Preliminary Assessment of the Production and Management of Economically Important Shellfish Resources of Ondo State Coastal Waters

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Abstract

This paper assessed the production and management status of economically important shellfish resources in Ondo State coastal waters.. A multi-stage sampling procedure was used to collect primary data from 48 coastal communities in the area. Data collected were analysed using descriptive statistics. Results showed that *Nematopalaemon hastatus* had the highest percentage (90.8%) in terms of frequency of occurrence. *Penaeus notialis* (5.2%), *Parapenaeopsis atlantica* (2.9%) and *Macrobrachium macrobrachion* (1.1%), *Penaeus monodon* (0.005%) followed with no significant (P>0.05) difference between landing locations. While *N. Hastatus, P. notialis* and *P. atlantica* occurred in all sampled catches, *M. macrobrachion* and *P. monodon* had 44.4% and 95.8% number of Occurrence Index respectively. The study indicates the need to ensure that efforts are kept within the limit of available stock.

Introduction

Fish and fishing contribute immensely to the national economy by providing high animal food protein source, employment and poverty alleviation (Olaoye *et al., 2012*). Capture fisheries operations both at industrial (trawl) and small-scale (artisanal) levels thrive very well within and around the country's vast coastal waters from the shallow waters of the coastline to the open deep waters of her EEZ limits across the nine coastal states. Ondo State, one of the nine coastal states of Nigeria has about 180 km coastline thus, the longest amongst the lot. It is therefore imperative that Ondo State coastal waters and indeed the entire Nigerian coastal waters, required prompt monitoring and regulations to ensure enhanced renewable resources (biodiversity) stock management and development. The need to ensure sustainable exploitation as well as guarantee employment/ engagement of the coastal population cannot be overemphasized. The specific objective of this paper is to identify, classify and evaluate the abundance and distribution pattern of the various shellfish species available in the coastal waters of Ondo State. It identified the commercial species, distribution and its abundance and evaluated the catch, cost and income of the fishery. A multi-stage sampling procedure was used to collect primary data from 2012 to 2014 from the 48 coastal communities in the state.

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Materials and Methods

The study area

The study area is in Ondo State with Akure as the capital. Located in the south-western part of Nigeria, it covers an estimated total land mass of about 15,086 km^2. It has an estimated population of 3,441,024 (NPC, 2006, p 10). It is a multi-ethnic state with vast majority being Yorubas of varying dialects. There are also Arogbo and Apoi Ijaws who mostly resides within the riverine areas close to the coast. The area is characterized by two distinct seasons.

Description of study site(s)

The study was conducted in some of the communities along and within the 180 km long coastline of the state. All sampled communities are within the Ilaje Local Government Area of the state. It covers an area of about 1,318 Km^2. It shares boundaries with the Ikales of Okitipupa and Ese-Odo LGAs in the north; the Ijebus of Ijebu- Waterside LGA of Ogun State in the west; the Apoi and Arogbo Ijaws in the north-east, as well as the Itsekiris of Delta State on the eastern flank. The area lies between latitudes $6^{\circ}0'$ and $6^{\circ}30'$ north of the equator and longitudes $4^{\circ}45'$ and $5^{\circ}45'$ east of the Greenwich Meridian (Olujimi *et al*, 2011, p. 113).
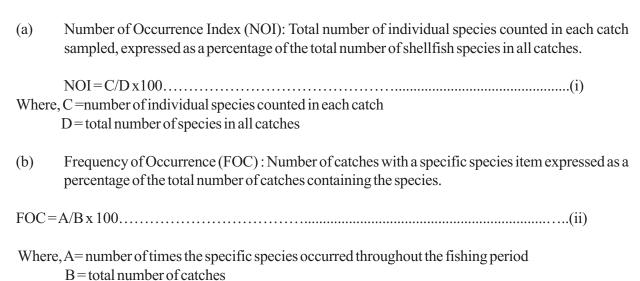
Method of Data Collection

Data used for this study were basically from both primary and secondary sources. The relevant primary data were obtained through direct contact with the shell-fishers for the collection of catch samples, physical identification and enumeration of species number and frequency of occurrence. Catch quantity/canoe and the economic value (price) were assessed based on prevailing prices for a period of 24 months (May,2012 – April,2014). This was complemented by personal interview of major stakeholders (utilizing trained field assistants/enumerators) with the aid of structured questionnaires. A mixed methods approach (Moore *et al*, 2010, p797) was adopted. 20 randomly selected coastal fishing communities were selected and given structured questionnaires to elicit general information on the fishery. This was complemented with detailed socio-economic case study of six of the sampled communities.

