

National Report

Marine biodiversity in Nigeria – the known and the unknown

Catherine E. Isebor
Nigerian Institute for Oceanography and Marine Research,
Victoria Island, P. M. B. 12729, Lagos, Nigeria

Introduction

Nigeria has a coastline of 853 km, a maritime area of 46,500 km² and an exclusive economic zone of 210,900 km². The Nigerian coastal area is hot and humid, with an annual temperature range between 26 and 34°C, and the highest temperatures occurring during the dry season (November to March). The total annual rainfall averages between 350 and 600 centimeters. More than 80 percent of the rain falls during the rainy season (April to October) when tropical storm conditions are frequent. Rainfall is usually heavy and occasionally lasts for over 24 hours. Rainfall of about 50mm/hour between July and August are common and results in flash floods. The predominant wind is the rain bearing southwest trade wind from the Atlantic Ocean. During the short dry period, the dust laden north east dry wind from the Sahara desert reaches the coastal areas, producing hazy conditions (Ibe et al. 1985).

The Nigerian intertidal mangrove swamps cover an area of about 5,590 square kilometres (Allen 1965). The swamps are separated from the sea by barrier-bar islands that are usually broken by tidal channels. The Niger delta area, which has a flourishing mangrove ecosystem, was formed by long and continuous interactions of sediment laden Niger River water and coastal processes, creating beach-ridges, barrier islands, a fresh water floodplain and brackish mangrove swamp. This coastal habitat is interrupted by a series of estuaries, lagoons and embayments. The total brackish water habitat is estimated as 12,900 km². The mangroves, wetlands and inter-tidal systems occur in saline soil subject to tidal inundation and occupy a total area of almost 1 million hectares (Okigbo 1984, FAO 1981).

Fishing is the main occupation of the coastal communities, with various types of gears being employed. Fishing is conducted in creeks, rivers, estuaries, mudflats, near-shore and offshore. Commercial fishing supports about 440 trawlers, with about three quarters of the fleet targeting the shrimp resources. The mangrove plants and associated halophytic plants are used for building, extraction of tannin; construction works, curing of fish, and other fishing implements. Mineral resources in the coastal and marine waters include petroleum, with an oil reserve of about 21 billion barrels and gas reserve estimated at more than 11 trillion cubic feet. Current production levels are at about 1.9 million barrels of crude oil and 200,000 barrels of gas condensate per day. The current natural gas production is 3,400 million cubic feet per day in the form of associated gas, of which about 340 million is marketed in the domestic market, 340 million re-injected and 2,720 million cubic feet is flared daily.

Sand and gravel are exploited onshore and offshore, in the riverbed, lagoons, estuaries and beaches. Millions of cubic meters of sand are dredged annually during oil exploration and exploitation, as well as for the construction industry. Most of the sand mined is used for reclamation of swampy areas, in the block-making industry and construction work.

The Known

The Nigerian coast comprises four distinct geomorphic zones. On the western side is the barrier bar lagoon complex that changes about 100 km eastwards of Lagos into mud beaches. The mud beaches then grade into the Niger delta that consists of a chain of sandy beach ridge barrier islands backed by an extensive mangrove swamp. The barrier islands rim the sub-aerial Niger delta from the Benin River on the northwest flank of the delta to the Opobo River in the east. There are more than 20 major beach ridge barrier islands between the mangrove swamp and the open sea (Allen 1964). Eastward of the Opobo River to the eastern border with Cameroon is the strand complex coastline. The continental shelf widens from 25-30 km off Lagos to 75 km at the Niger delta. There are 36 estuaries on the coast, which owe their origin to bar-built (such as the Lagos lagoon) drowned river valleys (such as Qua Iboe River) and river delta estuaries

The end of the continental shelf is marked by an often-steep continental slope. The slope is the beginning of what is called the offshore ocean environment (as distinct from what is generally referred to as the near shore coastal ocean). Most of the physical factors such as winds, waves and tides affecting the coastal zone have their origin in the offshore ocean. This offshore ocean feature, together with the near shore ocean and their drainage basins (the so-called marine catchment basins) constitute the geographical space sometimes referred to as a Large Marine Ecosystem (LME) by Sherman and Alexander (1986).

