known (IUCN).

Abundance: No data available.

Migrations or local movements: No information.

Incidental takes: Not recorded, but may be taken in tuna purse-seine nets.

Directed catches: Four animals harpooned off Dakar in 1958 (Cadenat and Doutre, 1959).

Other threats: Unknown.

Ecology and life history: Stomachs (4) contained a variety of otoliths (many from Scopelidae), deep-water shrimp and small cephalopod beaks. All stomachs were infested with nematodes. Two adult males had testes 30-33cm long that weighed 850-925g (Cadenat and Doutre, 1959).

Curated specimens: According to Perrin *et al.* (1981) five *S. longirostris* skulls from Senegal exist in museums (ZMA 12.263; 13146; 13.147; IFAN no.2; EDM 784), unfortunately none of these in Senegal.

New records and comments: Species not encountered during this project.

Clymene dolphin, Dauphin clymene (*Stenella clymene,* Gray, 1850)

First authenticated records: Senegal - Cadenat and Doutre (1958) published a photo and external measurements of a 183cm Clymene dolphin captured south of the Saloum delta, at about 14°S. A calvaria (PFM-001) collected on a beach of the Bijol Islands (13°23'N,16°49'W) by PFM was identified by KVW as from a Clymene dolphin, a first record for The Gambia. *S. clymene* is not yet reported from Guinea-Bissau.

Distribution: Tropical and subtropical waters of the Atlantic Ocean (Perrin *et al.*, 1981). Based on capture records, *S. clymene* appears to be the most common cetacean in Ghana's coastal waters (Van Waerebeek and Ofori-Danson, 1999).

Stock identity: No stocks have been distinguished.

Status: Unlisted (CMS); insufficiently known (IUCN).

Abundance: No data.

Migrations or local movements: No information.

Incidental takes: Not recorded, but may be taken in tuna purse-seine sets.

Directed catches: One animal (authenticated by photo) from south of the Saloum delta was taken deliberately, probably harpooned (Cadenat and Doutre, 1958).

Other threats: Unknown.

Ecology and life history: No information.

Curated specimens: Robineau *et al.* (1994) referred to three skulls IFAN 78-11a, 79-106 and 79-102; J.Maigret took these to the Paris Muséum d'Histoire Naturelle for study, where they still are at present (D. Robineau, *in litt.*, 5 March 2000). The Bijol Islands specimen (PFM-001) is curated at DPWM headquarters, Abuko National Park, The Gambia (this paper and Murphy *et al.*, 1997).

New records and comments: See above. The species was reviewed by Perrin *et al.* (1981) and Robineau *et al.* (1994). Some standard cranial measurements of PFM-001 (in mm): CBL, 379; RW1/4, 65; ZYW ~175, RW at base 94.5; GW PREMAX, 65; TFL, 48; TFW, 29; transverse tooth width, 3.3.

PHYSETERIDAE (SPERM WHALES)

Sperm whale, Cachalot (*Physeter macrocephalus,* Linnaeus, 1758)

First authenticated records: Senegal - An 11m sperm whale stranded at the entrance of Fasna Creek near the village of M'Bodiène (14°15'N,16°52'W), Petite Côte, on 8 January 1954 (Cadenat, 1954, 1956); several subsequent cases are known (Cadenat, 1956, 1957; this paper). There are no records for The Gambia or Guinea-Bissau.

Distribution: Cosmopolitan.

Concentrations of sperm whales were sighted off Saint-Louis, northern Senegal, in May 1979 (Maigret, 1980).

Stock identity: Not studied, but sperm whales from Madeira are considered part of the (only) North Atlantic stock (Donovan, 1991; Dufault *et al.*, 1997).

Status: Not listed (CMS); insufficiently known (IUCN).

Abundance: No data.

Migrations or local movements: Sperm whales are expected to pass at least occasionally through the EEZ waters of each GST nation.

Incidental takes: None recorded. The sperm whale stranded at M'Bodiène was flensed down to the bones in less than a day (Cadenat, 1956).

Directed catches: A 12m sperm whale was harpooned by a flotilla of 'pirogues' off Joal/Fadiouth, Petite Côte, landed and utilized for human consumption, on 12 November 1955 (Cadenat, 1956).

Other threats: Cadenat (1956) reports on a violent collision between his boat and sperm whales, halfway between Dakar and the Cape Verde Islands, on 9 June 1955.

Ecology and life history: No specific information available for WAF. Sperm whales are principally teuthophagous and their presence may be related to an abundance of large cephalopods.

Curated specimens: A mandible of a juvenile (without voucher data) is at IFAN-CAD. Cadenat (1957) indicates that the skeleton of the Joal/Fadiouth sperm whale is at IFAN-Gorée (possibly SN89, Table 1). A juvenile skull (unregistered) is kept at the Joal office of the Service de Pêches Maritimes. One voucher vertebra of Diombos specimen (see below) is in the COREWAM collection.

New records and comments: Vertebrae, left mandible, scapula, and vomer of an unsexed juvenile sperm whale stranded alive on a sandbank at the mouth of the Diombos tidal creek (13°47'N,16° 38'W) on an unspecified date in 1997 were examined by KVW at *Iles Paradis* hunting lodge on the upper Diombos, Saloum delta.

Pygmy sperm whale, Cachalot pygmé *(Kogia breviceps,* de Blainville, 1838*)*

First authenticated records: Senegal - Two pygmy sperm whales stranded at Bel-Air beach in Dakar in July 1957 (Cadenat, 1959a: photo), and another pair stranded near Rufisque (14°43'N,17°17'W) on 12 May 1965 (Maigret and Robineau, 1981). Not recorded in The Gambia or Guinea-Bissau.

Distribution: Pelagic, in all tropical to warm temperate waters.

Stock identity: To date no biologically defined stocks have been proposed, but genetic variation between Atlantic and Pacific *K. breviceps* is small (Chivers *et al.*, 1999).

Status: Not listed (CMS); insufficiently known (IUCN).

Abundance: No estimates available for the ETA.

Migrations or local movements: No information.

Incidental takes: None recorded.

Directed catches: No information but significant directed take seems unlikely.

Other threats: None identified.

Life history and ecology: No information.

Curated specimens: Specimen material is lacking in GST collections.

New records and comments: None encountered. Maigret and Robineau (1981) reviewed *Kogia* spp. in Senegal.

Dwarf sperm whale, Cachalot nain (*Kogia sima,* Owen, 1866)

First authenticated records: Senegal - A 250cm male dwarf sperm whale stranded at Cap Manuel (14°39'N,17°26'W) on 1 December 1977; a second male of 222cm came ashore at Pointe de Fann (14°40'N,17°28'W) (Maigret and

Robineau, 1981). *K. sima* is not known from The Gambia or Guinea-Bissau.

Distribution: Pelagic, in all tropical to warm temperate zones.

Stock identity: No subspecies or stocks have been proposed to date, but dramatic differences exist between the mitochondrial cytochrome B gene haplotypes from Atlantic and Pacific *K. sima* (Chivers *et al.*, 1999).

Status: Not listed (CMS); insufficiently known (IUCN).

Abundance: No estimates available for the ETA.

Migrations or local movements: No information.

Incidental takes: None recorded.

Directed catches: No information but significant takes are improbable.

Other threats: None identified.

Life history and ecology: Stomachs of the two Senegalese specimens contained cephalopod beaks and deepwater shrimp (*Aristeomorpha* sp.). A 222cm male had very large, 40-50cm testes of some 3kg weight each; the other animal seemed to be sexually inactive (Maigret and Robineau, 1981).

Curated specimens: Specimen material is lacking in GST collections.

New records and comments: None encountered during this study. Rice (1999) correctly argued that the genus *Kogia* as a feminine Latin noun should be composed with the feminine *–a* ending for species epitheton, thus *sima* and not *simus.*

BALAENOPTERIDAE (RORQUALS)

Minke whale, Petit rorqual, rorqual à museau pointu (*Balaenoptera acutorostrata,* Lacépède, 1804)

First authenticated records: Senegal - A 376cm female balaenopterid was found stranded on 21 September 1977 at Mbao (15°48'N, 16°31'W) in the Parc National de la Langue de Barbarie, northern Senegal (Dupuy and Maigret, 1978), but was only recently confirmed as a minke whale (Van Waerebeek *et al.*, 1997a, 1999). No substantiated records are known for The Gambia nor Guinea-Bissau; however dolphin-watching tour operator Mr. Mervyn Baldwin reports seeing minke whales off Kartung (13°06'N,16°46'W), southern coast of The Gambia 'with sufficient regularity to merit organising whale-watching trips'.

Distribution: Long considered not to occur south of the Strait of Gibraltar, *B. acutorostrata* was recently confirmed from coastal areas of the Canary Islands (Martin *et al.*, 1992), Western Sahara/southern Morocco, Mauritania and northern and central Senegal (Van Waerebeek *et al.*, 1997a, 1999).

Stock identity: Preliminary cladistic analysis of a fraction of the mt-DNA control region of minke whale KVW-3036 (Dakar) locates it in a cluster related to, but independent from, a cluster containing Antarctic dwarf plus North Atlantic minke whales (Dr. M. Goto and Dr. Luis Pastene, pers. commn, 1 Oct 1998), is indeed *B. acutorostrata.* How Senegal minke whales relate to NE Atlantic and Central North Atlantic stocks, or whether they form a formerly unrecognized population, awaits analysis of further samples (Van Waerebeek *et al.*, 1999)

Status: Not listed (CMS); insufficiently known (IUCN).

Abundance: No data, however the six records for Senegal indicate minke whale is not so uncommon.

Migrations or local movements: The preponderance of juveniles and neonates suggests Senegal's coastal waters may be an important calving and breeding area (Van Waerebeek *et al.*, 1997a, 1999).

Incidental takes: A juvenile minke whale was trapped in a net off Anse de Hann (Cap Vert Peninsula) in 1993. Brought to port by artisanal fishermen, it was butchered for human consumption (Mamadou Faye, pers.commn). Gillnet entanglement is a worldwide problem for, especially juvenile, minke whales (Van Waerebeek *et al.*, 1997a, 1999).

Directed catches: None recorded.

Other threats: Inshore habitat may be disturbed by coastal development and shipping.

Ecology and life history: All specimens known from Senegal were either juveniles or neonates (Van Waerebeek *et al.*, 1997a, 1999).

Curated specimens: In the IFAN the cetacean collection is composed of three minke calvariae (Table 1) and a set of small cream-colored baleen without a collection number (Fig. 10), possibly from one of the former.

New records and comments: Mamadou Faye conserves, at the Centre National de Formation de Techniciens des Pêches Maritimes in Dakar, the skeleton (left mandible and few ribs missing) of a calf taken in 1993. We examined it on 20 May 1998 (KVW-3036; condylobasal length, 91.5cm; zygomatic width, 45.5cm). Minimum body length (reconstructed from skeletal elements) was 373cm. Dry muscle tissue sampled yielded usuable mt-DNA (see above).

Bryde's whale, Rorqual de Bryde (*Balaenoptera edeni,* Anderson, 1878)

First authenticated records: Senegal - A 445cm juvenile Bryde's whale stranded alive on a beach of Dakar on 26 March 1955. Three photographs in Cadenat (1955) clearly show the characteristic three head ridges.

Distribution: Little can be said on the distribution of Bryde's whales in the North Atlantic (Donovan, 1991), but inhabiting tropical and subtropical waters they generally do not move poleward of 40° latitude in either hemisphere (Jefferson *et al.*, 1993). Bryde's whales have been taken off Gabon, Congo and Angola (Ruud, 1952).

Stock identity: Almost nothing is known of the stock identity of Bryde's whales in the North Atlantic (Donovan, 1991).

Abundance: No information. At least some of several unidentified balaenopterids stranded on the Senegalese coast (Cadenat, 1947, 1949, 1955) may have been Bryde's whales.

Migrations or local movements: No regional information, however Bryde's whales typically do not exhibit strong latitudinal seasonal movements.

Status: Not listed (CMS); insufficiently known (IUCN).

Incidental takes: None reported.

Directed catches: Norwegian whalers took 134 and 171 Bryde's whales off Gabon in 1951 and 1952 respectively (Ruud, 1952) but the affinity of that stock with the Senegal specimen is unknown.

Other threats: None identified.

Ecology and life history: No information available for WAF. Elsewhere, Bryde's whales feed on small schooling fishes as well as euphausiids.

Curated specimens: One possible cranial specimen of a neonate at IFAN (no catalogue number); genetic typing is recommended.

New records and comments: Species not encountered during project. Skeletal remains, especially if incomplete and juvenile, require detailed examination as not to confuse with minke whale.

Sei whale, Rorqual de Rudolphi (*Balaenoptera borealis,* Lesson, 1828)

First authenticated records: Senegal - A series of nine baleen plates from a sei whale were recovered from a tiger shark stomach landed at Joal (14°10'N,16°50'W) in July 1949. The 40cm long plates were "black with white bristles" (Cadenat, 1955), diagnostic for the species. No sei whales have been documented from The Gambia or Guinea-Bissau (but see unidentified balaenopterids).

Distribution: Cosmopolitan, from tropics to polar seas. Maigret (1981) reported on a stranding of an 11m *B. borealis* on 16 February 1981 in the Baie du Lévrier, north of Nouadhibou, Mauritania. Kirpichnikov (1950) mentioned three sightings off West Africa in May 1948, the southernmost at 06°30'N, 18°20'W, however it is unclear whether these were positively differentiated from Bryde's whales.

Stock identity: On geographic grounds, sei whales off West Africa can be tentatively considered part of the eastern North Atlantic stock (*sensu* Jonsgård and Darling, 1977; Donovan, 1991).

Status: Not listed (CMS); vulnerable (IUCN).

Abundance: No estimates available; some stocks are well below pre-exploitation levels (Reeves and Leatherwood, 1994).

Migrations or local movements: According to Allen (1916), sei whales are rarely seen south of the Straits of Gibraltar. Ingebrigtsen (1929) argued however that they stay in the southern part of the North Atlantic during the winter and their northward migrations seem to take place in the open. Anonymus (1914, in Jonsgård and Darling, 1977) indicated that sei whales were observed, sometimes in large numbers, in the area that stretches from the Madeira Islands, south past the Canary Islands towards the Cape Verde Islands.

Incidental takes: None reported.

Directed catches: In the early 20th century, a number of sei whales were caught off Cabo Blanco, Mauritania, in winter months (Ingebrigtsen, 1929).

Other threats: Increasing shipping traffic off West Africa inevitably results in a greater risk of collision (see below).

Ecology and life history: Mostly in oceanic habitat. No specific information for WAF region.

Curated specimens: One small, apical baleen plate and one sawed-off plate deposited at IFAN (without number) from specimen described below. We were unable to locate the baleen reported on by Cadenat (1955, 1959a).

New records and comments: One of us (Papa Ndiaye) provided the following record. On 19 March 1998, a sei whale (SL=12m; 9,960 kg, weighted at port facilities) was landed on dock #2 of the Dakar port, collected when stuck on the bow bulb of the German container ship *OSNA Bruck* (Group Somico-Smith and Kraft). Nobody knew whether the whale was scooped up dead by the ship or whether it had been hit and died on impact, however the carcass was fresh (Fig. 11). The Dakar daily *Le Soleil* published (19 and 23 March 1998) a photo of the whale on the ship's bow and reported that it was struck off Gorée Island (14°40'N,17°24'W). However, the captain specified that the ship left Las Palmas, Canary Islands, two days earlier and the crew became aware of the whale only after passing Gorée Island. The captain admitted that the collision could have occurred earlier en route.

The specimen was collected for burial at Sangalkam with the purpose of retrieving the skeleton after decomposition. Unfortunately only two small, apical baleen plates were collected but photos taken by P. Ndiaye allowed positive identification (Fig. 11): an arched rostrum with down turned tip, absence of auxiliary rostral ridges, overall grey body colouration, a high

falcate dorsal fin and the shiny black baleen with fine, white bristles, are characteristic for *B. borealis*. One flipper measured 156 cm.

Mr. I. Ndiaye (*Le Soleil*, Friday, 27 March 1998) reported "two other cetaceans have been found [floating dead] yesterday afternoon [i.e. 26 March 1998] off our coasts". The whales were towed towards dock no.3 of the Port Autonome de Dakar, but were found to be decomposed. A photograph taken by Sarakh Diop showing two balaenopterids belly-up illustrates the article. Papa Ndiaye, who saw the whales, suggested these were also sei whales, but no samples were taken.

When the first sei whale was landed, port Captain Mr. Edouard Sarr declared (*Le Soleil,* 27 March 1998) that this was the third whale found in Dakar waters in less than 6 months, after the one which stranded at dock 17, then a second which had found its end north of the port. In total then, five dead whales, only one of which positively identified as a sei whale, have been found off the Senegal coast in less than 6 months.

Species of unconfirmed occurrence

Fin whale, Rorqual commun (*Balaenoptera physalus,* Linnaeus, 1758)

A.R. Dupuy found a 17 m balaenopterid carcass, reported as a fin whale (Dupuy and Maigret, 1982) floating near the Dakar port on 25 May 1981. A photo (in Dupuy and Maigret, 1982) shows a mostly white ventrum, which would correspond to a fin whale, but no argumentation is elaborated. The loss of epidermis in *B. borealis* and *B. musculus* could result in a similar appearance and a definitive identification is not possible on the basis of available evidence.

Humpback whale, Baleine jubarte, mégaptère (*Megaptera novaeangliae,* Borowski, 1781)

One or more of the several unidentified whales stranded in Senegal (see below) may have been humpback whales. Although not a single well-documented case is known from GST states, humpback whales have been reliably reported from Morocco (Bayed and Beaubrun, 1987), Mauritania (Cadenat, 1955; Maigret, 1980b) and the Cape Verde islands where NE Atlantic humpbacks overwinter (Lagendijk, 1985; Wenzel, 1995). Lagendijk (1985) presented a regional review. Any further records would be noteworthy considering the threatened status of the Northeast Atlantic population (Appendix I of CMS, 1997; 'vulnerable' - IUCN).

Unidentified whales

A series of reported balaenopterid whale strandings and sightings off Senegal have not been identified to the species level (e.g. Cadenat, 1947, 1949, 1955). One of us (PT) reported on an unidentified balaenopterid of c.15m length, which was washed up in an advanced state of decomposition (condition IV) inside a creek near Cadjelan (12°07'15"N, 16°22'15" W) at the mouth of the Rio Cacheu, Guinea-Bissau, around late April 1997. Tous *et al.* (1997) briefly narrated the find in an internal IUCN memo and included photographs of some throat grooves, vertebrae and a scapula. The whale appears physically subadult. None of the larger *Balaenoptera* spp. can be excluded, but the narrow ventral grooves suggest it was not *Megaptera*. There are no indications for the likely cause of its death. Some vertebrae were salvaged and deposited at the IUCN-Bissau office.

There have been two reported incidents of large cetaceans stranding on the coast of The Gambia within the last two decades (Murphy *et al.*, 1997). A baleen whale of between 7 and 10m was washed ashore dead immediately north of Bald Cape in the mid 1980s. A vertebra of this specimen was presented to the DPWM and an individual claimed to have had a sample of baleen from the same whale, but was unable to locate it. A whale of slightly larger proportions was reported to

have been washed ashore dead near Tujerring further to the south some years previously though no further information was available.

A medium sized (10-15m) whale was sighted blowing 1km offshore from Tanji in September 1996. Reports of medium-sized cetaceans feeding in waters c.10km due west from Sanyang were made by local fishermen who frequently fish those grounds. The reports indicated that the cetaceans were seen on more than one occasion over a number of years, during the months of May to July. Water depth at this location is about 60m (Murphy *et al.*, 1997).

COUNTRY ACCOUNTS

SENEGAL

1. BACKGROUND

Senegal benefits from some exceptional marine factors, including an oceanography characterized by sub-tropical upwelling, abundant fish stocks and a coastline extending over 531 km, significant for a country of 192,000 km^2. Its maritime claims include a territorial sea of 12 nm, a contiguous zone of 24 nm and an exclusive economic zone (EEZ) of 200 nm. The climate is mostly tropical; hot and humid in the rainy season (May to November) with strong SE winds. The dry season (December to April) is dominated by a hot, dry harmattan wind.

Intensive field work was organised from 11 October-20 November 1997, 16-29 May, 9-14 June and 23-30 June 1998, coinciding with KVW's presence, while a lower-intensity programme was implemented at other times. Main activities included training, port monitoring, beach combing, study and preparation of stranded specimens, establishing and reinforcing contacts with relevant institutions. All cetacean specimens in the collections of the Institut Fondamental d' Afrique Noire at the Université Cheikh Anta Diop (IFAN-CAD), Dakar, and at the Musée de la Mer on Gorée Island, also administrated by IFAN (IFAN-MER) were cleaned and reviewed.

By-catches are a major cause of human-related mortality among small cetaceans in Senegal and a solid background on the type of fisheries and their effort can serve to identify potential trouble spots. Furthermore, if incidental catch per unit effort (CPUE) can be determined in future work, dolphin mortality levels may be estimated for past fisheries effort. Available fisheries information, much of it unpublished, is reviewed below in some detail.

2. FISHERIES AND INTERACTIONS

2.1. Legal status of cetaceans in Senegal

By Ministry of Fisheries decree # 97-1044 of 18 August 1987 'cetaceans of all species and all sizes' are protected animals in Senegal. The same is true for marine turtles. While the decree does not specify the exact meaning of 'protected', it is widely interpreted that even the possession of a by-caught dolphin carcass is against the law. Hence the universal practice among fishermen of hiding dead cetaceans, even if these accidentally entangled in the nets. A law extension stipulating specific guidelines on what should be done with by-caught specimens is recommended. Authorizing the local utilization of by-caught animals (but not permitting export), linked to a requirement to report the take to Fisheries authorities, may provide a means to compile statistics on such takes.

The Parc National de la Langue de Barbarie (PNLB), situated at the mouth of the Senegal River, protects habitat suitable for inshore-dwelling dolphins. The Parc de Basse-Casamance, on the extreme southwest coast, is traversed by the Casamance river which is utilized by bottlenose dolphins (this report) and,

rarely, by *S. teuszii* (one animal sighted by Dupuy and Maigret, 1980). The Parc National du Delta du Saloum (PNDS) constitutes the most important protected habitat for nearshore occurring cetaceans, including at least *S. teuszii* and *T. truncatus*, in Senegal.

Until June 2000 when Guinea-Conakry acceded, Senegal was the only West African nation which signed (in July 1982) the International Whaling Convention of 1946 which is administered by the International Whaling Commission (IWC). However it did not ratify the Convention and no delegations attend the annual meetings. In addition to the Convention on Migratory Species (CMS), Senegal is also a party to the following international treaties: Convention on Biological Diversity (CBD), Climate Change, Trade in Endangered Species (CITES), Hazardous Wastes, UN Law of the Sea (UNCLOS), Marine Life Conservation, Nuclear Test Ban, Ozone Layer Protection, Wetlands (Ramsar), and Marine Dumping.

2.2. Marine fisheries in coastal waters of Senegal

2.2.1 General

Fisheries are a vital sector in Senegal's economy, both domestically and as a source of foreign currency that adds significantly to the balance of payments. They contribute greatly to employment by providing jobs to some 55,000 fishermen –not including the many people involved in processing, distribution and retailing, boat building and net manufacture. On the whole, fisheries engage about 15% of the Senegalese work force (Diakhate, 1984; Deme, 1997). Most importantly, fish and molluscs are the primary source of animal protein, urban as well as rural. Authorities have long acknowledged this importance and instituted several fisheries development projects. However, as Warren *et al.* (1982) pointed out, such a development programme should be supported by studies of the effects of such investments on the fish stocks, long-term fish production, national employment, local income, and foreign exchange. We propose to add: investigate the impact of increased fisheries effort on non-target species such as cetaceans and marine turtles.

