

**Action plans for protection of the sea**

Action plan	Priority	Possible source of funds
• Estimates of fishing the available biological resources and optimally possible (permitted) exploitation levels	PR!	SB
• Protection of loggerhead turtle against accidental catches	PR!	SB, IF
• Construction of recipient units for oily water from ships in international ports	PR!	SB, IF, CB
• Evaluation and preparation of programmes for the protection of individual marine areas	ST	SB
• Establishment of zoological marine reserves (for dolphins etc.)	ST	SB
• Mapping and protection of submarine caves	ST	SB
• Protection of the Malostonski Bay against pollution	ST	SB, CB
• Preparation of final designs, installation and putting into operation the municipal and industrial wastewater purification plants up to the level as specified by national and/or international regulations aiming at the sea pollution abatement	ST-LT	SB, CB, IF
<b>Research and monitoring</b>		
• Continued monitoring of the state of settlements of benthic algae and marine flowering plants in the already surveyed threatened coastal areas	ST	SB
• Study of the almost unknown benthic algal flora and marine flowering plants of certain islands and underwater reefs in the open sea of the Central and Southern Adriatic	ST	SB
• Determining and mapping the distribution of meadows of marine flowering plants and places of their extinction due to human impact	ST	SB
• Monitoring the condition of the sea and living communities in all protected areas of the Croatian territorial waters	ST	SB
• Research in the population state and dynamics of endemic and threatened fish, crustacean and cephalopod species	ST	SB
• Research in the impact of fish-farming in cages on benthic biocenoses	ST	SB
• Research in the state of renewable biological resources in threatened and devastated marine areas to enable their protection	ST	SB

2. to carry out the protection of biological resources of the Adriatic in co-ordination with the countries involved in its exploitation on the basis of co-ordinated national and joint programmes and under the auspices of the General Committee on Mediterranean Fisheries (CFCM) within the framework of FAO
3. to ensure purification of municipal and industrial wastewater discharged into the sea
4. to ensure construction of recipient units for oily waters from ships in international ports
5. to carry out the conservation of marine biological diversity by means of including specific areas and the appertaining living communities into some of the categories of a stricter protection
6. to preserve the existing marine biological diversity by applying stricter protection measures when adopting physical plans for utilisation of the sea and the coast
7. to target the scientific and research programmes and projects towards examination of specific, valuable, economically important and exploited, vulnerable, insufficiently known and threatened communities, taxa and habitats.

**Box 82. Meadows of marine flowering plants**

Meadows of marine flowering plants are considered one of the most distinct landscapes of the shallow sand and gravel seabed. Due to a generally high density of populations and marked photosynthetic activities of the plants the meadows of some species belong at the same time to the most productive benthic biocenoses of coastal areas throughout the world, including the Mediterranean and the Adriatic. In the Adriatic there are meadows of four species of marine flowering plants, popularly called sea grass because of their leaves. On the sand and sometimes silt seabed the commonest among them are meadow of the lesser Neptune grass (*Cymodocea nodosa*), with eelgrass (*Posidonia oceanica*) inhabiting the bottom covered by coarse sand and gravel. It often grows out of the sediment inserts inside the recesses of hard rocks, giving the impression of inhabiting the craggy seabed too. The eelgrass meadows are characterized by a high density (up to several hundreds of wisps on a square meter) and by tough leaves over 1 m long. The thicket of leaves provides excellent conditions for settlement of a number of epiphyte algae, as well as for a shelter, habitation and spawning of numerous animals, from the smallest to the fish generally important for the phytal and not seldom for the coralogenic biocenosis and various communities of the movable bottom. The meadows of eelgrass are considered the last or rather the climax stage of the evolutional development of biocenoses of the movable base. However, as a result of pollution, reduced transparency of the sea, anchoring of vessels and sand extraction, and maybe due to global changes in littoral ecological systems the meadows of eelgrass have in many places withdrawn and even disappeared over the last several decades. This moved a number of Mediterranean countries to designate eelgrass a threatened species and protect it by the law and in some places where it disappeared the steps of artificial settling have been taken. Although there are signs of the eelgrass degradation in the Croatian part of the Adriatic too, competent authorities have not undertaken appropriate measures for its protection.

