

MAJOR MARINE BIODIVERSITY COMPONENTS IN CAMEROON

1. Fish

The diversity of marine fish in Cameroon marine and coastal waters totals some 381 species, with an additional 70 species recorded as being associated with brackish estuarine environments (Fishbase, 2004). The fishery sector contributes some 0.6% to the national GDP (Baer, 2001) with the near-shore shrimp fishery representing an important economic activity.

1.1. Commercial Species

The exploitable species consist of essentially of fish, shrimps and molluscs. The fish comprise two major groups: Pelagic and Demersal, both accounting for about 63% and 19%, respectively of the total fishery exploitation. Commonly exploited species, their ecology and exploitation status are listed below in Table 1. However, the most exploited are:

- Pelagic species: *Ethmalosa fimbriata*, *Sardinella maderensis* and *Illisha Africana*;
- Demersal species: Scianidae (croakers especially), *Arridae* (*Arius spp*), *Polymenidae* (*Galeodes decadactylus*) and *Polydactylus quadrifilis*, Big eye (*Brachydeuterus auritus*), *Pomadasy spp.*, Soles and *Cynoglossidae*

Table 1: List of common fish species exploited in Cameroon waters (modified after Wolfgang, 1990).

Species	Habitat	Exploitation type
Scianidae (<i>Croakers, Mussobo</i>)	Marine up to 350m depth, also in estuaries (benthic)	commercial
<i>Pseudolithus typus</i>	Muddy and sandy bottoms to about 150m depth	
<i>Pseudolithus senegalensis</i>	In shallow waters on muddy, sandy and rocky bottoms	
<i>Pseudolithus elongatus</i>	Brackish waters and estuaries	
<i>Umbrina sp</i>	Sandy muddy bottoms up to 75m depth	
<i>Pteroscion peli</i>	Coastal waters to about 200m depth, more common between 30-60m	
Polynemidae (threadfins, Capitain)	Marine coastal waters, up to 30m depth; benthic	Commercial
<i>Galeodes decadactylus</i>	Sandy and muddy bottoms in shallow coastal waters, also estuaries	
<i>Pentanemius quinquarius</i>	Sandy and muddy bottoms to 50m depth	
<i>Polydactylus quadrifilis</i> (shine nose)	Sandy bottoms to 50m, also estuaries	
Pomadasyidae(Grunts)	Mostly marine, up to 200m depth (benthic)	Commercial
<i>Brachydeuterus auritus</i>	Coastal waters from 10-100m depth, common 40-50m	
<i>Pomadasy jubelini</i>	Sandy and muddy bottoms in coastal waters and estuaries, common between 20-50m depth	
Clupeidae (Sardines)	Coastal marine waters, estuaries(pelagic)	Commercial
<i>Sardinella maderensis (Strong Kanda)</i>	Warm coastal waters, from surface to 50m, sometimes in estuaries	
<i>Ethmalosa fimbriata (Bonga)</i>	Coastal marine waters, estuaries	
<i>Illisha Africana (Menyanya)</i>	Coastal marine waters, estuaries	
Ariidae (Sea catfish)	Coastal marine waters, estuaries (benthic)	Commercial
<i>Arius heudoloti</i>	Rivers, estuaries and adjoining coastal waters	
<i>Arius laticutatus</i>	Coastal, marine and brackish waters	
Drepanidae (Sicklefishes)	Marine, from about 20-50m depth	Subsistence
<i>Drepana africana</i>		
Spariidae (Seabreams)	Marine upto about 150m(benthic)	Commercial
<i>Dentex angolensis</i>	On different types of bottoms on the continental shelf	
<i>Dentex congoensis</i>	idem	
<i>Dentex canariensis</i>	idem	
<i>Pagellus bellotti</i>	On hard and sandy bottoms to 100m	
<i>Pagrus caeruleostictus</i>		

