

Box 71. Yellow sea fan (*Eunicella cavolini*)

- Order: *Gorgonaceae*
- Family: *Gorgoniidae*
- Croatian name: morsko stabalce, bradavičasta rožnjača
- IUCN: 1 (mostly average settlements, the state could, at least locally, become serious in the future)
- Protection in Croatia: not protected

Yellow sea fan is one of the most frequent species of horny corals in the Adriatic, particularly significant in coralogenic biocenosis of the deep craggy seabed and in the biocenosis of semi-dark caves. Its presence is the indication of a clean sea and the marked dynamics of seabed currents. Individually richly branched out and flattened colonies of yellow sea fan can reach more than 50 cm of height. By their wider side they are turned towards permanent sea currents, thus collecting to the highest extent possible the organic detritus and planktons for food. Coral trees and branches are often overgrown by other organisms, particularly by coral *Paralcyonium corralloides*, and it is here that pouch sacs with



squid eggs and spawn of cartilaginous fish may be found. Well-developed settlements of yellow sea fan in the Adriatic may be found first of all on steep craggy slopes and vertical rocks, rarely in submarine caves too. In places visited constantly by autonomous divers the signs of devastation of settlements have been recently discovered. Since yellow sea fan can adapt well to living conditions in aquariums, they are brought out by diving for the purpose of aquarium keeping or as a souvenir although without any greater market value. As not a single species of genus *Eunicella* is protected in this country there is a danger of the local disappearing of this most beautiful ornament of our submarine rocks and cliffs.

D. Zavodnik

Map 24. Map of yellow sea fan distribution

(according to data by D. Zavodnik)

Figure 128. Yellow sea fan, undersea of Elba island

(photo by A. Jaklin)

pig of Turopolje). Breeders of individual breeds unite into associations of breeders through which they seek to implement the protection programmes.

Box 72. Taxa protection deficiencies

- insufficient legislation
- incomplete inventories of protected taxa that require revision
- missing data on the composition of species and invertebrate threats
- violation of regulations, poor control and almost no sanctions
- shortage of funds for implementation of action plans for individual taxa and
- lack of incentive measures for breeding of threatened indigenous taxa of domesticated plants and animals.

Protection of habitats

Apart from the protection provided within protected areas it is necessary to protect by law certain **threatened or rare types of habitats** such as, for example, moors, silty and sandy coasts, reeds, some types of meadows, etc. which means that such habitats would be protected wherever recorded. The present Nature Protection Act has not foreseen such a category, which is to be taken into account when preparing the new draft law.

Protection of habitats in economically exploited areas may be improved by implementing specific **nature protection guidelines** on the part of departments dealing with agriculture, forestry, water management, physical planning, etc. It is also very important to encourage the preservation and, if possible, the restoration or even generation of small new **diverse biotopes** that are of local importance and therefore protected primarily at the municipal level. These biotopes form a network that the denser and the more interconnected it is, the higher stability and ecological balance of the overall biological diversity it may ensure.

EX-SITU PROTECTION

The ex-situ protection means the preservation of components of biological diversity outside their natural habitats. Such measures are especially important for very rare and threatened species on the verge of extinction. It is therefore important that they or their genes are preserved or, in case of animals, even multiplied for the purpose of re-settling them into their natural habitats. Plant genes may be preserved in form of seeds or tissue cultures, and animal genes in the so-called genetic libraries where deep frozen genomes are stored. Another method is to keep and grow certain plant and animal species. In Croatia such genetic material is chiefly kept in **botanical gardens** (Fig. 129).

The preservation of genofunds of individual types of forest trees and natural components is carried out by various ex situ methods that include provenance experiments, offspring tests, clonal seed plantations, cloning tests and living archives. In this way the genofund of the following species is kept: common oak, European larch, Weymouth pine, green Douglas fir, common pine, black pine, black alder and small-leaf lime. In the area of the "Hrvatske šume" p.o. Zagreb certain approved seeding components have been separated (4,784 hectares) intended for the production of seed required for production of seedlings. Since that they cannot satisfy the needs always and for all species, individual productive forests have been separated under specific criteria and registered as selected seed sites with the total surface area of 13,826 hectares. The approved and selected seed components include the following species: common oak, durmast_oak, common ash, black alder, sweet chestnut, lime, beech, common hornbeam, common spruce, larch, Weymouth pine, green Douglas fir, black pine, Scots pine, common fir, Aleppo pine, Calabrian pine, maritime pine, Dalmatian black pine, holm oak and pubescent_oak. The forestry experts in the field of genetics are involved in the project of conservation of genetic resources of European forests (EUFORGEN) that includes the network research of black poplar, noble hard broad-leaved trees, social broad-leaved trees (common oak, durmast oak, common beech) and Mediterranean oaks (holm oak and pubescent oak).

In the organization of the Faculty of Agriculture in Zagreb the project of the establishment of the **Croatian Bank of Plant Genes** is in preparation and the project of the **Croatian Bank of Domestic Animal Genes** is completed. Zoological gardens play worldwide an important role in ex-situ preservation of rare animal species. The **zoological garden** in Zagreb has recently been included into the **European**

Figure 129/1,2.
Botanical garden of the
Department of Botany
(Faculty of Science) in
Zagreb, founded in
1889, contains about
10,000 species of
vascular plants on the
area of 4.7 ha
(photo by D. Mihelji)



Endangered Species Programme (EEP) which is co-ordinating the breeding of certain threatened species in individual zoological gardens with the assistance of the International Species Information System (ISIS). Although presently this includes only two non-indigenous species – the snow leopard and the maned wolf, the inclusion in this project is very important for the protection of biological diversity on the global scale. Unfortunately, nothing of the kind exists for threatened and endemic animals in Croatia.

For the purpose of protecting the most threatened indigenous sorts of cultivated plants and breeds of domestic animals **incentive measures** by the state are indispensable in order to ensure breeding of such taxa by the greatest possible number of farmers under the professional and scientific control.



INSTITUTIONAL FRAMEWORK

There are several types of institutions dealing with biological diversity. Some of them collect data and identify the composition of biological diversity in a certain area, the others determine rules of behaviour from the legislative aspect, while some regulate professionally the use of natural resources and control the preservation of biological diversity and the use of natural resources. From educational aspect all levels of education are to be counted herein, with a special emphasis on high education in the field of natural sciences (fundamental and applied), economy, law and building. Non-institutional forms of associating (NGOs) as the widest form of influence of population on preservation of biological diversity are necessarily linked with co-operation and critical review of results achieved by above mentioned institutions, but are also present as potentially the widest active power in practical implementation of protection.

