SOME CONSIDERATIONS FOR THE MANAGEMENT OF TROPICAL LAGOONS; THE EXAMPLE OF TOGO

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Abstract

The Togolese lagoons provide subsistence to a large population of fishermen and traders. Various fishing practices are employed here but all are based on small scale fisheries, responsible for meeting the self-consumption demands of riverside families. Several years of drought and increasing fishing pressure have resulted in a detoriation of fishermen's living conditions. The diminishment of the catches indicates a state of stock-depletion. Some classic development measures can be proposed to improve this situation: limiting the fishing pressure, regulating the mesh size, prohibiting certain fishing gears and protecting spawning areas; but the fishing department seems hardly capable of imposing these, having no means of doing so. To achieve this, one must win the interest of the fishermen and once again give importance to traditional authorities, which in the past have become powerless. It is also possible to increase lagoon productivity by calling upon traditional customs which meet the demands of the fishermen better: the opening of the lagoon belt and traditional water farming techniques (Acadja). All these projects will require the intervention of a village council, the only authority which is capable of avoiding conflicts between the families. In Togo, and more generally speaking in Africa, the success of development projects depends upon a good cooperation between the administration and the customary structure.

Introduction

Coastal lagoons provide significant food resources (fishing and mariculture) and recreational and aesthetic enjoyment (Fig.1). They can also be used as harbour facilities or as the repositories for wastes (Valejo, 1981). In Togo, the lagoon is a source of readily available animal proteins for the local population and an important source of employment in the field of fishing and fish-processing: smoking and drying, fish transport and trade. However, since the start of the drought (1974) and the consequently increasing fishing pressure, the fishermen's living conditions have shown a tendency towards deterioration. Hence it is important to achieve a rational management of the stock and to find means of improving the production level of the lagoons. These measures should be adapted to the Togolese environment.

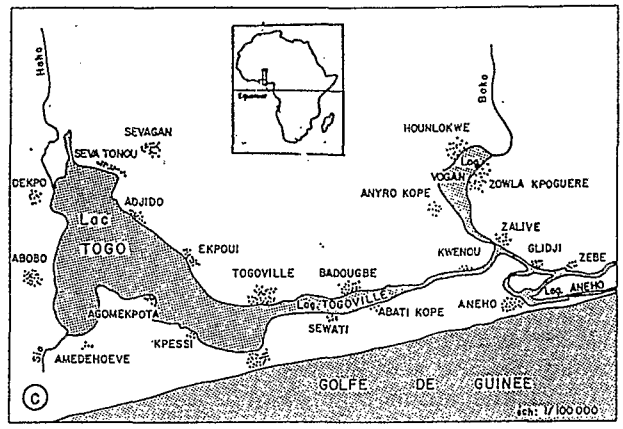

Figure 1. Togolese lagoons.

Regime of the Lagoons

Normally these lagoons are fed by rainwater and by the rising waters of the rivers Sio, Haho and Mono. Due to the absence of a natural outlet, the waterlevel of the lagoon may rise sharply and the difference in waterlevel between periods of low water and flooding may reach 2.78 metres (maximum observed). In such a period the city of Aneho may be threatened by floods; to prevent this the local river population digs an artificial opening in the lagoon belt (every other year on an average). During the first few days the subsidence in this opening is rather strong which leads to a considerable widening of the water outlet; this situation is usually well-maintained for another month or two by the tidal currents (Millet, 1984). Because of the severe drought presently prevailing in Africa, the continental deposits were insufficient for creating an opening in the lagoonbelt: from 1980 until 1984 there was no opening at all and in 1985 there was a limited opening characterised by a low level exchange.

Stock composition

The lagoons have a rich fauna of fishes and crustaceans (crabs and shrimp). About 50 species of fish have been counted. One may distinguish four major groups following the classification that was proposed by Durand and al. (1982) for the Ivory Coast.

- Solely estuarian forms whose entire existence takes place in a mixo-haline environment. These are euryhaline species like *Sarotherodon* and *Tilapia*.

- Estuarian forms of marine origin that are perfectly adapted to lagunary conditions; these are characterised by the presence of an ecophase in the sea, reproduction being possible both in lagoons and in the sea: *Liza, Ethmalosa*, etc.
- Estuarian forms of continental origin that can only reproduce in the river or in very slightly brackish waters: *Chrysichthys Clarias, Hemichromis*, etc.
- The marino-estuarian forms that never reproduce in lagoons. These are species widely distributed in space and time within the lagoons. The juveniles are often predominant species: *Elops, Polynemus, Shpyraena*, etc.

