Journal of Research and Development

Ambrose and Isangedighi, J Res Development 2016, 4:1
DOI: 10.4172/2311-3278.1000135

Research Article Open Access

Ingress Rate of Fish to Baited Traps Soaked at Different Fishing Grounds in the Estuary of New Calabar River, Nigeria

Ambrose EE* **and Isangedighi IA**

Department of Fisheries and Aquatic Environmental Management, University of Uyo, PMB 1017, Uyo, Akwa Ibom State, Nigeria

Abstract

A study was conducted in the estuary of New Calabar River with a view to finding the best fishing ground for artisanal trap fishery. A conical fish trap was used in the study and was set forth-nightly for one year in five different habitats, namely: mangrove habitat, nypa palm habitat, shallow water with muddy bottom habitat, deep water with sandy bottom habitat and water hyacinth habitat. A total of eight families; *Gobidae, Portunidae*, *Periophthalmidae, Bagridae, Cyprinodontidae, Moringuidae, Xenothidea*, and *Paleamonidae* and respectively eightspecies;*Porugobinnus schelli, Callinectes latimanus, Periophthalmus papilio, Chrysichthys filamentosus, Aplochilicthys splanchen, Moringua arundinacea, Lophopanobeus bellus* and *Macrobrachium macrobrachion* of fishes were caught, numbering 809 and weighing 11.88 kg. Mangrove habitat caught significantly (F – test, < 0.05; 0.01) more fish (4.18 kg) than all other four habitats. The lowest weight of fish caught (1.19 kg) was from water hyacinth habitat.

Keywords: Biotopes; Aquatic macrophytes; Tidal current; Fishing effort; Passive gear

Introduction

A fishing ground is a place with condition suitable for fish to come together in group for habitation and a place where it is easy to handle fishing gear by the fishermen [1]. This implies that not all areas of water bodies (ocean, estuary, river, lake and stream) are fishing ground because varieties and wide spectrum of conditions need to be satisfied. Unfortunately, small scale fishers does not discriminate any part of the water body for fishing, instead their choice of fishing ground is based on nearness to port of departure and history of good catch in the past. Suitable biotopes for fish habitation is influenced by ecological factors like light penetration, depth, bottom substrate, temperature, plankton bloom and aquatic macrophyte. These factors singly or in combination determine the spawning behavior and feeding habit and regime of fishes which make them vulnerable to capture.

The technology of small-scale fisheries exploitation in Nigeria is characterized by the use of simple fishing gears such as trap to catch fisheries resources in sheltered water bodies namely: rivers, estuaries, lakes etc. The types, designs and mode of operations of traditional fish traps employed in inland and brackish waters of Nigeria have been described [2-4]. Apart from hand picking of gastropod mollusk from exposed tidal mud flat and the use of wounding gear like spear, trap fishing is the oldest small scale fishing method. In early times, flowing water caused by tidal movements and changes in river and lakes levels were probably used to trap fish behind barriers such as sticks, stones and pot holes. FAO [5] defined trap as simple, passive fishing gear that allows fish to enter and then make it hard for them to escape. This is often achieved by putting chambers in the trap or pot that are closed once the fish enters, and by a funnel that make it difficult for fish to escape. Brandt [6] produced for FAO a system for the naming of traps and pots and classified traps into seven groups of which non- return valve/conical trap used in the study is one of them.