The Centre de Recherches Océanographiques de Dakar-Thiaroye (CRODT), a subsidiary of the Institut Sénégalais des Recherches Agricoles (ISRA) gathers qualitative and quantitative information on domestic fishing effort and catches through a network of trained observers in all major fishing ports of Senegal. Statistics such as the number of operational boats, of sorties per day and the quantity landed of each commercial species are archived (but not published) as yearly ISRA *Archives Scientifiques*. Unfortunately, captures of marine mammals are not registered. Currently the series is complete up to 1993, more recent data are still being processed. The main exploited fish species are listed in Table 2.

Information presented below is taken mostly from these reports (Bakhayokho *et al.*, 1988; CRODT, 1995, 1996; Gérard *et al.*, 1996; Deme, 1997) as well as from numerous personal communications by individual CRODT researchers. Statistics for foreign vessels are collected by observers and volunteers in the programme named 'Protection et Surveillance des Pêches au Sénégal' and are received by CRODT from the Direction de l'Océanographie de la Pêche Maritime (DOPM).

Senegal's coastline is divided into seven fishing areas with, in 1986, a total of 149 recognized fish disembarkation points (numbers in parenthesis). From north to south the areas are: Fleuve [Senegal River] (15), Louga (2), Thiès-Nord (4), Cap-Vert (20), Thiès-Sud (15), Saloum (45) and Casamance (48) (Bakhayokho *et al.*, 1988).

2.2.2. Trawl fisheries

Marine demersal resources of the Senegalese continental shelf and slope (crustaceans, fishes, cephalopods) are exploited by two types of trawler fleet. One fleet is based in Dakar and is

constituted in its majority by boats operated by Senegalese. The other fleet is foreign and encompasses mostly Italian, Greek, Spanish and Gambian boats. Both fleets operate bottom trawls and mid-water (pelagic) trawls.

Coastal bottom trawl fishery

The bottom trawl fishery targets demersal coastal species, mainly crevette blanche (shrimp), soles, rouget (goat fish), dorades, cuttlefish and octopus, but also sompat (grunt), machoirons (sea catfish), thiekem, ombrine (drum), several carangids, pageot, brotule and dorade rose. In 1993, 121 Senegalese trawlers (seven of these working in pairs) and four foreign trawlers based in Dakar unloaded their catches at the port of Dakar. The volume decreased some 20% from 46,797 metric tons (MT) (1992) to 38,945 MT (1993) (Thiam *et al.*, 1996). It should be noted that catches not only came from the continental shelf off Senegal but also from The Gambia, Guinea-Bissau, Guinée-Conakry and Sierra Leone (Thiam *et al.*, 1996).

Catches, in MT, by foreign trawlers for 1993 (and 1992) were: crustaceans 2,257 (2,883), cephalopods 974 (1,784), fishes 7,483 (10,741); total 10,714 (15,408). In 1993 the foreign coastal trawl fishery operated by a permit system under international agreements. The fleet was composed of 17 ships, six Greek, two Gambian, two Spanish, two French and five Italian (Thiam *et al.*, 1996). Total takes, in MT, for 1993 (1992 figures in brackets) are: cephalopods, 6,331 (7,349 or minus 3.3%); crustaceans 2,550 (2,633 or -16.1%), fishes 30,406 (47,409 or -23.1%) and total 39,288 (47,409 or -20.7%) (Thiam *et al.*, 1996).

Mid-water trawl fishery

In 1993 the fleet of mid-water (pelagic) trawlers based in Senegal was composed of four vessels flying the national flag, each between 151 and 500 tons. They exploited principally four species of deep-water shrimp and red crabs (*Geryon maritae*), performed 16 voyages (compared to 24 in 1992) and disembarked a total of 342 MT, i.e. a decrease of 79% compared to 1992. Foreign pelagic trawling was the exclusive domain of Spanish vessels. In 1993 there were 13 ships taking hake (*Merluzza* spp.) and 16 fishing for shrimp, i.e. 29 ships in total, the same number as in 1992.

2.2.3. Sardine fisheries

The output of the sardine fisheries off Senegal, by mixed purse-seine and trawl, has steadily increased over the last three decades: from 2,000 MT in 1962 to 32,000 MT in 1973 (Boely and Chabanne, 1975). In these years about 70% of the catch consisted of two sardine species *Sardinella aurita* and *S. eba*.

In 1993 a total registered catch of 50,564 MT of 'sardines' (see below) was landed: 55% by Soviet trawlers, 8% by Soviet purse-seiners and 7% by Senegalese purse-seiners. Four Senegalese vessels were operating: one of the 25-100 MT category and three of the 100-250 MT category. Three vessels of more than 500 MT fished only a few months a year, giving a total of seven purse-seiners and 19 pelagic trawlers activily fishing. The two *Sardinella* spp. represented only 25% (versus 59% in 1992) but catches of chinchards (several species) were up from 17% to 30%. This may be explained by the progressive replacement of purse-seiners by trawlers (Lévenez *et al.*, 1996) or, more likely, by the depletion of *Sardinella* stocks. Most catches (67%) were made in the south, i.e. sectors Casamance and Roxo. The Gambia sector is good for 14% of takes. In any one month, from 7-14 vessels were fishing. Effort (sorties) varied between months but CPUE was at its maximum from December-April, during the coldest months.

2.2.4. Other purse-seine fisheries

The principal species on which purse-seines were set are: horse mackerel and

scads (30%), undetermined *Sardinella* spp. (15%), *Sardinella aurita* (6.6%), *Sardinella maderensis* (3.7%), but also *Caranx rhonchus, Pomadasys jubelini, Pomadasys* sp., *Chloroscombrus chrys* (2.8%), *Ethmalosa fimbriata, Trachurus trecae, Trachurus trachurus, Scomber japonicus* (2.4%), *Caranx carangus, Argyrosoma regium, Boops boops* and *Sphyraena* sp. (Lévenez *et al.*, 1996).

2.2.5. Pelagic tuna fisheries

Very little information is available on tuna fisheries off Senegal or anywhere else off West Africa (reviewed by Donahue and Edwards, 1996). Three tuna species are predominantly exploited: albacore or longfin tuna *Thunnus alalunga*, skipjack or listao *Katsuwonus pelamis* and yellowfin or patudo *Thunnus albacares*, captured by rod-and-pole or purse-seine nets. In 1988, the national fleet comprised three seiners and two rod-and-pole fishing boats, the foreign fleet comprised 39 seiners and 16 tuna liners (Maigret, 1994a). More recent data are not available. The seiners are a cause for concern for potential significant dolphin catches as in the eastern tropical Pacific (Anonymous, 1992). While the industry claims sets on dolphins are rare, such claims are not credible since no independent observer system is in place to verify practices.

2.2.6. Artisanal fisheries

The catches made by artisanal fisheries, including pelagic and demersal fish, shrimps and gastropods have increased steeply in the past decade and a half. While in 1985 total catch was 168,268 MT, it reached 327,101 MT in 1993 (Deme, 1997). Our observations in ports suggest that numbers of artisanal boats have risen steeply as well, but a recent estimate is not available. Maigret (1994a) reported 4,500 small boats, in addition to the 'pirogues' without engine which work in the estuaries. Joal-Fadiouth and Saint Louis (alone: 1,800 'pirogues') are now the main ports from where 'artisanal' fisheries operate; many of these are in fact semi-industrial.

Principal small pelagic fish landed are round sardinella (*Sardinella aurita*), flat sardinellla (*S. maderensis*) and bonga (*Ethmalosa fimbriata).* These three species accounted for more than 70% of the small pelagic catches in 1993 and their high abundances allow economic exploitation, despite low prices. Round sardinellas are found in the cooler water upwelling areas, and since they migrate, they are present off Senegal for no more than six months a year. Flat sardinellas and bonga are found in areas of upwelling and warm waters with low salinity such as estuaries and river mouths (Deme, 1997).

The 'artisanal' purse-seine (*senne tournante*) is by far the most widely used gear in the small-scale fishery. It is deployed by two outboard-powered 'pirogues', each about 14-20m in length with a load capacity ranging from 16-25 MT and a crew size of 20 people on average. The purse-seine net has a length ranging from 300-400m. After introduction by FAO in 1972, the number of artisanal purse-seines has increased sharply over the years. The latest 1988 CRODT census counted 430 operational nets along the Senegalese coast (Deme, 1997), but this number may have multiplied many-fold by 1999.

The surrounding gillnet, which is used less intensively in small-scale fishery, is on average operated by a seven man crew using a 14m motorized canoe. The bigger-meshed nets capture bonga, while the smaller-meshed nets are directed mainly toward flat sardinella.

Fish taken in drift gillnets (*filets dormants*) include barracuda, mackerel, horse mackerel, liche, bonito, Atlantic bonito, and ceinture. Major demersal species taken in bottom gillnets are black seabream, groupers (*Ephinephelus aeneus, Mycteroperca rubra*), courbine, as well as various unspecified species of sharks and rays. Recent statistics on artisanal fishing effort are not yet available.

In 1997, KVW interviewed artisanal

fishermen who complained about massive industrial fishing operations by large Korean and Taiwanese vessels in nearshore waters, exploiting stocks allocated for artisanal fishers. The past two years, they specified, the sea 'is regularly covered' with clearly discarded, rotting undersized fish or non-target species of lesser commercial value.

3. FIELD RESEARCH

3.1. Port monitoring for dolphin capture

3.1.1. Sector Le Fleuve

Saint Louis (16°02'N,16°27'W), the principal port of northern Senegal, was surveyed from 22-24 October 1997 (KVW, AD, Abdellahi O. Samba O. Bilal). No dolphins were seen landed and only a single vertebra of a large delphinid (KVW-3030), probably a blackfish, was found just north of the port. However, independent interviews with a number of local fishermen revealed that this scant material evidence did not adequately reflect dolphin by-catch levels, which were described as 'regular'. Reportedly fishermen land and process dolphins taken incidentally in driftnets and share the meat with families and neighbours. If carcasses are cut-up in pieces and are cooked with bones attached (i.e. carcasses are not filleted), few or no skeletal remains will be found on beaches, which we confirmed. Locals claimed that dolphin meat is seldom commercialised but is used as barter.

Others said that it is consumed 'whenever available'. The blubber is boiled and the oil filtered. The latter product is used in folk medicine, e.g. for the treatment of gout and may have a distribution beyond coastal communities. Dupuy (1983) reported that Niominka fishermen from Bassoul and Poutak (Delta du Saloum) used to sell dolphin oil in the belief it cures venereal diseases.

We inspected three 'pirogues' with mummified dolphin flukes nailed to either the bow or the stern of the craft, presumably meant as good luck charms (Fig. 12). The flukes were too weathered to be attributed a species level, and possibly they were *T. truncatus*. Fisher Bara Sêne of Saint Louis described the common presence of two dolphin species, one 'with a long beak and tricolored' (presumably either *Delphinus* or *Stenella* sp.) and another, bigger and heavier, bold in behaviour and known to pick fish from nets (likely *T. truncatus)*. Mr. Sêne argued that in recent years dolphin groups have become smaller and are less frequently sighted 'because fish resources are over-exploited'. By all accounts fishing effort is immense; many hundreds of large dugout 'pirogues' were hauled out on the crowded beaches during our visit. More than 1,800 large 'pirogues' now operate from Saint Louis (CRODT, unpublished data). In addition, foreign factory vessels reportedly enter the 12nm territorial waters at night.

Mr. Mamadou Sy, inspector for the Service Régional de l'Océanographie et de Pêches Maritimes de Saint Louis, kindly responded to our questions at his office. He did not have any numerical data on dolphin takes 'because these are not declared'. A mummified *T. truncatus* head and an unidentified whale vertebra (photos, COREWAM files), from strandings, adorned his office.

3.1.2. Cap Vert Peninsula and the Petite Côte

Van Waerebeek *et al.* (1997) visited the artisanal landing sites of Soumbediounne, Ouakam, Yoff and Hann, the principal fish disembarking sites along the Cap Vert Peninsula, as well as M'Bour, but found no direct evidence of cetacean takes. Fishermen claimed (unconvincingly) none were caught. Maigret (1981) reported average catches of 2-3 dolphins each month in purse-seines in M'Bour in 1977. Yoff and Hann were re-visited on a few occasions during 1997-98 with the same negative results. Locals generally reacted indifferently and avoided questions. Interviews which had yielded interesting

information elsewhere resulted useless here and we discontinued the effort.

Semi-artisanal purse-seines of 400-1,000m length and stretched mesh sizes of 30.5, 35.5 and 40.6cm (12, 14 & 16 inches) are widely used. Purse-seiners set out in the early morning and return before night. Target fishes include *Sardinella* spp., yaboyes, teboer and saca.

Mr. Mansour Diatta from Joal, considered a reliable source, reported that few fishermen released dolphins if netted alive. Freshly dead dolphins are either cut up on land, with entrails and bones typically buried on the beach (to avoid detectance by the Service de Pêche), or carcasses are butchered in the boats and offal is discarded offshore. Diatta witnessed an unidentified dolphin die inside a net from wounds inflicted by a large number of spiny fishes entrapped in the net.

In the period 2-7 June 1997, one of us (END) was informed that a dolphin, possibly a hump-backed dolphin, was captured by Fadiouth fishermen. The meat was sold locally and the remains were dumped offshore.

An elder fishermen and chief from (muslim) Niodior, Saloum Delta, confirmed (interview by KVW and END, 19 Oct 1998) that dolphin by-catches occur. The species was unclear but 'dolphins of different sizes' are involved. The chief believed that while some Niodior inhabitants consume dolphin meat, most do not because they strictly adhere to Muslim rules that dictate that animal slaughter must be by bleeding (slitting the jugular vein). Net-entangled, asphyxiated or drowned dolphins are said not be suitable.

3.1.3. Casamance

Because of recrudescent-armed conflict and mined off-road areas, fieldwork in the Casamance, southern Senegal, was not conducted. One of us (AD), a native of Casamance, managed to monitor the port of Kafountine (12°56'N,16°43'W), from 28 October to 1 November 1997. AD did not witness any dolphin landings but fishermen confirmed these occur 'with some regularity'. They denied hunting them. Dead dolphins are cut up away from the port area, which is regularly inspected by fisheries officers, and, as elsewhere, butchered offal is dumped at sea to eliminate evidence. In April 1997, MD recorded strips of dolphin meat hung to dry in a community on Ile Bediankhassa, which confirms that dolphin meat is utilized in the Casamance.

3.1.4. Deliberate capture

Due to the legal protection of cetaceans in Senegal, it is extremely difficult to obtain hard evidence of intentional takes, even while these seem to occur with some frequency. Since 1996 we could document only three probable and one confirmed case. In November 1996, Van Waerebeek *et al.* (1997) found three carcasses (body condition 4) of *S. teuszii* close together on a remote southwest beach of Sangomar Island (Fig.5). Curiously, the carcasses, apparently transported (netting was tightly knotted around tailstocks), had not been utilized. Possibly they were abandoned or were offered to the `Esprits de Sangomar´, a common ritual among local fishermen (Mamadou Seck, pers. communication).

At Cambérène-Malika (14°48'N,17°20'W), Cap Vert Peninsula, we gathered additional evidence that dolphin carcasses are manipulated. The half-buried vertebral column of a probable *Delphinus* sp. (END-020) showed strips of strong PVC plastic sheet knotted behind the atlas/axis vertebrae, which must have served to haul or lift the carcass (Fig. 13). The head had been severed before the knot could be applied. Most likely the carcass was stripped of its meat and the skeleton buried on the beach.

On 9 October 1997, a wounded short-finned pilot whale that swam into the Dakar harbour was captured and hauled onshore, where it died (Fig. 9; photos in

daily *Le Soleil*, Dakar, 10 October 1997). Mr. Matar Diouf, chief of the Service Régional des Pêches Maritimes de Dakar, stated that the pilot whale presented harpoon or lance wounds (*Le Soleil*, 13 October 1997; copy in COREWAM files). The whale was quickly butchered *in situ* for its meat before biologists could examine it. Only a skin sample could be salvaged.

As detailed in the species accounts, a juvenile minke whale was incidentally netted in Anse de Hann in 1993 and landed to be eaten. On 21 October 1997, END noted the head of an unidentified dolphin on the floor of a hut at Djiffer (13°56'N,16°46'W). This agrees with earlier reports of the utilization of dolphins in this town (Van Waerebeek *et al.*, 1997).

3.2. Beach surveys

Besides dedicated beach combing (mostly by END, KVW and AD), seashores and banks of estuaries were also searched opportunistically. Below we summarize only beach-combing effort of minimum a half-day duration. Bony remains of at least 28 individuals were collected during beach surveys from November 1997-October 1998 (Table 3). Most were found in the vicinity of landing sites and fishing ports and bore evidence (mainly cutmarks) of handling and butchering, which suggests they were captured.

April 1997: Cambérène – Keur Massar, northern Cap Vert Peninsula, no findings.

3 July 97: END walked beach of Kayar but did not find cetacean bones. Dolphins are reportedly seen nearshore.

20 Oct. 1997: END searched the landing site at Djiffer and found a rib from a West African manatee *Trichechus senegalensis* (END-011).

21 Oct. 97: END checked Saloum riverbank from Djiffer to Palmarin, no specimens.

21 & 25 Oct. 97: Ndangane, Siné river: shores searched, south of town and around hotel, neither effort yielded any material.

22-23 Oct. 97: Survey (by END) of beaches around Niodior and Dionewar; no finds.

26 Oct. 97: Beach of Joal, south to land-tongue, no finds.

1 Nov. 97: South shore of l'Ile de Tindine, Fadiouth; no cetacean remains.

3 Nov. 97: Baie de Hann, no cetacean remains.

4 Nov. 97: From Thiaroye-sur-Mer towards industrial zone. No remains found. Fishermen respond evasively when questioned about dolphins.

5 Nov. 97: Beaches at Yoff, Cap Vert peninsula. No findings.

6-7 Nov. 97: Beaches around Cambérène, north shore Cap Vert peninsula: several cetacean bones collected (END-017, 018, 019, 020; Table 3).

09 Nov. 97: END checked the small beach at l'Anse Bernard; no remains.

14 Nov. 97: Intensive search of entire beach of Joal (KVW, END), and several km north; notable absence of cetacean bones, especially considering that Joal is the major artisanal fishing port on the Petite Côte.

15 Nov. 97: ~22km beach from Joal port north to Pointe Saranne walked by KVW and END; surprisingly, no cetacean finds.

16 Nov. 97: Beach survey over ~8km north of Djiffer. No material found.

17 Nov. 97: Extensive beach survey of Sangomar island, several specimens (Table 3) including first record of Fraser's dolphin (KVW-3032) for Senegal.

16 Oct. 1998: All-day beach combing, from Djiffer north to Palmarin (KVW) and

southern end of Fadiouth estuary mouth to Palmarin (END). Several skulls recovered (Table 3).

19-20 Oct. 98: Niodior, Saloum, and environs. Mangrove shores of creeks around Niodior were walked, nothing found.

24 Oct. 98: three observers searched Beach south of Saint Louis; no remains found.

25 Oct. 98: North beach of Saint Louis (~10km) walked both ways by three observers (see 3.1.1). A lumbar vertebra (KVW-3030) of a middle-sized cetacean was collected.

3.3. Occasional dolphin sightings and small boat surveys

3.3.1. Northern Senegal

Several of us (AD, END, KVW) crossed both ways the Senegal River at Rosso, a border town with Mauritania, on 27 October 1997. Locals interviewed were unaware of any dolphin occurrence in the river. END had participated in a hydrographic survey of the Senegal River for several weeks in 1994 without observing any dolphins. Maigret (1980) did not encounter *S. teuszii* in the Senegal River estuary. The only known observation is by Cadenat (1959a) who reported two killer whale sightings in the Senegal River, without further details.

3.3.2. Petite Côte and Saloum delta

Cetacean sightings and miscellaneous sighting effort are compiled in Table 4. From independent interviews (19-20 October 1998) with Niodior fishermen it is concluded that small groups of unidentified dolphins are seen in the principal channels of the Saloum delta, in particular during the rainy season (*l'hivernage*) when salinity levels drop. A resident French bridge engineer had not seen dolphins in the smaller creeks around Niodior, but confirmed fishermen's claims that dolphins are seen around Pointe de Sangomar. Mr. I. Kante, who sets out to fish from Niodior on a daily basis, also reported dolphins around Sangomar Island, especially off the (southern) Pointe. Fishermen at Ndangane (14°05'N,16°42'W) affirmed that 4-5 years ago small groups (2-4) of dolphins were periodically seen, at high tide, in the Siné river near Ndangane. Sighting datasheets were given to Mr. Alianne Gana, observer for the Ministère des Eaux et Forêts but no completed ones have been returned at time of writing this report. Students of the Ecole des Pêches, Dakar, reported (pers.comm. to END, 8 November 1997) several unidentified dolphin groups of more than 20 individuals at Cap de Naze, Popenguine (14°34'N,17°07'W) in the period 1-15 September 1997. Dolphins most often traveled direction south.

3.3.3. Casamance

A long-time inhabitant of Ziguinchor related that in the 1970s dolphins were 'very often' observed from the Ziguinchor bridge across the Casamance river. Presently dolphins are rarely seen from the bridge or anywhere near Ziguinchor. Also, in 1984-86 biologist Dr.C. Hazevoet (pers. communication to KVW) recorded *T. truncatus* 'far upstream' in the Casamance river. On a ferry ride downstream from Ziguinchor in September 1996, KVW counted an estimated 20-30 bottlenose dolphins near Pointe St. George and Carabane Island (Van Waerebeek *et al.*, 1997; Table 4). Some animals rode the bow of the M/V *Djola* (Fig. 6) but turned back as the ferry approached the last stretch of river leading towards the ocean. Much as the Gambia River bottlenose dolphins, we suspect this is a resident population.

4. EDUCATION

4.1. Establishment of a network of observers

At least four Senegalese biologists (all co-authors) demonstrated interest in cetaceans and actively participated in the

implementation of the project. In mid-1998 END, based on his involvement, was offered the temporary position of *scientifique associé* with the IFAN Institute. Commandant Souleye Ndiaye, director of the Direction des Parques Nationaux du Sénégal, Lt-Colonel Jacques Rigoulot (Park Manager) and personnel of the IUCN-Senegal office have contributed to successful fieldwork in the Saloum delta. Several laymen in key coastal locations participated in field activities and some of these are maintaining a regular contact. Principal contacts are Mr. Pape Dione (Joal-Fadiouth), Lt-Colonel J. Rigoulot (Bakedadji), Mr. Mamadou Seck ('Doudou Gueye', Djiffer) and Mr. Ismael Kante (Niodior). A number of others have contributed with the logistics for single events or sorties. However, to keep the network operative, incentives are required, for most members do not have the means to volunteer.

4.2. Corewam

On 19 November 1997, the non-profit association 'Conservation and Research of West African Aquatic Mammals' (COREWAM) was formally founded in Dakar. The first NGO of its kind in sub-Saharan West Africa it has the following principal aims: 1) conduct scientific research on aquatic mammals; 2) promote the conservation of aquatic mammals in the WAF region; 3) actively contribute to awareness building and organization of aquatic environmental education. Membership by scientists of other WAF countries is encouraged.

Future institutional development of COREWAM should include set-up of a minimum lab/office infrastructure incorporating a reprint library and filing system, a study collection and storage space for field equipment. Collaborative links with marine mammal workers and organisations in industrialised and other developing nations (South-South collaboration) will be established. Examples of efforts in countries with similar socio-economic background can help tackle common problems and avoid known pitfalls. The Peruvian Centre for Cetacean Research (CEPEC) donated reprints on marine mammal biology. Although the first Board of Directors included only representatives of Senegalese institutions, the future goal is to invite board members of other WAF nations or set up separate local chapters. COREWAM's English name was chosen so as to convey a clear reference to its regional scope.

