

MARKET SURVEY OF THE PERIWINKLE *TYMPANOTONUS FUSCATUS* IN RIVERS STATE: SIZES, PRICES, TRADE ROUTES AND EXPLOITATION LEVELS

By

C. B. Powell*, A. I. Hart* and S. Deekae**
 Zoology Department*
 University of Port-Harcourt
 Port-Harcourt

Nigerian Institute for Oceanography**
 and Marine Research (N.I.O.M.R.)
 Buguma Station

ABSTRACT

Tympanotonus fuscatus was collected from 23 markets through Rivers State, a few in neighbouring States, and from an unexploited population at Buguma. The size distribution of shells was determined, and information on prices and trade routes was also obtained.

The mean shell length of specimens from the unexploited Buguma population was 46.4 mm, compared to 30.4 mm for the Buguma market samples. Mean sizes in other markets showed a geographic pattern: the smallest were from the Adoni-Ogoni-Opobo sector (28.1-30.9); the largest were from the Nembe-Brass sector (37.7-44.2) and Bendel State (35.7-45.6);

The results suggest the population structure of *Tympanotonus* in much of Rivers State has been strongly impacted by overharvesting. They show that local market as well as some in Cross River State, are increasingly being supplied by road with specimens from the Benin River area of Bendel State.

Differences between shell types, and relations between shell size, selling price and market distance from source, are also discussed.

INTRODUCTION

The mangrove snail, *Tympanotonus fuscatus* is a major food item in soups prepared by coastal peoples of south-eastern Nigeria. It is harvested from the swamps by women and retailed by petty market traders who remove the meat from the shells for sale. The snail is very hardy, and is able to survive many days out of water, so it is easily transported in quantity to inland markets.

The present survey was started to test our observations that excessive harvesting appears to be leading to a marked reduction in mean sizes in local populations: a simple and easily demonstrated case of over-exploitation. In the course of the sampling, a second point became evident: that a significant proportion of periwinkles now marketed through Rivers State (and also Cross River State) originate from the Sapele/Benin River area of Bendel State from where they are transported by road.

The paper thus, aims to identify the major trends in exploitation levels and marketing of the periwinkle; and to provide preliminary information for deciding on research priorities.

METHODS

Shell length was measured from the end of the outer lip to the tip of the spire, with vernier calipers. As normal, most of the medium and larger sized shells were decollate (tips of spires missing) thus the length measurements under-represent the true differences in sizes. Shells with extreme decollation were not measured.

Samples of about 200 shells if possible, were used from each source. Each shell was categorized as "smooth" (from *radula*) or "spiny" (from *fuscatus*). Shell length was measured to the nearest millimeter, but for the purpose of analysis, the data were reduced to size-classes of 3 mm.

During market visits, information was obtained from the traders on prices, and the source(s) of the periwinkles in each market. In many cases, the periwinkles being sold had been obtained from other markets, which in turn were visited if possible. Many were traced back to traders bringing large consignment from Sapele in Bendel State.

Other anecdotal information was obtained from local indigenes from various areas.

RESULTS AND DISCUSSION

Comparison of Market Sample with Sizes in an Unexploited Population

Figure 1 shows a comparison of the size-frequency distribution of shells from Buguma market (i.e. collected from wild, exploited populations), and from the Buguma station fish ponds. The difference in size is clear. The pond population had been subject to some limited harvesting by workers and except for this, the shell-size difference between the two samples would have been greater.

Similar differences between shell-sizes in exploited and unexploited populations were observed circa 1980 at the tributary of Elechi Creek supplying the fish ponds of the Rivers State University of Science and Technology, Port-Harcourt. The periwinkles of the peat flats subject to normal harvesting by local persons, were small; exceptionally large specimens occurred in two areas: the University's fish pond, and an isolated bend of the creek which was by-passed by the local gatherers.

Comparison of Market Samples and Geographic Sectors

Data for the market samples are shown in Table 1. Samples are arranged into four groups according to area of origin and market route. Each area has a surprisingly distinct range of mean sizes only a few extreme values in each group overlap the size range of other groups. Figure 1 compares graphically, the frequency distribution of shell sizes in samples from each of the four groups (Kono for the Andoni-Ogoni-Opobo sector; Okrika for Okrika-Bonny-Kalabari sector, Brass for the Brass-Nember sector; and Benin River for Bendel.

