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Workshop on biosphere reserves in the Mediterranean region: Development of a conceptual basis and a plan for the establishment of a regional network

Final Report

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Previous reports in this series:

1. *International Co-ordinating Council of the Programme on Man and the Biosphere. First session. Paris, 9-19 November, 1971.*

2. *Expert panel on the role of systems analysis and modelling approaches in the Programme on Man and the Biosphere (MAB). Paris, 18-20 April, 1972.*

3. *Expert panel on Project 1: Ecological effects of increasing human activities on tropical and subtropical forest ecosystems. Paris, 16-18 May, 1972.*

4. *Expert panel on Project 12: Interactions between environmental transformations and genetic and demographic changes. Paris, 23-25 May, 1972.*

5. *Expert panel on Project 5: Ecological effects of human activities on the value and resources of lakes, marshes, rivers, deltas, estuaries and coastal zones. London, 19-22 September, 1972.*

6. *Expert panel on Project 3: Impact of human activities and land use practices on grazing lands: savanna, grassland (from temperate to arid areas), tundra. Montpellier, 2-7 October, 1972.*

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9. *Expert panel on Project 13: Perception of environmental quality. Paris, 26-29 March, 1973.*

10. *International Co-ordinating Council of the Programme on Man and the Biosphere. Second session. Paris, 10-19 April, 1973.*

11. *Expert panel on Project 7: Ecology and rational use of island ecosystems. Paris, 26-28 June, 1973.*

12. *Expert panel on Project 8: Conservation of natural areas and of the genetic material they contain. Morges, 25-27 September, 1973.*

13. *Expert panel on Project 11: Ecological aspects of energy utilization in urban and industrial systems. Bad Nauheim, 16-19 October, 1973.*

14. *Working group on Project 6: Impact of human activities on mountain and tundra ecosystems. Lillehammer, 20-23 November, 1973.*

15. *Consultative group on Project 9: Ecological assessment of pest management and fertilizer use on terrestrial and aquatic ecosystems (Part on fertilizers). Rome, 7-9 January, 1974.*

16. *International working group on Project 1: Ecological effects of increasing human activities on tropical and subtropical forest ecosystems. Rio de Janeiro, 11-15 February, 1974.*

17. *Task force on the contribution of the social sciences to the MAB Programme. Paris, 28 February-2 March, 1974.*

18. *Regional meeting on integrated ecological research and training needs in the Sahelian region. Niamey, 9-15 March, 1974.*

19. *Expert panel on Project 2: Ecological effects of different land use and management practices on temperate and mediterranean forest landscapes. Paris, 16-19 April, 1974.*

20. *Task force on pollution monitoring and research in the framework of the MAB Programme. Moscow, 23-26 April, 1974.*

21. *International working group on Project 5: Ecological effects of human activities on the value and resources of lakes, marshes, rivers, deltas, estuaries and coastal zones. Paris, 13-17 May, 1974.*

22. *Task force on criteria and guidelines for the choice and establishment of biosphere reserves. Paris, 20-24 May, 1974.*

23. *Regional meeting on integrated ecological research and training needs in the Andean region. La Paz, 10-15 June, 1974.*

24. *Expert consultations on Project 9: Ecological assessment of pest management and fertilizer use on terrestrial and aquatic ecosystems (Part on pesticides).*

25. *International working group on Project 3: Impact of human activities and land use practices on grazing lands: savanna and grassland (from temperate to arid areas). Hurley, 2-5 July, 1974.*

26. *Regional meeting on integrated ecological research and training needs in the South East Asian region. Kuala Lumpur, 19-22 August, 1974.*

27. *International Co-ordinating Council of the Programme on Man and the Biosphere. Third session. Washington, D.C., 17-29 September, 1974.*

28. *Regional meeting on integrated ecological research and training needs in Latin America, with emphasis on tropical and subtropical forest ecosystems. Mexico City, 30 September–5 October, 1974.*

29. *Expert panel on Project 4: Impact of human activities on the dynamics of arid and semi-arid zones' ecosystems, with particular attention to the effects of irrigation. Paris, 18–20 March, 1975.*

30. *Regional meeting on the establishment of co-operative programmes of interdisciplinary ecological research, training and rangeland management for arid and semi-arid zones of Northern Africa. Sfax, 3–12 April, 1975.*

31. *Task force on integrated ecological studies on human settlements, within the framework of Project 11. Paris, 2–6 June, 1975.*

32. *Task force on Project 14: Research on environmental pollution and its effects on the biosphere. Ottawa, 5–8 August, 1975.*

33. *Regional meeting on integrated ecological research and training needs in the humid tropics of West and Central Africa. Kinshasa, 29 August–5 September, 1975.*

34. *Regional meeting on integrated ecological research and training needs in the southern Asian mountain systems, particularly the Hindu Kush-Himalayas. Kathmandu, 26 September–2 October, 1975.*

35. *Regional meeting on integrated ecological research and training needs in tropical deciduous and semi-deciduous forest ecosystems of South Asia. Varanasi, 5–11 October, 1975.*

36. *Regional meeting on integrated ecological research and conservation activities in the northern Mediterranean countries. Potenza, 27–31 October, 1975.*

37. *Expert consultations on Project 10: Effects on man and his environment of major engineering works.*

38. *International Co-ordinating Council of the Programme on Man and the Biosphere. Fourth session. Paris, 18–26 November, 1975.*

39. *Regional planning meeting of the MAB National Committees of Andean countries, with particular attention to Project 6. Lima, 2–5 December, 1975.*

40. *Regional meeting on integrated ecological research and training needs in North East Africa and in the Near and Middle East, with emphasis on the ecological effects of irrigation derived from large river basins. Alexandria, 24–27 February, 1976.*

41. *Regional meeting on integrated ecological research in temperate zones of the northern hemisphere, in the framework of Project 2. Brno, 24–29 April, 1976.*

42. *Planning meeting for Project 11, with emphasis on industrialized settlements. Amsterdam, 8–12 June, 1976.*

43. *MAB Mediterranean Scientific Conference. Regional meeting for MAB National Committees of countries bordering the Mediterranean Sea. Montpellier, 26 September–2 October, 1976.*

44. *International workshop on tropical rainforest ecosystems. Hamburg-Reinbek, 12–17 May, 1977.*

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S Y N O P S I S

Representatives from the MAB National Committees of Egypt, France, Iran, Italy, Portugal, Spain, Tunisia, Turkey and Yugoslavia attended a workshop on biosphere reserves in the bioclimatic Mediterranean region **sensu lato** *(see also bioclimatic map of the Mediterranean region, published jointly by FAO/Unesco, Arid Zone Research XXI, 1963). This was organized jointly by the Turkish MAB National Committee and the Turkish National Commission for Unesco, and with considerable support from the General Directorate of National Parks and Wildlife of the Turkish Ministry of Forestry and in collaboration with the MAB Secretariat. It was held at Side, Turkey, from 6 - 11 June 1977.*

The meeting was also attended by observers from the United States MAB National Committee as well as by representatives from the United Nations Environment Programme (UNEP), the Council of Europe, the International Union for the Conservation of Nature and Natural Resources (IUCN) and the International Council for the Preservation of Monuments and Sites (ICOMOS).

The main objectives of the meeting, which was organized in response to a recommendation of the MAB/Mediterranean Scientific Conference held in Montpellier, France, from 27 September to 2 October 1976 (see MAB Report Series No. 43), were: to adapt the concept of biosphere reserves to the special needs of the Mediterranean region; to elaborate an improved typology of Mediterranean ecosystems as a frame of reference for the regional biosphere reserve network; and to discuss recommendations for methods of management, the interchange of information and personnel, and the establishment of new biosphere reserves.

The meeting stressed a number of specific points concerning the adaptation of the biosphere reserve concept to the special ecological and historical situation of the Mediterranean region:

- *Because the Mediterranean region is so internally diverse and is bounded by so many different biogeographic regions, it is important that these interfaces should be represented in biosphere reserves.*

- *The presence of man is a fundamental characteristic of the region and the biosphere reserves should cover the various sequences of ecosystems that have been modified by man, including traditional land use practices.*

- *Since Mediterranean ecosystems have been degraded or even destroyed by successive civilizations in the region, the restoration of natural conditions and research on problems of regeneration of degraded landscapes should be among the major tasks in Mediterranean biosphere reserves.*

- *In view of the importance of the region's historical heritage and its aesthetic and cultural integration with the natural heritage, the biosphere reserves should, as appropriate, include sites of archaeological and historical interest.*

- *In addition to wholly terrestrial reserves, sites representative of wetlands, coastal zones and small Mediterranean islands should be designated.*

A working classification system was drawn up which corresponds to ecosystems in arid, semi-arid, sub-humid and humid bioclimatic zones and for various altitudinal levels in the Mediterranean region. One part relates to 'natural' forest ecosystems, another to various stages of degradation or regeneration, a third to the main types of agro-ecosystems.

Problems of the management of biosphere reserves were discussed at some length, taking as the starting point a presentation of the management plan for the Turan Biosphere Reserve in Iran. Various aspects of research oriented towards the solution of specific problems, the drawing up of natural resource inventories, the monitoring of environmental change, and the setting up of educational and training facilities were discussed in detail. Delegates stressed that, above all, adequate management of biosphere reserves, especially in the Mediterranean region, involved the active participation of the populations living in or around reserves. Such participation could only be achieved if the people involved were made fully aware of the underlying aims of the global biosphere reserve network and that the long-term well-being of man was the centre of interest of the whole MAB Programme.

The participants agreed that it was essential that the legal status of sites to be designated as biosphere reserves should provide for continuity in the conservation, research and educational efforts. Nevertheless, legal procedures to be adopted would necessarily vary from country to country and it was considered neither possible nor desirable to attempt to lay down international legal standards.

With regard to a specific plan of action for a biosphere reserve network, particular emphasis was placed on the need to develop co-operative links between the different reserves for the interchange of information and personnel. Agencies concerned with the management of certain reserves were already in a position to accept regional responsibility for the promotion of training activities, for pilot research projects, and for sub-regional co-ordination. The establishment of a centre for ecosystems conservation, ecological research and training was proposed by Turkey. Such a centre, which may be established in the Antalya region of Turkey, could play a significant role in the implementation of the biosphere reserve concept on a sub-regional level.

Finally, the representatives of the participating countries announced proposals for new biosphere reserves which would be submitted to the MAB Bureau for approval and possible inclusion in the international biosphere reserve network.

1. INTRODUCTION

The workshop on biosphere reserves in the Mediterranean region took place at Side, Province of Antalya, Turkey, from 6 to 11 June 1977. The workshop was organized by the Turkish MAB National Committee and the Turkish National Commission for Unesco with support from Unesco.

The workshop was a further step towards setting up a Biosphere Reserve network in the Mediterranean region. It took into account the recommendations of the subregional meeting on integrated ecological research and conservation activities in the northern Mediterranean countries which was held in Potenza, Italy, from 27 to 31 October 1975 (see MAB Report Series No. 36) and of the MAB Mediterranean Scientific Conference, which was convened at Montpellier, France, from 27 September to 2 October 1976 (see MAB Report Series No. 43).

The principal objective of the workshop was to adapt the biosphere reserve concept to the particular conditions of the Mediterranean region. Among these are the great diversity and fragility of its natural ecosystems, its long history of transformation by man, the need for ecological restoration, and growing human pressures on coastal zones and wetlands.

The meeting was attended by national representatives of the MAB National Committees of Egypt, France, Iran, Italy, Portugal, Spain, Tunisia and Yugoslavia, together with observers from the MAB National Committee of the United States and the United Nations Environment Programme (UNEP), the Council of Europe, the International Council for Preservation of Monuments and Sites (ICOMOS) and the International Union for the Conservation of Nature and Natural Resources (IUCN). The list of participants is given in Annex 1 of this report.

Professor Suat Sinanoğlu was elected President, Professor Valerio Giacomini first Vice-President and Professor Mahamed El-Mahdi second Vice-President.

The host country organized field excursions to the Koprülü Canyon National Park and to the Olympus-Beydağlari National Park. These enabled participants to become familiar with the outstanding natural and cultural features of these areas and to discuss, on the spot, problems of land use and human settlement which are typical of many biosphere reserves in the Mediterranean region.

Each delegate outlined the proposals of his country or organization for implementing MAB Project 8. Summaries of these statements are incorporated in Chapters 8 and 9 of this report.