4.3. Feasibility survey of marine environmental education

Mrs. Marie Ba, a Joal resident, was commissioned to carry out a feasibility interview study of directors of Joal primary schools. The purpose was to evaluate the viability and interest in a potential marine environmental education programme directed at students in a typical Senegalese fishing town. Of the four schools surveyed, two head teachers, Mr. Loum of the Ecole Waly Dioub and Mr. Sidy Diamé of the Ecole Joachin Fode Ndiaye, indicated they welcomed such an initiative. Reportedly, environmental educational talks could be incorporated in the teaching curriculum with a minimum of bureaucratic interference. Experience in comparable artisanal fishing towns in Peru has shown that target groups most receptive for environmental education include pupils of primary schools as well as juniors (9-13 yrs) at secondary schools (J. Alfaro-Shigueto and M.F. Van Bressem, CEPEC, pers.communication). In a next phase, appropriate personnel will need to be contracted to organise test courses. COREWAM could contribute to develop such marine environmental education.

4.4. Marine mammalogy training

Varying degrees of guidance on cetacean issues were offered during the project. END and AD, most active in field activities, also received the most intensive training in cetacean biology. Information was provided also to Abdellahi O. Samba O. Bilal of Nouakchott, Mauritania, who

graduated from the Université de Dakar Cheikh Anta Diop with a thesis on allometric growth in skulls of bottlenose and common dolphins from Mauritania (Samba Ould, 1997). His work indicated large numbers of skulls of *T. truncatus* and *Delphinus* sp. gathered from beaches around Nouakchott. A. Samba also participated in a field sortie and expressed the wish to become directly involved in further marine mammal research. Late 1999 he took up a position at the Parc National du Banc d'Arguin, Mauritania, and maintains contacts with COREWAM.

5. REHABILITATION OF THE IFAN CETACEAN COLLECTION

The Director of IFAN, Prof. D. Samb, agreed upon a proposed Memorandum of Understanding in November 1997 which stipulated that UNEP/CMS funds would contribute to: (a) A general curatorial overview of the IFAN cetacean collection (cleaning, new tags); (b) set-up of an electronic database of specimens; (c) new specimen retrieval. A delay of several months in the receipt of funds postponed activities until mid-1998.

IFAN's cetacean collection is conserved at two locations: one part at the main IFAN building on the campus of the Université de Dakar Cheikh Anta Diop (IFAN-UCAD), while most specimens are at the IFAN-administrated Musée de la Mer on Gorée island. At the latter, many skulls were inappropriately stacked, mandibles often separated from respective calvariae and scores of tags were detached or lost. Relatively few skulls could be matched with catalogued data. Two of us (END, KVW) cleaned each specimen, re-identified it where necessary, checked the museum catalogues for accompanying data and looked for cues in order to match bones and detached tags as much as possible, guided by historical annotations marked on the bones. For the many specimens for which this procedure was not possible, a new 'SN' series number was assigned, while for the 18 specimens of which a tiny tissue sample was taken (for experimental DNA extraction), a new 'KVW' serial number was given. Specimens were entered in a database, copies of which are held by all concerned.

A combined total of 269 cetacean specimens, respectively 73 (IFAN-UCAD) and 196 (IFAN-Gorée) per sub-collection, were registered (Table 1). Primarily skulls and calvariae, the collection contained also a few small boxes with teeth and a series of vertebrae (without skull). Some of these specimens may as yet be matched if additional information can be found. The species composition was: *Balaenoptera acutorostrata* (3), *Balaenoptera borealis* (1), *Balaenoptera* sp. (2), *Delphinus capensis* (83), *Delphinus* cf. *capensis* (17), *Delphinus delphis* (11), *Delphinus* cf. *delphis* (7), *Delphinus* sp. (43), *Globicephala macrorhynchus* (10), *Orcinus orca* (3), *Phocoena phocoena* (10), *Physeter macrocephalus* (2), *Tursiops truncatus* (34), *Sousa teuszii* (15), *Stenella* sp. (4), *Steno bredanensis* (14), *Ziphius cavirostris* (1), and unidentified cetaceans (7).

To augment the scientific value of the collection (cf. easy comparison) it would be desirable to unite the two sub-sets. use ologically it may seem preferable to curate the entire cetacean collection at IFAN-CAD, if space and curatorial care can be ensured. However, considering its marine focus much is to be said for the option to re-install the historical marine mammal collection at the Musée de la Mer. The only new specimen acquired by IFAN (but still buried at time of writing) is a sei whale carcass, important as the first complete specimen for Senegal.

THE GAMBIA

1. BACKGROUND

The Gambia, as an enclave wedged inside Senegal between 13°04'N and 13°31'56"N, has a coastline of some 80km length. The small country, bordered in the south by the Casamance, is bisected by the river Gambia which has a mean wet season flow of 1,000 m^3/s with a maximum recorded flow of 2,160m^3/s. Dry season flow declines to 3m^3/s (FAO/IFAD, 1994).

In the estuary inward sediment transport is experienced due to the gravity circulation induced by a density gradient, which results from salt-water intrusion. During the dry season, saline intrusion extends to Kaur, 104 nm upriver from Banjul, while the tidal influence on river level is experienced to the eastern extremity of the country, ca. 240nm (Whyte and Russell, 1988). Nevertheless, tidal ranges are low with a maximum of 2.0m during equinoxal spring tides and an average of 0.6m during neap tides. Sea surface temperatures fluctuate between 18°C in winter to 28°C during summer. The 200m bathymetric limit of the continental shelf extends to 80km offshore. The coastal profile is dominated by sandy embayments with low laterite headlands rising to 10-15m. The Bijol Islands are located 1.5km offshore from Bald Cape and are composed of low lying sand accumulations on a laterite reef (Murphy *et al.*, 1997).

No published material (see Maigret, 1994a) and virtually no other information was available on dolphins and whales within Gambian waters before KVW contacted biologists at the Department of Parks and Wildlife Management (DPWM), Ministry of Agriculture, in Banjul in 1996. Chief Dr. A. Camara pointed out that despite limited resources his department was eager to start work with aquatic mammals. A collaborative field research effort was initiated in 1996, supported mainly by the King Leopold III Fund for Nature Exploration and Conservation, which led to a preliminary assessment of cetaceans from The Gambia (Murphy *et al.*, 1997).

The present project set out to expand this initiative. KVW, based in Serrekunda or at Abuko National Park, performed fieldwork in the country in October-November 1997 and in June 1998, and otherwise remained in regular email contact. The Gambia activities included *inter alia* the development of work strategies, field research proper, working meetings on specific issues and informal training. To date solid evidence was gathered for the presence of four species of Delphinidae: *Tursiops truncatus*, *Sousa teuszii*, *Stenella clymene* and short-finned pilot whale *Globicephala macrorhynchus*. An unidentified small to medium-sized whale, probably minke whale, appears to be a regular visitor to Gambian coastal waters (see below; Van Waerebeek *et al.*, 1997).

2. FISHERIES INTERACTIONS

2.1. Legal status of cetaceans in The Gambia

Under the Gambian national legislation, dolphins and whales, as well as manatees, are fully protected. As early as 1977 the Fisheries Act included marine mammals within the definition of 'fish'. This was further developed under the Fisheries Act of 1991 where 'aquatic animal' includes 'any aquatic mammal and its young, fry, eggs or spawn, shellfish, crustaceans, or turtle' and 'Fish means any aquatic animal, whether piscine or not'. All fishing activities within the 200 nm territorial and EEZ marine waters of The Gambia require a licence which may specify the species, equipment and method of exploitation. Among the duties of the Director of Fisheries is the introduction and implementation of conservation measures necessary for the protection of all living resources within the EEZ.

An additional legal protection for cetaceans is guaranteed under the Wildlife Protection Act, issued by the Ministry of Agriculture: all wild animals are considered protected unless explicitly listed as pest species. The Wildlife Conservation Act of 1977 provides for the creation of national parks, national reserves and local sanctuaries. Areas covered by seawater may be declared reserves. The Tanji Bird Reserve which incorporates the Bijol Islands and associated inshore waters, and the Kiang West National Park on the south bank of the Gambia river, are conservation areas which protect confirmed cetacean habitat. Since 1994 The Gambia has agreed on the principles of the UNEP/CMS Convention and has stated the intention of becoming a Party to the Convention. Unfortunately, the ratification process has suffered repeated delays.

Commercial dolphin-watching, focused on a *T. truncatus* population resident in the Gambia River estuary, is expanding (see below). Although there is no reason for immediate concern partly because the principal operator is exemplary in respecting self-imposed guidelines, it is recommended that a precautionary policy be followed and that a licensing system is established that would allow regulation of commercial dolphin-watching before problems develop. Examples from around the world abound where the industry, uncontrolled, caused major disturbance (Beach and Weinrich, 1989; IFAW *et al.*, 1995; Findlay, 1997). DPWM has already drafted a set of dolphin-watching guidelines based on these put forward by IWC (1997).

2.2. Marine fisheries in The Gambia

2.2.1. Artisanal fisheries

Little information, none of which is up-to-date, has been published on Gambian fisheries. According to Maigret (1994a) the artisanal fishery includes 400 'pirogues': 300 working in the open sea and the remainder in the Gambia River estuary, employing about 1,800 fishermen. There are 11 landing points on the coast and lower estuary. By 1998 the number of artisanal fishermen appears to have drastically increased. Purse-seine nets and drift gillnets are more widely used than set gillnets.

The Fisheries Department does not have the resources to study exploitable marine resources in national waters but it provides observers onboard a Norwegian research vessel which annually surveys Gambian and Senegalese EEZ waters. The Icelandic government recently donated two half-deck, 12m fisheries research vessels to The Gambia. If these come into operation, the option may exist to have a cetacean observer onboard.

2.2.2. Industrial fisheries

The number of coastal purse-seiners decreased from seven in 1982 to three in 1988. These are Ghanaian vessels, as are all those operating in the Gulf of Guinea. In 1988 total catches included: pelagic fish (10,500 MT), demersal fish (10,000 MT) and tuna (280MT) (Maigret, 1994a).

In 1998, Fisheries Department officials complained that foreign industrial fishing vessels illegally operate close inshore (less than 7nm), especially at night. A trawl fishery was operating in 1997.

Also, Japanese vessels are said to deploy purse-seine nets, presumably for tuna. At a workshop in February 1998 government representatives of The Gambia wisely expressed concern about the long-term sustainability of such fisheries in its waters.

At the same time, domestic fisheries are expected to contribute to a greater degree to Gambia's development. The Permanent Secretary at the Department of State for Fisheries and Natural Resources, Mr. Cherno Joof, stated (*Daily Observer*, Banjul, 5 November 1997) that "it is now common knowledge that the development of the Fisheries Sector is accorded high priority in the economic policy and development programme of The Gambia and the government has the

determination and resolve to work to translate the potentials of the fisheries sector into a major contributor in the country's economy. The addition of value added fish products to the list of export products would result in significant increase in revenue".

An increase in fishing effort also augments the incidences of interactions with cetaceans and other non-target species, a matter that will require attention.

2.2.3. Fisheries observers

Mr. Gabidon, head of the Monitoring and Surveillance Unit of the Ministry of Fisheries, welcomed the proposal of a training session on cetaceans for Gambian fishery observers. In early 1998 one of us (P.Murphy) lectured on the identification of the various species of dolphins and whales which were likely to be encountered by observers and explained which are the minimum data that should be collected. Datasheets for cetacean sightings (slightly simplified from a standard datasheet provided by KVW) were distributed among 30 Gambian observers who were preparing to board fishing vessels from South Korea, Taiwan and Japan, for monitoring of takes. Photocopies of drawings of whales and dolphins, waterproofed in polyethylene folders, were also distributed. Information on both sightings and by-caught animals was solicited. A first group of 15 observers were out at sea during June 1998. However, only four completed datasheets were returned. A wide lack of understanding on how to fill out the datasheets as well as problems with identification is apparent. Moreover there exist a need for instruments, especially binoculars, thermometers and compact cameras (Gabidon, pers.communication to A. Jallow, September 1998). While Jallow organised another briefing with observers about to embark for three months, the observers unanimously expressed the need for further training. Sessions with slides and videos to illustrate distinct field characteristics, behaviour and group size are required and could be implemented during a next phase.

Considerable fine-tuning will be necessary before untrained observers, especially due to the very high replacement rate of observers, can gather useful information. Most are contracted only once and there is little incentive in collecting cetacean data. Most importantly at this stage, the exercise builds awareness about the presence of marine mammals in Gambian waters and their role in the ecosystem.

2.3. Incidental and directed takes

On 31 October 1997, KVW, PM and AJ convened an informal meeting with Mr. Amadou Saine and another fisheries officer at the Fisheries Department, Ministry of Agriculture and Natural Resources to discuss monitoring for cetacean by-catches. To date the Fisheries Department holds no cetacean by-catch data for any fishery, domestic or foreign, but the proposal to have Gambian observers to inspect landings for cetaceans would be given due consideration.

During the early 1950's a number of live bottlenose dolphins were captured in shark nets 3-4 miles off the coast at Gunjur. Six specimens (Table 5) are kept in the marine mammal collection of the US National Museum of Natural History (Dr. J.G. Mead, pers. communication to KVW). Reportedly a renewed interest in shark fishing for Asian markets, mostly for shark fins, is developing in the Gunjur area.

Reported cases of intentional takes are rare because, as in Senegal, catches are illegal and difficult to detect. However circumstantial evidence implies that at least a few small cetaceans are hunted. A credible source (name withheld) reported on a `large dolphin´ that was killed off Gunjur in 1996. It was flensed *in situ* and locals took the meat for food. A dolphin, probably an Atlantic hump-backed dolphin, was taken off Niumi National Park on 25 October 1996 and utilized by the fishermen (Fig.14). Other collected data are presented below.

2.4. Other potential threats

The commercial harvest of fish and squid species which are principal prey items for small cetaceans can put significant pressure on both prey and cetacean populations (Beddington, 1984; Trites *et al.*, 1997). Bonga fish (*Ethmalosa fimbriata)*, a popularly marketed fish in The Gambia, has been found in the stomach of a bottlenose dolphin captured off Gunjur (USNMNH data), but whether it is commonly or only occasionally preyed upon is unknown. Mullet (*Mugil* spp.), a major prey item for inshore *T. truncatus* off Mauritania (Robineau and Vely, 1998) as well as in other ocean provinces, is also sought after in The Gambia.

Fishermen and dolphins utilize some of the same fish species in the Gambia River. With the advent of the dry season, wedges of dense seawater penetrate higher upriver and with it, as yet undetermined, stenohaline marine fish species. The appearance of bottlenose dolphins upstream in the narrow channels (see Table 6) reportedly alerts local fishermen to the return of marine fishes with rising salinity at the start of the dry season.

3. FIELD RESEARCH

3.1 Beach surveys for strandings

Throughout the project period participants inspected beaches for strandings on an opportunistic basis. Below we summarize only major dedicated beach-combing effort (by KVW, unless indicated otherwise).

Atlantic Ocean coast

- Leybato Point: on 30 October and 2 November 1997 beaches were inspected from Leybato Point in both northerly and southerly directions. No cetacean remains were found but huge amounts of dead fish littered beaches, most likely discarded, judging from the uniformly small size of the fish. Wasteful fisheries also seem to be a problem here.
- Fajara Point: on 9 November 1997, KVW thoroughly checked the southern beach over at least 10km, but no cetacean material was found.
- Bijol Islands: beaches searched by KVW, PM and AJ on 3 November 1997; no cetacean remains. A skull of each *S. clymene* and *T.truncatus* had been found in 1995-96 (Murphy *et al.*, 1997).

Gambia river

- Albreda: a fishing village situated on the river's north bank. A thorough inspection of beaches at and around the Albreda landing site for fishing boats on 8 June 1998 yielded skeletal remains of two, possibly three, individuals of bottlenose dolphins (see below).
- James Island: on 8 June 1998 KVW searched the pebble beaches of the island but nothing was found.
- Dog Island: shores checked on 5 November 1997; no cetacean material encountered.
- Kiang West National Park: KWNP park rangers are instructed to gather any bones they may find on the Gambia river shores of the park. No finds have been reported so far.

3.2 Dolphin sightings

3.2.1 Kiang West National Park

The Kiang West National Park (KWNP) is situated more than 80 km upriver on the south bank of the Gambia River. Park manager AJ and KVW searched parts of the riverine habitat (31/10/97 - 01/11/97) but no cetaceans were seen. Interviews with park rangers and locals indicated a seasonal presence of bottlenose dolphins in the tidal creeks. In the dry season, from December to March, when a minimum flow of fresh water (rainy season normally ends in October) leads to strong seawater intrusion and high salinity, dolphin groups of up to ca. 25 individuals appear, even in some narrow creeks. Fishermen traditionally utilize the appearance of the dolphins as a cue to fish for marine fish species which in the rainy season fail to

penetrate upstream. Park ranger Lamin Saidy registered 32 *T. tursiops* sightings (mean group size 10.41, SD 4.95; range 3-23) in the period 4 March-16 June 1998. *S. teuszii* appears to be absent from the upper Gambia river. Three *T. truncatus* were observed in the outer reaches of the Nganinkoi Bolon in May 1997 (PFM, personal observation).

3.2.2 Bijol Islands

Dolphins are regularly reported from the area around the Bijol islands off the Atlantic coast. To identify the species involved, on 3 November 1997, three observers (AJ, KVW, PM) surveyed the waters around the Bijol Islands in a 4.5m, outboard-powered polyester skiff from DPWM. Observation height was ~1.5m.

Slip Cape Point (Cape St. Mary), around north coast, Bakau, Fajara. Sea 2 Bf, open sky, excellent visibility. Large numbers of dead fish floating, presumably discarded. A small, (probably juvenile) monk seal (*Monachus monachus)* was sighted within 200m from the Bijol Islands. This endangered pinniped has repeatedly been reported around the islands (Murphy, 1997). Green turtles (*Chelonia mydas)* were abundant around the Bijol Islands, a breeding site.

Return trip. Slip 15:10h. Off Bijilo village, at some 2-3km from shore, we sighted a group of 8-9 *T. truncatus* traveling south. At least two were juveniles, but no calves were seen. Surprisingly, blows were not only heard but also seen, due to the high air humidity. With a lateral approach, dolphins first headed towards our skiff but did not close in. Photos (Fig. 7) taken by KVW are deposited at COREWAM.

3.2.3 Gambia River estuary

H. and S. Bassinet reported an unidentified whale close to Banjul in May 1982. The cetacean repeatedly lifted its flukes out of the water (Dupuy, 1983).

On 05 November 1997, three observers (AJ, KVW, PM) set out in a small skiff. Good visibility. At 11:05h slip from Lamin Lodge, shortcut through mangroves. [11:40h] leaving mangroves, crossing to north bank of Gambia River. Good visibility; [13:10h] Check laterite shore of Dog Island for possible cetacean strandings, but none found; [14:50h] Slip from Dog Island. Choppy, short waves; wind force Bf 4. No dolphins sighted during this trip.

Mrs. Ann Rivington from Cape Point (pers. communication to KVW, 03 Nov. 1997) saw over a three week period in October 1997 `large numbers of dolphins' off the north bank of the Gambia estuary and in the Masserinko Bolon (just north of Barra) from a sports fishing boat. These could either be *T. truncatus* or *S. teuszii*. Hump-backed dolphins were reliably sighted in this general area in 1996-97, i.e. off Jinack Island and off Barra Point (Murphy *et al.*, 1997).

Invited by owner Mr. Mervyn Baldwin, KVW boarded a dolphin-watching vessel, the M/V *Lady Jaserine*, on 08 June 1998 for a day trip on the Gambia River. Slip, Banjul harbour (10:00h) via Albreda, situated upriver on the north bank to James Island and back to Banjul. On the return trip, some 2nm west of James Island four large *T. truncatus* appeared briefly, traveling upriver in tight formation. The near-black colouration of the dolphins was remarkable. A few days later, AJ and KVW sighted a group of at least 10 *T. truncatus*, equally darkly coloured during a dolphin-watching sortie with a small fibreglas boat in the outer Gambia estuary. According to guide Milko Berben, dolphin encounter rate per sortie is more than 90% year-round.

3.3. Port monitoring

The fish port and terminal at Bakau (13°28'N,16°39'W) was totally renovated with Japanese development aid money in 1993. It currently serves as homeport for some 50 larger (7-15 meter) 'pirogues'. Most boats are fibreglass versions of the traditional wooden dugout canoes. Several Senegalese boats also operate out of this port for periods up to 2-3 months.

Bakau was chosen as a test port for monitoring due to its good accessibility.

02/11/97: Only bonga fish was seen landed.

04/11/97: Starting around 15:30h, a total of 14 'pirogues' returned from sea. No cetacean landings recorded. The catch consisted of bonga (predominantly), mullet and butterfish (*Stromateus fiatula).*

10/11/97: Large boats, which unload ladyfish, butterfish, barracuda, and mullet, leave port for 2-3 day trips. Smaller skiffs that return each night usually take Bonga fish, a neritic species.

From our own observations and from (cross-checked) interviews with workers at the Bakau fish market it was concluded that dolphin carcasses, even if utilized for meat, would not be openly disembarked in the port area. Gambian fishermen are conscious that it is illegal to catch dolphins. Passive monitoring of landings would not yield any reliable estimates of dolphin takes, and further comprehensive effort was discontinued. Brief visits were made over the duration of the project in order to record any significant changes, of which there were none.

On 8 June 1998, a search of the beach around the landing point of the artisanal fishing village of Albreda, situated on the north bank of the Gambia river, yielded broken skeletal remains (KVW-3041 to KVW-3044) of at least two, and possibly three *T. truncatus* individuals. Two fishermen's sons readily identified these bones as being from dolphins landed `at least once a month´. Reportedly dolphins become accidentally entangled in gillnets set for catfish, bonga and ladyfish, and are landed dead. Dolphin meat is consumed in Albreda.

4. TRAINING

4.1. Gambian cetacean working group

Since briefings on the importance of cetacean conservation during earlier visits, a cordial working relationship has been established with the Department of Parks and Wildlife Management (DPWM). Thanks to the resolve of Chief Dr. A. Camara, cetaceans and other aquatic mammals have become an integral part of the DPWM field of competence. A. Jallow, Manager of the Kiang West National Park, and P. Murphy (research and development officer) from DPWM made up the new Gambian task force on aquatic mammals. Their senior positions unfortunately were also the reason for their many responsibilities and the limited time they could dedicate to aquatic mammals.

Informal hands-on training helped AJ and PM to identify and measure cetacean specimens. Boat sorties on both sea and river focussed on the recognition of dolphins in the wild, how to approach them with minimum disturbance, and rehearse sighting cues. Recently, park ranger L. Saidy has shown a great interest and ability for detailed observations of dolphin movements at KWNP.

A parallel interest and technical competence is being developed at the Department of Fisheries (DoF) under the guidance of Mr. Gabidon (see below). Chances are that in the course of the follow-up WAFCET-2 project a permanent Gambian cetacean-monitoring programme can be established. The recording of sightings, strandings, by catches as well as the collection of specimens could become a standard activity for fishery observers and park rangers. A long-term database would be essential for future comparative studies and trends analysis. PM distributed data forms and explained their use to a group of first-time fisheries inspectors at DoF. The absence of a university in The Gambia is the major obstacle in finding biologist candidates for specialisation in marine mammal biology. The few Gambian foreign-educated biologists like AJ are fully employed by government agencies and have little spare time to take on new tasks. Enthusiastic laymen are available but lack of knowledge of biological concepts is a major impediment for independent work. Within

DPWM, Mr. Saidy in particular has proved to be a keen observer, which shows that laymen observers without a formal biological education can contribute. It is hoped that the budding dolphin-watching business in The Gambia will attract more students.

The International Whaling Commission invited AJ to attend the Annual Meeting of the Scientific Committee at Bournemouth, UK, in September 1997. AJ presented a joint paper including preliminary information on Gambia's cetaceans (Murphy *et al.*, 1997). Future participation in IWC meetings would be highly advisable.

4.2. Commercial dolphin-watching

Commercial dolphin-watching operations conducted responsibly can be educational and contribute to enhanced awareness regarding the vulnerability of cetacean populations (Hoyt, 1992; IFAW *et al.*, 1995; Findlay, 1997).

