

**MINISTRY OF ENVIRONMENT, PHYSICAL PLANNING
AND PUBLIC WORKS
GENERAL DIRECTORATE FOR ENVIRONMENT
NATURAL ENVIRONMENT MANAGEMENT SECTION**

**FIRST NATIONAL REPORT
ON THE
CONVENTION ON BIOLOGICAL DIVERSITY**

GREECE

JANUARY 1998

Publisher:

Ministry of Environment, Physical Planning and Public Works, General Directorate for Environment,
Environmental Planning Division, Natural Environment Management Section, Trikalon 36, 115 26 Athens,
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1. EXECUTIVE SUMMARY

This report presents the progress of the implementation of the Convention on Biological Diversity (CBD) in Greece, during the period 1993 - 1997. Being the First National Report, it was felt that it should also present the most up-to-date information regarding the status of biodiversity in Greece, as well as the current actions for its conservation and sustainable use.

From the outset it should be stressed that Greece is at the point of drafting the National Biodiversity Strategy (NBS), and because of this, specific action programmes resulting from this Convention, have not yet been realised, since they will be determined by the National Action Plans conducted according to the NBS. Nevertheless, Greece has been active in biodiversity related subjects for several years, especially as a result of its membership of the European Union, the OECD and the Council of Europe and due to the ratification of relevant International Conventions including those of Ramsar, CITES, Barcelona, Bern. Therefore, for Greece the CBD is considered as the logical framework for all the current initiatives, which have been integrated in Greek environmental policy. This framework serves as a check list of achievements and a means for identifying policy gaps and necessary broadening of objectives in order to meet the challenges of the CBD.

The principal steps taken towards the implementation of the CBD, by the National Focal Point (Ministry of Environment, Physical Planning and Public Works, Environmental Planning Division, Natural Environment Management Section) include :

1. Initiation of the "Biodiversity Convention Co-ordinating Project", which aims to support the NFP in the first stages of implementation, which has been assigned to the Zoological Museum of the University of Athens (person in charge: Asst. Prof. A. Legakis).
2. Organisation of working methods and time schedules: formation of an Experts' Committee and a Supervising Committee for the better functioning of the Project
3. Evaluation of the present situation (collection of data on the status of Greek biodiversity, legislative and institutional background, and related activities)
4. Identification of the bodies involved and consequent dissemination of information, (State administration, NGOs, research institutions etc.)
5. Detection of gaps in knowledge and problems in running activities, and in policy implementation (co-operation with administrative bodies)
6. Evaluation of priorities - definition of targets for the elaboration of the National Biodiversity Strategy (by the end of 1998)
7. Specification of the NBS in particular actions per sector (collaboration with administration and other bodies) - Elaboration of National Action Plans (by the end of 1999)

In spite of the fact that the largest part of the **biodiversity of Greece** at the species and genetic levels remains unidentified, existing data show clearly that it is especially high with regard to the wild fauna and flora and the genetic resources related to agriculture and food products. It is estimated that there are approximately 50,000 animal species, while 15,000 are already known of which up to 25% are endemic. Similarly, there are over 5,500 species of plants of which over 1,000 are endemic.

Species protected by law are comparatively few (appr. 700 animal species and 900 plant species) and specific management measures have actually been taken for only a part of them. For many organisms such as micro-organisms, fungi etc., there are no reliable collective data, although all the indications suggest that they present great diversity. It should also be stressed that, because of its high level of endemism and because it

comprises one of the last refuges of many threatened, endangered and rare species on a European scale, Greece is an important area for the European and the Mediterranean fauna and flora.

Genetic resources are currently being recorded with regard to biotechnology applications and several endemic plant varieties, as well as many aromatic and medicinal plants are known. In addition, a important number of farm and domestic animal races and varieties is known.

At the level of ecosystems Greece also possesses a great diversity, as a result of the complex relief and the relatively mild, until recently, human activities. Twenty-five groups of habitat types (according to the CORINE classification and Directive 92/43/of the European Union) are represented in Greece, the most important of which are *maquis*, *phrygana*, wetlands , *marine* and *coastal*, but also, for European standards, the *forests*.

Marine/ coastal habitats and islands comprise a priority for Greece, since the country has the longest coastline in the Mediterranean (about 15,000 km) and the coastal sites hold important economic, cultural and biodiversity interests. Work on the sustainable use policies for the coasts has been undertaken during the last 5 years and a reform of policies is underway. Nine Specially Protected Areas have been enlisted under the relevant Protocol of the Barcelona Convention.

Forests in Greece, as in the rest of the Mediterranean regions have been exposed to human activities. As ar result, coastal and lowland forests especially have been degraded to a significant extent due to urbanisation and conversion to agricultural land. Sustainable managemet practices have been introduced gradually since 1920, especially with regard to felling and grazing and there is strong legal protection. Today, Greek forests of the Central European and Mediterranena types as well as the natural vegetation of the maquis and phrygana comprise important biodiversity components and efforts have been undertaken for the identification and conservation of their biodiversity values.

Agricultural habitats have been exposed to either intensification of production in the lowlands or relative abandonment in the mountainous areas. Since they possess a relatively rich biodiversity wealth, but also hold important interest for economic activities, they are subject to special policies. Considerable progress has been made in recent years towards recording biodiversity in agricultural ecosystems and taking measures to protect it.

The **wetlands** of Greece, although comparatively covering a small surface and despite the fact that their number has been considerably reduced over the last century mainly due to drainage, are of many types and are particularly rich as far as biodiversity is concerned. Eleven important wetlands have been included in the List of Wetlands of International importance (Ramsar Convention) and conservation measures are being implemented. Despite some persisting threats, over the last few years though, the wetlands in Greece have become the focus of remarkable research and conservation efforts and their outlook for the future is quite optimistic.

In the area of ***in situ* conservation**, there are established 10 National Parks and 1 Marine Park, while in total up to 696,000ha (3.6% of the total surface of Greece) have been designated under various conservation categories. In addition, 264 areas have been included in the national list for the European Ecological Network Natura 2000, which correspond to about 16 % of the country's terrestrial area. The design of the network in Greece has included most known locations with high biodiversity value, thus comprising a contribution of Greece towards the global biodiversity conservation needs.

Special attention is inevitably given to threatened and endangered species as for several of them Greece is one of their last refuges in Europe and the Mediterranean. Species oriented conservation projects have been implemented for monk seals *Monachus monachus*, sea turtles *Caretta caretta*, brown bears *Ursus arctos*, and many other endangered or endemic species, including highly endangered birds .

Red Data Books of threatened vertebrates and threatened plants have been produced by initiatives of independent bodies (Hellenic Zoological Society - Hellenic Ornithological Society and the Department of Biology of the University of Patras in collaboration with a group of other European scientists, respectively). Still, there is a long way to go in order to achieve monitoring of species and habitats of terrestrial , coastal and marine ecosystems. Very important deficiencies occur in the fields of invertebrates, fungi and marine - coastal species, alien species and studies of their impact on natural ecosystems have not been realised so far.

Ex situ conservation has been developed to a certain extent, especially as far as cultivated species and plants are concerned, while there are several deficiencies in the development and operation of Zoos and faunal Genetic Banks.

Research on biodiversity is being carried out mainly by the Departments of Biology, Forestry, Agriculture and Environment of Universities, and the relative Research Institutes. This sector poses important problems, since basic research, especially in the areas of Taxonomy and Ecology, does not receive the support it deserves. The main deficiencies concern the knowledge of systematics and biogeography of terrestrial invertebrates and marine species, while the biology and ecology of most organisms remains unknown. Finally, the number of available research positions is very limited mainly due to lack of funding.

Public awareness is carried out either by nation-wide schemes through environmental education projects conducted by certain NGOs, the Ministries of Environment, Agriculture and the Ministry of Education, or in site-related schemes, organised by local authorities in collaboration with the Ministries of Environment and Agriculture and NGOs. Relevant campaigns focus either on general environmental problems and/or some of the “flag” threatened species which are related with the biodiversity values of certain types of ecosystems (e.g. coasts, wetlands, forests, fresh water habitats). A major campaign for the conservation of biodiversity in the wider countryside has been organised in the context of the 1995 Nature Conservation Year of the Council of Europe.

There are some University owned and privately owned Natural History Museums, which have a satisfactory level of organisation and of number of specimens. Other small sized Museums private or state own exist as well, most of which are facing financial and managerial problems.

With regard to financing the implementation of the Convention, it is important to consider all biodiversity related activities in the fields of research, surveys and inventories as well as specific projects for the conservation of species and sites, public awareness and the related operational costs. There is an on going effort to identify the relevant amounts invested by all institutions involved and at the moment it can only be stated that investment in surveys and monitoring, *in-situ* conservation projects and public awareness by the Ministry of Environment in the period 1993 - 1997 has been identified at the scale of 10 millions \$ (US), part of which is funded by the European Union. The Ministry of Agriculture has invested approximately 576 millions \$ (US) in the period 1993-96, in forest management related to biodiversity conservation, research, cartography and awareness. Complementary to these funds, an amount of 40 millions \$ (US) has been made available in Greece for agro-

environmental management in favour of biodiversity conservation in the framework of the relevant initiative of the European Union.

The issues of **biotechnology and biosafety** are being approached through the implementation of European Union Directives and policies, and in 1997 a specific national mechanism (the Biotechnology Committee) has been established to deal with related problems. **Access to the genetic resources** of Greece and the equitable benefit sharing from their use is a very important issue, not dealt with at the moment.

2. TOWARDS THE IMPLEMENTATION OF THE CBD

2.1 General information and organisation of work

Greece ratified the Convention on Biological Diversity (CBD) by National Law 2204 (G.G. 59A/15.4.1994) and is a Part of the Convention both as a sovereign State and in the context of a Member State of the European Union.

The aim of the Convention is the conservation and sustainable use of the components of biological diversity and the equitable sharing of benefits from their use. This aim is a major framework for Greek policy in the fields of environmental management and biodiversity conservation, with regard to integrating biodiversity considerations in all sectors of political, social and economic activities.

The role of national co-ordination for the implementation of the CBD has been undertaken by the National Focal Point (NFP) of Greece, which is the Ministry of Environment, Physical Planning and Public Works (Environmental Planning Division, Natural Environment Management Section) within its broad competence on environmental issues.

In November 1996, the Zoological Museum of the University of Athens (person in charge: Asst. Prof. A. Legakis) undertook the "Biodiversity Convention Co-ordinating Project", which provides support to the NFP in the follow up of the CBD and more specifically in drafting the First National Report (1997), the National Strategy and the National Plans of Action for Biodiversity, which will be completed during 1999 (see diagram on next page).

For the execution of the project, the Zoological Museum has set up an Expert Committee that has undertaken to collect the necessary data and to determine the priorities and main targets of the National Biodiversity Strategy, as well as the specification of the latter into particular Action Plans. The Experts' Committee found necessary to enlist the help of many experts in different fields related to biodiversity as well as of public and private institutions working in relevant issues.

The work of the Expert's Committee is being supervised and directed by the Supervising Committee consisting of representatives of the directly related Ministries, including the Ministry for Environment, Physical Planning and Public Works, the Ministry of Agriculture, the Ministry of Development (Tourism, Science and Technology, Energy and Natural Resources), the Ministry of National Economy and the Ministry of Foreign Affairs. The Supervising Committee will contribute to the incorporation of the National Strategy within the broader policies of the country.

At the same time, the project aims at collecting the necessary material (documents, reports, raw data, bibliography, project reports, legislation, current and planned actions etc.) which is needed for the completion of the total picture of Greek activity in the field of conservation and use of biodiversity. This material will form the basis for a National Clearing House Mechanism for Biodiversity, which has not been defined as yet.

Also, the project provides direct assistance to all administrative relations with the CBD Secretariat and the project leader has been appointed as the Greek representative in the SBSTTA, while other experts been appointed to represent Greece in the several Groups of Experts under the CBD.

