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PRELIMINARY SURVEY OF AQUACULTURE POTENTIALS OF MANGROVE OYSTER (*CRASSOSTREA GASAR*) IN ARID ZONE NIGERIA.

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ABSTRACT

The need for aquaculture intensification and expansion for sustainable production of rich protein means that there is the need to turn to the living resources of the adjacent sea, creek waters and inland water bodies mostly shell fish species. The tide of public opinion needs to be turned to the culture of mollusk which offers great potentials both as a rich protein source and as a source of income. In time past Mangrove Oysters known as lesser fishery resource was either invisible or ignored, but should now be seen as an extractive industry with a proud renewable potential and thus sustainable way of making a living. This survey is aimed at establishing the potential culture of oyster on River Yobe. Water quality parameters of importance were accessed which include water depth, salinity, pH, dissolved oxygen and freedom from pollution. Basic requirements of culture area are the same for fish farming. Facilities for culture are inexpensive and can be easily made using local materials. Most important to establishing an oyster farm is the correct placing of collectors and adequacy of harvesting as they thrive successfully without formulated diets and concludes that salinity has no effect on growth and survival since the study area is a freshwater environment.

Keywords: Arid zone, Bivalve, Salinity, Kwanda, Oyster

INTRODUCTION

Oysters are one of the cultivable sessile bivalves and the methods of its culture were established centuries ago. The ever-increasing food demands of the exploding human population resulted in the depletion of natural oyster stocks. Population growth has been accompanied by destruction of natural oyster ground, both locally and intentionally through domestic and industrial pollution. Pollution constitutes a double threat to shellfish industries even where the animals themselves are not harmed they may, due to their habit of filter feeding, concentrate pollutants in their flesh and become unfit for human consumption. Industrial pollution siltation and over harvest threaten future oyster harvest. Food and Agricultural Organization FAO (1998) defined aquaculture as the farming of aquatic organisms including fish, molluscs, crustaceans and aquatic plants. Farming implies some sort of intervention in the rearing process to enhance production, such as regular stocking, feeding and protection from predators' etc. It also implies individual or corporate ownership of the stock being cultured. Fish already makes a vital contribution to the food and nutritional security of over 200 million Africans and provides income for over 10 million mostly small-scale fishers, farmers and entrepreneurs' majority of who live in the riverine and coastal communities (FAO, 2005). On global production of food fish, Delgado *et al.*, (2003) in Sotolu (2011) reported an annual growth rate of 11.1% for cultured Mollusc against 3.3% for captured between1985-1997. The earliest intervention of fishery development in Nigeria was first based on oyster, in which the Administrator of Lagos State Sir John H. Glover and the legislative council levied a tax on oyster fishing on the fisher folks in Lagos in 1869 (Tobor, 1993).

Prospects of oyster farming development.

On a worldwide basis, oyster farming yields a valuable food product with increasing demand. The potential for increasing oyster production through aquaculture is considerable as much of the technology is relatively simple, inexpensive and consumes minimal energy. Moreover, oysters are filter feeders (Brook, 2002) and may not require being fed as cultured fish. Hence, they are much easier to manage. Although major oyster producers are in the temperate, it is only recently that the potential in many tropical countries has been realized as a local protein source and as a possible export commodity. Cultivation of oyster in Nigeria was undertaken for experiment (Bardach *et al.*, 1972).The genus *Crassostrea*, has a world-wide distribution and the species, *C. gasar* occurs along West African Coast between Senegal and Angola, with Nigeria cited as a location where numerous specimens were collected (Nickles, 1955; Ajani, 2008). This provides a cheap protein source in the coastal towns and villages (Ibama *et al.,* 2014 and Okereke *et al.,* 2014). Equally important is the fact that seed oyster can be collected in immense quantity on substrate in Lagos Lagoon and throughout the year in Kuramo waters and the Niger Delta. The larvae settle readily on clean substrate. Besides, there is the fact that oyster grow fast in warm waters (Sandison, 1967) and can be stocked at remarkably high densities with no apparent ill effects. Afinowi (1974) reported that 12 metric ton can be produced per hectare under optimum environmental condition.

Biology of *Crassostrea gasar*

Oysters starts life as a planktonic larva carried by the tide for about 6-8 days (Sandison, 1967) after which it settles on a substrate in the water as spat. The newly metamorphosed juvenile oyster anchors itself with the help of the byssus threads, and settles there for the rest of its life or lives free on the bottom in shallow water along the sea coast or in brackish water and feeding on minute phytoplankton and zooplankton carried to them by the current (filter feeding). It discharges its reproductive products directly into the water and has no larval development in the gills of the parents (Salvini-Plawens *et al.,* 1974). It is a sessile bivalve mollusc from the family Ostreidae, with rough greyish irregular shell. It is almost kidney shaped. It is closed by a single adductor muscle. The upper plate lid shell is controlled only by an inner ligament in a toothless hinge. They are characterized by eulamelli branch gills. The male and female gametes of the hermaphroditic oyster do not mature simultaneously in the same animal and this prevents self-fertilization. However, it is important that the ova or sperm of the various individuals mature at approximately the same time, and hence a satisfactory rate of reproduction