Species Identification

Catch samples were collected from fishermen as they arrive at the landing sites. Preliminary identification was carried out right at the point of collection to specie level using the Field guide to the commercial Marine Resources of the Gulf of Guinea (FAO, 1990, p35). Morphomeric features (coloration, pleura arrangement, shape of rostrum, number of spines on the rostrum) of each species were used for identification to species level (Bello-Olusoji *et.al*, 2004, p. 282). Samples for further works were preserved in 10% formaldehyde solution. Detailed identification and listing of shellfish as well as the fin-fish by-catch of shell fishing activities were carried. Shellfish diversity and species prevalence in terms of Number of Occurrence Index (NOI) and Frequency of Occurrence (FOC) were estimated by counting numbers of individual specie in 300 grams samples collected monthly from the randomly selected locations and fishermen.

Analytical Procedure

Combinations of both descriptive and inferential analytical techniques were employed in this study. Descriptive statistics such as mean, frequency distribution and percentages were used to describe the characteristics of the shellfish resources. Abundance and distribution pattern of the target shellfish resources are expressed in percentages as Number of Occurrence Index (NOI) and Frequency of Occurrence (FOC) as follow:

(a)   Number of Occurrence Index (NOI): Total number of individual species counted in each catch sampled, expressed as a percentage of the total number of shellfish species in all catches.

$$NOI = C/D \times 100 \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \text{(i)}$$

Where, C = number of individual species counted in each catch

D = total number of species in all catches

(b)   Frequency of Occurrence (FOC) : Number of catches with a specific species item expressed as a percentage of the total number of catches containing the species.

$$FOC = A/B \times 100 \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \text{(ii)}$$

Where, A = number of times the specific species occurred throughout the fishing period

B = total number of catches

Results and Discussion

Shellfish Species Composition of Ondo State Coastal Waters

All the sampled landings of artisanal shell-fishermen in the study areas were characterized with the preponderance of N. *hastatus*, P. *notialis* and P. *atlantica*. However *M. macrobachium* were occasionally encountered during the months of September to November when water dilution under high water discharge into the ocean by the rivers were very freqyent. There were incidental catches-the Tiger prawn- *Penaeus monodon*. Crabs encountered were identified as smooth swim crab-*Sanquerus validus*; marbled swim crab, *Callinectes Marginatus* and the African ghost crab- *Ocypode africana*. Crushed and dead crabs were common on a typical landing beach in Ondo State coastal area (Plate 1). The estimation of Frequency of occurrence (FOC) and Number of Occurrence Index (NOI) in this study therefore focused on *N. Hastatus, P. notialis, P.atlantica , M. macrobrachion* and *P. monodon* (Plates 1, 2 & 3) as the economically important shellfish resources of the study area.

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Plate 1: *P. monodum*   **Plate 2:** *N. hastatus*

Plate 3: Collection of *P. notialis, P.atlantica , M. macrobrachion* and *P. monodon*

Frequency of Occurrence (FOC)

The Frequency of Occurrence (FOC) of the economically important shellfish species prevalent in the Ondo state coastal waters is presented in Table 1. *N. hastatus, P. atlantica and P. notialis* had 100% value as the three species were prevalent in all sampled catches (all year round), while M. *macrobrachion* had 44.4%. This might not be unconnected with its normal preference for fresh/brackish environment; venturing into the near shore waters especially around the river outlet into the sea or estuary under the dilution effect of the river discharge into the sea. *M. macrobrachion* prevalence in catches is often enhanced by fishermen encounter with shoals of *N. hastatus* in or close to the shore and/ or the river "mouth". Rough sea, from July to September which generally impact negatively on catches tend to encourage operations closer to the shore line. Situation usually gets better from October and best between December and June. The occurrence of *P. monodon* in almost all sampled canoes (95.8%)

seems to be coincidental as there were many observed cases of expeditions without any *P. monodon* in the landings. Total catch of *P. monodon* per canoe varied from 0 (none) to 12 pieces weighing as much as 152g each. Regularity of its occurrence and abundance per trip was a function of sheer luck as individual expertise or fishing experience, net mesh size, boat size or out-board engine capacity are yet to be proven responsible.