A considerable part of institutions associated with conservation of biological and landscape diversity make an integral part of the government structure or are directly funded by the national budget. Similarly, the majority of measures undertaken in the space are directly or indirectly financed from the national budget too. This is potentially good, because it facilitates an integral approach to protection with clearly structured control mechanisms. However, **the situation in practice is far from being satisfactory**. The reason lies in the inefficient structure of departments (organization, staff, funds) directly responsible for the segment of protection, but also in the inadequate education of the population (insufficiently organized in the context of local administration and NGOs). At the level of legislation and policy-making the segment of protection of biological and landscape diversity is still only of a declarative nature, lacking the actual willingness to invest sufficiently and to implement the logic of sustainable development. At the educational level the exchange of knowledge among educational institutions of Croatia is not satisfactory, and neither is the level of exchange of specific knowledge with foreign institutions.

The following is a presentation of institutions covering the major part of activities concerning the protection of biological and landscape diversity in Croatia.

State institutions

Institutions for protection of biological diversity

The system of legislative power includes first of all the **Croatian Parliament** with committees for individual problem areas. The system of executive authorities consists of the **Government of the Republic of Croatia** and individual sectoral **government bodies**. The main body responsible for conservation and utilization of biological and

landscape diversity is the **Ministry of Environmental Protection and Physical Planning**, accompanied partly by some other ministries and government organizations.

In the present situation the Ministry of Environmental Protection and Physical Planning can hardly satisfy the actual needs in the field of protection. The comparison of funds and the number of employees in such ministries of transition countries shows that Central-European countries allocate more funds and have more staff involved in protection activities.

Public institutions for the management of specially protected parts of nature still employ only a small number of professionally qualified staff. The orientation towards exploitation of these nature parts for tourist purposes is unfortunately constantly repressing efforts of actual protection.

At the **county level** this problem area lies within the competence of offices for physical planning, housing and public utility services, building and environmental protection. Their activities are frequently strongly affected by technical sciences because of the personnel professional structure which is, consequently, the reason for the lack of understanding and striving for the actually efficient preservation of biological diversity. The **Ministry of Interior** covers the area of the protection of biological diversity insufficiently and is not adequately informed about this problem area which results in its being insufficiently involved in cases of threatening parts of nature protected by law. The role of the **public and NGOs** in the practical protection and control has grown in recent years as a result of endeavours to change the value-oriented judgement in favour of the so-called "unprofitable" parts of nature by education, individual campaigns and permanent presence of sustainable development problems in mass media.

The situation of **inspection departments** in the field of environmental protection is particularly difficult. Teams with too few people and poorly developed local network and support is today certainly not able to gather in time sufficient information on violation of legal provisions

Name of institution	Activity
Faculty of Science, Zagreb	scientific and educational activities, micro-organisms, botany, zoology, invertebrates, vertebrates, ecology, biological diversity, geology
Faculty of Philosophy in Split, Department of Natural Sciences	scientific and educational activities, botany, invertebrates
Teacher Training College, Department of Ecology, Osijek	scientific and educational activities, invertebrates
Faculty of Forestry	scientific and educational activities in the field of forestry and hunting
Faculty of Agriculture	scientific and educational activities in the field of agriculture, genetic diversity of domesticated species
Faculty of Veterinary Medicine, Zagreb	scientific and educational activities, research and protection of carnivores
Faculty of Medicine, Zagreb	educational activities
Ruđer Bošković Institute, Zagreb	scientific and research activities, fungi, micro-organisms, molecular genetic
Ruđer Bošković Institute, Marine Research Centre, Rovinj	scientific and research activities, benthos communities
Institute for Oceanography and Fisheries, Dubrovnik	scientific and research activities, sea fishing, benthos communities and plankton
Institute for Oceanography and Fisheries, Split	scientific and research activities, sea fishing, benthos communities
Croatian Academy of Arts and Sciences, Institute for Ornithology, Zagreb	scientific and research activities related to birds and their habitats
Forestry Institute, Jastrebarsko	scientific and research activities in forestry
National Meteorological and Hydrological Service	collection of data on climate
Hydrological Institute, Zagreb	scientific and research activities – inland waters
Geological Institute, Zagreb	geology, hydrology
College of Biochemical Engineering	scientific and research activities – micro-organisms
Croatian Natural History Museum, Zagreb	educational, scientific and research activities, keeping and processing of collections, mammals, amphibians, reptiles, fish, invertebrates, geology, mineralogy

Table 28. Scientific institutions significant for study of biological and landscape diversity

concerning nature protection. The possibility to react to information provided by the population (individuals, NGOs) is still not developed enough. It is particularly necessary to work intensively on development of inspection departments in counties.

Institutions for biological diversity studying and documenting

In Croatia the greatest portion of information on biological diversity is collected by institutions of high education, museums and institutes. University collections, and especially collections in museums of natural sciences are the main places for documenting biological diversity of Croatia (Box 73 and 74, Fig. 130).

The Ministry of Environmental Protection and Physical Planning is involved in collecting the knowledge necessary for an efficient protection of biological diversity by means of studies ordered. However, since the Ministry does not have all the required data available, it is necessary to develop a special structural unit to deal with **data collecting and processing**, including the co-ordination of their collecting. Such a team would have a task of developing expert and research projects indispensable for protection activities, of processing expert and scientific data into a form acceptable for political decision-making levels, of preparing summaries acceptable for promotional activities and presentation on the international scale. At the same time the team would be a link to NGOs in terms of disseminating data, data collection and co-ordination of activities.

Figure 130. Herbarium Croaticum (ZA) of the Department of Botany (Faculty of Science, Zagreb) founded in 1880 is the oldest herbarium in Croatia and with its about 200,000 specimens the greatest too

(photo by S. D. Jelaska)



Non-governmental organizations

Basic information

The development of public awareness of importance and preservation of nature in the Republic of Croatia is evident from increasingly frequent associations of citizens in their concern for nature and environment at various levels, with the aim to solve some general and specific problems. Beginning in the late 80s, there is now an ever-growing public interest in the protection of nature, reflected in a powerful influence of such non-governmental organizations on further popularization and creation of sensitivity for this problem area. By identifying the problems and investigating the needs and possible solutions at the local or a broader

Box 73. Most significant collections in the field of natural sciences

HERBARIUMS

- Herbarium Croaticum, the Department of Botany Faculty of Science, Zagreb
- Faculty of Forestry, Zagreb
- Faculty of Agriculture, Zagreb
- Croatian Natural History Museum, Zagreb
- Nature and Sea Institute, Makarska

VERTEBRATE COLLECTIONS

- Croatian Natural History Museum, Zagreb
- Department of Zoology, Faculty of Science in Zagreb
- Institute for Ornithology, Croatian Academy of Arts and Sciences, Zagreb
- Department for Quaternary Paleontology, Zagreb
- Faculty of Veterinary Medicine, Zagreb
- Natural History Museum, Rijeka (fish)
- Natural History Museum, Split (birds)
- Natural History Museum, Dubrovnik (birds)
- National Museum, Zadar (birds)

INVERTEBRATE COLLECTIONS

- Croatian Natural History Museum, Zagreb
- Natural History Museum in Varaždin, Koprivnica and Rijeka
- Teaching Training College, Osijek
- Mountain and Sea Institute, Makarska

level, they encourage the citizens to join them and work for the common good.