OGONI-ANDONI-OPOBO ZONE

This zone had consistently small specimens, with mean lengths of 28.1-31.4mm. Harvested specimens are marketed inland through the Bori area and up the Imo River to Azumini. Reports from the Kono area indicate that extensive commercial harvesting began only around 1980, after which time there was a noticeable drop in sizes. Inland at Azumini, the small-sized periwinkles originating from the lower Imo River (Kono-Opobo) are now receiving competition in the market, from large specimens originating from Bendel.

OKRIKA-BONNY-KALABARI ZONE

The mean sizes in this zone are 30.4-34.7mm, excluding an additional, exceptional value of 36.5 (Choba market, purportedly from Kalabari but possibly from the Bendel market route). The sizes are intermediate between the previous zone, and those of the next two zones.

The zone can be subdivided into two, according to market routes. First is the Okrika-Bonny River area. Specimens from here are routed through Okrika to markets a few kilometers inland, mainly on the outskirts of Port-Harcourt (Eleme, Elenwo etc).

Second is the Kalabari area extending from Bakana and Bille (New Calabar River) westwards to the Degema area. Specimens from these area are routed to (1), the Diobu-area markets of Port-Harcourt from where they are distributed to other markets of the city, and (2), local markets along the upper New Calabar River such as Ogbogoro and Choba. The major source area is the Soki region west of Degema, from where large quantities are sent directly to Port-Harcourt, and also inland to Abua and Ahoada.

BRASS—NEMBE ZONE

Only two samples were obtained. They had mean shell sizes (37.7 and 44.2mm length) larger than all other market samples of Rivers State origin. Several informants specifically noted that "l jaws" (meaning Brass and Nembe *inter alia*) do not export their periwinkles, which suggests that their periwinkle populations are under less harvesting pressure.

BENDEL (BENIN RIVER)

These samples had large mean sizes (34.1–45.6mm), with most of the means larger than any from the Andoni–Ogoni–Opobo and Okrika–Bonny–Kalabari zones. The snails are transported from Sapele to Timber Waterside in Port Harcourt by traders who receive them from the lower Benin River. Timbe Waterside serves as a distribution center for markets in the Port-Harcourt area and further east: traders from Aba, Ikot Ekpen, Uyo and Calabar reportedly visit there to buy for re-sale. Some of these traders also buy directly from Sapele.

Evidently, none of the Bendel traders goes east of Port-Harcourt. Some stop at Ahoada.

According to the Bendel traders, there are also occasional shipments of periwinkles from the Forcados–River area via Warri to Port-Harcourt, but the shipments are infrequent and the periwinkles are smaller.

Relation Between Shell Size and Price of Removed Flesh

There is a general positive correlation between shell size and the selling price of removed flesh (Figure 2), even though the unit measure of flesh is the same.

The correlation is partly due to a strong consumer preference for large bodies periwinkles. However, it should be noted that the samples of large snails all came from inland markets, so their higher selling price may also be related to distance from source and middlemen. In all the main market sectors, there was evidence that larger shell sizes were sent to more distant markets, and the smaller ones kept for local consumption. This may be connected with differences in collecting efforts by persons gathering the snails full-time for sale to commercial transporters.

Differences Between Spiny and Smooth Forms

It is well documented that the spiny and smooth forms of the *Tympanotonus* belong to the same species (*T. fuscatus*) (Pilsbry and Bequaert, 1926; Brown, 1980). All individuals are of the smooth form early in life; the difference in forms is due to some individuals soon changing to the spiny pattern of shell growth. The occurrence of each form has been shown to be related to habitat factors (e.g. Binder, 1957) and changes in shell growth pattern from one form to the other has been accomplished experimentally by transplanting snails from one habitat to another (Routeillet, 1979; Gabriel, 1980, 1981).

Both forms reach large sizes (Table 1). Inspection of the data does not show any marked correlations of price or other factors with shell type, between samples (but see next paragraph). Within samples, there is a tendency for spiny forms to have a larger mean size than smooth forms (Figure 3) but significance of this is not clear. In two samples of small shells, the smooth forms had a larger mean size (Figure 3).