D. Zavodnik



**Figure 153.** Meadows of eelgrass on the left and lesser Neptune grass on the right in the Opat cove, the island of Kornat

(photo by D. Zavodnik)



Figure 154. Sea squirt, *Clavelina lepadiformis* in the Limski Channel  
(photo A. Jaklin)

## 6. Strategic objective – grassland and arable land

To reduce the trend of losing the areas and the diversity of subnatural and seminatural grassland as valuable anthropogenic habitats extremely rich in biological diversity; to stimulate agricultural measures that ensure conservation of the highest possible biological diversity of the arable land.

### Strategic guidelines

1. to manage agricultural land and provide suitable natural ecological conditions for the protection of the spontaneous plant and animal life
2. to stop exploitation at the point where it begins to pose threat to natural properties of grassland ecosystems and thus reduce the biological diversity

3. to revitalise extensive cattle breeding in highland, mountain, island and littoral regions
4. to prevent draining and preserve the water resources of the wet lowland grasslands
5. not to encourage hydromeliorative operations for land improvement, but rather to use the existing, in particular the deserted, agricultural land more rationally
6. when agglomerating the agricultural areas, to preserve the network of natural and seminatural habitats of no commercial interest, especially at the edges of vast monoculture areas, along the roads, paths and canals
7. to prepare action plans for individual representative areas with diverse grassland types including the programme for adequate active protection measures



Figure 155. Meadow on the Bilogora Mt.  
(photo by D. Grlica)

### Action plans for protection of grassland and arable land

Action plan	Priority	Possible source of funds
<b>Protection</b>		
• Protection of sandy grassland of the Drava basin and the Valley of Požega	PR!	SB, IF
• Protection of the dry grassland ecological system of Čučerje – snowdrop anemone, site	PR!	SB
• Protection of the Babina Greda wet grassland ecological system – communities of <i>Rhinantho-Filipenduletum</i>	PR!	SB
• Protection of grassland sites in the Drava basin, vital for the survival of butterflies of the large blue <i>Maculinea</i> genus	PR!	SB, IF
• Protection of Petrijevci grasslands – Siberian iris, sites	PR!	SB
• Protection of semi-steppe grasslands of the Danube basin (Bistrinci, Bilje, Šarengrad)	PR!	SB, IF
• Protection of Istrian wet meadows along the border with Slovenia – habitats of the butterfly false ringlet	PR!	SB
• Protection of wetland vegetation at the Neretva river mouth – the unique site of the upright dorycnium in Croatia	PR!	SB, IF
• Protection of coastal vegetation on the Cape Kamenjak – the only site of woolly chamomile and narrow-leaved bindweed	PR!	SB
• Protection of grasslands near Žminj in Istria – habitat of mountain anemone	PR!	SB
• Protection of the remains of wet grasslands in the Baranja region – communities of <i>Serratulo-Plantaginetum altissimae</i>	PR!	SB
• Setting up and maintaining grasslands on both sides of the Limski Channel	ST-MT	SB, CB
• Maintaining of alpine grasslands on Snježnik Mt., Velebit Mt. and Bjelolasica Mt.	ST-MT	SB, CB
<b>Programmes</b>		
• Adoption of regulations for withdrawing the highly toxic preparations (lindane, atrazine) from use and reduction of the use of broad spectrum insecticides	ST	SB
• Preparation of the programme for preservation of traditional forms of agricultural activities in specific protected areas	ST-MT	SB
• Evaluation of grasslands and preparation of a proposal for the protection of individual sites including the specific management programme	ST-MT	SB
<b>Research and monitoring</b>		
• Research in a single stand of the characteristic grassland communities per each phytogeographic area	ST	SB
• Research in a single stand of the characteristic arable land communities per each phytogeographic area	ST	SB





Figure 156. *Dropwort*  
(photo by T. Nikolić)



Figure 157.  
*Mountain anemone*  
(photo by T. Nikolić)

8. to keep the weed coverage of arable land at the level of 10% including the adequate treatment; to maintain and introduce important habitat segments like hedges
9. to develop ecological agriculture and ensure a more nature-like vegetative composition of agrophytocoenoses
10. to renew and encourage the rural development based on ecological acceptable forms of agricultural production
11. to regulate application of pesticides in a more appropriate manner, encouraging the use of selective preparations
12. to remove from use the active substances contained in plant protection chemicals proven to be highly toxic (lindane, atrazine); reduce the use of insecticides, especially those of a broad spectrum, and to use selective insecticides
13. to upgrade the soil quality and monitor the state of soil.