The main achievements of the workshop were the following:

(1) the development of a concept of the biosphere reserve specially suited to the particular conditions in the Mediterranean region;

(2) the preparation of a preliminary typology of major Mediterranean ecosystems. This would be used in evaluating how far the existing network of biosphere reserves included examples of the most important representative ecosystems and in guiding the choice of further biosphere reserves;

(3) the development of plans to include wetland and coastal areas in the regional biosphere reserve network;

(4) consideration of the legal aspects of protection and of the possible restriction of use within biopshere reserves;

(5) recommended measures to strengthen links between biosphere reserves in the Mediterranean region and to foster co-operation with other international organizations and with countries outside the region.

These points will be discussed further in following chapters.

Seventeen new sites were proposed as biosphere reserves, ten in Spain, six in Turkey and one in Yugoslavia.

2. GENERAL DESCRIPTION OF MAB PROJECT 8

2.1 Background

The general framework for the implementation of Project 8 of Unesco's Man and the Biosphere Programme: 'Conservation of natural areas and of the genetic material they contain' was developed by an expert panel which met in September 1973 (see MAB Report Series No. 12). Subsequently, a meeting of a special task force was jointly organized by Unesco and UNEP in Paris in May 1974, to elaborate 'criteria and guidelines for the choice and establishment of biosphere reserves' (see MAB Report Series No. 22).

This task force for Project 8 recommended the following objectives for each biosphere reserve: conservation, research, education and training. The task force defined these objectives as follows:

(1) to conserve for present and future use the diversity and integrity of biotic communities of plants and animals within natural ecosystems, and to safeguard the genetic diversity of species on which their continuing evolution depends;

(2) to provide areas for ecological and environmental research including, particularly, baseline studies, both within and adjacent to such reserves; such research to be consistent with objective (1) above;

(3) to provide facilities for education and training.

Conservation is the objective of highest priority. Only through the appropriate management of reserves and protected areas can the conservation, research, monitoring, education and training objectives of MAB Project 8 be implemented.

The general characteristics of biosphere reserves were summarized by the task force as follows:

(1) Biosphere reserves will be protected areas of land and coastal environments. Together they will constitute a world-wide network linked by international understanding on purposes, standards and exchange of scientific information.

(2) The network of biosphere reserves will include significant examples of biomes and their sub-divisions throughout the world.

(3) Each biosphere reserve will include one or more of the following categories:

(a) Representative examples of natural biomes;

(b) unique communities or areas with unusual natural features of exceptional interest. It is recognized that representative areas may also contain unique features, e.g. one population of a globally rare species; their representativeness and uniqueness may both be characteristics of an area;

(c) examples of harmonious landscapes resulting from traditional patterns of land use;

(d) examples of modified or degraded ecosystems capable of being restored to more natural conditions.

(4) Each biosphere reserve should be large enough to be an effective conservation unit, and to accommodate different uses without conflict.

(5) Biosphere reserves should provide opportunities for ecological research, education and training. They will have particular value as benchmarks or standards for measurement of long-term changes in the biosphere as a whole. Their existence may be vital to other projects in the MAB Programme.

(6) A biosphere reserve must have adequate long-term legal protection.

(7) In some cases biosphere reserves will coincide with, or incorporate, existing or proposed protected areas such as for example, national parks, biogenetic reserves, sanctuaries or nature reserves.

2.2 Practical aspects of implementation of MAB Project 8

Experience since 1974 has shown that pragmatism is necessary in implementing MAB Project 8 on a national and regional level.

Fortunately the concept elaborated by the special task force has considerable flexibility, and can readily be adapted to meet the specific needs of different regions of the world. For example, in selecting areas for designation as biosphere reserves, some countries have emphasized the conservation aspects of MAB Project 8, while others have emphasized research. Furthermore, the largest and best potential sites for conservation purposes are often remote from scientific institutions and separated from their research sites. To accommodate this the concept has been developed of a biosphere reserve cluster, composed of a central conservation reserve (the core), associated where available with a contiguous buffer zone and with nearby experimental reserves each of which may provide for the needs of manipulative research. Such a cluster of separate reserves with different conservation and research objectives can be as successful in fulfilling the goals of a biosphere reserve as one in which all the zones are contiguous.

In several countries of the region, most important natural ecosystems have been converted to agriculture or have become degraded, so that remnants available for

preservation are not large and may have lost some of their fauna and flora. Therefore, in some biosphere reserves, restoration is a major task, based on integrated ecological studies and supported by continuous observations to monitor recovery.

Although a variety of approaches are being taken, the following major elements seem to form a regular part of the evolving biosphere reserve concept. These are somewhat different in emphasis to other national conservation programmes, but complement these programmes.

(1) Emphasis upon use of natural areas in research, including the kind which provides an improved scientific base for conservation.

(2) Emphasis upon conservation of ecosystems, rather than upon conservation of individual species.

(3) Emphasis upon providing sites for long-term, continuous research and monitoring.

(4) Choice of sites for representativeness, rather than for uniqueness.

(5) Provision of an international framework for co-operation among nations in conservation and research.

2.3 Previous MAB meetings in the Mediterranean region

The biosphere reserve network for Mediterranean countries began at the regional meeting on integrated ecological research and conservation activities in the countries of the Northern Mediterranean at Potenza, Italy, October 1975 (MAB Report Series No. 36). The seven countries (France, Greece, Italy, Portugal, Spain, Turkey, Yugoslavia) represented at Potenza proposed 14 sites for inclusion in the future network of biosphere reserves in the Mediterranean.

At the MAB Mediterranean Scientific Conference, which was held at Montpellier, France, between 27 September and 2 October 1976, recommendations were made for further development of MAB Project 8 in the Mediterranean region. Delegates warmly endorsed the idea of convening a scientific workshop in Side, Turkey, principally to adapt the biosphere reserve concept to the particular conditions of the Mediterranean region and to develop a regional classification as a theoretical framework for the establishment of a comprehensive network of biosphere reserves.

3. ADAPTING THE BIOSPHERE RESERVE CONCEPT TO THE PARTICULAR CONDITIONS OF THE MEDITERRANEAN REGION

Experience has shown that the success of the biosphere reserve concept depends largely on a flexible approach, taking into account the prevailing conditions, specific conservation needs and research problems encountered in various regions of the world. Such a flexible concept has nevertheless to be consistent with the general guidelines and criteria developed for biosphere reserves (see previous chapter).

There is a special need to adapt the biosphere reserve concept in the Mediterranean region, to take into account the present ecological, socio-economic and socio-cultural conditions. A crossroads of cultures and civilizations, a highway for communication and the exchange of ideas, materials, human energies and natural and cultural resources, this region has changed profoundly over the millenia. Settlements, cultivated fields, maquis, garrigue and pasture have replaced the original natural condition, when forests of evergreen and deciduous trees covered plains and mountain slopes. The natural state is still in retreat, before the force of human intervention; and much of the land has become seriously degraded.

In these circumstances nature conservation is particularly difficult. Yet it is in just such places, in the frontier areas of nature and the impoverishment of man's livelihood, that it is perhaps most necessary.

The numerous difficulties arising from this situation also require the solution of several scientific, technical and socio-economic problems peculiar to the Mediterranean region. The establishment of biosphere reserves is proposed as one of the possible measures to combine conservation, land restoration and environmental education.

In adapting the biosphere reserve concept to specific conditions and needs of the region, the following are important:

- to represent the ecological diversity of this very varied region;
- to represent transitional zones between this and neighbouring regions and ecotones within the region;
- to take account of socio-economic development;
- to include semi-natural and artificial ecosystems;
- to take account of land use around biosphere reserves;
- to consider degraded landscapes and the possibility of their restoration;
- to preserve the cultural heritage within biosphere reserves.

3.1 Representing the diversity of the region

The Mediterranean climate is very varied, especially in precipitation and temperature. This is reflected by its outstanding floristic and phytosociological heterogeneity notably in comparison with cold and temperate regions. The diversity of climate, coupled with geological and geomorphological history, and particularly the presence of many islands and broken mountain masses, have made the region a very important centre for the evolution and survival of species. There is consequently great variation in the composition of communities round the Mediterranean basin; the species show many different and specialized morphological and ecological adaptations; and there are many isolated concentrations of endemic species.

Mediterranean ecosystems have proved to be most unstable in the face of human disturbance, and they become very vulnerable to the intense periodic droughts and torrential rain which are characteristic of the climate. This has led to widespread soil erosion and degradation of the vegetation.

Emphasis in the choice of biosphere reserves should be on a full range of sites representative of the major ecosystems. This will lead to a rather different selection from those preferred as national parks. Unique sites should only be chosen as biosphere reserves if research has been carried out or is planned which would provide valuable comparisons with other broadly similar areas elsewhere.

Biosphere reserves should include as much internal variation of habitat as possible to render them more effective and durable conservation units. They should include, for example, differences in altitude, rainfall, drainage and soils. They should also contain different intensities of human activity. Attention should be directed at studying the dynamics of natural and of man-induced processes.

3.2 Representing transitional zones and ecotones

Because the Mediterranean region is so internally diverse and is bounded by so many different biogeographic regions, it is important that these interfaces should be represented in biosphere reserves as well as typical examples of ecosystems at the centre of their distribution. Two types of interfaces can be recognized: transitions between the Mediterranean region and adjacent biogeographic realms or provinces; and ecotones within the region itself as for example between land and sea.

From the biogeographical point of view, the principal transitions between the Mediterranean and adjoining regions are the following:

- North Mediterranean - Atlantic.
- North Mediterranean - Central European.
- North and East Mediterranean - South-Eastern Black Sea.
- East Mediterranean - Irano-Turanian.
- South Mediterranean - Saharo-Arabian.
- West Mediterranean - Macaronesian.

It is at the great interregional interfaces that most interactions, transitions and conflicts occur; and, generally the most active, rapid processes of change and the most serious imbalances. Since the entire MAB Programme concerns itself with world-wide ecological problems, it is deeply interested in these interfaces.

When man's intervention at these critical points becomes heedless, this may result in very dangerous and sometimes disastrous consequences. There is, accordingly, a growing need for them to be subjected to intensive, systematic, scientific control, taking into account not only physical and biophysical, but also cultural, ethnological and sociological variables.

Particularly serious problems arise in the East-Mediterranean-Irano-Turanian and South-Mediterranean-Saharo-Arabian transition zones, where the classic Mediterranean problems of degradation intermesh with the general problems of desertification. The relationship between MAB Project 8 and Projects 3 and 4 takes on a special significance in these zones.

3.3 Socio-economic development

The problems of socio-economic development should be carefully considered in relation to the establishment of biosphere reserves, their development, and their use for research and public education. This is particularly important in the Mediterranean region where a number of biosphere reserves include human settlements or are continually affected by human populations living outside the reserve but drawing upon its natural resources for survival. Therefore, the economics of human communities should be considered an important component of a framework that is conceived to integrate and harmonize the economies of man and nature.

Nevertheless, consideration for the economy of existing human communities should not jeopardize the ecological viability of the biosphere reserves. The criteria for ecological viability of each biosphere reserve should be stated in its basic administrative policies which should conform to the natural characteristics of the site.

Within such biosphere reserves the justifiable needs of the local population should be provided for by appropriate socio-economic development. In these cases the local population should be encouraged to participate actively in the formulation of biosphere reserve management objectives and in decisions. The possibility of subventions, subsidies, leases and easements should be considered and used if necessary for the proper fulfilment of the functions of the biosphere reserve.

In all dealings with rural communities in or around biosphere reserves, the utmost care should be taken to create harmonious relations with the local people to avoid any adverse reactions such as deliberate forest fires.

Lasting success depends upon the co-operation and comprehension of local human communities, especially in the developing countries of the Mediterranean basin. This understanding is largely related to the educational and cultural level of the society involved. Consequently public relations gain paramount significance. In order to encourage the understanding and co-operation of the local population, special programmes should be set up to provide them with information about the biosphere reserve and the significance and importance of its functions. When providing socio-economic subsidies enough provision should be made for public education and for public relations in order to make local people more conscious of their environment and willing to co-operate in its protection.

In these ways biosphere reserves could pioneer rational economic development, being planned and implemented as a joint enterprise by biosphere reserve managers, scientists, local decision-makers and the resident population.

