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Research

Effectiveness and selectivity considerations of a fenced basket trap fishery in a tropical tidal creek, Southwestern, Nigeria.

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Abstract

The effectiveness and selectivity considerations of a fenced basket trap fishery in Abule Eledu creek were studied between October 2006 and March 2007. The basket trap was tedious to operate because of the fence and the fixing of the gear. The trap had preference for Macrobrachium spp and B. lebritonis. Sixteen fish species (including the shellfishes) belonging to 10 families were recorded in this study. Most fin fish caught were juveniles which probably indicated that the creek served as a nursery ground for these species. Species abundance estimate revealed that M. macrobrachion was numerically more abundant in the creek followed by M. vollenhovenii among the shell fishes while B. lebretonis was most abundant numerically among the fin fishes. The highest catch was reported for October (128). This could be related to the well being of the fish in relation to food availability and environmental favorability as a result of nutrients in flush from inland and the storm water in to the creek during the rainy season. The catch per unit effort (CPUE) was 499.67g (0.50kg) per trap. This was low for a good fishing operation since most "fish" caught had low economic value. The trap had low life span of three months without mending. They were attacked by Serpulid, Mercierella enigmatica because of the saline nature of the creek. In general, the basket trap catch was low in diversity, this is a good indicator of a stressed ecosystem and it is commonly agreed that the higher the fish diversity, the more stable the fish community.

KEY WORDS: Basket trap, selectivity, *Macrobrachium spp, Mercierella enigmatica.*

Introduction

Fishing is one of the oldest ways by which people have fed themselves and their families. Except for gathering shellfish by hand and spearing fish, premature trapping is probably the oldest form of fishing (Okawra and Masthaewee, 1980).

In early times, flowing water caused by tidal movement and changes in river and lake levels were probably used to trap fish behind rudimentary barriers often made from sticks and stores (Slack-smith, 1997), it is likely that early humans found that fish catches could be improved by driving fish in to these barriers. They would have found that catches from these barriers decreased overtime, as fish became accustomed to them and would have had to move the traps to fresh areas where more fish could be caught (Okawra and Masthawee, 1980).

Shallow areas of estuaries and coastal lagoons contain some of the most productive coastal habitat such as tidal flats, subtidal channels and salt mashs (Pihl and Rosenberg, 1982; Weinstein, 1982; Kneib 1997; Emmanuel and Kusemiju, 2005). Many of these shallow habitats support diverse and abundant fish assemblages and sustain significant fish species (Bell and Pollers 1990; Edgar and Shaw, 1995; Emmanuel, 2004). However, the ichthyoids fauma is heterogeneously distributed among the different types of habitats, according to sediment type, vegetation preference and temperate scale (tidal, diet, lunar and seasonal).

According to Von-Brandt (1984), the trap is a tube like cylinder made of a bamboo screen hanging over the water. It was further reported that the fish are attracted by the bait inside this tube. Von-Brandt (1984) also implicated that the cylindrical trap is hanging with the help of a line fixed onshore, Holden and Reed (1991) reported on the traditional fishing gear and method in Rivers Niger and Benue. They identified clap net, cast nets, foul-hook, long-line, fences, fish pounds, funnel-entrance traps and triggered traps as the major gears used in the rivers.

Udolisa *et al.,* (1994) documented the small-scale fishing gear in Nigeria where they identified seven (earthen pot trap, basket trap with two valves, basket trap with single valve, Gura trap, bamboo trap and barrier trap). Holden and Reed (1991) identified basket trap as fence trap. Emmanuel (2008) worked on the comparative catches of crab pot and wire gauze trap in Lagos Lagoon and its adjacent creek. It was observed that the two traps were efficient for crab fishery.

Saad *et al.,* (2002) implicated that the number of canals and the size of such connections with the sea, as well as environmental condition such as winds, tidal streams, rivers and precipitation account for variation in salinity gradients and water circulation both of which have a direct influence on the hydro-salt balance water quality and eutrophication.