The New Calabar river appears very turbid, when viewed the color is dark and light penetration may be low [7]. Several ecological studies done on this river reveals that it is a fresh water system at some point but brackish water at Choba axis where University of Port Harcourt is situated. Three types of aquatic macrophyte dominate the vegetation, mangrove plant, *Rhizophora spp* and Nypa palm, *Nypa fructicans* fringed both side of the river competing for space. Water hyacinth, *Eichorniacrassipes* occurs abundantly in wet season and flourished towards the mid portion of the river. The littoral portion of the river is shallow with muddy bottom due to detritus brought in by surface drainage, while the open water is sandy at bottom and is deep due to sand dredging. Thus, five different aquatic habitats, known as "fishing grounds" for fisheries purpose are identifiable in the water body at Choba, namely: (1) Shallow water with muddy bottom habitat, (2) Deep water with sandy bottom habitat, (3) Nypa palm habitat, (4) Mangrove plant habitat and (5) Water hyacinth habitat. Conical fish traps are used by artisanal fishers to catch fish in these five habitats. The objective of the study was to assess the fish species abundance and catch per unit effort of fishes caught bynon return valve conical trap soaked at these fishing grounds.

Materials and Methods

The study was carried out in New Calabar River (Latitude $4^{0}1$'ON and Longitude $7^{0}1$'60E) from January to December, 2011. The fish trap used in the study was the non-return valve conical trap, described by Udolisa et al., [4] and FAO [5], which is the commonest type of gear used in rivers, lagoons, lakes and estuaries by artisanal fishers. As the name implies, the trap is conical in shape with the valve fixed at the entrance of the trap. The entire body is made of cane stripe. Five traps were constructed with the fishers. One was operated at each of the five fishing grounds/ habitats found in the water body namely; mangrove habitat, Nypa palm habitat, shallow water (1-5 m) with muddy bottom habitat, deep water (6-10 m) with sandy bottom habitat and water

***Corresponding author:** Ambrose EE, Department of Fisheries and Aquatic Environmental Management, University of Uyo, Nigeria, E-mail: eyoambrose@yahoo.com

Received September 05, 2015; **Accepted** January 08, 2016; **Published** January 18, 2016

Citation: Ambrose EE, Isangedighi IA (2016) Ingress Rate of Fish to Baited Traps Soaked at Different Fishing Grounds in the Estuary of New Calabar River, Nigeria. J Res Development 4: 135. doi:10.4172/ 2311-3278.1000135

Citation: Ambrose EE, Isangedighi IA (2016) Ingress Rate of Fish to Baited Traps Soaked at Different Fishing Grounds in the Estuary of New Calabar River, Nigeria. J Res Development 4: 135. doi:10.4172/ 2311-3278.1000135

hyacinth habitat. The traps were set at low tide and recovered when the tidal water starts receding. It was tied to a stick or anchored to prevent been carried away by water or tidal current [4]. The traps were baited with dead black carcass of crab. Indicator buoys made of plastic containers were attached to the trap to serve as a marker on the water surface to show the position of trap in water. Catches were recovered from the trap after six hours of soaking.

Upon landing, all fishes caught by the trap from each of the five different fishing grounds were sorted into species, the number counted and the weight of each species recorded in kilogram. Twenty replicate landings of each of the treatments were collected for analysis. Catch per unit effort (CPUE) was taken as index of efficiency of trap set at the five different fishing grounds [8] and was expressed as catch (in kilogram) per man. Thus

$$\text{CPUE} = \frac{\text{weight of fish caught (Kg)}}{\text{Fishing Effort!}}$$

Where F is the number of fishing crew (2)

A completely randomized design was used to analyze the catch data. The treatments were assigned completely and at random to the experimental unit. Only one treatment (different fishing grounds) was the experimental factor of variation. The hypothesis that the five treatments caught the same weight of fish was tested.

Results

Table 1 is the summary of total and mean weights of fish caught from the five fishing grounds. Trap soaked in mangrove habitat predominantly caught more weight of fish (4.18 kg) than traps from four other habitats. Landings from mangrove habitat were highest in 16 out of 20 replicate fish landings used in analysis from each of the five treatments. The lowest weight of fish caught (1.19 kg) was from water hyacinth habitat. Mangrove habitat also have the highest catch per unit effort of 2.09 kg/man (Table 2). Analysis of variance indicates that trap set in the five different habitats did not catch equal weights of fish. Mangrove habitat caught significantly more fish (4.18 kg, F – test < 0.5; 0.01) than all other four habitats.