By early 1998 at least three operators offered dolphin-watching trips on the Gambia River in pursuit of bottlenose dolphins. *PleasureSports Ltd.* is the leading company in terms of number of trips (daily), number of tourists taken out and quality. The owner Mr. Mervyn Baldwin guides daytrips on the Gambia River between Banjul and James Island with the 22m M/V *"Lady Jaserine"*. Dolphin-watching is combined with visits to sites of historical interest. *Pleasuresports Ltd.* also operates a small outboard-powered boat dedicated to dolphin-watching (mostly *T. truncatus*) in the outer estuary of the Gambia River and can take ten persons. KVW boarded both craft to evaluate potential disturbance. Boat drivers approached dolphins cautiously and showed a great personal concern for their welfare. Moreover, Mr. Baldwin records the location and time when dolphins are encountered (see Table 7), which makes it a useful reference dataset for future dedicated research on diurnal and seasonal movements, as well as area utilization. Bottlenose dolphins are present year-round from the mouth of the river up to at least James Island. Hump-backed dolphins are occasionally sighted in the outer estuary.

Lamin Lodge, near Abuko Reserve, also organizes dolphin-watching day-trips on the Gambia River, typically to Dog Island. *T. truncatus* often congregate around Dog island, presumably because of extensive tidal rip-wave action just south of it, facilitating foraging. A third, unnamed, operator based at Denton Bridge yachting harbor, offers dolphin trips on an *ad hoc* basis besides the usual sports-fishing trips. The latter two have not yet been evaluated. Presently most dolphin-watchers are foreign tourists, but Gambians who can afford the ticket have also showed interest. Potential may exist for commercial whale-watching. Unidentified, small to medium-sized whales, possibly minkes, are regularly reported by fishermen ca. 10km due west from Sanyang (Murphy *et al.*, 1997).

4.3. The Gambia Cetacean Reference Collection

All cetacean specimens were pooled in a single Gambian reference collection, maintained at DPWM headquarters, Abuko National Park, Serrekunda. Four delphinids are present: *Tursiops truncatus, Stenella clymene, Sousa teuszii* and *Globicephala macrorhynchus* (Table 5). During an informal meeting at DPWM in May 1998 a permanent deposit for the Gambian cetacean reference collection was debated. Options included keeping bones temporarily in a DPWM office accessible only to scientists, or stacking them on racks at the existing Abuko Park's educational centre where visitors can view them. With awareness enhancement in mind, the latter option was preferred.

GUINEA-BISSAU

1. BACKGROUND

The coastline of Guinea-Bissau, mostly low coastal plains, extends over some 350km (ca. 11°-12°N), for a total country area of 36,120 km². A prominent geographic feature, Dos Bijágos Archipelago consists of 48 islands and islets that shelter the mainland from the Atlantic Ocean. The tidal range in the archipelago varies from about 3m at neap tide to about 4.5m at spring tide. The seawater in the northern part is turbid due to the large sediment load of the Rio Gêba, whereas in the southern part it is very clear. The climate in Guinea-Bissau is tropical, generally hot and humid; the monsoonal-type rainy season is from June to November with southwesterly winds, and a dry season from December to May with northeasterly Harmattan winds. Guinea-Bissau claims a territorial seaboard of 12nm and an exclusive economic zone of 200nm.

Published information on the cetaceans of Guinea-Bissau is limited to a few papers with only three species reported so far. Reiner (1980) documented a Gervais' beaked whale (*Mesoplodon europaeus*) stranded in 1979 at an unspecified location. Spaans (1990) compared sightings of *T. truncatus* (n=13) with *S. teuszii* (n=56) from inshore areas. Bottlenose dolphins concentrated in the Canal do Gêba in turbid water, while Atlantic hump-backed dolphins frequented the more sheltered parts of the area in both turbid and clear water. Sequeira and Reiner (1992) presented selected external and cranial measurements and stomach contents for a single hump-backed dolphin.

Krömer *et al.* (1994) found that *S. teuszii* and *T. truncatus* are seen in the Rio Grande de Buba (RGB) upstream to the confluence of the Rio Sahol. Large concentrations of observations were recorded on the confluence of the rivers Buba, Fulacunda and Empada, but survey effort was also concentrated there (Tous, 1997). Most groups of *S. teuszii* consisted of 2-4 animals but could contain up to 12 individuals when foraging. Interestingly, some mixed schools with *T. truncatus* were reported, both at low and high tide, but juvenile hump-backed dolphins may be mistaken for bottlenose dolphins. The latter species appeared less abundant in the Rio Grande de Buba (a fjord-like sea arm) where a few dozen Atlantic hump-backed dolphins are known to reside (Tous, 1997).

2. FISHERIES INTERACTIONS

2.1. Legal status of cetaceans in Guinea-Bissau

Further research of legal documents is required, but reportedly no national management legislation that deals specifically, or covers implicitly, the conservation of cetaceans in the waters of Guinea-Bissau exists. Nonetheless, personnel at the Centro de Investigaçao Pesquera (CIPA, Ministry of Fisheries, Bissau) were convinced that cetaceans are legally protected in their country. Guinea-Bissau, as a Party to the CMS Convention since 1995, subscribes to the conservation of migrating wild animals, including cetaceans in EEZ waters.

2.2. Marine fisheries off Guinea-Bissau

The artisanal fishery includes 400-750 'pirogues', dispersed in the mangrove channels along the coasts; it is essentially a subsistence fishery for shrimps and pilchards (Maigret, 1994a). In 1988, 135 trawlers, 11 tuna seiners and 45 tuna liners, all foreign, worked the coastal waters but not year-round. Catches included 91,300 MT pelagic fish, 36,000 MT demersal fish and 2,600 MT tuna (Maigret, 1994a).

Well-equipped 'artisanal' fishermen from northern Senegal operate from large 'pirogues' in Guinea-Bissau waters (Tous, 1997). Foreign fishermen usually have

much less interest in the conservation of local marine resources and, generally, a penchant for over-exploitation of fish stocks. By comparison, some indigenous ethnic groups like the Bijagó and Balante from the Dos Bijágos Archipelago exhibit a strong religious (animist) attachment to their natural environment (Tous, 1997), an attitude which acts so far as buffer against the mainstream policy of fast, depredatory exploitation.

2.3. Incidental and directed takes

A 190cm male *S. teuszii* was by caught in a fishing trap at Canhabaque Island, Bijagós, in March 1989 (Sequeira and Reiner, 1992). According to CIPA personnel (pers. communication to KVW) no other specific cases of incidental takes have been reported in Guinea-Bissau, which agrees with Maigret (1994). However it would be ill-advised to interpret this as an indication that no regular by-catches take place. Most likely these go unreported due to the lack of a systematic monitoring scheme. Presently such a scheme seems unfeasible, being too costly and complicated to operate due to the peculiar geography of the country and its precarious socio-economic situation. Nevertheless, it is recommended that reporting of anecdotal observations of by-caught dolphins be requested from all field workers active in fisheries and marine projects. An appropriate institution in Bissau, capable and willing to gather, edit and store such data may be agreed upon. CIPA and IUCN-Bissau office seem obvious candidates. Once a baseline assessment has been made, and in case levels of incidental takes would necessitate further action, a more structured monitoring protocol adapted to local reality, could be formulated.

There are no cited incidences of directed catches for Guinea-Bissau in the literature (see Maigret, 1994). With planned fieldwork curtailed by the 1998 war, it is still an unanswered question whether any dolphins are taken directly, also due to low fisheries observer coverage. It is likely that Senegalese fishermen which operate in Guinea-Bissau waters at least occasionally take dolphins, as they do on domestic fishing grounds.

3. NARRATIVE OF ACTIVITIES

3.1. Coordinating efforts

Unfortunately the timing of the present project coincided with political instability and civil war. Two of us (AJ and KVW) made a brief visit to Guinea-Bissau 6-8 November 1997, traveling overland from Banjul in an official (DPWM) vehicle. The Casamance was fully militarized and at the frequent roadblocks, Senegalese military personnel urged a speedy return trip from Bissau because safe passage was compromised.

In Bissau, meetings were held with Mrs. Louisia Cassama Ferreira, chief of the Centro de Investigaçao Pesquera (CIPA, Ministry of Fisheries), with CIPA biologists Mr. Paulo Insali and Mr. Amadeu Mendes de Almeida and with Mr. Philippe Tous of the IUCN Regional Office. The aims of the project were explained and possible collaborative activities explored. Mr.Tous, IUCN officer for marine projects, agreed to act as the on-site coordinator for cetaceans in Guinea-Bissau and the project's ad interim local contact as long as no Guinean counterpart could be identified.

Several CIPA-IUCN joint aquatic environment and fisheries projects were scheduled to start in the first half of 1998 and it was hoped for opportunities to actively collect cetacean data. By far the main problem was the unavailability of a Guinea-Bissau biologist/student. CIPA biologists already had to cope with very demanding workloads (L. Cassama Ferreira, pers. comm.). Mr. António Araújo, IUCN technical assistant for National Parks, described the difficult (and costly) access to the Dos Bijágos Archipelago due to their remoteness, but added that in principle IUCN Bissau was prepared to cooperate with the aims of the WAFCET-1 project.

A meeting was convened with Portuguese researchers Dr. Francisco Reiner and Mr. Giorgio Caporin (Projecto Delfim, Centro Portugues para o Estudo dos Mamiferos Marinhos), who were in Bissau to set up a study of the behaviour and photo-identification of Atlantic hump-backed dolphins in the Bijagos Islands. To avoid duplication of effort, it was decided not to initiate a separate effort in the archipelago now but rather wait for preliminary results. Reiner stated that monetary restrictions in Projecto Delfim did not allow him to contract local biologists for training.

The original plan to carry out fieldwork during KVW's second field period (May-June 98) had to be cancelled due to civil war. Until March 1999 the political situation had not yet stabilized.

3.2. Surveys

Most of the coastal area of Guinea-Bissau is covered with thick mangrove forest which hinders surveying for strandings; shores are best explored from a boat. Strandings, while they occur (Tous *et al.*, 1997), seem to be rare or at least are rarely detected. No boat surveys were carried out for the reasons stipulated above. In 1995, a Spanish bridge engineer reported (pers. communication to KVW, 14 September 1995) to see dolphins 'almost daily' at the Ingore (Rio Cacheu) and Bulla ferry crossings, where he had worked for more than two months. From opportunistic sightings in 1995 (Table 8) it appears that both *T. truncatus* and *S. teuszii* are still commonly present in coastal waters of Guinea-Bissau much as in 1986-87 (Spaans, 1990), especially in the Rio Caciné and Rio Grande de Buba.

4. RESEARCH AND AWARENESS BUILDING

4.1. Establishment of a cetacean working group

Philippe Tous (PT) volunteered to act provisionally as contact person for cetacean reports in Guinea-Bissau and to keep KVW informed of any opportunities that arise to form a working group on cetaceans or of potential local trainees. IUCN's marine programme (IUCN, 1997) permitted PT to regularly spend time in coastal areas. He perused his and others' field notes and compiled information on dolphin sightings gathered on an *ad hoc* basis over the last few years (Table 7). As in most of West Africa, volunteer work is impractical because of the precarious socio-economic situation of many. Therefore we consider it premature to set up a local cetacean working group, unless substantial funding becomes available.

As in The Gambia, there are no universities in Guinea-Bissau. We were unsuccessful in locating a Guinean biologist to be trained in marine mammal research. CIPA biologists Paulo Insali and Amadeu Mendes de Almeida expressed interest but admitted to an excessive current workload. The very few Guinean biologists in the country are equally fully employed being in demand because of the need to recoup the investment in their studies overseas. Moreover, they command salaries beyond the budget of this project. Considering the fast development in fisheries, other marine biologists, perhaps from other WAF countries, may become interested in marine mammals.

4.2. Dolphin/whale-watching operations

No formal dolphin ecotourism has been organised in Guinea-Bissau, but the potential clearly exists, especially for dolphin-watchers wishing to see the rare Atlantic hump-backed dolphin. If volume is controlled and guidelines to properly approach cetaceans are installed and respected, dolphin- watching tours could be educational and probably economically viable.

DISCUSSION

1. STATUS OF THE ATLANTIC HUMP-BACKED DOLPHIN

Evidence gathered during WAFCET-1 and preparatory fieldwork since 1995 (Van Waerebeek *et al.*, 1997) confirms that the concern by CSG/IUCN for the conservation status of the Atlantic hump-backed dolphin (Reeves and Leatherwood, 1994) is fully warranted, especially with reference to the population in Senegal and The Gambia. Conservation status in Guinea-Bissau appears to be better, indeed inshore fisheries and human disturbance have not reached the levels found in Senegal and The Gambia.

According to Jefferson *et al.* (1993) *Sousa teuszii* is found primarily in estuarine and coastal waters, and 'some hump-backed dolphins inhabit rivers, such as the Niger [no supporting evidence], but it is not known if there are separate freshwater populations'. The concept of riverine distribution of *S. teuszii* is commonly expressed (e.g. Jefferson *et al.*, 1993; Newton, 1998) and initially it led us to believe that the numerous verbal reports by fishermen and locals of regular dolphin sightings in the large Casamance and Gambia rivers were attributable to *S. teuszii*. Observations have established that the large majority of these sightings refer to *T. truncatus*. Commercial dolphin-watching operations in the Gambia River rely almost exclusively on the presence of bottlenose dolphins. Neither are there any indications for the presence of *S. teuszii* in the Senegal River. It is doubtful that separate freshwater populations exist.

The situation in the Saloum delta and the outer estuary of the Gambia River, and especially its north bank, where hump-backed dolphins are confirmed, is unclear. Maigret (1981) found that hump-backed dolphins move inshore with the rising tide to feed in the mangrove channels of the Saloum delta, returning towards the sea with ebb tide. In 1998 despite several boat sorties in the Saloum estuary we did not sight *S. teuszii*, but effort need to be increased. Dolphin sightings reported by laypersons cannot be assigned to species with certainty due to relative morphological similarity between *S. teuszii* and *T. truncatus* (see below).

The most recent indication that *S. teuszii* still occurs in the Saloum delta dates from November 1996 when we discovered three carcasses, obviously manipulated by fishermen, close to each other on a beach of Sangomar island (Van Waerebeek *et al.*, 1997). Off the north bank of the outer Gambia estuary, four reliable sightings of *S. teuszii* were made in 1996-97 near Djinack Island (also spelled Jinack, Ginack), Barra Point and Buniada Point (Murphy *et al.*, 1997). The distribution centre for Senegambia's principal *S. teuszii* population apparently encompasses the Delta du Saloum, part of which is National Park, south 15km to Gambia's Niumi National Park on the north bank of the Gambia River estuary. Future work should concentrate here. It is likely that at least some individuals move in the area between the north bank of the Gambia river and Guinea-Bissau: a skull was recovered at Sanyang Point, some 30km south of the Gambia estuary (Table 5), but the extent of such movements need to be investigated.

In the many sea arms and river estuaries of Guinea-Bissau, the least disturbed area, hump-backed dolphins may still occur in healthy numbers, although there is no population estimate and fisheries have also started to diversify and expand rapidly. To the north, in Mauritania, a small but apparently viable population of *S. teuszii* occupies the coastal waters of the Parc National du Banc d'Arguin (Robineau and Vely, 1998). Some specimens are encountered in between the known distribution centres and some gene flow hopefully takes place. There is no information for other areas of the species' presumed range (Guinea-Conakry

south-east to Cameroon and beyond). Exploratory work in Ghana and Togo by scientists of the Water Research Institute (Achimota, Ghana) has yet to encounter *S. teuszii* (Van Waerebeek and Ofori-Danson, 1999). No recent information is available for other parts of the Gulf of Guinea.

While the estuarine environments of the Saloum Delta and Gambia River are still relatively unpolluted, whether or not measures to reduce mortality in fisheries and to minimize habitat disturbance can be installed and implemented may determine the fate of this population and perhaps even the species (Murphy *et al.*, 1997; Van Waerebeek *et al.*, 1997).

2. TAXONOMY OF COMMON DOLPHINS FROM WEST AFRICA

Progress in the study of the taxonomic status of common dolphins *Delphinus* spp. from West Africa has been slow. Review and study of the IFAN specimens was repeatedly postponed for technical reasons. So far 60 skulls of common dolphins from Senegal have been examined at IFAN-UCAD and the Musée de la Mer. Numeric data are being digitized. In addition, 13 skulls were studied at the Zoölogisch Museum, University of Amsterdam[1]. At least another 25 measurable common dolphin skulls are in storage at Gorée Island, but these specimens require more than a superficial cleaning job as they have been stored unattended for some 35 years. Additional specimens were studied at the US National Museum of Natural History (Smithsonian Institution, Washington DC). An important sample is available at the Fisheries Institute of Nouakchott, Mauritania (Ould Samba Ould Bilal, 1997).

A preliminary study of a subsample demonstrated the occurrence of both long-beaked *D. capensis* and short-beaked *D. delphis* common dolphins off West Africa. The discriminatory value of the differing morphology of the palatine bone was documented (Van Waerebeek, 1997). Both species of common dolphin occur in Senegal waters, but *D. capensis* is the predominant species in artisanal fisheries by-catches. The high concentration of long-beaked common dolphins in cold, coastal upwelling water of the Peru Current (Van Waerebeek, 1993; Van Waerebeek *et al.*, 1994 a,b) suggests that densities of long-beaked common dolphins in the cool Canary current off central and northern Senegal, Mauritania and Western Sahara/southern Morocco may also be high. Short-beaked common dolphins probably are widely distributed in the offshore eastern tropical Atlantic.

3. TECHNICAL PROBLEMS ENCOUNTERED

3.1 Hiding of by-caught specimens

In many coastal developing countries by-caught cetaceans are utilized for human consumption (IWC, 1994). During this survey the principal impediment to estimate catches consisted in the absence of dolphin carcasses from fish landing and processing sites, despite abundant indirect evidence of takes and utilisation. This situation leads to several practical problems: (i) unless cetaceans are openly landed and handled, by-catch levels can not be quantified through the monitoring of landing sites; (ii) the primary source for biological samples is unavailable; (iii) authorities are led to believe captures are rare or even non-existent, so there is no incentive for investigation or specific management measures. Especially in Senegal, fishermen go to great lengths in hiding captured dolphins and their products. While cetacean meat is utilized, offal is either dumped at sea or buried on secluded beaches. The illegality of dolphin captures is widely known and fishermen may fear punitive actions and seizure of their catch by fisheries officers, though in practice offenders have not been prosecuted.

As an initial future strategy (recommended below), the national

[1] One skull originates from the BM(NH), London.

monitoring and data recording systems should be actively involved to gather information on marine mammal catches. Even if only a fraction of actual catches will be uncovered, any information will be valuable. It can provide a relative measure of catch volume and composition; indicate problem gear (interactions), fishing grounds and seasons. Finally it may aid in the design of an improved monitoring scheme.

Admittedly, the only workable monitoring scheme to totally circumvent the non-reporting predicament is the deployment of well-trained, independent observers (see Northridge, 1996) who board fishing boats, both industrial and smaller craft, determine actual fishing effort and simultaneously record cetacean by-catches. At least some of the specimens should be brought to port but if there are shipboard space limitations, selected samples and photographic evidence can be taken offshore. The determination of by-catches per unit of effort (CPUE) can then be extrapolated to total fishing effort by the entire fleet in order to estimate total mortality.

3.2. Shortage of local biologists

The unexpected difficulty to identify biologists and students in The Gambia and Guinea-Bissau to contribute to the project seriously interfered with project implementation. Clearly the absence of universities in these countries is an important, but not the only, factor to blame. Volunteers are not an option because people do not have the resources to volunteer labour as in industrialised countries.

In The Gambia, despite strong support from the leaders of DPWM and the Fisheries Department, only a single Gambian biologist (AJ) was able to dedicate some limited time to aquatic marine mammals from his otherwise full-time responsibilities as park manager. In the future the problem may be partially solved by training motivated park rangers who can then assume particular survey assignments. Still, a full-time cetacean investigator is not at hand. In Guinea-Bissau the situation was even worse, no autochthonous candidate investigator was available. There was no other option than to invite French biologist Philippe Tous (at IUCN-Bissau) to act as an interim contact on cetacean matters until a G-Bissauan national could be identified. The search was suspended in 1998.

3.3. Problems of species identification

Reliable sighting information on Atlantic hump-backed dolphins was considerably harder to obtain than anticipated. Confusion between this species and the coastal bottlenose dolphin, because of their general similarity in morphology and shared habitat, proved an obstacle in evaluating sightings by collaborators and lay observers. Casual sightings could rarely be assigned to species unless the observers had received dedicated instruction and had gained supervised field experience.

3.4. Delays in communication and transfer of funds

Communication between field researchers and the principal investigator, not unexpectedly, was a major challenge and a source of multiple delays. For instance, faxes rarely reached the intended recipient in a timely manner; field workers were out of reach and any modification of plans required sending personal messengers. Several collaborators did not have access to a phone at home. For long-distance communication difficulties multiplied. While recent e-mail access at institutes like DPWM, IFAN and IUCN-Bissau has improved the potential for good communication, Internet usage is typically limited to a single computer (often down) in the head office in the capital city. E-mail messages were often lost or not delivered to the recipient by the postmaster. It is expected that efficiency will gradually improve as Internet provider service improves and people adapt to this novel medium. Another major problem consisted of excessive delays, up to 3-6

months, in the cashing of cheques in local banks. Future money transfers should be by telegraphic wiring or by cash payment.

3.5. Calamities

During much of the project period, unpredictable fighting in Senegal's Casamance province made it practically off-limits for field research. Anti-personnel mines were reported to be abundant in off-road areas and locals avoid interactions with outsiders. In 1998 field activities in Guinea-Bissau had to be cancelled due to civil war.

A hut was rented in the fishing village Djiffer for temporary deposit of cetacean specimens recovered during beach surveys along Senegal's Petite Côte. Apart from being economical, skeletal material could be deposited without the need for immediate cleaning. However, in January 1998 a disastrous fire destroyed a substantial part of the village including our hut and more than 20 cetacean specimens. In the future new material should be more speedily transferred to a safe deposit.

4. RECOMMENDATIONS

4.1. Conservation status of the Atlantic hump-backed dolphin

i) No abundance estimates are available but circumstantial evidence from small boat surveys, stranded remains and fishery monitoring indicates that the Atlantic hump-backed dolphin, while still present, has become a rare species in Senegal and Gambian coastal waters.

ii) The ranges and habitat of the Atlantic hump-backed dolphin in Senegal and The Gambia were found to be considerably more limited than previously assumed and does not, or not anymore, include true riverine habitat. All dolphins positively identified in the Gambia and Casamance rivers (excluding the outer estuaries) have been *Tursiops truncatus*.

iii) Firm evidence showed that by-catches in artisanal fisheries kill unknown numbers of Atlantic hump-backed dolphins in central Senegal and in The Gambia.

iv) Artisanal fishing effort, which has dramatically increased over the past decade both in the number of fishermen and boats, and advancing coastal development which may result in a fractured range with partial reproductive isolation, probably are the most serious threats to the species long-term survival.

v) The waters that comprise Senegal's Saloum Delta (including Siné, Saloum, Diombos, Bandiala and Djinack) and creeks of The Gambia's Niumi National Park as well as the outer estuary of the Gambia River, may constitute the species' only distribution refuge of significance in these countries;

vi) Monitoring of a dolphin fishery on the coast of Ghana (Van Waerebeek and Ofori-Danson, 1999) has not produced any evidence for the occurrence of Atlantic hump-backed dolphin and in fact no positive records have been reported from the entire Gulf of Guinea over the past decade.

It is therefore strongly recommended that *Sousa teuszii* (Kükenthal, 1892) be firmly maintained on Appendix II of the Convention for the Conservation of Migratory Species of Wild Animals. If future work confirms the precarious status of the species, an Appendix I listing may be necessary.