Species	Habitat	Exploitation type
Serranidae (Groupers)	Marine, upto 300m, also estuaries(benthic)	subsistence
<i>Epinephelus aeneus</i>	Sandy and muddy bottoms from coastline upto 100m	
<i>Epinephelus spp.</i>		
Lutjanidae (Snappers)	Mostly marine, up to 450m depth, also estuaries(benthic)	Commercial
<i>Lutjanus atlantica</i>		
<i>Lutjanus dentatus</i>	Rocky bottoms, also estuaries	
<i>Lutjanus gorensis</i>	Rocky and other hard bottoms, juveniles in estuaries	
Cynoglossidae (tonguesoles)	Marine, up to 300m(benthic)	Commercial
<i>Cynoglossus canariensis</i>	On sandy and muddy bottoms from 15-300m depth	
Carangidae (Jacks, pilotfishes etc)	Marine upto 200m depth, few in brackish waters(benthic)	subsistence
<i>Alectis alexandrinus</i>	Adults near bottom to about 60m, young pelagic	
<i>Caranx crysos</i>	Usually close inshore, but also in deeper waters, 100m	
<i>Caranx spp.</i>		
<i>Chlorosocumberus chrysurus</i>	Coastal waters, also in estuaries and mangrove-lined lagoons	
<i>Decapterus punctatus</i>	Demersal in coastal waters to about 100m, also pelagic	
<i>Selar crumenophthalmus</i>	Shallow coastal waters, more regularly found in dry season	
<i>Seriola sp.</i>		
<i>Selene dorsalis</i>	Coastal waters up to 60m, regularly found in May-October	
<i>Trachinotus sp</i>	Coastal waters and estuaries	
Trichuriidae (Cutlass fish)	Marine, up to 1500m(pelagic (night) and benthic)	Commercial
<i>Trichurus lepturus</i>		
Sphyraenidae (Barracudas)	Marine, up to about 100m depth (pelagic)	subsistence
<i>Sphyraena guachancho</i>	Estuaries and muddy bottoms	
<i>Sphyraena piscatorium</i>	idem	
Scombridae (Tunas)	Marine up to 100m depth(pelagic)	subsistence
<i>Scomberomorus tritor</i>	Warm water species, sometimes enters estuaries	
<i>Thunnus obesus</i>	Mainly offshore species, but also occurs near shore	
Dasyatidae (Stingrays, Coverpot)	Coastal waters, up to 300m depth(demersal)	subsistence
<i>Dasyatias spp.</i>		
Rajidae (Rays, Coverpot)	Marine, up to 400m depth(benthic)	subsistence
<i>Raja miraletus</i>		
Mugilidae (Mullet)	Estuaries, freshwaters, up to 20m(pelagic)	subsistence
<i>Mugil cephalus</i>		
Carcharinidae (Requiem Sharks)	Coastal oceanic waters, up to 800m depth(benthic or pelagic)	Accidental catches
<i>Carcharhinus limbatus</i>	Pelagic in coastal and offshore waters	
<i>Carcharias taurus</i>		
<i>Carcharias sp.</i>		
<i>Carcharodon sp.</i>		
<i>Carcharhinus plumbeus</i>	Coastal waters on sandy and muddy bottoms, often near estuaries	
Family Pristidae (Sawfishes)	Marine and brackish waters, up to 10m depth(benthic)	
<i>Pristis pectinata</i>	Coastal waters up to 100m, also estuaries	
<i>Pristis pristis</i>	Demersal in littoral	
<i>Pristis microdon</i>	Demersal in inshore coastal waters to about 45m depth, also in estuaries	

1.2. Threatened/Endangered fish species

Table 2 presents threatened/endangered fish species in the Cameroon marine waters together with their common names and status. A total of 12 families and 16 species that are enumerated. Main threats are include: Pollution (chemical and industrial etc), Over-exploitation (use of inappropriate gears and techniques), Habitat degradation, and inadequate legal and Institutional policies.

Table 2: Overview of Threatened or Endangered Marine Fish fauna (Fishbase, 2004; IUCN 1995).

Fish Species	Common Name	Status
Family Rhincodontidae <i>Rhincodon typus</i> Smith, 1828	Whale shark	Vulnerable
Family Lamnidae <i>Carcharodon carcharias</i> (Linnaeus, 1758) <i>Isurus oxyrinchus</i> Rafinesque, 1810	Mackerel sharks or white sharks	Vulnerable
Family Odontaspidae <i>Carcharias taurus</i> Rafinesque, 1810	Sand tigers	Near Threatened
Family Carchahinidae <i>Carcharhinus limbatus</i> (Muller & Henle, 1839)	Requiem sharks	Vulnerable
Family Centrophoridae <i>Centrophorus granulosus</i> (Bloch & Schneider, 1801) Family Dalatiidae <i>Dalatias licha</i> (Bonnaterre, 1788)	Sleeper sharks	Vulnerable
Family Pristidae <i>Pristis microdon</i> Latham, 1794 <i>Pristis pectinata</i> Latham, 1794 <i>Pristis pristis</i> (Linnaeus, 1758)	Saw fishes	Vulnerable
Family Myliobatidae <i>Aetobatus narinari</i> (Euphrasen, 1790)	Eagle and Manta rays	Data deficient
Family Syngnathidae <i>Hippocampus hippocampus</i> (Linnaeus, 1758)	Pipefishes and Sea horses	Vulnerable
Family Gobiidae <i>Bathygobius burtoni</i> (O' Shaughnessy, 1875)	(Gobies) known from Victoria	Data deficient
Family Scombridae <i>Thunnus alalunga</i> (Bonnaterre, 1788) <i>Thunnus obessus</i> (Lowe, 1839)	Mackerels, Tunas	Vulnerable
Family Serranidae <i>Epinephelus itajara</i> (Geoffrey St Hilaire, 1809) Syn. <i>Parepinephelus acutirostris</i> Valenciennes, 1828/ <i>Mycteroperca rubra</i> (Bloch, 1793)	Sea basses, Groupers	Critically Endangered

1.3. Overview of Dangerous Fish species for human

A list of dangerous marine fish species for human and common names is highlighted below in table 3. A total of 22 families and 42 species are reported. The most represented group is the Carcharhinidae (Requiem sharks).