## 7. Strategic objective – coast and islands

To preserve the existing biological diversity and peculiarity of the coast and islands, among others by incorporating protection, restriction and utilization measures into development programmes and physical planning documents.

### *Strategic guidelines*

1. to map the sites, habitats and distribution of threatened species and make the respective register
2. to carry out a revision of evaluation of the space and to incorporate the results into physical plans
3. to ban introduction of foreign species and populations without permission of the Ministry of Environmental Protection and Physical Planning
4. to protect the sites important for endemism (primarily small islands)

### Action plan for protection of coast and islands

Action plan	Priority	Possible source of funds
• Protection of small islands characterised by endemic taxa	PR!	SB, IF
• Protection of the Neretva wetlands	PR!	SB, IF
• Protection of wet habitats on islands (wells, pools, lakes, wetlands and watercourses)	PR!	SB, CB
• Protection of sand and gravel beaches	PR!	SB, CB
• Protection of silty coastal areas	PR!	SB, CB
• Protection of islets and reefs – nesting grounds for sea birds and <i>Falco eleonorae</i>	PR!	SB, IF
• Protection of indigenous domestic animal taxa: island pony and asses	PR!	SB, CB
• Protection of Saplnara and the bay of Blaca on the island of Mljet	PR!	SB, CB
• Protection of wells in Ubli, island of Lastovo	PR!	SB, CB
• Research and protection of habitats of <i>Vipera ursinii</i> on the island of Krk	PR!	SB
• Protection of marine caves	ST	SB, CB
• Identification of sites, construction and arrangement of waste disposal sites and permanent removal of wastes from small and scattered islands	ST-MT	SB, CB
• Construction of infrastructure utilities on islands	ST-MT	SB, CB



*Figure 158. One of the action plans relates to the protection of small islands significant for their endemic taxa*  
(photo by D. Grlica)

5. to ensure a more efficient enforcement of the law and public control of the enforcement
6. to encourage the traditional economy and raising of traditional breeds and cultures
7. to prepare a long-term plan for environmental pollution abatement
8. to ensure monitoring and management of threatened species and habitats.

### 8. Strategic objective – habitats

To map habitats in Croatia and, based on the analysis of threats, to provide legal protection of rare and threatened habitat types including certain most threatened sites.

#### *Strategic guidelines*

1. to map habitats in Croatia and carry out the analysis of threats to certain habitat types

*Figure 159. Yellow flomed-poppy on one of rarely preserved gravel beaches*

(photo by D. Grlica)



2. to protect the threatened and rare habitat types by the Nature Protection Act
3. to protect the most threatened sites – representatives of certain habitat types.

#### **Action plans for protection of habitats**

<b>Action plan</b>	<b>Priority</b>	<b>Possible source of funds</b>
<b>Research</b>		
• Preparation of action plans for the protection of critically threatened habitat types	PR!	SB
• Mapping the threatened habitat types	ST-MT	SB, IF
• Red List of threatened habitat types	ST-MT	SB
<b>Protection</b>		
• Protection of the Sands of Đurđevac and Sands of Kloštar reserves	PR!	SB, IF
• Protection of the Dubravica moor near Zaprešić – site of <i>Drosera rotundifolia</i>	PR!	SB
• Protection of the moor in the Lepenica valley (the region of Gorski kotar) -site of <i>Drosera rotundifolia</i>	PR!	SB
• Protection of the Sungerski lug moor – site of <i>Calla palustris</i>	PR!	SB
• Protection of the Tršće moor – site of <i>Eriophorum gracile</i>	PR!	SB
• Protection of the wetland ecosystem in the area of the Neretva mouth – site of upright dorycinium	PR!	SB, IF
• Protection of pools and wells in coastal and island areas	PR!	SB, CB
• Protection of wetland meadows	PR!	SB, CB
• Protection of natural riverbanks of Mura and Drava	PR!	SB, IF
• Protection of semi-steppe grasslands in the Danube basin	PR!	SB, IF
• Action plan for the protection of low silty and sandy sea coasts	PR!	SB, CB
• Legal and practical protection of all other moors	PR!	SB, CB
• Mapping and protection of aquatic caves and cavities in coastal and island areas	ST	SB, CB



Figure 160. Sand beach on the island of Rab

(photo by I. Bralić)



Figure 161. Velo blato on the island of Pag, a significant resting site for migratory birds; glossy ibis

(photo by D. Grlica)

### III. Protection of species and subspecies

#### 9. Strategic objective – protection of species and subspecies

To preserve the existing diversity of plant, fungi and animal species and subspecies and, wherever possible and appropriate, to reintroduce the formerly extinct indigenous taxa.