4.2. On Ratification of CMS the Convention

Considering that,

The Gambia has not yet ratified and that Senegal has both signed and ratified the Convention on the Conservation of Migratory Species of Wild Animals;

The Gambia's Department of Parks and Wildlife Management as well as the Fisheries Department have over the past few years paid considerable attention to the by-catch problem, and generally to the

conservation status of cetaceans and other aquatic mammals within The Gambia jurisdictional waters;

The trans-national protection of Atlantic hump-backed dolphins moving between waters of the Gambian Niumi National Park and contiguous Parc National du Delta du Saloum would be highly advantageous to the conservation of the species. These combined areas may be the principal, and perhaps only remaining, home range of this rare marine mammal in the Sene-Gambia region;

Therefore, it would be desirable for The Gambia Government to consider proceeding with the accession process of the CMS Convention as to ensure maximum protection for *Sousa teuszii* and other endangered migratory species of marine and terrestrial wildlife.

4.3. On commercial dolphin and whale-watching

- Unregulated commercial whale and dolphin-watching on several locations in the world, *inter alia* in the Canary Islands and the Azores, have created unacceptable disturbance which can lead to increased stress, morbidity and mortality.
- Commercial dolphin-watching on the Gambia River is now firmly established and is gaining in popularity.
- Although the current market leader is operating responsibly, when other companies will join this ecotourism boom it will inevitably lead to increased boat traffic with a concomitant increased risk for harassment and threat to the population(s).
- If properly conducted, dolphin-watching can be a welcome form of ecotourism and a genuine educational experience.

It is recommended that a licensing scheme of tour operators, a code of conduct and a control system be developed before any conflict situations take root. A draft code of conduct produced by DPWM and published in Gambia's *Daily Observer* may be officialized.

4.4. On fisheries monitoring

It is recommended that the official fishery monitoring systems in Senegal and The Gambia which through its nation-wide observer scheme gather statistics on fin-fish and mollusc landings, would actively seek information on (by)catches of cetaceans. Considering that extant national observer schemes are well organized and have a broad coverage, even occasional note-taking on aquatic mammal catches could yield very useful information. The option of permitting (even encouraging) by-caught cetaceans to be landed, either as a permanent measure or for a predetermined test period, under the condition that they are properly declared to fisheries authorities, deserves consideration. A simultaneous biological data collection programme should be operative. Carcasses would have to be permitted to be utilized locally but not traded out of town. Such a scheme could shed light on current catch compositions, provide much needed samples for research and lead to further improvements in catch data gathering. Observers are more likely to acquire useful information on by-catches and use of cetacean products if they are related to the community or at least conversant in the local language.

Beach combing conducted on foot is an efficient and economical method to search for stranded cetacean remains, especially partially visible, small, broken or isolated bones. In comparison motorized beach surveys, while fast, are biased towards large species and fully exposed specimens, besides the high operation costs of a vehicle.

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Table 1 (A). Catalogue of cetacean specimens at the Institut Fondamental d'Afrique Noire (IFAN), Universite Cheikh Anta Diop (UCAD), Dakar.

SPECIES	CAT. N0.	SPECIMEN	D	M	Y	COLLECTOR	LOCALITY	CIRC.	CRA.MAT	COMMENTS
Balaenoptera acutorostrata	93-17	calvaria	15	7	1986	A.A. Djiba	Beach of Mbao	bpu	neonate	bullae L. 80mm, R. 79mm; no nasals, skull in pieces
Balaenoptera acutorostrata	15?	calvaria					Senegal?		neonate	not catalogued; nasals broken
Balaenoptera acutorostrata	78-1	R.mandible, maxill., occip.	21	10	1977	A.R.Dupuy	PNLB, islet		neonate	small baleen cf.minke FO/77/10
Balaenoptera acutorostrata	none	~20 small, cream-colored baleen			?	?	unknown		?	in bag; whitish fringe; "B.physalus", 42mmx72mm
balaenopterid	none	partial calvaria								
unidentified delphinid	SN6	left rib								no data
Delphinus ?	SN5	mandibles								no data
Delphinus capensis	77-90	calvaria (partial), teeth	23	3	1977	A. Djiba/Maigret	Yoff	bpu	adult	cranial box broken; almost trapezoid palate
Delphinus capensis	77-106	skull, teeth	5	6	1977	Toure	PNL Barbarie		adult	good condition; lanceolate palate
Delphinus capensis	93-12	calvaria		12	1979	Y.Prevost	Kayar - Mboro		adult	rostrum base damaged; pseudo-lanceolate palate
Delphinus capensis	81-1	calvaria		2	1981	PNS personnel	PN du Saloum	bpu	adult	damaged rostrum; lanceolate palate
Delphinus capensis	81-7	calvaria		2	1981	PNS personnel	PN du Saloum	bpu	adult	good condition; lanceolate palate
Delphinus capensis	81-3	calvaria		2	1981	PNS personnel	PN du Saloum	bpu	adult	good condition; lanceolate palate
Delphinus capensis	81-6	calvaria		2	1981	PNS personnel	PN du Saloum	bpu	adult	good condition; pseudo-lanceolate palate
Delphinus capensis	81-8	calvaria		2	1981	PNS personnel	PN du Saloum	bpu	adult	good condition
Delphinus capensis	81-5	calvaria		2	1981	PNS personnel	PN du Saloum	bpu	adult	good condition; pseudo-lanceolate palate
Delphinus capensis	81-9	calvaria		2	1981	PNS personnel	PN du Saloum	bpu	adult	good condition; pseudo-lanceolate palate
Delphinus capensis	81-10	calvaria		2	1981	PNS personnel	PN du Saloum		subadult	rostrum tip broken; lanceolate
Delphinus capensis	81-12	calvaria		2	1981	PNS personnel	PN du Saloum		adult	moderate condition; pseudo-lanceolate
Delphinus capensis	81-11	calvaria		2	1981	PNS personnel	PN du Saloum		adult	pseudo-lanceolate palate
Delphinus capensis	81-4	calvaria		2	1981	PNS personnel	PN du Saloum		adult	good condition; lanceolate palate; classic D.capensis
Delphinus capensis	93-6	calvaria			1993?	PNLB personnel	PNLB	bpu	adult	"Sotalia sp."; good condition; lanceolate palate
Delphinus capensis	93-15	calvaria			1993?	Y.Prevost?	Kayar - Mboro	bpu	adult	slightly damaged; lanceolate
Delphinus capensis	93-16	calvaria			1993?			bpu	adult	damaged rostrum; lanceolate
Delphinus cf. capensis	81-2	calvaria		2	1981	PNS personnel	PN du Saloum	bpu	juvenile	good condition; pseudo-lanceolate palate
Delphinus delphis	77-105B	skull	5	6	1977	J. Maigret	Yoff		adult	good condition; pseudo-lanceolate
Delphinus delphis	77-105C	skull	5	6	1977	A. Djiba	Yoff		adult	good condition; pseudo-lanceolate
Delphinus delphis	77-105A	skull	5	6	1977	J. Maigret	Yoff		adult	good condition; pseudo-lanceolate
Delphinus delphis	77-105D	skull	5	6	1977	A. Djiba	Yoff		adult	good condition; pseudo-lanceolate; small alveoli
Delphinus delphis	77-105F	calvaria	8	12	1977	A. Djiba	Yoff		adult	good condition; almost trapezoid; small alveoli
Delphinus delphis	77-105G	calvaria	8	12	1977	A. Djiba	Yoff		adult	rostrum tip broken; pseudo-lanceolate
Delphinus delphis	95-11	calvaria	8	12	1979	A. Djiba	Yoff		adult	good cond.; ~ trapezoid palate
Delphinus sp.	93-13	skull	23	4	1960	J. Cadenat?	Yoff	stra	adult	220cm, female; good condition; w/teeth
Delphinus delphis	77-105b	skull, broken	5	6	1977	A. Djiba	Yoff		juvenile	in bag; in pieces
Delphinus sp.	79-110	calvaria, partial	23	2	1979	Y.Prevost	South of Dakar		Indeterm.	severely damaged, hardly usable; pseudo-lancelate palate
Globicephala macrorhynchus	77-85	calvaria	21	5	1977	J.Montelleit	Barbarie		juvenile	good condition; found "large au Barbarie"
Globicephala macrorhynchus	93-18	skull			1993	A. Djiba	Mboro beach		subadult	good condition

SPECIES	CAT. N0.	SPECIMEN	D	M	Y	COLLECTOR	LOCALITY	CIRC.	CRA.MAT	COMMENTS
Globicephala macrorhynchus	(sn1)	calvaria					Senegal		juvenile	not catalogued
Globicephala macrorhynchus	(sn2)	calvaria					Senegal		adult	not catalogued
Orcinus orca	93-19	calvaria, left mandible			1993?	A. Djiba?	Senegal		adult	
Phocoena phocoena	78-157	skull	1	6	1978	I.Toure (PNLB)	PNLB	bpu	adult	F.O. 78-18; found at village Mbao
Phocoena phocoena	79-108	calvaria	23	2	1979	Y.Prevost	Fasboue	bpu	subadult	damaged with teeth marks; 20km north of Fasboue
Phocoena phocoena	79-107	calvaria	19	2	1979	Y.Prevost	St.Louis	bpu	subadult	heavily damaged; found 10km south of city
Phocoena phocoena	79-161	calvaria	21	6	1979	Y.Prevost	Kayar - Mboro	bpu	subadult	rostrum heavily damaged
Phocoena phocoena	79-162	calvaria	23	6	1979	J. Baker/Prevost	PNLB	bpu	subadult	rostrum v. damaged (teeth marks); N. of river mouth
Phocoena phocoena	93-5	skull, stylohyale (2), teeth			1993?		PNLB	bpu	adult	dried tissue available
Phocoena phocoena	93-1	calvaria, teeth			1993?		Mauritanie	bpu	adult~	partly broken
Phocoena phocoena	93-2	calvaria			1993?		Mauritanie	bpu	subadult	rostrum heavily damaged
Phocoena phocoena	93-3	calvaria			1993?		Mauritanie	bpu	subadult	rostrum very damaged (teeth marks)
Physeter macrocephalus	78-89	bulla, small bone fragments	3	1	1978	J.Maigret	Yoff (39km N.)			"voir FO 78-1; crane en mauvais etat" (not seen)
Physeter macrocephalus	none	mandible (right), broken							juvenile	no data
small delphinid	none	lumbar vertebra (1)	27	2	1977	A. Djiba	Yoff	bpu	juvenile	"Delphinus delphis" written on it
small delphinid	SN4	backbone (incomplete)							adult	no data
Stenella sp. (*clymene*?)	79-159	calvaria	21	6	1979	Y.Prevost	Kayar - Mboro	bpu	adult	damaged rostrum; scavenger teeth (dog?) marks
Stenella sp. (clymene?)	79-158	calvaria	21	6	1979	Y.Prevost	Kayar - Mboro	bpu	adult ?	damaged rostrum, broken tip
Stenella sp. (clymene?)	93-7	calvaria			1993?	Y.Prevost	Kayar - Mboro	bpu	adult	partial calvaria; locality uncertain
Steno bredanensis	76-57	skull, postcranial skeleton	21	10	1969	M.Roy	Hann, beach	bpu	adult	collected from the beach of Hann
Tursiops truncatus	76-56	calvaria	12	8	1976	A.T. Ly?	Semmyatt		subadult	good condition
Tursiops truncatus	77-84	skull	12	3	1977	Coly	Hann beach		juvenile	broken rostrum tip; legit conservator Isle Madeleine
Tursiops truncatus	78-92	skull, teeth	15	1	1978	E.Sagna PNDS	Sangomar		adult	good condition
Tursiops truncatus	79-119	skull	30	4	1978	J.Maigret	Bandiala shore		subadult	good condition; not in catalogue; right mandible missing
Tursiops truncatus	79-101	calvaria	24	1	1979	Y. Prevost	PNL Barbarie		juvenile	moderate condition
Tursiops truncatus	79-144	skull, teeth	27	2	1979	PNDS personnel	Palmarin-Djiffer		adult	good condition
Tursiops truncatus	79-105	calvaria	23	2	1979	Y. Prevost	Fasboue	bpu	subadult	good condition; found 5km north of town
Tursiops truncatus	79-118	skull, teeth, backbone		3	1979	J. Maigret	Ile aux Oiseaux		adult	cut marks on rostrum; vertebral column F.O.79-14
Tursiops truncatus	79-160	calvaria	21	6	1979	Y. Prevost	Kayar -Mboro		subadult	good condition
Tursiops truncatus	81-14	calvaria		2	1981	PNS personnel	PNL Saloum		subadult	damaged, eroded
Tursiops truncatus	93-9	calvaria w/ teeth			1993	Y.Prevost	Kayar - Mboro		adult	good condition
Tursiops truncatus	93-8	calvaria			1993	Y.Prevost	Kayar - Mboro		subadult	good condition
Tursiops truncatus	93-10	calvaria w/ teeth			1993	Y.Prevost	Kayar - Mboro		subadult	good condition; found in between two towns
Tursiops truncatus	none	mandible w/ teeth			?		?			not catalogued; probably separated from calvaria
Tursiops truncatus	none	mandible w/ teeth			?		?			not catalogued; probably separated from calvaria
Ziphius cavirostris	SN3	calvaria			?		?		adult	calvaria, fair condition; male (cf. prenarial basin)

Abbreviations: beach pick-up (bpu); by-catch (byc); stranding (stra); Parc National Langue de Barbarie (PNLB); Parc National Delta du Saloum (PNDS).

Table 1 (B). Catalogue of cetacean specimens at the Musee de la Mer, Ile de Goree, Dakar, Senegal.

SPECIES	CAT. NO.	SPECIMEN	D	M	Y	COLLECTOR	LOCALITY	CIRC	CRA.MAT	COMMENTS
Delphinus ?	15	teeth					Senegal			teeth kept in box
Delphinus capensis	6	calvaria					Senegal		adult	palate lanceolate, large alveoli; no data
Delphinus capensis	18	calvaria				J. Cadenat	Joal	byc?	adult	palate lanceolate, large alveoli, long rostrum; DMSO sample
Delphinus capensis	21	skull	9	10	1958		Senegal	byc?	subadult	SL=195cm, 61kg, No.7; pseudo-lanceolate
Delphinus capensis	22	skull, stylohyale (2)		4	1958		"mission sud"		adult	palate lanceolate; no data
Delphinus capensis	25	skull			1950	J. Cadenat	Joal		adult	slightly damaged, palate lanceolate; cartilage in DMSO
Delphinus capensis	27	skull	3	9	1958	Doutre, STPM	Dakar ?	byc?	adult	good cond; SL=217cm, 94.8kg; pseudo-lanc; no.1
Delphinus capensis	28	skull	9	10	1958		Senegal	byc?	subadult	palate pseudo-lanceolate, large alveoli, good condition
Delphinus capensis	31	skull (long rostrum)	23	4	1960		Yoff	stra	adult	SL=219 , male, palate lanceolate, large alveoli, earbones
Delphinus capensis	32	skull					Senegal		adult	no data; good condition; palate lanceolate pal.
Delphinus capensis	35	skull	9	10	1958		Senegal	byc?	subadult	SL=198cm; 70.5kg; palate lanceolate, broad palate
Delphinus capensis	36	skull					Senegal		adult	good cond; palate lanceolate, teeth
Delphinus capensis	40	skull (long rostrum)					Senegal		adult	no data; palate lanceolate; typ. capensis; DMSO sample
Delphinus capensis	40	skull	10	7	1959		Goree		adult	palate lanceolate, long rostrum, good shape
Delphinus capensis	43	skull	30	7	1958		Senegal	cap?	adult	SL=202cm, 69.2kg; palate lanceolate
Delphinus capensis	46	skull (long rostrum)	10	7	1959		Goree	byc?	adult	SL=198cm, male; palate pseudo-lanceolate; large teeth
Delphinus capensis	54	skull	23	4	1960		Yoff	byc?	adult	SL=206cm; "(5)"; palate pseudo-lanceolate; large alveoli
Delphinus capensis	56	calvaria	23	4	1960		Yoff	stra	subadult	SL=199cm, female, lanc., large alveoli; DMSO sample
Delphinus capensis	62	skull	30	7	1958		Senegal	byc?	adult	SL=198; 75kg; palate lanceolate; DMSO sample
Delphinus capensis	65	skull					Senegal		adult	good condition; palate lanceolate, large teeth
Delphinus capensis	68	skull					Senegal		subadult	no data; palate lanceolate; broken mandible
Delphinus capensis	73	skull, hyale, earbones	10	12	1959		off Goree	cap?	adult	SL=2m, 65kg; palate pseudo-lanceolate; good condition
Delphinus capensis	76	skull					Senegal		subadult	no data, palate pseudo-lanceolate; long rostrum; large teeth
Delphinus capensis	77	calvaria					Senegal		subadult	palate pseudo-lanceolate; light skull, large alveoli; good condition
Delphinus capensis	82	skull					Senegal		adult	no data; good condition; palate pseudo-lanceolate
Delphinus capensis	83	skull	9	10	1958	J. Cadenat?		byc?	subadult	SL=183cm, 48.5kg, pseudo-lanc. no.6, large alveoli
Delphinus capensis	84	skull (long rostrum)					Senegal		adult	no data; palate pseudo-lanceolate; large teeth
Delphinus capensis	103	skull (long rostrum)	27	12	1969	M'Baye N'Daye	Yenn	byc?	adult	no data, palate lanceolate; good condition
Delphinus capensis	109	skull	17	7	1959		Goree	byc?	subadult	SL=176cm, female, pseudo-lanc., large teeth, good condition
Delphinus capensis	128	calvaria (long rostrum)					Senegal		adult	no data, palate pseudo-lanceolate, large teeth, good condition
Delphinus capensis	"85 a 101"	skull					Senegal		adult	no data; palate pseudo-lanceolate, large teeth, good condition
Delphinus capensis	44 (and 81)	calvaria (long rostrum)		6	1952		Yoff	stra	adult	partially damaged, palate lanceolate, large alveoli; "epave"
Delphinus capensis	47 (and 39)	skull (long rostrum)	31	7	1952	[unreadable]	N'Gor	byc?	adult	no data, palate lanceolate, large teeth; good shape
Delphinus capensis	6 (also 51)	skull	23	4	1960		Yoff	stra	adult	fem.; pseudo-lanc.;~broad palat; SL=207cm; good condition
Delphinus capensis	A 102	skull (long rostrum)					Senegal		adult	no data; pseudo-lanc., large teeth, DMSO sample
Delphinus capensis	(KVW-3005)	skull					Senegal		adult	no data; good condition; teeth; ex. KVW 3-06-95
Delphinus capensis	(KVW-3002)	skull (long rostrum)					Senegal		adult	palate pseudo-lanceolate, no teeth, good condition

SPECIES	CAT. NO.	SPECIMEN	D	M	Y	COLLECTOR	LOCALITY	CIRC	CRA.MAT	COMMENTS
Delphinus capensis	(KVW-3003)	skull (long rostrum)					Senegal		adult	palate lanceolate, large alveoli, some teeth, good condition
Delphinus capensis	(SN11)	calvaria	26	11	1959		off Goree		adult	SL=207cm, female, large alveoli, palate pseudo-lanceolate
Delphinus capensis	(SN13)	skull					Senegal		adult	palate lanceolate, large teeth; slightly damaged
Delphinus capensis	(SN14)	skull (long rostrum)					Senegal		adult	typ. palate pseudo-lanceolate; large teeth; good condition
Delphinus capensis	(SN16)	calvaria	9	10	1958		Senegal		subadult	SL=192cm, "no.5", pseudo-lanc. palate, good condition
Delphinus capensis	(SN17)	calvaria, partial					Senegal		subadult	no data, palate pseudo-lanceolate; bad shape; large alveoli
Delphinus capensis	(SN23)	calvaria, sawn longitud.					Senegal		subadult	no data, calv. cut longit.in half, palate pseudo-lanceolate
Delphinus capensis	(SN26)	calvaria (~short rostrum)					Senegal		adult	rostrum tip broken; palate lanceolate; damaged; DMSO sample
Delphinus capensis	(SN27)	skull					Senegal		adult	no data, long rostrum, palate lanceolate pal., good condition
Delphinus capensis	(KVW-3004)	calvaria					Senegal		adult	palate lanceolate, large alveoli; good shape
Delphinus capensis	(KVW-3006)	skull					Senegal		adult	no data; palate lanceolate; large alveoli; long rostrum
Delphinus capensis	(KVW-3008)	skull					Senegal		adult	no data; palate lanceolate (typical); good condition
Delphinus capensis	(KVW-3009)	skull					Senegal		adult	no data; palate lanceolate
Delphinus capensis	(KVW-3010)	skull					Senegal		adult	no data; palate lanceolate; good condition
Delphinus capensis	(KVW-3011)	skull					Senegal		subadult	no data; good cond; palate lanceolate, large teeth
Delphinus capensis	(KVW-3012)	calvaria					Senegal		adult	palate pseudo-lanceolate, teeth, long rostrum; good condition
Delphinus capensis	(KVW-3013)	skull (long rostrum)					Senegal		adult	palate lanceolate pal., DMSO sample; good condition
Delphinus capensis	(KVW-3014)	skull					Senegal		adult	no data; palate lanceolate, long-rostrum; good shape
Delphinus capensis	(KVW-3016)	calvaria (long rostrum)					Senegal		adult	no data, palate lanceolate, large teeth, typ.; good condition
Delphinus capensis	(KVW-3017)	calvaria (long rostrum)					Senegal		adult	no data; palate lanceolate; large alveoli, good condition
Delphinus capensis	(SN 58)	right mandibula					Senegal		adult	no teeth, good condition
Delphinus capensis	(SN 59)	left mandibula					Senegal		adult	no teeth, long rostrum, good condition
Delphinus capensis	(SN 73)	calvaria					Senegal		adult	teeth, long rostrum, palate lanceolate, good condition
Delphinus capensis	(SN 75)	calvaria, partial					Senegal		subadult	no teeth, rostrum and frontale
Delphinus capensis	(SN 35)	skull (long rostrum)					Senegal		juvenile	palate pseudo-lanceolate, good condition
Delphinus capensis	26	skull	18	8	1959	F.Paraiso	Rufisque	byc?	subadult	SL=179cm; male; almost trapezoi, large teeth
Delphinus capensis	(SN 9)	skull					Senegal		subadult	good cond; palate pseudo-lanceolate
Delphinus capensis	(KVW-3007)	skull					Senegal		subadult	prmx fully fused, not other sutures incl.FROC; DMSO
Delphinus capensis?	(SN 81)	head (mummified)					Senegal		adult?	teeth, head cut transversely; long rostrum
Delphinus delphis	63	skull	1	12	1958		Yenn		juvenile	unfused sutures, DMSO sample; good condition
Delphinus delphis	78	skull					Senegal		juvenile	no data; trapezoid palate
Delphinus delphis	(SN 7)	skull		8	1961		Yenn		juvenile	good cond; trapezoid, broad palate
Delphinus delphis	(SN 50)	mandibula					Senegal		adult	no teeth, good condition
Delphinus sp.	4	right mandible			1949	J. Cadenat	Camberene-Malika		adult	some teeth, good condition
Delphinus sp.	8	teeth (kept in box)					Senegal			good condition
Delphinus sp.	16	mandibula		7	1949	J. Cadenat	Hann			no teeth
Delphinus sp.	18	mandibula			1948	J. Cadenat	Joal		subadult	tip broken, no teeth
Delphinus sp.	20	skull				B.M'Baye Gueye	Yenn ?		juvenile	no data, ~trapezoid (or pseudo-lanceolate), slightly damaged
Delphinus sp.	29	right mandible	9	10	1958		Senegal			SL=192cm, 64.2kg
Delphinus sp.	33	calvaria					Senegal		adult	no data, palate lanceolate, short rostrum; good condition
Delphinus sp.	37	mandibula, right					Senegal		juvenile	no data, no skull

