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Aspects of reproduction and diet of the long-finned herring, *Ilisha africana*, off Cape Coast, Ghana

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I. africana off Cape Coast bred continuously throughout the year. The major breeding season was preceded by a period of high feeding activity, mainly on fish fry, penaeid shrimps and crustacean zooplankton.

Key words: reproductive biology, stomach content.

The long-finned herring, *Ilisha africana* (Bloch, 1795) occurs in commercial quantities throughout the year in landings at most Ghanaian beaches. To provide a basis for the management of this potentially important resource, knowledge of its biology is required, but this is limited to brief accounts of meristic features (Tobor, 1966), food (Fagade & Olaniyan, 1973) and information on aspects of the reproductive biology (Marcus & Kusemiju, 1984) of Nigerian stocks. The present paper highlights some differences in reproductive biology between the Cape Coast, Ghana, and Nigerian stocks, with some additional information on foods.

Monthly samples of *I. africana* were obtained from beach seine landings at Ola-Duakor near Cape Coast (5°05′N, 1°20′W) from April 1985 to March 1986. The total lengths of all fish sampled (2·5–21·8 cm) were measured to the nearest 0·1 cm, and the sexes and maturity stages of 206 individuals determined by the methods of Bagenal (1978). A micrometer eyepiece was used to measure the diameters of oocytes in sectioned ovaries while fecundity was estimated by the gravimetric method. Fish stomachs were preserved in 70% alcohol prior to analysis of their contents using the ' numerical ' and ' frequency ' methods (Hynes, 1950). The degree of fullness of the stomachs was also determined using an arbitrary five point scale (Blay & Eyeson, 1982).

The Cape Coast samples matured at a slightly larger size than those from Nigeria (Table I). Hence, environmental conditions support either faster growth in the Cape Coast population or earlier maturation of the Lagos stock. The sex ratio in both populations was approximately 1 : 1. Ripe and ripe-running fish occurred in the Cape Coast population throughout the year which suggests continuous breeding similar to the stock off Lagos. However, two periods of enhanced breeding are evident: a major one from January to May and a shorter one between August and October. In the Lagos population major and minor breeding periods occurred in May to December and January to February respectively. Another difference was the relatively high monthly percentages of mature fish and the apparent absence of spent individuals in the Cape Coast population, suggesting a high reproductive activity which possibly compensated for the lower fecundity of the Cape Coast specimens. These also had a smaller mean egg diameter at maturity, but the Cape Coast samples were slightly smaller (13·4 to 19·3 cm) than the Lagos fish (14·0 to 25·4 cm). The continuous and high breeding activity off Cape Coast could account for this species frequent abundance in beach seine landings in the area (personal observation).

Feeding activity was low between June and September, moderate from February to May and high from October to January. The period of protracted spawning was preceded by

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TABLE I. Aspects of reproductive biology of *I. africana* off Cape Coast compared with those of the stock off Lagos

Aspect of reproduction	Cape Coast population (present study)	Lagos population (Marcus & Kusemiju, 1984)
Maturity size (T.L., cm)		
50% maturity	Male: 13·2	Male 13·8
	Female: 14·7	Female: 13·1
Smallest mature individual	Male: 12·0	Male: 11·5
	Female: 13·2	Female: 11·7
Sex ratio (male : female)	0·98 : 1	1 : 0·97
Percentages of mature fish	Male: 0·0–85·7	Male: 0·0–41·2
(annual range)	Female: 0·0–73·0	Female: 0·0–46·6
Spawning periods	Major: Jan.–May	Major: May–Dec.
	Minor: Aug.–Oct.	Minor: Jan.–Feb.
Mean egg diameter (μm) (histological sections)	310	480
Fecundity	1013–10600	2098–11687

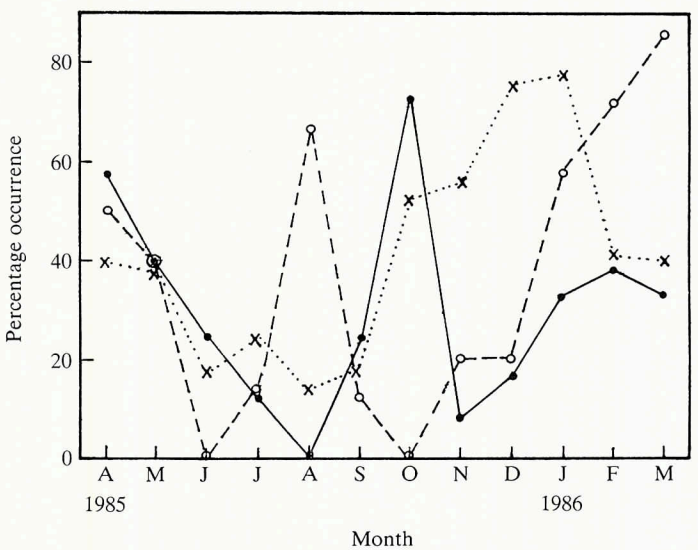

FIG. 1. Monthly variations in percentage occurrence of ripe and ripe-running stages: (○---○, male; ●——●, female) and degree of stomach fullness (×···×) in *I. africana* off Cape Coast.

4 months of active feeding and this may have resulted in pre-spawning accumulation of energy reserves.

From 10 Nigerian specimens Fagade & Olaniyan (1973) concluded that *I. africana* was planktophagous, feeding on mysids, juvenile prawns and fish fry. In this study the contents of 127 stomachs were categorized as follows:

Fish larvae, fingerlings, scales and bones were found in 45, 7, 52 and 34% of the samples, respectively, and fish was the most abundant food item in individual stomachs ranging from moderate to numerous in all months except September.

Crustacea were represented by *Temora* sp., *Paracalanus* sp., *Hyperia* sp., *Synopia* sp., a cladoceran, a mysid, a penaeid shrimp, an euphausid and an unidentified species.

Hyperia sp. predominated numerically (55·8%) but its frequency of occurrence was only 15·8%. With the exception of the penaeid shrimp (which occurred in the stomachs throughout the year) all the other crustaceans were restricted to the period from August to October which corresponds to the ' upwelling ' season in the region during which high zooplankton crops are recorded (Mensah, 1974).

Molluscs were only found as three juvenile squid in one fish in December 1985.

Sand grains occurred in 32·3% of the stomachs examined, numerous from April to June, but at other times either moderate or few.

Organic detritus occurred at a frequency of 18·1%. Moderate in April, August and November; few in September and absent in all the other months.

Sand grains and organic detritus in fish stomachs suggest browsing on benthic organisms (Fagade & Olaniyan, 1972), and may be acquired by *I. africana* with penaeid shrimps (benthic dwellers). These data support Fagade & Olaniyan's (1972) conclusion that *I. africana* is a carnivore feeding mainly on fish (larvae and fingerlings) and crustacea (young penaeid shrimps and zooplankton).

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