If the objectives of biosphere reserves are to encompass the actual human problems found in the Mediterranean, agro-ecosystems, silvicultural systems, or even urban and industrialized systems should be included in some instances. In the Mediterranean the problems of areas under continuous use increase in importance; when human activities are continuous and without change, man assumes a role comparable to that of natural factors. In such instances, then, we pass from the problems of nature conservation to problems of the conservation of sustained usable productivity, which means working in harmony with basic natural processes. When, on the contrary, human activities and uses are disorderly and cause degradation either of productivity or of the landscape in general, efforts should be made to restore the overall quality of the environment.

It seems appropriate, therefore, that biosphere research should include continuous experimental work on the control and rationalization of uses of the land so as to improve their ecological effectiveness and reduce harmful effects.

A particular problem in this context is how to maintain indefinitely these traditional systems in which man has established a certain equilibrium, for example, between vegetation, livestock and simple techniques of cultivation. The perpetuation of such systems may be very important for the preservation of genetic stocks such as those of the primitive cereals.

3.4 Semi-natural and artificial ecosystems

The semi-natural and artificial ecosystems created by the action of man have their own characteristic flora and fauna, and play an important part in the economy of local communities. The preservation of samples of these modified ecosystems is therefore important for genetic conservation and the study of them is vital for understanding the interactions between man and the land. They should therefore be considered as essential, integral parts of any biosphere reserve.

The various zones of a biosphere reserve should cover the whole range from natural to man-modified ecosystems, including traditional and modern land use practices. These would provide sites for the comparative ecological and socio-economic studies that are urgently needed for regional planning in the Mediterranean.

Four levels of intensity of human influence should be analysed and compared:

- no influence (core areas);
- some influence (core and buffer zones);
- traditional land use (buffer and peripheral zones);
- intensive management (peripheral zone).

In areas where no unmodified ecosystems remain, the core might be formed of modified areas which would then be allowed to develop by natural succession.

The last would allow a comparison to be made between major development schemes outside biosphere reserves and the less intensive management and natural situations within.

As it may not be possible to find all of these kinds of land in contact with one another, it may prove more practical to include them all in a biosphere reserve cluster (see page 12).

3.5 Land use around biosphere reserves

Particular attention should be given to the problem created by land use practices in the areas surrounding biosphere reserves. As the land outside becomes more intensively used there is bound to be more effect on the conditions that prevail within reserves. Effects may include air, water and soil pollution, invasion of introduced plants and animals, and of diseases. Biosphere reserves should not be treated as islands separate from the surrounding land. On the contrary, they should be closely related to the ecological, economic and social conditions which prevail in the surrounding areas. Here, therefore, a special burden of responsibility falls on interdisciplinary efforts and real active participation by human communities directly concerned.

The effects of land use practices around biosphere reserves and particularly of environmental pollution, such as application of insecticides, should be studied in detail.

3.6 Degraded landscapes and the possibilities of restoration

Man has been active for at least four millenia in the Mediterranean region. Ecosystems have been degraded and even destroyed by successive civilizations who found in them materials essential for their survival or sometimes considered them as obstacles to development.

Since degraded and impoverished areas are so prevalent, some should be incorporated within biosphere reserves as restoration zones. Research should be conducted on these degraded landscapes to establish the scientific basis for restoration. Certain areas should be kept in a degraded state as demonstrations, and as controls against which the improvement of the remainder may be assessed.

In some Mediterranean countries there may already be legislation to protect degraded or destroyed vegetation to restore it to a desired state. In this case biosphere reserves may cover this kind of area as well.

Such extensive degradation and destruction of the landscape illustrate the severity of the impact of local inhabitants on the natural resources readily available to them from their immediate environment. If this population is still living in the area, the adverse effects are likely to continue unless active restoration is undertaken. In these circumstances the land capability of the area should be assessed in order to bring it as rapidly as possible under productive, sustainable use as, for example, vineyards, olive or pistacio orchards, or plantations of irrigated crops, supported by proper catchment protection. This is likely to produce more rapid

benefits than the process of natural recovery. As indicated in the preceding section, all these alternatives should be studied.

3.7 The preservation of the cultural heritage within biosphere reserves

Many parts of the Mediterranean region contain an invaluable wealth of cultural heritage, especially from greek and roman times. Because of the importance of this heritage and the need to integrate it both aesthetically and culturally with the natural heritage, biosphere reserves should, wherever appropriate, include sites of archaeological and historical interest. Special measures may be required to preserve the integrity of the natural and the authenticity of the cultural features. These may include protection, landscape management, regulation of tourists and the education of people living in and around the site.

Development of awareness of the moral obligation to respect and safeguard those natural and cultural properties most representative of a natural environment or of the genius and history of the peoples of the world has made great progress since the Convention concerning the Protection of the World Cultural and Natural Heritage was adopted by the General Conference of Unesco in 1972. The Convention is not intended to provide for the protection of all properties of great interest anywhere, but only for a selected list of the most outstanding of those from an international viewpoint. Some of the Mediterranean biosphere reserves may become World Heritage sites in the future due to their outstanding universal value.

4. CLASSIFICATION SYSTEM FOR THE MEDITERRANEAN REGION AS A BASIS FOR THE FUTURE DEVELOPMENT OF A REGIONAL BIOSPHERE RESERVE NETWORK

The main goal of MAB Project 8 is to establish a network of representative sites in each of the major biogeographical provinces of the world. The following criteria are to be taken into consideration in selecting these sites: representativeness, diversity, naturalness and effectiveness as a conservation unit. These criteria (explained further in MAB Report Series No. 22) allow also for the selection of unique and man-modified areas, including areas of established, harmonious land use and degraded landscapes. The contribution of such sites to the MAB 8 programme will depend greatly on their value in research and their comparability with the representative sites of the network.

Some form of classification system is necessary in order to evaluate the representativeness of a series of biosphere reserves. A contribution to this, in the form of a global classification system based on biogeographical criteria and prepared by M.D.F. Udvardy, has recently been published by the International Union for the Conservation of Nature and Natural Resources (IUCN) in co-operation with Unesco. This proposes a division of the world into 193 biogeographical provinces, according to floristic and faunistic differences and the broad physiognomy of the vegetation. This inventory of biogeographical provinces is most useful in considering the distribution of biosphere reserves at a global level but is too general to provide a satisfactory detailed framework for the Mediterranean region.

Such a framework is, however, needed for a proper evaluation of the representativeness of the biosphere reserves proposed so far, for the identification of gaps in the network and as a guide to the choice of new biosphere reserves to fill these gaps. An attempt was therefore made at this workshop to define the limits of the Mediterranean region and to draw up a working classification of ecosystems as aids in the selection of biosphere reserves.

4.1 Delimitation of the Mediterranean region

The map in Annex 2 shows approximate boundaries for the Mediterranean region, including, for convenience, part of the Saharo-Arabian region in North Africa and part of the Irano-Turanian region in the Near and Middle East. The limits have been based on the following criteria: in Europe, climate and vegetation; in North Africa and in the south of the Near East, an arbitrary boundary coinciding with the isohyet of 100 mm average annual precipitation; in Northern Turkey, the limits of the Pontic region; in the Near East, an arbitrary borderline with the Irano-Turanian region. These boundaries are adequate for present purposes, but may have to be redefined in

detail as more ecological knowledge becomes available, in particular in the Western Mediterranean, in parts of the Appennines and in the Balkan Peninsular. The boundaries established within the Mediterranean region itself are also approximate, and should be delineated more precisely as further information becomes available.

4.2 A working classification for the Mediterranean region

The proposed classification (Annex 3) is set out in the form of three Tables: one of presumed natural vegetation; the second of the various stages of degradation from the original forest, and of recovery towards it (including for example maquis and garrigue ecosystems); and the third of the main types of agroecosystems. In each of these tables one axis is given by aridity (per-arid, arid, semi-arid, sub-humid and humid), and the other is largely based on altitude and thus indirectly on temperature. An ideal network of biosphere reserves should contain adequate areas representing every cell of these three tables. It should also contain representatives of the various azonal ecosystems of the region (sand dunes, salt marshes, riverine forests, wetlands, etc.).

Natural forest ecosystems. These are defined in the Table by the principal tree species occurring in them. The climax vegetation of most of the Mediterranean region was forest except for some azonal formations and the marginal climatically-determined steppes. This now remains only in fragments which are much altered from their original condition, but in many parts of the region, sufficient to draw reasonable hypotheses about the nature and composition of the original forest. They comprise three broad physiognomic types: coniferous; broad-leaved sclerophyll; and broad-leaved deciduous. But each varies much in composition from one part of the region to another, and the forests contain in all some 40 principal tree species and 50 of less importance. It is clearly important to include in the biosphere reserves samples of each of these forest types in as near natural a condition as possible; and where the remnants are very small or non-existent to extend them or reconstitute them.

Degradation stages of forest and steppe ecosystems. These are mainly defined by the genera or families of shrubs that characterize them. Their distribution follows broadly that of the forest types from which they are derived and shows a partial diversity of species. Various stages of degradation can often be recognized within the area potentially occupied by one forest type. Many of these ecosystems are the product of sustained use for fuel cutting and grazing and can be managed on a sustained yield basis. Their maintenance in this form depends on continuing active management. Elsewhere, they have been overexploited and their soil and productivity have been seriously diminished. In some localities in the region this has led to complete degradation and

loss of all fertility. These communities often contain species which are rare or absent in the original forest.

Main types of agroecosystems. These are defined, in the Table, by the principal crops or grazing animals. They also vary broadly in parallel with the zonal forests that they have replaced. They contain many species, especially ephemeral and geophytic plants, which are characteristic of them and are, in particular, the principal habitat of many of the wild relatives and primitive cultivars of economic cereals and leguminous crops.

4.3 Gaps in the network of Mediterranean Biosphere Reserves

By January 1977 the following sites had been recognized by Unesco as biosphere reserves in the Mediterranean region:

France : the Camargue national reserve
the national forest of Fango (Corsica)

Italy : Collemeluccio - Montedimezzo
Circeo national park

Spain : Ordesa - Viñamala reserve
Grazalema reserve

Tunisia : Djebel Bou-hedma national park
Djebel Chambi national park
Ichkeul national park
Zembra and Zembretta Islands national park

All these 10 biosphere reserves have been formally designated for the Mediterranean region and have been approved by the MAB Bureau which considers that they have the potential for the full development of biosphere reserve functions.

Although these biosphere reserves cover many of the major ecosystems, in particular the forests, there are important gaps. The following are not or are poorly represented:

(1) Thermo-Mediterranean

Argania spinosa
Acacia gummifera
Pistacia atlantica
Tetraclinis articulata
Pinus halepensis
Juniperus (*littoralis* formation)
Quercus suber

(2) Eu-Mediterranean

The ecosystems of deciduous oaks (*Quercus pubescens, Q. aegilops, Q. faginea*)

(3) Supra-Mediterranean

Juniperus thurifera
Quercus pubescens
Quercus infectoria
Abies alba (Mediterranean)

(4) Mountain-Mediterranean

Cedrus atlantica
Abies marocana
Abies numidica
Abies cilicica
Pinus nigra ssp. *laricio*
Pinus silvestris

These deficiencies are largely caused by the absence of reserves in certain parts of the region, notably north west Africa, south east Spain, south France, parts of Turkey, Syria and Lebanon. If reserves were set up in these areas, coverage would be much more satisfactory.

North west Africa. Three or four well chosen reserves (Sous, Rif, Middle Atlas, Babors, Aures) would give a valuable representation of the forest ecosystems.

South east Spain. There should be at least one reserve for *Juniperus thurifera, Pinus nigra* ssp. *clusii* and *P. silvestris* (Mediterranean race).

France. The forests of *Quercus pubescens, Pinus silvestris, Abies* and *Fagus* should be covered; and on Corsica *P. nigra* ssp. *laricio*. The Mont Ventoux area would be valuable in filling most of these gaps.

Turkey. The establishment of reserves in Amanos (for the deciduous oaks, *P. nigra* ssp. *pallasiana, Abies cilicica, Ostrya*) and on the Ayaş mountains (*Quercus pubescens* ssp. *anatolica*, steppes) would be desirable.

Syria and Lebanon. Reserves for the protection of *Q. calliprinos* and *Q. infectoria* would be desirable.

Existing and planned reserves in Greece, Italy and Yugoslavia appear to provide adequate representation of the forest ecosystems in these countries.

From the information available it was not possible to evaluate the gaps in the coverage of modified ecosystems or of agro-ecosystems or transition zones with arid climate. Each country should examine the categories identified in Tables 2 and 3 in order to ensure that the coverage of these also was complete. Attention should equally be given to the conservation of a representative selection of azonal ecosystems.