##### Strategic guidelines

1. to prepare and implement the priority action plans for all critically threatened wild taxa
2. to prepare action plans for threatened taxa and implement the same according to the list of priorities.

Numerous other aspects of the protection of flora and mycoflora, including other activities more or less connected with the protection, are covered by general and specific strategic objectives and guidelines, as well as by the related general and specific action plans (e.g. inventoring, mapping, red lists, flora, protection of habitats and areas, etc.).

Figure 162. Yellow gentian, a vulnerable and legally protected taxa of bare mountain areas

(photo by T. Nikolić)



#### Action plans for protection of species and subspecies

Action plan	Priority	Possible source of funds
• Setting up a national commission for the verification of the status of threat and updating the priorities for Red Lists of habitats, flora, mycoflora and fauna	PR!	SB
• Preparation of Red Lists of threatened flora, mycoflora and fauna	PR!	SB
• Implementation of action plans for critically threatened taxa according to the list of priorities	PR!	SB, IF
• Preparation of action plans for the protection of threatened plant taxa	PR!	SB
• Implementation of action plans for the protection of all threatened plant taxa	ST	SB
• Establishment of mycological reserves	ST	SB
• Construction of a crossing for wild animals over the Karlovac-Rijeka railway track	ST	SB, BS
• Removal and rehabilitation of at least 5 solid waste disposal sites in forests of the Gorski kotar region (Delnice, Mrkopalj, Vrbovsko, Lokve and Ogulin) and preventing the access of wild animals to disposal sites by fencing and maintaining the fence	ST	SB, CB
• Preparation and implementation of medium-term action plans for fauna	MT	SB, IF
• Preparation and implementation of long-term action plans for fauna	LT	SB, IF

#### Short-term action plans for the protection of wild taxa

Flora		
Action plan	Priority	Possible source of funds
• Preparation of action plans for all representatives of vascular flora that are endangered (status E) or facing extinction (status ?Ex) (Box 83)	PR!	SB
• Implementation of action plans for all representatives of vascular flora that are endangered (status E) or facing extinction (status ?Ex)	PR!	SB, IF

### Box 83. List of threatened and presumably disappeared plants for which protection action plans are to be prepared and implemented, including species already disappeared (extinct)

(E) – endangered species; (?Ex) – probably extinct species, (Ex) – extinct species, \* – endemic species or subspecies  
(prepared according to the Checklist of Croatia's Flora 1994–2000)

#### Endangered (E)

1. *Asplenium sagittatum* (DC.) Bange
2. \**Aubrieta columnae* Guss. ssp. *croatica* (Schot Nyman et Kotschy) Mattf.
3. *Rynchospora alba* (L.) Vahl
  4. *Scopolia carniolica* Jacq.
  5. *Daphne blagayana* Freyer
  6. *Botrychium matricariifolium* (Retz.) A. Br. ex Koch
  7. *Ilex aquifolium* L.
  8. \**Brassica botterii* Vis.
  9. \**Brassica cazzae* Ginzb. et Teyber
  10. \**Brassica mollis* Vis.
  11. *Carex curta* Gooden.
  12. *Carex echinata* Murray
  13. *Carex extensa* Gooden.
  14. *Carex nigra* (L.) Reichard
  15. *Carex serotina* Mérat
  16. *Cephalanthera damasonium* (Mill.) Druce
  17. *Corynephorus divaricatus* (Pourr.) Breistr.
  18. *Betula pubescens* Ehrh.
  19. *Carex davalliana* Sm.