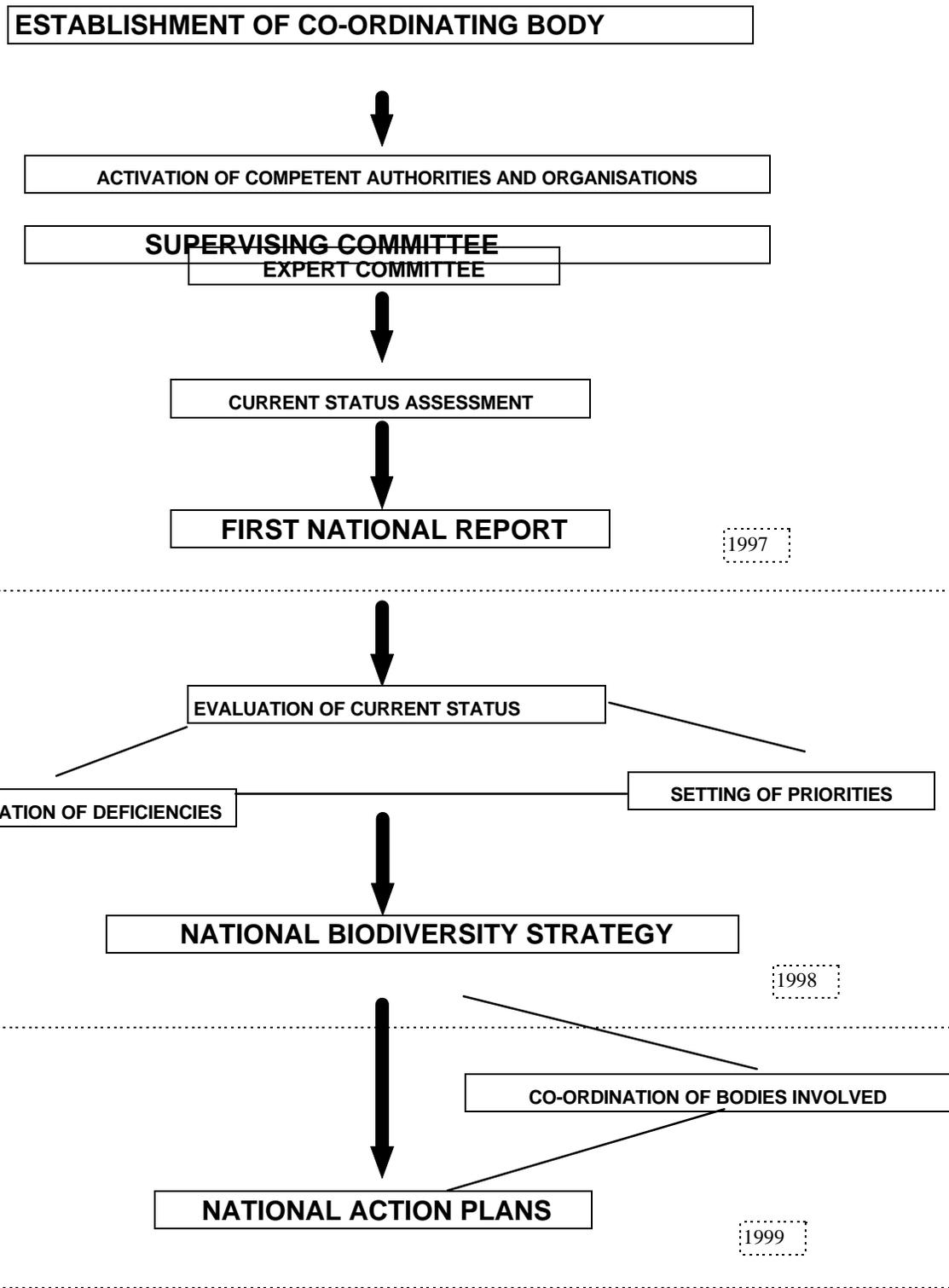


Diagram 2.1. Structure of the “Biodiversity Convention Co-ordinating Project “

BOX 2.1. Activity planning towards the implementation of the CBD

The major steps towards implementation of Article 6 of the CBD (see also Diagram 1)

- Establishment of competent organisations. The National Focal Point for the CBD and a supportive Co-ordinating Scheme for the Implementation of the CBD in Greece have been appointed as such. The Experts' and the Supervising Committees have been established and have undertaken certain tasks.
- Activation of sectoral partners, such as competent authorities (Ministries), research institutions and NGOs has been achieved by contacts and questionnaires, while exchange of information and data is continuously broadening the involvement of different sectors in the planning of the NBS.
- Assessment of current knowledge and institutional/ legislative framework. This has been already achieved, and a relative report is in press. A synopsis of these data is given in the present report.
- Compilation of the First National Report. This task has been achieved through the collaboration of all the above mentioned organisations/authorities, under the co-ordination of the Zoological Museum.
- Evaluation of current biodiversity status. This is the next step towards the NBS. Evaluation is presently being done through the "Biodiversity Convention Co-ordinating Project"
- Identification of deficiencies - Definition of priorities. This is part of the evaluation process and workshops are planned in early 1998, with the participation of authorities, research institutes and the public (NGOs etc.). The major issues already identified are given in the respective chapter of the present report.
- Compilation of the NBS. This is the crucial stage of the Article 6 implementation, planned for the end of 1998. The outputs of all the previous stages will be used in order to make the best possible strategy for the conservation and sustainable use of the components of Greek biological diversity.
- Co-ordination of authorities involved. Using the NBS as a guide, the co-ordination of authorities will be the next crucial step for its success. This will be achieved through close collaboration of competent authorities within the "Biodiversity Convention Co-ordination Project", in order to identify the way that NBS can be implemented in each and every sectoral policy.
- Compilation of National Action Plans. The previous stage will lead to the specification of activities needed in each sector, in order to implement the NBS. The National Action Plans are going to be specified through continuous co-operation with competent authorities. The conclusion of this stage is planned for the end of 1999.

2.2 The main concept in implementing the CBD in Greece

The conservation of Biodiversity is an integral part of Agenda 21 and a basic consideration in all United Nations policies and legal texts such as the Law of the Sea and other global or regional International Fora such as FAO etc.

The main concept used in the Greek approach, considers the Convention of Biological Diversity as the global framework for all related initiatives that have already been activated by the European Union, the OECD, the Council of Europe, and the Ramsar, Bern, Bonn, Washington and Barcelona Conventions. Our application of the CBD articles should serve as a checklist of what has been achieved so far by all other instruments and a guide for the identification of gaps in integrating national and international policies and of needs for further broadening of perspectives (see chapter 4.1).

The same concept applies within the national context, and the implementation of the Convention embraces and evaluates all related activities, ranging from nature conservation initiatives to the basic national productive sectors, mainly agriculture, fishing and tourism. Existing policies for the conservation and the sustainable use of biodiversity in these sectors are not as yet a result of implementing the CBD, nevertheless they comprise the starting point for evaluating the national state of biodiversity and the required National Strategy and Action Plans.

3. THE BIODIVERSITY OF GREECE

3.1 The importance of Greek biodiversity

Greece, with an area of 132,000 km² and a population of ca. 10,500,000, lies at the southernmost part of the Balkan peninsula, and belongs to the Mediterranean zone of the Palearctic biogeographical region. It is characterised by a large climatic diversity (29 climatic zones according to the Thornwaite classification), because of its geographical location, its varied relief (max. altitude 2918 m.) and its proximity to the sea. The country is also characterised by its extensive coastline of about 15,000 Km and many island complexes in the Archipelagos of Aegean Sea and the Ionian Sea.

Greece hosts a great wealth of biological diversity, one of the richest in Europe and the Mediterranean. This wealth is a result of the following main factors:

- **The biogeographic position of Greece at the crossing of three continents:** Europe, Asia and Africa. The European character prevails in most taxa, but in the sense of a Mediterranean and Balkan European sub-division. There are several examples of the biotic influence of the other two continents on the fauna and flora of Greece. Asiatic elements are common, especially in the flora and fauna of the eastern Aegean islands. Many taxa have their western-most distribution limits in Greece. Such elements can be found among plants (e.g. *Amygdalus graeca*, *Consolida phrygia*, *Minuartia thymifolia*, *Quercus infectoria* ssp. *veneris*, *Onosma graeca*), mammals (e.g. *Sciurus anomalus*), birds (e.g. *Sitta krueperi*, *Hoplopterus spinosus*) reptiles and amphibians (e.g. *Eirenis modestus*, *Blannus strauchi*, *Mertensiella luschani* etc.), and numerous invertebrate taxa (e.g. the terrestrial isopod genus *Schizidium*). African elements also can be found in certain groups (e.g. the plants *Arum cyrenaicum*, *Allium chamaemoly*, *Alyssum minutum*, *Callitriche pulchra*, the mammalian genus *Acomys*, the beetle *Scarites subcylindricus* etc.).

- **The high topographical diversity of Greece.** This is due to the large number of islands, the rapid landscape change from marine to alpine within just a few kilometers' distance, the extensive compartmentalisation of Greece by numerous rivers, rivulets, gorges, valleys, peninsulas etc., and the large number of caves and other subterranean environments. This diversity has promoted the geographical isolation of populations and has triggered increased diversity at all levels (genetic, population, species, habitats, communities, ecosystems).

- **The complex geological and ecological history of Greece.** The Greek region has been subject to complex tectonic, eustatic, climatic and biotic interactions throughout its existence. Additionally, the continuous presence of human activities for more than 8,000 years, have shaped an extremely variable environment. All these have promoted the diversification of biotic communities, increasing biodiversity.

- **The relatively mild human interference.** Continuous human presence has occurred in the area for millenia, always interacting with the natural resources. The natural environment as we see it today, has been the result of extensive but mild human intervention, especially compared to that of Northern Europe. Actually, many practices, especially in agriculture, are believed to having lead to an increase of certain components of biodiversity. No significant heavy industry has ever been active in Greece, therefore pollution levels of air, sea and freshwater is relatively low, at least by European standards. Also, human activity has increased habitat heterogeneity, thus promoting biodiversity levels. These trends have changed significantly only in the last few decades.

As stated above, the biological diversity of Greece is high for all taxa and at all levels. Although there is no single measure for biodiversity as a whole, among the most important and widely used measures are species richness and the levels of endemism. Also, biodiversity at an ecosystem level, meaning the diversity of biological communities in large scale is an important component of biodiversity, and relatively easily identified. These are also the measures we are currently most capable to evaluate. Genetic and intraspecific diversity has not been adequately studied so far. The next chapter documents the biodiversity of Greece at the above mentioned levels.

3.2 Biodiversity at the species level

3.2.1. Richness

The total species richness of the Greek fauna lies approximately between 30,000 and 50,000 species. The number of species described so far for the better known taxa, is given in Table 3.1.

The total number of Greek species of flowering plants is approximately 5,500, with the total number of known taxa (species + subspecies) being 6,308. This figure combined with the respective figures from Italy (approx. 5,600), and Spain (approx. 8,000) gives a sense of the Mediterranean biodiversity richness. The flora of lower plants (Bryophyta, Pteridophyta) has not yet been systematically studied in Greece.

Additionally, around 2,000 species of fungi have been described so far, being just a small fraction of the total species number of these little-studied organisms.

Scientific information on viruses, procaryotic organisms and Protoctista is extremely limited, since very few, and mostly medically-oriented, studies have been carried out so far.

Despite the lack of knowledge of many taxa, it is evident that Greece is a "hot-spot" area for Europe, not only because of its species richness, but also because the constitution of its flora and fauna is unique.

TABLE 3.1

The species richness of the better known faunal taxa of Greece, and approximate percentage of known species number in each taxon,

| TAXA | SPECIES No | SUBSPECIES | %KNOWLEDGE |
|-------------------------|-------------------|-------------------|-------------------|
| MAMMALS | 116 | ca. 50 | >90 |
| BIRDS | 422 | +85 | >95 |
| REPTILES | 59 | | >95 |
| AMPHIBIANS | 20 | | >90 |
| FISH (freshwater) | 110 | +21 | 80 |
| FISH (marine) | 447 | | 80 |
| ECHINODERMATA | 107 | | 80 |
| ORTHOPTERA | 317 | +19 | 90 |
| TRICHOPTERA | 255 | | 70 |
| HETEROPTERA | 811 | | 80 |
| PSOCOPTERA | 75 | | ? |
| DICTYOPTERA | 40? | | ? |
| SIPHONAPTERA | 57 | +11 | 80 |
| MOLLUSCA (Bivalvia) | 293 | | 80 |
| MOLLUSCA (other marine) | ~700 | | 80 |
| SCORPIONIDA | 6 | | >90 |
| DIPLOPODA | 130 | | 70 |
| CHILOPODA | ~100 | | 70 |
| ISOPODA (terrestrial) | 195 | | 70 |
| DECAPODA | 231 | | 80 |
| CNIDARIA | 91 | | 80 |
| BRYOZOA | 200 | | ? |
| PORIFERA | 132 | | ? |

3.2.2. Endemism

One of the most important aspects of Greek biodiversity is the high level of endemism in many animal and plant groups. This is due to the geographical and ecological fragmentation of Greece into many isolated areas such as islands, mountains, rivulets, valleys etc., and to the refugial nature of Greece during the Pleistocene glaciations. Another important source of endemics is the existence of thousands of caves. Although just a few dozen have been biologically studied so far, a large number of endemic species (mainly of invertebrate taxa) has already been found, many of them being endemic to just one cave. This means that the total number of endemic species is expected to increase dramatically for taxa such as terrestrial and stygobiotic Isopoda, freshwater Amphipoda, Copepoda, Diplopoda, Orthoptera, Araneae, Pseudoscorpionida, Mollusca, freshwater fishes and others with cave dwelling representatives.

The number of endemic species and subspecies in some of the better known animal groups are given in Table 3.2.