5. SPECIFIC PROBLEMS IN THE CONSERVATION OF WETLAND, COASTAL AND ISLAND ECOSYSTEMS IN THE MEDITERRANEAN

5.1 Problems of conservation of wetland systems

Compared to the temperate and colder areas to the north, the Mediterranean region is lacking in wetlands. This is due to the relatively sparse and intermittent precipitation and to the geomorphology - many mountains, narrow plains, few extensive deltas and a small tidal range.

For many centuries the area of wetlands has been diminished by drainage for agriculture (notable examples are the Pontine marshes in Italy and the Huleh swamp in Israel). At present the remaining areas are seriously threatened, for further agriculture, for aquaculture, for urban and industrial growth, and for tourism, each of them competing for space and bringing danger of increased pollution. The threats are greatest and most immediate for coastal wetlands but extend to all.

In spite of this about 1 million hectares of natural or semi-natural wetlands still remain in the region, with important concentrations in some countries. An estimated 71 per cent of the population of European palaearctic waterfowl spends the winter in these wetlands, amounting to several million birds. Many sites also contain significant breeding populations of many species, including some that are endangered. Among these are the White and Dalmatian Pelicans (*Pelecanus onocrotalus* and *P. crispus*) in Greece and Turkey, and the White Headed Duck (*Oxyura leucocephala*), of which more than half the world population winters in one site in Turkey. Another species facing extinction is the Bald Ibis (*Geronticus eremotica*) which breeds in very small numbers in Turkey and Morocco.

Mediterranean wetlands cover a wide range of habitats from saline flats in the steppes to freshwater and from the mountains to the coast; and they contain a great variety of genetic material much of it endemic. These ecosystems can very easily be totally destroyed.

Because of the scarcity of the remaining wetlands, their importance as genetic reservoirs and the urgency of the threat, international action is necessary to safeguard them. They should be considered as key areas in any programme to select biosphere reserves in the region. Biosphere reserves, for their part, can play a vital role in maintaining a continuum of Mediterranean wetland ecosystems which could be of great importance to the future needs of man in the region, especially as a source of protein.

Wetlands afford some unusual and difficult problems in management. Because of the hydrological continuity of the system, from mountain catchments, lakes and rivers to deltas, estuaries and coastal wetlands, the maintenance of any wetland depends greatly on the management of the water regime in the whole catchment. This can have important effects also on the continued health of fisheries; for example, *Mugo* spp. or *Atherina* sp. depend on shallow inshore wetlands as spawning areas. Because marine fish production relies so heavily on estuaries, these should be carefully managed against erosion and pollution.

The discontinuous but interdependent nature of wetland ecosystems makes them particularly well suited to the cluster approach for setting up biosphere reserves. Wetland ecosystems have great recuperative capacity and can be restored much more rapidly than those on land; they lend themselves very well, therefore, to studies in management. There is a great need within the region for such studies, which are all the more urgent because of the contribution which these wetlands could make to the declining resources of protein for the people of the region.

5.2 Problems of conservation of coastal zones

Reference has already been made to the ecotone between the sea and land. This zone has exceptional ecological characteristics related to the dynamic processes taking place there. It is characterized by a high biological productivity and is the centre of intense human activity. This applies also to marine islands and the seas immediately surrounding them.

Because of the serious problems affecting these critical habitats and the very great length of coastline in the Mediterranean region, special attention should be given to establishing a representative series of biosphere reserves in the coastal zone. This could build upon, and supplement, the efforts that have been made in recent years to establish marine parks and reserves in the region which have been the subject of a number of international meetings and conferences. Biosphere reserves should, however, place more emphasis on the changing effects of human activities on the coast, notably increased urbanization, tourism, fishing pressure and pollution.

5.3 Problems of conservation of island ecosystems

The meeting recognized the need to establish a number of biosphere reserves for conservation of the great natural heritage found in Mediterranean islands. Such reserves could also fulfil important research and monitoring functions as in many cases islands offer unique possibilities for the study of effects of human impacts. Such research would be carried out under MAB Project 7, 'Ecology and rational use of

island ecosystems', which would benefit from permanent research sites within a future network of Mediterranean island biosphere reserves. These would offer an exceptional opportunity to study under relatively controlled conditions the entire spectrum of ecological, economic and social factors that influence man's relationship with his environment.

Three research themes could be considered in the first place:

- the management of their natural resources by island populations;
- the effect on islands of external influences, especially tourism;
- the effect of alien plants and animals on island ecosystems.

The small size and the relative isolation of islands make the efficient exploitation of resources of paramount importance to their inhabitants. Smallness implies unusually acute spatial constraints on any attempt by the islanders to increase production in the face of population pressure or the need for development. Isolation means that islands suffer seriously from the many economic problems of a marginal location. Moreover, island ecosystems tend to be extremely susceptible to serious, even irreversible, environmental degradation if their resources are mismanaged. It is, therefore, of great importance to islanders that the consequences of external influences or the results of their own actions do not cause long-term damage to their environment. At the same time, islands provide unusually favourable conditions for scientists to study ecological, social and cultural aspects of the management of environmental productivity, and for the formulation and testing of models of human carrying capacity. Islands represent discrete units of manageable size in which scientific measurement is relatively simple. They are also relatively homogeneous in culture and ecology; the influences between man and the island environment and between the island and the world outside can thus be readily identified and measured. Yet between islands there is also great variability, so that valuable opportunities exist for comparative studies. In these circumstances an integrated, multi-disciplinary approach has an exceptional chance of achieving fruitful results.

In addition, and most important, the establishment of biosphere reserves on selected Mediterranean islands could help to preserve the great wealth of local endemic plant and animal species to the benefit of present and future generations.

6. THE DEVELOPMENT OF MANAGEMENT PLANS FOR MEDITERRANEAN BIOSPHERE RESERVES

If the many general objectives of biosphere reserves are to be met (conservation, research, monitoring, training and education), together with any specific local requirements, this can only be ensured by management plans related to well-defined short-term, medium-term and long-term objectives. The careful definition of these objectives is crucial.

In a region such as the Mediterranean which has been under human occupation for millenia the management plans must be set in historical perspective. An understanding of the history of vegetation and the ways in which the natural processes of succession have been modified and deflected by man is essential to understanding the present status of any reserve and to making informed decisions about future management.

The management plan should be based on a comprehensive survey of both natural and cultural factors. It should be subject to review at set intervals and will develop and become modified as the results of continuous monitoring are taken into account.

The participation of the local population in defining the objectives of the management plan and in implementing it is of great importance if the plan is to be successful and the idea of the biosphere reserve widely understood.

6.1 Ecological inventory and cartography as a basis for management

Although some planning can be started immediately, detailed planning will only be possible after a full inventory has been made, including an analysis of existing information, collection of new data, and synthesis and evaluation. A good base map is essential. This inventory need not be restricted to the reserve, but may extend outside if this is necessary to provide a complete picture of the natural and man-modified ecosystem under consideration.

A recommended method to reach planning and management decisions best related to the physical and biological qualities and constraints of a given area starts with mapping each of these to the same scale. The features which can be mapped, according to the needs of the particular survey, are geology, vegetation, fauna, remarkable natural or cultural features, significant natural elements such as the habitats of rare, endangered or threatened plant and animal species, points of visual interest, existing land uses, existing access and circulation, etc. The scales may range from 1:1,000 to 1:100,000 depending on the size of the area under study and the particular objectives of management.

By overlaying and comparing these maps in various combinations important areas can be identified and delimited. These will include, for example: areas of special scientific interest which may be set aside as the core areas of biosphere reserves; areas of more general scientific interest which may be included in either the buffer zone or the peripheral zone; areas or points of conflict between existing or proposed uses which might be the subject of research; areas suitable for particular development; and areas of existing or possible visitor pressure.

Planning based on this information will enable each biosphere reserve to make its best possible contribution within the social and economic circumstances of the region.

6.2 Research and its relation to management

As one of the main purposes of the biosphere reserve is to lead to greater understanding of the interactions between man's activities and his natural surroundings, this should be a prime target of research; and management, based on this research, should be directed at developing a harmonious relationship.

Basic studies should include the following: the history of vegetation in relation to past climatic change; the effects of changing human land use on natural ecosystems; the progress of deforestation and land degradation related to the development of technology (for example, cultivation, irrigation, charcoal burning metallurgy), trade patterns, periods of instability, etc.; the productivity and utilization of range lands; interrelationships between wildlife and domestic stock and their competition for food; nutrient and energy cycling and the role which the various components in the ecosystem play in this process; the possible impacts of modern agricultural technology on the natural and man-modified environment; and studies of the socio-economic factors affecting the lives of the rural population and how this will further influence man's impact on the environment.

Natural ecosystems should be studied in order to obtain baseline data against which the effect of man's activities can be assessed.

In order to make a proper evaluation of present and future demands on the environment studies should also be made of the economic interaction and interdependence between transhumant and sedentary populations in different political, social and economic settings. Population parameters, settlement and communication patterns, and the educational status of the population should be considered. Although sociological and economic studies deserve their appropriate places in a biosphere reserve programme,

ecological studies should be given the focal attention, because it is ecological processes - whether natural or man-modified - which are of main concern.

6.3 Monitoring of the natural and human environment

As studies in biosphere reserves should have a continuing influence on management, it is essential that an adequate monitoring programme is designed at an early stage to analyse appropriate environmental variables and that this should be adequately staffed and implemented.

The particular factors to be monitored must be decided for each biosphere reserve according to its particular circumstances, but should include the main physical, biological and human variables. The intensity of study must, of course, be related to the resources available. Long continued, consistent observations and measurements are of particular value. The principal purpose of monitoring is to be able to guide the future course of management of the reserve in order to develop balanced and sustainable patterns of conservation and of human use that are in harmony with the natural environment.

6.4 Development of a programme schedule

It is important that a programme be devised, for the timing of various phases of the management plan, and to improve co-ordination of activities. This should be based on an assessment of priorities in relation to available resources. It will vary from reserve to reserve and should take account of the various requirements mentioned above.

6.5 Organizational aspects

One of the most important aspects of a study is programme analysis. This should be undertaken at regular intervals in order to ensure that studies are not only made in the proper sequence, but also that they are adequately integrated and are producing results.

Much data is required to obtain satisfactory solutions to such complicated problems. The analysis of accumulated data will be a considerable undertaking, requiring the co-operation of statisticians, modellers and planners under the supervision of a leader of task analysis who is able to co-ordinate activities. Task analysis - an evaluation of the various jobs assigned to investigators - is one of the most important components of programme analysis, as it will disclose gaps of information

where team work between scientists will be required and will indicate how a study can best be finalized.

If trained staff are in short supply, or there are other constraints, much can be accomplished by simple management plans; but, whenever possible, a fully developed programme of management, research and monitoring should be started with the results of research and monitoring used to modify and improve the process of management.

7. ASPECTS OF LEGAL PROTECTION OF BIOSPHERE RESERVES

Biosphere reserves are not only important for *in situ* conservation of the diversity of plant and animal species and ecosystems for future generations, but also as permanent sites for ecological studies and for monitoring and training activities. Long lasting protection must therefore be provided through appropriate legal measures. Requirements vary, however, from the strict preservation needed for core zones to less stringent regulations of human activities in other zones to enable the objectives of research, restoration work and conservation management to be accomplished.

This question is dealt with more fully in Annex 4. The main points are:

(1) that biosphere reserves can be established under existing legislation dealing with planning and the establishment of protected areas;

(2) legislation should provide for a graduated series of planning constraints; and

(3) there is no need for a separate legal category of biosphere reserve.

8. IMPLEMENTATION AND CO-ORDINATION OF THE MEDITERRANEAN BIOSPHERE RESERVE NETWORK

With the establishment of 10 biosphere reserves and the additional proposal of 18 sites at the Side workshop by national delegations, a Mediterranean biosphere reserve network is taking shape. At the national level, the time has come for elaboration of concise operational plans for biosphere reserves, taking into account links with other biosphere reserves within and outside the region.

Effective international co-ordination and co-operation depends on exchange of information and a good communication system. As a first step it may be advisable to concentrate efforts on a few selected biosphere reserves as pilot areas. These may require bilateral or multilateral international assistance for exchange of personnel, expert advice, or exchange of knowledge and techniques, etc.