The total weights and number of fish caught by traps from the five habitats were 11.88 kg and 809 respectively (Table 3). Eight different families of fishes were encountered namely: *Gobidae, Portunidae, Periophthalmidae, Bagridae, Cyprondontidae, Moringuidae, Xenothidae* and *Palaemonidae*. These are elaborated in Table 3. Out of 809 numbers and 11.88 kg weight of fish caught by five traps in 20 replicate landings during the study period (Table 3), mangrove habitat constitutes 28.55% by number and 35.18% by weight of the total fish caught, indicating that it is the best fishing ground for artisanal trap fishery in the study area.

Replications (number of landings)	Mangrove habitat (A) (kg)	Nypa palm habitat (B) (kg)	Shallow water with muddy bottom habitat (C) (kg)	Deep water with sandy bottom habitat (D) (kg)	Water hyacinth habitat (E) (kg)
1	0.22	0.1	0.2	0.24	0
2	0.3	0. 22	0. 04	0. 24	0
3	0.22	0. 22	0. 0.2	0. 24	0.121
4	0.3	0. 22	0. 04	0. 02	0.1
5	0.1	0.18	0.04	0.04	0.02
6	0.1	0.02	0.06	0.02	0
7	0.08	0.06	0. 04	0.06	0.1
8	0.28	0.1	0. 18	0. 2	0.18
9	0.18	0.10	0. 18	0.06	0.04
10	0.2	0.18	0.12	0.06	0.02
11	0.3	0.26	0	0.12	016
12	0.32	0.28	0. 02	0. 02	0
13	0.24	0.02	0. 02	0. 01	0.22
14	0.28	0.2	0. 04	0. 02	0.01
15	0.18	0.1	0.02	0.24	0.12
16	0.2	0.1	0.2	0	0
17	0.18	0.16	0. 02	0. 24	0
18	0.1	0.01	0. 02	0. 06	0.1
19	0.24	0.04	0. 162	0. 42	0
20	0.16	0.01	0.08	0.10	0
Total	4.18	2.58	1.48	2.45	1.19
Grand Total of A,B,C and E Mean	0.209	0.129	0.074	0.1225	0.0595

Table 1: Summary of total and mean weights of fish caught from five different treatments that was used for ANOVA (N=20).

Habitat	Total Weight Of Fish Caught (Kg)	CPUE
Mangrove Habitat	4.I8	2.09 kg/man
Nypa Palm Habitat	2.58	1.29 kg/man
Shallow Water muddy bottom Habitat	1.48	0.74 kg/man
Deep Water Habitat with sandy bottom Habitat	2.45	1.225 kg/man
Water Hyacinth Habitat	1.19	0.595 kg/man

Table 2: Estimate of CPUE of fish caught from the five habitats.

Citation: Ambrose EE, Isangedighi IA (2016) Ingress Rate of Fish to Baited Traps Soaked at Different Fishing Grounds in the Estuary of New Calabar River, Nigeria. J Res Development 4: 135. doi:10.4172/ 2311-3278.1000135

