SYNOPSES OF RESEARCH ON SHRIMPS

1. The Common Shrimp Species of Sierra Leone's Coastal Waters: Their distribution, abundance ans size composition.

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An attempt has been made to provide some quantitative information on the Shrimp Resources of Sierra Leone Waters. This is important now that the export shrimp Industry has been reactivated. The present study of the bionomics of the stocks is the beginning of our efforts in this direction.

Of the nine species of Penaeid Shrimps previously recorded off Sierra Leone (Longhurst, 1958) four have been studied here, Penaeus duorarum notialis being the dominant species in the Sierra Leone shrimp fishery.

Two cruises were undertaken in June 1977 and in March 1978 in order to make synoptic surveys of the distribution and abundance of the shrimp stocks on the inshore shelf. Two Freetown-based Soviet Shrimpers (MRC - 304 and MRC 305) were made available to us for the surveys. The average cruising speed was 9 knots, towing a single net from the stern. Trawling was at night from 19.30 GMT to 05.30 GMT, each trawl lasting one hour.

Trawling stations were established in four locations, namely, off Bullom; Freetown Peninsula; Sherbro Island and North Turner's Peninsula; and South Turner's Peninsula. The

ATLANTNIRO fishery research vessels SRTM PROGNOZ and SRTM VYKMA carried out hydrographic surveys during the two periods respectively and their data have been used to obtain some information on the hydrographic conditions prevailing at the time of the shrimp surveys.

During the second survey, the attempts to trawl stations off Sherbro Island and North Turner's Peninsula were given up because of massive catches of a rhizostome jellyfish (up to 1 ton per 30 min trawl) posing risks of loss or damage to the gear.

The Temperature - Salinity - Depth curves for the fishing grounds showed the existence of three water masses as follows:

(1) A Tropical Superficial Water (TSW) with temperatures greater than 24°C. This extended down to 35-45m in June (wet season) and to 20-30m in March (dry season). During the former period this top layer may itself consist of two layers: an upper desaline layer called "Guinean" or "Liberian" water with salinities less than 35 ppt and temperatures greater than 27°C at depths of 20-30m; and a lower layer with salinities 35-35.5 ppt, temperatures greater than 24°C at depths 30-45m. In March the desaline layer was closer to shore and the high salinity layer came close to the surface along Sherbro Island and Turner's Peninsula.

(ii) Discontinuity zone with temperatures 24°C-18°C from top to bottom, at depths of 35-43m to 65-70m in June; and in March close to the sur surface. Salinity was over 35.5 ppt.

(iii) Cool subtropical waters (T 18°C; S, 35.6-35.85 ppt) below layer (ii).

The ichthyofaunal composition of the trawls was mainly Sciaenidae at depths of 10-25 or 30m, with patches of mixed sparid and sciaenid fauna in the central and northern parts of the coast.

The shrimp distribution and abundance were as follows: Penaeus duorarum and P. kerathurus were found at depths of 10-70m; Parapenaeus longirostris at depths of 40-70m. In June 1977 P. duorarum was almost absent from the northern coast but in March 1978 it was taken mixed with the more numerous P. kerathurus. P. duorarum was most abundant off the Freetown Peninsula especially at the Banana Islands shrimp grounds where smaller quantities of P. atlantica and P. kerathurus were also taken. Further south, off Sherbro Island and Turner's Peninsula P. duorarum notialis was virtually absent.

Catches of P. d. notialis varied from 0.4-43 kg/hr off Banana Island and 3.5-7.5 kg/hr off Bullom. Catches of P. kerathurus averaged 3.8 kg/hr off Bullom (1.9-10 kg/hr) and at Banana Islands grounds they varied from 0.6-4 kg/hr. Further south it was almost absent. Here P. atlantica was dominant with catches ranging from 0.5-16 kg/hr at depths of 14-70m.

