Influence of environmental parameters and fishery on demersal fish distribution along the Tunisian coast

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Abstract

According to the latest FAO statistics, since the 1990s, the world production has shown a trend to decrease which differs from one area to another and from one group of species to another. This trend can be essentially explained by the progressive increase in, and the inefficient control of, the fishing effort. Indeed, according to the Reykjavik Conference on Responsible Fishing in the Marine Ecosystems, October 2001, more than half of the fisheries in the world have been fully exploited, a quarter have been overexploited and the remaining quarter would not withstand a higher level of exploitation. This situation is most marked in the Mediterranean, which is a semi-enclosed sea. Indeed, the productivity of the majority of fishing units is continually decreasing and a majority of the demersal stocks are either fully exploited or overexploited.

This overexploitation of marine resources in the world is probably due particularly to the ineffectiveness of present classical management measures, which consider the exploitable marine resources independently of their habitats and without taking into account the ecosystems in which they live. Nowadays, the marine ecosystems, as well as the impact of fishing on their structure, arouse a growing interest.

In Tunisia, in recent years, the Laboratory of Living Marine Resources of the National Institute of Marine Sciences and Technology (INSTM) has carried out an important number of stock assessments. Initially, the National Research Programme on the Evaluation of the Tunisian Marine Fishery Resources considered about 20 demersal species and lasted from 1996 to 1999. In a second phase, these assessments were strengthened and completed by the launching, in 1999, of a new Research Programme that considered more than 15 new exploited species. These research programmes mainly dealt with:

- **The typology of the Tunisian fishing fleet:** For the first time in Tunisia, it was possible to record the totality of the fishing fleet operating along all the Tunisian coast. We were also able to collect and analyse all the information relative to this fleet, such as vessel characteristics (size, strength, tonnage, age, material of construction), the fishing activity (fishing gears, fishing period, fishing zone, commercialization of the catch) and the production (fished species, fished quantities, output of boats, etc.). All this detailed information was recorded in a data base and can be updated whenever necessary. In 1998, the data were transmitted to the Ministry of Agriculture (General Direction of Fishing and Aquaculture, DGPA) which took the responsibility for maintaining the data base and updating it whenever a change occurs.
- **The analysis of the present fishing systems:** During a consecutive period of two years, we established a permanent network of investigators in about 30 fishing harbours and landing points, with the collaboration of the Ministry of Agriculture and

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the fishery professionals (UTAP). The tasks of these investigators were to regularly follow up the fishing activity of a representative sample of the fishing fleet and record all information relative to the fishing effort, production and size/age composition of the main species. Thanks to this operation, we collected more than 40,000 technical information sheets. All this information was organized in a data base that provided the following results ventilated by area, species, fishing gear and season:

- ♦ Evaluation of the production of all species fished along the Tunisian coast; the gathered data were used as an input parameter of the stock-assessment model for pseudocohort analysis
- ♦ Daily productivity per boat
- ♦ Size/age composition of the catch of the studied species.

- **The biological study of the main exploited species**: The biological study considered more than 40 species recommended by the professionals. To this end, 10,000 marine organisms have been dissected. Growth, reproduction and diet were the main parameters studied. For each species, the most important results were recorded on a Biological Identity Sheet. These results were communicated to the Ministry of Agriculture in order to elaborate legislation on the authorized minimum catch size and the fishing periods, based on recommendations made by the Research Institute. Finally, it is important to stress that these biological results are very important to the understanding of the interactions between the species and the marine ecosystems in the Tunisian fisheries. They are also useful as input parameters for the mathematical models used to assess the main exploited demersal stocks.
- **The stock assessment**: The dynamical study consists particularly in evaluating the state of exploitation (fully, under- or over-exploited) of the most studied species. Up to now, we have been able to study 29 demersal species and 10 pelagic species.
- **The spatio-temporal distribution of the exploitable fishery resources along the Tunisian coast**: The experimental trawl survey is important for the development of the fishing sector. Indeed, it allows us to determine densities and the spatio-temporal distributions in different prospected zones. These operations along the Tunisian coast started in 1998, thanks to the new research vessel "Hannibal". More than 10 experimental trawling surveys and more than 700 experimental trawling operations were executed from 1998 to 2002. To study biodiversity and the quality of the environment in the fishing zones, we took advantage of each survey to collect samples of water, sediments and marine organisms. We organized a data base that will allow us to evaluate the influence of environmental parameters and of the fishery on the spatial distribution of the marine resources.

In the future, this prospecting and experimental trawling will be strengthened, as well as the setting of national and regional programmes. Indeed, this remains the appropriate method for understanding the climatic and the environmental factors that are important in the spatio-temporal distribution of demersal fishes.

Regarding the MedSudMed Project, in particular the component Spatial Distribution of Demersal Resources in the Strait of Sicily and the Influence of Environmental Parameters and Fishery Characteristics, an adequate research programme should cover the main objectives of

the Project, the survey zone, the material and the necessary means, and the methodology used.

The objectives should be clearly identified; the influence of the environmental factors and the fisheries on the marine ecosystems in the study area should be stressed. The study area should also be clearly defined and should take into account the existing geographical delimitation of Management Units in the Mediterranean, as defined by the Scientific Advisory Committee (SAC) of the GFCM.

With regard to the material aspects of the survey, the fundamental means remains the research vessel. Indeed, every research team participating in this project should organize a seagoing research unit, in order to conduct the different experimental trawl surveys that will be scheduled in the study area. These research vessels should be the most coherent possible among the participant teams. On the Tunisian side, the R.V. "Hannibal" is used for our trawling and prospecting operations. Besides, the fishing gear that will be used in the different experimental trawling operations should be the same for all the research teams. A trawl with a large vertical opening would be a good choice.

The adopted sampling protocol and the methodology used should be standardized initially among the different research teams. For this, a stratified sampling protocol according to the depth could give good results. Regarding the use of the swept-area method, some scientists express reserve essentially because of the difficulty in evaluating escapement factors relevant to the different species studied; these factors should be carefully analysed.