The Composition and Relative Abundance of Fish Species in a Mangrove Creek in the Niger Delta, Nigeria, Based on Different Types of Gear

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Abstract. The composition and relative abundance of fish species assemblage of a mangrove creek in the Niger Delta, Nigeria based on different types of gear was assessed at four stations between November 2004 and June 2006. The overall community structure was made up of 25 species of 16 families. Visual observation showed that tilapia species comprising of *Sarotherodon melanotheron* and *Tilapia guineensis* were the most dominant species. Samples from baited entrance traps indicated that *S. melanotheron* dominated *T. guineensis*. Samples from baited hook and line, and cast net showed dominance of *P. elongatus* followed by *P. quadrifilis*. (The baited hook and line is commonly used by the fishers because it is effective in catching diversity of species, except that it is unable to catch bottom feeders such as mullets and tilapia species). Funnel entrance trap had the highest species selectivity, catching only tilapia species. Cast net was more selective in species catch than baited hook and line, but it was effective in catching both pelagic and benthic species. Among the fish species, members of the families: Sciaenidae, Polynemidae, Ariidae, Monodactylidae and Cichlidae were permanent residents; Carangidae, Luthjanidae and Serranidae were temporary residents; while Elopidae, Gobiidae, Dasyatidae, Cynoglossidae, Sphyraenidae and Trichiuridae were rare species.

Keywords: composition, fish species, mangrove creek, Niger delta

Introduction

Knowledge of fish biology and species composition of different water bodies is necessary to enhance the management of water resources (Okereke, 1990). Niger Delta is located in the Southern part of Nigeria bordering the Atlantic Ocean in the Gulf of Guinea ecoregion. It is a flood plain of over 70,000 sq km. The environment has been reported to be highly diverse and sensitive being the home of the largest stands of mangrove in Africa (over 1 million ha) and the fourth largest in the world (Spalding *et al.*, 1997). The relative contribution of mangrove-related species to total fisheries catch is significant (Islam and Ikejima, 2010). Fisheries in and around mangroves provide direct employment to about 0.5 million fishermen worldwide (Matthes and Kapetsky, 1988). However, mangroves have declined due to increasing pressures from human activities including over-harvesting, aquaculture and coastal development (Alongi, 2002). The significant threat of oil pollution, over-exploitation of fisheries and mangrove resources among other environmental pressures coupled with poor interest and recognition for brackish water bodies and aquaculture pose a great danger to the sustainability of Nigeria's brackish waters and diverse fish resources, and consequently the coastal communities of the nation (Oribhabor *et al.*, 2005).

The importance of mangroves as nurseries has been one of the reasons advanced to support its conservation and management (Sheridan and Hays, 2003). There have been warnings, that supportive data have not been collected and that fish and decapods use of mangroves may not be the same in all areas of the globe (Hoss and Thayer, 1993; Chong *et al.*, 1990). For effective conservation and management of mangroves, it is necessary to synthesize biological and socio-economic information on mangrove processes and values, and bring this to the attention of policy-makers for community development (Walters *et al.*, 2008). The earlier records of mangrove fisheries were those of Blabber and Blabber (1980); Blabber (1980), Day (1974), Austin (1971), Boeseman (1963) and Inger (1955). Fish studies

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on Nigerian coastal waters include those of Chindah and Tawari (2001); King (1996a; 1996b); Chinda and Osuamkpe (1994); Wright (1986); Fagade and Olaniyan (1974; 1972). The Buguma Creek has been used by the Federal Government of Nigeria in collaboration with FAO in 1963 for pilot investigation of the possibility of converting mangrove swamps into brackish water fish farms. Oribhabor and Ogbeibu (2010) have assessed the impact of anthropogenic activities on the predatory fishes of the creek. This paper is the first to document the composition and relative abundance of fish species in Buguma Creek, based on different types of gear.

Study area. The Buguma Creek is located Southeast of the Niger Delta between longitude 6° 47'E and 6° 59'E, and latitude 4° 31'N and 4° 59'N (Fig. 1) in Asari-Toru Local Government Area of Rivers State. The Buguma Creek system consists of the main creek channel and associated interconnecting creeks, which inter-connect and surround Buguma and Ido communities. The Buguma Creek serves as a source of tidal water for the Nigerian Institute for Oceanography and Marine Research/Buguma Brackish Water Experimental Fish Farm, which was constructed between 1963 and 1966 under the auspices of the FAO. The New Calabar River brings the salty ocean water as tidal flows diurnally to the fish ponds (Dublin-Green and Ojanuga, 1999). A more detailed description of the study area and water quality has been given by Oribhabor and Ogbeibu (2009a; 2009b); Ogbeibu and Oribhabor (2008).

