



United Nations Environment Programme



Distr.
RESTRICTED

UNEP/WG.6/INF.9
25 November 1976

Original: ENGLISH

Expert Consultation on
Mediterranean Marine
Parks and Wetlands
Tunis, 12-14 January 1977

Note by the Executive Director

The attached paper, which was prepared by the Food and Agriculture Organization of the United Nations, is submitted to those participating in the Consultation for their information.

GE.76-11706

CONTRIBUTION OF MARINE PARKS
TO FISHERIES RESEARCH AND AQUACULTURE

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GE.76-12453

Introduction

Marine parks, or reserves, although very often established for the social benefit of man, are created as a conservation measure, as such providing an environment where the required research into the understanding of the biology and ecology of living organisms can be undertaken without disturbance from man's activities in the area.

One of the many uses of the ocean is the harvesting of its living resources as a source of food. The ever-increasing interest of governments in fishery has resulted in the heavy exploitation of most of the fish stocks in the world, thus obviating the need for management. The techniques for management of stocks depend on the amount of environmental control that can be applied, on the particular factors that limit the size of the stocks, and on the part played by man. For marine species the available management measures are often restricted to understanding man-induced mortality (and natural mortality), and manipulating or controlling such activities in order to produce the largest available surplus to be harvested.

The application of successful management depends on comprehension of the facts that affect the dynamics of fish populations, which in itself requires research directed towards well-defined objectives. Although most of the marine fishery research is undertaken at sea, some basic and applied research requirements can only be met in inshore or coastal areas where the use of marine parks or reserves would be highly desirable.

Mediterranean Sea and its Fisheries

The Mediterranean Sea is a large almost land-locked water mass with very low productivity. The fish fauna is basically related to the fauna of the sub-tropical Atlantic. Large industrial-scale fisheries do not exist due to the general lack of big concentrations of fish. The high price of fresh fish throughout the region has, however, favoured development of a large number of small-scale fisheries. During 1974 the total catches of fish, crustaceans and molluscs, etc., were:

	<u>1974</u> (metric tons)
All marine fish (including Diadromous)	1 215 027
Crustaceans	15 824
Molluscs (excluding Cephalopods)	47 154
Cephalopods	43 166
Sponges	133

Although in parts the resources are not utilized to their fullest extent, e.g. in the Black Sea, the Mediterranean fish resources are generally heavily exploited.

With the increased demand for fish, management of the present resources and aquaculture have been identified as two important areas of activity by the GFCM member governments, and various action plans towards their implementation are at present under way.

Marine Parks for Fishery Purposes

A marine park is an area set aside for a special purpose, for which management guidelines are established, and which constitutes a source of ecosystem baseline data, where the natural processes can be studied and man's perturbation measured. Such parks have also protective functions for species, habitats or the genetic material they contain.

Fisheries research needs facilities in the marine environment separate from the generally and freely accessible waters of the country. Such areas should be set aside specifically for research purposes. Ideally they should be representative of every habitat and coastal or marine environment, although it is likely that they would not be economically practicable, or even possible, for political or social reasons. Priorities are therefore necessary in the selection of habitats and environments which need to be set aside as reserves for various research purposes.

Marine parks for fishery purposes can be roughly grouped into:

- (1) Modified environments for the study and culture of food and nutrient organisms, either of known use or of potential use and economic importance.
- (2) Resource replenishment zones, where natural processes necessary to the resource food chain are promoted or permitted to flourish free from degrading action.
- (3) Sanctuaries, nursery grounds, or spawning areas, where recruitment to the resource is of great importance.
- (4) Natural habitat areas, where the open culture, natural regeneration or manipulation of a species is undertaken, e.g. sponges, seaweeds, shellfish.

Fisheries and Aquaculture Research

Research programmes associated with reserve and ecosystem management, inclusive of fisheries management, fall into a number of categories and frequent reference has been made in recent years to seek an integrated approach to all aspects of fishery research and management. In the list below, some indication is given of the tasks that have to be undertaken, the results of which will be of no less interest to fisheries than other marine research programmes. These points are relevant for any country planning or establishing marine parks or larger ecologically oriented programmes

collection of available data taxonomy and listing of local species

productivity studies and food chains supporting important fisheries

determining the impact on the resources and the environment of human and natural changes which are to be identified and evaluated prior to further modification; monitoring to identify seasonal changes and to detect pollutant effects

- collection of data on the absolute population size, distribution and biology of species which are recognized as being in need of protection and others that may be in danger; biology and population dynamics and migration patterns of economically important species
- ecology and biology of coastal zone complexes; undertaking studies in areas as yet unmodified by man, as baselines with which to compare similar data recorded in each reserve or modified system in the area
- establishing priorities for the development of the commercially important species; investigating the feasibility of culturing identified organisms as a resource replenishment or economic project

Fisheries research has, in the past, been mainly concerned with the particular species in the environment rather than the environment as a whole, and has necessarily been directed towards improved management and techniques of fishery exploitation. However, in recent years recognition has been given to the importance of an inter-disciplinary approach to management of the marine resources and greater integration between research and management interests, leading to better utilization of the whole ecosystem. For the proper implementation of integrated research programmes - and most of the fisheries research programmes would fall into this category - marine parks would provide the necessary field facilities. It may only be necessary or desirable to reserve or manage an area for a fixed period of time, seasonally or for a limited period sufficient to achieve the objectives of management such as resource recovery, etc.