Some countries should develop national centres, from which others may benefit, for conservation, research, monitoring, and education in biosphere reserves and their management. Advantage should be taken of already existing national parks, biogenetic reserves and other protected areas to form the nuclei of new biosphere reserves. In this respect there are promising prospects of co-operative arrangements with the Council of Europe to use certain biogenetic reserves as parts of biosphere reserves.

8.1 Establishment of national operational plans and requirements for their execution

All national delegations represented at the workshop expressed an interest in developing more detailed operational plans, but most of them mentioned certain difficulties.

Egypt. The National Committee for MAB has recently developed some proposals for initiating biosphere reserves. The Academy of Scientific Research and Technology has established a National Committee for the Conservation of Nature to carry out joint activities with the IUCN, and to be responsible for the study and realization of activities and programmes related to MAB Project 8. This committee works in close co-operation with the National MAB Committee.

At present there are no biosphere reserves in Egypt. The major task of the National Committee for the Conservation of Nature is to concentrate its efforts, and to act as a pressure group to establish an operational plan for priority areas to be designated as biosphere reserves, with financial and technical assistance from national and international organizations.

A preliminary survey of potential areas has been carried out, taking into consideration those areas already proposed previously by the National Committee for MAB. These potential areas are:

- the Ras-el-Hekma area (north-west coast);
- one or more small oases in the western desert;
- Gabal Elba (southern Red Sea mountains);
- St. Catherine Mountain;
- Gabel Ouenat (south-west corner);
- Lake Bardawil;
- Ghardagua (Hurghada);
- Lake Nasser;
- a wadi in the eastern desert;
- Khattarah Depression;
- a lagoon area on the north coast;
- north coast of Sinai.

Most of these will meet the criteria for the selection of biosphere reserves.

The north west coast area (area No. 1) seems to be a particularly high priority site for a biosphere reserve. Accordingly, the Department of Natural Resources, Institute of African Research and Studies, Cairo University, is carrying out a feasibility study in order to designate this area as a biosphere reserve.

Egypt is in need of more information about biosphere reserve programmes in other countries and would welcome the visit of a mission. Egyptians should be offered training in research programmes in other countries, particularly in France and Iran. The convening of a workshop for establishment of a network of biosphere reserves representative for arid and semi-arid ecosystems in Northern Africa and the Near and Middle-East was recommended.

France. The French MAB Committee has warmly endorsed the concept of biosphere reserves and has proposed two biosphere reserves which were agreed upon in 1976 - the Delta of the Camargue and the Valley of Fango in Corsica. The former is already a 'natural reserve' in the legal sense of the term, but the latter does not yet enjoy juridical status. This is one of the primary difficulties that has been encountered as a

specific legal status has not yet been given to these reserves which takes into account the objectives and criteria of biosphere reserves.

An effort has been made, especially in scientific matters, to respond to the general resolutions adopted by the MAB Mediterranean Scientific Conference which was held at Montpellier in 1976. These resolutions should lead to the determination of rational criteria for the implementation of biosphere reserves so that they could better serve as samples of ecosystems of universal interest. Thus, a preliminary typology of the ecosystems of the Mediterranean forests has been worked out jointly with ICONA, Spain, for evaluation of the representative character of biosphere reserve sites.

Similarly, as was pointed out at the regional MAB meeting which was held in Potenza, botanical reserves and genetic banks are, or will shortly be, set up. The Centre of Porquerolles specializes particularly in endangered or threatened Mediterranean species, while the Centre of Brest is more concerned with palaearctic species.

The French delegation expressed the wish to see a continuation of efforts to co-ordinate the present programmes of conservation (especially the biogenetic reserve network which has been under development for several years by the Council of Europe), and to make these complementary to one another.

In conformity with the resolutions adopted by the Montpellier Conference, it is hoped that criteria will be elaborated for the international functioning of biosphere reserves, particularly in relation to exchange of information, research and training.

The French delegation made two formal proposals to the workshop: that the drawing up and dissemination of scientific programmes for each biosphere reserve be based on a sample programme, established at the regional level; and that national committees ensure that proposed biosphere reserves are covered by a minimum status of protection, ensuring the long-term protection of core zones and the following-up of activities and objectives related to conditions in buffer and manipulative zones, with a view to perfecting them gradually in the spirit of MAB Project 8. Further it expressed satisfaction about the collaboration which continues between the various international organizations, thus stimulating networks of protected zones, and more particularly about the complementarity between the biogenetic reserves of the Council of Europe and the biosphere reserves of the MAB Programme.

It was also recommended that more information about work in biosphere reserves be made available to the public, in order to make them more aware of the importance of the programme.

The French delegation recognized that certain ecosystems should be included as reserves in order to fill some of the gaps not presently covered by the network. France also offered to make specialists available to other countries in the region and to provide training in existing facilities in ecological inventories, research, methodology, and natural resources management.

Iran. Nine biosphere reserves have been proposed and accepted by Unesco. Among these, the Turan reserve is now being studied by a group of scientists and a research centre will be constructed there. Six of these biosphere reserves are also national parks. Four master plans for national parks have been completed, and similar plans for the remaining parks will be finished within five years. The plans will have to be modified to meet the requirements of the biosphere reserve programme. Iran is in need of foreign assistance in park planning, management and interpretation, and therefore welcomes co-operation provided by others. Training of Iranian personnel in various aspects of park management, such as by offering short courses, is also badly needed.

Iran proposes to ask Unesco for assistance in the preparation of a workshop in the Turan biosphere reserve in 1978, to train scientists from other countries in certain research procedures on a team work basis.

Italy. Although three biosphere reserves have been proposed, only two have become a reality so far, namely Circeo and Collemeluccio-Montedimezzo. The Circeo reserve is given the greatest amount of attention, because of its floristic, faunistic and landscape values. Plans to increase the size of the area have not been accepted, because of local real estate and touristic interests. However, the shore lagoons will be included. Because two towns are situated within the reserve, there will be the opportunity to study man's impact on the area. It is hoped that other MAB field projects can be undertaken in this reserve as well. It is intended to make the Circeo study a truly integrated project.

Plans are under way to establish biosphere reserves in Sardinia, on the Etna volcano, and also near Rome. Beyond this there are no plans for further biosphere reserves, because of the extensive commitments required to develop these reserves properly.

Facilities and specialists are available in Italy for the further training of scientists of other Mediterranean countries.

Portugal. A State Secretariat for the Environment has been established and a system categorizing four types of parks and reserves has been set up. A national MAB Committee will soon be established and it is hoped that plans for establishing biosphere reserves will be implemented soon.

As many as 80 different areas have so far been identified as suitable sites for national parks or reserves. Potential sites will continue to be identified in order to obtain a better idea of what is available. After completion of this survey, requests will be submitted to Unesco on reserves appropriate for inclusion in the Mediterranean biosphere reserve network.

The Peneda-Geres national park, covering 70,000 ha, was established in 1971. Since then other reserves have been created.

The Portuguese delegation felt that phytosociological and biocenotic studies should be launched within a suitable international framework which could be MAB. Portugal is seeking advice on this and other technical matters and may request international assistance.

Spain. ICONA (The Institute for Nature Conservation) has the responsibility for MAB Project 8. Programmes are envisaged at four levels: (1) national, (2) the Iberian peninsula, (3) the western Mediterranean region, and (4) the entire Mediterranean region. ICONA is particularly involved in the preparation of information and education materials dealing with conservation problems aimed at schools, universities and the general public. Conservation education is accomplished through conferences, courses, films, and the publication of two magazines, booklets and leaflets.

Two biosphere reserves, the Ordesa-Viñamala and the Grazalema reserves, have been formally designated by Unesco. The former is a reserve that characterizes the Mediterranean region. The latter is of particular interest, not only from the genetic aspect, but also as an area set up for the conservation and development potential of *Abies pinsapo*.

A plan for the establishment of 10 new reserves has been worked out. Their sizes and characteristics are very different. Some may be of specific interest, like the Las Tablas de Daimiel reserve which is a nesting and resting area for migratory birds.

ICONA has accepted with gratitude the responsibility given to it at the Montpellier Conference, to define the basis for the creation of a Mediterranean network of biosphere reserves. It has also, in liaison with French scientists, produced a

report on the typology of Mediterranean ecosystems and a provisional map of the Mediterranean region. ICONA is prepared to assist other Mediterranean countries in the implementation of their biosphere programmes on a bilateral basis.

Tunisia. A rather detailed analysis of the various climatic zones, geological and geomorphological conditions, and various types of forest vegetation was presented. The system used is in line with the overall classification system outlined in this report and may thus be used as a model for a national procedure in examining needs for the establishment of biosphere reserves.

The forest vegetation consists of the following series:

- *Quercus faginea*
- *Quercus suber*
- *Olea europea* and *Pistacia* sp.
- *Quercus ilex*
- *Pinus halepensis*
- *Quercus coccifera*
- *Tetraclinis* spp.
- steppes
- zonal formations
- azonal formations

This extensive classification system reveals quite important gaps in the existing reserve network which will guide future national efforts in attaining a more complete coverage.

Four biosphere reserves have been proposed and accepted by Unesco, namely: Djebel Chambi national park (6,000 ha); Ichkeul national park (10,770 ha); Djebel Bou-Hedma national park (10,625 ha) and Zembra and Zembretta islands (386 ha of maquis and 3,639 ha of marine environment).

Tunisia requires further training for its specialists in other Mediterranean countries which have more experience in the field of management and ecological research and monitoring.

Turkey. Although Turkey has a great wealth of endemic species and genetic materials, it has not yet proposed sites for inclusion in the biosphere reserve network.

The Ministry of Forestry has already set aside 16 areas as national parks, 37 as protected forest lands and 30 as wildlife reserves. An outstanding wetland ecosystem, Kuscenneti, has already been awarded a Class A European Diploma by the Council of Europe. A pure stand of *Quercus vulcanica*, localized near Kovada Lake (Southern Turkey), is under a special protection status. These two areas, as well as a stand of *Liquidambar orientalis* will be proposed for inclusion in the biogenetic reserves network of the Council of Europe.

In the light of the discussions during this meeting and in the course of the excursions to both Köprülü Kanyon and Olympos-Beydağlari National Parks, the Turkish MAB National Committee proposed that extensive natural and cultural areas become biosphere reserves. These are listed on page 45.

Six of these areas are to be officially declared, in the very near future, as biosphere reserves and the Committee will make its official submission to Unesco in due course.

The Turkish MAB National Committee intends to start action in the field of these six biosphere reserves as soon as possible. This action will progress in the following order:

- Inventory and basic ecological studies
- Planning
- Management
- Research, monitoring, base-line studies
- Education and training

The existing Governmental organizations involved in similar conservation work have already some experience in certain aspects of this particular field. At present, there are a limited number of officials from conservation organizations in the MAB National Committee, but it is planned to invite further national experts, particularly from the recently established General Directorate of National Parks and Wildlife of the Ministry of Forestry, who could take actual responsibility for carrying out the Committee's plans of action. A MAB Project 8 sub-committee may be established and located in the General Directorate of National Parks and Wildlife, following the recommendation of the Side Workshop.

The Committee is well aware of the fact that this organization is in need of experts to cope with the work involved in establishing biosphere reserves and carrying

out scientific studies and research. MAB Committees of other countries are therefore invited to assist Turkey in the accomplishment of these tasks.

As for scientific research, monitoring and baseline studies in biosphere reserves, the Committee would be very much in favour of establishing a Research and Training Centre to deal with major environmental problems of the Eastern Mediterranean Region in Antalya. This Centre could also act as a logistic base for international co-ordination of information in the Region. Such a Centre, mainly to be financed out of national sources, should also be supported by Unesco and other international organizations, and receive continuous technical assistance from these organizations and other MAB National Committees under bilateral and/or multilateral agreements. The International Ecological Research Centre in the Antalya Region would be open to researchers from all over the world, particularly from the Mediterranean region, thus providing a scientific basis for proper management of biosphere reserves as well as management policies for other natural reserves and for regional development, with particular emphasis on conservation.

As a most urgent prerequisite for getting field work started, Turkey needs to train staff as soon as possible and put them in charge of the implementation of the Man and Biosphere Programme, particularly MAB Project 8. In this connection, Turkey would like to ask Unesco to mobilize resources for providing assistance to Turkey in recognition of the great task involved and from which the whole Mediterranean region could benefit.