The coastal area is richly endowed with abundant aquatic and other natural resources, both renewable and non-renewable. Considerable information is available on the plankton, fish and fisheries of the Nigerian coastal zone (Olaniyan 1957, Williams 1962, Fagade 1969, Ezenwa 1981, Ajayi 1982, Ssentogo et al 1986).

Coastal vegetation (mangroves)

Taxonomic considerations are based on Hutchinson and Dalziel (1927-1936) and Olorode (1984). Strict mangroves are separated from their relatives at least by generic level, often at subfamily or family level. Minor elements are distinguished by their inability to form conspicuous elements of mangrove vegetation, and may occupy peripheral habitat and only rarely form a pure community. Mangrove associates are never inhabitants of strict mangrove community and may occur only in transitional vegetation. Specialized elements include climbers, epiphytes and parasites. Attempts have been made to classify mangrove zones occurring within the Nigerian coastal zone. These categories are not sharply circumscribed and assessment is somewhat subjective given the continuum of possibilities. The major elements of mangroves in the country include the dominant species *Rhizophora racemosa*, *Avicennia africana* and *Nypa fructicans*. A list of plant families found in the Nigerian coastal zone is given in Table 1 and includes 60 species belonging to 49 genera. Various surveys carried out in the Nigerian coastal zone indicate that the mangroves have been impacted by human activities.

Phytoplankton

Nwankwo (1988b) produced a checklist of Nigerian marine algae. Other studies on plankton of the Nigerian coastal zone have been documented (Olaniyan 1969&1977, Nwankwo 1984, 1988a, 1990a and 1990b). A total of 103 genera of phytoplankton have already been identified from Nigerian coastal waters (Table 2).

Table 1: Mangrove and associated vegetation in the Nigerian coastal zone

No.	Family	Genera	Species
1	Rhizophoraceae	1	3
2	Avicenniaceae	1	1
3	Combretaceae	2	2
4	Adiantaceae (Polypodiaceae)	1	1
5	Amaranthaceae	1	2
6	Palmae	5	6
7	Araceae	2	2
8	Apocynaceae	1	1
9	Cannaceae	1	1
10	Convolvulaceae	1	2
11	ceratophyllaceae	1	1
12	Panadanaceae	1	1
13	Papilionaceae	2	2
14	Cyperaceae	5	8
15	Typhaceae	1	1
16	Lemmaceae	2	2
17	Loganiaceae	1	1
18	Moraceae	1	2
19	Nymphaeaceae	1	1
20	Onagraceae	1	1
21	Poaceae	5	7
22	Polygonanceae	2	2
23	Rubiaceae	4	4
24	Salviniaceae	1	1
25	Scrophulariaceae	1	1
26	Sphenocleaceae	1	1
27	Passifloraceae	1	1
28	Pontederiaceae	1	1
	Total	49	60

Source: Chapman, V. J. (1984), RPI/NNPC (1985) & Isebor, C. E. (1998)

Table 2: Taxonomic listing of phytoplankton genera from Nigeria

No.	Family	Genera
1	Bacillariophyceae	42
2	Chlorophyceae	39
3	Cyanophyceae	17
4	Chrysophyceae	1
5	Dinophyceae	3
6	Euglenophyceae	1
	Total	103

Zooplankton

Within the zooplankton community, crustaceans are the dominant group, with copepods frequently the most abundant component. Shrimp larvae are recorded in most samples, with tunicates and chaetognaths also common. Other zooplanktonic animals found in the Nigerian coastal zone include protozoans, bryozoans, cnidarians, ctenophores, worms (e.g. oligochaetes), and the larvae of crustaceans (e.g. barnacles, crabs, shrimps), insects (e.g. mosquitoes), molluscs (e.g. bivalves, gastropods, scaphopods), echinoderms, ascidians and fishes. A listing of the number of species and genera already identified is given in Table 3.