Coastal aquaculture practices are now well established in various regions and are undergoing rapid development. However, although the Mediterranean countries have put considerable effort into mollusc culture, they have not yet developed fish and crustacean culture aspects adequately. With the increasing demand for fish, the countries in the region now realize the great importance of the industry in increasing the production of animal protein to meet the needs of the populations, producing high-priced commodities for export, and consequently for earning foreign exchange, and finally creating employment opportunities and utilizing areas of unproductive idle land and water bodies.

The marine parks, once established, would provide the required facilities for studying the biology of cultivable species, and controlled breeding of, and seed production from, those species identified as suitable for mass production. Developing new aquaculture techniques for fish and shellfish, site selection and pond construction on pilot scales, as well as pest and predator studies as they affect the coastal aquaculture systems, would also require well-controlled and managed parks.

Investigations

The recommendations made at a recent meeting in Paris (UNESCO, 1975) which highlight the lack of research knowledge and the need to acquire it, are listed below. Suggested types of management zones or parks are indicated in brackets.

- Chemical Oceanography : Investigations leading to greater knowledge on the distribution of nutrients and primary production studies (oceanic and shallow water monitoring stations)
- Marine Biology : The taxonomy and listing of local species (whole area, all habitats but no need for reserves until cause shown)
- : Monitoring and baseline studies on seasonal and long-term changes (research reserve and monitoring stations in other reserves)
- : Migration patterns and population dynamics of commercially important species (whole area and marine reserves)
- : Establishment of priorities for the development of existing commercial species (or potentially commercial species)
- : Provision of more basic ecological information (research or habitat reserve)
- Pollution : Probable effects of pollutants on marine organisms, measures adopted for the control of pollution (special managed reserve and monitoring stations at all reserves)
- Conservation : A research base is required on the absolute population size, distribution, migration and population dynamics of the species which are in need of conservation, particularly endangered species such as certain sea birds and turtles (special marine habitat reserve)
- : The impact of various development on coastal zone processes and ecosystems should be evaluated by national and regional studies prior to further modification of the environment (all reserves).
- Systems planning and management
- : Protected zones for future development of industrial sites, resorts, marine parks and wetland reserves should be located. Sediments should be mapped to assess the occurrence of minerals of economic importance (applies to all reserves/management zones)
- Mariculture : Areas suitable for the culture of identified saleable species should be surveyed (research and management reserves).

Within this wide spectrum of disciplines fisheries interests can be narrowed down and restricted to the study of fish stocks and those factors affecting their state.

A stock of fish is a biological entity, interacting with other species and environmental conditions in the ecosystem. Knowledge of migrations and seasonal overlapping in ranges of different stocks is essential for proper management action. Knowledge of the effects of the physical, chemical and biological factors of the environment on fishes is also important in understanding the natural fluctuations in the abundance of stocks.

Fisheries research sites will therefore be of several classes:

- (1) Those selected for general environmental research into the biology and ecology of the reserve, in which specific information and behavioural studies may be carried out and in which there will be monitoring data collected on the physical and chemical changes taking place for comparison with other stations and allied to a national or regional environmental programme. The area may be representative of several marine habitats and should be in unpolluted waters as far as possible. Proximity to land-based research facilities would be desirable. If it can be located in an area of current fishing activity this would be an advantage.
- (2) Sites for sanctuary, critical areas such as mangrove cays or wetlands require identifying and setting aside for specific purposes but these sites would only be of short-term research interest, sufficient to identify and quantify the biota and its productivity. Thereafter, the fisheries research activity would be confined to ensurance of the reserves' integrity by monitoring changes in the environment that might affect productivity or recruitment. These reserves then would not be created in the long-term for fisheries research purposes, and would normally be created as strictly managed reserves.
- (3) Underwater reserves including those of a "low tide elevation", described in Article 11 of the Territorial Sea Convention of 1958 as a naturally formed area of land which is surrounded by and lies above water at low tide but submerged at high tide, may be the most widely selected for both recreation and fisheries research.

Conclusion

The Mediterranean region has the required intellect and interest in the rational exploitation of its living aquatic resources and their proper management including the improvement of such resources which are being, or continue to be, heavily fished. The wise use of natural resources within a sound and protected environment, is the ultimate declared aim of the Mediterranean countries. Under the guidance of UNEP and other specialized United Nations agencies, a very important step towards the protection of the Mediterranean Sea from pollution had already been taken when the governments of the region signed the "Convention for the Protection of the Mediterranean Sea against Pollution". Furthermore, the UNEP Mediterranean Action Plan, as adopted at the 1975 inter-governmental meeting in Barcelona, aims at the protection and development of this regional sea which will require studies on:

- living resources, their status, and trends in their exploitation
- pollutants affecting the Mediterranean, their sources, amounts, and ways of input

- levels of pollutants in the various components of the marine environment
- effects of pollutants on marine and coastal ecosystems
- identification of harmful human activities or of endangered parts of the ecosystems,

and will need, amongst other things, facilities in the form of coastal and marine reserves.

To achieve this ambitious programme the required technical assistance and know-how could be provided to the developing countries of the region, as well as to those already developed who may wish to receive such advice on the protection of environmental health and the rational utilization of their resources. Marine parks have an important function in achieving the aims set out by the governments in the region. Careful planning at local, national and international levels will be necessary to satisfy the need for chains of reserves required in the Mediterranean region in order that the variety of uses to which the ocean and coastal zones are subjected can be met.

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