Table 3: Overview of Dangerous marine fish fauna Cameroon (Fishbase, 2004)

Fish Species	Common Name
Family Lamnidae <i>Carcharodon carcharias</i> (Linnaeus, 1758) <i>Isurus oxyrinchus</i> Rafinesque, 1810	Mackerel sharks or white sharks
Family Carchahinidae <i>Carcharhinus limbatus</i> (Muller & Henle, 1839) <i>Carcharhinus falciformis</i> (Muller & Henle, 1839) <i>Carcharhinus leucas</i> (Muller & Henle, 1839) <i>Carcharhinus longimanus</i> (Poey, 1861) <i>Prionace glauca</i> (Linnaeus 1758)	Requiem sharks
Family Pristidae <i>Pristis microdon</i> Latham, 1794 <i>Pristis pectinata</i> Latham, 1794	Pipefishes and Sea horses

Fish Species	Common Name
Family Sphyrnidae Sphyrna couardi Cadenat, 1951 Sphyrna lewini (Griffith & Smith, 1834)	Hammerhead sharks
Family Squatinidae Squatina oculata Bonaparte, 1840	Angel sharks
Family Torpenidae Torpedo mackayana Metzelaar, 1919 Torpedo marmorata Risso, 1810 Torpedo nobiliana Bonaparte, 1835 Torpedo torpedo (Linnaeus, 1758)	Electric sharks
Family Dasyatidae Dasyatis centroura (Mitchill, 1815) Dasyatis pastinaca (Linnaeus, 1758)	Stingrays
Family Myliobatidae Aetobatus narinari (Euphrasen, 1790)	Eagle and manta rays
Family Rajidae Rostroraja alba (Lacepede, 1803)	Skates
Family Albulidae Albula vulpes (Linnaeus, 1758)	Bonefishes
Family Megalopidae Megalops atlanticus Valenciennes, 1847	Tarpons
Family Scorpaenidae Scorpaena leavis Trochel, 1866	Scorpion fishes
Family Setarchidae Setarches guentheri Johnson, 1862	Deepwater scorpion fishes
Family carangidae Alectis ciliaris (Bloch, 1787) Caranx crysos, (Mitchill, 1815) Caranx hippos (Linnaeus, 1766) Caranx lugubris Poey, 1860 Seriola carpenteri Mather, 1971	Jacks and pompanos
Family Coryphaenidae Coryphaena hippurus Linnaeus, 1758	Dolphin fishes
Family Gempylidae Promethichthys Prometheus Cuvier, 1832) Ruvettus pretiosus Cocco, 1833	Snake mackerels
Family Scombridae Acanthocybium solandri (Cuvier, 1832) Euthynnus alletteratus (rafinesque, 1810) Katsuwonus pelamis (Linnaeus 1758) Sarda sarda (Blach, 1793)	Mackerels, tunas
Family Sphyraenidae Sphyraena afra Peters, 1844	Barracudas
Family Molidae Mola mola (Linnaeus, 1758)	Molas
Family Monacanthidae Aluterus schoepfii (Walbaum, 1792)	Filefishes

2. Crustacea, Molluscs and Crabs

Important Crustacea, Crabs and Molluscs occurring in Cameroon waters are listed below together with their ecology and status of exploitation in table 4. Shrimps constitute an important part of the fisheries with Peneids and *Nematopalaemon hastatus* being most exploited and making up about 2% and 16% respectively. Recently, exploitation of the exotic shrimp *Penaeus monodon* that was introduced into Nigeria from Asia is gaining grounds. Molluscs and crabs are exploited mainly for subsistence.

Table 4: Important Crustacea, Crabs, Molluscs and other species exploited by artisanal and industrial fisheries.

Crustacea	Ecology	Exploitation type
<i>Parapaeneus atlantica</i> (Guinea shrimp)	Coastal marine waters, estuaries, up to 40m depth -benthic	Commercial
<i>Parapaeneus longirostris</i> (deepwater rose shrimp)	Sandy and muddy bottoms, upto 600m	Commercial
<i>Nematopalaemon hastatus</i> (Estuarine prawn)	Sandy and muddy bottoms in estuaries and coastal marine waters, upto 50m depth	Commercial
<i>Penaeus notialis</i> (Pink shrimp)	Coastal marine waters, estuaries Muddy and muddy sand 15-100m	Commercial
<i>P. monodon</i>		
<i>Macrobrachium spp</i> (Giant river prawn)	Riverine and brackish water	subsistence
Crabs		
<i>Callinectes marginatus</i> (Marbled swim crab)	Backish waters of estuaries and lagoons	subsistence
<i>Ocypoda ippeus</i> (African ghost crab)	Sandy beaches	subsistence
Molluscs		
<i>Sphonaria moure t</i> (Snails)		
<i>Purpura spp.</i>		
<i>Sepia officinalis</i> (Common cuttle fish)	Demersal on sandy and muddy bottoms, from surface to 200m	subsistence
<i>Mytilus tenuistriatus</i> (Sea Snails)	Rhizophora roots, rocky beaches	subsistence
<i>Crassostrea gasar</i> (Oyster, bivalve)	Rhizophora roots,	subsistence
<i>Crassostrea rufa</i> (Oyster, bivalve)	Rhizophora roots,	subsistence
Others		
<i>Periopthalmus hoelferi</i> (mudskipper)		subsistence
<i>Tympanotonus fuscatus</i> (Periwinkle)		subsistence