In plants, endemism is also high. The total number of endemic taxa is 1221 (936 species, 17%). Another interesting aspect of endemism is the genetic differentiation of populations, which is also high in Greece. Endemism is very important for Greece, since many endemics have very restricted distributions (e.g. on one small islet), and consequently they are very sensitive to disturbance.

Besides the endemic species and forms of the wild fauna and flora, there are numerous local **varieties of cultivated plants** and many **indigenous breeds of domestic animals**. Although a large amount of this wealth has not been properly documented, more than 300 plant varieties and 43 local breeds of farm animals have been already included in national lists, while many more are known to scientists.

TABLE 3.2
Richness of known endemic species of several animal taxa of Greece

| TAXA | SPECIES | +SUBSPECIES | ENDEMIC SPECIES | END.SUBSPECIES |
|-----------------------------|---------|-------------|-----------------|----------------|
| MAMMALS | 116 | ca. 50 | 4 | 35 |
| BIRDS | 422 | +85 | 0 | 4 |
| REPTILES | 59 | | 6 | 71 |
| AMPHIBIANS | 20 | | 2 | 3 |
| FISH (freshwater) | 110 | +21 | 35 | 16 |
| FISH (marine) | 447 | | | |
| ECHINODERMATA | 107 | | | |
| ORTHOPTERA | 317 | +19 | 113 | 15 |
| NEUROPTERA | | | 26 | |
| LEPIDOPTERA | | | 142 | |
| HYMENOPTERA | | | 13 | |
| COLEOPTERA | | | 649 | |
| TRICHOPTERA | 255 | | 59 | |
| HETEROPTERA | 811 | | 36 | |
| PSOCOPTERA | 75 | | 6 | |
| SIPHONAPTERA | 57 | +11 | 1 | 6 |
| MOLLUSCA (terrestrial) | | | 174 | |
| >> (freshwater Gasteropoda) | ~40 | | 12 | |
| >> (Bivalvia) | 293 | | 1 | |
| SCORPIONIDA | 6 | | 1 | |
| CHILOPODA | ~100 | | 25 | |
| ISOPODA (terrestrial) | 195 | | 134 | |

3.3 Biodiversity at the habitat and ecosystem level

The main features of ecosystems present in Greece are described below:

a) Natural functions of the major ecosystems have been maintained to a large extent, a fact indicated by the Greek Wetland Inventory for wetlands, by the Forest Inventory for mountainous areas and the presence of high biodiversity at the species levels in coastal and agricultural ecosystems.

b) The magnitude of biodiversity at the level of habitats - ecosystems is considerable since there are marine, coastal and terrestrial habitats which cover the gradation from the central - European to the Mediterranean and subtropical ecosystems.

c) All types of ecosystems present in the country contain a large number of species, notably endemics, rare, threatened and migratory.

d) Several habitat types and ecosystems have a significant cultural and wider social importance as well as economic importance, such as wetlands, coasts, islands.

Classification of Greek habitats

The continuing effort for the development of a common European information system for nature has led to the Palearctic classification of habitats which is the extension of the CORINE habitat classification in Europe. This effort has been co-ordinated at the European level by the European Environmental Agency (European Topic Centre for Nature Conservation, ETC/NC). The Palearctic classification is used also as a basis for the implementation of relevant European Union legislation (interpretation of the habitats of Annex I of the Directive 92/43/EEC).

The main Greek habitats were initially classified into 25 groups within the framework of the above-mentioned programmes (Table 3.3). The specific codes of the Palearctic classification of Annex I of the Directive 92/43/EEC correspond to these groups.

Table 3.3
Ecosystem level : Groups of habitats occurring in Greece

| No. | Group |
|-----|---|
| 1 | Marine Habitats |
| 2 | Lagoons |
| 3 | Reefs |
| 4 | Coastal Marshes and Salt Meadows |
| 5 | Salt Steppes |
| 6 | Shingle and Sandy Beaches, Sanddunes |
| 7 | Rocky Coasts |
| 8 | Flowing Water |
| 9 | Stagnant Water |
| 10 | Inland Ponds and Marshes |
| 11 | Riparian Forests |
| 12 | Phrygana |
| 13 | Maquis |
| 14 | Dry Grasslands |
| 15 | Wet Grasslands |
| 16 | Alpine and Subalpine Grassland Formations |
| 17 | Deciduous Forests |
| 18 | Mediterranean Coniferous Forests |
| 19 | Mountain Coniferous Forests |
| 20 | Subalpine Coniferous Forests |
| 21 | Sclerophyllous |
| 22 | Screes |
| 23 | Inland Rocky Formations |
| 24 | Inland Caves |
| 25 | Volcanic Fields |

Marine and coastal habitats (groups 1, 2, 3 - groups 4, 5, 6, 7))

All the marine Mediterranean habitat types are represented in Greece. These include the following general groups, as defined by the CORINE programme:

- Open marine waters. These include waters beyond the continental shelf (oceanic), and waters of the continental shelf, further subdivided in inshore waters, offshore waters, continental slope waters, upwellings and shoals. An important characteristic of Greek waters is that the above mentioned habitat types are not easily distinguished, since their components may co-exist and overlap.

- Seabed. These include deep sea floor, sublittoral soft seabeds, sublittoral pebbly seabeds, sublittoral rocky seabeds, sublittoral organogenic concretions, and undersea caves. In the Mediterranean Sea 31 types of seabed communities have been identified. These are represented also in Greece, but due to the different conditions of the Greek waters in comparison to those of the western Mediterranean (from where these communities have been originally described), and especially due to the dynamic nature of these communities, this categorisation can only serve as a general description. The use of qualitative and quantitative structure of the communities, and the quantitative comparison of their similarities, is a better method for distinguishing among them. Moreover, the co-occurrence of many rare species in Greek communities, decreases the significance of characterisations based on just a few species.

Of special interest are the protected communities, such as the *Posidonia*, and *Zostera marina*-*Cymodocea nodosa* meadows, the forests of *Cystoseira* (*C. amentacea*, *C. spicata*), the *C. zosteroides* communities of great depths, and the coral formations. Finally, the communities of geothermal upwellings, where high temperatures, salinity and H₂S concentration are met, should be also mentioned. Such upwellings occur around several volcanic islands of Greece.

Coastal habitat types include:

Coastal dunes. All Mediterranean sand-dune habitat types are present in Greece, with some plant communities (e.g. *Ipomaeo-Elymetum farcti*, *Lygaeum spartum*), which are unique in Europe.

Coastal rocky habitats. These host many endemic species, especially chasmophytic and arohalophytic (*Crithmo-Limonietaea*).

Coastal wetlands. These mainly include estuaries, lagoons and deltas with halophytic species. The most common of such communities are the therophytic (e.g. *Salicornietum europaeae*), salt grasslands (e.g. *Juncetum maritimi*), marshes and salt marshes (e.g. *Arthrocnemetalia fruticosae*), and brackish reed thickets (*Phragmitetea*).

Freshwater habitats (groups 8, 9, 10)

These include inland wetland ecosystems which encompass the habitats of lakes and smaller water concentrations, rivers and streams as well as reservoirs and canals/ditches. Coastal forests (group 11) are also part of this group, but have been described above. Inland raised and blanket bogs, which are unstable and relatively rare habitats in Greece, are included in this unit as hydrophilous vegetation.

Phrygana and Maquis (groups 12 and 13)

These habitats which are characteristic of Mediterranean ecosystems, cover a large part of the vegetation of Greece. Phryganic ecosystems cover 13-15% of the country and are the typical vegetation in areas with a dry Mediterranean climate, limited water and poor soils, mainly in southern Greece and in the Aegean, in lowland areas. In areas of semi-dry climate, the maintenance of phrygana could be due to the effect of fire and grazing or perhaps because phrygana have colonised abandoned agricultural or burned land.

The ecosystems of Mediterranean maquis cover 26% of Greece and are developed in the thermo- and mesomediterranean zones, usually at an altitude of up to 800m. Maquis vegetation, with shrubs of up to 2m high, is considered as the stage before forest vegetation or a degradation of the forest ecosystem and it has excellent potential in areas of drier climates.

Forest Ecosystems (groups 11, 17, 18, 19, 20, 21)

Within the forest vegetation, zonal and azonal biotopes can be distinguished. In zonal types of vegetation the following are included: Mediterranean biotopes, deciduous oak biotopes and mountain biotopes.

In **mediterranean biotopes**, the vegetation of sclerophyllous shrubs is included which covers a total surface of 315,000 hectares, ie. 13.5% of the total forest surface of Greece. Particular mediterranean biotopes are the ones with *Pistacia lentiscus*, the ones with *Quercus coccifera* and the ones with *Quercus ilex*.

Biotopes with deciduous oaks have a large distribution in mainland Greece, as their surface is estimated to cover approximately 750,000 hectares, ie. 30% of the total forest surface. Particular deciduous oak biotopes are the ones with *Quercus aegilops* (*Q. macrolepis*), the ones with *Quercus pubescens* and the ones with *Quercus sessiliflora*.

In **mountain biotopes**, two chorological types can be distinguished: that of southern Greece (Peloponnisos and south-central Greece) can be considered as a dry mountain biotope or as a Mediterranean one, characterised by the typical forms of *Abies cephalonica* and the absence of beech, while that of northern Greece, which extends north of the above-mentioned area, is characterised mainly by the presence of beech, the importance of which increases from south to north, as well as by the forms of hybrid fir.

Pine woods with *Pinus sylvestris* can be found in the northern slopes of Pieria, Vermion and in the mountain peaks along the borders with former Yugoslavia, mainly on volcanic rock. There are also some localised forests of *Pinus heldreichii* at high altitudes and *Pinus nigra* ssp. *palassiana* on certain mountains.

The **special vegetation types (ie. azonal)** include the riparian biotopes of *Nerium oleander* and *Vitex agnus-castus*, the riparian ones of *Platanus orientalis*, those of *Fraxinus oxyphylla*, those of *Alnus glutinosa*, those of *Populus alba* and finally those of *Populus nigra*.

The first two types of riparian biotopes are well distributed in Greece along streams of seasonal or all-year-round flow. The third type, that of *Fraxinus oxyphylla*, is very rare in Greece.

Meadows and Grasslands (groups 14, 15, 16)

Meadows and grasslands are divided, according to the CORINE classification, into dry grasslands on limestone or siliceous soils, into wet meadows and into sub-alpine and alpine meadows. At lower altitudes (up to 600m in northern Greece), in the thermo- and mesomediterranean zones, both in mainland Greece and the islands, xerophilous therophytic communities with annual grasses grow, frequently with a high number of annuals together with perennial grasses, aromatic Labiatae and geophytes. On nitrogen-rich soils, especially after agricultural use, certain sub-nitrophylous communities with grasses, Cruciferae and Labiatae. In the coastal Mediterranean zone, perennial grasses dominate. In the mountain zone, on siliceous sub-strata, meadows with *Nardus stricta* (*Trifolion parnassi*) develop.

Rocky Habitats (groups 22, 23, 24, 25)

Inland, rocky habitats, cliffs and screes, can be found all over Greece and are characterised by the plant communities which colonise the rock crevices, ledges or screes and have a significant diversity and a high degree of endemism. The plant communities are divided according to their geographical position (northern, central, southern Greece and the Aegean islands), their altitude (from the Mediterranean zone to the alpine zone) and their sub-strata (mainly limestone and serpentinic). The chasmophytic vegetation is characterised by a high percentage of endemic species.

4. Background

4.1. An overview of the corresponding implementation of related International Conventions and European Union Legislation to CBD in Greece

EEC Directive 92/43 for the conservation of natural habitats, wild fauna and flora, and EEC Directives 79/409 and 91/244/EEC for the conservation of birds

These two directives have been the framework for the set up of the European Ecological Network NATURA 2000, which includes both specially protected areas (SPAs) for birds identification and Sites of Community Importance for the conservation of Species and habitats. Greece has delivered a national list of **264 sites** to be included in this network. For almost half of these sites Special Environmental Studies are currently being carried out, in order to define land-uses and zones of special conservation.

The implementation of these directives is linked with Article 7 (CBD) on identification and monitoring of biodiversity components of special interest, Article 8 on *in situ* conservation, particularly paragraphs a, b, c, d, f, i, and l, Article 10 on sustainable use of biodiversity components, particularly paragraphs a, b and e., Article 13 on public education and awareness, through the activation and involvement of local communities. and Article 14 on impact assessment, particularly paragraphs a and b.