The fishing activity

The fishing is usually carried out with the use of small scale fishermen's practices. In the lagoons, the most commonly used fishing gears consist of standing or drift nets with mesh-sizes ranging from 10 mm. to 100 mm., unbaited multihook lines, sweep nets and traps. All these techniques require a knowledge of the ecology and behaviour of the species. Recent developments
have resulted in a more widespread use of commercial nets with a small mesh-size (15 to 20 mm). The number of fishermen is relatively high (1800) considering the size of this lagoon. In fact, amongst these fishermen one ought to distinguish the professional fishermen who fish during the whole year (37%), the seasonals who fish and farm alternately (21%) and the occasionals for whom fish is merely a supplementary earning (41%). However, lagoon-fishing is primarily aimed at self-consumption.

Stock fishing and management by classic means

Fish-yields were estimated at 1,000 tons (150 kg/ha) which places the Togolese lagoons on a middle rank among other tropical lagoons (Lae and al., 1984).
The best performing gears with respect to the amount of fish caught (table 1) are the following: sweep nets (51,4%), small mesh nets (23,1%), multihook lines (10,5%) and bow nets (8,6%).
Of the 35 species observed in the catches, a majority seems to be incidental. In fact, not more than eight species represent 91% of the catches, with *Sarotherodon* being by far the most abundant species (50,1%), followed by *Chrysichthys* (14,7%) (table 2).

Model-calculations of the different stocks caught by the various gears do not yet seem to be satisfactory. The application of these models to lagoons is usually impossible, thanks to the general disregard of base level hypotheses. A further difficulty is the anadromic and catadromic migration of this species. In the absence of such sophisticated methods, certain rule-of-thumb

Table 1. General characteristics of lagoon fisheries within the annual cycle (1983 - 1984). SM: small mesh nets (20 mm), MM: medium mesh nets (35 mm), LM: large mesh nets (over 50 mm), MHL: unbaited multihook lines, SN: sweep nets, BN: bow nets.

Gears	SM	MM	LM	MHL	SN	BN
Number	3500	1300	700	900	3100	8600
Effort(10^3)	175	25	ø	139	176	476
Utilization %	0.14	0.05	ø	0.40	0.16	0.14
Catches (tons)	222	39	ø	101	494	83

Table 2. Average size (L) of catches in Togo and Ivory Coast, first maturity size (L1) in Togo.

	L Togo		L C.I.		L1
	SM	SN	SM	SN	Togo
Sarothorodon	12.4	10.7	18.8	23	12.5
Tilapia	12.3	10.1	18.4	22.8	10.4
Chrysichthys	14.7	12.8	22	24.6	13.6

regulations may be conceived of by a simple study of fishing data as well as by a comparison with data of the Ebrié lagoon in Ivory Coast (Ecoutin and al., 1988) where the same species and the same fishing gears are found. The average size of catches of *Sarotherodon, Tilapia* and *Chrysichthys* with small mesh and sweep nets, representing 57% of total catches, are much smaller in Togo than in the Ebrié lagoon. Furthermore, the sizes are smaller than the size of the sexual mature phase of these species. This phenomenon gives rise to concern since it is possible that the stock fertility may be affected. However that may be, this situation clearly reveals an imbalanced stock-composition and an alarmingly high fishing pressure, worsening steadily as the mesh-sizes become smaller. Therefore it seems indispensable that this fishing activity will be regulated. Some actions may be envisaged. A solution which consists in limiting the fishing effort, seems hardly realistic since it concerns people of which a majority escapes inspection of any sort (fishing for self-consumption). A regulation concerning minimum mesh sizes of 20 to 30 mm. would allow a significant increase in the average size of the catches (Fig. 2), as well as a long term increase of total production. It seems absolutely necessary to prohibit the use of sweep nets capable of catching fish everywhere and in particular along the banks where juveniles abound. These measures, to which may be added a seasonal prohibition of fishing in the spawning areas, should lead to a better stock production and to an optimum profitability level. They will bring about a short term decrease in catches. (table 3). For this reason the regulatory measures could either be

progressively applied in order to spare the fishing populations, or imposed by force combined with creating alternative trade activities or the provision of a temporary nutritional aid. Even though, in theory, these solutions may appear workable, the Togolese fishing department seems unable to apply these in reality because it lacks the means to do so.