Table 3: Taxonomic list of zooplankton from Nigeria

No.	Group	Genera	Species
1	Copepoda	8	8
2	Ciliata	2	2
3	Hydrozoa	4	4
4	Polychaeta	3	3
5	Cirripedia	1	1
6	Isopoda	2	2
7	Pisces	unknown	unknown
8	Scyphozoa	3	3
9	Chaetognatha	2	3
10	Polychaeta	4	5
11	Ostracoda	3	4

Table 4: Taxonomic list of Cnidaria from Nigeria

No.	Class	Genera	Species
1	Hydrozoa	4	4
2	Scyphozoa	3	3
3	Anthozoa	2	unknown
	Total	4	unknown

Table 5: Taxonomic list of Annelida from Nigeria

No.	Family	Genera	Species
1	Capitellidae	5	5
2	Nereidae	4	4
3	Nephytidae	2	3
4	Paraonidae	1	1
5	Pilargiidae	5	5
6	Cossuridae	1	1
7	Maldanidae	7	7
8	Glyceridae	1	4
9	Pisionidae	1	1
10	Chaetopteridae	5	5

11	Spionidae	3	3
12	Orbiniidae	6	6
13	Arenicolidae	1	1
14	Opheliidae	1	3
15	Cirratulidae	1	1
16	Ampharetidae	3	3
17	Flabelligeridae	1	1
18	Nanidae	unknown	unknown
19	Hesionidae	3	3
20	Mageloniadae	1	1
21	Funicidae	4	4
22	Aphroditidae	2	2
23	Sabellidae	1	1
24	Sternapsidae	1	1
25	Owenidae	1	1
26	Pectinariidae	1	2
27	Sabellaridae	2	2
28	Scalibregmidae	4	4
29	Terebellidae	4	6

A total of 23 species of shrimp, belonging to 16 genera, have been recorded (Table 6). These include commercially important species such as *Penaeus notialis*, *Penaeus monodon*, *P. kerathurus*, *Parapenaeopsis atlantica*, *Macrobrachium macrobrachium*, *M. vollehovenii* and *Nematopalaemon hastatus*. These species are most abundant and dominate the catch landings. Shrimps are concentrated in Nigerian estuaries, lagoons and adjacent near shore waters. There are 9 families of crabs comprising 17 genera and 23 species (Table 7). The Portunidae (*Callinectes* sp. and *Portunus* sp.) are the most economically important in the Nigerian coastal zone.

Table 6: Taxonomic list of some commercially important Crustacea from Nigeria

No.	Family	Genera	Species
1	Hippolytidae	1	1
2	Nematocarcinidae	1	1
3	Palaemonidae	1	7
4	Pandalidae	3	3
5	Pasiphaeidae	1	1
6	Palinuridae	1	1
7	Scyllaridae	1	1
8	Aristeidae	2	2
9	Penaeidae	3	4
10	Sicyonidae	1	1
11	Solenoceridae	1	1
	Total	16	23

Table 7: Taxonomic list of Decapoda from Nigeria

No.	Family	Genera	Species
1	Calappidae	1	3
2	Gecarcinidae	1	1
3	Geryonidae	1	1
4	Graspsidae	4	4
5	Homolidae	1	1
6	Majidae	1	1
7	Ocypodidae	2	3
8	Portunidae	4	7
9	Xanthidae	2	2
		17	23

Molluscs

The diversity of the coast corresponds to the variety of coastal and marine sediments (sandy, muddy and rocky) that are transported into the coastal area and sea by the numerous rivers. There are no near shore coral reefs but there is dead coral in deeper waters. The different bottom sediments support different populations of molluscs. In Nigeria, molluscs are found on/in various substrata, including the zones between fresh and brackish waters, and between estuaries and the marine environment. A taxonomic listing of the number of bivalves, gastropods and cephalopods is given in Tables 8, 9 and 10.