3. Marine turtles

Of the 6 regional species of marine turtles, 4 are known to occur in Cameroon (Table 5): these include the green turtles (*Chelonia mydas*), the hawksbill turtles (*Eretmochelys imbricate critically endangered*) and the Olive ridley turtles (*Lepidochelys olivacea*) all belonging to the family Cheloniidae: then the Leatherback turtle (*Dermochelys coriacea*) of the family Dermochelidae (WWF, 2005) The green turtle and imbricate turtle are listed in the IUCN red list as threatened with extinction and the others as threatened. The south of Cameroon is a favourable site for breeding and feeding of these turtles.

Table 5. Threatened or Endangered marine turtles: Species listed in CITES* Convention (IUCN, 1998) CITES:

Species	Status	Common Name
<i>Eretmochelys imbri</i>	Critically endangered	Hawksbill Turtle
<i>Dermochelys coriacea</i>	Endangered	Leatherback turtle
<i>Lepidochelys olivacea</i>	Endangered	Olive ridley turtles
<i>Chelonia mydas</i>	Endangered	Green Turtle

4. Cetaceans and other marine mammals

There is no specific information on cetaceans (diversity and abundance) and other marine mammals occurring specifically in Cameroon coastal waters. A list of Cetaceans likely to occur in Cameroon marine waters is given below in table 6. But information between 1909 and 1915 shows that approximately 17,000 humpback whales were killed along the coast of Gabon (which shares boundaries to the south with Cameroon), Angola, Namibia and South Africa. This is confirmed by

the recent entanglement of a humpback at the Bakingili Beach near Limbe in the South West Province in February, 2005 which served as food for the entire Limbe and Idenau populations. Dolphins have often been caught and even sighted by fishermen mostly during the rainy season. All these animals are threatened. Manatees are also found in the Sanaga and Ntem estuaries and are endemic to lake Ossa, near Edea.

Table 6: Threatened or Endangered Cetaceans likely to occur in Cameroon waters (source: Jefferson et al. 1997 cited in Burns, 2002)

Species	Common Name
Family Delphinidae	
<i>Orcinus orca</i>	Killer Whale
<i>Globicephala macrorhynchus</i>	Short-finned Pilot Whale
<i>Pseudorca crassidens</i>	False Killer Whale
<i>Feresa attenuate</i>	Pygmy Killer Whale
<i>Peponocephala electra</i>	Melon-head Whale
<i>Grampus griseus</i>	Risso's Dolphin
<i>Steno bredanensis</i>	Rough-Toothed Dolphin
<i>Sousa teuszii</i>	Atlantic Humpback Dolphin
<i>Tursiops truncatus</i>	Bottle-nosed Dolphins
<i>Stenella attenuate</i>	Pantropical Spotted Dolphin
<i>Stenella frontalis</i>	Atlantic spotted Dolphin
<i>Stenella longirostris</i>	Spinner Dolphin
<i>Stenella clymene</i>	Clymene Dolphin
<i>Stenella</i>	Striped Dolphin
<i>coeruleoalba</i>	Common Dolphin
<i>Delphinus delphis</i>	
<i>Lagenodelphis hosei</i>	Fraser Dolphin
Family Phocoenidae	
<i>Phocoena phocoena</i>	Harbor porpoise

5. Birds

The sea birds of Cameroon marine waters are poorly studied. However, birds likely to occur in Cameroon marine waters are listed below in table 7.

Table 7: Seabirds likely to occur in Cameroon waters (Burns, 2002)

Scientific Name	Common Name
<i>Hydrobates pelagicus</i>	British Storm-petrel
<i>Oceanodroma castro</i>	Madeiran Storm-petrel
<i>Puffinus puffinus</i>	Manx Shearwater
<i>Puffinus gravis</i>	Great Shearwater
<i>Stercorarius pomarinus</i>	Pomarine Skua
<i>Stercorarius parasiticus</i>	Arctic Skua
<i>Stercorarius longicaudis</i>	Long-tailed Skua
<i>Larus sabini</i>	Sabine's Gull
<i>Sterna fuscata</i>	Sooty Tern
<i>Anous minutus</i>	Black Noddy
<i>Anous stolidus</i>	Brown Noddy
<i>Morus capensis</i>	Cape Gannet
<i>Sula leucogaster</i>	Brown Booby
<i>Sula dactylatra</i>	Masked Booby
<i>Sula sula</i>	Red-footed Booby
<i>Fregata aquila</i>	Ascension Frigate bird
<i>Phaeton aethereus</i>	Red-billed Tropic bird
<i>Phaeton lepturus</i>	White-Tailed Tropic bird

