Mollusc and Crustacean Culture Possibilities in Lagos Lagoon and the Niger Delta

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Introduction

In Nigeria, finfish farming dominates the scanty literature on aquaculture. There is much less on molluscs and crustaceans (FAO 1965; Bayagbona and Lefevere 1967; Afinowi 1986). It is widely known, however, that artisanal fishers harvest molluscs together with fish caught with set nets, traps, pots and other traditional gears. Shrimps and shrimp larvae, a by-catch of capture fisheries, are also used as condiments.

Demand for fish protein and present agricultural policy, emphasizing economic activity in the rural areas to curtail urban drift, seem to favor aquaculture in Nigerian swamps, floodplains and coastal waters. There are about 1,010,000 and 741,500 ha of perennial fresh- and brackishwater swamps, respectively: portions of which could be exploited for aquaculture (Scott 1966; Afinowi 1975; Ajayi and Talabi 1984). The development of mollusc and crustacean culture, especially in traditional harvesting areas of the Niger Delta, could accelerate protein self-sufficiency for a population that relishes such produce.

Molluscs

1. Periwinkles

The periwinkles (*Pachymelania aurita* and *Tympanotonus fuscatus*) are candidate species for aquaculture in Nigeria. Their collection at low tide by villagers and subsequent marketing, form an important industry in the Niger Delta. A mature periwinkle, measuring about 5 cm in length, has an average total weight of 8.0 g (edible portion, 1.0 g). Periwinkles are not esteemed but are a source of good quality protein and are eaten in Cross River, Akwa Ibom and Rivers States, and the Delta areas of Bendel State. Live periwinkles are also sold in Dugbe market at Ibadan, Yaba, Baba-Olosha market in Mushin, and Maroko on Victoria Island. A milk-can containing 80 g wet weight of animal flesh now sells for 1.87-2.25 Naira (US$0.25-0.30): a 230-280% increase from 1985.

The biology and ecology of *Pachymelania* sp. have been studied in Lagos lagoon where a large population exists (Oyenekan 1979). Their culture on the eastern side should be favored by the sand-silt bottom, tolerable salinity fluctuations and high temperatures (25-30°C) year-round. Presently, they are not cultured, but observations at the Nigerian Institute for Oceanography and Marine Research (NIOMR) Ikoyi experimental fish farm suggest rapid growth to harvestable size in one to two years in relatively shallow ponds (1.0-1.5 m) with salinity variations of 4-30 ppt. Under intensive culture, it might be possible to harvest periwinkles in nine months, and sell at the markets in Lagos and the eastern states which are potentially ready for such produce. A pilot project is required to develop culture methods and assess economic aspects, especially markets.

2. Oysters

The only attempt to culture oysters in Nigeria has been with the commercially important *Crassostrea gasar*, which occurs from Sénégal to Angola and is abundant on the aerial roots of mangrove trees that line the numerous creeks of the Niger Delta. Oyster meat provides abundant cheap protein in coastal towns and villages, and is available year-round in most markets in Port Harcourt. *C. gasar* has been cultured on an experimental basis in off-bottom plastic trays (Afinowi 1986) but this has not yet been followed by the establishment of commercial farms. Spatfall is consistently heavy in Buguma, Owoko, Dabara, Tuma and part of Egebegenekiri in Rivers State. A high tidal range, relatively high salinity (6-24 ppt) and constant high water temperatures (25-30°C) favor high growth rates, given adequate food. Experimental culture at Buguma (Afinowi 1986) indicated a potential production of 3.0-6.0 t/ha/year of oyster meat.

The marketing of oysters and oyster products follows traditional methods. They may be shucked, dried, brined, pickled, processed into a sauce or sold fresh. In the Delta area, oysters are steamed in tins for 10 to 15 minutes, drained, rinsed, salted and smoked. The processed meats are skewered in dozens on sticks for retailing (Ajana 1980). Shells are used as building materials or as a source of calcium in poultry feeds. Smoking and drying have been recommended for processing intensively cultured oysters in coastal areas (Angell 1986) to reduce or eliminate bacterial contamination.