E.U. Regulation 2078/92 for agricultural practices compatible with the need for environmental protection and nature conservation

Regulation 2078/92, regards the "Methods of agricultural production which comply with the requirements for the conservation of the environment as well as with the preservation of natural land". This regulation institutes, for the implementation of its aims, a system of subsidies, 75% co-funded by the E.U. and 25% by Greece. Among the aims of this regulation are the following:

- The use of other production methods which comply with the requirements for the conservation of the environment, natural resources and the preservation of the natural land and landscape
- The keeping of farm animals of local races which are threatened with extinction
- The of agricultural activity on farm lands for a period of at least 20 years in order to be used for the conservation of the environment, especially for the creation of reserves or national parks or for the protection of hydrological systems.
- The growing and propagation of useful plants, adapted to local conditions which are threatened by genetic degradation..

Its implementation period is 5 years (1996-2000). As with other regulations, Regulation 2078/92 is compulsory for all E.U. member states. Each member state is responsible for the implementation of the aims of the regulation through the formulation of national (horizontal) or local (zonal) projects. The participation of farmers in these programmes is voluntary and can be assured through information, awareness, education and the granting of financial incentives. The latter aims to counter the losses of income of farmers who participate, because of the reduction in production and/or the increase of production costs incurred by the measures for the conservation of the environment. In the aforementioned incentives, a participation bonus is to be included which, however, should not exceed 20% of the potential loss in agricultural income (see chapter 6).

Related CBD articles are Article 6, paragraph b, Article 7, Article 8, paragraphs I and j, Articles 9-11, Article 13.

Washington Convention (CITES) for the international trade of endangered species

Greece ratified the Washington Convention in 1992, and the Ministry of Agriculture is the competent authority for its implementation. Its proper implementation requires action on several issues including penalties, installations for keeping animals, dissemination of scientific knowledge and information to the public, and law enforcement.

Ramsar Convention for the protection of wetlands of international interest

Greece ratified the RAMSAR convention in 1974. Eleven wetlands (see Table 4.1), amongst the most important ones in Greece, have been characterised as RAMSAR sites, and their conservation is promoted through relevant legislation and other incentives.

Related CBD articles are Article 7 on identification and monitoring of biodiversity components of special interest, Article 8 on *in situ* conservation, particularly paragraphs a, b, c, d, i, and l, Article 10 on sustainable use of biodiversity components, particularly paragraphs a, b and e. The National Wetland Strategy as required by this Convention is currently under elaboration.

Barcelona Convention for the protection of the Mediterranean Sea against pollution

Greece ratified the Barcelona Convention for the protection of the Mediterranean Sea against Pollution in 1979. Nine coastal and marine protected areas of Greece have been characterised as Specially Protected Areas according to the Geneva Protocol for Mediterranean SPAs under the Barcelona Convention (ratified by Greece in 1987).

Additionally, Greece has ratified all other protocols and acts under the Barcelona Convention, which refer to the prevention of pollution from various sources. This is in accordance with the importance of marine ecosystems for Greek policy and the special attention they receive.

Bern Convention for the conservation of wildlife and the natural environment of Europe

Greece ratified the Bern Convention in 1983. As this Convention is covering almost the same species with the relevant European Union legislation, its implementation is based on the same initiatives. The National Focal Point is again the Ministry of Environment, Physical Planning and Public Works. The CBD articles related to this Convention are the same as those mentioned above for the E.U. Directives.

Bonn Convention (Convention on Migratory Species of Wild Animals, 1979).

The parent Convention has not yet been ratified by Greece, but it is implemented as ratified by the European Union. Greece has signed the Agreement with regard to the Cetaceans of the Mediterranean and the Black Seas, and is about to sign the African -Eurasian Waterfowl Agreement.

Convention against Desertification

This Convention is indirectly related to the conservation of biodiversity components, especially through the adoption of measures promoting the protection of habitats and ecosystems from the effects of soil erosion and vegetation degradation. It is an important initiative for Greece, since desertification is intense in many parts of the country due to the interplay of special topographical, geological and climatic conditions, certain farming practices, and the frequency of fires in Mediterranean ecosystems. A National Committee is currently working on drafting a National Strategy against Desertification.

4.2. National legislative and institutional framework

The legislative framework in Greece is complex, since there are several competent authorities with sectoral jurisdictions.

Besides specific laws, ministerial decisions and presidential decrees, the national **Law 1650/1986** “for the protection of the environment”, serves as a general framework concerning most biodiversity related subjects. This law sets the major directions for the conservation of biodiversity components. It includes regulations for the following subjects:

- Environmental Impact Assessment studies, their content and related procedures.
- Measures against pollution from all sources.
- Protection of nature and landscapes. It defines the categories of protected areas (National Parks, Nature Reserves, Strict Nature Reserves, Protected Natural Formations-Landscapes-Landscape components, and Eco-development areas).
- Protection of wild animals and plants and their habitats.
- Definition of zones where special environmental support is needed and zones for development of productive activities.

Other relevant legislation with respect to current activities, according to sectoral areas of implementation are the following:

IN SITU CONSERVATION

- Presidential Decree 67/81 “On the protection of native flora and wild fauna and the determination of the coordination and control procedure of related research”. It includes 916 plants, 82 invertebrates and 139 vertebrates to be protected
- Ministerial Decision 414985/29.11.85 “Management measures for wild avifauna” (74 non-game species are mentioned)
- Ministerial Decision 180755/4425/28.3.1979 “On the determination of useful game, and hunting ban of certain birds threatened with extinction” (4 mammals and 120 non-game birds, plus all birds under 17cm in length)
- Law 1469/1950 for Landscapes of Outstanding Natural Beauty.

- Law 996/1971 for Natural Parks, Aesthetic Forests and Natural Monuments.
- Law 177/1975 for Controlled Hunting Areas.

Based on the above, several Presidential Decrees and Ministerial Decisions have been issued for the designation and management of National Parks and other protected areas (see Table 4.1). In total, around 696,000 hectares (about 3.6 % of the total surface of Greece) have been designated as protected areas. The management of these areas fall in the jurisdiction of the Ministry of Environment, Physical Planning and Public Works and the Ministry of Agriculture, while new schemes are being developed there are also cases of overlapping jurisdictions, especially in sites where both forested and non-forested areas occur.

Table 4.1
Protected areas of Greece

4.1.a. National Designations

| Category | No. of areas | Area (ha) |
|---|--------------|---------------|
| Absolute Nature Reserve Area | 2 | 748 |
| Aesthetic Forest | 19 | 32506 |
| Controlled Hunting Area | 11 | 164835 |
| Core zone in National Park | 10 | 34588 |
| Game breeding station | 23 | 12990 |
| Marine Park | 1 | 220000 |
| National Park - Peripheral Zone | 5 | 34254 |
| Natural Monuments and Landmarks | 51 | 16625 |
| Nature Reserve Area | 5 | 4323 |
| Protected Area not yet Classified | 23 | 175505 |
| Protected Significant Natural Formation | 1 | 6 |
| TOTAL | 151 | 696380 |

4.1.b. International and European Union Designations

| Category | No. of areas |
|--|--------------|
| Ramsar Wetlands | 11 |
| World Heritage Area | 2 |
| Biogenetic Reserves | 15 |
| Biosphere Reserves | 2 |
| Barcelona Convention (marine-coastal SPAs) | 11 |
| Areas of Special Protection for Birds (EU Dir. 79/409) | 28 |
| Proposed sites of community Importance NATURA 2000 network (EU Dir. 92/43) | 230 |

TABLE 4.2
Protected and threatened Greek species of several animal groups

| TAXA | SPECIES | +SUBSPECIES | PROTECTED(%) | THREATENED |
|-----------------------------|---------|-------------|--------------|------------|
| MAMMALS | 116 | | 83(71) | 8 |
| BIRDS | 422 | +85 | 396(94) | 1 |
| REPTILES | 59 | | 58(98) | 1 |
| AMPHIBIANS | 20 | | 18(90) | 0 |
| FISH (freshwater) | 110 | +21 | 50(45) | 29 |
| FISH (marine) | 447 | | 8(2) | 14 |
| ECHINODERMATA | 107 | | 1(1) | 0 |
| ORTHOPTERA | 317 | +19 | 11(3) | 0 |
| NEUROPTERA | | | 0 | 3 |
| LEPIDOPTERA | | | 57(| 39 |
| HYMENOPTERA | | | 0 | 15 |
| ODONATA | | | 5 | 4 |
| COLEOPTERA | | | 11 | 2 |
| TRICHOPTERA | 255 | | 0 | 0 |
| HETEROPTERA | 811 | | 0 | 0 |
| PSOCOPTERA | 75 | | 0 | 0 |
| DICTYOPTERA | 40? | | 0 | 2 |
| SIPHONAPTERA | 57 | +11 | 0 | 0 |
| MOLLUSCA (terrestrial) | | | 24(14) | 5 |
| >> (freshwater Gasteropoda) | ~40 | | 3 | 1 |
| >> (Bivalvia) | 293 | | 4(1) | 0 |
| >> (other marine) | ~700 | | 5 | 0 |
| ARACHNIDA | | | 0 | 1 |
| SCORPIONIDA | 6 | | 0 | 0 |
| DIPLOPODA | 130 | | 0 | 0 |
| CHILOPODA | ~100 | | 0 | 0 |
| ISOPODA | 195 | | 0 | 0 |
| BRYOZOA | 200 | | 0 | 0 |
| AMPHIPODA | | | 0 | 1 |
| DECAPODA | 231 | | 3 | 0 |
| OTHER CRUSTACEA | ~600 | | 0 | 0 |
| ANNELIDA | | | 5 | 0 |
| CNIDARIA | 91 | | 1+19CITES | 1 |
| PORIFERA | 132 | | 0 | 0 |

The existing network of protected areas will be enlarged after the adoption of the NATURA 2000 network sites (according to E.U. Directive 92/43, see Chapter 2.2.1). The national list for this network includes 264 sites, with a total area of 3,170,447ha, for which Special Environmental Studies are currently being carried out or planned for the future. These studies will determine the final limits and the activities allowed in the sites, and afterwards they will be officially ratified by proper legislative acts.

Also, the numbers of animal species protected by the various legislative instruments are given in Table 4.2, where the species identified as threatened by several scientific documents but not protected, are also given.

For plants, relevant data are given in Table 4.3.

Table 4.3
Endemic, threatened and protected taxa of Greek flora (Chloris database)

| | Endemics | Doubtful Endemics | Non-endemics |
|-------------------------------|-----------------|--------------------------|---------------------|
| Non-threatened* & Unprotected | 538 | 35 | |
| Protected | 92 | 5 | 161 |
| Threatened | 150 | 3 | 107 |
| Threatened & Protected | 441 | 8 | 206 |

* Taxa designated as non-threatened or taxa of which the conservation status is not known.

ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

The major legislative instrument for EIA, following the prerequisites of the Law 1650/86, is the Common Ministerial Decision 69269/5387/1990 regarding the contents of EIA studies and the categorisation of activities according to their possible effects on the environment. EIAs are compulsory for most categories of activities (construction of new installations, roads etc.), and are performed in accordance with E.U. standards. Another category of assessment is the Special Environmental Studies (S.E.S) that are carried out in order to create new protected areas, or to provide management plans for existing ones. SES specify permitted activities, land uses, limits, components to be protected, and specific protective measures. The supervision, control and approval of EIA and SES studies are under the jurisdiction of the Ministry of Environment, Physical Planning and Public Works.

FISHERIES

There is a large number of Presidential Decrees and other legislative instruments regulating certain aspects of fisheries, the most important of which is the Mediterranean Regulation 1626/94/EEC for the fishing activity.

Some of the most important regulations concern:

- vessel licencing, trying to stabilise the vessel tonnage to current levels and to limit entry to the fisheries,
- the establishment of limits to trawlers and beach seiners,
- the regulation of gear use,
- the minimum fish and shellfish size according to species, and
- the closed seasons/localities.