6. Mangrove and Estuarine diversity

6.1. Mangroves trees

Six true mangrove tree species belonging to three families occur in Cameroon coastal zone. These include *Rhizophora mangle*, *R. harrisonii* and *R. racemosa* of the family Rhizophoraceae, *Avicennia germinans* and *A. Africana* of the family Verbenaceae and *Leguncularia racemosa* and *Conocarpus erecia* of the family Combretaceae (Annon, 1992). The total area of mangroves in Cameroons is about 2, 434 km². Mangroves in Cameroon still have enormous potentials, despite the destruction of about a third of their total area for building materials, fuel wood, fishing materials, etc. They serve various purposes: shelter marine and coastal shrimps, fish, molluscs and other animals, constitute potential aquaculture and ecotouristic sites, nursery zone for fish and other marine animals.

The *Rhizophora sp* (red mangroves) are most dominant and characteristic of tidal areas and are followed by ilots of *R. harrisonii* while *R. mangle* is rare and limited to terrestrial periphery of mangroves. *Avicennia sp.* appears on sandy and rocky bans and is rare in the Cameroon estuary but abundant in the Tiko, Limbe and the Rio del Rey region.

6.2. Fauna

Table 8 below presents important mangrove/estuarine species, their ecology and common names. They mainly comprise: Crustacea, Molluscs, Crabs, Fish, and others (Mudskiper, Periwinkles and *Sepia spp*). Marine mammals that could be of interest here include: otters, water or marsh mongoose, manatees (*Trichechus senegalensis*). The manatee is a herbivore aquatic mammal found in rivers, estuaries, lakes and lagoons of west Africa. In Cameroon they are abundant in the Korup area. They also occur in the Sanaga and Wouri estuaries. It is threatened with extinction and in the red list of the IUCN as vulnerable.

Table 8: Important Estuarine and mangrove species many of which are exploited by artisanal and industrial fisheries. (Burns, 2002, COMRAF, 1990)

Crustacea	Common Name	Habitat
<i>Nematopalaemon hastatus</i>	White Shrimp	muddy bottoms in estuaries/coastal marine waters, upto 50m depth
<i>Penaeus notialis</i>	Pink shrimp	Coastal marine waters, estuaries Muddy 15-100m
<i>Macrobrachium spp</i>	.Giant river prawn	Riverine and brackish water
Crabs		
<i>Callinectes marginatus</i>	Marbled swim crab	Backish waters of estuaries and lagoons
Molluscs		
<i>Crassostrea gasar</i>	(<i>Oyster, bivalve</i>)	Rhizophora roots,
<i>Crassostrea rufa</i> (Oyster, bivalve)	Rhizophora roots,
Fish		
Clupeidae		
<i>Ethmalosa fimbriata</i>	Bonga, an important species targeted by artisanal fishery	Pelagic, estuarine and mangrove
<i>Sardinella maderensis</i>	Strong Canda	Light sandy , muddy habitats 6-30m depth
Ariidae		
<i>Arius heudeloti</i>	Catfish	Demersal, estuarine
<i>Chrysichthys nigrodigitatus</i>		
Cynoglossidae		
<i>Cynoglossus spp</i>	Sole	Demersal, muddy sediments at 15-100m
Lutjanidae		

Crustacea	Common Name	Habitat
Lutjanus spp.	Snapper	Demersal, estuaries
Lutjanus agennes		
Polynemidae		
Polydactylus quadrifilis	Shine nose	idem
Pentanemus quinquarius		
Galeodes decadactylus		
Sphyaena piscatorium	Barracuda	Idem
Scianidae		
Pseudolithus typus	Croaker	idem
P. elongatus		
Carangidae		
Caranx hippos		
Trachinotus ovatus		
Drepanidae		
Drepana africana		
Mugilidae		
Mugil spp	Mullet	Flats in swamps
Lophiidae		
Lophius sp		
Gerridae		
Eucinostomus malanopterus		
Cichlidae		
Tilapia mariae		
Tilapia sp.		
Others		
<i>Periophthalmus hoelferi</i>	mudskipper	Mud in swamps
<i>Tympanotonus fuscatus</i>	Periwinkle	Mud in swamps
<i>Sepia officinalis</i>		

7. Benthic fauna

The benthic fauna of the marine environment has been poorly documented. The few existing works are those of Kobina et al. (2001), Zabi et Le Louef, (1993) and Burns, (2002). These authors identified 49 species in estuarine and near-shore habitats. Polychaetes and Gastropods molluscs are well represented in these environments (Table 9)

Table 9: Diversity of Benthic Species identified in the Cameroon coast and their ecology (Kobina et al. 2001; Zabi et Le Bouef, 1993, Burns, 2002)