Habitat name	Family	Species caught	No of fish caught	% No of fish	Weight (kg)	%weight	Length range (cm)
Mangrove habitat	Gobidae	*Porugobinus schelli*	166	20.519	3.76	31.649	4-8
	Portunidae	*Callinectes latimus*	26	3.2138	0.26	2.1885	4-9.9 (CL)
	Periophthalmidae	*Periophthalmus papilio*	18	2.2249	0.08	0.6734	6-14
	Bagridae	*Chrysichthys filamentosus*	181	0.1236	0	0	8.11
	Cyprinodontidae	*Aplocheilicthys splauchen*		2.2249	006	0.5050	4-8
Nypa palm habitat	Moringuidae	*Moringua arundinacea*	1	0.1236	0.02	0.1683	39
	Xenothidae	*Lophopanobeu sbellus*	1	0.1236	0	0	2.8-3
	Cyprinodontidae	*Aplocheilicthys splauchen*	67	8.2818	0.3	2.5254	4-8.5
	Gobidae	*Porugobinus schelli*	91	11.248	2.0	16.8355	4-18
	Periophthalmidae	*Periophthalmus papilio*	12	1.4833	0.12	1.0101	6-14
	Portunidae	*Callinectes latimus*	4	0.4944	0.16	1.3468	4-9.9
	Gobidae	*Porugobinus schelli*	89	11.001	1.34	11.279	4-18
	Portunidae	*Callinectes latimus*	11	1.3597	0.02	0.1683	4-9.9
	Bagridae	*Chrysichthys filamentosus*	1	0.1236	0	0	8-11
	Palemonidae	*Macrobrachium macrobrachion*	14	1.7305	0.02	0.1683	4.2-7.2
	Cyprinodontidae	*Aplocheilicthys splauchen*	9	1.1124	0.02	0.11683	4-8.2
	Periophthalmidae	*Periophthalmus papilio*	8	0.9888	0.085	0.7154	6-14
	Portunidae	*Callinectes latimus*	17	2.1013	0.2	1.6835	4-9.9
Deep water with sandy bottom habitat	Periophthalmidae	*Periophthalmus papilo*	12	1.4833	0.2	1.6833	4-9.9
	Gobidae	*Porugobinus schelli*	115	14.215	2.03	17.087	4-18
	Xenothidae	*Lophopanopeu sbellus*	1	0.1236	0	0	2.8-3
Water hyacinth habitat	Palemonidae	*Macrobachium macrobachion*	2	0.2472	0	0	4.2-7-2 (CL)
	Cyprinodontidae	*Aplocheilicthys splauchen*	13	1.6069	0.02	0.6835	4-8.2
	Periophthalmidae	*Periophthalmus papilio*	12	1.4833	0.085	0.7154	6-14
	Gobidae	*Porugobinus schelli*	65	8.0346	1.05	8.8383	4-18
	Portunidae	*Callinectes latimus*	17	2.193	0.04	0.3376	4-9.9
	Cyprinodontidae	*Aplocheilicthys splauchen*	18	2.224	0.015	0.1262	4-8
Total			**809**	**99.99**	**11.88**	**99.49**	

Table 3: Weights and number of different species of fish caught at each habitat from 20 replications.

Discussion

In tropical areas, shallow waters and estuaries are exploited for fin and shell fish resources with traps, although sometimes deep water fish are also trapped. FAO [5] reported that most pots and traps used in the tropics have been designed for fishing in reefs, rocky areas and on the rough bottom where nettings gears (gill, trawl and seine nets) are not suitable due to entangling. As elucidated in the study, fish species such as crabs, catfish, shrimps, and mud skipper etc. are the target species for trap in unfavorable fishing grounds; under the roots and leaf canopy of aquatic macrophytes which netting gear cannot be operated.

Physicochemical characteristics of the water body have an influence on the ecological niche exploited by different species of fish. Fish habitat is any area that is occupied, or periodically or occasionally occupied by fish or marine vegetation (or both) and includes biotic or abiotic components [1]. Essential fish habitats are bodies of water and substrate required for fish spawning, breeding, feeding, and a place they can grow to maturity [9]. Mangrove, *Rhizophora racemosa* fishing ground/ habitat attracted the highest number of fishes with mean weight of 0.209 kg. This is attributed to the fact that mangrove have a number of physiological adaptations to overcome the problems of anoxia, high salinity and frequent tidal inundations [10]. The mangrove habitat usually rich in detritus are highly suitable for fishing. The major fishery resources found in the water are detritivorous species of fishes, crabs, shrimps and mollusks. They are also extremely important fishing grounds for many fin fishes, with species such as *Porugobinus schelli* and *Periophthalmus papilio* spawning or maturing among others in the mangrove swamp. Mangrove vegetation in estuary provides an important nursery ground for fishes migrating from adjacent aquatic environment and is therefore significant in fisheries resources enhancement and yield for fishers. The mangrove ecosystem is also considered as most productive in biodiversity, providing significant functions in coastal zones by reducing erosion and ocean/storm surge.