Table 8: Taxonomic list of Bivalvia from Nigeria

No.	Family	Genera	Species
1	Arcidae	4	4
2	Aloididae	4	4
3	Cardiidae	1	3
4	Carditidae	1	2
5	Chamidae	1	2
6	Donacidae	3	7
7	Dreissenidae	1	1
8	Erycinidae	1	1
9	Garidae	1	1
10	Glycymeridae	1	1
11	Hiatellidae	1	1
12	Mactridae	2	5
13	Mytilidae	4	7
14	Ostreidae	1	3
15	Pectinidae	2	2
16	Petricolidae	1	1
17	Pholadidae	3	3
18	Pinnidae	2	2
19	Pteriidae	1	3
20	Saxicavidae	1	1

21	Solecurtidae	2	2
22	Solenidae	3	3
23	Tellinidae	2	4
24	Teredinidae	1	1
25	Veneridae	4	6
26	Vulsellidae	1	1
	Total	49	71

Table 9: Taxonomic list of Gastropoda from Nigeria

No.	Family	Genera	Species
1	Haliotidae	1	1
2	Fissurellidae	2	3
3	Patellidae	1	1
4	Neritidae	1	2
5	Littorinidae	2	4
6	Turritella	1	4
7	Architectonia	1	1
8	Vermetidae	2	3
9	Melanidae	1	2
10	Potamididae	1	2
11	Cerithidae	2	3
12	Calyptraeidae	1	2
13	Xenophoridae	1	1
14	Strombidae	1	1
15	Naticidae	1	8
16	Cypraeidae	1	4
17	Cassididae	1	3
18	Doliidae	1	1
19	Muricacea	4	15
20	Columbellidae	1	1
21	Buccinidae	1	2
22	Galeoidae	1	1
23	Nassidae	4	7
24	Olividae	1	3
25	Mitridae	1	1
26	Harpidae	1	1
27	Volutidae	1	5
28	Turridae	3	6
29	Conidae	1	5
30	Terebridae	1	2
		42	94

Table 10: Taxonomic list of Cephalopoda from Nigeria

No.	Family	Genus	Family
1	Sepiidae	2	6
2	Loliginidae	2	2
3	Ommastephidae	8	9
4	Octopodidae	1	2
		13	19

Pisces

Marine fish resources off West Africa exhibit a geographical variation in distribution and abundance. Longhurst (1961) observed three distinct zones as follows:

- (a) A northern subtropical zone of abundant fish resources beginning from the south of Senegal (under the influence of the cold Canary Current).
- (b) A southern subtropical zone of equally abundant resources beginning from the mouth of the Congo River (under the influence of the cold Benguela Current).
- (c) The two rich zones enclose a less productive equatorial tropical zone with the Nigerian marine area located in the Gulf of Guinea.

The listing of teleost and elasmobranch fishes found in Nigerian coastal waters is given in Tables 11, 12 and 13.

Demersal fishes

The term 'demersal' refers to fishes and invertebrates that spend most of their adult life on or near the sea bottom. The demersal assemblages considered here account for the bulk of the catches by various gears. Despite such rich diversity, only about 284 species occur regularly in trawl catches and far less is commercially important. Trawl surveys provide information on the magnitude, composition and distribution of demersal resources over time. The bulk of the demersal fish biomass comprises zoobenthos feeders, indicating the importance of the large detritus sources as a major driving factor in the coastal fisheries ecosystem of Nigeria.

Pelagic Fishes

The term 'pelagic' as used here refers to fishes that spend all or most of their adult life living in the water column, away from the sea bottom. While considerably less diverse than the demersal species, the pelagic assemblage is still species-rich. The species listed are brackish, coastal marine and oceanic species. The pelagic species have been categorised into small and large, the former characterised by maximum lengths of 20-30 cm. The small pelagic species feed mainly on zooplankton and small crustaceans. They are fast growers with high mortality rates and relatively short life spans (2-3 years). Spawning is frequently a year round activity with two spawning and recruitment peaks annually. In contrast, the large pelagics are located at the top of the aquatic food chain and are piscivorous in adult life. Large pelagics are frequently the first resource group to suffer the effects of heavy fishing pressure in view of their more favourable market prices. Small pelagics include Clupeidae (*Ethmalosa fimbriata*, *Sardinella aurita*, *S. maderensis* and *Ilisha africana*), Ariommidae (*Ariomma bondi* and *A. melanum*) and Engraulidae (*Engraulis* sp.). Large pelagics include Carcharchinidae, Scombridae (*Thunnus albacares*, *Katsuwonus pelamis*, *T. obesus*) and Sphyraenidae.