Species	Ecology
Polythoa monody	Anthozoos, generally sea anemones and corals covering marine rocks forming large green or reddish colonies
Chaetopterus typicus	Polychaets of intertidal zone
Nereis lamellose	Estuarine polychaetes
Eunice sp	Tube polychaetes living in rock fissures or sediments
Lepidonotus hupferi	Polychaetes found on rocky beaches
Amphiura sp.,	Polychaetes estuarine/mangroves
Nephtys sp.	idem
Hermodice carunculata	Very mobile worm found under stones in intertidal zone
Corophium sp	Amphipodes of the estuarine zone with low salinity
Aorids sp	Amphipodes of herbs and mangroves
Ocypoda cursor	Crabs living hidden in sand in beaches
Uca tangeri	Crabs living in muds in estuaries
Sesarma huzardii	Crabs living in mangroves and swamps
Menipe nodiform	Rock crabs living in the intertidal zone and estuaries
Grapsus grapsus,	Crabs rocky shore
Maja squinado	Idem

Species	Ecology
Cardisoma armatum	idem
Diodora menkeana Dunker	Gastropodes living in shallow waters and on beach rocks
Clanculus kraussi	Gastropods living in reefs
Nerta senegalensis	Gastropods that appear at low tides on rocks
Littorina angulifera	Littoridae found on rocks and mangrove roots
Littorina punctata,	idem
<i>P. fusca</i>	Bivalves estuarine/mangroves
<i>P. aurita</i>	Bivalves estuarine/mangroves
<i>Thais callifera</i>	Bivalves estuarine/mangroves
<i>Scabra angulifera</i>	Bivalves estuarine/mangroves
<i>Melampus liberianus</i>	Bivalves estuarine/mangroves
<i>Nerita cf. glabrata</i>	Bivalves estuarine/mangroves
<i>Cyrenoida cf. rosea</i>	Bivalves estuarine/mangroves
<i>Ostrea tulipa</i>	Bivalves estuarine/mangroves
Cerithium atratum	Rocky areas at low tides feeding on sedentary animals
Perna perna	Bivalves living attached by a byssus to rocks
Arca nukulana,	Bivalves estuarine/mangroves
Aloides,	Idem
Nsa sp.	idem
Crassostrea tulipa	Mangrove oysters
Crassostrea cucullata	Midlittoral barnacle
Donax sp	Estaurine species
Tellina nymphalis	Asteroide, on rocks or sandy bottoms
Asteria sp(star fish)	Sea urching living on shallow reefs
Echinometra lucunter	Sea urching rocky shore
Arbacia lixula	idem
Echinometra sp.	
Tectarius granosus	Rocky shore barnacles
Nerita senegalensis	Rocky shore snails
Balanus tintinnabulum	Midlittoral barnacles
Chthamalus dentatus	idem
Siphonaria sp	Middle littoral gastropod
Brachiodontes puniceus	Gastropod middle littoral rocky shore

8. Algae

The extended banks of the coastal marine area inhabit a variety of biota (fauna and flora) which are organised into distinct communities. Their composition is determined by their exposure to wave action and to a lesser extent by the tides creating a vertical and horizontal zonation of species communities. The main algal communities distinguished here and their zonation are listed in table 10 according to Stephenson and Stephenson, (1972, cited in Burns, 2002).

Table 10: Algal species common to the coast of Cameroon and their zonation (after Stephenson and Stephenson, 1972 cited in Burns 2002)

Algae of the midlittoral zone	Algae of the infralittoral fringe
<p>Turf-forming species <i>Gymnogongrus nigricans</i> <i>Herposiphonia densa</i> <i>Lynghya majuscula</i> <i>Pterocladia pinnata</i> <i>Centroceras clavulatum</i>, <i>Lithothamnium sp.</i>, Red seaweed: <i>Gelidium pusillum</i></p> <p>Low level species <i>Bryopsis sp</i></p>	<p>Species forming felts on boulders <i>Ceranium tenuissimum</i> <i>Gigartina acicularis</i> <i>Herposiphonia secunda</i> <i>Polysiphonia sp.</i> Sea weed: <i>Sargassum vulgare</i></p> <p>Species in wave sheltered environment <i>Acanthophora spicifera</i> <i>Callithamnion spp.</i> <i>Dictyota sp</i></p>

Algae of the midlittoral zone	Algae of the infralittoral fringe
<i>Chaetomorpha sp</i> <i>Champia parvula</i> <i>Dictyota sp</i> <i>Padina sp</i> <i>Pocockiella variegata</i> <i>Struvea anastomosans</i> Deep shade species <i>Bostrychia radicans</i> <i>Bostrychia tenella</i> <i>Lophosiphonia obscura</i> <i>Murrayella pericladus</i>	<i>Gigartina acicularis</i> <i>Hypnea musciformis</i> <i>Padina sp</i> <i>Pocokiella variegata</i> <i>Sargassum vulgare</i> <i>Sphacellaria spp.</i>
Supra littoral Species <i>Bostrychia tenella</i> , <i>Rhizocionum riparium</i> , <i>Cladophora camerunica</i>	

9. Plankton

9.1. Phytoplankton

The phytoplankton diversity in Cameroon marine waters is poorly documented. A total of 38 species are presented (Table 11) based on identifications by few authors (Folack, 1989, COMARAF, 1990, Oben and Oben, 2006, SOWEDA, 2005). Folack (1989) based on the structure and shape of the siliceous parts, especially the valves. The major groups encountered are the Diatoms, Dinoflagellates, and Cyanophytes and Chlorophyceae. There is still a lot to uncover in this area.