The first initiatives for the protection of environment and space in Croatia appeared at the beginning of this century through actions for the protection of natural and cultural values. Beside the **Croatian Society for Natural Sciences (CSNS)** that has been publishing the journal entitled *"The Nature"* since 1911, a professional association of biologists – ecologists called **Croatian Ecological Society (CES)**, including the **Croatian Biological Society (CBS)**, is particularly involved and permanently active in popularization of nature protection. In the 70s and 80s several groups appeared consisting predominantly of experts and scientists concerned about environmental pollution. At the time of establishing the **Croatian Association of the Greens (1990)** about sixty groups were active in the field of nature and environment protection.

There are presently about 200 groups in Croatia dealing with the protection of nature and environment, of which one third is registered in Zagreb (Tab. 29). Some organizations with a very wide field of activities have branches all over Croatia, such as **"Our Beautiful Homeland" Movement of Nature Friends and Young Nature Guards** of the Croatian Society of Natural Sciences. In their activities about 1/3 of non-governmental organizations in the field of nature and environment protection are giving top priority to protection of biological diversity. However, the majority of non-governmental organizations dealing with biological diversity are "biological" by their character, or rather **professional organizations** based on scientific foundations (biology, forestry, agriculture, etc.). Members and heads of projects in these organizations are predominantly scientists. Apart from professional organizations, biological diversity is the field of interest of various ecological societies and alpine clubs, including the Scouts Association. Activities of organizations involved in the protection of biological and landscape diversity are most often of local nature. In most cases these are activities for the protection of individual natural habitats

Box 74. Herbarium collections in Croatia entered in the world collection list “Index Herbariorum”

- **Herbarium Croaticum (ZA)** of the Department of Botany at the Faculty of Science, University of Zagreb, founded in 1880, is the oldest herbarium in Croatia. It is estimated to consist of about 180,000 specimens, which makes it the largest in Croatia. It contains representatives of 150 families and 1,340 genera. The specimens originate mostly from the area of Croatia and the Balkan peninsula. The major part of the holdings includes collections of Croatian famous botanists: A. Haračić (8,000 leaves), D. Hirc (12,000 leaves), S. Horvatić (15,000 leaves), F. Kušan, Lj. Rossi (30,000 leaves), J. C. Schlosser (15,000 leaves), Lj. F. Vukotinović (10,000 leaves) and others. A special department, the so-called General Herbarium, contains about 100,000 specimens from all over the world. The major part of fungi and mosses may be found in the ZAHO and algae in the ADZ (Figure 130).
- **Herbarium of Ivo and Marija Horvat (ZAHO)** is located in the Botanical garden in Zagreb. It was founded in 1918 and consists of about 78,000 specimens. In terms of space the plants represented come from the Balkan peninsula, Poland, Norway, Switzerland and Finland. The herbarium contains mainly higher plants, but also the collections of fungi and mosses from the Herbarium Croaticum (ZA). This herbarium belonged originally to Professor I. Horvat, but is at present considered a part of the ZA herbarium and was moved to the current location in 1998 from Croatian Academy of Arts and Sciences.
- **Herbarium Adriaticum (ADRZ)** with the Marine Research Centre of the Ruđer Bošković Institute in Zagreb. The herbarium was founded in 1966 and consists of about 20,470 specimens. In terms of area the plants represented originate from the Adriatic islands and the Balkan peninsula and the algae from the Adriatic Sea.
- **Herbarium in Rovinj (RI)** with the Marine Research Centre of the Ruđer Bošković Institute. The herbarium was founded in 1900 and contains about 21,000 specimens. In terms of area it represents the northern Adriatic area and in terms of contents, the marine flora. The herbarium was destroyed in 1943 and later renewed.
- **Herbarium in Makarska (MAKAR)** of the Institute for Mountain and Sea at the Museum Malakološki. This is a private-type herbarium, founded in 1963 and contains about 25,000 specimens. In terms of area it represents the Dalmatian region and in terms of contents, higher plants and algae.
- **Herbarium of the Croatian Natural History Museum in Zagreb (CNHM)** is the youngest herbarium in Croatia, founded in 1998 and consisting of about 9,000 specimens.

Legal framework

The **Associations Act** came into force in July 1997. According to this Act associations may be registered at the local or national level depending on the area in which they operate.

On the basis of the Decision on Criteria for Identification of Associations with Activities of Interest for the Republic of Croatia and on Financial Support to Associations from the Government Budget, associations whose activities bring about conservation of nature and human environment are considered to perform activities of interest for the Republic of Croatia and may be granted financial support from the government budget.

In 1998 the Republic of Croatia Government Commission for Associations and the Republic of Croatia Government Office for Associations were set up.

Co-operation of non-governmental organizations with government bodies and local government and self-government units

The co-operation between non-governmental organizations and government bodies and local government and self-government units takes place through various forms, such as the celebrations of certain dates related to environmental protection, co-operation in publishing, providing space for work, securing finance for individual concrete projects, involving representatives of organizations in activities of individual government bodies, information exchange, etc. In the field of the protection of biological and landscape diversity professional organizations often co-operate with relevant government bodies (MEPPP, certain ministries). In general, these organizations co-operate more closely with relevant local government and self-government bodies than with those at the state level.

At present the co-operation between non-governmental organizations and government bodies and local government and self-government units in the field of the protection of biological and landscape diversity in Croatia is not an explicit legal obligation. Public participation is provided through the process of public hearing and evaluation of environmental impact studies related to activities which require environmental impact assessment, as well as in the procedure of making decisions and adopting plans, programmes and certain administrative documents.