SPECIES	CAT. NO.	SPECIMEN	D	M	Y	COLLECTOR	LOCALITY	CIRC	CRA.MAT	COMMENTS
Delphinus sp.	38	mandibula	10	7	1959		Goree			SL=196cm
Delphinus sp.	47	mand.,scapulae, stylohyale	23	5	1960		Yoff	stra	adult	SL = 219cm, male; some teeth, good condition
Delphinus sp.	48	mandibula	9	10	1958		Senegal		subadult	no teeth, good condition
Delphinus sp.	57	mandibula	27	5	1958		Senegal		subadult	some teeth, good condition
Delphinus sp.	61	calvaria	27	5	1958		Senegal		adult	tissue obscures skull, "no.2"; palate not discernable
Delphinus sp.	107	mand., stern., stylo-/hyale	17	7	1959		Goree		subadult?	female, SL = 1950mm, some teeth, good condition
Delphinus sp.	112	skull	9	10	1958		Senegal	capt?	subadult	SL=185cm, 50kg; broad, palate pseudo-lanceolate
Delphinus sp.	45-20-6	left mandibula					Senegal		adult	no teeth, the anterior tip broken, bad condition
Delphinus sp.	46 (and 52)	mandibula			1952	J. Cadenat	Yenn		juvenile	
Delphinus sp.	(SN 48)	mandibula					Senegal		juvenil	some teeth, good condition
Delphinus sp.	(SN46)	mandibula					Senegal			no teeth, good condition
Delphinus sp.	(SN24)	calvaria					Senegal		juvenile	no data, palate pseudo-lanceolate, small alveoli, good condition
Delphinus sp.	(SN25)	calvaria					Senegal		juvenile	no data, pseudo-lanceolate, parallel tooth row
Delphinus sp.	(SN28)	calvaria					Senegal		juvenile	no data, ~trapezoid; long rostrum
Delphinus sp.	no number	left mandibula					Senegal		juvenile	some teeth, good condition
Delphinus sp.	(SN 47)	mandibula					Senegal		subadult	some teeth, good condition
Delphinus sp.	(SN 51)	mandibula					Senegal		subadult	no teeth, short rostrum, left tip broken
Delphinus sp.	(SN 53)	mandibula					Senegal		subadult	no teeth, good condition
Delphinus sp.	(SN 54)	left mandibula					Senegal		juvenile	no teeth, good condition
Delphinus sp.	(SN 55)	mandible (left broken)					Senegal		adult	no teeth, left mandible broken
Delphinus sp.	(SN 56)	right mandibula					Senegal		subadult	some teeth, good condition
Delphinus sp.	(SN 57)	left mandibula					Senegal		subadult	no teeth, rostrum damaged
Delphinus sp.	(SN 60)	mandibula					Sengal		adult	some teeth, good condition
Delphinus sp.	(SN 71)	skull		4	1961		Yenn		juvenile	teeth, palate pseudo-lanceolate; good condition
Delphinus sp.	(SN 72)	cranial box, partial					Senegal		adult	no teeth, no rostrum
Delphinus sp.	(SN 74)	skull					Goree		neonate	some teeth, good condition
Delphinus sp.	(SN 76)	occipital								
Delphinus sp.	(SN 77)	skull		12	1961		Yenn		juvenile	some teeth, good condition
Delphinus sp.	(SN 34)	skull (long rostrum)					Senegal		juvenile	no data; ~trapezoid; good shape
Delphinus sp.	(SN 52)	mandibula	26	11	1959		off Goree	byc?	adult	no teeth, female, SL = 207cm,
Delphinus sp.	45	skull	30	7	1958		Senegal	byc?	adult	SL=210cm; 82kg; broad, pseudo-lanceolate; large alveoli
Delphinus sp.	59	skull	3	9	1958		Senegal		adult	no data; palate pseudo-lanceolate
Delphinus sp.	71	skull, partial					Senegal		subadult	no data, palate pseudo-lanceolate; cranial box missing
Delphinus sp.	(SN 21)	skull (long rostrum)					Senegal		juvenile	no data, ~trapezoid palate; rostrum slightly damaged
Delphinus sp.	(SN 15)	skull					Senegal		juvenile	~trapezoid, teeth, fair condition
Delphinus sp. (*capensis*?)	(SN 18)	skull (long rostrum)					Senegal		juvenile	palate pseudo-lanceolate, rostrum partly damaged
Delphinus sp. (*delphis*?)	(SN 10)	skull (short rostrum)	3	9	1958	Doutre, STPM	Dakar?	byc?	adult	SL=223cm, 103.8kg; no.3; lanceolate, broad palate;small alveoli
Delphinus sp. (*capensis*?)	8	calvaria					Senegal		juvenile	no data, palate pseudo-lanceolate, good cond, teeth
Delphinus sp. (*capensis*?)	23	calvaria				J. Cadenat?	Yoff		adult	no data; palate pseudo-lanceolate; ~short rostrum
Delphinus sp. (*capensis*?)	25	calvaria, partial					Fann		adult	male, broken rostrum, "45-20-5", palate lanceolate
Delphinus sp. (*capensis*?)	42	skull, DMSO	26	6	1959		Goree	byc?	adult	SL=205cm, female, palate pseudo-lanceolate, good condition

SPECIES	CAT. NO.	SPECIMEN	D	M	Y	COLLECTOR	LOCALITY	CIRC	CRA.MAT	COMMENTS
Delphinus sp. (*capensis*?)	44	skull	3	9	1958	Doutre, STPM	Dakar?	byc?	subadult	SL=193cm; 66.2kg; palate pseudo-lanceolate; good condition
Delphinus sp. (*capensis*?)	104	calvaria, partial		9	1959		Yenn		juvenile	palate pseudo-lanceolate, cranial box broken, 1zygom.
Delphinus sp. (*capensis*?)	(SN 12)	skull		8	1961		Yenn		subadult	few data, palate pseudo-lanceolate, good condition
Delphinus sp. (*capensis*?)	(SN 19)	calvaria					Senegal		juvenile	no data, palate pseudo-lanceolate, long rostrum; damaged
Delphinus sp. (*capensis*?)	(SN 20)	calvaria					Senegal		juvenile	no data, palate pseudo-lanceolate, long rostrum
Delphinus sp. (*capensis*?)	(SN 30)	head (mummified)					Senegal		adult	occipital part broken (by fishermen?)
Delphinus sp. (*capensis*?)	(KVW3018)	calvaria					Senegal		adult	no data, ~trapezoid, small teeth; DMSO sample
Delphinus sp. (*capensis*?)	(SN 31)	head (mummified)					Senegal		adult	muscle tissue still present
Delphinus sp. (*capensis*?)	(SN 32)	head (mummified)					Senegal		subadult?	
Delphinus sp. (*capensis*?)	(SN 33)	head (mummified)					Senegal		adult	good condition
Delphinus sp. (*delphis*?)	19	skull (short rostrum)	3	9	1958	Doutre, STPM	Dakar?	byc?	adult	SL=220cm; 99.5kg; no.2; pseudo-lanceolate
Delphinus sp. (*delphis*?)	34	skull (short rostrum)	3	9	1958	Doutre, STPM	Dakar?		adult	SL=211cm, 84.1kg, pseudo-lanceolate, No.7, DMSO
Delphinus sp. (*delphis*?)	73	skull					Senegal		juvenile	no data; trapezoid palate; fair condition
Delphinus sp. (*delphis*?)	129	skull		7/8	1958		Goree-Yahr		calf	all teeth; trapezoid palate; good condition
Delphinus sp. (*delphis*?)	45 (and 106)	skull	28	1	1953	J. Cadenat	Goree?		juvenile	no data?; broad trapezoid palate; good condition
Delphinus sp. (*delphis*?)	(SN 8)	skull					Senegal		calf	trapezoid palate; good condition
Delphinus?	(SN 85)	vertebrae					Senegal		subadult	five parts, missing skull; subadult
Globicephala macrorhynchus	45-20-8	mandibula					Senegal		juvenile	no teeth, 8/8 lower alveoli; good condition
Globicephala macrorhynchus	GG 2-1	skull			1961		Yoff beach	stra	juvenile	no teeth, the mandibles broken
Globicephala macrorhynchus	(SN 63)	mandibula					Senegal		juvenile	no teeth, 8/8 lower alveoli; good condition
Globicephala macrorhynchus	(SN 64)	mandibula 8/9 alveoli					Senegal		juvenile	no teeth, good condition
Globicephala macrorhynchus	(SN 78)	skull		8	1961		Yenn		juvenile	teeth, SL = 2.20m
Globicephala macrorhynchus?	(SN 87)	teeth					Senegal			stored in box
unid. Cetacean (middle-sized)	(SN 84)	Cv.7 + 4 Th. vertebra					Senegal		adult	vertebrae only
Orcinus orca	53	teeth, from sn 61 ?		6	1948	J. Cadenat	Camberene		subadult	stored in box
Orcinus orca	(SN 61)	skull					Senegal		adult	no teeth, fairly good condition
Phocoena phocoena	(SN 22)	calvaria							subadult	SL=127cm, darkened as if saved from fire
Sousa teuszii	114	calvaria	14	7	1956		Joal		subadult	male, SL=106.5cm, 70.5kg, teeth, good condition
Sousa teuszii	115	calvaria, right mandible	10	8	1958		Joal	byc?	subadult	female, SL=191cm, 77kg
Sousa teuszii	116	calvaria		2-3	1959		Pointe Jackonsa		subadult	teeth, "no. II "
Sousa teuszii	117	calvaria		2-3	1959		Pointe Jackonsa		subadult	seven teeth , " no. I "
Sousa teuszii	118	calvaria	15	8	1958		Yene Kao		adult	no teeth, good condition
Sousa teuszii	(SN 29)	head (mummified)					Senegal		subadult?	lower 26-28, upper 30-29 teeth
Sousa teuszii	(SN 62)	mandibula					Senegal		adult?	some teeth, good condition
Sousa teuszii	(SN 65)	mandibula					Senegal		subadult	some teeth, good condition
Sousa teuszii	(SN 67)	left mandible					Senegal		subadult	no teeth; hole in ramus
Sousa teuszii	(SN 68)	right mandible								no teeth; good condition
Sousa teuszii	(SN 83)	vertebral column	10	8	1955	J. Cadenat?	Joal		juvenile	some vertebrae broken; skull missing
Sousa teuszii	(SN 88)	teeth in box					Senegal			teeth only; mistakingly referenced to Tursiops "26"
Sousa teuszii	(SN 44)	calvaria	28	8	1952		Joal	stra	subadult	no teeth, rostrum damaged on the side
Sousa teuszii?	(SN 82)	Cv., Th. vertebrae					Senegal		adult	two parts, good condition

SPECIES	CAT. NO.	SPECIMEN	D	M	Y	COLLECTOR	LOCALITY	CIRC	CRA.MAT	COMMENTS
Sousa teuszii?	(SN 86)	teeth					Senegal			stored in box
Stenella sp.	(SN 80)	head (mummified)					Senegal		adult	teeth, cut, short rostrum; 31 lower teeth
Steno bredanensis	1	skull	15	9	1958	STPM	Senegal	byc?	subadult	SL=223cm, 102.46kg, teeth
Steno bredanensis	39	left mandible	29	5	1948	J. Cadenat	Camberene		adult	some teeth, right row broken
Steno bredanensis	40	right mandibula	29	5	1948	J. Cadenat	Camberene		adult	damaged, teeth (box 7), tympanoperio. (box 6)
Steno bredanensis	41	mand., tympanoper.	29	5	1948	J. Cadenat	Camberene		adult	teeth/ tympanoperiotics in box, good condition
Steno bredanensis	"6"	tympanoperiotics	29	5	1948	J. Cadenat	Camberene			in box
Steno bredanensis	33 (8)	calvaria	29	5	1948	J. Cadenat	Camberene		adult	no teeth, good condition, det.KVW (29 V 1996)
Steno bredanensis	34 (and 7)	calvaria	29	5	1948	J. Cadenat	Camberene	stra	subadult	no teeth
Steno bredanensis	35 (4)	calvaria	29	5	1948	J. Cadenat	Camberene		adult	no teeth, good condition
Steno bredanensis	(KVW-3009)	calvaria					Senegal		adult	no data, some teeth available
Steno bredanensis	(KVW-3011)	calvaria					Senegal		subadult	no teeth, good condition
Steno bredanensis	(SN 69)	mandibula					Senegal		adult	some teeth, good condition
Steno bredanensis	(SN 69)	left mandible								no teeth; damaged
Steno bredanensis	(SN 38)	calvaria					Senegal		subadult	no data, no teeth
Tursiops truncatus	13	calvaria				J. Cadenat	Joal		adult	some teeth, good condition
Tursiops truncatus	14	mandibula				J. Cadenat	Joal		adult	some teeth, good condition
Tursiops truncatus	16	skull	10	1	1956	Derivot, Cadenat	Dakar	stra	adult	male, 3m; found between Lido and Cap Manuel
Tursiops truncatus	15 (45 - 20 - 1)	skull					Senegal		subadult	no teeth, good condition
Tursiops truncatus	26 (and 17)	calvaria			1950	J. Cadenat	Joal		adult	some alveoli damaged
Tursiops truncatus	45-20-2	right mandibula					Senegal		adult	some teeth, good condition
Tursiops truncatus	45-20-3	right mandibula					Ngor		subadult	tip broken, no teeth
Tursiops truncatus	(SN 66)	left mandibula					Senegal		adult	one tooth, good condition
Tursiops truncatus	(SN 70)	right mandible					Senegal			teeth
Tursiops truncatus	(SN 79)	skull					Senegal		adult	teeth, good condition
Tursiops truncatus	(SN 36)	skull					Senegal		juvenile	no data, one bulla
Tursiops truncatus	(SN 37)	skull					Senegal		adult	no data, "2" marked in red
Tursiops truncatus	(SN 39)	calvaria, left mandibula					Senegal		adult	some teeth, good condition
Tursiops truncatus	(SN 40)	calvaria					Senegal		adult	no teeth, damaged
Tursiops truncatus	(SN 41)	calvaria					Senegal		adult	some teeth, rostrum broken
Tursiops truncatus	(SN 42)	skull					Senegal		adult	some teeth, good condition
Tursiops truncatus	(SN 43)	skull	13	8	1958		Senegal		subadult	some teeth, good condition
Tursiops truncatus	(SN 45)	skull					Senegal		adult	some teeth in mandibles and rostrum
Tursiops truncatus	121	skull					Senegal		juvenile	25/25 lower, ~26/26
whale (sperm?)	(SN 89)	vertebrae and ribs					Senegal		subadult	~large vertebrae, unfused epiphyses; see Cadenat (1957)

Abbreviations used: standard length (SL), beach pick-up (bpu); by-catch (byc); stranding (stra). Specimens without catalogue number were assigned a new SN number, or a KVW number if a tissue sample for DNA analysis was taken. Terminology used to describe Delphinus palate morphology taken from Van Waerebeek (1997).

Table 2. Fish species of the eastern tropical Atlantic commonly taken in fisheries in Senegal, The Gambia and Guinea-Bissau, with names in Wolof and Lebou, two major languages spoken by local fishermen.

FAMILY	SCIENTIFIC NAME	WOLOF	LEBOU	FRANCAIS	ENGLISH
Sphyrnidae	*Sphyrna zygaena*	Diangué	Ndiagadaw	Requin marteau	Hammerhead shark
Carcharhinidae	*Carcharhinus signatus*	Gaïndé guedj	Mâne	Requin de nuit	Night shark
	Mustelus mustelus	Mâne		Emissole lisse	Smooth dogfish
Squalidae	*Squalus blainvillei*	Nguindagne	Thiour	Aiguillat galludo	Dogfish
Dalatiidae	*Somniosus rostratus*	Nguindagne	Thiour	Laïmargue de Méditerranée	Sleeper shark
Squatinidae	*Squatina aculeata*	Meumougnère	Mbeugne	Ange de mer	Angel shark
	S. oculata				
Pristidae	*Pristis microdon*	Sagne	Diassâne	Poisson-scie à queue échancrée	Sawfish
Torpedinidae	*Tapedo bauchotae*	Ndougne sokhor	Ndougne sokhor	Torpille ocellée	Eyed electric ray
	T. marmorata	Mbeudj mbeudiane		Torpille marbrée	Marbled electric ray
Rhynchobatidae	*Rhynchobatus lubberti*	Thiauker	Yanneu	Raie-guitare	Guitarfish
Rhinobatidae	*Rhinobatos rhinobatus*	Thiauker	Yanneu	"	Guitarfish
Playtyrhinidae	*Zanobatus schaenleinii*	Lalan	Lalan	Raie-tigrée	
Rajidae	*Raja miraletus*	Lalan	Lalan, (Yandé)	Raie-miroir	Skate
Dasyatidae	*Dasyatis margarita*	Ragntiaan	Ragntiaan	Pastenague à perle marbrée	Stingray
	D. marmorata			Pastenague marbrée	
Mobulidae	*Mobula mobular*	Ndiaoutt bedjène	Souki	Diable de mer	Devil ray
	Manta birostris		Choucounteu	Mante	Manta ray
Rhinopteridae	*Rhinoptera bonasus*	Ndiaoutt	Toumboulânn	Mourine échancrée	Cow nosed
Elopidae	*Elops saurus*	Lak	Lak	Elops du Sénégal	Lady fish
Albulidae	*Albula vulpes*	Nguignane	Nguignane	Albule ou banane de mer	Bone fish
Clupeidae	*Ethmalosa fimbriata*	Cobo	Obeu	Ethmalose	Bonga
	Sardinella aurita	Yaboï beureug	Beureug	Sardinelle ronde	Round sardinella
	Sardinella maderensis	Yaboï tass	Tass	Sardinelle plate	Flat sardinella
Engraulidae	*Anchoa guineensis*	Youssou nokoum	Ngaladâkh	Anchois de Guinée	Guinean anchovy
Tetraodontidae	*Ephippion guttiferum*	Boun foki	Reguègne	Tétrodon tacheté	Puffer fish
	Lagocephalus lagocephalus	"	"	Poissons globes	Smooth puffer
	Lagocephalus laevigatus	"	"	"	Smooth puffer
	Sphoeroides splengeri	"	"	Tetrodons	Puffer

FAMILY	SCIENTIFIC NAME	WOLOF	LEBOU	FRANCAIS	ENGLISH
	Arius heudelotii	Ank	Ngoudj	ou	Sea catfish
	Arius mercatoris	"	"	Silure	Sea catfish
Muraenidae	*Gymnothorax spp.*	Siik	Siik	Murène	Moray
	Muraena robusta	"		"	Moray
Muraenesocidae	*Cynoponticus ferox*	Dieye	Dieye	Congre-murène	Pike-conger
Belonidae	*Ablennes hians*	Soundou soundou	Khessen	Orphie plate	Flat needlefish
	Tylosurus spp	Sambassilet	Galandou	Aiguillette	
Hemiramphidae	*Hemiramphus spp*	Soun-soun	Soun-soun	Demi-bec	Halfbeak
Exocoetidae	*Cypselurus spp*	Findö	Nawane	Poisson volant	Flying fish
Fistulariidae	*Fistularia tabacaria*	Mbimbânne	Mbeumbânne	Poisson trompette	Cornet - fish
Sphyraenidae	*Sphyraena sphyraena*	Khède	Seudeu	Brochet de mer	Barracuda
	S. guachancho	"	"	"	"
	S. barracuda	"	"	Barracuda	"
	S. piscatorum		"	"	"
Mugilidae	*Mugil capurii*	Dème	Guiss	Mulet, muge	Grey mullet
	Mugil metzelari	Khir	"	"	"
	Liza saliens hoefleri	Thiap	Karamante	"	"
	Mugil bananensis	Thiar	Thiar mbekh	"	"
	Mugil cephalus	Diabaï	Guiss		"
	Mugil ashantensis				
Polynemidae	*Galeoides decadactylus*	Siket mbao	Tiekem	Plexiglass	Thread fish
	Polydactylus quadrifilis	Ndiao ndiao	Ndiané	Capitaine de mer	
Holecentridae	*Holocentrus hatastus*	Walanka		Poisson soldat	Soldier fish
Zeidae	*Zeus faber mauritanicus*	Diamou ndor	Diamou ndor	St Pierre	John Dory
Coryphaenidae	*Coryphaena hippurus*	Ndiakhssine	Kakatarou guetj	Coryphène commune	Dolphin fish
Serranidae	*Ephinephelus aeneus*	Thiof, loguer	Thiof, loguer	Mérou blanc, bronzé	Grouper
	Ephinephelus guaza	Kauthieu	Dialakh	" de Méditerranée	"
	E. caninus	Ngaïngo	Rour	" gris	"
	E. goreensis	Doï	Doï	" de Gorée	"
	Mycteroperca rubra	Yatante	Gueudj	Badèche	"
	Cephalopholis taeniops	Khonke	Kelle	Mérou rouge	Seabass
	Petrometopon migri	"	"	" à points rouges	"
	Serranus cabilla	Sopa ngane	Saliou guetj	Serran chevrette	Comber
	Serranus scriba	"	"	" écriture	Painted comber

FAMILY	SCIENTIFIC NAME	WOLOF	LEBOU	FRANCAIS	ENGLISH
	Anthias anthias			Barbier	"
	Dicentarchus punctatus	Sauroï	Silengkeu	Bar tacheté	Black spotted bass
Kuhliidae	*Parakuhlia macrophtalmus*	Dara	Dara	Croco à gros yeux	
Priacanthidae	*Priacanthus arenatus*			Beau	Atlantic bigeye
Lutjanidae	*Lutjanus fulgens*	Mame simère	Mame simère	Carpe rouge	Snapper
	Lutjanus agennes	Diabar	Yakh	"	"
	Lutjanus dentatus	Warale	"	"	"
	Lutjanus goreensis	Ndiagatoum	Ndiagatoum	Lutjan de Gorée	"
	Apsilus fuscus	Mbeureugane	Mbeureugane		
Pomadasyidae	*Pomadasys (bennetti) incisus*	Rum mbodj	Mbélé	Croco ou tambour	Grunt
	P. peroteti	Corogne khadre	Sompatt	Pristipome ordinaire	"
	P. rogerii	" tidiane	Yekem	Carpe blanche	"
	P. jubelini	"	Sompat	" "	"
	Parapristipoma octolineatum	Mbeulbeute	Mbeulbeute	Pristipome doré	"
	Brachydeuterus auritus	Faïour	Faïour	Pelon	"
	P. mediteraneus	Banda	Banda	Dorate grise	"
	P. macrolepis	Banda bou gnoul			
Emmlichthyidae	*Erythrocles monodi*	Saumon			
Gerreidae	*Eucinostomus melanopterus*	Khour khour	Kamaro	Friture argenté	Mojarras
Branchiostegidae	*Branchiostomus semifasciatus*	Banda	Banda bir guetj	Zèbre	Tilefish
Sciaenidae	*Umbrina canariensis*	Niaw nekh	Niaw nekh	Ombrine du large	Drum
	Pteroscion peli	Barale	Faïour	Friture	
	Pseudotolithus senegalensis	Feute	Feute	Otolithe du Sénégal	Croaker
	P. typus	Tounoun	Tounoun	" "	"
	P. brachygnathus	Ngoukeu	Ngoukeu	" épai	"
	Argyrosomus regius	Seukhebi	Beur	Courbine, maigre	Meager
	Sciaene umbra	Kuye	Niaw nann	Corbeau, corb	Brown meager
Carangidae	*Elagatis bipinnulatus*			Coureur arc-en-ciel	Rainbow runner
	Seriola rivoliana	Thiè	Thiè	Sériole limon	Almaco jack
	Trachurus trachurus	Diaï bou gnoul	Diaï bou gnoul	Saurel, chinchard	Common scad
	Trachurus trecae	" " "	" " "	Chinchard noir	" "
	Selar crumenophthalmus	Diaï	Nengho	" à gros yeux	Big eye scad
	Caranx rhonchus	"	Diaï	" jaune	Horse mackerel
	Caranx crysos	Cafang	Cafang	Carangue	Blue runner
	Caranx hippos	Sotto	Saka	Grande carangue	Kingfish, yellow –jack