Table 1: Frequency of Occurrence(FOC) of commercially important shellfish species of Ondo State Coastal Area

SPECIES	ABEREKE	OKESIRI	ARAROMI	AWOYE	GBABIJO	AJEGUNLE	TOTAL N	%
N.hastatus	12	12	12	12	12	12	72	100
P.notialis	12	12	12	12	12	12	72	100
P.atlantica	12	12	12	12	12	12	72	100
M.macrobrachion	6	7	3	5	5	6	32	44.4
*P.monodon***	10	12	12	12	12	11	69	95.8

Source: Field survey, 2012/2014

Number of Occurrence Index (NOI)

The Number of Occurrence Index (NOI) of commercially important shellfish species in all the sampled stations is presented in Table 2. The result showed that *N. hastatus* was the most abundant species in the six sampled stations throughout the study duration with an average of 90.8%. *P. notialis, P. atlantica* and *M. macrobrachion* constituted 5.2%, 2.9% and 1.1% respectively of catches (by number). The occurrence values for. *P notialis, P. atlantica* and *M. macrobrachion* jointly referred to as "Ipa" by the IIajes could be lower in the catch measured for sale to the vendors. This might not be unconnected with the retention of the sizeable ones for consumption by the fishers household or acquaintances especially when there is lack or inadequacy of worthy finfish by-catch for the fishers family. The total number of *P. monodon* in any typical trip landing were so few that its inclusion in the sample count (about 300g) would have been biased thereby giving an over-estimation or under-estimation of the species occurrence. An estimation of a total trip landing showed that *N. hastatus* with an estimated population of 127,163 constituted 93.633% of total landing. The "Ipa" or "brown" shrimp, (combination of *P. notialis, P.atlantica* and *M. macrobrachion*) with an estimated population of 8,639 made up of *P. notialis* (6,125 nos/4.51%); *P. atlantica* (1,806 nos/1.33) and *M. macrobrachion* (708 nos/0.521%) jointly constituted 6.361% of the trip landing. The *P. monodon* content of the entire catch was seven with an estimated number of occurrence Index (NOI) value of 0.005%.

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Table 2: Number of Occurrence Index (No and %) of commercially important shellfish species of Ondo State Coastal Area

SPECIES	ABEREKE		OKESIRI		ARAROMI		AWOYE		GBABIJO		AJEGUNLE		MEAN	
	No	%	No	%	No	%	No	%	NO	%	No	%	No	%
N.hastatus	754	90.7	701	89.1	854	93.3	782	92.7	672	92.2	795	91.9	760	90.8
P.notialis	51	6.1	54	6.8	38	4.1	40	4.7	41	5.6	39	4.5	44	5.2
P.atlantica	11	1.3	22	2.8	16	1.8	13	1.5	11	1.5	24	2.8	24	2.9
M.macrobrachion	16	1.9	10	1.3	7	0.8	9	1.1	5	0.7	7	0.8	9	1.1
P. monodon	(4)		(5)		(3)		(6)		(5)		(4)		(4.5)	

%= percentage.   N=frequency

( )= Number of *P.monodon* per canoe trip (Catch)

b. Estimated Occurrence of Commercially Important Shellfish in a typical landing.

SPECIES	No/500g Sample	Est. No/35.7kg (Total catch)	%
N. hastatus	1,781	127,163	93.634
P. notialis	86	6,125	4.510
P. atlantica	25	1,806	1.330
M. macrobrachion	10	708	0.521
P. monodon	--	7	0.005
TOTAL		**135,809**	**100**

Shellfish Management Evaluation of Ondo State Coastal Area

Crayfish (*N. hastatus*) has remained the target species of choice to the coastal shellfishers of Ondo State and their counterparts in other maritime states of Nigeria. Shellfishers were usually fisher of fish (fin-fish) who later graduated into the specialised art of shellfishing. All the shellfisher(s) in the study area had aside from their beam trawl nets, other net(s) of varying mesh sizes, hook(s) or traps for fish as secondary gears. These alternative gears were often deployed when the conditions at sea are considered much more favourable for fin fish catch than shellfish. The study showed that about 10,942 or 36.9 % of the total estimated coastal fishers (29,664) in Ondo State are engaged in shell fishing. Investigation revealed that catch per unit effort (catch/canoe/trip) has been on the decline in recent years.

Conclusion

Based on the result of this study, the following recommendations are made for the advancement of the management of the artisanal shellfish resource of not just Ondo state but the entire nation's coastal waters. Resource (shellfish species) occurrence and abundance evaluation should be a regular and continuous exercise to enhance early detection of ecological disruption or imbalance and onset of depletion for prompt remediation. For a holistic understanding of the coastal waters resource base, species specific investigations of this type should be considered for the various commercial fish (fin and shell) species before the unacceptable but imminent collapse sets in. The resource potential estimates of over three decades can no longer adequately portray the current status of the stocks. A comprehensive and pragmatic re-evaluation to be followed by continuous monitoring should be considered.

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