In recent years, researchers have emphasized the importance of the knowledge produced and orally transmitted by traditional fishermen and the potential role of traditional fishing and related environmental knowledge can play for the development and implementation of fisheries management in the modern world (Nishida *et al.,* 2006).

Despite the age of trap fishery in Nigeria very little or no information has been documented on it. Therefore, this study aimed at the design and construction of basket trap, costs of production, operation and catch composition in relation to a tropical tidal creek in Lagos State, Nigeria.

Material and methods

Description of the Study Sites

Abule Eledu Creek is situated near the University of Lagos Guest House, extends to the back of University of Lagos Chapel, terminates at the back of Faculty of Environmental Science and it is one of the numerous creeks that empty into the Lagos Lagoon. It is tidal with a depth which decreases inland. It is located in the wet tropics where the alteration of the dry and wet season is phenomenal. During wet season, nutrients are brought down into the creek via the storm waters. The riparian vegetation was characterised by *Paspalum vaginatum, Acrostichum aureum* and *Rhizophora racemosa*. The floating macrphytes associated with the creek are, *Eichornia crassipes, Pistia stratiotes, Lemna pancicostate* and *Vossia cuspidate*. Artisanal fishing is the mainstay of communities that leave around the creek.

Field Operations

The basket trap is operated with the aid of a fence. The fence was made from reeds, Paspalum sp and sticks as described by Emmanuel (2008). The fence was erected across the creek (at the upper and the lower course). The traps were baited (with grinded cooked

maize pellets) placed in the holes created on the fence and were tightened by placing *Paspalum* sp and reeds on the sides to block any available holes. The catches were removed by loosing the closing rope at the lait region. The fishing operations were done overnight bimonthly for a period of six months (October, 2006 to March, 2007). Bimonthly samples from the traps were later pooled to form the monthly data.

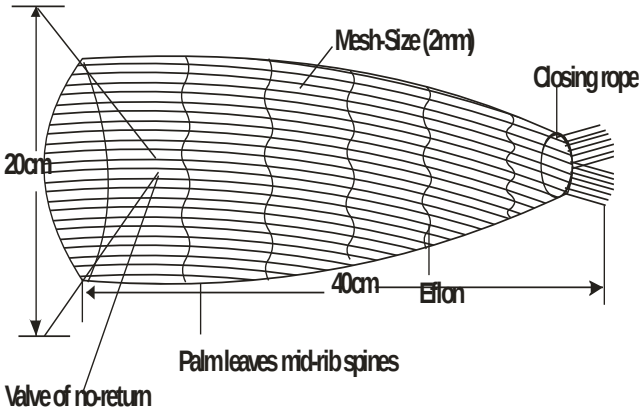
Laboratory Analysis

determined by the use of questionnaires in the study areas. The financial analysis for basket-trap operation was examined to know the economic effectiveness of the gear.

Results

Basket Trap Design Detail

The cane and the pole strips were procured from Makoko and the trap was designed and constructed in the Marine Sciences Postgraduate Laboratory. The trap **(Fig. 2)** has an entrance in form of funnel or non-return value with 5.0cm diameter opening. The length of the trap was 40cm (length overall). The mesh-size (distance between the strips) was 2mm. The strips were sown together with eflon bought from Lagos Island and the eflon was also used as closing rope.



All samples were transported to the laboratory and put in a deep freezer (<4^{0}C) immediately after appropriate labeling and identifications were made with the aid of relevant texts (Tobor and Ajayi, 1979; Fischer, *et al.*, 1981; Schneider, 1990; Holden and Reed, 1991; Olaosebikan and Raji, 1998) while numerical abundance of the fish species were recorded. The measurement (in centimeter) of the fishes (standard and total length), the shrimp (carapace length) and the crab (carapace and width (species were taken using the methods described by Adetayo and Kusemiju (1994) and Chindah *et al.*, (2000). The specimens were also weighed on a Sartorius weighing balance to the nearest gram. The durability of the trap was also

Fig.2: Side – view of a basket trap with a valve of no – return and closing rope.