Table 11: Phytoplankton Diversity along the Cameroon coast (Folack, 1989, COMARAF, 1990, Oben and Oben, 2006)

Cyanophyceae <i>Gleocapsa dispersa</i> <i>Microcystis aeruginosa</i> <i>Aphanocapsa grevillei</i> <i>Microcystis viridis</i> <i>Chamaesiphon focus</i> <i>Microcystis flos-aquae</i> <i>Lyngbya birge</i> <i>Trichodesmium dispersa</i> <i>Trichodesmium lacustre</i>	Diatomophyceae <i>Coscinodiscus sp</i> <i>Asterionella sp</i> <i>Diatoma sp</i> <i>Navicula spp</i> <i>Pleurosigma sp</i> <i>Tabellaria sp</i> <i>Biddulphia mobiliensis</i> <i>Hemiaulus haucki</i> <i>Skeletonema costatum</i> <i>Licmophora sp</i> <i>Nitzschia sp</i> <i>Thalassionema nitzchoides</i> <i>Cynedra p</i> <i>Closterium sp</i> <i>Chaetoceros tortissimus</i> <i>Nizschia closterium</i> <i>Diatoma vulgare</i> <i>Trachyneis sp</i> <i>Rhizolenia sp.</i>
Diniflagellates <i>Peridinium spp</i> <i>Peridinium trochoideum</i> <i>Pyrocystis pseudonociluca</i> <i>Dinophysis cuadatum</i> <i>Ceratium cf. declinatum</i> <i>Ceratium cf. macroceros</i> <i>Ceratium furca</i> <i>Cearium cf. trichoceros</i>	
Chlorophyceae <i>Ankistrodesmus sp</i> <i>Trichodesmium sp</i>	

9.2. Zooplankton

The zooplankton fauna of Cameroon marine waters is poorly documented. However, some species are presented based on the works of Wiafe and Frid (2002) (Table 12). The specimens identified came from two sources: (i) samples collected with continuous plankton recorder (CPRs) from Côte

d'Ivoire to Cameroon under Gulf of Guinea Large Marine Ecosystem Project for West Africa; (ii) Literature review of oceanographic expeditions to the Gulf of Guinea, especially by the *Atlantide Expedition of 1945-66* (kramp, 1955; broden, 1961, Vervoot, 1963, 1965 and Furnestine, 1966).

Table 12: Zooplankton species in the Cameroon coastal and marine environment (Wiafe and Fritz, 2002)

<p>Cladocerans Evadne spinifera Muller, 1859 Pennilia sp. Podon polyphemoides Luckart, 1859.</p> <p>Cyclopoida Oithonia plumifera Baird, 1843 Oncaea venusta Philippi, 1843 Lubbockia squillimana Giesbrecht, 1891 Corycaeus speciosus Dana, 1849 C. clausi Dahl, 1849 C. flaccus Giesbrecht, 1891 C. limbatus Brady, 1883 C. vernustus Dana, 1849 Farranula gracilis (Dana, 1853) Copilia mirabilis Dana, 1852 C. quadrata Dana 1852</p> <p>Aetideidae Acartia danae Giesbrecht, 1889 Acartia negligens Dana, 1849 Euchirella splendens Vervoort, 1963</p> <p>Calanidae Calanoides carinatus (Kroyer, 1849) Nannocalanus minor (Claus, 1863) Neocalanus gracilis (Dana, 1849) N. robustior (Giesbrecht, 1888) Undinula vulgaris (Dana, 1849)</p> <p>Candaciidae Candacia magna Sewell, 1932 C. curta (Dana, 1852) C. elongate (Boeck, 1872) C. pachydactyla (Dana, 1849) C. bipinnata (Giesbrecht, 1889) C. tenuimana (Giesbrecht, 1889) C. longimana (Giesbrecht, 1889) C. varicans (Giesbrecht, 1892)</p> <p>Eucalanidae Eucalanus crassus Giesbrecht, 1888 Eucalanus pileatus Giesbrecht, 1888 E. attenuatus (Dana, 1849) E. elongates (Dana, 1849) Rhinocalanus cornutus (Dana, 1849)</p> <p>Euchaetidae Euchaeta marina (Prestandrea, 1833) E. aequatorialis (Tanaka, 1958)</p> <p>Metrinidae Pleuromamma xiphias Giesbrecht, 1892 P. abdominalis (Lubbock, 1856)</p>	<p>Paracalanidae Paracalanus parvus (Claus, 1863) P. aculeatus Giesbrecht, 1888</p> <p>Centropagidae Centropages chierchiai Giesbrecht, 1889 C. furcatus (Dana, 1849)</p> <p>Pontellidae Labidocera acutifrons (Dana, 1849)</p> <p>Pseudocalanidae Clausocalanus arcuicornis (Dana, 1849)</p> <p>Scolecithricidae Scolecithrix danae (Lubbock, 1856) Scottocalanus helenae (Lubbock, 1856) Temora stylifera (Dana, 1849) T. turbinata (Dana, 1849)</p> <p>Harpacticoida Microsetella norvegica (Boeck, 1864) Macrosetella gracilis (Dana, 1852) Euterpina acutifrons Dana, 1848 Micraccia efferata Dana, 1848</p> <p>Euphausiacea Euphasia spp.</p> <p>Decapod Larvae Lucifer faxoni (Nobili, 1901) Penaeoidea, Sergestoidea, Caridea Thalassinidea, Scyllaridae Polychelidae, Stenopodidea, Hippidae Paguridae, Diogenidae, Portunidae Nephropoidea, Porcellanidae</p> <p>Cirripedia Balanus spp da Costa, 1778</p> <p>Chaetognatha Sagitta enflata Grassi, 1883 Sagitta hispida Conant, 1895</p> <p>Annelida Tomopteris septentrionalis Quatrefages, 1865</p> <p>Mollusca Hyalocylis striata Rang, 1828 Creseis virgule rang 1828 Oxygyrus keraudreni Lesuer, 1817.</p> <p>Ctenophora: Tentaculata</p> <p>Cnidaria: Hydromedusae, Anthomedusae, Leptomedusae etc</p>
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The zooplankton fauna is rich in species diversity and it has representatives of almost every major group. The members in the community with the exception of bacteria could be classified under 8 phyla: Cnidaria, Ctenophora, Mollusca, Annelida, Arthropoda, Chaetognatha, Echinodermata and