Materials and Methods

The fish species composition and relative abundance of Buguma Creek fishes in Niger Delta, Nigeria were conducted based on different types of gear. Fish samples were collected monthly at four stations, at flood tides during the period November 2004 to June 2006. Sampling was conducted between 0800 and 1700 h on each sampling day for 6 h, depending on the flow and ebb of tide.

Baited hook and line were used throughout the sampling duration at stations 1, 3 and 4; cast-net was used at station 1 from January to October, 2005; while baited funnel entrance traps were fortnightly used at stations 1 and 2 specifically for tilapia species from August to December, 2005. Fish samples were pooled based on gear, ice-packed after capture, kept chilled under
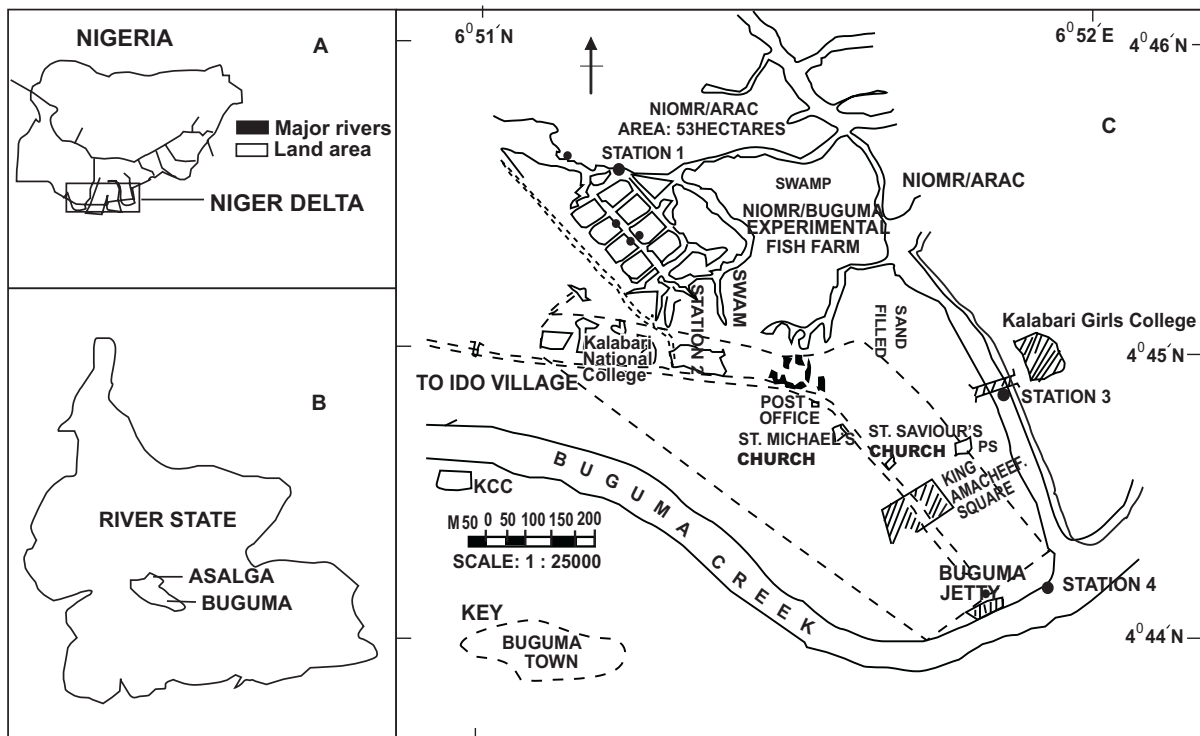
Fig. 1. Map of the study area: A : Nageria showing Niger delta, D - Rivers state showing Buguma, C. The study creek showing study station.

ice-blocks in a plastic cooler and immediately transported to the laboratory. In the laboratory, fish specimens were sorted and identified to the species level using the keys and descriptions of Olaosebikan and Raji (2004); Teugels *et al.* (1992); Schneider (1990) and enumerated. Visual observation of extraneous fish species periodically harvested from two associated recruitment ponds of Nigerian Institute for Oceanography and Marine Research/Buguma Brackish Water Experimental Fish Farm was also carried out during the study period.