By some accounts, the smooth form is preferred by the petty traders because the flesh of this type is more easily removed in its entirety. In contrast, however, there is a general consumer preference for the spiny form, which is reputed to taste better.

Effects of Harvesting on Population Structure

The effect of harvesting on periwinkle population structure in the Port-Harcourt area was suggested earlier in a yet unpublished report (Powell, 1981).

From a different perspective, Nzewunwa (1985) reported archaeological evidence of reduction in shell size in the Okrika area, based on shells of specimens harvested there approximately 2,000 years ago. It is not possible, however, to say when in the intervening period the decrease occurred or was greatest.

Concerning the data at hand, it might be suspected that the larger size of the Buguma fish pond specimens, compared to the market sample, could be due to differences in habitat zones involved (permanently underwater vs intertidal) or trophic conditions. However, those arguments do not account for the size differences also observed at the Elechi Creek/University of Science and Technology site, between harvested and unharvested populations. In that instance, one of the unharvested populations, with larger specimens, was in a natural intertidal site. Moreover, the only growth study available (Gabriel, 1980), showed that growth rates of a pond population (at the U.S.T. site) was if anything lower than a natural intertidal site (at Borokiri, Port-Harcourt).

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Table 1

Market	Source	Mean Size	N=	% Spiny	Cost per		
					Tomat	Milk	Cigarette
ANDONI/OGONI/OPOBO ZONE							
Kono	Kono	28.1	200	42.5	—	25	—
Opobo	Opobo	29.5	200	3.0	—	—	—
Kaa	Andoni	30.7	200	33.0	—	50	—
Bodo	Bodo	30.9	201	1.5	20	—	—
Bori	Bodo & Maa	31.4	202	4.5	20	40	—
OKRIKA/BONNY/KALABARI ZONE							
Buguma	Buguma	30.4	200	8.0	—	—	50
Umuagbai	OilMill (Okrika)	30.8	201	.0	30	50	—
Onne	Onne & Bodo	31.7	201	12.4	—	50	—
Bonny	Bonny R.	31.8	200	11.5	—	40	—
Nchia Eleme	Okrika	31.9	201	33.3	20	50	—
Degema	Degema	32.4	201	37.3	—	50	—
Okrika	Okrika	32.5	200	7.5	20	—	—
Oil Mill Mkt	Okrika	33.3	202	10.9	30	80	—
Eledenwo	Okrika	33.7	201	48.8	25	50	—
Rumueme	Bakana	34.7	201	41.3	—	40	—
Choba	Kalabari	36.5	201	79.0	—	100	—
BRASS/NEMBE ZONE							
Brass	Brass	37.7	201	100.0	—	—	50
Nembe	Nembe	44.2	29	89.7	—	—	—
BENDEL (SAPELE/BENIN R. ZONE)							
Sapele		34.1	132	.0	30	50	—
Obigbo	CkRd (Bendel?)	35.7	201	30.3	30	50	—
PH Mi3 Mkt	Timber/W/S Bendel)	36.9	206	96.1	30	—	—
Ahoda	Bendel	39.7	202	100.0	70	100	130
PH Creek RdMkt	Bendel	42.3	200	3.5	35	—	—
PH Timber W/S Bendel	-Benin R	45.6	156	.0	—	—	—
UNEXPLOITED							
	Buguma Pond	46.4	200	7.0	—	—	—
OTHER CALABAR							
Calabar	Local?	32.7	95	.0	—	—	—
Calabar	Bendel?	43.0	107	100.0	—	—	—