Figure 131. Green forum – a meeting of non-governmental organizations held in December 1998 under participation of the MEPPP

(photo by T. Novaković)



in a devastated area or activities for preservation of individual plant and animal species. Some non-governmental organizations were founded with the objective to protect certain species and preserve their genetic diversity – these are mainly non-governmental organizations dealing with the protection of autochthonous breeds (Association of Breeders of the Horse of Posavina, Association of Breeders of Istrian Cattle).

Figure 132.
Professional non-governmental organizations may give considerable scientific contribution to familiarity with the biological diversity
(photo by D. Radović)



The Republic of Croatia is a party to the **Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters.**

The Ministry of Environmental Protection and Physical Planning, certain sectoral ministries and local government and self-government units have allocated a portion of their budgets for projects and activities carried out by such organizations. These funds are in general comparatively limited. No data on the portion of funds spent for the activities connected with the protection of biological and landscape diversity have been collected and evaluated so far. The compulsory manner of allocating funds for projects in the field of protection of biological and landscape diversity is not legally prescribed. The co-operation in concrete projects is most often based on individual contacts, or rather requests of organizations submitted to government bodies and local government and self-government units. Within the Ministry of Environmental Protection and Physical Planning all activities are performed by the Public Relations Department. Supports to projects of these organizations are very seldom provided by government bodies and local government and self-government units on the basis of public tenders. The obligation to invite public tenders for programmes of such organizations would ensure the distribution of relatively limited funds exclusively by the criterion of the quality of programmes offered and thus institutionalize the co-operation with the public in a more effective manner.

Conclusions

- Organizations dealing with the protection of biological and landscape diversity may be divided into two basic groups: one consisting of professional organizations operating mainly at the state level whose members are biologists and other experts of a similar profile, and the other consisting of organizations bringing together citizens mostly concerned about local issues.
- The main problem is the shortage of funds for implementation of concrete projects of organizations in

the field of the protection of biological and landscape diversity.

- The majority of organizations is institutionally underdeveloped – they have neither permanently employed staff nor offices required for their work and are poorly equipped with EDP and similar devices.
- No tax reliefs are given to citizens and companies for the payments made for the purpose of common benefit, except in the field of culture and sports.
- The mode of co-operation between organizations and government bodies and local government and self-government units is to be determined in detail by laws and regulations. This particularly applies to the method of financing projects through public tenders.
- There is no organization network that might ensure a high quality implementation of concrete projects concerning protection of biological and landscape diversity at the local level, including the control over them. When establishing a network special role should be played by professional and scientific associations. In terms of organization they can define a network of local associations which would cover the area of the Republic of Croatia and implement educational programmes for the members of local associations in connection with biological and landscape diversity issues. This is a widely spread practice in developed countries – numerous organizations and volunteers at the local level are involved in projects for the protection of biological and landscape diversity, for example, in collecting data on the spread of individual species and elaboration of inventories and maps of spread. This would to a high extent relieve the pressure on a portion of government bodies and local government and self-government units that under present circumstances have neither enough financial nor professional capacities available to satisfy all the needs of the protection of biological and landscape diversity at the local level.
- The role of organizations in the protection of biological and landscape diversity should be extremely great: they should be in many ways involved in concrete action plans for the protection, from their formulation, implementation and monitoring to general public information and education.
- It is in the interest of the state to encourage and motivate non-governmental organization in various ways to deal with the issues of the protection of biological and landscape diversity, especially at the local level, and to facilitate and encourage partnership of organizations with local governments and institutions.

Box 75. Deficiencies of institutional framework

- the majority of counties are lacking staff for nature protection
- in the majority of counties no provisions have been made for management of protected parts of nature
- there is no government institution responsible for co-ordination of collecting and processing data on biological diversity
- markedly insufficient inspection in the field of nature protection
- poor organization and mutual co-ordination, shortage of funds for activities of non-governmental organizations and
- failure to enforce and monitor the enforcement of laws and regulations.

NGO name	Field of activities
Ecological Society of Brod	protection and rehabilitation of nature
Caput Insulae Eco-Centre, Beli	protection of griffon vulture, ecological tourism, cleaning of pools on islands
Eko-Liburnia, Rijeka	ecological tourism, ecological agriculture
“Green Osijek” Ecological Society	nature protection, biological diversity, ornithology, forestry, hunting, tourism, water management
Eurocoast	ecology and protection of the Adriatic Sea, development planning
Croatian Centre of Environmental Education	protection of nature and environment, education
Croatian Mountaineering Association, Nature Protection Commission	protection of nature and environment
Croatian Biological Society	protection of nature and biological sciences
Croatian Biospeleological Society	study and protection of the karst underground
Croatian Society of Landscape Architects	protection of landscape diversity and cultural heritage
Croatian Society for Water Protection	protection of waters
Croatian Society for the Protection of Birds and Nature	ornithology
Croatian Ecological Society	environmental education of the public
Croatian Entomological Society	protection of insects, protection of plants in agriculture and forestry
Croatian Ornithological Society	ornithology, nature protection, environmental education
Croatian Society of Natural Sciences	protection of nature and environment, education
Croatian Society of Forestry	protection of nature, protection of forests, biological diversity, education
HYLA – Society for the Protection and Study of Amphibians and Reptiles in Croatia	study and protection of herpetofauna, protection of nature, education
NATURA – Society for Nature Protection in Croatia	biological diversity, education, protection of nature and environment
“Our Beautiful Homeland” Movement of Nature Friends	biological diversity, education, sustainability of agriculture, protection of nature and environment, waste management, water protection
Association of Breeders of Istrian Cattle	breeding and protection of Istrian cattle
“Hrvatski Posavac” Association of Breeders of the Horse of Posavina	horse breeding, protection of pastures
Svanimir – Croatian Society for the Protection of Natural and Cultural Heritage	protection of nature, biological diversity, ecological education, practical protection of nature

Table 29. List of significant non-governmental organizations dealing with the protection of biological and landscape diversity

EDUCATION, SCIENCE AND PUBLIC INFORMATION

The principal tasks in the field of upbringing and education, science and public information have arisen from the need to protect the biological and landscape diversity.

Changes taking place at the end of the 20th century have brought about changes in science, in the system of upbringing and education and in mass media. They can be described by the key words of the contemporary world: insecurity, intolerance, uncontrolled technological development, consumer society and profit. All these facts cause a mental confusion: people do not know any more what to approve and what disapprove.

Information, knowledge or facts provided do not suffice; it is necessary to develop thinking about basic values and the underlying causes. Within such a framework of values the relationship towards the immediate environment is formulated, including that towards the biological and landscape diversity.

