

Status of Fish Stocks in Senegal

A. Diallo

Centre de Recherches Oceanologique de Dakar-Thiaroye

B.P. 2241, Dakar, Senegal

DIALLO, A. 2000. Status of fish stocks in Senegal, p. 38-40. In E.K. Abban, C.M.V. Casal, T.M. Falk and R.S.V. Pullin (eds) Biodiversity and sustainable use of fish in the coastal zone. ICLARM Conf. Proc. 63, 71p.

Senegal's 700-km marine coast supports artisanal and industrial fisheries, targeting essentially two groups: pelagic fishes (sardines and mackerels, etc.) and demersal fishes, crustaceans and cephalopods. Landings are around 350 000 t.year⁻¹, worth a total value of about US\$250 million. Up to 1994, about two-thirds of the total catch supplied the domestic markets and one-third was exported. Landings increased regularly until 1985, after which the major stocks became fully exploited and some overexploited (Caveriviere and Thiam 1992).

Artisanal and industrial fisheries employ more than 1 500 000 persons directly or indirectly. Fishing is the second most important economic sector of the country. There are conflicts between artisanal and industrial fishers and among artisanal fishers who use incompatible gears in the same places. For more efficient management and sustainable development of fishing, a new "code of fishing" was promulgated in 1998. The most important pelagic and coastal species are sardines (*Sardinella aurita* and *S. maderensis*) and chinchards (*Trachurus trecae*, *T. trachurus* and *Caranx rhonchus*) (Barry-Gerard et al. 1992). Their abundance depends essentially on the upwelling phenomenon. Artisanal fisheries represent about 70% of the total landings and 90% of local fish consumption, e.g., 200 900 t from artisanal fisheries vs. 21 500 t from industrial fisheries.

Demersal fisheries are composed of: (1) scienids (estuarine and inshore populations); (2) species that live below the thermocline, mainly sole, shrimp and sparids, plus bottom

dwellers such as *Epinephelus* and *Dentex* spp.; and (3) mixed species like *Pagellus* spp. (Barry-Gerard et al. 1992). Many stocks have shown signs of overexploitation, with the 0-60 m zone as the most affected. This has favored, since 1986, the proliferation of cephalopods (*Sepia* spp. and *Octopus vulgaris*). New fishing strategies have appeared, such as mixed gears, and the exploitation of new grounds for new and value species. Some of these new strategies targeting high-value species for export have been detrimental to the local market. Compared to artisanal fisheries, industrial fisheries take the larger proportion of the demersal landings (e.g., artisanal landings for fish [35600 t] and shrimp [2 100 t] vs. their industrial landings [46800 t for fish and 2800 t for shrimp]).

Inland fisheries in Senegal River and the Casamance estuary produced less than 20000 t.year⁻¹ after a decade of drought in the Sahel zone (Diouf et al. 1992). Aquaculture production is still less than 200 t.year⁻¹ (Diallo et al. 1999).

Per caput consumption of fish is about 24 kg.year⁻¹ but with disparities between the coastal zone and the inland areas (Diallo et al. 1999). Fish represents more than 70% of the protein consumption and about 20% of family diets (M. Chaboud, pers. comm.) but its availability is decreasing because of the stagnation of landings at around 300 000 t, high annual population growth and overexploitation of many stocks (Caveriviere and Thiam 1992). The recommended level of fish consumption of 34 kg"person⁻¹.year⁻¹ will not be met in the near future (Diallo et al. 1999).

Aquaculture has been tried only in the Senegal river valley in the north (ponds, cages and rice-fish culture), in the Saloufi estuary in the center (oyster culture) and in the Casa-fiance (fish and shrimp ponds, integrated farming systems, fishpen culture). Production is still less than 200 t/yearl (Diallo 1996; FAD 1997), i.e., about 100 t of fish (mainly *Oreochromis niloticus*) and 25 t of oyster (*Crassostrea gasar*). Nevertheless, there is potential for aquaculture development in:

- new dams, constructed in the Senegal River valley (Aguilar-Manjarrez and Nath 1998);
- the Saloufi estuary, for oyster culture, where organized groups are now focusing on its production-the demand for oyster is very high and the price is about US\$4 per kilogram; and
- the low and middle Casamance, where normal rainy seasons have returned and where fish culture can find its place in farming systems that are based on dammed valleys: pond culture, pen culture, rice-fish culture, oyster culture and shrimp culture have great potential, and fish culture was traditionally practiced here in ponds or as an alternative use for ricefields (Diallo 1997).

The government has created a consulting scientific and technical committee for aquaculture projects. Intensive tilapia culture will be viable if feeds cost less than 200 FCFA (US\$0.36) per kilogram (Diallo et al. 1999).

Recent trials on reproduction and growth of *Octopus vulgaris* in captivity have shown new possibilities for its culture (Caveriviere et al. 1997; Domain et al. 1997).

Conclusion

Because of its importance, fishing is subjected to many rules and laws for its management as well as for the sustainable exploitation of marine and coastal resources. With a recommendation to maintain catches at 300000 t/yearl to encourage recruitment and decrease the loss of marine species diversity, the gap between fish supply and demand will further increase. One solution is to develop well-managed integrated

farming systems in rural agricultural areas using low-priced fish species. A second way is to promote intensive aquaculture management through enterprises with a production not exceeding 200 t-year-1 but with consideration of the risks these enterprises might pose on the environment.

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Discussion

Dr. Pullin: Could you give some idea about the percentage of fish catches now exported and therefore not available for local consumption?

Dr. Diallo: Since the devaluation of the FCFA, there has been a change in fishing strategy. Fishing is now concentrated on high-value fishes and about 50% of the catch is exported. Present catches do not meet local market demand. During the rainy season, there could be no fish in the local market for two to three days.

Dr. Laleye: The statistics you gave were mainly for the marine sector. Is there any information for inland fisheries? In Benin, inland fisheries play a very important role. Is it the same in Senegal?

Dr. Diallo: The coastal area of Senegal is an important upwelling area, so the marine fishery is very important. Inland fisheries contribute less than 200 t to national production.

Dr. Folack: Your definition of coastal and pelagic

resources is not very clear to me. Do you have demarcation for artisanal and industrial fisheries in Senegal?

Dr. Diallo: I said that species living near the mouth of rivers and those living in the nearshore/littoral are coastal resources, those further inland are the inland fisheries/resources. There is a 12-mile exclusion zone from the coast for the semi-commercial fishers and they have conflicts with the artisanal fishers. Commercial boats fishing in the artisanal zone are heavily fined when caught.