ensured (Brook, 2002). Studies have shown that swarms of oyster larvae of approximately 8 days of age always appeared during specific periods in the year. The peak period of these swarms can be expected from June 26th-July 10th (Korringa, 1974). The periodicity between June-July ensures that sufficient sperms enter the mantle cavity of spawning bivalves via the repository current and permit the fertilization of the eggs. The eggs have to be laid and fertilized within the mantle cavity two days after. Spawning is influenced by an external factor which is tide. Spawning takes place during the spring tide. It is still unknown what specific factor triggers spawning but possibly water pressure which is strongest during the spring tide and also light penetration to the water bed have been reduced. The gonads of the American oyster has been found to release up to 1.5million eggs at one time, other less fertile bivalve species still release several thousands of eggs (Salvini-Plawens *et al.* 1974). Sandison (1967) and Ajana (1973) reported the influence of salinity on survival. Afinowi (1974) investigated factors affecting growth while Ajana (1973) reported substrate preference for the settlement of the larvae. *C. gasar* occurs in some areas of the coastal saline swamps and locally in the coastal western states it is known as *Isan/Ipasan*, *Kwanda* in the study area (Northern Nigeria) and it constitutes an important fishery resource (Afinowi 1974). Ajana (1980) observed that oyster suffers heavy mortality during the rains (July-October) when salinity of the water becomes as low as 0.5‰. Afinowi(1974) reported all year round of oyster in Buguma, this he reported is due to the high tidal range in the area with minimal effect on the salinity of the water. While in Lagos lagoon the tidal range is low resulting in high salinity fluctuation. On the average it requires about 7-8months for mangrove oyster to attain the local market size of about 3.45cm-5cm (Bayagbona and Leferere, 1967; Afinowi, 1974; Kamara *et al.*, 1976).

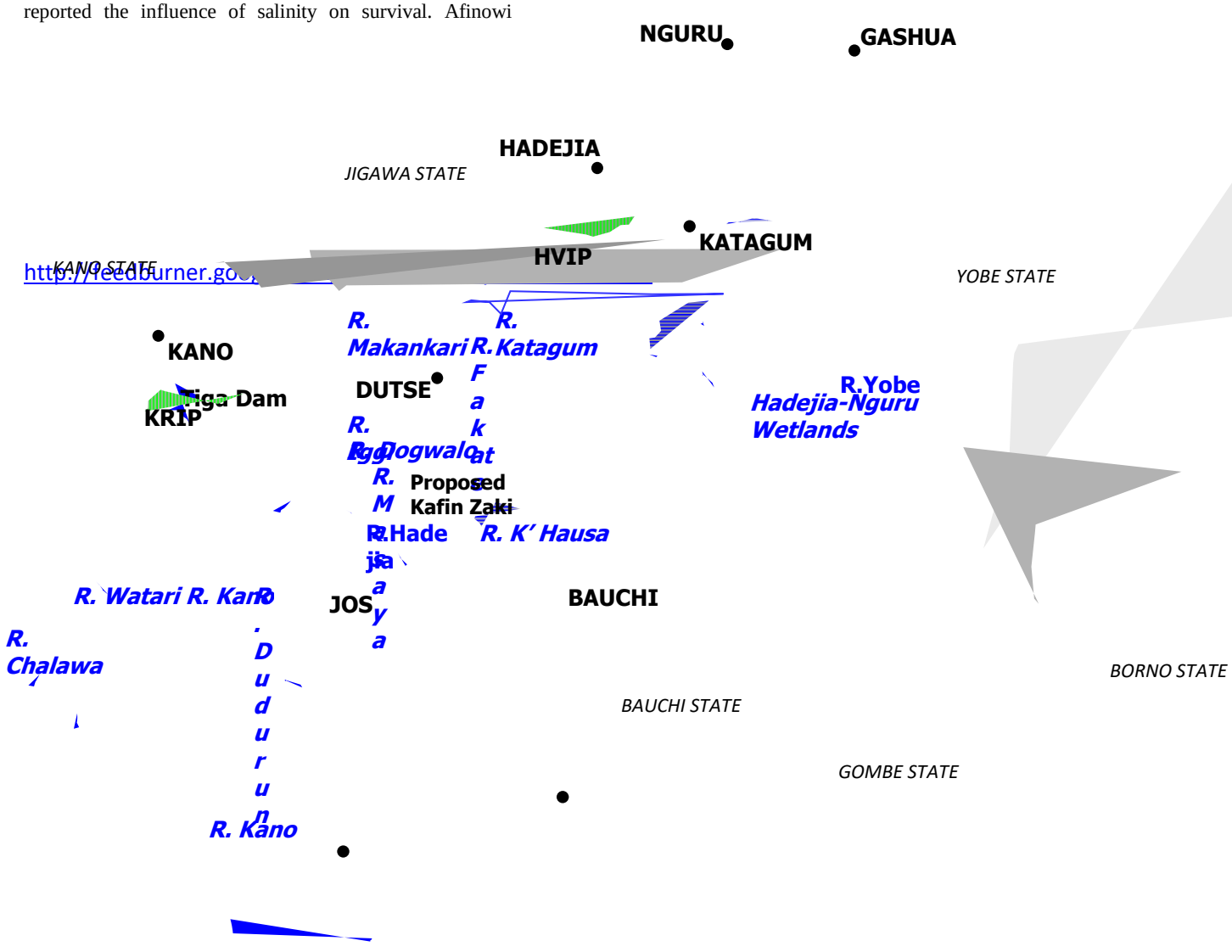

Fig 1: Map showing Gashua/River Yobe.
Source: Bashir (2015)