Chordata. They may be present in the aquatic environment as holoplankton (spending all their life in plankton) or meroplankton (spending only the early stages of their lives in the plankton). The crustaceans are probably the dominant group. Most of the zooplankton is concentrated in the upper 25m of the water column. They become uniformly distributed down to about 75m during the daytime.

References

- Amou'ou, Jam J. P., Melingui, A., Moukam, J. & Tchepanou, A. 1985. *Geographie- Le Cameroun*. Armand Colin, Paris.
- Baer, A., 2001. Aquatic biodiversity in the National Biodiversity Strategy and Action Plan of Signatories to the Convention on Biological diversity. World Fisheries Trust, Victoria BC, Canada.
- Burns M. (2002): Environmental Impact Assessment of Exploration Drilling: Ebodje PH69 CSIR Report No. 2002-118
- COMARAF, 1990. Etude pluridisciplinaire de l'ecosysteme de l'estuaire de la Bimbia, Cameroun. Atelier de recherche conjointe, 2-7 decembre, 1990 Limbe. Mission report.
- Fishbase, 2004. Overview of threatened/Endangered fish species for Cameroon.
- Folack, J., 1989. Etude preliminaire du phytoplankton d'une zone cotiere d'exploitation crevetticole Kribi-Cameroun. *Cam. J. Biol. Bioch. Sc.* Vol.2, No. 1, pp51-65
- Folack, J. 1995. Impact des activite industrielle et agricoles sur les ressources marines et cotieres au Cameroun. Atelier regionale sur la gestion interegree des zones littorals, Palais des Nations, Conakry (Guinee) 17-22/12. 19pp.
- Folack, J. & Njifonjou, O., 1995. Characteristics of marine coastal ecosystems in Cameroon and human impacts. UNESCO reports in Marine Sciences, no. 66: 49-64.
- IUCN (1995). A global Representative System of Marine Protected Areas. Marine Region 8: West Africa. Wells, S and Bleakley. C. (eds). Internet report at www.deh.gov.au/coasts/mpa/nvsmpa/gobal.
- Kramikel, J.M, Bousquet, B., 1987. Mangrove d'Afrique et de Madagascar. Les mangrove du Cameroon. CEE, SECA, Luxembourg: 127-137.
- MINEF, 1995. Forestry policy document: national Forestry Action Programme of Cameroon.
- Morin, K.M., 1989. Le littoral Camerounais: problemes morphologiques *Trav. Doc. Geogr. Trop. CEGET/CNRS*, No. 51: 38-7.
- Oben, P.M. & Oben B.O., 2006. Influence of nutrient concentrations on the seasonal abundances and distribution of Cyanophyceae in the coastal region of Mount Cameroon. *African Journal of Marine Sciences*, 28 (1): 25-31.
- Sayer, J.A, Harcourt, C. S., Collins, N.M. (eds), 1992. *Conservation atlas of tropical forest-Africa*. Macmillan Publishing limited.
- WWF, 2005. Three years of Marine Turtle Monitoring in the Gamba Complex of protected areas, Gabon, Central Africa.
- Wiafe and Frid (2002). Marine zooplankton of West Africa.
- Zabi et Le Boeuf, 1993. Revue des connaissances sur la faune benthique des milieu margino-littoraux d'Afrique de L'Ouest. *Rev. Hydrobiol> tropicale* 26(1): 19-51.