In order to draw up a specific plan for the establishment of both Turkish biosphere reserves and the Research and Training Centre in the Antalya Region, Turkey would highly appreciate having an adequate number of experts from well experienced countries through Unesco. These would include an ecologist-planner, landscape architects, information specialists for the visiting public, resource management specialists, wildlife biologists, a marine biologist and a plant biologist. Turkey would also like to have interpretive materials produced by other countries, such as Spain.

USA. (observing country). The USA established a national MAB Committee in 1972 which is guiding all MAB activities. Assisting this Committee is a MAB Secretariat. Individual directorates have been established for the 14 MAB projects. The directorate for MAB 8 is co-chaired by representatives from the US Forest Service and the US National Park Service.

There are at present 28 biosphere reserves, ranging in size from 600 to 3 million hectares. A major conflict of single-purpose reserves is the potential incompatibility

between the conservation and manipulative research objectives of the MAB programme. The biosphere reserve cluster concept was developed to overcome these difficulties.

Among the major ongoing activities is an Information Synthesis Project, established for the purpose of acquiring and organizing the relevant information base concerning the US biosphere reserves. Specific tasks include:

(1) A description and characterization of the reserves;

(2) An evaluation and analysis of these sites as systems;

(3) A summation of existing research and monitoring projects in each reserve; and

(4) A bibliography of the information about these sites.

Another activity is the organization of regional workshops to encourage the development of collaborative programmes and to stimulate the development of research and monitoring programmes. Three such workshops have been held so far.

Since the beginning of MAB Project 8 activities, the USA has stressed the need for communications planning, a process by which a project's past, present and future communication needs are examined in the context of a programme's overall goals and objectives. An overall communications plan has been developed. This communications plan includes the full range of information exchange methods that are related to MAB Project 8.

The USA could provide assistance in international co-operation. For example, the regional workshop scheduled for biosphere reserves in California for 1978 could be attended by scientists from the Mediterranean region and visitors could be given a tour of existing biosphere reserves.

The USA would also like to assist in identifying gaps in an international network.

Yugoslavia. So far only the Tara River reserve has been officially recognized as a biosphere reserve.

The Yugoslavian delegation proposed that the network of biosphere reserves be linked with the 'Collection of specimens for future reference' programmes of WHO in a joint effort to establish Environmental Specimen Banks.

In the biosphere reserve in the Tara River basin, data on vegetation, pedology, climate geomorphology, etc., are being collected for the preparation of various base maps. This will be followed up by an analysis of data. The river Piva with similar ecological characteristics and flowing close to the Tara river has been harnessed for hydroelectric power and offers good possibilities for a comparative study of the effects of development.

The Velebit Mountain biosphere reserve will be formally proposed for official Unesco recognition. This area has already been extensively studied by the University of Zagreb and the Institute for the Protection of Nature of Croatia. Further research will be undertaken.

The existing state laws of Montenegro and Croatia cover the legal aspects of biological reserves in a general way. Bearing in mind the conclusions of the Side workshop, however, special statutes will be proposed for these reserves for approval by the respective authorities.

Management, research, training and education of the population will be undertaken in accordance with the spirit and conclusions of the workshop.

At a certain stage, some technical and financial aid and/or co-operation from Unesco and other agencies or countries on a bi- or multilateral basis will be needed.

8.2 Aspects of regional implementation and co-ordination

In addition to national operational plans, regional co-ordination should be strengthened through exchange of information within a regional communication network, to share knowledge, techniques and methodological approaches, and to make full use of existing training facilities.

As already stated, a major objective of MAB Project 8 is to improve the well-being of human beings with regard to a well-balanced use of man-modified and natural ecosystems. In order to accomplish this objective, it is mandatory that the population living in and around biosphere reserves is brought up-to-date not only with the objectives of ongoing studies, but also with the immediate and ultimate objectives of the management of these reserves. Accordingly, a well organized programme of information and communication will be required.

Information would include the following aspects:

(1) A description and characterization of various existing biosphere reserves;

(2) An evaluation and analysis of, and comparison between, these sites as part of the total network of biosphere reserves in the region;

(3) A summation of existing research and monitoring projects in each reserve;

(4) A bibliography of the information about these sites;

(5) A synthesis of the above information.

Such information will improve understanding of the work in progress. It will also be available for national or regional training programmes dealing with biosphere reserves.

A communications plan includes the full range of information exchange methods, informal as well as formal, that are related to MAB Project 8 and also provides for direct communication such as workshops and symposia; information gathering techniques such as surveying and interviewing; and information handling and delivery systems such as mass media contacts by TV spots, slide shows and newsletters. It is important that the population resident in a biosphere reserve becomes involved in the work that is in progress or is planned. This implies that the various co-operators in such work keep in close touch with the people concerned about their activities and that these people be involved in any land use manipulations that are contemplated.

In situ training of specialists in selected biosphere reserves representing different examples of Mediterranean ecosystems is very much needed. Examples of suitable biosphere reserves for such a purpose include the Camargue in France; forest ecosystems and maquis typical for the western Mediterranean region near Mont Ventoux, France; Ichkeul biosphere reserve in Tunisia, the Antalya region for the eastern Mediterranean and the Turan biosphere reserve in Iran for desert ecosystems.

Workshops and training courses are also important elements in the Mediterranean region. Specific proposals submitted during the deliberations in the workshop included a workshop on techniques of cartography and mapping systems for biosphere reserves and also a course for the training of biosphere reserve and park managers.

The ICONA in Spain and the proposed Antalya Centre in Turkey should be developed respectively for the western and eastern Mediterranean as focal points for exchange of information and training.

8.3 New proposed biosphere reserves for the Mediterranean network

It is gratifying to know that already - considering the relatively brief duration of the MAB Project 8 programme - so many biosphere reserves have been established and that many others are in the process of being nominated. Many gaps in the network continue to exist, however. It is hoped that these will be identified and filled in the foreseeable future.

The following new sites have been proposed as biosphere reserves:

Turkey

(1) Köprülü National Park. (This is suggested as a suitable site for the Antalya Research Centre. It contains some important historical monuments.)

(2) Olympos - Beydağlari National Park. (It contains very important historical monuments.)

(3) Dilek Yarimadasi National Park. (A large peninsula.)

(4) Marmaris Datça Yarimadasi National Park. (A large peninsula, considered to become a land as well as a marine park.)

(5) Kerme Körfezi (proposed) Marine Park. (A large bay.)

(6) Sultansazligi Wetland Reserve. (It is of international significance because of the great variety of aquatic birds.)

(7) Muş Ovasi. (A vast plain.)

(8) Kaçkar Dağlari.

(9) Çoruh Vadisi.

(10) Munzur Dağlari.

(11) Munzur Vadisi.

(12) Konya-Bozdağlari.

(13) Aladağlar.

(14) Uludağ National Park.

Spain

(1) Sierra de Santo Domingo.

(2) Serranía de Montalbán.

(3) Tejera Negra.

(4) Castañar de Hervás.

(5) Las Batuecas.

(6) Tablas de Daimiel.

(7) Sierra de las Nieves.

(8) Sierra de Gador.

(9) Sierra del Buitre.

(10) Lugar Nuevo.

Yugoslavia

Velebit Mountain.

8.4 Co-operative arrangements with Council of Europe

At the workshop a co-operative arrangement was reached with the Council of Europe, recognizing the complementary role and functions of the network of biogenetic reserves of the Council of Europe and the Biosphere Reserve network of Unesco. Three specific cases were singled out in which biogenetic reserves could form part of biosphere reserves:

(1) biogenetic reserves fulfilling the criteria for biosphere reserves. In this case Member States of the Council of Europe will be asked to include such biogenetic reserves in the biosphere reserve network;

(2) biogenetic reserves constituting a core zone of biosphere reserves;

(3) biogenetic reserves forming part of a cluster biosphere reserve.

9. RELATIONS WITH INTERNATIONAL ORGANIZATIONS AND PROGRAMMES

At the workshop, representatives of the United Nations Environmental Programme (UNEP), the Council of Europe, the International Union for the Conservation of Nature and Natural Resources (IUCN) and the International Council for the Preservation of Monuments and Sites (ICOMOS) described how the work of their organizations is related to MAB Project 8.

9.1 UNEP

The representative of UNEP conveyed the good wishes of the Executive Director of UNEP to the meeting. The MAB Programme, and perhaps especially MAB Project 8, is considered of great importance by UNEP. Various parts of the UNEP programme are especially related to the MAB Programme, in particular the part devoted to the 'Conservation of ecosystems and genetic resources' under which UNEP provides support both to Unesco and IUCN; the Earthwatch Programme of monitoring to which it is hoped that biosphere reserves would make a notable contribution; and the programme on oceans. He also presented a synopsis of the action being taken as a result of the Expert Consultation of Mediterranean Marine Parks and Wetlands (Tunis, 12-14 January, 1977) with particular reference to its connection with the biosphere reserve programme.

9.2 Council of Europe

The Council of Europe is an intergovernmental organization in Western Europe created in 1949, and has been working since 1962 on environmental matters. The responsible organ in this field is the European Committee for the Conservation of Nature and Natural Resources. This Committee is composed of high officials from the Ministries concerned with environmental problems in the member countries. The European Committee has at its disposal technical bodies (e.g. expert groups, etc.) which put into practice the projects included in the programme of work proposed by the European Committee and which are responsible for its proper execution. In the field of environment the medium-term programme of work (1976-1980) consists of more than 25 activities. The programme is focussed on the problems of the biological environment: the flora, the fauna and the biotopes. Some of these activities are complementary to the MAB programme, particularly to MAB Projects 2, 5, 6 and 8.

Co-operation with Unesco has been and is still very close and fruitful. An example of this co-operation is the MAB Technical Notes 2 entitled 'Mediterranean forests and maquis: ecology, conservation and management', the maquis part elaborated by Prof. Tomaselli for the Council of Europe, and published jointly with the contributions of Prof. Morandini and Prof. Quezel on Mediterranean forests by Unesco.

MAB Project 8 and the activity of the Council of Europe, called the European network of biogenetic reserves, complement each other harmoniously as the common objective is to regroup in the network of the Council of Europe and Unesco a representative selection of our habitats, biocenoses and ecosystems.

Concerning Resolution 17 of the Committee of Ministers of the Council of Europe, adopted in 1976, in which the aims and the criteria of biogenetic reserves have been determined, individual States can propose one or several habitats, biocenoses or typical and unique ecosystems, endangered or rare, and which should be oriented in accordance with ecological principles.

As this project is limited to Europe, the principles and the criteria which should pertain to a biogenetic reserve are adapted to European conditions. Due to the high population density and to the parcelling out of ecosystems, it is useless to hope to be able to include large, intact examples of all biogeographical regions in the European network. Such a policy could be conceived in other continents than Europe. The area of biosphere reserves in the United States, for example, varies from 3 million to several thousand hectares. Only one reserve has less than 1,000 ha. In Europe, due to these factors, it is very important to include in the network of biogenetic reserves, small areas of only a few hectares together with large areas, as these frequently give shelter to typical, unique, rare or endangered plant and animal species. As its activity is complementary to that of Unesco, the European network of the Council of Europe could constitute a contribution to the universal network of biosphere reserves.

It might be of interest to review the activities of the Council. At present, France has proposed 15 areas, Italy 43, Luxembourg 1, the Netherlands 2, Norway 1, and Portugal 3 for inclusion in the European network of biogenetic reserves. The areas range from several thousand hectares to less than 10 hectares.

It is hoped that other countries will follow and propose sites for the universal biosphere reserve network of Unesco and/or that of the Council of Europe and that thus a big step will be taken towards safeguarding our natural patrimony.

9.3 ICOMOS

The representative of ICOMOS stated that the MAB and ICOMOS programmes resembled each other in several aspects. As cultural heritage can be found almost anywhere in the Mediterranean region, this should be incorporated into biosphere reserve activities

9.4 IUCN

The representative of IUCN informed the meeting that one of the principal objectives of IUCN is to promote and stimulate the conservation of ecosystems and the populations of plants and animals they contain, together with the genetic resources represented by these populations. This should be accomplished within the framework of good land use planning and balanced development. Among other means, it can be brought about by a network of protected areas, whatever these may be called. It is the objective that is important and the means to bring it about - nomenclature is of secondary importance, though the introduction of such a term as 'biosphere reserve' has brought about an important new burst of activity.