FAMILY	SCIENTIFIC NAME	WOLOF	LEBOU	FRANCAIS	ENGLISH
	Caranx senegalus	Safar	Tawett	Carangue du Sénégal	
	Lichia amia	Ouarangal	Yeur bèèl	Liche amie	Leerfish
	Trachinotus ovatus	Khane	Ouinthiour	" glauque	Derbio
	Campogramma glaycos	Tathieu	Tathieu	" vadigo	
	Chloroscombrus chrysurus	Lagna lagna	Lagna lagna	Patite carangue	Atlantic bumper
	Trachinotus goreensis	Doungou doungou	Ndoumbou takh	Trachinote de Gorée	Pompano
	T. maxillosus	Teraï guetj	Yacol	Grande trachinote	"
	Selene dorsalis	Fanta mbaï	Fanta mbaï	Mussolini	Atlantic moonfish
	Scyris alexandina	Yawal	Yawal	Scyris d'alexeandrie	
Pomatomidae	*Pomatomus saltator*	Ngott (Ngal ngal)	Ngott (Ngal ngal)	Tassergal	Bluefish
Rachicentridae	*Rachycentron canadum*	Todie	Todie	Mafou	Prodigal son
Mulidae	*Pseudupeneus prayensis*	Ngor sikim	Ngor sikim	Rouget	Goat fish, mullet
Lethrinidae	*Lethrinus atlanticus*	Simpott	Simpott	Carpe lethrine	Scavenger
Sparidae	*Dentex gibbosus (filosus)*	Diankhar fett	Sel sel, Diarègne	Denté bassa	Punk dentex
	D. canariensis	Kbaro ngokh	Bassé	" à tache rouge	
	D. macrophthalmus	Mbagne mbagnère	Mbagne mbagnère	" à gros yeux	Large eye dentex
	Spondylisoma cantharus	Uersoun	Uersoun	Dorate grise	Black seabream
	Pagellus bellottii	Youfouf	Tiki	Pegueau à tache rouge	Common pandora
	Lithognatus mormyrus	Ringueu	Firir	Marbré	Striped seabream
	Sparus pagrus africanus	Kibaro ñoul	Khaya	Pagre des tropiques	Red porgy
	S. caeruleostictus	" naar	Ouaragne	" à points bleus	Gilt-head bream
	S. auriga	Yeuneu	Yeuneu	" rayé	" " "
	Boops boops	Uekh uekh	Uekh uekh	Bogue	Saupe, Gold line
	Sarpa salpa	Rassaw	Rassaw	Saupe	Saupe, Gold line
	Diplodus sargus cadenati	Siga	Ngaté bu gaur	Sar commun du Maroc	Silver porgy
	D. vulgaris	"	" djigène	" à tête noire	"
	D. cervinus	"	" yenno	" à grosses lèvres	"
	D. bellottii (senegalensis)	"	" sündo	Sparaillon africain	"
	Oblada melanura			Oblade	
Centracanthidae	*Pterosmaris melanurus*		Assan Kamara	Picarel	Picarel
Chaetodontidae	*Chaetodon hoefleri*	Souroupagne	Souroupagne	Poisson-papillon	Butterflyfish
Monodactylidae	*Psettus sebae*	Thiagarak	Thiagarak	Poissson-lune	Moon-fish
Ephippidae	*Drepana africana*	Tapandar	Tapandar	Drepane africain	Spadefish
	Chaetodipterus spp.	"	"	Disque	
Pomacentridae	*Chromis chromis*	Sur doul	Ouassou guedj	Petite castagnole	Damselfish

FAMILY	SCIENTIFIC NAME	WOLOF	LEBOU	FRANCAIS	ENGLISH
Labridae	*Diastodon speciosus*	Dienou guewel	Tiathieu	Vielle du Sénégal	Wrasse
Scaridae	*Sparisoma radians*			Poisson-perroquet	Parrot-fish
Brotulidae	*Brotula barbata*	Mori	Mori	Brotule	Brotula
Acanthuridae	*Acanthurus monroviae*	Doctorou djeunn	Ndiapatar	Chirugien	Surgeon-fish
Balistidae	*Balistes carolinensis*	Ndor	Ndor	Baliste cabri	Triggerfish
	B. punctatus	"	"	" ponctué	Spotted triggerfish
Monacanthidae	*Stephanolepis hispidus*	Ndor bu gaur		Poisson-bourse	Filefish
Scombridae	*Scomber japonicus*	Ouo	Ouo	Maquereau espagnol	Chub mackerel
	Orcynopsis unicolor	Sipon	Sipon		Plain bonito
	Scomberomorus tritor	Ndiouneu	Ndiouneu	Maquereau bonite	West African mackerel
	Sarda sarda	Oual	Oual	Bonite à dos rayé	Atlantic bonito
	Euthynnus alletteratus	Kiri kiri. Oualass	Douleu douleu	Thonine	Atlantic littletunny
Istiophoridae	*Istiophorus albicans*	Dieunoudong	Doung doung	Voilier	Atlantic sailfish
Trichiuridae	*Trichiurus lepturus*	Tallar	Khauss	Poisson-sabre	Cutlassfish
Stromateidae	*Schedephilus pemarco*	Khaussaw	Khaussaw		Ruff
	Stromateus fiatola	Khaussaw	Khaussaw	Demoiselle	Butterfish
Echeneidae	*Echeneis naucrates*	Takagal	Dag	Poisson-ventouse	Remora
Scorpaenidae	*Scorpaena spp.*	Tëyantan	Nâwane	Rascasse	Scorpion-fish
Triglidae	*Chelidonichthys spp.*	Nâwane	Nâwane	Rouget-grondin	Searobin
Dactylopteridae	*Cephalacantus volitans*	Dieunou laaf	Nâwane	Grondin-volant	Flying gurnard
Psettodidae	*Psettodes belcheri*	Mbang	Palpalé bigne	Turbot tropical	Brill
Bothidae	*Scyacium micrurum*	Tapale	Ndérère	Fausse limande	Flounder
Soleidae	*Synaptura spp.*	Papayo	Tapalé	Sole de roche	Sole
Cynoglossidae	*Cynoglossus canariensis*	Tapale	Ndérère	Sole-langue	Tonguesole
	C. senegalensis	"	"	"	"
	C. monodi	"	"	"	"

Table 3. New cetacean specimen records (N=45) from Senegal, 1995-1999. Collectors include Edouard Ndiaye (END), Koen Van Waerebeek (KVW).

SPECIES	CON	TYPE	CATAL.NO	REGION	LOCALITY	COLLECTE	VOUCHER MATERIAL	COMMENTS
Delphinus sp.	4	bpu	END-037	Cap Vert Pen.	Malika	04-Jul-97	skull (postcranials in prep.)	stranded near "les trois cases"
Delphinus sp.	5	bpu	END-016	Cap Vert Pen.	Camberene-Malika	06 Nov 97	skull, Cv 7+ 20 vertebrae, 7 ribs	calf (v. small); burried at 90cm; tissue in 90% EtOH
Delphinus sp.	5	bpu	END-014	Cap Vert Pen.	Camberene-Malika	06 Nov 97	fractured occipital bone	found near END-016; DMSO sample
Delphinus ?	5	bpu	END-020	Cap Vert Pen.	Camberene-Malika	07 Nov 97	partial thoracic cage	PVC plastic as rope wrapped behind cervicals
Delphinus sp.	5	bpu	END-041	Cap Vert Pen.	Camberene - Yoff	10-Aug-98	calvaria	juvenile
Delphinus sp.	5	bpu	END-012	Petite Cote	Djiffere	24-Oct-97	calvaria	immature; found by Mr. C.T. Seck
Delphinus sp.	5	bpu	END-039	Petite Cote	Mboro (Fass Boye)	06-Jul-98	caudal vertebrae (11)	physically immature
Delphinus sp.	5	bpu	END-040	Petite Cote	Mboro (Fass Boye)	06-Jul-98	calvaria, teeth (4)	subadult; probably *D. capensis*
Delphinus delphis	5	bpu	END-004	Petite Cote	Palmarin (N. of)	16 Oct 97	calvaria, 15 vertebrae	
Sousa teuszii	4	cap	KVW-3017	Petite Cote	Sangomar Island	22-Nov-96	skin sample, photos	carcass; SL~222cm, rope/net attached to tailstock
Sousa teuszii	4	cap	KVW-3018	Petite Cote	Sangomar Island	22-Nov-96	skin sample, photos	carcass; SL=261cm, knotted rope/net around tailstock
Sousa teuszii	4	cap	KVW-3019	Petite Cote	Sangomar Island	22-Nov-96	skin sample, photos	carcass : no netmarks but lying besides KVW 3017, 3018
Sousa teuszii	5	bpu	KVW-3001	Petite Cote	Djiffere	26-Apr-96	occipital, partial mandible (lost)	from island in Saloum delta opposite Djiffer
Delphinidae (unident.)	5	bpu	KVW-3024	Petite Cote	Palmarin	24-Nov-96	1 Th. Vertebra	
Delphinidae (unident.)	5	bpu	KVW-3025	Petite Cote	Palmarin	24-Nov-96	1 Th. Vertebra	
Delphinidae (unident.)	5	bpu	END-003	Cap Vert Pen.	near Malika	26-Nov-96	16 Lu & Ca vertebrae	subadult
Delphinidae (unident.)	5	bpu	KVW-3030	Fleuve (Sen.)	Saint Louis (N.beach)	24 Oct 97	vertebra (1)	middle-sized delphinid, probably blackfish
Delphinidae (unident.)	5	bpu	END-013	Cap Vert Pen.	Camberene-Malika	06 Nov 97	caudal vertebra (1)	
Delphinidae (unident.)	5	bpu	END-019	Cap Vert Pen.	Camberene-Malika	07 Nov 97	L. mandible, 5 vertebrae, 6 ribs	
Delphinidae (unident.)	5	bpu	END-018	Cap Vert Pen.	Camberene-Malika	07 Nov 97	lumbar vertebrae (2)	physically immature
Delphinidae (unident.)	5	bpu	END-017	Cap Vert Pen.	Camberene-Malika	07 Nov 97	double-headed left rib	
Delphinidae (unident.)	5	bpu	END-042	Cap Vert Pen.	Camberene - Yoff	10-Aug-98	one flipper	
Delphinidae (unident.)	5	bpu	END-008	Petite Cote	Palmarin	16 Oct 97	lumbar vertebra	(*Tursiops* or *Sousa*)
Delphinidae (unident.)	5	bpu	END-005	Petite Cote	Palmarin (beach N. of)	16 Oct 97	lumbar vertebra	(*Tursiops* or *Sousa*)
Delphinidae (unident.)	5	bpu	KVW-3034	Petite Cote	Palmarin (beach S. of)	16 Oct 97	vertebra (1)	(*Tursiops* or *Sousa*)
Delphinidae (unident.)	5	bpu	END-009	Petite Cote	Niodior	19 Oct 97	thoracic vertebra (1)	beach along mangrove; immature *SousaorTursiops*
Delphinidae (unident.)	5	bpu	END-010	Petite Cote	Niodior	19 Oct 97	caudal vertebra (1)	physically mature
Delphinidae (unident.)	5	bpu	KVW-3033	Petite Cote	Sangomar Island	17 Nov 97	1Th,2Lu,5Ca,3ribs,1chevron	(*Tursiops* or *Sousa*)
Stenella sp.	5	bpu	END-002	Cap Vert Pen.	near Malika	26-Nov-96	premax. and maxillary bones	specimen lost
Tursiops truncatus	5	bpu	END-015	Cap Vert Pen.	Camberene-Malika	06 Nov 97	occipitale + frontale	subadult specimen
Tursiops truncatus	5	cap	KVW-3026	Petite Cote	Djiffer	11-Nov-96	photos in CEPEC archives	damaged calvaria attached to tree as ornament in restaurant
Tursiops truncatus	5	cap	JCD-001	Petite Cote	Joal	22-May-96	calvaria examined by KVW before loss	collected from fisherman's house (had been used for food)
Tursiops truncatus	2	cap	JCD-002	Petite Cote	Djiffer	28-Jun-96	skull examined by KVW before loss	dolphin captured 25June 1996, landed 27June; used as food

SPECIES	CON	TYPE	CATAL.NO	REGION	LOCALITY	COLLECTE	VOUCHER MATERIAL	COMMENTS
Tursiops truncatus	5	bpu	KVW 3031	Petite Cote	Palmarin	16 Nov 97	calvaria, 7 ribs, 7 Cv, 2 Th	cranially immature; Mamadou Seck legit
Tursiops truncatus	5	bpu	END-006	Petite Cote	Palmarin (beach N. of)	16 Oct 97	occipitale	
Tursiops truncatus	5	bpu	END-007	Petite Cote	Palmarin (beach N. of)	16 Oct 97	calvaria	
Tursiops truncatus	5	bpu	KVW-3028	Petite Cote	Palmarin (Ngalou)	15 Oct 97	calvaria	Mamadou Seck legit
Tursiops truncatus	5	bpu	KVW-3020	Petite Cote	Sangomar Island	22-Nov-96	occipital of calvaria	found by KVW and END on beach
Lagenodelphis hosei	5	bpu	KVW-3032	Petite Cote	Sangomar Island	17 Nov 97	skull, postcranials, photos	Pointe de Sangomar (south point)
Globicephala macrorhynchus	1	cap	KVW-3027	Cap Vert Pen.	Dakar (port)	11-Oct-97	skin sample in DMSO; photos	wounded adult male hauled on dock of Dakar port (ENDt)
Globicephala macrorhynchus	5	?	none	Petite Cote	Joal ?	?	skull at Joal's Bureau de Peches	juvenile specimen without reference data; examined by KVW
Phocoena phocoena	2	cap	99-43	Petite Cote	Fadiouth	Jan-99	skull at COREWAM collection	captured in undetermined net by artisanal fishermen
Balaenoptera acutorostrata	5	bpu	KVW-3021	Petite Cote	Djiffer	23-Nov-96	photos in CEPEC archives	left mandible (91cm) bought from fisherman; destroyed in fire
Balaenoptera acutorostrata	2	cap	KVW-3036	Cap Vert Pen.	near Hann	14-May-93	skeleton	by-caught; see Van Waerebeek *et al* 1999
cetacean (unident.)	4	stra	none	Cap Vert Pen.	Camberene	22-Jun-95	photos in CEPEC archives	photos taken by P. Ndiaye; cetacean ~ 5-6m

Condition (cond: 1-5) follows Geraci and Lounsbury (1993). Unless mentioned otherwise, specimens are deposited at Corewam collection, Dakar.
Abbrevations : beach pick-up (bpu), indirected or directed capture (cap), stranding (stra), standard length (SL).

Table 4. Opportunistic sightings of cetaceans and miscellaneous sighting effort in Senegalese waters in 1995 and 1997-98.

DATE	TIME	LOCALITY	SPECIES	GROUP SIZE	OBSERVERS	COMMENTS
17-Sep-95	14:40 - 14:44	Casamance river, off Pointe St. George	*T. truncatus*	4	KVW	approach ferry and bowride for several minutes; no dorsal cape visible
17-Sep-95		Casamance river, off Carabane Island	*T. truncatus*	4-5	KVW	mill around ferry and bowride for 10min direction river mouth; clear dorsal cape
17-Sep-95	18:21 - 18:26	Atlantic Ocean (coastal) enroute to Dakar	*Stenella frontalis*		KVW	bowride; striking dark cape pattern and white tip of beak; no or subdued spotting
11-Mar-97	~ 2hours	Djiffer - Sangomar - Djiffer	no sightings		END,P.Dione	motorized pirogue
19-Oct-97	~ 45min	Djiffer to Niodior	no sightings		END, KVW	motorized pirogue, good visibility
20-Oct-97	~ 45min	Niodior to Djiffer	no sightings		END, KVW	motorized pirogue, good visibility; SS 3 BF
22-Oct-97	~ 45min	Djiffer to Niodior	no sightings		END	motorized pirogue, good visibility; passengers claimed occasional dolphin groups
						up to ~15 animals; others pointed out that observations have become more rare.
24-Oct-97	~45min	Niodior to Djiffer	no sightings		END	motorized pirogue
17-Nov-97	~1.5 hrs	Djiffer-Sangomar-Djiffer	no sightings		END, KVW	pirogue w/ outboard ; good visibility
24-Jun-98	09:00 - 19:45	Bandiala, Djombos, Missirah, Bakedadji	no sightings		KVW	outboard powered 4.5m aluminum skiff; choppy; with Park Chief Col. J. Rigoulot
18-Jul-98	17:04 - 17:09	Yoff beach	possibly *T. truncatus*	1	END	swimming N, parallel to beach; some low jumps; grey dorsally
24-Jul-98	10:20	Mbodiene beach	unid. small cetacean	1	END	swimming S (direction Joal) ~150m from beach; dark grey
03-Aug-98	~ 17:50	Joal, Petite Cote	probably *T. truncatus*	1	fishers	seen near Joal from an artisanal fishing boat; estim. SL ~3.5m; grey to black
07-Aug-98	-	Cap de Joal, Petite Cote	unid. small cetacean	1	fishers	seen from beach; villagers called it "Ngoungueck" (harbour porpoise)
13-Aug-98	-	Mar, Saloum	dolphins	~35	fishers	large group reported, heading W. towards Sangomar island; END reported
17-Aug-98	8:00	between Mar and Betanty, Saloum	dolphins	~8	fishers	group sighted from fishing boat; low tide ; END reported
19-Aug-98	-	Saloum delta	dolphins "two species"	groups	G.Lenoir	"robust animals" (*Tursiops* ?) and "smaller dolphins" separately ; END reported
26-Aug-98	-	S. of Kafountine, Casamance	small whale	1	fishers	whale of an estimated 7-8m length seen in coastal waters (A. Djiba reported)

Time refers to duration of sighting or to duration of sighting effort (if no animals were seen).

Table 5. Cetacean specimens from The Gambia (1951-1998) and voucher material (n=19). Department of Parks and Wildlife Management (DPWM), Abuko, The Gambia; US National Museum of Natural History (USNMNH). Collectors: Alpha Jallow (AJ); P.F.Murphy (PFM); K. Van Waerebeek (KVW). Tissue refers to 20% DMSO saline solution based samples taken for DNA analysis.

Species	Number	Date collect.	Locality	Specimens	Deposit	Comments
Globicephala macrorhynchus	none	Jan-98	Sanyang Point	skeleton, teeth, muscle	DPWM	Stranded, 425cm male; buried by fishermen, possibly harpooned
				tissue, photos		Collected on 12 Jan 1998 by PFM and AJ
Sousa teuszii	PFM 005	Sept 1996	Sanyang Point	skull	DPWM	Beach pick-up
Stenella clymene	PFM 001	Nov 1995	Bijol Islands	calvaria	DPWM	Beach pick-up
Tursiops truncatus	none	12-Jan-98	near Sanyang	tissue	DPWM	Washed ashore dead with two (harpoon?) holes
Tursiops truncatus	PFM 002	Aug 1996	Bijol Islands	skull	DPWM	Beach pick-up
Tursiops truncatus	PFM 003	Oct 1996	Fajara	skull, teeth	DPWM	Beach pick-up
Tursiops truncatus	PFM 004	Jan 1997	Solifor Point	skull, muscle	DPWM	Beach pick-up
Tursiops truncatus	PFM 006	Jan 1997	Sanyang Point	skull	DPWM	Beach pick-up
Tursiops truncatus	PFM 007	June 1996	Kiang West NP	lower jaw	DPWM	Beach pick-up
Tursiops truncatus	STRO 03923	17-Jan-97	3nm off Gunjur	full skeleton; photos	USNMNH	Captured alive; 288.5cm; 2 bonga fish in stomach
Tursiops truncatus	STRO 03924	13-Jan-97	3nm off Gunjur	full skeleton; photos	USNMNH	Captured alive in shark net; male 286cm
Tursiops truncatus	STRO 03925	17-Jan-51	3nm off Gunjur	full skeleton	USNMNH	Captured alive in shark net; female 309cm
Tursiops truncatus	STRO 03926	13-Jan-51	2nm off Gunjur	full skeleton; photos	USNMNH	Taken in shark net; male, 265cm, 209kg
Tursiops truncatus	STRO 03927	13-Jan-51	2nm off Gunjur	full skeleton	USNMNH	Alive in shark net; male, 335cm; 409kg; testes 151x 32mm
Tursiops truncatus	STRO 03928	18-Feb-51	4nm off Gunjur	full skeleton; photos	USNMNH	Captured alive in shark net; 372.5cm, female
Tursiops truncatus	KVW 3041	18-Jun-98	Albreda	4 ribs	DPWM	Beach pick-up, reportedly from by-catch
Tursiops truncatus	KVW 3042	18-Jun-98	Albreda	R.max/premax.,frontale	DPWM	Beach pick-up, reportedly from by-catch
Tursiops truncatus	KVW 3043	18-Jun-98	Albreda	calvaria (damaged)	DPWM	Beach pick-up, reportedly from by-catch
Tursiops truncatus ?	KVW 3044	18-Jun-98	Albreda	caudal vertebra	DPWM	Beach pick-up, report. from by-catch; physically immature

Table 6. Sightings of bottlenose dolphins in the Gambia river and creeks in and around Kiang West National Park.

DATE	HOUR	LOCALITY	GROUP	PLATFORM	BEHAVIOUR AND OTHER COMMENTS
04-Mar-98	12:32	Tendaba wharf	12 (2)	boat	Jumping and moving in groups in a line form
05-Mar-98	12:30	Toubabkolon Point	6 (2)	boat	In a tight group; indifferent to boat. Royal tern associated.
06-Mar-98	7:40	Tendaba wharf	9 (2)	shore	Formed subgroups of three and followed each other.
07-Mar-98	9:32	Jali fishermen camp	6 (0)	shore	Scattered group; did not approach fishing area.
09-Mar-98	10:00	Tendaba wharf	15 (5)	boat	A tight group; avoidance of fishing boat.
11-Mar-98	14:00	Jali river	15 or >	boat	At least 5 or 6 subgroups moving independently; indifferent to boat.
16-Mar-98	9:43	Njamali river side	23 or > (9)	boat	About 4 subgroups, traveling; avoided the boat.
19-Mar-98	11:03	Tankular sea side	20 (5)	boat	3-4 dolphins per subgroup; do not approach anchored boats. Drooping dorsal seen.
26-Mar-98	9:40	Tendaba camp	7 (4)	boat	Did not come near the shore when moving very fast with the tide. Boat avoidance.
31-Mar-98	8:49	Toubabkolon Point	15 (2)	boat	A few subgroups; were indifferent to boat; info supplied by fisherman.
03-Apr-98	10:52	Kissy/Tunku Point	15 (6)	boat	Dolphins came close to boats; moved in subpods of three animals.
07-Apr-98	9:35	Jali fishermen camp	3 (0)	shore	Passed the mouth of the Maryokah bolong and diverted course heading towards sea.
13-Apr-98		Kissy/Tunku bolong end	10 (3)	boat	One group; avoided the boat presumably because of set nets. Observer Alieu Sarr.
15-Apr-98	8:40	Nyaningko bolong entrance	14 (2)	boat	3-4 subgroups, came to entrance of Tendaba bolong & turned towards ocean.
21-Apr-98	10:52	Jali bolong entrance	15 (6)	boat	Avoided boat; swim with tide heading Tendaba area. Individuals in wide arc.
23-Apr-98	15:25	Kemoto wharf	12 (4)	boat	One group, feeding on small fishes. Going along with tide current. Low tide.
26-Apr-98	14:10	Bintang beach side	16 (4)	boat	Separate subgroups, run away fastly from area; "some were caught in that area".
27-Apr-98	14:10	Toubabkolon (Sibiding beach)	5 (3)	boat	Swimming along with tide towards Tendaba point. Avoid boat.Swim in one line.
28-Apr-98	13:48	Toubabkolon Point	12 (5)	boat	Two subgroups moving independently and playing. Indifferent to boat.
04-May-98	13:40	Jali Fishermen camp	9 (4)	boat	Single group. Did not come close to fishing boat or net; swim along with tide.
09-May-98	12:05	Toubabkolon (Sibiding beach)	6 (2)	boat	Single pod avoiding boat. Chasing fast (possibly feeding). Royal terns. High tide.
12-May-98	12:00	Tendaba camp area	14 or > (6)	shore	Single pod. Indifferent to line and net-fisfing boats. Assoc. Gull bill terns.
16-May-98	11:10	Toubabkolon Point	7 (2)	shore	Jumping very high 50m from shore; single group.
18-May-98	14:35	Kemoto	7 (0)	boat	Avoided anchored boats; were attracted to small fishes floating on the water.
23-May-98	15:15	Nyaningkoi bolong	4 (1)	shore	One group chasing each other; moved away with tide.
25-May-98	13:32	Tankular beach	4 (0)	boat	Single group heading to Kemoto area with tide; 40m from boat (indifferent).
29-May-98	13:09	Jali bolong entrance	7 (4)	shore	In wide arc approach Jali bolong and then turn to the sea, repeatedly. Feeding.
31-May-98	10:16	Jali fishermen camp	8 or > (3)	shore	In small groups, avoiding boats and their engine noise. Come in with rising tide.
06-Jun-98	11:20	Toubabkolon	15 or > (4)	shore	Single pod coming in with high tide. Drooping dorsal fins seen. African skimmer.
10-Jun-98	12:10	Tendaba wharf	9 (3)	shore	Single pod; feeding on small fishes (seen from binoculars); shallow water.
14-Jun-98	14:33	Kemoto	5 (1)	shore	Dolphins approached shore where fishermen threw small fish in water. Moved fast.
16-Jun-98	11:35	Jali fishermen camp	8 or > (2)	shore	One pod accompanied by flock of royal terns; moving with the tide.