Education

The **unsatisfactory state of natural sciences in the primary and secondary education** is a result of an equally poor state of natural sciences, particularly of zoology and botany at universities, institutes and museums of natural sciences. This applies to the presence of specialists, the insufficient number of high-quality scientists in individual disciplines, the lack of

a sound scientific criticism, financial constraints in zoology and botany, the lack or absence of co-operation between institutions of natural sciences, etc.

The first precondition for covering the total school population with adequate education is the **appropriate time allocation** within the regular school time-table and the second is an **adequately trained teacher**, educated, skilled, sensitised and motivated. In this country these preconditions are to the most part not fulfilled. Another weak link is the Ministry of Education and Sports, with employees who have been absent from the immediate teaching process for years and, without an adequate professional improvement, become a brake to changes and flexibility in organizing the work of schools.

The **teachers complain** bitterly about the inadequacy of schoolbooks, poor school equipment, the shortage of supplementary sources of knowledge and professional improvement, feeling a special need for professionally organized excursions and adequate incentives for teaching work (particularly after-hours).

As far as the **university education** in this field is concerned there is a shortage of high quality, modern university textbooks, even those translated, which results in the unsatisfactory level of knowledge of students who will to the most part become teachers of biology in primary and secondary schools.

Within the Ministry of Environmental Protection and Physical Planning one of the activities of the Public Relation Department is environmental education. Although still in its beginnings, this activity is increasingly developing.

Figure 133. "Eco-contributions", regional schools competition for the Day of Planet Earth – exhibition of awarded works (photo by D. Spudić)



Box 76. Deficiencies of educational system

- insufficient number of classes in natural sciences within regular teaching time-table
- small possibilities for professional improvement of teachers and
- shortage of adequate schoolbooks, particularly in university education.

popular-science handbooks (the so-called keys) for identification of species, even the translations of similar handbooks that apply to the entire Europe. Such handbooks would enable a larger circle of nature lovers to join the inventorying projects. This method of data collection is accustomed in developed countries that invest a lot in education of amateurs and receive from them an enormous quantity of information that would hardly have been collected by experts and scientists.

Without being familiar with the present state of biological taxa as one of the fundamental national wealths, they can be neither correctly evaluated nor properly protected. Consequently, **it is impossible to prepare the Red books** of threatened plant, fungi and animal species, which everywhere form the basis for the protection of taxa.

The majority of Croatian national parks and other especially protected natural objects have neither the inventory of species living in the relevant area nor knowledge about the state of their population. Therefore it is difficult to apply the adequate approach to their management and protection.

A particular problem in **gathering information** on the biological and landscape diversity is its being **unsystematic and incoordinated**. The Ministry of Environmental Protection and Physical Planning does not have at disposal any special funds that would be allocated for nature inventorying and evaluation, and such projects are, as a rule, not funded by the Ministry of Science since being more professional than scientific. For that reason this area remains absolutely uncovered which is reflected in the shortage of the fundamental knowledge such as lists of flora, micoflora and fauna, or inventories of natural features of the most valuable protected areas.

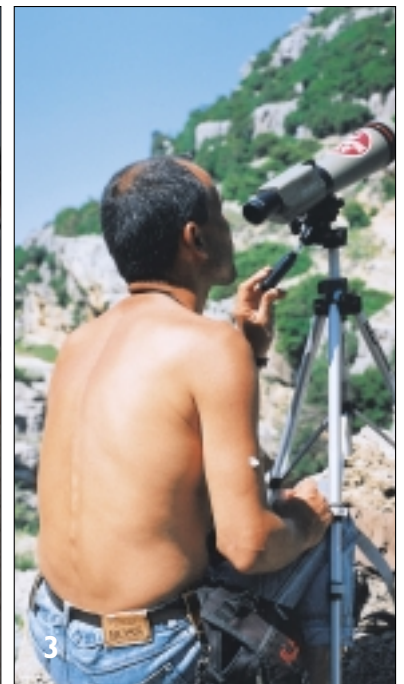
Another serious problem is also the **insufficient number of scientists – taxonomists** that could "cover" individual groups of taxa. Among 35 botanists in Croatia there are enough experts that could participate in preparing the flora of higher plants. However, it is not enough to be familiar with nearly all groups of lower plants, and only a few experts are qualified for such studies. Particular attention is to be paid to study of lower plants by means of advanced microscopical techniques, to development of co-operation with the geneticists without neglecting the keeping of documents, to providing conditions for preparation and

Science

The basic problem lies in the **lack of a systematic study and monitoring of biological diversity**. There is no national programme of inventorying Croatia's biological diversity available. This results in the fact that **Croatia belongs to rare European countries that have not described its flora, micoflora and fauna and is still lacking the essential**

Figure 134. Field studies of flora and fauna; students and assistant lecturers for the study of biology at the Faculty of Science in Zagreb working on the plant (1) and animal (2) material; observing ornithofauna (3)

(1 and 2 photo by T. Nikolić, 3 photo by K. Leskovar)



Journal title	Publisher	Biological diversity topics
NATURA CROATICA	Croatian Natural History Museum, Zagreb	flora and fauna inventories, distributions
ACTA BOTANICA CROATICA	Department of Botany, Faculty of Science, Zagreb	flora, vegetation, distributions
LARUS	Institute for Ornithology of the Croatian Academy of Arts and Sciences, Zagreb	ornithofauna, distributions
ACTA ADRIATICA	Institute for Oceanography and Fisheries, Split	biological diversity of the sea, distributions

Table 30. Major journals publishing papers related to biological diversity inventorying

development of herbariums, and to specialisation of young researchers in the problem areas mentioned. **The study of fauna, particularly of invertebrates, is lagging far behind in relation to our knowledge of Croatia's flora.** Of a total of 25 zoologists active in the country's scientific, high education and cultural institutions only several of them are dealing predominantly with the fundamental taxonomic studies. There is a great danger for young researchers to focus entirely on molecular-biological and other, the so-called, modern studies and to leave the identification of organisms that are the subject of their interest completely to foreign experts.

Journals in which taxonomic papers and checklists are published are few and regularly in a very difficult financial state. For that reason their publication is discontinuous and papers wait long to be published (Table 30).

Box 77. Deficiencies of the sciences

- lack of system and co-ordination in biological diversity study and monitoring
- lack of basic checklists and maps of the spread of species
- lack of scientists – taxonomists, particularly for invertebrate groups and
- a small number and discontinuity in publishing journals that report on inventorying the biological diversity.

Public information

A common feature of all **mass media** in Croatia (printed and electronic), regardless of whether government or privately-owned, independent or oppositional, is that in **addressing the problem areas of biological diversity they show not even nearly enough interest or a systematic behaviour.** The basic defect is the lack of a system, integrity and targets that characterize the media campaign. The non-specialized press mostly does not show interest in these issues (for the same or similar reasons as the non-governmental radio stations too), and therefore, despite the fact that eco-scandals and cases of misuse do not lag behind others, they follow or describe such cases very seldom.