TABLE 4.4
The native races of Greek farm animals identified so far, and their status

| GROUP | RACE | POPULATION | STATUS |
|-------------|-------------------------------------|------------|--------------|
| CATTLE (5) | Tinos | minimal | Endangered |
| | Kea | >> | >> |
| | Sikia - Chalkidiki | >> | >> |
| | Katerini | 100 | >> |
| | Short Horned | 7000 | Vulnerable |
| BUFFALO (1) | Native Buffalo | 500 | Critical |
| SHEEP (27) | Katafygio | 300 | Endangered |
| | Roumlouki | minimal | >> |
| | Evdilos Ikaria | >> | >> |
| | Lefkimi Corfu | >> | >> |
| | Argos | >> | >> |
| | Chalkidiki | 180 | >> |
| | Zakynthos | 480 | Critical |
| | Palagonia | 350 | >> |
| | Sarakatsaniko | 460 | >> |
| | Katsika Ioannina | 370 | >> |
| | Skopelos | 1800 | Vulnerable |
| | Kymi | 1200 | >> |
| | Chios | 7200 | >> |
| | Agrinio | 2400 | >> |
| | Drama | 2800 | >> |
| | Thraki | 4800 | >> |
| | Kalarytiko | 3800 | >> |
| | Pilioritiko | 1400 | >> |
| | Karagouniko | | Unthreatened |
| | Lesvos | | >> |
| | Sfakia | | >> |
| | Frizarta | | >> |
| | Serres | | >> |
| | Kefallonia | | >> |
| | Mountain Race of Ipeiros (Boutsiko) | | >> |
| | Skyros | | >> |
| | Karystos | | >> |
| GOATS (3) | Ioannina | 370 | Critical |
| | Skopelos | 7000 | Vulnerable |
| | Greek | | Unthreatened |
| PIGS (1) | Native | | Critical |
| HORSES (6) | Thessalia | minimal | Endangered |
| | Andravida | >> | >> |
| | Pineia | 180 | >> |
| | Skyros Pony | 120 | Critical |
| | Pindos | 300 | >> |
| | Messara Crete | 100 | >> |

AGRICULTURE

- Presidential Decree 80/1990, on the “conservation of the plant genetic material of the country”. The aim of this P.D. is the protection and conservation of the native unimproved genetic material of cultivated plant species and their wild counterparts. Through this P.D., a national system for the conservation of phyto-genetic resources of cultivated species has been established, under the co-ordination of the Bank for the Conservation of Genetic Material of National Agricultural Research Foundation (NAGREF). Under Article 9 of the P.D., it is stated that protected zones are considered to be the areas where wild counterparts of the cultivated species are to be found, in which the preservation of the existing genetic variability and the evolutionary potential is safeguarded. Finally, the P.D. determines the procedure concerning the related studies for the designation of the protected zones and the management measures within them.
- Presidential Decree 434/30.11.95 regarding the “measures for the conservation and protection of native farm animal races”. This P.D. is similar to P.D. 80/1990 but, of course, refers to livestock. So far, 43 native races of farm animals have been officially identified (Table 8), and measures for their protection are currently evaluated.
- Law 1546/1985 on the “Organisation, production and trade of propagating material of plant species”. This law regulates the production and trade of propagating material and the patenting rights of those who have created varieties listed in the national lists. These lists include improved varieties that are unique, uniform, and stable.
- Presidential Decision 396851/22.10.92 for the “entering of fruit tree varieties, shrubs and other fruit-bearing species in the National Varieties List”.
- Presidential Decision 396943/24.11.92 for the “entering of grape varieties in the National Varieties List”.
- Presidential Decision 329360/5.4.94 for the “entering of vegetable varieties in the National Varieties List”.
- Presidential Decision 433374/16.12.94 for the “entering of cultivated species in the National Varieties List”. This concerns arable crops.

FORESTS

The legislative and institutional framework for the management and protection of forests is generally covered by the Forest Code which includes a variety of laws, decrees and decisions, some of which refer to the conservation of biodiversity components. Additionally, the regulation of local issues is the responsibility of the Forest Services and local authorities (at the County level). Forest Services and the management of forests in general, is under the jurisdiction of the Ministry of Agriculture.

An important instrument is **Law 998/1979** where many aspects of forest protection are regulated. It defines categories of forests and regulates activities and protection measures. An important aspect is the compilation of a national Forest Cadestral which is currently under development.

4.3. Background of biodiversity assessment and research

4.3.1. Sources and databases

FAUNA

In spite of its wealth, there has been no comprehensive effort to record the Greek fauna. The most important collective work to date has been the “Red Data Book of Threatened Vertebrates” (Hellenic Zoological Society and Hellenic Ornithological Society) in which all known vertebrates are recorded with data on population status and other aspects concerning the threatened and rare species. The main sources of information for Greek fauna are the odd publications of Greek and foreign researchers, PhD theses on subjects related to the fauna, the results of research projects and the series entitled FAUNA GRAECIAE of the Hellenic Zoological Society (HZS). The publications concerning the Greek fauna during the period from 1800 up to 1996 amount to ca. 6,500. The most complete bibliographical archive is that of the Documentation Centre for the Fauna of Greece of the Hellenic Zoological Society.

Recently, certain electronic data bases for the Greek fauna have been created, notably the following:

- The “Data Bank for the Greek Natural Environment” which has been created by a team of scientists from the National Technical Univ. of Athens in collaboration with other specialists and by the use of questionnaires within the framework of MEDSPA (ECE, DGXI). The foundation of this database was the creation of the CORINE Biotopes DataBase for Greece, which was structured, enlarged and completed.
- The BIOGREECE database. A site-oriented base with Standard Data Forms for the sites proposed for the “Natura 2000” network. This data base was created within the framework of the project entitled “Inventory, Identification, Evaluation and Mapping of the Habitat Types and Flora and Fauna Species in Greece (Directive 92/43/EEC)”, Ministry of Environment, Physical Planning and Public Works, Ministry of Agriculture, 1994-1995. This was done under the co-ordination of the Greek Biotope Wetland Centre of the Goulandris Natural History Museum and with working groups of the Universities of Athens, Thessaloniki and Patras.
- GRFAUNA of the Hellenic Zoological Society. It contains distributional and ecological data for all vertebrates and a number of invertebrates of Crete.
- Data base of the Natural History Museum of the University of Crete for the fauna of southern Greece, with data on the distribution of all vertebrates and many invertebrates.

Additionally, there are some smaller databases including data for certain species, established by NGOs and other institutions (e.g. for the Monk Seal by Mom-, for the Brown Bear by ARCTUROS etc.), as well as international data bases, such as the World Conservation Monitoring Centre (WCMC) data base on threatened animal species, that include data on the fauna of Greece.

FLORA and HABITATS

Sources for the compilation of the Greek flora are the generally accepted Floras and floral lists as well as the original publication in reputable scientific journals or books and PhD theses. The publications concerning the Greek flora during the period from 1753 to 1994 amount to about 10,000, according to the recently published review of the bibliography of “Flora Hellenica”.

In spite of the number of publications, the total picture of Greek flora is still lacking and relevant information can be found in the "Flora Europaea". The "Mountain Flora of Greece" only includes areas with an altitude of over 1,400m, while the MedChecklist (floral list of Mediterranean countries) has not yet been completed. Important information can be found in Floras and floral lists of specific areas of Greece, such as the floral list of the Cretan area, the flora of Samos, and others. The completion of "Flora Hellenica", of which the first volume was recently published will be a valuable contribution of information.

The major Greek databases containing data on Greek flora are the following:

- The "Data Bank for the Greek Natural Environment" which has been created by a team of scientists from the National Technical Univ. of Athens in collaboration with other specialists and by the use of questionnaires within the framework of MEDSPA (ECE, DGXI). In its final phase it included 5,517 plant taxa, nearly the total of the higher plants of Greece, and the description of 430 sites (CORINE biotopes).
- The database system of Flora Hellenica, which was developed in order to store and manage the large amount of data for Greek flora used for the writing of "Flora Hellenica". In 1994 this data base included information on 5,605 species.
- The data base on endemic, rare and threatened plants of Greek flora, entitled "Chloris", of the Department of Biology, Univ. of Athens, within the framework of the Programme for the Support of Research Manpower. It includes information on the taxonomy, distribution, status, protection, biology, ecology and bibliography of about 2,000 plant taxa of Greece and contains all threatened and protected Greek taxa, as well as the majority (> 90%) of the endemic taxa.
- The ecological database on the floral diversity of Greece, developed by the Laboratory of Plant Ecology of the Department of Biology, University of Patras, in order to cover needs in the field of research concerning ecological information about the plant taxa of Greece. To date it includes 2,080 plant taxa of mainly mountain flora.
- The BIOGREECE data base with Standard Data Forms for the 296 sites of the national Greek list of areas proposed for the "Natura 2000" network.
- The data base of the Genetic Material Bank of the National Agricultural Research Foundation, supporting the functioning of their seed bank.
- In 1994, an attempt to include all the phytosociological information in a data base was initiated by the Greek Biotope/Wetland Centre and co-operating scientists. Two data bases have been created, one for bibliography and one for phytosociological data, by using the TURBOVEG programme for phytosociological counts and appropriately developed programmes.
- A data base, supported by GIS, is being developed at the Department of Environment, University of Aegean, aimed at the creation of a scientific protocol for the planning of an ecological network in Greece. This database will allow the inclusion of non-biological data (eg. socioeconomic data) as well as biological/ecological factors.

In addition to the above mentioned databases, there are also some databases specialised in certain issues, such as the Inventory of Greek Wetlands as Natural Resources database of GBWC of the Greek Biotope/Wetland Centre, or the databases of Herbaria and forest institutes, as well as international data bases, such as the World Conservation Monitoring Centre (WCMC) data base on threatened plant species and the European CORINE data base, that include data on the flora of Greece.

4.3.2. Research

4.3.2.1. FAUNA

Research on the Greek fauna is carried out by:

- a) the Biology Departments of the Universities of Athens, Thessaloniki, Patras and Crete, in the Agricultural University of Athens and the Agricultural Schools of the Universities of Thessaloniki and Thessalia, in the Veterinary and the Forestry Schools of the University of Thessaloniki, in the Environment Department of the University of Aegean, and at the Fisheries Department of the Technological Educational Institution of Mesolongi
- b) the National Marine Research Institute, the Institute of Marine Biology of Crete, and the Benakeion Phytopathological Institute
- c) NGOs, such as the Hellenic Zoological Society, the Hellenic Ornithological Society, the Mom-Hellenic Society for the study and protection of the Monk Seal, the Sea Turtles Protection Society, ARCTUROS, and the Goulandris Natural History Museum
- d) amateurs with a high level of zoological knowledge and foreign scientists working for Universities and Museums in other countries

There are ca. 300 Greek researchers, including amateurs, post-graduate students, post-doctoral researchers, staff of Research Institutes and staff of Universities and Technological Educational Institutions. The vast majority of Greek zoologists are members of the only scientific organisation that deal with the Greek fauna, the Hellenic Zoological Society (HZS).

From a recent analysis of the research activities of HZS full members (June 1997), which is indicative of the general situation in Greece, the following conclusions were reached:

a) Researchers per animal group:

| | |
|---------------------|----|
| Mammals | 40 |
| Reptiles | 20 |
| Amphibians | 12 |
| Fish | 35 |
| Insects | 45 |
| Other invertebrates | 80 |
| Birds* | 30 |

* Especially for birds, there is a number of additional researchers, that are working for the Hellenic Ornithological Society.

b) Researchers per general field of research *

| | |
|--------------------------|-----|
| Systematics/Biogeography | 90 |
| Ecology | 170 |
| Applied (fisheries etc.) | 45 |
| Genetics/Physiology | 15 |
| Veterinary/Pathology | 15 |
| Conservation/Management | 20 |

* Several researchers are active in more than one field

c) Researchers per ecosystem type *

| | |
|------------------------|-----|
| Terrestrial ecosystems | 130 |
| Marine | 90 |
| Freshwater | 20 |

* The field of research of the remaining zoologists cannot be included in one of these categories

d) Researchers per general geographical area*

| | |
|--------------|-----|
| Athens | 125 |
| Thessaloniki | 80 |
| Crete | 40 |
| Patras | 20 |
| Other | 10 |

* These are the areas of their permanent addresses and not their region of research, which generally is not constant but may include either small or large geographical entities, depending on the research project.

From the above mentioned information it is obvious that research efforts on vertebrates are disproportionately large, taking into account their actual representation in the Greek fauna, whilst among invertebrates, insects are studied far less than their actual representation. The distribution of research fields mostly reflects the current economical and "conservation value", and the "ease of handling" of the various animals, instead of knowledge deficiencies. Also, the terrestrial fauna is studied on a smaller scale, as far as its actual representation is concerned, because the study of the marine environment is more important in financial terms (relations to fisheries, tourism etc.).

Most scientific work on Greek fauna is published in foreign journals. The main Greek scientific journals, that accept zoological papers, are: *Biologia gallo-hellenica*, *Annales Musei Goulandris*, *BIOS*, *Entomologia hellenica*, *Annales de l'Institute Phytopathologique Benaki*, *Thalassographica*, *Hellenic Zoological Archives*

Several results of zoological research are also published in semi-scientific journals, such as *Oionos*, *Nature*, *Newsletter of HZS* etc. Doctoral dissertations and technical reports constitute an important part of zoological research. Additional important scientific publications are the series *FAUNA GRAECIAE*, published by HZS (7 volumes up to now) and the *Red Data Book of Threatened Vertebrates of Greece* (HZS and HOS, 1992).

Financing of research is provided mostly by foreign sources, especially EU projects (such as LIFE, MAST, FAR), while to a lesser extent by the General Secretariat of Research and Technology, the Ministry of Environment, Physical Planning and Public Works, the Ministry of Agriculture, local authorities etc. The major proportion of the budgets is given to management studies, while Systematics and Biogeography often receive only minimal support.