Table 11: Teleost fish families recorded, including the number of genera and species

No.	Family	Genera	Species
1	Acanthuridae	2	2
2	Albulidae	2	2
3	Antennariidae	1	1
4	Ariidae	1	4
5	Ariommidae	1	2
6	Ateleopodidae	1	1
7	Balistidae	1	2
8	Batrachoididae	4	4
9	Belonidae	4	5
10	Bothidae	6	9
11	Bramidae	1	1
12	Branchiostegidae	1	1
13	Carangidae	14	26
14	Centracanthidae	1	2
15	Centrolophidae	2	2
16	Chlorophthalmidae	1	1
17	Citharidae	1	1
19	Clupeidae	4	6
20	Congridae	1	2
21	Coryphaenidae	1	2
22	Cynoglossidae	2	8
23	Dactylopteridae	1	1
24	Diodontidae	1	1
25	Diretmidae	1	1
26	Drepanidae	1	1
27	Eleotridae	1	1
28	Elopidae	1	1
29	Emmelichthyidae	1	1
30	Engraulidae	1	1
31	Ephippidae	1	2
32	Excocoetidae	4	7
33	Fistulariidae	1	2
34	Gempylidae	3	3
35	Gerridae	2	2
36	Grammistidae	1	2
37	Haemulidae	2	5
38	Hemiramphidae	4	5
39	Istiophoridae	3	5
40	Kyphosidae	1	1
41	Labridae	3	3
42	Lampridae	1	1
43	Lethrinidae	1	1
44	Lobotidae	1	1
45	Lophiidae	2	2
46	Lutjanidae	2	6

47	Macrouridae	3	4
48	Megalopidae	1	1
49	Merlucciidae	1	1
50	Molidae	1	1
51	Monodactylidae	1	1
52	Moridae	3	3
53	Mugilidae	3	6
54	Mullidae	1	1
55	Muraenesocidae	1	1
56	Muranenidae	5	9
57	Ophichthidae	6	6
58	Ophidiidae	1	1
59	Percophidae	1	2
60	Periophthalmidae	1	1
61	Peristediidae	1	1
62	Platycephalidae	1	1
63	Polynemidae	3	3
64	Pomacentridae	1	2
65	Pomatomidae	1	1
66	Priacanthidae	2	2
67	Psettodidae	1	1
68	Rachycentridae	1	1
69	Scaridae	2	2
70	Sciaenidae	6	13
71	Scombridae	9	11
72	Scorpaenidae	2	5
73	Serranidae	6	10
74	Soleidae	6	13
75	Sparidae	6	11
76	Sphyraenidae	1	4
77	Stromateidae	1	1
78	Synodontidae	1	1
79	Tetraodontidae	3	4
80	Trachichthyidae	3	3
81	Trachinidae	4	4
82	Trichiuridae	4	4
83	Triglidae	2	5
84	Uranoscopidae	1	2
85	Xiphiidae	1	1
86	Zeidae	2	2
		191	284

Table 12: Rajiform fish families recorded, including the number of genera and species.

No.	Family	Genera	Species
1	Dasyatidae	1	4
2	Gymuridae	1	2
3	Torpedinidae	1	4

4	Myliobatidae	3	3
5	Mobulidae	2	3
6	Pristidae	1	3
7	Rajidae	1	5
8	Rhinobatidae	1	3
9	Rhynchobatidae	1	1
10	Rhinopteridae	1	1
	Total	13	29

Table 13: Squaliform fish families recorded, including the number of genera and species.

No.	Family	Genera	Species
1	Hexanchidae	2	2
2	Carcharhinidae	3	6
3	Hemigalidae	1	1
4	Ginglymostomatidae	1	1
5	Leptochariidae	1	1
6	Odontaspidae	1	1
7	Oxynotidae	1	1
8	Scyliorhinidae	2	2
9	Sphyrnidae	1	2
10	Squalidae	4	9
11	Squatidae	1	2
12	Triakidae	2	2
		21	30

Reptiles

The Nile crocodile, *Crocodylus niloticus*, is found in some estuaries. Turtles are protected species, species occurring in the Nigerian zone include (*Caretta caretta caretta* (Atlantic Loggerhead), *Lepidochelys olivacea* (Pacific riddley turtle), *Eretmochelys imbricata* (Atlantic Hawksbill turtle) and *Demochelys coriacea* (Leatherback turtle). They nest along the Nigerian beaches and inhabit mainly coastal waters.