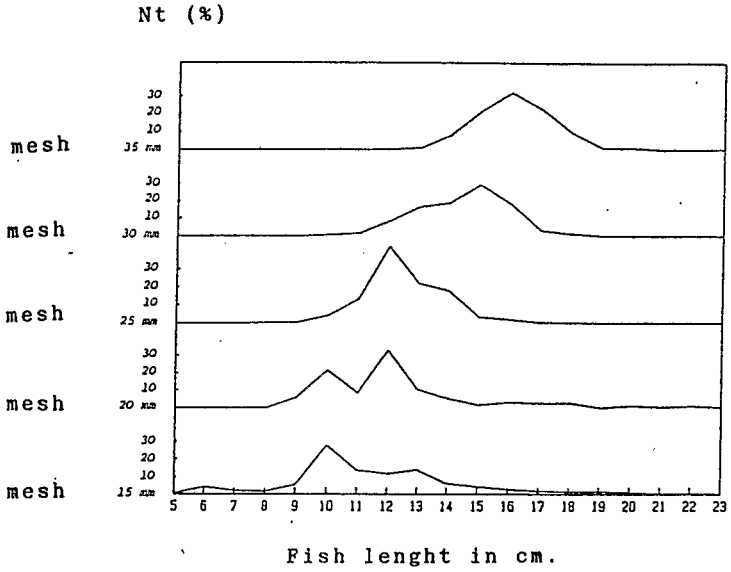

Figure 2. Average size of catches from different net's meshes. Nt: Percentage of catches.

Table 3. Annual landings (m.t.) in Togolese lagoons. TR: traps

Gears	*SM*	*MM*	*MH*	*SN*	*BN*	*TR*	*Total tons*	*%*
Sarotherodon	154	10	9	253	54		480	50.0
Chrysichthys	11	1	76	53	1		142	14.8
Tilapia	16	1	3	46	3		69	7.2
Penaeus	2			52	1		55	5.7
Callinectes	4	4	1	14	5	21	49	5.1
Gerres	7			24			31	3.2
Clarias	4	9	8	3	4		29	3.0
Hemichromis	4			15	4		23	2.4
Ethmalosa	6			18			24	2.5
Diverse	14	14	4	16	11		59	6.1
Total tons	222	39	101	494	83	21	960	
%	23.1	4.1	10.5	51.4	8.7	2.2		

Adaptation of methods and of traditional management

In fact all the regulations suggested above were already existing in traditional management of lagoons (Weigel, 1985), until the administration disclaimed the water- and villagechiefs when the country gained its independence. Therefore it appears absolutely necessary to return to a mixed system which combines administrative and village authorities into one single council, entrusted with the formation and application of the rules. Any other solutions would certainly fail.
The lack of a connection between see and lagoon gives rise to a situation of confinement which leads to an environmental impoverishment and the disappearance in lagoon waters of estuarian forms. The maintenance of a water pass during one part of the year, or the construction of a channel allowing a temporary contact, would reestablish the traditional custom of an artificial lagoon belt opening created by the fishermen. Species such as *Polydactylus, Trachinotus,* and *Liza* would once again be able to enter the lagoon and would get caught in the large-mesh fishing nets which are ever-present in the lagoons but out of use for the time being. At the same time there should be a lesser utilization of small-mesh mets in order to relieve the fishing pressure on juveniles. The opening of the lagoons would also encourage the entry of the *Penaeus* shrimplarvae transported by the tidal currents. Although this species lays its eggs at sea, it spends a part of its biological cycle in lagoons (juveniles). The recruitment of young shrimp in the lagoons would also help in improving catches in sea. Finally the increase of watersalinity would encourage the development of the *Callinectes* crab.