Figure 163. Spring adonis, a species of sands threatened by extinction

(photo by T. Nikolić)

20. *Cephalanthera rubra* (L.) Rich.
21. *Daphne cneorum* L.
22. *Orchis quadripunctata* Cirillo ex Ten.
23. *Cephalanthera longifolia* (L.) Fritsch
24. *Carex dioica* L.
25. *Elymus farctus* (Viv.) Runemark ex Melderis
26. *Elymus pycnanthus* (Godr.) Melderis
27. *Trollius europaeus* L.
28. *Fimbristylis bisumbellata* (Forssk.) Bubani
29. \**Geranium dalmaticum* (Beck) Rchb. f.
30. *Arnica montana* L.
31. *Cypripedium calceolus* L.
32. *Orchis purpurea* Huds.
33. *Hemerocallis lilioasphodelus* L.
34. *Carex hostiana* DC.
35. *Digitalis ferruginea* L.
36. *Hymenophyllum tunbrigense* (L.) Sm.
37. \**Iris pseudopumilla* Tineo
38. *Koeleria glauca* (Schrad.) DC.
39. *Osmunda regalis* L.



Figure 166. Common periwinkle is threatened by fragmentation of habitats and forests clearing, including the excessive gathering

(photo by T. Nikolić)

40. *Lilium carniolicum* Bernh. ex Koch
41. *Orchis spitzelli* Saut. ex Koch
42. \**Lilium bosniacum* (Beck) Beck ex Fritsch
43. \**Lanigera borbasiana* (Kuntze) Degen
44. *Lilium bulbiferum* L.
45. *Lilium martagon* L.
46. *Vinca minor* L.
47. *Mandragora officinarum* L.
48. *Calla palustris* L.
49. *Myricaria germanica* (L.) Desv.
50. *Orchis lactea* Poir.
51. *Hippophaë rhamnoides* L.
52. *Campanula cochleariifolia* Lam.
53. *Typha minima* Funck
54. *Ophrys apifera* Huds.
55. *Ammophila arenaria* (L.) Link
56. *Gentiana pneumonanthe* L.
57. *Poa remota* Forselles
58. *Fritillaria meleagris* L.
59. *Pancreatium maritimum* L.
60. *Adonis vernalis* L.
61. *Pulsatilla pratensis* (L.) Miller ssp. *nigricans* (Störck) Zam.
62. *Saccharum ravennae* (L.) Murray
63. *Carex divisa* Huds.

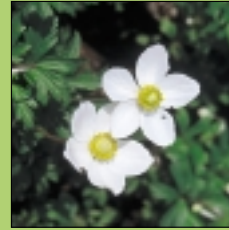


Figure 164. Wood anemone, a threatened and rare plant

(photo by T. Nikolić)

64. \**Saxifraga sedoides* L. ssp. *prenja* (Beck) Hayek
65. *Ligularia sibirica* (L.) Cass.
66. *Iris sibirica* L.
67. \**Alyssum montanum* L. ssp. *pluscanescens* (Raim. ex Baumgartner) Trpin
68. *Corynephorus canescens* (L.) P. Baeuv.
69. *Sporobolus pungens* (Schreb.) Knuth
70. *Eriophorum latifolium* Hoppe
71. *Butomus umbellatus* L.
72. *Orchis italica* Poir.
73. *Carex lepidocarpa* Tausch
74. *Asparagus tenuifolius* Lam.
75. *Eriophorum angustifolium* Honck.
76. *Carex diandra* Schrank
77. \**Degenia velebitica* (Degen) Hayek
78. *Digitalis grandiflora* Mill.

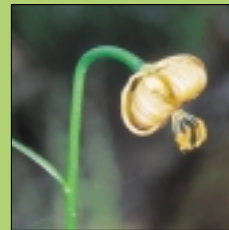


Figure 165. Turk's-cap lily is threatened by excessive gathering and has been protected in all natural habitats since 1970 under the Nature Protection Act

(photo by T. Nikolić)

79. *Anemone sylvestris* L.
80. *Festuca vaginata* Waldst. et Kit. ex Willd.
81. *Catabrosa aquatica* (L.) P. Beauv.
82. *Platanthera clorantha* (Custer) Rchb.
83. *Arctostaphylos uva-ursi* (L.) Spreng.
84. *Narcissus radiiflorus* Salisb.
85. *Ophrys lutea* (Gouan) Cav.
86. *Carex flava* L.

#### Probably extinct (?Ex)

87. *Drosera anglica* Huds.
88. *Drosera intermedia* Hayne
89. *Eriophorum gracile* Kock ex Roth.
90. *Cuscuta epilinum* Weihe

#### Extinct (Ex)

91. \**Dianthus multinervis* Vis.
92. *Ophioglossum lusitanicum* L.