There are several **specialized editions** dealing with issues of biological diversity. These are printed materials varying in quality (in terms of journalism and professional biology and ecology) and reaching in general a very limited public that is already fairly educated and highly perceptive. Their survival is additionally threatened by the population's inability to pay, the non-existence of reading habits and the orientation towards electronic media.

Speaking about the **television and radio broadcasts of the Croatian Radio and Television** it may be said that the existing broadcasting medium space allotted to inform and draw the attention of the public to issues of preserving the biological diversity suffers from the following basic deficiencies:

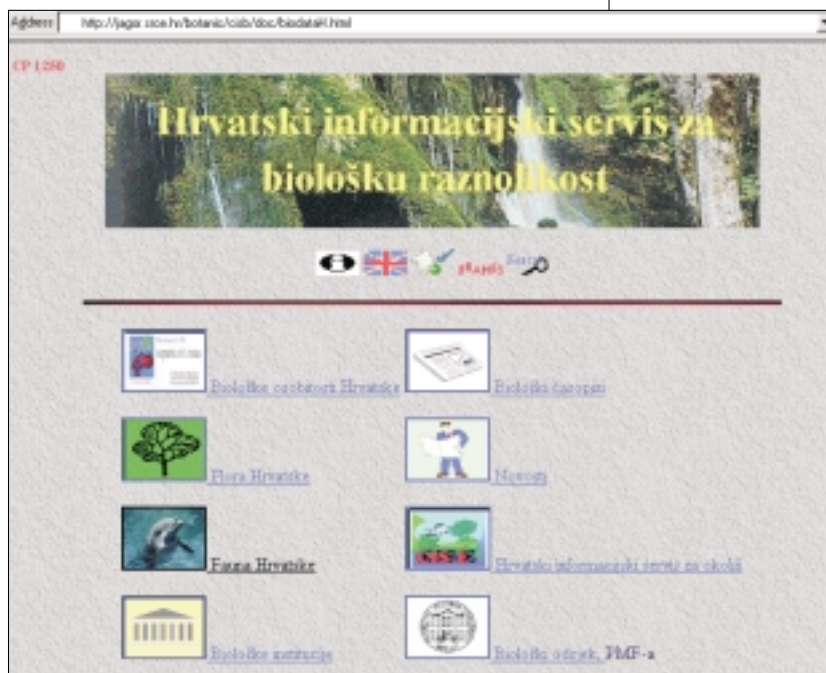
- lack of coordination and system typical for campaigns
- lack of popular-science films about Croatia's biological diversity (that should be broadcast at the best viewing time as distinguished from the current practice)
- non-existence of adequate promotional material (commercials, films, etc.)
- inactiveness of the majority of educational broadcasts in the field of ecology and
- structure resulting in the inability to produce a high quality programme.

At the IV. Ministerial Conference "Environment for Europe" held in June 1998 the Republic of Croatia signed the **Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters.** By the act of signing Croatia demonstrated its commitment to continue the implementation of principles adopted earlier and incorporated in the country's legislation in the matters of nature and environment protection.

The obligation of public information and participation in making decisions on environmental matters is determined by the Law on Environmental Protection laying down the right of the citizens to be timely informed about environmental pollution and measures taken in this regard, including a free access to information on environmental state in accordance with the Law and other regulations. When solving institutionally the environmental protection issues, the government bodies and the bodies of local government and self-government units ensure the participation of the parties concerned in accordance with the provisions of the Law on Environmental Protection and other regulations.

The principle of openness and collaboration with the general public is daily applied in activities of the Ministry of Environmental Protection and Physical Planning. For seven

Figure 135. WWW sites of the Croatian Information Service for Biological Diversity on the Internet offer a variety of data, but require constant updating (photo by D. S. Jelaska)



years now the journal called “**Environment**” has been published and distributed free of charge to all interested persons. The “**Environment**” brings information about the activities of the national and local government and self-government, explanations of regulations within the competence of the Ministry of Environmental Protection and Physical Planning, including information on events concerning Croatia’s nature and environment and on international activities in this field.

The Internet site *www.duzpo.hr* contains the scope of activities of the Ministry of Environmental Protection and Physical Planning, including regulations for which it is competent, the Environmental State Report, the Report on Implementation of Agenda 21 in the Republic of Croatia and all information on the Environmental Label. This implies the obligation of the Ministry to answer any question or complaint of the citizens.

For the purpose of collaborating with the general public and public information about environmental state a special Public Relations Department was established within the Ministry of Environmental Protection and Physical Planning.

Box 78. Deficiencies of the public information

- low interest of media and non systematically reporting about biodiversity and
- lack of specialised papers, TV and radio programs, i.e. specialised reporters.



Figure 136. Three-lane motorway through the forests of Gorski kotar

(photo by A. Frković)

1.6. Threats and problems of biological and landscape diversity protection

BIOLOGICAL AND LANDSCAPE DIVERSITY THREATS

During preparation of the NSAP the analysis of the current state, threats and problems of the protection of biological and landscape diversity in Croatia demonstrated the following:

- a very high degree of value and conservation of the biological and landscape diversity on the European

scale, particularly in West-European and Central-European proportions

- the trend of losing the biological and landscape diversity in Croatia caused by recognisable factors
- the necessity to undertake immediate actions for the protection of individual sections of the biological and landscape diversity and
- heterogeneity of the quantity and quality of existing information on biological diversity that are in many cases not sufficient for implementation of adequate protection measures.

Criteria for selection of priorities

The NSAP development took place within thematic working groups. They singled out the priority sections of the biological and landscape diversity whose protection requires implementation of special action plans based on previously agreed criteria that include:

- critically threatened species, habitats and landscapes of global, regional or national importance
- habitats containing a great number of endemic or threatened taxa and/or a considerable biological diversity and
- landscapes containing significant biological and cultural diversity.

Priorities

The analysis of the data collected showed the following:

- **ecological systems** of the karst represent a uniqueness and wealth on a global scale of value
- due to anthropogenic activities the most threatened ecological systems are **aquatic and wetland systems**
- **the most threatened habitats** are areas small in surface threatened by anthropogenic factors (sand and gravel beaches, pools on islands, small wetlands, etc.) or extremely rare habitats beyond the usual distribution areas (moors, vegetation of sands)
- the **priority species and subspecies** are those that are threatened on a global, European or national scale, endemic taxa and those showing the economic and/or educational importance.