General Survey of the Fauna in the Creek

A total of 496 fish specimen made up of fin and shell fish species and weighing 2,998.02 (29.98kg) were caught, identified and classified. They consisted of 16 species belonging to 10 families. Numerically Palenmonids (represented by *Macrobrachium macrobrachion* (Herklots), *M. felicinum* (Herklots) and *M. vollenhoeni* (Herklots) were the most abundant accounting for a total of 344 (69.34%) of the catch. Portunidae was represented by *Callinectes amnicola* (De Rocheburne) (42) with 8.64 of occurrence. Potamididae was represented by *Tympanotonus fuscatus* (Linnaeus). The families Grasspidae and Xanthidae were represented by *Sersama huzardi* (Desmarest) and *Menippe* (Stompson). The fin fishes were numerically scanty in the catch. Gobiidae was represented by *Balanga lebretonis* (Herre), *Eleotris vittata* (Dumeril) and *Bathygobius soporator* (Valen Gennes) which were most abundant and they accounted for 24 specimens (4.83%) of the total catch. The cichlids *Sarotherodon melanotheron* (Ruppell) and *Tilapia guineensis* (Bleeker) accounted for 7 specimens (1.44%). The family ophichthidae was represented a single species (*Ophichthus rufus* (Linneaus). Mugilidae was represented by *Liza dumerilli* (Steindachner) as presented in **Table 1**.

Table 1: Fin Fish and Shell Fish Caught in Abule Eledu Creek

Family/Species	Number	Total Length Range (cm)	Weight Range (g)
Cichlidae			
Tilapia guineensis (Bleekers)	2	11.0 – 12.0	25.0 – 34.0

Sarotherodon melanotheron (Ruppell)	5	6.80 – 12.0	7.00 – 32.00
Gobiidae *Bathygobius soporator* (Valneciennes)	3	6.70 – 14.0	7.00 – 38.50
Batanga lebratonis (Herre)	12	3.8 – 7.0	0.06 – 4.09
Ophichthidae *Ophichthus rufus* (Linnaeus)	5	23.5 – 25.9	10.0 – 42.00
Kribia nana (Boulenger)	2	10.00 – 14.00	10.21–23.31
Mugilidae *Liza dumerilli* (Steindaehner)	1	11.00	11.05
Palaemonidae *Macrobrachium vollenhoeveni* (Herklots)	102	3.20 – 9.0	1.60 – 10.60
Macrobrachium macrobrachion (Herklots)	161	4.8 – 8.9	1.19 – 9.00
Macrobrachium felicinum (Holthius)	81	5.10 – 12.00	0.96 – 25.29
Grapsidae *Sesarma huzardi* (Desmarest)	15	2.00 – 4.10	7.01 – 15.23
Clibanarius africanus	17		2.50 – 19.86
Xanthidae *Menippe nodifrons* (Stimpson)	1	4.00	15.73
Portunidae *Callinectes amnicola* (De Rocheburne)	42	4.00 – 12.00	6.00 – 75.72
Potamididae *Tympanotonus fuscatus* (Linnaeus)	28	1.40 – 2.00	0.03 – 6.00

Index of abundance of the species in the creek

The index of abundance of the species caught in the creek is shown in **Table 2**. Out of the 496 specimens caught, 161 (32.46%) were *M. macrobrachion* which was the most abundant species accounting for 536.28g (17.89%) of total weight, *M. vollenhoevenii* made up 102 (20.56%) specimens and accounted for 482.04g weight, *M. felicinum* comprised 81 specimens (16.33%) and 319.20g by weight (10.65%), *C. amnicola* was made up of 42 specimens (8.64%), accounting for 723.88g (24.15%), *T. fuscatus* comprised of 28 specimens and accounted for 42.96g (1.43%) by weight, *C. africanus* comprised 17 specimens while others like *S. huzardi* (15 by number and 172.82g by weight) and *M. nodifrons* (I) respectively were also recorded. Among the fin fishes *B. lebretonis* was the most abundant with 12 specimens (2.42%) and weight, 49.8g (1.66%). *E. viltator* accounting for 9(1.81%) specimens and 171.84g (5.73%) by weight, *S. melanotheron* and *O. rufus* comprised 5 specimens each. Others like *B. soporator, T. guineensis, K. nana* and *L. dumerilli* had three, two and one specimens respectively.