Birds

A total of 13 bird families, comprising 45 species, have been recorded in the Nigerian coastal zone (Table 14). Most of these birds are migratory, utilizing the mangrove and mudflat areas of the estuaries for short periods each year, while others are resident. The most common palaeartic migrant shorebirds are *Charadrius hiaticula*, *Pluvialis squatorola*, *Tringa tetanus*, *T. nebularia* and *Actitis hypoleucos*. Among the water birds, the most common large residents are *Egretta* species (e.g. *E. intermedia*, *E. garzetta* and *E. alba*).

Table 14: Families, genera and species of birds in the coastal zone of Nigeria

No.	Family	Genera	Species
1	Alcedinidae	8	11
2	Ardeidae	3	8
3	Charadriidae	2	2

4	Hirundinidae	3	3
5	Laniidae	1	1
6	Muscicapidae	1	1
7	Nectarinidae	2	2
8	Pelicanidae	1	2
9	Phylacrocoracidae	1	1
10	Pycnonotidae	2	2
11	Scolopacidae	4	9
12	Scopidae	1	2
13	Sylviidae	1	1
		29	45

Source: Roux, F. (1999)

Studies of the mangrove forests have so far not taken into account the bird community living within this habitat. A previous contribution (Roux 1998) has underlined the common features of mangrove bird community in Senegal and in Western Nigeria, as well as peculiarities of these countries in terms of specific composition. There is a degree of dependency of the most characteristic mangrove species towards the coastal zone.

All 45 species have been reported to utilize the mangrove and mudflat areas as foraging grounds and/or roosting sites. Shore and water birds consume large amounts of crustaceans, annelids, molluscs and fish in their diet. The Nigerian coastal zone is a very suitable wintering or staging site for migratory waders. The expansive areas of exposed mud and sand flats at low tide and the large mangrove systems provide rich nutrient flows into the intertidal zone, thus providing suitable conditions for visiting water birds. A typology of mangroves in terms of bird composition may reflect the different organisational types of mangrove ecosystems, an essential tool for mangrove study and management.

Mammals

Fruit bats most likely play an important role in the reproductive biology of most mangrove plants by acting as their pollinator. A large population of tree pangolin (*Manis tricuspis*), Grasscutter (*Thryonomys swinderianus*), Leopard (*Panthera capensis*), Otter (*Aonyx capensis*), Nile crocodile (*Crocodylus niloticus*), short nosed crocodile (*Orteolaemis tetraspis*), Mona monkeys (*Cercopithecus mona*), Putty nose monkey (*C. nictitanus*), Forest genet (*Genetta poensis*), Hippopotamus (*Hippopotamus amphibius*), Red river hog (*Potamochoerus porcus*), Buffalo (*Syncerus caffer*), Bushbuck (*Tragelaphus scriptus*), Maxwell duiker (*Cephalophus maxwelli*), Yellow-backed duiker (*Cephalophus sylvicultor*), Blue duiker (*C. monticola*), Brush tailed porcupine (*Antherurus africanus*), Olive colobus (*Colobus verus*), Chimpanzees (*Pan troglodytes*), Pygmy hippopotamus (*Choeropsis liberiensis*), Sitatunga (*Tragelaphus spekei*) and manatees (*Trichenchus senegalensis*) classified as endangered species of wildlife utilize the coastal zone, occurring in remote and undisturbed mangrove forests, they feed on leaves and fruits and palm shoots. Some monkeys have a preference for feeding on mangrove leaves.

The Unknown

The marine environment is very difficult to study, as it requires special mobility and equipment. Unlike the terrestrial environment that is easily accessible by road or by foot, the marine environment

has wide ranging depths, from one metre to thousands of metres deep. The craft used are expensive and most of the vessels used for research have been donations from the Japanese Government.