IUCN has been closely associated with Unesco since the beginning of MAB in developing the concept of biosphere reserves and in promoting their establishment. At present the principal contribution of IUCN is two-fold: assistance in developing concepts and criteria, and stimulus towards the creation of biosphere reserves in IUCN's regional programmes. A further contribution to the conservation of genetic resources is IUCN's threatened plants programme.

On concepts and criteria, IUCN through its Commission on National Parks and Protected Areas, has prepared a document on the relation between biosphere reserves and other categories of protected areas. After comments by MAB National Committees, this will be published jointly by Unesco and IUCN. A further study is being made of the aims of various kinds of protected areas, the criteria for each, means of achieving proper conservation in them and the problems of nomenclature.

Coming to the Mediterranean, there are two relevant activities:

(1) the Threatened Plants Committee of IUCN has made a study in co-operation with the Council of Europe of the threatened plants in the countries of Europe. This is now being extended to the countries around the Mediterranean;

(2) IUCN will be engaged in a Mediterranean programme starting in 1978 in which priorities for action will be identified and assistance provided where possible. IUCN looks upon this meeting as a very important starting point and will continue to act in the closest co-operation with Unesco in promoting action.

10. CONCLUSIONS

The following conclusions and/or agreements were reached during the workshop:

(1) *It was agreed that it would not be profitable to try to define too rigidly the boundaries of the Mediterranean region; they should be interpreted in a flexible manner. In North Africa, for example, part of the Saharo-Arab Region and in the Near East part of the Irano-Turanian Region could be included in the Mediterranean biosphere reserve network.*

(2) *The criteria for typology which were presented (namely, matrixes for natural forest ecosystems, degraded ecosystems including steppes and agro-ecosystems) were considered acceptable as working classification systems for Mediterranean biosphere reserves. Although the vegetation is the major variable on which this classification framework is based, this does not imply that in the future it should necessarily be given priority in comparison with zoological criteria. These should equally be taken into consideration as more data becomes available.*

(3) *Establishment of biosphere reserves should be relevant to ecological requirements and situations in the Mediterranean, and priority should be accorded, among others, to:*

- *the critical problems of ecotones and transition zones;*
- *the problems of the relations between socio-economic development and conservation;*
- *a multidisciplinary research to monitor and evaluate the ecological and socio-economic effects of the impact of human utilization;*
- *the problem of regeneration of degraded ecosystems and landscapes;*
- *representativeness in view of the problems of conservation of the diversity of natural and man-modified ecosystems in the Mediterranean;*
- *complementarity within the national and regional network.*

(4) *Much emphasis should be given to the transition zones or ecotones between biogeographic regions and different kinds of ecosystems, and particularly between aquatic and terrestrial ecosystems. These are to include coastal areas or estuaries, wetlands, small islands, and small marshes or ponds.*

(5) *Man's impact on his environment should be considered an important and integral component of the concept of biosphere reserves. Four levels of intensity of human influences should be studied:*

- *no human influence whatsoever in core areas of biosphere reserves;*
- *some human influence in buffer zones surrounding these core areas;*
- *traditional land use in buffer or fringe zones of biosphere reserves;*
- *intensive management in fringe zones allowing for a comparison of major development schemes, outside biosphere reserves, with less intensive management and natural situations to be studied within the biosphere reserve. In some cases the establishment of a cluster*

biosphere reserve should be envisaged to link up separate conservation and research areas.

(6) *Diversity should be recognized as an important criterion for biosphere reserves. This concept should also include series of ecosystems affected by different stages of degradation.*

(7) *Historical and pre-historical sites and monuments and the historical impact of man on his environment should be studied within the context of biosphere reserves.*

(8) *Management plans for biosphere reserves should follow the major goals of the programme, namely conservation, research and monitoring, and training/education. They should also be in close accord with the involvement of man in these reserves and reflect the international nature of Project 8. Management should be problem-oriented and take short- and long-term objectives into account. Although biosphere reserve research should start with simple surveys and inventories, making use of available personnel, certain sophisticated techniques, particularly for monitoring, might be used from the start.*

Scientific research should:

- *be organized on a continuing basis;*
- *be directed towards setting up methods and models for restoration of natural conditions wherever necessary, and towards the management and development of natural resources, in ways which might also be applied in land use development and natural resources management outside reserves;*
- *be based on understanding of the structures, functioning and dynamics of the ecosystems.*

(9) *Each country should make an inventory of its ecosystem types and representative areas, and this information should then be evaluated as far as possible on the basis of a working system of classification for national biosphere reserves, taking into account the regional and global framework of MAB Project 8. Recognition of the status of biosphere reserves includes international recognition and national legal status. Recognition by Unesco requires three steps, namely an official request by a MAB National Committee, approval by the MAB Bureau and the issuing of a formal certificate by Unesco. With regard to the national legal status, there appears to be ample flexibility in already existing legislation and there does not seem to be any need for new legislation.*

(10) *With regard to a future plan of action, there are still gaps in the regional network, which should be filled if at all possible in the near future by countries' proposing new sites for biosphere reserves.*

(11) *Training and education were generally considered inadequate and should be greatly increased because their absence limits progress significantly. There is a need for regional and inter-country co-operation in workshops and exchange of personnel. Unesco can play an important catalytic role in this. An information bulletin should be published to serve the countries in the region; this would require assistance from the MAB Secretariat.*

Exchanges of information between MAB Committees with similar scientific and practical problems should be intensified.

(12) *There is a need for better co-ordination at the national and international levels; co-ordination at the international level is enhanced by effective co-ordination at the national level. Close co-ordination and co-operation should be established between the biosphere reserve programme of Unesco and related programmes supported by UNEP, FAO, IUCN and the Council of Europe in the Mediterranean region.*

An agreement was reached between Unesco and the Council of Europe on three levels of co-operation:

(1) the recognition of selected biogenetic reserves as biosphere reserves,

(2) the functioning of a small biogenetic reserve as a core for biosphere reserves, and

(3) the possibility of several biogenetic reserves forming part of a cluster biosphere reserve.

(13) *Germplasm banks should be set up on a multicountry or regional basis to ensure the survival of important gene pools.*

(14) *An inventory should be made in each country of endangered species of plants and animals and special efforts should be made to protect these species in appropriate reserves.*

ANNEX 1

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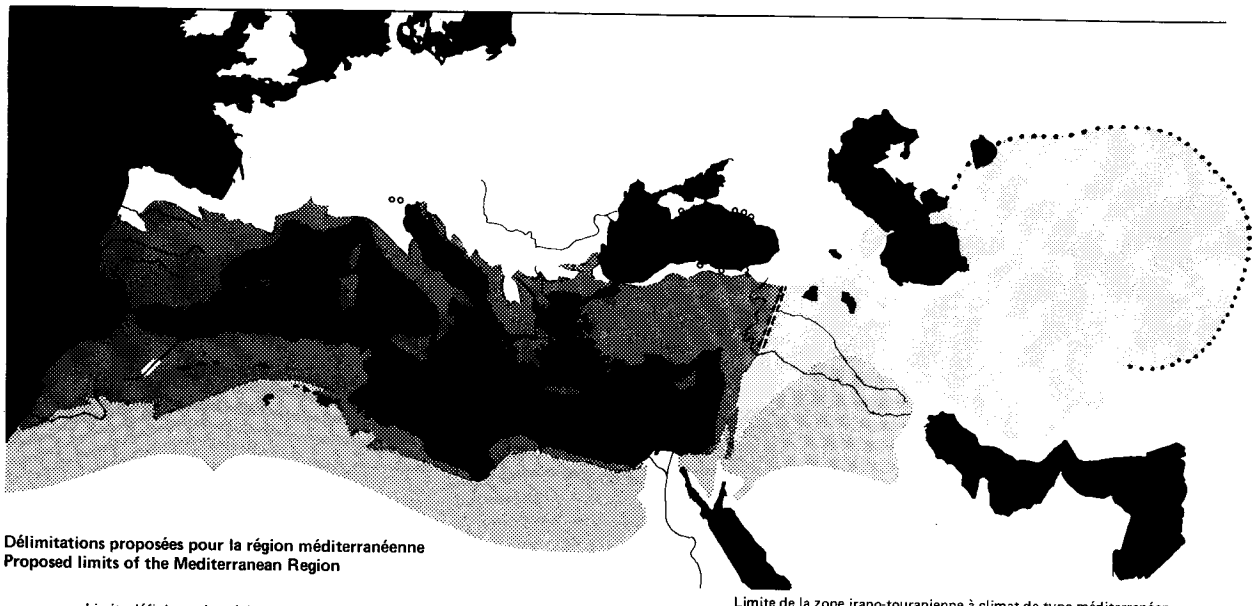
ANNEX 2

WORKING MAP REPRESENTING LIMITS

OF THE MEDITERRANEAN REGION



Délimitations proposées pour la région méditerranéenne
Proposed limits of the Mediterranean Region

Limite définissant les régions de climat et de végétation de type méditerranéen.
Boundary of regions with Mediterranean climate and vegetation.

Enclaves de végétation méditerranéenne.
Areas of Mediterranean vegetation.

Lisières de la zone semi-aride et aride climatiquement influencée par la zone méditerranéenne.
Boundaries of the semi-arid and arid zone climatically influenced by the Mediterranean zone.

Limite de la zone irano-touranienne à climat de type méditerranéen et à flore d'origine mésogéenne.
Boundary of the Iranian-Turanian zone with a mediterranean-type climate and a flora of mesogean stock.

Limite imprécise (le climat de la zone irano-touranienne a tendance à influencer vers l'ouest le climat de type strictement méditerranéen).
Undefined boundary (the climate of the Iranian-Turanian zone influences markedly the Western part belonging to the strictly Mediterranean climate).

Limite orientale à préciser.
Eastern boundary to be determined.

ANNEX 3

PRELIMINARY CLASSIFICATION SYSTEMS FOR THE MEDITERRANEAN AS A THEORETICAL FRAMEWORK FOR A REGIONAL NETWORK OF BIOSPHERE RESERVES

Table 1. *Natural Forest Ecosystems**.

ZONES	ARID	SEMI-ARID	SUB-HUMID	HUMID
ORO-MEDITERRANEAN		*Juniperus thurifera* *Juniperus excelsa*	*Juniperus thurifera* *Juniperus excelsa* *Cedrus atlantica-libani* *Abies cephalonica -* *Abies Cilicica*	*Juniperus hemispherica* + name *Juniperus sabine* *Cedrus atlantica-libani* *Pinus heldreichii - Pinus uncinata* *Abies cephalonica - Abies cilicica*
MOUNTAIN MEDITERRANEAN		↓*Juniperus thurifera* ↓*Juniperus excelsa* ↓*Juniperus foetidissima* *(Pinus nigra* ssp. *pallasiana)* *(Cedrus atlantica)* *(Cedrus libani)*	*Juniperus thurifera* *Juniperus excelsa* *Juniperus foetidissima* *Pinus nigra* *Pinus silvestris* *Abies pinsapo* *Abies cephalonica* *Abies cilicica* *Cedrus atlantica-libani* *Cedrus brevifolia* *(Fagus silvatica)*	*Juniperus communis hemipherica* *Juniperus communis nana* *Juniperus sabina* *Pinus nigra* *Pinus silvestris - Pinus uncinata* *Pinus heldreichii - Pinus leucodermis* *Abies pinsapo - maroccana* *Abies numidica* *Abies cephalonica - borisii - regis* *Abies cilicica* *Abies equitrojani - bormmuelleriana* *Cedrus atlantica - libani* *Fagus silvatica*
SUPRA-MEDITERRANEAN	*Juniperus phoenicea* *(Juniperus thurifera)*	↓*Juniperus excelsa foetidissima* *Pinus brutia* ↑*(Pinus halepensis)* *Quercus ilex* *Quercus coccifera - calliprinos* *Juniperus phoenicea* *Quercus pubescens* ssp. *anatolica* *(Pinus nigra* ssp. *pallasiana)*	*Pinus brutia* *Pinus pinea* ↑*(Quercus ilex)* *Quercus coccifera-calliprinos* Deciduous oaks: *Quercus pubescens* *Quercus faginea-infectoria* *Quercus cerris-pseudocerris* Mixed deciduous forest: *Ostrya-Carpinus orientalis* *Abies cephalonica* *Abies borisii regis* ↓*Pinus nigra* ↓*Pinus silvestris* ↓*Cedrus*	*Pinus brutia* *Pinus pinea* ↑*(Quercus ilex)* *Quercus calliprinos* Deciduous oaks: *Quercus pubescens* *Quercus faginea-infectoria* *Quercus cerris-pseudocerris* *Quercus frainetto-castanea* *Quercus sessiliflora - pedumalata* Mixed deciduous forest: *Ostrya-Carpinus orientalis* *Fagus - Carpinus betulus* *Juglans Alnus cordata* *Abies alba* *Abies cephalonica - Abies borisii regis* *Abies pinsapo* ↓*Pinus nigra* ↓*Pinus silvestris* ↓*Cedrus atlantica - Cedrus libani*