Deep water habitat attracted few numbers of fishes because light penetration may not be sufficient for primary production to lure fishes to the vicinity of set trap. Deep water habitat (depth 6-10m) is an artificial fishing ground created in the area due to sand dredging; naturally the depth of water is between 1-5m. Water hyacinth, *Eichornia crassipes* is an invasive plant and acts as a floating macrophyte with a strong capacity for nutrient uptake [11-13]. Floating mat of water hyacinth creates a canopy that shades the water column, preventing phytoplankton and submerged vegetation's from obtaining light for photosynthesis [14]. In addition to reduced oxygen production, biological respiration within water hyacinth habitat is higher than all other habitats, as a result, the habitat is dominated by higher invertebrate and low fish density [15]. Due to the lack of light for photosynthesis, trap set in water hyacinth habitat caught the least quantity of fish with a mean weight of 0.0595kg.

Conclusion

Fishing efforts, like the number of crew or the time spent in fishing can dramatically be reduced if a productive fishing ground is known for quick operation, rather than searching for suitable ground per trip. This research identified areas of water dominated by mangrove vegetation to be the best fishing ground for small scale estuarine trap fishery.

References

1. Nomura M, Yamazaki T (1975) Fishing Techniques: Compilation of SEAFDEC lectures. Published by Japan International cooperation agency, Tokyo.
2. Reed W (1967) Fish and fisheries of Northern Nigeria. Ministry of Agriculture, Northern Nigeria.
3. Holden M, Reed W (1972) West African freshwater fishes. Longman Ltd, London.
4. Udolisa REK, Solarin BB, Lebo P, Ambrose EE (1994) A catalogue of small scale fishing gear in Nigeria. RAFR publication.
5. Food and Agricultural Organization (2001) Fishing with traps and pots. FAO, Rome.
6. Brandt AV (1972) Fish catching methods of the world. Fishing news books Ltd, London.
7. Gideon O, Chidiebere A (2008) The current pollution status of New Calabar River in the Niger delta region of Southern Nigeria: A survey of antibiogram profiles of its bacterial isolates. African Journal of Environmental Science and Technology 2: 134-141.
8. Stamatopoulos C (2002) Sample-based fishery surveys: A technical handbook. FAO Fisheries Technical Paper 425, Rome.
9. Welcomme RL (2001) Inland Fisheries: Ecology and Management. Fishing News Book, UK.
10. Plaziat JC, Cavagnetto C, Koeniguer JC, Baltzer F (2011) History and biogeography of the mangrove ecosystem based on a critical reassessment of the paleontological record. Wetland Ecology and Management 21: 161-179.
11. Gopal B (1987) Water Hyacinth. Elsevier, Amsterdam.
12. Aoi T, Hayashi T (1996) Nutrient removal of water lettuce. Water Science and Technology 34: 407-412.
13. Zimmel Y, Kirzner F, Malkovskaja A (2007) Advanced extraction and lower bound for the removal of pollutants from waste waters by plant. Water Environment Research 79: 287-296.
14. Rommens W, Maes J, Dekeza N, Inghelbrecht P, Nhiwatiwa T, et al. (2003) The impart of water hyacinth, Eichornia crassipies in a eutropic subtropical impoundment (Lake Chivero, Zimbabwe). I water quality Achiv Fur Hydrobiology 158: 373-388.
15. Perna C, Burrows D (2005) Improved dissolved oxygen status following removal of exotic weeds mats in important fish habitat lagoons of the tropical Burdekia River flood plain, Australia. Marine Pollution Bulletin 51: 38-148.