PERIWINKLE SIZE DISTRIBUTIONS

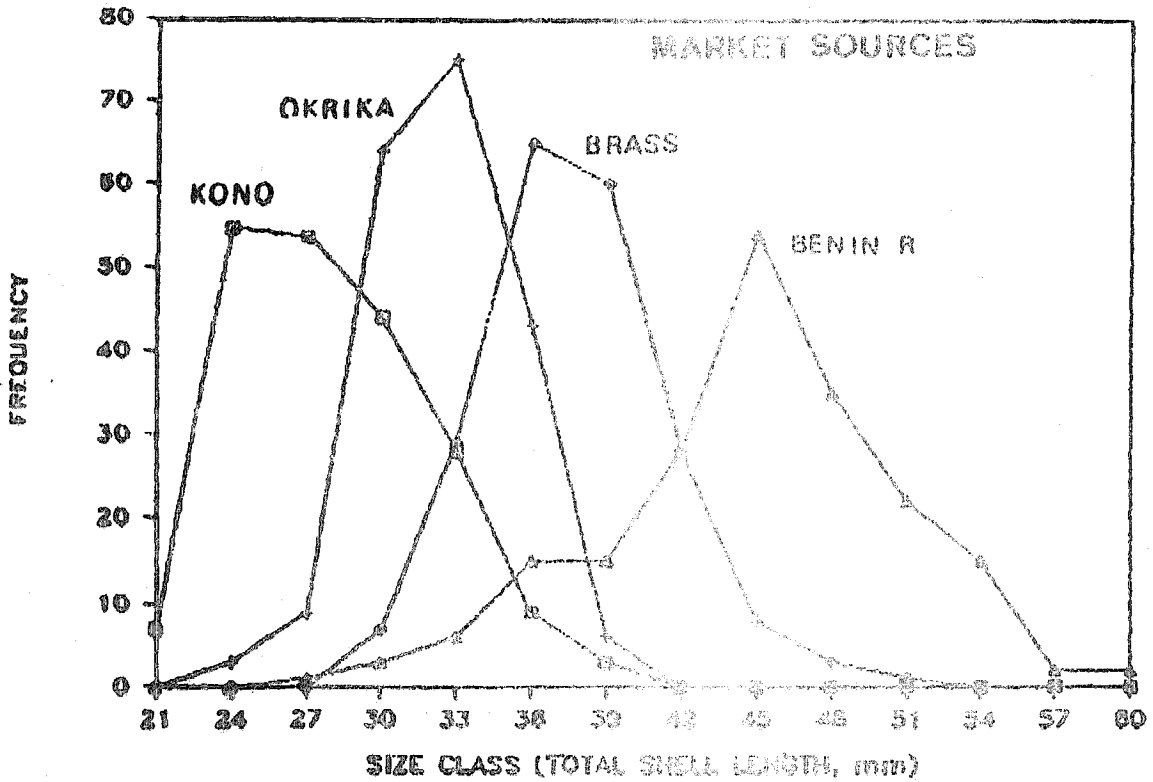
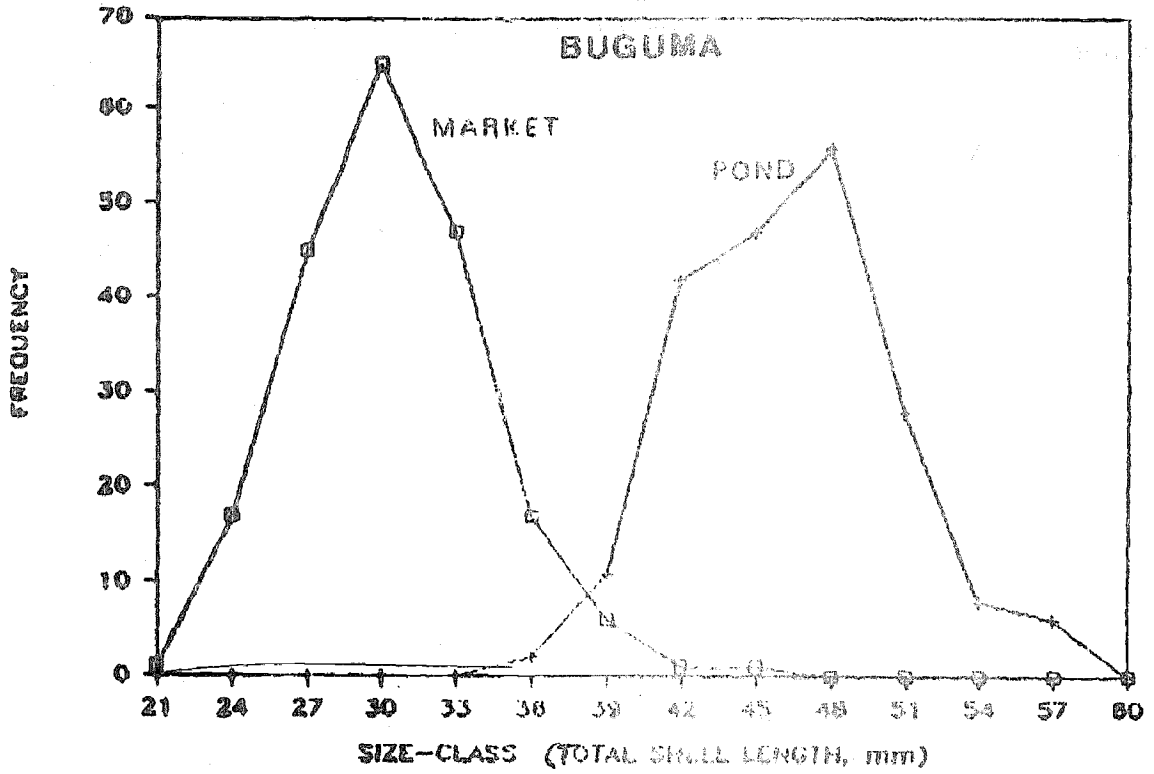
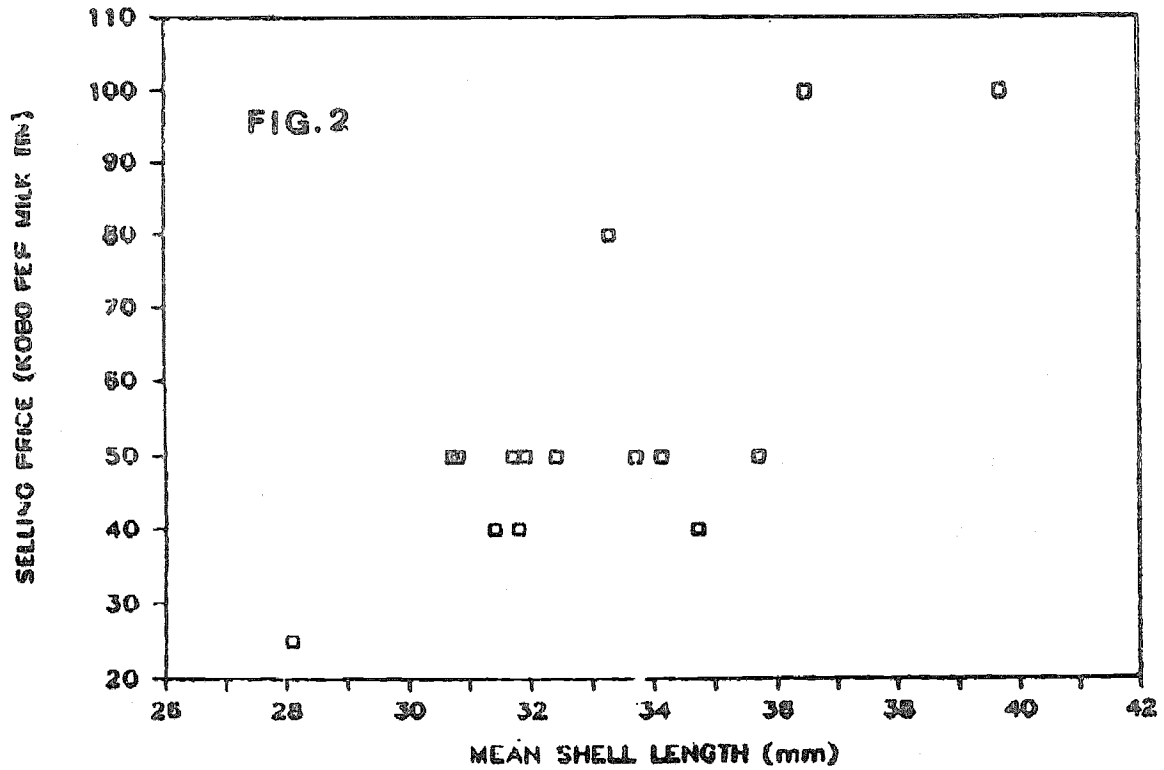


FIGURE 1.

PERIWINKLE SHELL SIZE vs FLESH PRICE



MEAN LENGTH OF EACH FORM WITHIN SAMPLE IN SAMPLES WITH OVER 15 OF EACH FORM