Except where indicated, all sightings were recorded by park ranger Lamin Saidy. Number of calves and juveniles in parentheses.
Group size: mean=10.41 (SD 4.95), n=32, range 3-23.

Table 7. Sample of near-daily sightings of bottlenose dolphins *Tursiops truncatus* in the Gambia river estuary from March till April 1998 by a commercial dolphin-watching operation. Data extracted from the logbook of M/V Lady Jaserine provided by owner Mr. Mervyn Baldwin, Banjul, The Gambia. Mean group size is 11.3 dolphins (SD 9.0 ; n=29; range 2 - 40+)

DATE	LOCATION	TIME	GROUP SIZE	COHESION	SEA STATE	SST D. CELSIUS	DEPTH (in m)	CLOSEST (in m)	COMMENTS
05-Mar	anchorage Dog Island	8:00	2	-	calm	22	6	25	
05-Mar	1.5nm SE abeam Albreda	10:40	15+	tight	calm	23	15	1	
05-Mar	abeam Albreda E.	11:30	4	tight	calm	23	8.5	200	
05-Mar	Lamin Point, W.	15:15	30+	spread 800m	calm	23	8	0	
06-Mar	Dog Island, W. 1nm	10:35	6	tight	low chop	26	17	200	
06-Mar	mid-river, off Dog Isl.	10:50	20+	spread 300m	low chop	26	11	0	
07-Mar	abeam Albreda, 1.5nm	11:20	4+	tight		23	9.3	0	
07-Mar	Lamin Point, 1.5nm circle	15:35	8+	tight	calm	23	8.6	0	
08-Mar	2nm S. of Dog Isl.	16:50	20+	-	calm	25	7.3	0	bowride 2nm
09-Mar	harbour, 2nm circle	9:45	4+	loose/spread	slight chop	23	11.3	400	feeding
09-Mar	Dog Isl., 2nm, backside	10:20	3+	spread 400m	chop	23	9.1	0	
09-Mar	Lamin Point	10:53	3+	loose	chop	23	8.6	10	
12-Mar	mid river, 3nm off Banjul	9:40	5+	spread 200m	calm	24	9.4	300	
13-Mar	mid river, 2nm off Banjul	9:35	5	tight	calm	23	9	0	
14-Mar	Dog Island	9:40	2	together	calm	24	17	0	
14-Mar	mid river, Lamin/Dog Isl.	11:23	12+	spread 800m	calm	23	8.6	0	
15-Mar	Dog Island	10:12	15+	spread 400m	calm	23	11.3	10	
16-Mar	1nm off Banjul, mid river	9:40	12+	tight	calm	24	17	0	
18-Mar	1.5nm off Dog Island	10:05	12	spread 300m	calm	26	9.6	0	3 bowride
21-Mar	1.5 nm off Dog island	15:45	40+	v. widespread	calm	26	12.3	0-800	
21-Mar	2nm off Dog island	16:10	14+	spread	calm	26	10	0	
22-Mar	2.5 nm off Dog island	15:23	15	spread 400m	chop	25	9.4	0	
24-Mar	Dog island	10:40	20+	tight 200m	calm	26	14	250	
26-Mar	Dog island 2nm off	14:30	?	spread	chop	25	8.9	15	
27-Mar	Lamin Point	10:17	2	together	chop	24	11	200	not interested
01-Apr	abeam Albreda	14:15	10	spread	calm	23	8.6	200	not interested
02-Apr	midway Dog is.& Lamin P.	10:05	10	close	calm	25	9.4	20	
02-Apr	midway Albread & Lamin P.	14:20	12	close	calm	26	9.6	10	
02-Apr	south of Dog island	10:10	20+	spread wide	calm	25	8.3	25	spread
04-Apr	Dog island	10:25	3	in line	calm	24	11.4	25	together

Table 8. Sightings of small cetaceans in coastal waters of Guinea-Bissau in 1995-1998. Abbreviations used: observer (Obs); Gordon d'Arcy (GD); Philippe Tous (PT); Rio Grande do Buba (RGB); Rio Cacine (RCA); Bubaque (BUQ).

DATE	HOUR	REGION	LOCALITY	SPECIES	#IND	OBS	COMMENTS
08-Oct-95	21:30	RGB	Ponta Nahal	unid. dolphins	?	PT	blows heard during 1 hour
09-Oct-95	11:30	RGB	Ponta Force	unid. dolphins	2	PT	2 separated individuals
09-Oct-95	14:02	RGB	Ponta Force	*Sousa teuszii*	3	PT	very close to the camp
10-Oct-95	11:00	RGB	Ponta Force	unid. dolphin	1	PT	jumps
11-Oct-95	-	RGB	Ponta Force	unid. dolphin	?	PT	-
12-Oct-95	-	RGB	Ponta Force	unid. dolphin	?	PT	-
18-Nov-95	18:00	BUQ	Bijante	*Sousa teuszii*	8-12	PT	neutral with respect to 3 passing boats
18-Nov-95	18:30	BUQ	Bubaque port	*Sousa teuszii*	4	PT	play and jump inside the port
03-Feb-96	17:30	RGB	mouth R. Farancunda	*Sousa teuszii?*	2-4	PT	swimming east
03-Feb-96	21:00	RGB	mouth R. Farancunda	unid. dolphins	2-3	PT	blows heard
07-Mar-96	10:00		Rio Cacine	unid. dolphin	1	PT	swimming S. 11.12'45"S,15.01'30"W; depth 5m
07-Mar-96	14:00	RCA	Cacine port	unid. dolphins	4	PT	swimming south
08-Mar-96	20:00	RCA	north	unid. dolphins	3	PT	swimming downstream; blows heard ~1 hour
12-Mar-96		RGB	mouth R.Empada	unid. dolphins	3-4	PT	11.38'30"S 15.17'30"W
13-Jul-96	16:00	RCA	Cacine	*Tursiops truncatus*	1	PT	-
18-Jul-96	12:00	RCA	Cacine port	*Sousa teuszii*	1	PT	heading south
26-Oct-96	15:30	RGB	Ponta Force	*Sousa teuszii*	7-8	PT	2-3 juveniles
10-Jan-98	-	-	Cabo Roxo	*Globicephala sp.*	3-4	GD	12.18'N,16.43'W
10-Jan-98	-	-	Cabo Roxo	*Globicephala sp.*	-	GD	12.01'N,16.43'W; group with 1 *Tursiops*
10-Jan-98	-	-	Canal de Jeta	*Sousa teuszii*	4	GD	11.59'N,16.23'W
10-Jan-98	-	-	Canal de Jeta	*Sousa teuszii*	20	GD	-
11-Jan-98	-	-	Canal de Pecixe	*Sousa teuszii*	6	GD	11.52'N,16.05'W
11-Jan-98	-	-	Canal de Pecixe	*Sousa teuszii*	2	GD	11.52'N,16.02'W
11-Jan-98	-	-	-	*Tursiops truncatus*	6	GD	11.42'N,15.54'W
11-Jan-98	-	-	-	*Tursiops truncatus*	10	GD	11.42'N,15.54'W
13-Jan-98	-	-	Galhinas Island	*Grampus griseus*	6	GD	11.27'N,15.46'W
15-Jan-98	-	-	Bubaque Island	*Tursiops truncatus*	2	GD	11.06'N,15.50'W
21-Jan-98	-	-	Isla de Porcos	*Tursiops truncatus*	4	GD	11.22'N,16.17'W
21-Jan-98	-	-	Caravella Island	*Sousa teuszii*	3	GD	11.30'N,16.25'W

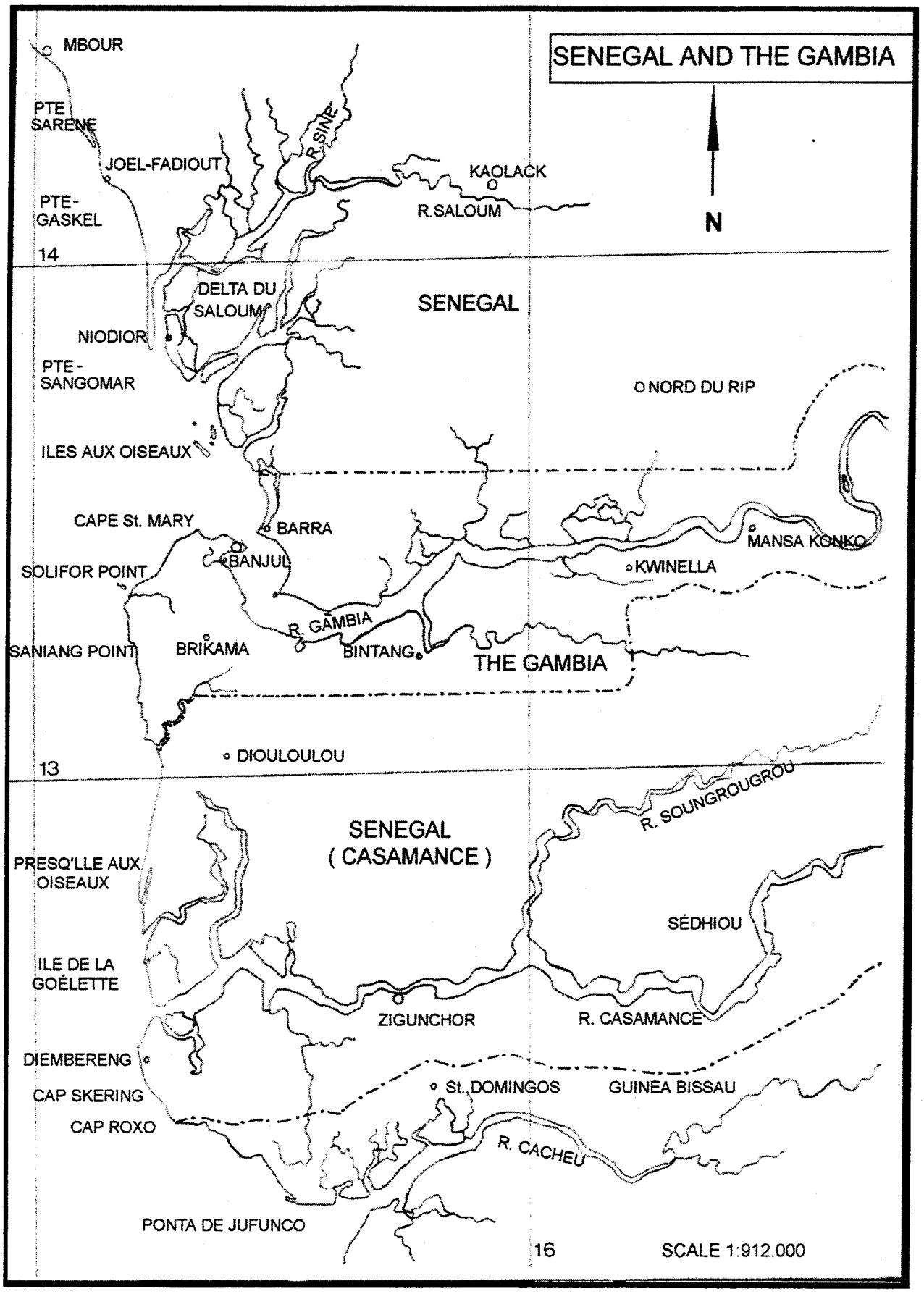

Figure 1.
The cork area of the WAFCET-1 project comprisng the costal border areas between southern Senegal, The Gambia and Northern Guinea-Bissau.

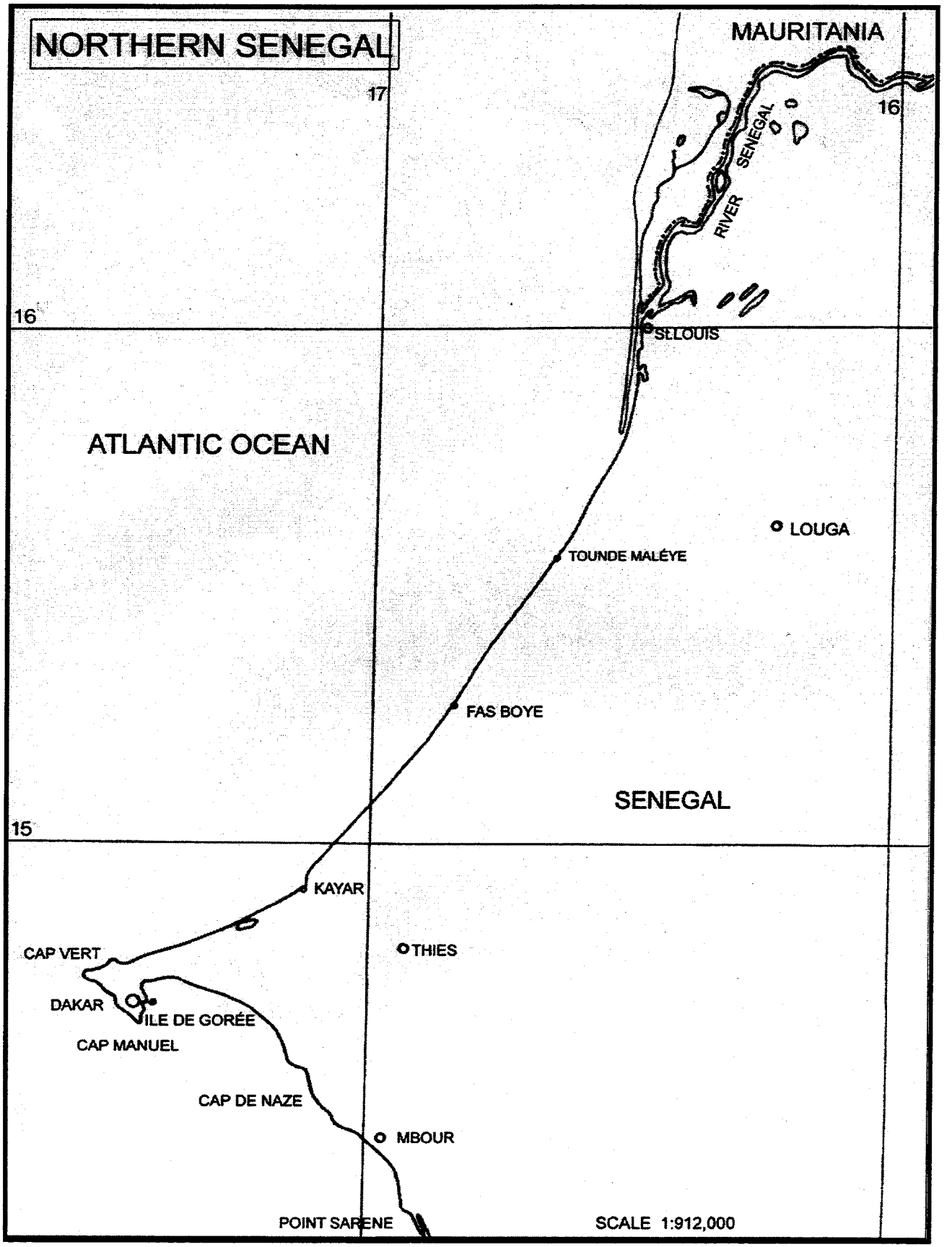

Figure 2.
Senegal's Cap Vert Peninsula separates the Petite Côte (south) from the Grande Côte (north) which leads to the Senegal river, the northern limit of the WAFCET-1 study area.

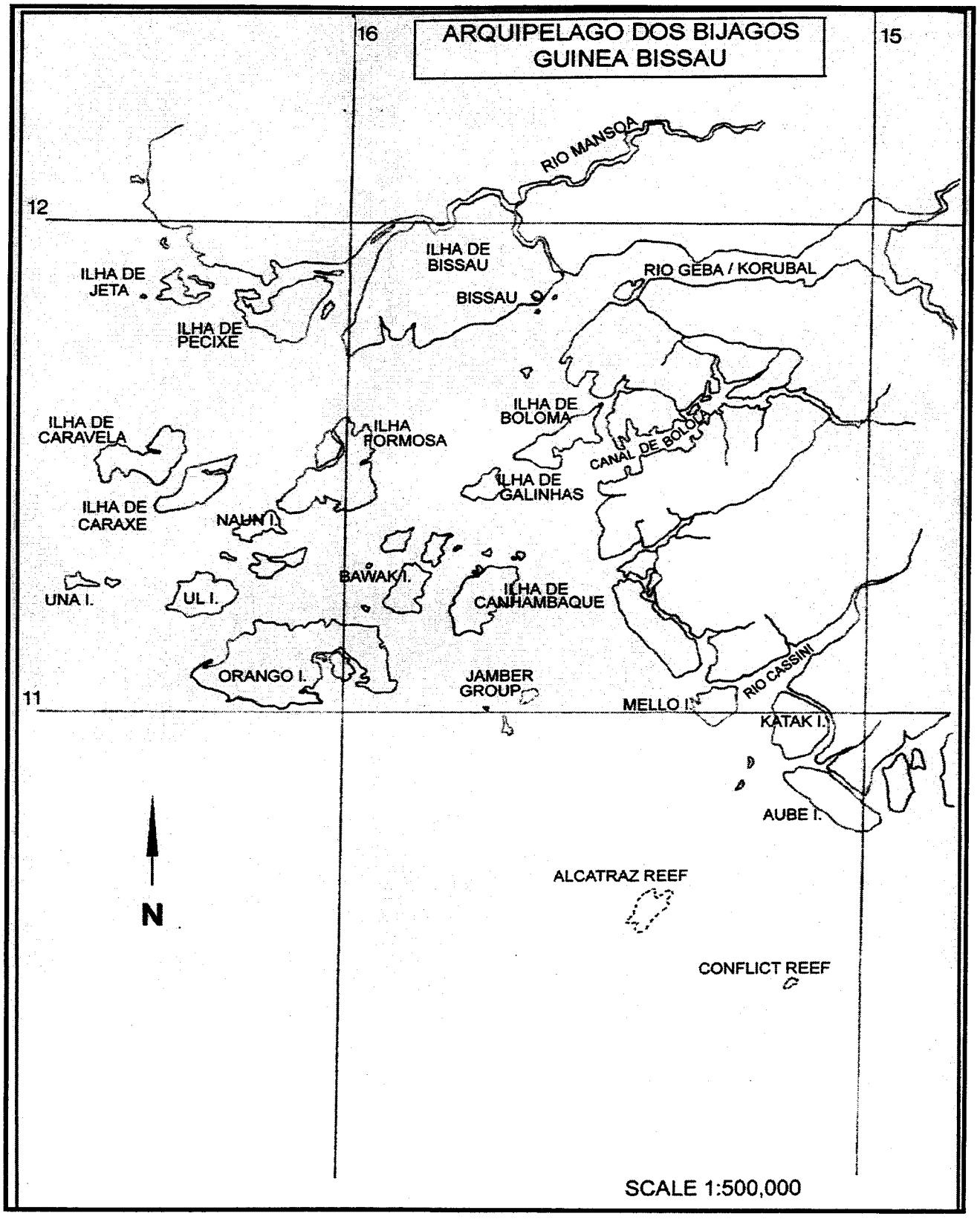

Figure 3.
The Arquipelago dos Bijagos, Guinea-Bissau, is an important biotope for Atlantic hump-backed dolphins and bottlenose dolphins.

Figure 4.
The head of a harbour porpoise *Phocoena phocoena* (No. 99-43 of the COREWAM collection) landed by artisanal fishermen at Fadiouth, Senegal, in January 1999. Captures are rarely documented but may occur more often than suspected (Photo: Edouard Ndiaye).

Figure 5.
One of three Atlantic hump-backed dolphins *Sousa teuszii* found on Sangomar island, Senegal, in November 1996 with netting knotted around tailstock (Photo: Koen van Waerebeek).

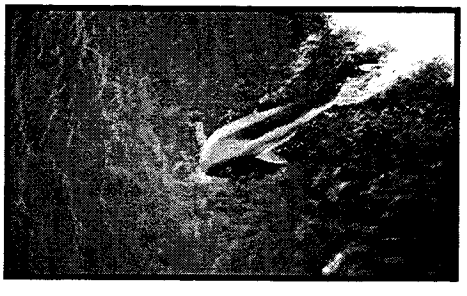

Figure 6.
Bottlenose dolphin *Tursiops truncatus* bowriding near the ferry *Djola* in the Casamance river on 17 September 1995. Dolphins did not appear to leave the river and may be a resident population (Photo: Koen van Waerebeek).

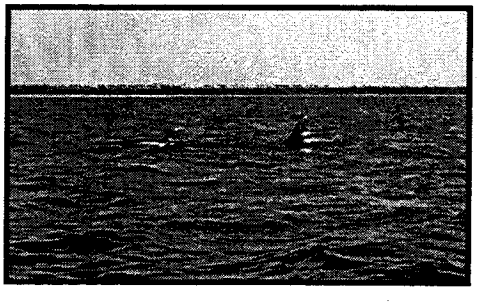

Figure 7.
A small pod of bottlenose dolphins *Tursiops truncatus* sighted between Bijol Islands and the Gambian mainland (visible in the background) on 3 November 1997 (Photo: Koen van Waerebeek).

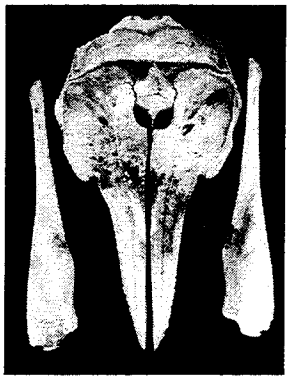

Figure 8.
Skull KVW-3032 of Fraser's dolphin *Lagenodelphis hosei* collected at Sangomar island on 17 November 1997; the first record of this species for the West African mainland (Photo: Koen van Waerebeek).

Figure 9.
Male short-finned pilot whale *Globicephala macrorhynchus* KVW-3027 captured at the Dakar port in 1997. The animal was reported to be wounded before entering the harbour (Photo: Edouard Ndiaye).

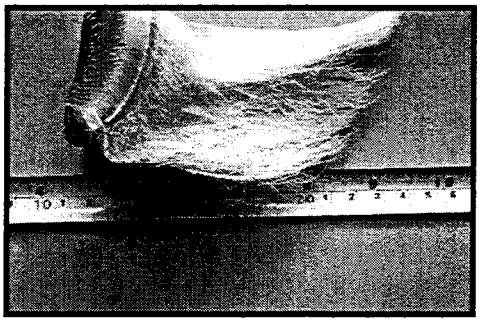

Figure 10.
A series of baleen plates from a minke whale *Balaenoptera acutorostrata* of unknown origin, deposited (without reference number) at the IFAN collection. (Photo: Koen van Waerebeek).

Figure 11.
A 12m Sei whale *Balaenoptera borealis* brought accidentally into the Dakar port on the bow bulb of a container ship, on 19 March 1998. Note the single median head groove and the slightly arched rostrum (Photo: Papa Ndiaye).