Results and Discussion

The overall community structure was made up of 25 species in 16 families (Table 1). There is no 'best' method for sampling fishes within mangrove habitats (Faunce and Serafy, 2006). Three sampling gears: baited hook and line, castnet, baited funnel entrance trap coupled with visual observation were used in this study because samples from the most environments are drawn blind with little or no study of the response of the fishes to sampling gear (Bagenal, 1978).

Among the fishing gears, funnel entrance trap was found to have high species selectivity, catching only tilapia species (Fig. 2). A total of 20 species in 14 families, and 16 species in 12 families were recorded for baited hook and line and castnet, respectively (Fig. 3 and 4). Although cast-net was more selective in species catch than baited hook and line it is effective in catching both pelagic and benthic species, unlike baited hook and line, which is specialized in catching only predatory species. Although catch composition varied with geographical habitat and the type of fishing gear and effort, the relatively low diversity found in the present study may in part indicate the over-exploitation of resources, resulting in destruction of habitat and consequent loss of species diversity (Islam and Ikejima, 2010).

Visual observation showed that tilapia comprising of *S. melanotheron* and *T. guineensis* were the most dominant species. Samples, from baited entrance traps (Fig. 2) indicated that *S. melanotheron* (306 individuals) dominated *T. guineensis* (136 individuals). The dominance of tilapia could be attributed to their prolific precocious breeding habit, ready availability of mud from which they derive their food, and euryhaline nature. Samples from baited hook and line (Fig.3), and cast-net (Fig. 4) showed dominance of *P. elongatus* followed by *P. quadrifilis*. Differences in dominant species observed among the fishing gears are in conformity

with the finding of Boromthanarath *et al.* (1991), who noted that dominant species differed by fishing gear types and methods. The baited hook and line fishing is commonly used by fishermen in Buguma because it is effective in catching diverse species, except that it is unable to catch bottom feeders such as mullets and tilapia species. Though quite selective by species, and to a considerable extent by size, in some situations, line fishing may be the most productive (Bagenal, 1978). Also in many of its forms, it can be conducted successfully by a single fisherman.

The low habitat diversity limits the number of fish species inhabiting tidal mangrove creeks (Krumme *et al.*, 2004). Although low number of species was

**Table 1.** Checklist of fish species collected from Buguma Creek

Family	Species
Ariidae	*Arius gigas* (Boulenger, 1911)
Carangidae	*Caranx latus* (Agassiz in Spix & Agassiz, 1831)
Cichlidae	*Sarotherodon melanotheron* (Rüppell, 1852), *Tilapia guineensis* (Güinther, 1862)
Cynoglossidae	*Cynoglossus senegalensis* (Kamp, 1858)
Dasyatidae	*Dasyatis margarita* (Günther, 1870)
Elopidae	*Elops lacerta* (Valenciennes, 1846)
Gobiidae	*Gobius* sp. (Peters, 1876)
Haemulidae	*Plectorhnchus macrolepsis* (Boulenger, 1899), *Pomadasys jubelini* (Cuvier, 1831)
Lutjanidae	*Lutjanus agennes* (Bleeker, 1863), *Lutjanus goreensis* (Valenciennes, 1830)
Monodactylidae	*Psettias sebae* (Cuvier, 1831)
Mugilidae	*Liza falcipinnis* (Valenciennes, 1836), *Mugil cephalus* (Linnaeus, 1758), *Mugil curema* (Valenciennes, 1836)
Polynemidae	*Polydactylus quadrifilis* (Cuvier, 1829)
Sciaenidae	*Argyrosomus regius* (Asso, 1801), *Pseudotolithus* (*Fonticulus*) *elongatus* (Bowdich, 1825), *Pseudotolithus* (*Pseudotlithus*) *senegalensis* (Bleeker, 1863)
Serranidae	*Epinephelus aeneus* (Geoffray St Hilaire, 1809)
Sphyraenidae	*Sphyraena afra* (Peters, 1844), *Sphyraena guachancho* (Cuvier, 1829), *Sphyraena sphyraena* (Linnaeus, 1758)
Trichiuridae	*Trichiurus lepturus* (Linnaeus, 1758)

recorded for Buguma Creek, all mangrove and estuarine systems are similar in that, they have relatively few species that are clearly dominant in abundance (Tongnunui *et al.*, 2002).