THREATS

Global threats to biological diversity

Although biological diversity is naturally subject to constant changes that brought about natural disappearance of numerous species from this planet in the course of evolution, over the last hundred years the major blame for a rapid impoverishment of biological diversity, which is constantly accelerating, is to be put on man. There are some global threats to biological diversity recognizable all over the world:

- excessive growth of population and consumption of natural resources
- a small number of agricultural and forestry products intended for trading, including introduction of foreign species for the needs of agriculture and forestry
- economic systems and policy that do not evaluate the environment and its resources adequately
- unevenly distributed ownership and access to natural potentials, including the access to potential benefits of the biological diversity use and protection
- insufficient knowledge of biological diversity and related topics, insufficient application of existing information
- legislative and institutional systems that encourage the unsustainable exploitation of natural resources and
- global climate changes.

Basic threats to biological and landscape diversity in Croatia

In the course of the NSAP preparation the following basic threats to biological and landscape diversity in Croatia were identified.

Threats to landscapes

- A. uneven, uniform urban development incompatible with the surroundings
- B. major infrastructure developments:
 1. roads
 2. power industry plants (power generating plants, storage lakes, transmission lines, piping, etc.)
 3. water management facilities (regulation of watercourses, channels, storage lakes – retentions, dams, etc.)
- C. agricultural activities (amelioration, land consolidation, monocultures, cutting down of small woods, lines of trees and hedges)
- D. construction of residential buildings, holiday and tourist facilities in, from the aspect of landscape, exposed places, without any plan and inadequate in relation to siting and architecture.

Basic threats to biological diversity

- habitat changes – destruction, degradation, fragmentation
- environmental pollution – soil, water, air
- excessive exploitation of natural resources – hunting, poaching, cutting, gathering, disturbing and
- introduction of foreign species into ecological systems.

In the area of Croatia there is also a noticeable process of biodiversity depletion. The formerly dominant ecological systems of forests are nowadays considerably reduced. In the course of the history new landscapes and ecological systems were formed in these regions, primarily as a result of agricultural activities (arable land, meadows, pastures) and, in recent times, more and more of urban development. Considerable damage was caused to once numerous wetlands that underwent excessive reclamation and reduction by man's having regulated the watercourses and thus extended his living space at their expense. Therefore wetlands are at present the most threatened ecosystems in Croatia.

In the course of the history agricultural activities combined with water management measures were beneficial for man, but at the same time affected adversely the biological diversity. Large agribusinesses (PIKs) that

Figure 137. Burned reedbeds in the lower part of Neretva river
(photo by D. Grlica)



developed in the former system produced vast areas of arable land by land consolidation and reclamation, applying measures of intensive agriculture accompanied by all usual negative consequences for the biological diversity.

The insufficient observance of generally known and accepted criteria of value from the aspect of nature protection, the inadequate implementation of the environmental impact assessment procedure when planning extensive development measures, isolation from European countries that were rapidly developing nature protection activities and numerous other reasons at that time typical to the majority of countries in this part of Europe resulted in the destruction of habitats and threats posed to their related species. The achievements of numerous projects have not justified the investments. A perfect example is the reclamation of the Neretva delta that has irretrievably degraded one of the most valuable Mediterranean wetland regions which is nowadays, due to high costs of maintaining, deserted from the aspect of agriculture and gradually regaining the 'zwild' state.

Some examples of habitat changes and degradation are the regulation of watercourses, conversion of forest areas into agricultural land, draining wetlands and abandoning traditional cattle grazing methods and growing native cultivated plants. One of the most important reasons of the threat to biological diversity is also the fragmentation of natural ecological systems, especially by constructing roads, settlements and public utilities, and the expansion of intensively managed agricultural areas. The natural and subnatural ecological systems thus broken into fragments remain isolated like islands on which species are not able any more to communicate with other related areas which again results in local extinction of species and a rapid impoverishment of biological diversity.

Environmental pollution

The consequence of almost all branches of economy (industry, agriculture, etc.) is the discharge of harmful substances (toxicants) into the environment, soil, water or atmosphere. It is important to mention that due to natural circulation of substances in ecological systems harmful substances reach all parts of the biosphere. For example, pesticides from the soil enter the underground watercourses through run-off, while harmful substances contained in the air fall to the ground with atmospheric waters and penetrate further into the underground waters. The impact of toxicant accumulations in food chains is also highly important.

Areas with intensive agriculture, forestry and mariculture are particularly threatened.

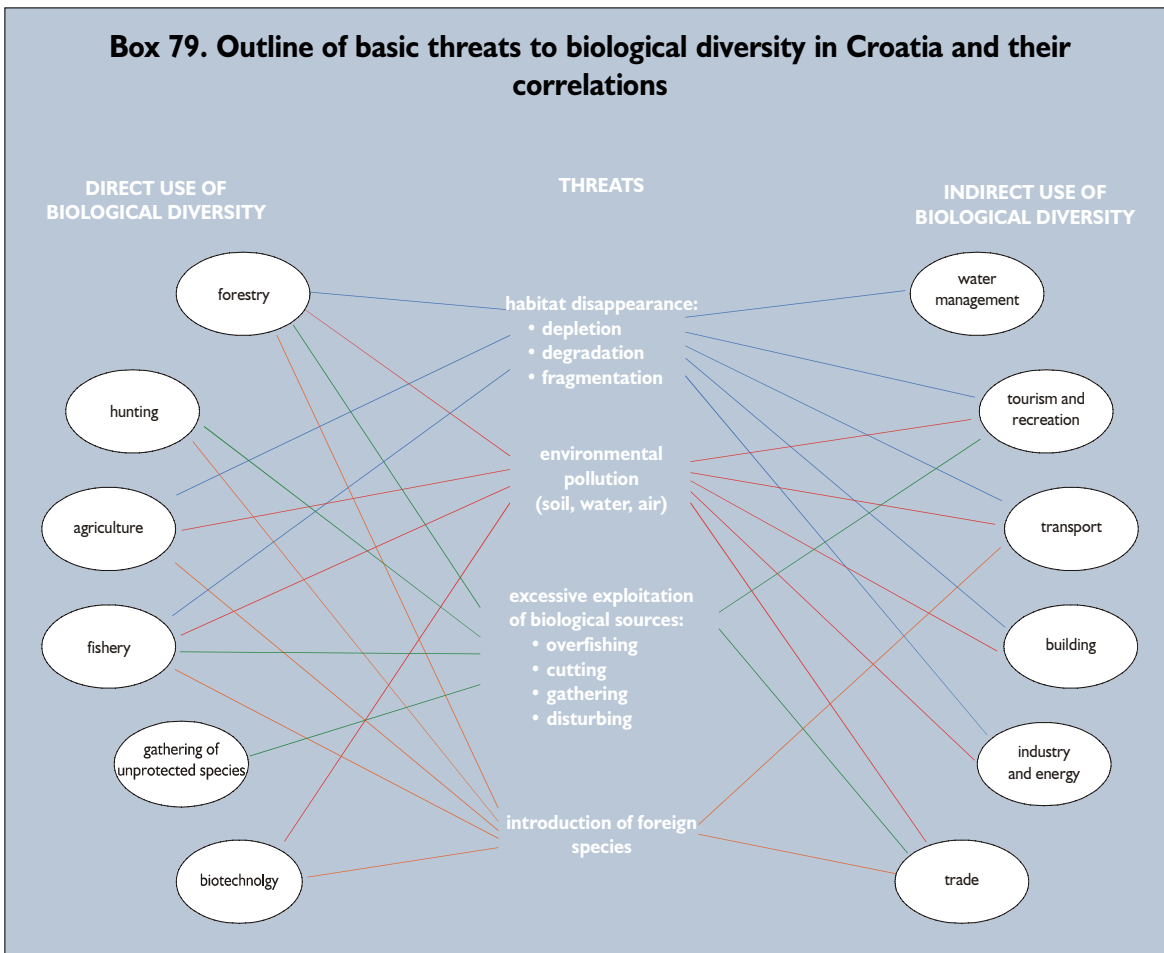
A major problem for waters and wetlands is the introduction of increased volumes of organic substances (agriculture – fertilizers, municipal wastewaters, etc.), which incites a series of modifications to such ecological systems, including rapid overgrowing of wetland biotopes.