4.3.2.2. FLORA

Research into the Greek flora is also carried out mainly by Universities, Technological Education Institutions and Research Institutes. Such research is also carried out in foreign Universities and Institutes (e.g. University of Copenhagen, Botanical Garden and Museum of Berlin), as well as by private Greek and foreign researchers. There are some Societies, such as the Hellenic Society for the Protection of Nature and the Hellenic Botanical Society, that support floral research. There are Herbaria in most research institutes, while there are several private plant collections, in Greece and abroad, too.

Most problems facing floral research are similar to those of faunal research. Below, a preliminary list of Greek research institutes is given, and those with Herbaria are indicated:

- National and Kapodistrian University of Athens, Dept. of Biology
 - Section of Botany (Laboratory of General Botany)
 - Section of Ecology and Taxonomy (Laboratory of Systematic Botany)
 - Herbarium of the Botanical Museum of the University of Athens
 - Ioulia and Alexandros N. Diomidis Botanical Garden
- Agricultural University of Athens
- University of Patras, Dept. of Biology
 - Section of Plant Biology: Laboratory of Systematic Botany
 - Laboratory of Plant Physiology
 - Herbarium of the Botanical Museum of the University of Patras (100.,000 specimens)
- Aristotle University of Thessaloniki, Dept. of Biology,
 - Section of Botany: Laboratory of Botany
 - Laboratory of Systematic Botany and Phytogeography
 - Herbarium of the Botanical Museum of the University of Thessaloniki
- Aristotle University of Thessaloniki, Dept. of Forestry
- Aristotle University of Thessaloniki, Dept. of Agriculture
- University of Crete, Dept. of Biology
 - Section of Organismic, Population and Environmental Biology, and Marine Biology
 - Groups of Marine Biology, Plant Biology and Biotechnology, Ecology of Terrestrial Ecosystems, Population Genetics and Evolutionary Biology.
 - Section of Applied Biology and Biotechnology
 - Groups of Biotechnology, Plant Protection and Enzyme Technology
 - Herbarium of the University of Crete
- University of Thessalia, Dept. of Agriculture, and Plant and Animal Production
- National Agricultural Research Foundation(NAGREF)
 - Athens Institute of Agricultural Research
 - Thessaloniki Institute of Agricultural Research
 - Local Research Institutes (7)
- Mediterranean Agronomic Institute of Chania (MAICH)
- Goulandris Natural History Museum (Herbarium)

4.3.2.3. FUNGI

Research into fungi is carried out in the following laboratories (with respective reference collections) :

- Section of Ecology & Taxonomy, Dept. of Biology, Univ. of Athens
(Collection of cultivated Fungi ATHUM, Herbarium of Fungi)
- Lab. of Agricultural Microbiology, Agricultural University of Athens
- Lab. of Plant Pathology, Agricultural University of Athens
- Lab. of Microbiology, Univ. of Patras
- Benakeio Phytopathological Institute
(Collection of plant-pathogenic fungi BPIC)
- Institutes for Forest Research of Athens and Thessaloniki (Ministry of Agriculture)
- Lab. of Microbiology, Medical School, Univ. of Athens
- Lab. of Clinical Allergiology, Medical School, Univ. of Athens
- Pneumonological Clinic, Medical School, Univ. of Thessaloniki

Research into Greek fungi is not developed in comparison with other groups, and only around 2,000 species have been described so far. Recently, significant efforts towards the development of fungal research have been made, mainly through the improvement of the ATHUM fungal collection of the Univ. of Athens.

4.3.2.4. HABITATS

Research at the habitat level is relatively well developed, especially as far as phytosociology and ecology are concerned. Research is carried out by scientists at all Biological, Environmental, Forestry and Agricultural Departments of all Universities of Greece, at the research institutes (National Agricultural Research Foundation, National Centre for Marine Research, Institute of Marine Biology of Crete, and Institute for Forest Research), and also by foreign scientists.

4.3.2.5. MARINE BIODIVERSITY

Marine habitats are among the most important for Greece, since a significant part of its economy is based on them (fisheries, tourism, shipping etc.). Consequently, research on marine biodiversity is relatively well developed, even though it is usually carried out as part of applied research. One of the older and most important research centres of Greece is the National Centre for Marine Research. It focuses on all aspects of marine ecology and applied marine research, and possesses an oceanographic ship, the "Aigaio" (62m). The Institute of Marine Biology of Crete possesses an oceanographic ship, "Philia" (26m), and is performing high quality research, including the genetic level.

The Zoological Laboratory and Museum of the University of Athens also plays a pioneering role in the study of marine zooplankton and zoobenthos, while the laboratories of the Universities of Thessaloniki and Patras have been actively participating in benthic and ichthyological research. The Democritus National Centre for Physical Sciences Research has set the foundations for the study of marine phytoplankton. In the same field, the Department of the Environment of the University of the Aegean has actively contributed over the last years. Two other centres, the Aquaculture Centre of Acheloos S.A., and the Institute of Fisheries Research of Kavala

(belonging to NAGREF), although having a more applied objective, have been active in projects related to the recording of marine organisms.

Today there are approximately 40 experienced specialists working in the afore-mentioned centres, working on the marine fauna and flora and with their publications, contribute to the better knowledge of the biodiversity of Greek seas. Of these researchers, more than a third (15) are working on benthic invertebrates. The groups of specialists working on mesozooplankton and fishes each have about 10 members and finally there are about 5 or less specialists working on phytoplankton, macrophytobenthos, marine mammals and population genetics. One or two researchers are concerned with research into meiobenthos, microphytobenthos and microzooplankton.

International magazines published in Greece and including research related to Greek marine biodiversity, are: *Biologia*, *Gallo-hellenica*, *Thalassographica*, *Bios* (Macedonia, Greece), *Annales Musei Goulandris*. The main volume however, of the results of research related to marine biodiversity, is published in well-respected international journals.

The following conferences have a long-established history in Greece: Panhellenic Symposium of Oceanography and Fisheries, Panhellenic Conference of Ichthyologists, and Panhellenic Conference of the Greek Society of Biological Sciences.

4.3.2.6. AGRICULTURAL DIVERSITY

Agricultural diversity is another nationally important subject of research, and has been developed to a significant degree, especially over the last decades. The National Agricultural Research Foundation, supervised by the Ministry of Agriculture, is the most important institution in this field. It has established a large number of Institutes, specialised in certain areas of research, that are spread throughout Greece. The most important such institutes, related to biodiversity, are the following:

- Institute of Subtropical Plants and Olives - Chania
- Institute of Aromatic Plants-Thessaloniki
- Institute of Cereals-Thessaloniki
- Institute of Cotton and Industrial Plants-Thessaloniki
- Institute of Fodder Plants-Larisa
- Institute of Deciduous Trees-Naoussa
- Institute of Vines-Lykovrisi, Attiki
- Institute of Vines, Vegetables and Flower Cultivation-Irakleion
- Institute of Cultivated Plant Varieties Control-Sindos
- Institute of Vines, Fruit and Vegetables-Gastouni, Ileia
- Institute of Tobacco-Drama

The Institutes of NAGREF possess, in most cases, reference collections and parent plantations and they also collaborate closely with the Genetic Material Bank (see below).

Under the supervision of the Ministry of Agriculture, there are also some Centres for the Genetic Improvement of Farm Animals that are responsible for the keeping of genealogical records of farm animal races as well as for the monitoring/evaluation of animals and races. These are:

- Centre of Genetic Improvement, Athens
- Centre of Genetic Improvement, Drama
- Centre of Genetic Improvement, Ioannina
- Centre of Genetic Improvement, Karditsa
- Centre of Genetic Improvement, Diavates, Thessaloniki

In the above-mentioned foundations, we must include the Institute of NAGREF in Agios Mamas, Chalkidiki, and the Laboratories of Animal Technology of the Agricultural University of Athens and the Aristotle University of Thessaloniki.

Important work on several aspects of agricultural diversity, such as aromatic/medicinal plants, alternative methods of cultivation etc., is carried out at the Mediterranean Agronomic Institute of Chania (MAICH).

4.3.2.7. FRESHWATER BIODIVERSITY

Research and management of freshwater biodiversity is well developed in Greece, especially after the creation of the Greek Biotope-Wetland Centre (GBWC) of the Goulandris Natural History Museum. Significant research is carried out at the Biological Departments of the Universities of Athens and Thessaloniki, and at the National Centre for Marine Research (Institute of Inland Waters), including studies on their ecology, management, protection, water quality, surveys, monitoring of biodiversity components (especially waterfowl) etc.

4.3.3. *Ex situ* conservation infrastructure

Ex situ conservation in Greece includes the Zoos and Botanical Gardens, the Seed and Genetic Banks and the Rescue Centres for wild animals.

4.3.3.1. ZOOS

According to a recent inventory, 29 zoos and animal collections exist in Greece. Most of the zoos are small, hosting a very small number of animals, usually birds (pheasants, partridges, parrots, peacocks, ducks, geese and various singing birds). In certain zoos there are also some mammals, mainly monkeys, wild goats, foxes, rabbits etc. The largest zoos, such as the Florina Zoo and the Nea Philadelpheia Zoo, host a larger variety of animals (bears, lions, wild boar, deer, birds of prey etc.). There are also two Aquaria, one in Rhodes (belonging to the NCMR) and one in Alimos (Municipal), a collection specialised in reptiles, and a private mobile collection, named Safari Show.

Most zoos belong to municipalities/communities and are managed mainly for recreation. They face problems like inadequate space, absence of variable environment, improper animal diets, poor hygienic conditions of animals, lack of specialised personnel, and lack of interpretation. As a result, in recent years there has been a tendency towards the reduction of the number of zoos and several municipal zoos have closed due to public pressure.

4.3.3.2. BOTANICAL GARDENS

The most important Botanical gardens of Greece are the following:

- The Ioulia and Alexandros Diomides Botanical Garden (DBG), which is a bequest of A. Diomides to the University of Athens. The DBG lies in the suburbs of Athens and has an area of 165ha. Its developed part (around 20ha) consists of 7 specialised sectors, hosting more than 2.000 plant taxa. The DBG publishes a Seed List (around 400 species). Over the last two years the garden has been reformed and enlarged, and its function is in accordance with modern biodiversity conservation practices (with an endemics section etc.). An important component of DBG is its natural part, with 24 endemic Greek species and characteristic biotopes, that is ideal for the creation of a genetic bank in the natural environment.
- The Botanical garden of the University of Athens, which was established in 1842 and has been gradually degraded due to the expansion of the city of Athens.
- A Botanical garden is under construction at the University of Patras. It will be based on the existing background of 23 cultivated threatened species, the existing know-how of the cultivation of several species, and mainly on the scientific expertise of the Botanical Laboratory.
- The Botanical garden of Neochori (Karditsa) has been created within the framework of a LIFE project.
- Two more attempts should be mentioned: the Garden of medicinal and aromatic plants (24 species) and the stands of forest species, both at the Aristotle University of Thessaloniki.

4.3.3.3. SEED AND GENETIC MATERIAL BANKS

In Greece the following such institutes are active at present:

- The seed bank of rare, endemic, threatened and protected Greek species, in the Section of Botany, Dept. of Biology, Univ. of Athens. Its creation was the result of a project of the General Secretariat for Research and Technology, with Asstn. Prof. K. Georghiou as project leader. It contains 106 taxa (138 seed lots) and a -20 °C temperature room is available. Seed germination, and, generally, the reproductive biology of plants is studied in order to improve the bank's function.
- The Herbarium of Labiatae species of the Aristotle University of Thessaloniki, with Prof. S. Kokkini as supervisor, contains a significant wealth of specimens and serves as a basis for the creation of a seed bank for the genus *Origanum*, with the co-operation of the International Plant Genetic Resources Institute (IPGRI).
- The Genetic Material Bank (GMB) was established in 1981 and belongs to NAGREF. GMB has been organised in collaboration with the Ministry of Agriculture and FAO. In its installations and on farm (at NAGREF institutes) there are 7,220 seed specimens or clonal reproductive material of 169 species of cultivated plants and their wild relatives. In the GMB the following activities are also included: a) seed reproduction that supplies the Active and Basic collections, b) the description and evaluation of bank material (morphological, agronomic and genetic characteristics), c) the compilation of a database, d) the identification of areas with significant genetic wealth of indigenous species towards their *in situ* conservation, and of traditionally cultivated varieties in order to protect them on farm, e) collaboration with other research institutes inside and outside Greece.

4.3.3.4. RESCUE CENTRES FOR WILD ANIMALS

There is a number of wild animal rescue centres in Greece, all of which have been created by private initiatives, while recently some of them have received some support by the state. Although infrastructure is generally inadequate, the Centres' work is important, especially concerning the medical care and reintroduction of rare and threatened wild species into their natural habitats.