The size composition revealed that females were of consistently greater lengths than males of P.d notialis, maximum recorded lengths being 22.3 and 18.1 cm respectively. Immature forms were absent (i.e. those 7.5 cm). Females were also more abundant than males, except at 4 stations on the Banana Islands grounds. There was evidence of a modal progression with depth.

For P. kerathurus the maximum sizes were 18.0 and 22.5cm for males and females respectively. The sizes were usually smaller at the sites of maximum concentration of the stocks i.e. at the shallowest depth. But there was little evidence of size - depth relationship. In general the Bullom populations were older than those of the Banana Islands, and consisted of more than one size group with females outnumbering males by 2:1.

At the Banana Islands sex ratios were roughly 1:1 for both P. duorarum notialis and P. kerathurus. But with P. atlantica the females outnumbered the males at all stations. The maximum sizes attained were: females, 14.7cm; males, 10.9cm. While the frequency distribution curves for males were unimodal those for females were bimodal or even trimodal, the respective modes being 6.8 or 7.3cm and anything between 10.3 and 11cm.

There is evidence that there might be three size groups increasing in size as follows: smallest at 10-12 metres; intermediate at 38-46m, and largest at 20-24m.

Parapenaeus longirostris consisted of small samples which do not allow significant generalizations to be made about the populations.

The ecological associations of the shrimp species were as follows:

P. kerathurus was dominant in the northern part of the coast off Bullom at depths of 10-25m over shelly sand and silt; and in association with a mixed sparid and sciaenid fish fauna in desaline 'Guinean' waters of the Tropical Surface Water (TSW). This is similar to the conditions reported by Grosnier (1963) off Zaire.

Southwards at the Freetown Peninsula - Banana Islands grounds over shelly sand and shelly mud, the species diminished in quantity as the pink shrimp became dominant.

P.d. notialis in this area was most abundant at depths of 15-40m associated with a similar sparid - sciaenid fish fauna in TSW and thermocline waters. Off Banana Islands the fish fauna was mostly juvenile sparid and polynemid species; and off Sherbro Island smaller quantities were taken at 20-70m depths in similar TSW and thermocline waters, associated with the sciaenid community. These observations agree with the reports for the Gulf of Guinea (Monod, 1966 and Garcia, 1974).

Parapenaeopsis atlantica was most abundant in the south off Sherbro Island and Turner's Peninsula at depths of 14-70m where muddy deposits predominate, in TSW and thermocline waters. This is evidence of an extension of its range which Grosnier (1963, 1964) reported to be strictly coastal "Guinean" waters.

Over such muddy deposits we had expected to take greater quantities of P.d. notialis (Garcia 1974) but unless the sites have already been over-exploited, we can only suggest that its relative absence is due to lack of nursery grounds for the post-larval forms.

The Bullom populations probably receive recruits from the Sierra Leone River Estuary while the Banana Islands populations receive from the Yawri Bay and Sherbro River estuaries. This promises to be the subject of a future study.

An even more important study will be the effect of shrimping on the mortality of young Sparidae and Sciaenidae and hence on the recruitment to the adult populations that form such an important component in our commercial fisheries. Present indications have given us cause for concern in this regard.

The two surveys have shown that the Banana Islands are the most productive shrimp grounds in the country. We believe that they can support a viable shrimp industry for several years to come at present rates of exploitation.

REFERENCES

Crosnier, A (1963) - Fonds de peche le long de la Republique federale du Cameroun. ORSTOM (Mimeo). 66pp.

Crosnier, A (1964) - Fonds de peche le long des cotes de la Republique du Cameroun. Cahs. Oceanogr. no. special. 133pp.

Garcia, S (1974) - Biologie de Penaeus duorarum notialis en Cote d'Ivoire. 4. Relations entre la repartition et les conditions du milieu. Etude des variations de sex-ratio. Doc. Sci. Cent. Rech. Oceanogr. Abidjan ORSTOM: 5(3-4): 1-39

Monod, Th. (1966) - Crevettes et Crabes de la cote occidentale de L'Afrique. Memoir IFAN No. 77.