BIOLOGY AND FISHERY OF THE REEF FISH *SCOLOPSIS BIMACULATUS*

RUPPELL (MONOCLE — BREAM) IN KENYA.

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DECLARATION

This thesis is my original work and has not been presented for a degree in any other University.

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The thesis has been submitted for examination with my approval as University Supervisor.

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ABSTRACT

The biology of the reef fish <u>Scolopsis bimaculatus</u> (Paragunda) which
is widely distributed in the East African Coast, is studied.
The study equips us with knowledge which is needed to manage
the stocks properly and avoid depletion of stocks due to
fishing.

The food and feeding habits have been studied by points method
of Hynes (1950). <u>S. bimaculatus</u> is a carnivore feeding
mainly on crustaceans, molluscs, echinoderms and fishes. The
feeding intensity is great during July, August, October,
December and May, and coincides with the resting period after
spawning. Though the species feeds on fishes almost throughout
the year, penaeid prawns form one of the main constituents
followed by molluscs and echinoderms. The fishes occurred in
the large size groups but the crustaceans, in all size groups.
The occurrence of sand and mud in all size groups throughout
the year was an indication that the species feeds primarily over
muddy or sand bottoms upon surface or sub-surface dwelling
organisms.

The length - weight relationship was calculated for immature
and mature females and males. A significant difference
between regression lines was observed between the sexes, but
it was possible to obtain a single regression to adequately

describe length weight relation. The relationship obtained was Log W = -1.537 + 2.765 Log L.

The relative condition factor of S. bimaculatus was observed to fluctuate with maturation cycle. With onset of spawning there was a steep fall in condition which was attributed to loss of gonad contents.

Maturity stages were determined by oocyte diameter and microscopic examination of gonads following stages suggested by Dadzie (1974) and Nzioka (1979). Six stages were distinguished in S. bimaculatus. The fish spawned twice a year with peaks in March to May and September to November. The gonadosomatic index was found to vary from 0.77 to 2.04 for females and 0.09 to 0.74 in males. The length at first maturity of the fish was determined graphically and by oocyte diameter. The length at which 50% of the fishes were mature was considered to be the length at first maturity. S. bimaculatus mature at about 16.5 cm total length by graphic method and 16.0 cm by oocyte diameter. The fecundity of the species ranged from 14600 - 69100 with mean fecundity of 35200. The relationship between fecundity and total length was found to be linear. The sex ratio analysed by chi-square test showed that there was predominance of females among groups larger than 16.0 cm, but as the fish reached 23.0 cm the ratio approached 1:1. For the whole population the ratio

was 1.0: 1.7 males to females which was found to differ from 1:1 at $P < 0.05$, and was probably attributed to behavioral difference.

In the investigation of age and growth of S. bimaculatus it was found that rings on otoliths did not correspond with age and so Petersen's method was used to analyse age and growth. Modes were observed at 12.0, 14.2, 16.8, 20.0, 22.5 and 25.5 cm with corresponding ages of 9, 12, 15, 21, 24 and 27 months respectively. Growth curves were fitted with von Bertalanffy's equation, and the asymptotic length was found to be 39.0 cm.

Morphometric characters such as head length, body length were studied in relation to total length. The difference in these characters in the samples from two different localities was studied by analysis of covariance. It was found that there were no significant differences indicating that fish from Vanga and Shimoni belong to the same stock.

The fishermen of Vanga/Shimoni area carry out their fishing on the reef using traps and handlines. The crafts they use on the reef use sails and those are dug-out canoes and canoes with sails. In the canoe with the sail there is a crew of 3 with 3-5 traps while the dug-out canoe has 1-2 people and 1 medium trap or 2 small traps. Traps are checked after from $\frac{1}{2}$ day to 3 days.

In the population of *S. bimaculatus*, natural mortality was found to be 0.3 and fishing mortality 0.2 when using dema traps of 4.3 cm mesh size. It was observed that this stock was underexploited when using this type of gear. Fishing mortality could be raised to 0.3 without any harmful effect to the fishery. This is possible because most fishing was carried out near Shimoni Park which acts as a reservoir.