Table 1. *Cont'd.*

ZONES	ARID	SEMI-ARID	SUB-HUMID	HUMID
EU-MEDITERRANEAN	*Pistacia atlantica* *Ziziphus lotus* *Juniperus phoenicea* *(Pinus halepensis)* ↟*(Tetraclinis articulata)*	*Pistacia atlantica* *Olea - Pistacia lentiscus* *Pinus halepensis* *Tetraclinis articulata* *Quercus suber* *Quercus ilex* *Quercus coccifera-calliprinos*	*Olea - Pistacia lentiscus* *Pinus halepensis* *Pinus pinea* *Pinus brutia* *(Tetraclinis articulata)* *Quercus ilex - Quercus alnifolia* *Quercus suber* *Quercus coccifera-calliprinos* ↡*Abies cephalonica* Deciduous oaks: *Quercus pubescens* *Quercus faginea* *Quercus infectoria* *Quercus aegilops* *Quercus brachyphylla* *Cupressus*	*Olea - Pistacia lentiscus* *Pinus brutia* *Pinus pinaster* *Pinus pinea* *Quercus ilex* *Quercus suber* *Quercus coccifera - calliprinos* *Abies cephalonica* Deciduous oaks: *Quercus pubescens* *Quercus faginea* *Quercus infectoria* *Quercus aegilops* *Quercus frainetto* *Quercus pedunculata*
THERMO-MEDITERRANEAN	*Argania spinosa* *Acacia gummifera* *(Acacia raddiana)*	*Olea-Ceratonia* *(Quercus suber)* *Pinus halepensis* *Pinus brutia* *Tetraclinis articulata* *(Argania spinosa)*	*Olea-Ceratonia* *Quercus suber* *Quercus coccifera - calliprinos* *Pinus halepensis* *Pinus brutia*	*(Olea-Ceratonia)* *Quercus suber* *Quercus coccifera - calliprinos* *Pinus brutia* *(Pinus halepensis)* ↡*(Pinus pinea)*

* *The species in parentheses correspond to the less important or marginal ones in the corresponding stages.*

The species preceeded by the sign ↡ *correspond in the relevant stage to an ecosystem generally of substitution and derived from a higher altitudinal stage.*

The species preceeded by the sign ↟ *correspond in the relevant stage to an ecosystem generally of substitution and derived from a lower altitudinal stage.*

Table 2. *Schematic presentation of the major types of degradation stages of forest and steppe ecosystems. (The steppes are underlined).*

	PER-ARID	ARID	SEMI-ARID	SUB-HUMID	HUMID
MOUNTAIN MEDITERRANEAN	?	?	Spiny Xerophytes *Astragalus* *Acantholimon*	Spiny Xerophytes Grasslands	Grasslands
SUPRA-MEDITERRANEAN	*Artemisia* (?)	*Artemisia* *Astragalus*	*Artemisia* *Astragalus*	*Artemisia* *Astragalus* / *Cistus laurifolius* *Buxus, Genista* *Lavendula*	*Buxus* *Spartium* *Genista*
EU-MEDITERRANEAN	*Arthrophytum* *Anabasis* Saharian Steppes	*Alfa** *Artemisia* Pre-Saharian Steppes	*Alfa* *Artemisia* Cistaceae *Rosmarinus* *Globularia*	*Artemisia* / Ericaceae Cistaceae Genisteae Labiateae *Quercus coccifera* *Juniperus oxycedrus* *Paliurus*	Ericaceae Cistaceae Labiateae *Quercus coccifera* *Juniperus oxycedrus*
THERMO-MEDITERRANEAN	*Aristida* *Calligonum*	*Alfa* *Artemisia* Pre-Saharian Steppes / *Withania* *Ziziphus* *Rhus*	*Alfa* *Artemisia* / Cistaceae *Rosmarinus* *Globularia* Labiateae	Ericaceae Cistaceae Labiateae Genisteae *Pistacia lentiscus* *Myrtus* *Sarcopoterium*	Ericaceae Cistaceae Labiateae *Myrtus* *Quercus coccifera* *Pistacia lentiscus*

* *Stipa tenacissima*

Table 3. *Main types of agro-ecosystems (excluding irrigated lands).*

	PER-ARID	ARID	SEMI-ARID	SUB-HUMID	HUMID
MOUNTAIN MEDITERRANEAN				Cereals: - oats	Cereals: - oats - rye Fruit trees
	Camels	Camels Goats	Goats Sheep	Sheep	Cattle Sheep
SUPRA-MEDITERRANEAN				Cereals: - corn Fruits	Cereals: - corn Fruits Natural grasslands
	Camels	Goats Camels	Sheep Goats	Sheep	Cattle
EU-MEDITERRANEAN		Figs (Cereals) (Olives)	Cereals (Hard wheat) Almonds Vines	Cereals Fruits Vegetables Olives Vines Tobacco	Natural grasslands Cereals: - corn Fruits Vegetables Olives Tobacco
	Camels	Goats Camels	Sheep Goats	Sheep	Cattle
THERMO-MEDITERRANEAN	Date palm Opuntia	(Cereals) (Olives)	Almonds Olives Figs Vines	Fruits Vegetables Olives Figs Vines Tobacco	Natural grasslands Fruits Market gardens Olives Cotton
	Camels	Goats Camels	Sheep Goats	Sheep	Cattle

ANNEX 4

LEGAL ASPECTS OF BIOSPHERE RESERVE PROTECTION*

The legal situation of biosphere reserves can be summarized as follows: there is no obligation for States to establish biosphere reserves and biosphere reserves have no legal status as such. Furthermore, designation of a biosphere reserve by a government and approval of that designation by the MAB International Co-ordinating Council and Unesco do not create, on the part of the State concerned, a legal obligation to protect the reserve so designated and approved. To create such a legal obligation a treaty would be required.

On the other hand, it is obvious that if biosphere reserves are to fulfill their objectives, namely to provide effective protection to the areas that have been designated as such, there must be some form of a commitment, on the part of the States concerned, to take whatever legal measures are required to protect these reserves. This has been well summarized in the report of the Task Force on criteria and guidelines for the choice and establishment of biosphere reserves (MAB Report Series No. 22) which among the characteristics of biosphere reserves mentions the requirement for adequate long-term legal protection.

The fact that on the one hand there is no international legal instrument to protect biosphere reserves while on the other it is considered that States concerned should adopt and implement adequate legal measures if biosphere reserves are to have any meaning at all, is only an apparent contradiction.

At its fourth session (November 1975), the International Co-ordinating Council of MAB agreed that creation of a biosphere reserve result in no international legal obligation to assure its protection. It recognized, however, at the same time, that there is a moral obligation to protect designated biosphere reserves and that establishment of a biosphere reserve can serve no useful purpose unless a country intends to provide for its preservation. This should be interpreted as meaning that the very fact that a State has designated a biosphere reserve and has applied for approval of that designation by the MAB Council implies that the State concerned has accepted the usual obligation to preserve that reserve.

This will necessarily have consequences at two levels:

- the level of national legislation in each country concerned and
- the international level in the MAB International Co-ordinating Council.

National Legislation

As specified by the 'Task Force on criteria and guidelines' protection given to biosphere reserves should be an adequate, long-term, legal protection. Each of these factors should be considered separately.

A. Legal protection

This would be examined at two levels:

- conservation legislation in general and
- specific laws or regulations designated to implement national legislation in respect of each biosphere reserve.

(1) General conservation legislation

It is essential that there be at national level, legislation empowering the government to create protected areas and to prohibit in or around these areas all activities which can have harmful effects on the natural environment, including the fauna and flora that such protected areas purport to preserve. Many countries have already enacted legislation of this kind and have established protected areas such as national parks or nature reserves. In some other countries, however, new legislation may have to be adopted, or existing legislation updated or otherwise improved.

(2) Specific legislation

It will often be necessary, in addition to general conservation legislation, to enact or adopt specific laws or regulations tailored to meet the specific requirements of individual reserves. Biosphere reserves being established, in each case, for a particular scientific purpose, specific legislation will probably be required in some cases to fulfill the particular purposes of certain reserves.

B. Long-term protection

Although governments would always remain free to withdraw the protection granted to a specific area and to repeal any legislation enacted in respect of that area, it is obvious that the very concept of biosphere reserves requires that protection given to such areas be continued indefinitely.

Two factors are of importance here:

- land tenure and
- the nature of the authority that has established the reserve.

(1) Land tenure

In order to ensure continuous preservation, it is important that the conservation status of the reserve should not be affected by changes in ownership. Land ownership by the central government or in some cases by the State or provincial government in a federal State, is, from the legal point of view, the best way to achieve this result. This can be done by establishing a reserve on land which is already government property, or by acquiring or expropriating private land. It must be realized, however, that this may be an expensive operation which may also, in some cases, be politically impracticable.

Other methods can be used when acquisition or expropriation are impossible. These will vary according to individual national legislations but they will normally be based on the imposition of

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* *Excerpt of a discussion paper prepared by C. de Klemm.*

a servitude on the land concerned. This can be done by a law which would provide for the possibility for the government to acquire from the owner some of the property rights he has on his land or to expropriate him of these rights with or without compensation. The owner would not change but he will have lost some of the rights which are normally associated with ownership such as the right to use the land, or to hunt, to fish or to bring in his cattle to graze. Another possibility consists in entering into an agreement with the landowner. Under such an agreement the owner would voluntarily relinguish some of his rights against proper compensation. In this latter case care should be taken, naturally, that such a contract remain in force with respect to any new owners of the land concerned whether they are heirs to the original owner or persons that have purchased the land from him.

(2) Authority establishing the reserve

Another important aspect of long-term protection for protected areas is related to the authority that is empowered to establish these areas. Generally, the higher the authority, the more difficult it will be subsequently to repeal the law or regulation under which the reserve has been created. Thus, as an example, if a reserve has been established by an Act of parliament, another Act of parliament will be required to repeal the initial act. It is obvious that this will be more difficult to achieve and will give rise to more publicity than if the reserve had merely been created by the decision of a local authority.

C. Adequate protection

Protection should be adequate both in law and in fact.

(1) In law

Not only must general conservation legislation provide for adequate protection to reserves in general, but specific regulations adopted in respect of individual reserves should give adequate protection to each one of these reserves. This seems to be of particular importance for biosphere reserves which are established with a view to preserving representative samples of specific ecosystems, animals or plants. If the objective for which the reserve has been established is not met because of gaps in the laws or regulations applicable to that reserve, it should not be considered as a biosphere reserve. It is important therefore that when a biosphere reserve is established, emphasis be placed on its specific features and conservation requirements and that specific legislation be adopted to meet these requirements.

As an example, if a biosphere reserve is created to protect a certain type of forest composed of pure stands of a certain species of tree possessing some particular genetic characteristics, in addition to the usual prohibitions concerning logging and the use of fire, it might be necessary to prohibit plantation of trees of the same species, but of a different genetic origin, in order to avoid hybridization. Such a prohibition would probably have to apply not only in the reserve itself but outside the reserve as well whenever there would be a risk that the pollen could be carried to the reserve by the wind or by pollinating insects.

Similarly if a biosphere reserve is created to protect a lake, regulations adapted to the specific conditions of that lake will have to be adopted. They might, for instance, include the requirement to maintain the water level of the lake and measures against specific forms of pollution such as pollutions caused by an excess of fertilizers or by pesticides. There again, to be effective, such measures may have to be taken well outside the reserve.

(2) In fact

The best laws and regulations are useless if nothing is done to enforce them. Provision should therefore be made for proper enforcement of regulations applicable to biosphere reserves. This includes designation of competent law-enforcement officers, the granting of sufficient authority to these officers and the provision of deterring penalties to be inflicted on offenders by the courts.

A great deal will, of course, depend on the willingness of all parties concerned and in particular of local law-enforcement authorities and the courts to apply the laws and regulations in the best interest of biosphere reserves, but this is no longer a legal matter but a matter of education and political will.