Table 2: Index of Abundance of Species in Abule Eledu Creek

Species	**Number**	**Percentage**	**Weight (g)**	**Percentage**

T. guineensis	2	0.40	59.03	1.97
S. melanotheron	5	1.00	72.71	2.43
B. soporator	3	0.60	81.02	2.70
B. lebretonis	12	2.42	49.8	1.66
O. rufus	5	1.01	96.02	3.20
K. nana	2	0.40	33.52	1.12
L. dumenili	1	0.20	11.05	0.37
E. vittata	9	1.81	171.84	5.73
M. macrobrachion	161	32.46	536.28	17.89
M. vollenhoevenii	102	20.56	482.04	0.37
M. felicicum	81	16.33	319.20	10.65
S. huzardi	15	3.02	172.82	5.76
C. africanus	17	3.43	130.12	4.34
M. nodifron	1	0.20	15.73	0.52
C. amnicola	42	8.47	723.88	24.15
T. fuscatus	28	5.65	42.96	1.43
Total	**496**		**2,998.02**	

Monthly Variation in Fish Specimens Caught by Basket Trap

The monthly variation in fish species caught with basket trap is shown in **Table 3**. The total numbers of specimens were 128, 102, 79, 65, 49 and 73 for October, November, December, January, February and March respectively. The highest number of specimen was caught in October (128) and the least was in February (49). *M. macrobrachion* was the mostly caught species in October, January, Fberuary and March, while *M. vollenhoevenii* was the most caught species in December and *M. felicinum* in the month of November. The least caught species throughout the six months were *Liza dumerilli* (1) and *M. nodifrons* (1) respectively.

Table 3: Monthly Variation in Specimens of Fish Caught by Basket Trap

Species	**October**		**November**		**December**		**January**		**February**		**March**	
	No	**Wt**	**No**	**Wt**	**No**	**Wt**	**No**	**Wt**	**No**	**Wt**	**No**	**Wt**
T. guineensis	0	0	259.03	0	0	0	0	0	0	0	1	0
S. melanotheron	0	0	0	0	0	0	1	32.0	4	40.7	0	0
T. fascistus	15	0.71	0	0	0	0	9	41.7	4	0.23	0	0

B. soporator	0	0	1	35.5	0	0	0	0	1	7.00	1	38.50
B. lebretonis	20	41.8	0	0	0	0	1	2.43	0	0	11	16.34
E. vitiate	3	21.0	2	26	1	4.19	3	119.7	0	0	0	0
O. rufus	1	10.00	0	0	0	0	1	26.00	2	18.0	1	42.00
K. nana	1	23.31	1	10.21	0	0	0	0	0	0	0	0
L. dumerilli	1	11.05	0	0	0	0	0	0	0	0	0	0
M. vollenhoevenii	9	48.42	26	179.3	27	70.3	7	36.11	7	27.3	27	141.24
M. macrobrachion	72	1654	0	0	24	97.0	26	124.5	24	80.5	27	53.49
M. felicicum	2	26.76	51	209.4	0	0	9	49.20	19	53.9	0	0
S. huzardi	0	0	4	43.82	3	36.2	0	0	5	55.5	3	36.81
C. africanus	0	0	9	115.4	7	14.7	0	0	0	0	0	0
M. nodifrons	0	0	1	15.73	0	0	0	0	0	0	0	0
C. amnicola	4	121.7	5	102	17	271.21	8	97.29	5	43.07	3	104.08
Total	**128**	**470.15**	**102**	**797.44**	**79**	**503.57**	**65**	**528.96**	**49**	**326.29**	**73**	**432.46**

Catch Per Unit Effort of Basket Trap

The monthly catch per unit effort was based on catch per the number of traps used. The CPUE is defined as the weight of fish in gram per fishing hours per traps. The CPUC based on this, a catch of 2,998.02g per 6 months was found to be 499.67g (0.50kg) per 12 hours.