Water bodies usually take their course from nearby big rivers and are invariably richer in diversity of both shell and fin fish species (Tobor, 1991; FDF, 1995; Faturoti, 2000). Water resources are spread all over the country from the coastal region to the arid zone of the Lake Chad Basin. Freshwaters start at the Northern limit of the mangrove ecosystems and extend to the Sahelian region (Sotolu, 2011). Inland water fisheries have also been recognized as a good source of supply of animal protein in human's diet especially, in Low Income Food Deficit Countries (LIFDCs) such as Nigeria (Sotolu, 2008; Sotolu and Adejumoh, 2009). The study area is an arid environment with some areas manifesting desert conditions. River Yobe is a confluence of River Hadejia and River Jama'are at Aware located between Nguru and Gashua (Bashir, 2015), which passes through Gashua with numerous artisanal fishing communities along the river course. The study site was the base reinforcement of the two Gashua bridges. At the base reinforcement was the settlement of both spat/adult oyster and mussel. Oyster shell and the Blue Mussel (*Mytilus edulis*) were not included in the 25 fishery resources identified by Audu (2006). Audu (2006) reported a total resident fisherfolks of 11,092 and 7,143 migrant fisher folks fishing in the area annually. The adult oyster collected from the study site grew to an average size of 11cm-14cm while the blue mussel grew to 6cm-8cm.

Culture technique

Oyster culture is broadly divided into two namely hanging and bottom rearing. Under the hanging method there are raft, rack and long line according to Glude (1976), Kamara *et al.,* (1976) and Koganezawa (1976). Bottom cultivation is a system where the oysters are grown directly on the bottom (i.e. substratum). These two culture techniques can be successfully carried out in the study area with no adverse effect on other fishery resources.

Economic potential

Large scale production of the oyster would provide the much needed food protein for Nigerian Consumers and in the long run be a foreign exchange earner for the country. Therefore, oyster culture as part of aquaculture production in Nigeria where there is a potential, needs to be given the recognition it deserves. It provides high nutritive value, relatively cheap protein and also promotes gainful rural employment which can transfer rural economy to high levels of vitality in maritime, brackish water area and other fresh water bodies (Sule, 2000). Presently oyster and mussel is being harvested from the wild and not cultured on commercial basis in Nigeria (Sule, 2007; Ajani, 2008; Sule, 2000; Ajani and Oyebola, 2010; Ibama *et al.,* 2014; Okereke *et al.*, 2014). However, preliminary trials on its culture show that it has a great potential in the Nigeria (Ajana 1978). Apparently, no record is available as regards the yield of oyster meat in the coastal states. Afinowi (1975) indicated that 12 metric ton of oyster meat could be produced per hectare of tray space per annum in the Niger Delta where 1.8million ha of undeveloped underutilized swamp exists. Bardach *et al.,* (1972) reported that a medium sized oyster business in inland sea may consist of 100-150 rafts. Running the operation requires a staff of 10-12 regular employees and about 20 additional suckers during the harvest season. The capital investment includes rafts, two 6-9 m workboats, and a modest building which serves as a workshop, warehouse and shucking house.

CONCLUSION

Potentials of oyster culture in Nigeria has not been assessed recently both in terms of suitable technology, it is almost certain that production could be greatly increased by educating the fisher folks to use readily adaptable methods of culturing oyster and expanding the industry by exploring existing water bodies. Increasing the market for oyster will require improvement of products form/value addition, good quality control/market development and all year-round availability of oyster meat. The total number of fisher folks in the study area makes it an important artisanal fishing community in the arid zone with promising fishery resources and can provide a cheap protein source to some undernourished children in the study area. Fishery biologists and managers are not unaware of the possibilities for technological improvement and expansion but are handicapped by the lack of adequate personnel and funds.

RECOMMENDATIONS

The provision of grants to the Department of Fisheries Federal University Gashua will enable research to be conducted on the biology, culture and utilization of the bivalves identified by this review in the study area being the closest tertiary institution to the area under review with capable research personnel. These sustainable renewable fishery resources will increase the income of local fisher folks, increase awareness on consumption by indigenes and reduce the impact of insurgency/poverty/undernourishment that pervade the region of the country with the employment of capable men in the extractive industry. It therefore becomes pertinent to designate some part of the River Yobe for the farming of oyster and mussel using the best cultural practice.

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