Excessive exploitation of biological resources

The uneconomical use of biological resources is a consequence of the insufficient integration of protection measures into various economic activities, through which man has modified the natural structure of ecological systems, by favouring a smaller number of species and destroying and thus threatening at their expense a multitude of other species (agriculture, forestry, hunting, fishing, water management).

The use of biological resources is often based not on actual knowledge of the state of populations, but is rather lead by profit-making interests. Intensive hunting, fishing, plant and animal gathering for commercial and other purposes, excessive cutting of trees and disturbing animals in

Box 79. Outline of basic threats to biological diversity in Croatia and their correlations



their habitats result in their direct disappearance from the ecological system.

Introduction of foreign species into ecological systems

Any intentional or unintentional introduction of foreign (allochthonous) species into the ecological system represents a serious degradation of the existing, highly vulnerable ecological balance in it. The species introduced are adapted to different habitat conditions, they have no natural enemies and frequently drive the indigenous (autochthonous) species off, becoming very rapidly the dominant species in the ecological system. The indigenous species disappear, thus causing the immediate reduction of biological diversity of ecological systems. In Croatia this phenomenon is posing threat particularly to freshwater fish, while in the plant life there are examples of bastard-indigo spreading over the meadows and pastures and of the aggressive alga *Caulerpa* in the Adriatic.

Other threats

Integration of protection measures into physical planning and regional development procedures is inadequate. A potential hazard for the protection of biological and landscape diversity lies in certain ambitious development plans that have not been comprehensively elaborated as regards their influence on and consequences for the nature and environment.

Although Croatia possesses ideal preconditions for the development of the so-called "ecological" tourism, these potentials are far from being exploited, and the tourist industry still poses threat to ecological balance of the space.

The migration of rural population to urban areas and socio-economic changes in rural communities have resulted in the disappearance of extensive cattle-breeding on alpine and littoral grassland and abandonment of indigenous cultivated plants and domestic animals at the expense of more profitable taxa.

PROBLEMS OF EXISTING PROTECTION

1. Lack of institutional framework for nature protection at the administrative, expert and scientific level

The Government of the Republic of Croatia still does not give enough consideration to issues of nature protection which is reflected in the structure of the government administration.

Institutional organisation of data compiling and processing is extremely felt, thus making the knowledge of biological diversity dependent on fragmented and mutually unrelated results of specific scientific research.

2. Lack of quality data on biological diversity as a key precondition for its efficient protection

In Croatia an extremely small number of plant, fungi and animal groups have been check-listed, and few red lists of threatened taxa and distribution maps for them made. Also, habitat types have not been mapped according to the international CORINE-Biotopes classification, which is a European standard.

A good knowledge of national biological and landscape diversity is a precondition for its effective protection at the national level and a background to develop concrete action plans for their protection. One of the underlying causes of such a situation is the insufficient number of biodiversity scientists of a high standard.

3. Non-existence of special finance mechanisms apart from regular funds provided by the state budget

The non-existence of special mechanisms to finance biological and landscape diversity protection beyond the regular finance for nature and environment protection activities secured by the state budget, which as a rule are absolutely insufficient, is one of the main drawbacks to an effective protection of biological and landscape diversity.

4. Inadequacy of the existing and uncoordination of various regulations

The need for numerous amendments to the legislative acts and the necessity of adopting a new Nature Protection Act in particular, which would regulate issues of protection of biological and landscape diversity in a systematic and integrated manner, is evident. There are areas that have not been legally regulated at all, e.g. protection of indigenous domesticated taxa or issues of biological safety in handling genetically modified organisms.

5. Insufficient co-ordination and co-operation among sectoral governmental authorities

Protection efforts are still considered opposition and impediment to the development and natural resource managers very frequently have inadequate "ecological" education. The difficult economic conditions and prioritising certain development programmes that pose a potential threat to biological and landscape diversity are further aggravating the problem.

6. Insufficient degree of general public information in the matters of protection of biological and landscape diversity

Participation of the public in decision-making concerning protection of nature and the environment is poor. The mass media show in most cases very little interest in the matters of nature and environmental protection which results in a low level of information and education of the general public. The influence of non-governmental organisations is also negligible.

7. Insufficient implementation and control of the protection of biological and landscape diversity in the field

A significant problem of practical protection of biological and landscape diversity is the lack of qualified expert staff to implement necessary protection measures in the field. Counties do not have their nature protection inspector whose duties are currently carried out by environmental inspectors. Similarly, customs and police officers are not adequately trained for prevention of illegal trade in natural resources.

8. No incorporation of the business sector into the protection of biological and landscape diversity

The business sector has so far been almost completely excluded from biological and landscape diversity protection. However, it could be included into the protection through sponsorships for concrete actions. The companies that directly use or influence the biological and landscape diversity should be committed to allocate certain funds to protection activities.