Cost of Operation of Basket Traps

The cost of operating 30 traps was given in **Table 4**. The trap lasted for just 3 months without repair.

Table 4: Operations of Basket Trap at Abule Eledu Creek

Capital Costs	**N**	**K**
Canoe rentage (N1000.00 per trip)	12,000	00
Trap design and construction expenses for 30 traps (1st 3 months)	3,000	00
Trap design and construction expenses for 30 traps (2nd 3 months)	3,000	00
Total	**18, 000**	**00**

Trap Longevity

The traps started to deteriorate at the end of the second month (November, 2006). At the end of the third

month (December, 2006) the trap were totally bad. Laboratory examination of the destructive agent revealed the serpulid, *Mercierella enigmatica* as the destructive agent.

Discussion

The basket trap was tedious to operate because of the fence and the fixing of the gear. This agreed with Emmanuel (2008) where it was stated that fencing was very tedious to construct for wire gauze trap. The trap had preference for *Macrobrachium spp* and *B. lebritonis*. This agreed with Marioghae (1990) and Emmanuel (2009), they both reported that seasonal rivulets and streams were fenced across with gears and stick leaving opening for the trap for catching prawn (*Macrobrachium spp*) and that basket traps. Elsewhere in the coastal parts of Ondo state this traps were specific for *B. lebriotonis* and *B. soporator* (per.com.).

Sixteen fish species (including the shellfishes) belonging to 10 families were recorded in this study. There was no comparison since no work has been done previously in the creek with the same trap. Most fin fish caught were juveniles which probably indicated that the creek served as a nursery ground for these species. This agreed with Emmanuel and Kusemiju (2005), that adjacent creek to Lagos lagoon are nursery ground for some lagoonal species. Species abundance estimate revealed that *M. macrobrachion* was numerically more abundant in the creek followed by *M. vollenhovenii* among the shell fishes while *B. lebretonis* was most abundant numerically among the fin fishes.

The highest catch was reported for October (128). This could be related to the well being of the fish in relation to food availability and environmental favorability as a result of nutrients in flush from inland and the storm water in to the creek during the rainy season as reported by Nwankwo (2004). This also agreed with Marioghae (1990) that the major fishing season for *Macrobrachium spp* in most part of Lagos Lagoon was from April to October. *Macrobrachium spp* were caught throughout the study months, this could be related to the influx from adjacent storm water that tend to dilute the creek. In view of the report by Marioghae (1990) reported that skeleton fishery existed in the dry season months in the permanent freshwater areas of Lagos lagoon. In general, the basket trap catch was low in diversity, this is a good indicator of a stressed ecosystem (Leveque, 1995; Emmanuel *et al.,* 2008) and it is commonly agreed that the higher the fish diversity, the more stable the fish community.

The catch per unit effort (CPUE) was 499.67g (0.50kg) per trap. This was low for a good fishing operation since most "fish" caught had low or no economic value. The trap had low life span of three months with out mending. They were attacked by Serpulid, *Mercierella enigmatica* because of the saline nature of the creek. This agreed with Sandison and Hill (1966) who reported that *M. enginatcea* appear in the lower harbour of interval during the season of high salinity also that it settled on mangroves in the sub littoral zone at and below the water level.

The cost of operation could be reduced if a boat could be purchased and if more trap could be purchased. The more the traps the more the basket traps catch (Emmanuel, 2008).

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