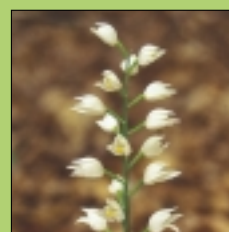


Figure 167. Narrow-leaved helleborine, an orchid declining in number as a result of excessive gathering and habitat changes; protected in all natural habitats since 1972 under the Nature Protection Act

(photo by T. Nikolić)



**Invertebrates**

Action plan	Priority	Possible source of funds
• Action plan for the protection of endemic, relict and rare species of underground terrestrial and aquatic habitats	PR!	
• Action plan for research and protection of wet meadow butterflies		
• Action plan for research and protection of fauna of small watercourses and wells in the Adriatic catchment area, islands and the coast	PR!	
• Action plan for research and protection of brackish water fauna	PR!	
• Action plan for research and protection of the sandy desert fauna		
• Action plan for research and protection of the moor fauna		

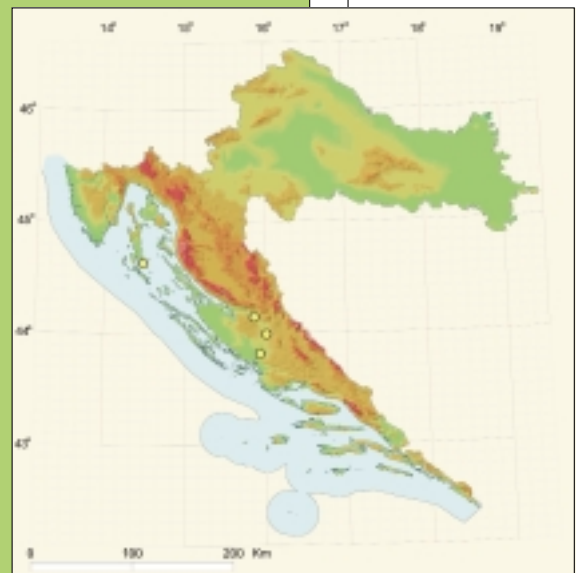
### Box 84. A rare and vulnerable endemic species of isopod crustacean *Monolistra pretneri* spp. *spinulosa*

- Order: *Isopoda*
- Family: *Sphaeromatidae*
- IUCN: vulnerable (V), low-risk (LR)
- Protection in Croatia: not protected

Higher crustacean and the majority of other groups of invertebrates in Croatia are comparatively poorly explored. Therefore the discovery of new species and subspecies, in underground biotopes in particular, may be expected. One of the numerous underground endemic species of Croatia's isopod is the troglobyontic species of *Monolistra pretneri* Sket, 1965 which is one of the *Monolistra* species inhabiting the islands (the island of Cres). So far two subspecies of this species have been described: *M. pretneri* ssp. *pretneri* Sket, 1965 and *M. pretneri* ssp. *spinulosa* Sket, 1965. Both taxa are eyeless and are mostly depigmented. The subspecies *M. pretneri* ssp. *spinulosa* has easily distinguishable by – wart-like growths on the dorsal and rear part of the body. Mature females have thin lateral spines. It inhabits the karstic springs and caves with flowing water. This underground crustacean is about 10 mm long and lives in a community with the largest underground aquatic isopod in Croatia – *Sphaeromides virei* ssp. *mediodalmatina* Sket, 1964. It is very rare in its distribution area and highly vulnerable to underground waters pollution in the karst. Since this species has been to date recorded mostly in caves and springs in the vicinity of settlements there is a realistic threat that it could disappear as a result of stronger anthropogenic impacts such as springs pollution, change in the ground waters level due to regulation of watercourses when constructing hydroelectric power plant reservoirs on the rivers Zrmanja and Krka, mining for the purpose of constructing utility infrastructure, etc. Viewing the fact that in Croatia the majority of endemic species of higher crustaceans lives precisely in underground waters it is necessary to undertake in time systematic protection actions so as to preserve this unique fauna.