However, no matter how efficient the above proposed measures may be, the increase in catches will remain insufficient in comparison with the demand: Togo's yearly import of fish runs to 10,000 tons. One must therefore increase lagoonary production by using water farming techniques. Traditional aquaculture is well adapted to African countries because it requires a low level of technology and abundant manpower. In Togo and Benin (Everet, 1976; Welcome, 1972) brush parks named Acadja, have been used for several years. It consists in the creation of an artificial ring of branches three-quarters submerged in quiet and shallow waters (1.50 m. deep). In this way the productivity is greatly increased (10 to 20 tons per hectare). At the time of fishing the Acadja is enclosed within a net and the branches are removed. *Sarotherodon* and *Chrysichthys* are predominant among the catches (70 to 90%). Although this technique may yield good profits, the experiments in the past have all failed due to the social tensions existing between fishermen and extensive water farmers. The fishermen's first argument against the Acadja system is that they serve as a shelter for fish, thus depriving them of any possible chance of capturing these fishes. Besides, the construction of Acadjas was conceived of as a privatisation of the lagoons by the leading citizen of Lome to whom village labour became cheap. The Acadja was therefore prohibited as a result of the pressure exercised by individual fishermen. Similiar events were also observed in Benin, Ghana and Ivory Coast (Kapetski, 1985). Hence, in order to overcome these social conflicts, the Acadja must be

isolated from the rest of the lagoon. Weigel and Hem (1984) propose the construction of an enclosed Acadja surrounded by a permanent net once the colonization has been achieved. Obviously, all sources of conflict must be reckoned with when choosing and distributing suitable sites. For this, it would again be necessary to lay the responsibility at the village associations, the only ones holding any authority over the fishermen.

Conclusion

The alarming situation observed in Togo point to a poor management of stocks, partly aggravated by unfavorable climatic conditions. Some options to improve this situation may be found in a reintroducing of regulations concerning stock fishing. Another series of measures aims at improving waterproductivity by opening the lagoon or by applying traditional techniques adapted to present day conditions. Although several regulations have already been proposed in developing countries, there are hardly any cases of success, since one of the conditions of this success remains unfulfilled: a certain respect for traditional authorities. It will therefore be necessary to find a solution by the cooperation of customary and administrative structures while taking care of maintaining the administrative authority. It is the task of the latter to establish the general context within which the development can take place. If these conditions are respected, we should be able to observe a long term rise in production along with an improved social status of fishermen - two confessed preoccupations of the Togolese government.

REFERENCES

Durand, J.R., Ecoutin, J.M., Charles-Dominique, E, (1982).'Les ressources halieuthiques des lagunes Ivoiriennes'. In P. Lasserre and H. Postma (editors), Coastal lagoons. Proceedings of a symposium, 8-14 sept 1981 at Bordeaux, France. Oceanologica Acta, V,4: 277-284.

Ecoutin, J.M., Durand, J.R., Lae,R., (1988). 'L'exploitation des stocks en lagune Ebrié'. In: synthèse des lagunes Ivoiriennes. Proceedings of seminar of Taabo, Ivory Coast. In print.

Everett, G.V., (1976). 'Quelques observations et recommendations sur le développement de la pêche maritime en république du Togo'. COPACE, technical rapport Dakar (76/1), 46 p.

Kapetski, J.M., (1985). 'Some considerations for management of coastal lagoons and estuarine fisheries'. FAO fisheries, technical paper, 218.

Lae, R., Faggianelli, D.J., Faggianelli, E. (1984).'La pêche artisinale individuelle sur le système lagunaire Togolais: description des pêcheries et

estimation de la production au cours d'un cycle annuel 1983-1984'. ORSTOM Lomé, 76 p.

Millet,B. (1984). 'Hydrologie et hydrochimie d'un milieu lagunaire tropical: le lac Togo'. Thèse université de Paris-Sud, Centre d'Orsay, 236 p.

Vallejo, S.M.A., (1982).'Development and management of coastal lagoons'. In P. Lassere and H. Postma (Editors), Coastal Lagoons. Proceedings of a symposium, 8-14 september 1981 at Bordeaux (France), Oceanologica Acta, V,4: 397, 402.

Welcome, R.L., (1972). 'An evaluation of the Acadja method of fishing as practised in the coastal lagoons of Dahomey (West Africa)'. Journal of fish biology, 4: 39-55.

Weigel, J.Y., Hem, S., (1984).'Le secteur des pêches au Togo, situation et perspective'. Mission française de cooperation.

Weigel, J.Y., (1985).'L'aménagement traditionnel de quelques lagunes du Golfe de Guinée (Côte d'Ivoire, Ghana, Togo, Bénin)'. FAO, circulaire sur les pêches, 790.

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