Another constraint has been that most of the available literature is usually from temperate or other tropical areas and species identification therefore often difficult. Many taxa have not been studied and others have not been described. The most studied taxa are those of commercial importance. Unknown marine invertebrate constitute the bulk of the unknown. These include the phyla Porifera, Cnidaria (Coelenterata), Ctenophora, Platyhelminthes, Nemertea, Sipunculida, Echiurida and Nematoda, Entoprocta, Tardigrada, Chaetognatha, Bryozoa, Branchiopoda, Mollusca (Aplousobranchia, Polyplacophora, shell-less gastropods, scaphopods, some bivalves and gastropods), Arthropoda (Crustacea, Insecta, Collembola, Pycnogonida and Arachnida) Annelida, Bryozoa, Brachiopoda, Echinodermata and Ascidiacea.

For the marine vertebrates, the fishes (bony and cartilaginous) are not fully studied and some are listed only by their generic name. The biology and ecology of most species still requires investigation. Marine birds are not always correctly identified, especially from a distance or based on listening to their calls. The coastal environment is not always suitable for ornithologists but a wide variety of birds winter on the mud flats, sand bars and within the mangroves. Coastal mammals, reptiles and amphibians are yet to be studied due primarily to the inhospitable terrain.

Threats

The Nigerian marine environment continues to come under various serious threats, usually linked to development pressure. Man-made impacts tend to impair the integrity of the marine environment and negatively influence biodiversity.

Pollution of coastal waters

The main sources of pollution include industrial waste, raw/untreated sewage and pesticides. Hydrocarbon production contributes about 95% of the country's Gross National Product (GNP). Oil exploration, exploitation and transportation have a significant effect on the environment. Crude and refined oil spills incidents are very frequent in the coastal and marine environment, especially during periods of very strong ocean currents when it can spread to cover the entire 853 km coastline. The area where frequent spillages occur is categorized as ecologically sensitive or critical (mangrove ecosystems).

Gas flaring

Efforts to reduce the flaring of associated gas have not been very successful as low technology does not permit the exploitation of natural gas. Flaring impacts on the quality of the coastal atmosphere and affects coastal vegetation and human habitation. The mixture of flared gas and precipitation causes acid rain, with harmful effects on the mangrove biota and marine organisms. These impacts are yet to be studied and fully understood.

Land reclamation

Land reclamation of swamps adjoining the coast for the increasing human population and other development activities destroys the nursery, breeding and feeding grounds of marine organisms. It also restricts the distribution of organisms and leads to considerable loss of biodiversity.

Coastal erosion

Coastline erosion is prevalent in Nigeria and has been closely associated with ocean front constructions such as ports and harbours. Ibe (1988) reported that the Nigerian coastline experiences some of the fastest erosion rates in the world averaging about 20-30 metres per year in some locations.

Over fishing

The coastal and marine resources are either over fished, or fished close to, or beyond their maximum sustainable yield. The heterogeneity of species of different sizes poses a problem in mesh size regulation in the fishery sub-sector.

Deforestation

Deforestation of the coastal mangrove vegetation exposes the coast to storm surges, coastal erosion and loss of land. The mangrove swamp is the spawning, breeding, nursery and feeding ground for fish and shellfish for both brackish and marine organisms.

Construction of canals and channels

Construction of canals/channels contributes to land loss as craft movement generates strong waves that impact on the banks of these waterways.

Mining of sand

Mining activities on the foreshore and seabed are a very common feature in Nigeria and they impact negatively on the bottom communities. Mining of sand affects the environmental sediment balance and has major impacts on the associated bottom dwelling organisms.

Invasive species

Water hyacinth *Eichhornia crassipes* entered Nigeria through the freshwater lagoon system in September 1984. The present distribution in coastal waterways has been estimated at 3,561 km² by the Chemical Task Force on Water Hyacinth Control (1992). Spreading of the infestation to adjoining lagoons in the Republic of Benin and the Cameroon is estimated at 500 km² and 275 km² respectively.