Among all the fish species, members of the families; Sciaenidae, Polynemidae, Ariidae, Monodactylidae, Mugilidae and Cichlidae were permanent residents. Members of the families; Carangidae, Lutjanidae and Serranidae were temporary residents, while those of
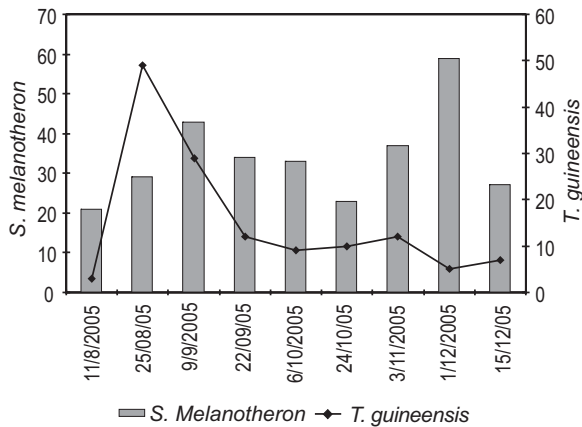
Fig. 2. Spatial and temporal variation in the relative abundance of the species caught with baited funnel entrance trap.
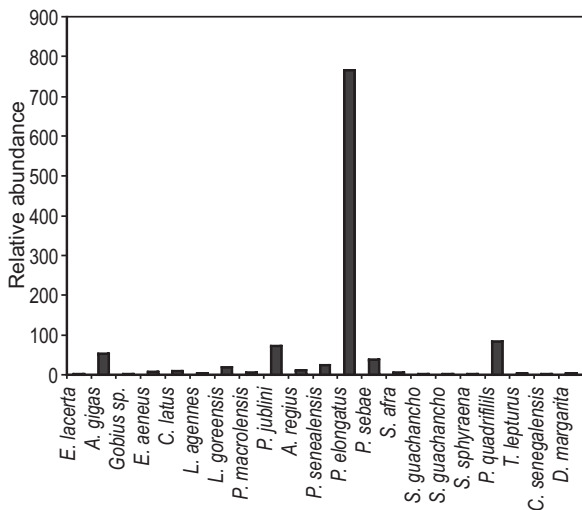
Fig. 3. Relative abundance of fish species caught with baited hook and line, November 2004 to June, 2006.
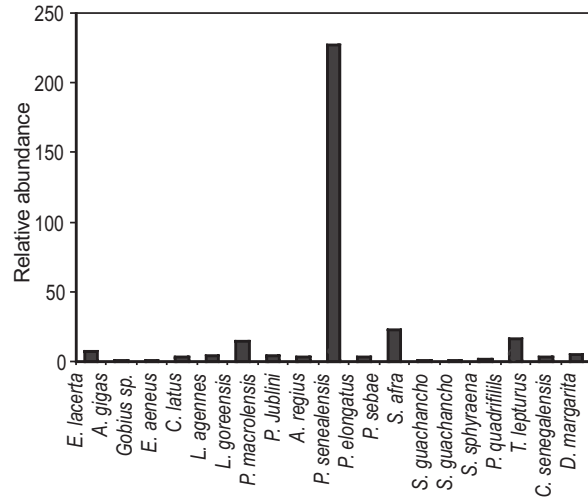
Fig. 4. Relative abundance of fish species caught with cast net, January to October, 2005.

the families; Elopidae, Gobiidae, Dasyatidae, Cynoglossidae, Sphyraenidae and Trichiuridae were rare species. Most fishes encountered in this study were sub-adults.

The number of species (25) recorded is high when compared to the 9 species of Wright (1986) for shallow water creeks of a Nigerian mangrove. About 30 species were reported in the Kaper mangrove in Malaysia (IPIECA, 1993). Davis (1988) caught 38 species in Austria, Krumme *et al.* (2004) caught 40 species in small intertidal mangrove creeks in Northern Brazil. Compared with other mangrove and estuarine systems, these records are low. A pool of all the species recorded in Lagos Lagoon, Nigeria over time revealed 115 species (Oribhabor and Ezenwa, 2005). Other high species record of mangrove and estuarine systems are 55 species (Beumer, 1978), 83 species (Little *et al.*, 1988), 128 species (Kimani *et al.*, 1996), 66 species (Laroche *et al.*, 1997) and 135 species (Tongnunui *et al.*, 2002).

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