Today, the active centres are the following:

- Greek Rescue Centre for Wild Animals and Birds (at Aigina island)
- Rescue Centre for Wild Birds (Hellenic Ornithological Society - at Thessaloniki)
- Aegean Wildlife Hospital (at Paros island)
- Bird and Wild Animal Rescue Centre (at Corfu island)
- Rescue and Wild Animal and Bird Protection Station (at Volos)
- Rescue and Rehabilitation Unit for Seals (Mom-Hellenic Society for the Study and Protection of the Monk Seal - at Alonnisos island)
- Rescue Centre for Sea Turtles - (Sea Turtles Protection Society- at Glyfada)

4.3.4. Natural History Museums (NHM)

According to a recent inventory of Greek NHM, 40 Natural History museum collections exist in Greece. These do not include some local collections maintained by hunting associations, schools, local offices of the Forest Service, municipal services and private collections that have not been possible to locate.

More than half of the NHM are concentrated in the region of Attiki, around Athens, the most important being the growing University collections and the private Goulandris NHM. There is a growing tendency towards

the creation of small local museums (municipal, communal, in schools or of environmental groups). The largest part of the provincial collections are in Makedonia and Thraki (20%) due to the existence of many important wetlands and mountains in this region.

About half of the country's NHM are under public management, while the other half are either private or belong to environmentalist associations or municipalities/communities.

As far as the species represented are concerned, birds are by far the most abundant (more than 60%), with mammals following, a fact that is indicative of the close relationships between Greek NHM and hunting activities. The only NHM that host other kinds of specimens are those that belong to research institutions (Universities, Hydrobiological Station of Rhodes etc.), whose collections did not have hunters' trophies as starting points.

4.3.5. Public education and awareness

Public education and awareness on biodiversity matters is realised mainly through general environmental education (EE) and is carried out through EE projects executed by public and private educational institutions, NGOs and EE Centres. Additionally, in the curriculum of the primary and secondary formal education there are some biodiversity related sections, mainly in lessons concerning biology and/or the knowledge of the environment. EE projects in schools and other institutions have been continuously growing during recent years. EE has been part of the official curriculum of the primary and secondary education since 1990 and many teachers are educated in this area. More than 1100 such projects are currently under development, and there is sufficient use of related EU projects (e.g. SOCRATES-Comenius, Globe etc.) with support by relevant ministries (Ministry of Education and Religious Affairs, Ministry of Environment, Physical Planning and Public Works).

Public awareness and information projects are being carried out by NGOs. The most significant work in this area is provided by the following organisations:

- Pan-hellenic Union of Educators for Environmental Education
- Greek Society of Environmental Awareness and Education
- WWF-Hellas
- Mom-Hellenic Society for the Study and Protection of the Monk Seal
- Sea Turtle Protection Society
- Hellenic Society for the Protection of Nature
- Goulandris Natural History Museum (Friends of the museum)
- ARCTUROS
- Greek Scouts

Site - specific awareness projects are being carried out in protected areas by their Management Schemes. There are 10 Information Centres operating in Ramsar wetland sites and on-site awareness projects are carried out at least in twenty other locations with high biodiversity value by NGOs.

5. PRELIMINARY STRATEGY CONSIDERATIONS

5.1 Outstanding issues

In this chapter we present the most important issues which have to be addressed in order to meet the CBD objectives. This is a preliminary account, that will be further evaluated during the next step of the NBS planning. These issues together with a more detailed evaluation of deficiencies and problems in existing strategies, institutional organisation and enforcement will serve as a basis for the NBS priority setting.

At the national level, the major issues comprise:

- National environmental planning with regard to biodiversity conservation
- Co-ordination between relevant policy sectors, mainly tourism, agriculture, fisheries.
- Institutional and enforcement deficiencies of existing legislation
- Re-direction of existing financial resources and complementary funds.
- Awareness and training of the public services in planning and handling biodiversity conservation projects.
- Evaluation of the economic aspects of biodiversity and the inclusion of biodiversity-related issues in planning sustainable development and land uses.

IN SITU CONSERVATION

The following issues comprise priorities, with regard to *in situ* conservation:

- Evaluation of existing policies, legal framework, institutional organisation and enforcement in existing protected areas.
- Assessment and planning of the implementation of the European Ecological network NATURA 2000 in the country.
- Development of vegetation and habitat maps for terrestrial and coastal ecosystems, together with monitoring mechanisms in protected areas.
- Development of Inventories and distribution Atlases at the species level, evaluation of the protected species list and the relevant measures taken .
- Evaluations for the effects of alien species both in the terrestrial, fresh water and the marine environments.
- Awareness and information-sharing among local authorities and communities.
- Evaluation of land use plans and market incentives for biodiversity conservation.

EX SITU CONSERVATION

Ex situ conservation includes a few Seed and Genetic Material Banks, which function at modern high standards. However, for the support of the existing Zoos and Botanical Gardens the following issues must be examined:

- Securing adequate financial resources for infrastructure improvements and running expenses.
- Training of specialised personnel for research and management activities
- Promotion of integration between *ex situ* and *in situ* protection

RESEARCH

- Promotion of basic taxonomic, biogeographical and ecological research for both the terrestrial and coastal-marine habitats in Universities and Research Institutes.
- Strengthening national co-ordination and planning of research priorities and directions
- Training of specialists and amelioration of research conditions (libraries, database, congresses)
- Promotion of research within existing and proposed protected areas.

ENVIRONMENTAL IMPACT ASSESSMENTS

- Improvement of the existing documentation of biological components for the country as a whole is necessary for achieving good quality in EIAs.
- Improvement in monitoring the enforcement of environmental conditions set for different projects.

EDUCATION / AWARENESS

- Further promotion of biodiversity oriented targets in school curricula and environmental and general education
- Training of teachers in communicating biodiversity subjects
- Improvement of operational conditions of Natural History Museums (NHM), including scientific personnel, specimen preservation etc.

5.2 Related initiatives

The National Wetland Strategy is being elaborated by the Ministry of Environment in collaboration with the Greek Biotope/ Wetland Centre and is foreseen to be completed in the near future. The strategy will be an integral part of the national Biodiversity Strategy and it comprises a general part applying to all wetlands and wetland related issues and a specific part for the Ramsar Wetlands, named the Ramsar Wetlands Action Plan.

The National Project for Coasts. A joint Committee from the Ministry of Environment (Environmental Planning Division and Physical Planning Division) and the Ministry of Finance, with the support of the University of the Aegean, was set up in 1996 to examine issues related with the sustainable use of the coasts. A specific working group elaborated guidelines for the conservation of biodiversity in the coasts and its deliberations were included in the considerations of the land use planning working group. The final report was issued in January 1998 and comprises an important contribution to the National Biodiversity Strategy and the relevant Action Plans for Coastal Biodiversity.

The Agri-environmental Policy Committee was set up in 1997 by the Ministry of Agriculture in order to evaluate existing policies and their integration with environmental requirements. The CBD has been one of the main inputs to the Committee aiming at enhancing co-ordination of policies with regard to biodiversity conservation.

The sustainable development of mountainous areas is also a priority issue addressed by the Ministries of Agriculture and National Economy, with the collaboration of the Ministry of Environment. One of the main considerations in this group is the potential in linking the biodiversity value of these areas to their sustainable use.

The National Committee for Biotechnology has been set up jointly by the Ministries of Environment, Agriculture, Labour, Public Health, Development (Technology Secretariat) and Commerce and Economics and it examines issues related to the contained and experimental use and the deliberate release of Genetically Modified Organisms for commercial reasons. More over, a related project of the Ministry of Environment is underway aiming at the development of data bases and promotion of public awareness

The Project for the Implementation of Agri-environmental Measures, is operated by the Ministry of Agriculture with the participation of the Ministry of Environment and it comprises actions for the promotion of biodiversity in agricultural areas.

The initiation of the European Network NATURA 2000 in Greece includes preparatory actions for the conservation of biodiversity in many sites, as well as the integration of biodiversity policies in the regional and local land use plans. Information and policy- making meetings are organised in the 13 regions of the country on this subject, by the Ministry of Environment and the support of the Greek Biotope / Wetland Centre.

6. AUTHORITIES AND ORGANISATIONS INVOLVED

In order to achieve the best possible results in the planning of the National Biodiversity Strategy, all competent authorities and organisations involved in biodiversity related sectors should be aware of the CBD and its implications, and should be well co-ordinated before specific action plans are undertaken. The same is also true for all policy implementation and economical bodies that are indirectly related to biodiversity themes.

In Greece, the administrative structure is relatively complex, and there are several bodies with overlapping jurisdictions as far as biodiversity related issues are concerned. The most directly involved competent authorities in the Supervising Committee are the following:

- **Ministry of Environment, Physical Planning and Public Works.** Its jurisdictions include both environmental and physical planning. More specifically it carries out planning with regard to the conservation of habitats and species, the establishment and management of protected areas, EIA related subjects, most issues that are related to environmental protection and awareness. It is also the National Focal Point of the CBD, the Bern Convention, the Barcelona Convention, and the RAMSAR Convention.
- **Ministry of Agriculture.** Its jurisdictions include the management of National Forest Parks and generally all forested areas, the protection of species, the management of fisheries, hunting, forestry and agriculture, genetic resources and *ex situ* conservation of plants and farm animals. It is also the NFP of CITES.
- **Ministry of Development.** It is responsible for the planning of the major development activities of Greece, for industry, for a significant part of research, for the management of energy, and for tourism.
- **Ministry of Education and Religious Affairs.** It is responsible for environmental education in schools and for several aspects of education and research in higher levels (Universities etc.).
- **Ministry of National Economy .** It is involved in the economic environmental aspects and it co-ordinates the national participation in OECD.

Through the National "Biodiversity Convention Co-ordinating Project", the objectives of the CBD have been made widely known among authorities and organisations. An analysis of the CBD was distributed among all related departments of Ministries, NGOs, Universities and other research institutes of Greece. A questionnaire has been used for the development of an inventory of current activities and existing infrastructure at a national level. Until now, 31 answers have been received (see list in box).

The involvement of administrative bodies during the present stage of the NBS and NAPs compilation project has been focused on the ministerial level. Lower levels, including local authorities and other administrative mechanisms, are going to be involved at later stages, during the specification of certain action plans. This has been decided in order to have a more flexible work schedule.

Respondents to the questionnaire (as by December 1997):

1. Immediate Intervention for the Protection of Nature
2. Aristotle University of Thessaloniki (AUT), Dept. of Biology, Sect. of Botany
3. AUT, Dept. of Biology, Sect. of Ecology
4. AUT, Dept. of Biology, Sect. of Zoology
5. AUT, Faculty of Agriculture, Dept. of Animal Production
6. Network Mediterranean-SOS
7. National Agricultural Research Foundation (NAGREF), Institute for Fisheries Research
8. NAGREF, Inst. of Vine, Vegetable and Flower Cultivations of Irakleion
9. NAGREF, Inst. of Land Improvement
10. NAGREF, Inst. of Soils - Athens
11. NAGREF, Inst. of Soils - Thessaloniki
12. NAGREF, Makedonia-Thraki Agricultural Research Centre, Genetic Material Bank
13. NAGREF, Inst. of Mediterranean Forest Ecosystems and Forest Products Technology
14. National Centre for Marine Research (NCOMR), Inst. of Oceanography
15. NCOMR, Inst. of Inland Waters
16. National Technical University of Athens, Sect. of Water Resources, Hydraulics and Marine Works
17. Hellenic Zoological Society
18. Hellenic Ornithological Society
19. Greek Biotope-Wetland Centre (Goulandris Natural History Museum)
20. Mediterranean Agricultural Institute of Chania (MAICH)
21. Mom-Society for the Study and Protection of the Monk Seal
22. WorldWide Fund for Nature-Hellas
23. Greek Scouts
24. Ministry of Development, General Secretariat of Research & Technology
25. Min. of Agriculture, G.D. of Agricultural Applications & Research, Dept. of Physical Planning and Environmental Protection
26. Min. of Agriculture, General Secretariat of Forests and Natural Environment, G.D. of Development & Forest & Natural Environment Protection, Dept. of Aesthetic Forests & National Parks & Hunting
27. Min. of Education and Religious Affairs, General Secretariat for Youth, Sect. of Ecology, Environment & Eco-development
28. Min. of Merchant Marine, Dept. of Marine Environment Protection
29. Min. of Foreign Affairs, Dept. of International Economic Organisations and Int. Conventions
30. Min. of Makedonia-Thraki, Sect. of Environment
31. Min. of Culture and Sciences, General Secretariat of Prehistoric and Classical Antiquities

In addition to the above mentioned authorities, a number of other administrative bodies, research institutions and NGOs have been directly contacted in order to provide data and opinions. The most significant such contacts is given in the following list:

- Greek Biotope-Wetland Centre (Goulandris Natural History Museum). This centre has provided a large body of data concerning inland waters and databases.