The tiger shrimp *Penaeus monodon* entered the Nigerian coastal waters in about 1992 following the escape of captive stocks from a shrimp farm in the Rivers area. These shrimps now occur throughout Nigerian coastal waters less than 20 m deep. They are most abundant in Akwa Ibom, Rivers and Cross River coastal waters and have recently been reported in Lagos lagoons and other estuaries along the coast. The shrimps are caught throughout the year with a peak period in abundance

between February and October. Initial trawl landings in 1998-1999 were limited (500-800 kg per trip of 50 days) but by the year 2000 it had become a major fishery for the commercial shrimp trawlers with each vessel landing between 10 and 14 tonnes per annum. By the end of 2001 each vessel landed an average of 17-21 tonnes per annum (Isebor 2003). The impact of this invasive species on indigenous shrimps is unknown.

Nypa fruticans is gradually replacing *Rhizophora* sp. due to mangrove deforestation and the lack of a management plan for the coastal zone. Slow natural regeneration of deforested areas leading to the rapid invasion and colonisation by *Nypa*. This invasive plant is a threat to the economically and ecologically important mangrove trees, as well as exacerbating the destabilisation and erosion of coastal foreshores. *Nypa* lacks the necessary prop root system that stabilises and consolidates the muddy banks.

Threatened coastal species

A list of threatened animal species in the coastal and brackish water zones of Nigeria is given in Table 15.

Table 15: Some threatened fauna in the coastal and brackish water zones of Nigeria.

Group	Species name	Common name
Pholidon	<i>Manis tricuspis</i>	Tree Pangolin
Rodentia	<i>Expixerus epii</i>	African palm squirrel
	<i>Thryonomys swinderrianus</i>	Grasscutter
Carnivora	<i>Panthera capensis</i>	Leopard
Carnivora	<i>Aonyx capensis</i>	Otter
Tubulidentata	<i>Trichenchus senegalensis</i>	Manatee
Artiodactyla	<i>Choeropsis liberiensis</i>	Pigmy hippopotamus
Artiodactyla	<i>Tragelaphus spekei</i>	Sitatunga
Reptilia	<i>Crocodylus niloticus</i>	Nile Crocodile
Reptilia	<i>Orteolaemis tetraspis</i>	Short nosed crocodile
Primates	<i>Pan troglodytes</i>	Chimpanzee
Primates	<i>Cercopithecus erythrogaster</i>	Red bellied quonons
Primates	<i>Cercopithecus mona</i>	Mona monkey
Primates	<i>Colobus verus</i>	Olive colombus
Primates	<i>Cercopithecus nictitans</i>	Putty nosed monkey
Primates	<i>Cercopithecus nictitanus</i>	White- throated monkey
Carnivora	<i>Genetta poensis</i>	Forest genet
Proboscidea	<i>Loxodonta africana</i>	Elephant
Artiodactyla	<i>Hippopotamus amphibius</i>	Hippopotamus
Artiodactyla	<i>Potamocherus porcus</i>	Red river hog
	<i>Syncerus caffer</i>	Buffalo
	<i>Tragelaphus scriptus</i>	Bushbuck
	<i>Cephalophus maxwelli</i>	Maxwell duiker
	<i>Cercopithecus sylvicultor</i>	Yellow-backed duiker
	<i>Cercopithecus monticola</i>	Blue duiker
Rodentia	<i>Antherurus africanus</i>	Bush tailed porcupine

Capacity

Human Capacity

Most taxonomists are focussed on terrestrial species. Marine biodiversity research is still in its infancy in Nigeria.

Institutional Capacity

Nigeria has signed and ratified all the necessary conventions. Research is primarily concentrated on species of commercial value. The Nigerian Institute for Oceanography and Marine Research was primarily established in 1975 to conduct research on the living and non-living resources of the coastal zone. Other institutions active in marine biodiversity research are the coastal Universities such as Lagos, Port Harcourt, Uyo, Calabar and the Science and Technology Institute in Port Harcourt.

There are no national museums but collections can be found in various institutions. Nigeria welcomes any assistance leading to establish a central national museum. The state of species identification and documentation is in its infancy, with limited and scattered collections currently available. There is no electronic cataloguing of museum specimens.

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