Economic analysis suggests that initial capital cost of *C. gasar* culture could be high, but amortizable in at most two to three years of operation (Afinowi 1986). Labor and operating costs would decline in the second and third years, and profits could accrue thereafter. Afinowi (1986) recommended off-bottom tray culture only to cooperatives and industrial operations that could attract large capital. However, the use of local materials for spat collection and culture could reduce costs, although yields may be less because of increased mortality. In the absence of market research and with high costs of transportation in the Delta area, inadequate infrastructure and lack of technical assistance to potential rural oyster farmers, there is a need for more growth trials and a properly designed pilot project to assess the feasibility of *C. gasar* culture.

3. Cockles

The cockle, *Anadara senilis*, is found in the upper intertidal to sublittoral reaches of estuaries in West Africa (Okera 1976). It is abundant in estuaries, creeks and lagoons in Nigeria and some information on its biology and ecology is available (Yoloye 1974, 1975; Djangmah et al. 1980; Yankson 1982). *A. senilis* landings are commercially unimportant in Nigeria at present, and throughout West Africa the species is harvested on a subsistence basis only (Okera 1976).

It has potential for culture. Its relatives *A. granosa, A. subcrenata* and *A. broughtoni* have become important sources of protein in many tropical, subtropical and warm temperate areas (Broom 1985). There may, however, be growth problems if *A. senilis* is cultured in the Niger Delta. Growth checks (rings) are formed when growth slows dramatically during the peak rainy season (July to September) (Okera 1976). The heavy rains lower water temperature and salinity and raise turbidity. Growth rates also vary with zones on the shore. However, *A. senilis* can grow to a large size (up to 46 mm). The species is recommended for pilot culture projects in the Niger Delta but was not found in recent (1985-86) benthic surveys in Lagos lagoon (E.A. Ajao, unpublished data).

4. Crustaceans

The penaeid species in Nigerian coastal waters include *Penaeus notialis* (pink shrimp), *P. kerathurus* (zebra shrimp), *Parapenaeopsis atlantica* (brown shrimp) and *Penaeopsis miersi, Aristeus varidens, Plesiopenaeus edwardsianus* and *Parapenaeus longirostris* (red shrimp). Powell (1982) records doubt that intensive crustacean culture would be economically feasible in Nigeria, mainly because of larval rearing problems. However, Nigerian species have close relatives elsewhere for which rearing technology exists. Powell (1982) also suggested a start with management of wild populations through habitat alterations to increase seed supply. Similar views have been expressed in other works (Scott 1966; Sivalingam 1968).

Current commercial interest in shrimps in Nigeria centers on marine penaeids harvested offshore by commercial trawlers. Many are exported to Europe, Japan and the USA. At the present level of exploitation, there are fears of a decline in future catches. Shrimp supply from artisanal fisheries has not been adequately determined, but is at best labor-intensive and low in productivity. Intensive culture could boost production and increase export earnings for the country.

The pink shrimp dominates the fishery and is widely distributed. In brackishwaters, catches include *P. atlantica* and some *Macrobrachium* spp. This list is not exhaustive. These and other species could be candidates for intensive culture. Experimental culture of the lagoon freshwater shrimp *Macrobrachium vollenhovenii* has started at the NIOMR Ikoyi experimental fish farm.

Conclusions

There is scope for growth of coastal aquaculture of molluscs and crustaceans in Nigeria, but its realization requires applied research in biology, culture technology, processing, marketing and economics. Knowledge of the growth rates of periwinkles and most cultivable crustaceans is lacking. In culture technology, practitioners in Nigeria would have to rely on practices elsewhere in the world and adapt them to suit local conditions. Market research and development will also play a crucial role, given the Nigerian propensity for quick cash returns on investment. There is need for detailed pilot- and commercial-scale trials and comparative economic studies of various culture and marketing techniques.

Acknowledgement

The authors thankfully appreciate the numerous useful comments and suggestions of Dr. T.O. Ajayi during the preparation of this paper.

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