- National Centre for Marine Research. Researchers at this centre have assisted the compilation of data on marine biodiversity.
- National Committee for Biotechnology - Ministry of Environment, P.P.P.W. Data and opinions on biosafety related themes.
- Genetic Material Bank - NAGREF (Macedonia-Thraki Centre for Agricultural Research). Researchers from this institution have provided assistance in *ex situ* plant conservation themes.
- Individual scientists at the A.Univ. of Thessaloniki, Univ. of Athens and University of Aegean have provided data on aromatic/medicinal plants, on fungi and on economic issues, respectively.

7. PAST AND CURRENT ACTIVITIES FOR THE CONSERVATION OF BIODIVERSITY

Some representative, among the most important, biodiversity related projects that are currently running, or have been executed during the last decade in Greece are the following (of course, this list is not exhaustive, since the projects carried out by the Greek institutions in the several sectors are numerous):

IN SITU CONSERVATION

Projects related to the conservation of biodiversity components at the species level have been undertaken for the following species:

- Monk Seal (*Monachus monachus*) - Mom-Hellenic Society for the Study and Protection of the Monk Seal and WWF-Hellas
- Loggerhead Turtle (*Caretta caretta*) - Sea Turtles Protection Society and WWF-Hellas
- Brown Bear (*Ursus arctos*) - ARCTUROS and Ministry of Agriculture
- Wolf (*Canis lupus*) - ARCTUROS and Ministry of Agriculture
- Kyklades Blunt-nosed Viper (*Macrovipera schweizeri*) - Goulandris NHM and Dept. of Biology, University of Athens
- Endemic-protected lizards - Dept. of Biology, University of Athens
- Lammergeier (*Gypaetus barbatus*) and its habitats in Crete - Immediate Intervention for the Protection of Nature (LIFE)
- Audouin's Gull (*Larus audouinii*) - Hellenic Ornithological Society (H.O.S)
- Imperial Eagle (*Aquila heliaca*) - H.O.S.
- Actions for the protection and restoration of the threatened endemic fish species *Pungitius hellenicus* - National Centre for Marine Research, Ministry of Environment, Physical Planning and Public Works
- Conservation and restoration of Pygmy Cormorant (*Phalacrocorax pygmaeus*) and Lesser White-fronted Goose (*Anser erythropus*) populations in 10 wetlands - WWF-Hellas, Ministry of Environment, Physical Planning and Public Works
- Conservation and restoration of Slender-billed Curlew (*Numenius tenuirostris*) populations - H.O.S., Ministry of Agriculture
- Conservation and restoration of Dalmatian Pelican (*Pelecanus crispus*) in wetlands of Northern Greece - Aristotle University of Thessaloniki, and at Amvrakikos gulf - H.O.S.
- Conservation and management of raptors in Evros District - A.U.T.

At the habitat / ecosystem conservation level most activities refer to the delimitation and management of protected areas. Additionally, it is important to take into account the Environmental Impact Assessment projects that are performed before any public or private installation or other construction has been approved.

MARINE BIODIVERSITY and FISHERIES

A large number of projects dealing with the biology and ecology of certain economically interesting species, and with the ecology of certain areas with increased interest for fisheries is carried out by the research institutes and the Universities. More applied projects dealing with biodiversity related subjects, are the assessment of the impact of fisheries on the benthic ecosystem, the installation of artificial reefs, and the deep water fisheries.

Additionally, the Ministry of Agriculture has promoted the Operational Fisheries Projects, co-financed by E.U., that cover the areas of Marine Fisheries, Aquaculture, Evaluation of Fisheries Production, and Fisheries Infrastructure. Also, several related projects have been carried out in the framework of the E.U. PESCA Operational Project.

The activities and orientation of research in the institutes

National Centre for Marine Research (NCMR)

The NCMR is the major Greek institution for marine research, and carries out a large variety of projects, most of which are directly or indirectly related to biodiversity.

It has three Institutes, each specialised in certain areas of research:

- The Institute of Marine Biological Resources, dealing with fisheries and aquaculture, the ecology and dynamics of most important species, and the management of marine biological resources.
- The Oceanographic Institute, dealing with applied marine studies, the ecology of coastal ecosystems, and the effects of human activities in the marine environment.
- The Institute of Inland Waters (see related paragraph)

Institute of Marine Biology of Crete

The IMBC has four departments, carrying out projects related to the marine environment and fisheries:

- Genetics Dept., dealing with the use of genetic methods for the analysis of natural and cultivated populations of marine species,
- Marine Environment Dept., dealing with the productivity of marine ecosystems, environmental changes, and the assessment of the effects of marine pollution,
- Fisheries Dept., dealing with population dynamics and stock assessment of several Mediterranean fish species, as well as the biology of demersal and pelagic fish, and
- Aquaculture Dept.

Institute for Fisheries Research (NAGREF)

The IFR participates in several national and E.U. projects, such as “Dimitra”, “Biological Studies” and “Life”, dealing with fisheries.

Aquaculture Centre of Acheloos S.A. (ACEA)

ACEA carries out several research projects dealing with aquaculture, the management of coastal ecosystems, such as lagoons and estuaries, the promotion of new species applied culture, and the support of environmental research in coastal areas.

University Laboratories

In the Universities of Athens, Thessaloniki, Aegean, Patras and Crete, there are laboratories working on marine biology and fisheries. Research carried out in these laboratories is mainly concentrated on the genetics, systematics, biology and ecology of certain species and communities, and on the impact of pollution on the marine environment.

FOREST BIODIVERSITY

Activities related to forest biodiversity include a wide range of management projects that are mainly regulated by the Forest Services of the Ministry of Agriculture.

These activities deal with the following major subjects:

- Management of National Parks, Aesthetic Forests, Controlled Hunting Areas, Nature Monuments and other protected areas that include forests
- Measures against forest fires
- Reforestation of burned and degraded areas
- Management of forest resources
- Regulation of hunting
- Control of forest pests and diseases

Additionally, there is a large number of related projects carried out by the Dept. of Forestry of the Aristotle University of Thessaloniki, the related departments of Technological Educational Institutions, and the Mediterranean Agronomical Institute of Chania.

AGRICULTURAL DIVERSITY - GENETIC RESOURCES

- An inventory project of indigenous breeds of cattle, goats, sheep and equines is being carried out by the Centres of Genetic Improvement of Animals in collaboration with the two Laboratories of Animal Technology, within the framework of the 2nd E.U. Cohesion Fund and the implementation of the Presidential Decree 434/95 for "Measures for the conservation and protection of native farm animal races".
- A programme for the "Conservation of rare farm animal races" has been approved by the STAR Committee (Agricultural Structures) of the European Commission (REF:VI/3823/97), within the framework of the implementation of regulation EU/2078/92. A ministerial decision for the implementation of the programme has already been signed. Its budget amounts to 2.8 billion drs for the five-year period 1997-2001. It allows for incentives for the preservation of 31 races of cattle, goats, sheep and equines, and in particular, 6 races of cattle, 18 races of sheep, 1 race of goat and 6 races of horses. All the above-mentioned races are under the status of endangered, critical or vulnerable. Up to now, Regulation EU/2078/92 has not included the conservation of native races of pigs and poultry. However, this change is anticipated with the first modification of the Regulation. On the contrary, although the conservation of donkey breeds has already been included, the Greek Ministry of Agriculture has not included their conservation in the submitted project because of its inability to certify the Greek races of donkey.
- The programme "Conservation of species and varieties of cultivated plants threatened by genetic degradation" has been undertaken by the Department of Physical Planning and Environmental Protection of the Ministry of Agriculture, within the framework of Regulation EU/2078/92, Its budget amounts to 10.7 billion drs for the period 1998-2002. It will cover a surface approximately 5,000 hectares in which it will attempt to preserve 63 species and 281 varieties of agricultural plants and about 100 species, subspecies and varieties of native plants which possess some financial interest.

- The programme "Long-term ceasing of farmland exploitation" has been approved within the framework of Regulation EU/2078/92. For its implementation the following Ministerial Decisions have been published:
 - Decision of Ministers of Finance and Agriculture, 237/348747/8765/9.9.96
 - Decision of Minister of Agriculture, 79184/1957/6.11.96
 The aim of this programme is the stoppage of arable agriculture or the grazing of pasture lands in areas of ecological interest, in order to create reserves, natural parks and in general to increase biodiversity. The following ecologically-sensitive areas have been designated:
 - The areas of the Natura 2000 Network
 - Areas neighbouring Network Sites
 - Areas neighbouring rivers and lakes
- Activities of the Genetic Material Bank of National Agricultural Research Foundation (NAGREF)

Today, it preserves *ex situ* 7,100 local varieties and their wild counterparts belonging to over 170 botanical species. From this number, between 100 and 150 samples are propagated and partially validated each year. Finally, it preserves *on farm* a collection of approximately 500 native varieties.
- Activities of other Institutes of NAGREF

The Institutes of NAGREF possess, in most cases, reference collections and parent plantations and they also collaborate closely with the Genetic Material Bank. The latter also collaborates with a non-governmental organisation called the Laboratory of Ecological Practice, which collects seeds from villages in an attempt to reintroduce native varieties into cultivation.
- Activities of the Centres for the Genetic Improvement of Farm Animals (Ministry of Agriculture) and the Laboratories of Animal Technology of the Agricultural University of Athens and the Aristotle University of Thessaloniki.

The above mentioned Centres are responsible for the keeping of genealogical records of farm animal races, as well as for the monitoring/evaluation of animals and races.

The most important such projects of the NFP for the protection and preservation of genetic material of farm animals of Greece (Laboratory of Animal Technology of the Faculty of Agriculture of the Aristotle University of Thessaloniki (AUT) - Ministry of Agriculture) are:
- Research on the population and production systems of Buffalo in Greek wetlands (with EKBY)
- The Greek Short-horned cattle race in the region of Prespa lakes (with the Centre for the Protection of Prespa lakes)
- Endangered ruminant breeds in the EEC: survey and status of population - proposals for adapted rules to favor their breeding (E.U. project)
- BovMap - the E.U. Bovine Gene Mapping Project (E.U. project, INRA)
- Study of indigenous cattle breeds
- A permanent inventory of European farm animal genetic resources and of activities on characterisation, conservation and utilisation of those resources (RESGEN 083 - EEAP, E.U. project)

- Analysis of genetic diversity in cattle to preserve future breeding options (E.U. project, AFRC Roslin Institute/Scotland)

The following projects focus on aromatic and medicinal plants:

I. Mediterranean Agronomical Institute of Chania:

- Identification, preservation, adaptation and cultivation of selected aromatic and medicinal plants suitable for marginal lands of the Mediterranean region.
- Towards a model of technical and economic optimisation of specialist minor crops: aromatic and medicinal plants
- Contribution to the breeding of aromatic and medicinal plants: comparative study in selected *Origanum* spp.
- *Origanum* sp. and *Salvia* sp.: integrated breeding research to improve homogeneity and quality of multifunctional secondary plant products.
- Cultivation, processing and trade of aromatic and medicinal plants.

II. Lab. of Systematic Botany and Phytogeography, Dept. of Biology, Aristotle Univ. of Thessaloniki:

- Biotechnology applications for plant propagation, identification and certification aiming at the production of healthy material and the industrial utilisation of certain aromatic plants.
- Aromatic flora of Greece.
- Study of the aromatic flora of the areas of Ipiros and Crete and the potential of its development.
- Inventory and study of the medicinal plants of Vikos-Aoos National Park.
- Possible impact of increased ultraviolet-B radiation on Greek aromatic plants.
- Threatened Medicinal Plant Habitats.

INLAND WATERS

- Studies on the population and production systems of the buffalo in Greek wetlands - Greek Biotope-Wetland Centre (GBWC) and Lab. of Genetic Improvement of Farm Animals, Agricultural Dept., Aristotle Univ. of Thessaloniki
- Studies on the restoration of the dried lakes of Mavrouda and Lantza - GBWC
- Studies for the partial restoration of the dried Karla lake - GBWC
- Forest and ecological studies of the coastal forests of Strymon river, Nestos river and Kerkini lake - GBWC
- Management of rice farms using the plant *Azolla filiculoides* - GBWC
- Chemical composition of freshwater plants in wetlands of N.Greece - GBWC
- Use of freshwater plants for water pollution control - GBWC
- Phytosociological - ecological study of Agios Mamas lagoon - GBWC
- Ecological value evaluation of Kalamas Delta - GBWC
- Quality control of surface waters of C. and W. Makedonia using biological indicators - Ministry of Development and Section of Zoology, Dept. of Biology, Aristotle Univ. of Thessaloniki
- Quality control of surface waters of Axios rivers - Ministry of Development and Section of Zoology, Dept. of Biology, Aristotle Univ. of Thessaloniki

- The system of Aliakmonas river above the artificial lake of Polyfytos - National Centre for Marine Research (NCMR)
- The biodiversity of artificial lakes' freshwater systems - NCMR
- Ecological classification of surface inland waters - NCMR
- Monitoring of water qualitative characteristics of the lakes Koroneia and Volvi, and the rivers Axios and Loudias - Ministry of Makedonia-Thraki, Environmental Dept.