S. Gottstein

Figure 168. Endemic and threatened isopod crustacean *Monolistra pretneri* ssp. *spinulosa*, the Miljacka cave (photo by D. Pelić)



Map 26. Distribution of the crustacean *Monolistra pretneri* ssp. *spinulosa* (according to data by S. Gottstein)

**Fishes**

Action plan	Priority	Possible source of funds
• Action plan for the protection of endemic fish: Cetina spined loach	PR!	
• Action plan for the protection of endemic fish: souffie ( <i>Leuciscus souffia</i> ssp. <i>muticellus</i> )	PR!	
• Action plan for the protection of endemic fish: <i>Leuciscus microlepis</i>	PR!	
• Action plan for the protection of endemic fish: Croatian minnow ( <i>Phoxinellus croaticus</i> )	PR!	
• Action plan for the protection of endemic fish: Adriatic salmon ( <i>Salmothymus obtusirostris</i> )	PR!	
• Action plan for the protection of endemic fish: Adriatic minnow ( <i>Phoxinellus alepidotus</i> )		
• Action plan for the protection of endemic fish: Dalmatian minnow ( <i>Phoxinellus ghetaldi</i> )		
• Action plan for the protection of endemic fish: south Dalmatian minnow ( <i>Phoxinellus pstrossi</i> )		
• Action plan for the protection of endemic fish: spotted minnow ( <i>Phoxinellus adspersus</i> )		
• Action plan for the protection of endemic fish: Vrgorac goby ( <i>Knipowitschia punctatissima</i> ssp. <i>croatica</i> )		
• Action plan for the protection of endemic fish: ide ( <i>Leuciscus illiricus</i> )		
• Action plan for the protection of endemic fish: <i>Leuciscus polylepis</i>		
• Action plan for the protection of endemic fish: "balkan" dace ( <i>Leuciscus svallize</i> )		
• Action plan for the protection of endemic fish: Dalmatian barbelgudgeon ( <i>Aulopyge hugeli</i> )		
• Action plan for the protection of endemic fish: endemic subspecies of the lake trout ( <i>Salmo trutta</i> )		

Figure 169. Leopard snake, renowned as the most beautiful snake in Croatia ♂  
(photo by M. Mrakovčić)

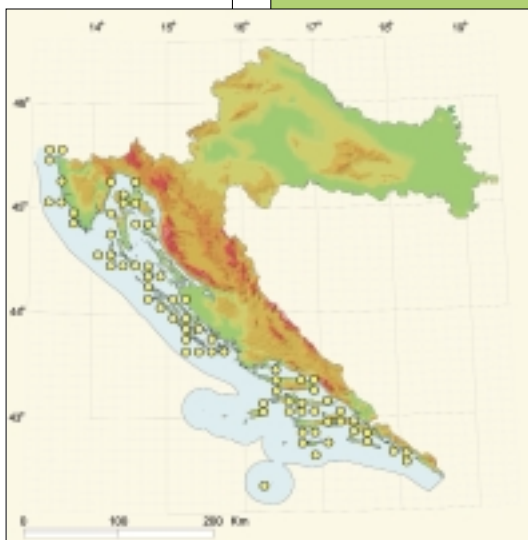
Figure 170. Moor frog, in the period of mating the male assumes a striking blue colour ♂  
(photo by M. Schneider-Jacoby)



Amphibians and reptiles		
Action plan	Priority	Possible source of funds
• Action plan for inventorying and protection of Italian agile frog ( <i>Rana latastei</i> )	PR!	
• Project for identification of inventory and state of stripe-necked terrapin ( <i>Mauremys caspica</i> ) in Croatia and introduction of first protection measures	PR!	
• Identification of habitats and nesting places of loggerhead turtle ( <i>Caretta caretta</i> )	PR!	
• Identification of remaining habitats and sites of Orsini's viper ( <i>Vipera ursinii</i> )	PR!	
• Research into characteristics and threats to green lizard ( <i>Lacerta viridis</i> ) and island lizards	PR!	
• Monitoring and protection of marked marine turtles and their wintering grounds		
• Identification of distribution, state of population and necessary measures for the protection of snake-eyed skink ( <i>Ablepharus kitaibeli</i> ) populations in Croatia		
• Identification of distribution, state of population and necessary measures for the protection of Caspian whip-snake ( <i>Coluber caspius</i> )		
• Action plan for inventorying and protection of endemic amphibians and reptiles: olm ( <i>Proteus anguinus</i> ), smooth newt ( <i>Triturus vulgaris</i> subsp. <i>meridionalis</i> , <i>Triturus vulgaris</i> ssp. <i>dalmaticus</i> ), Dalmatian algyroides ( <i>Algyroides nigropunctatus</i> ), Horvath's rock lizard ( <i>Lacerta horvathi</i> ), Mosor rock lizard ( <i>Lacerta mosorensis</i> ), sharp-snouted rock lizard ( <i>Lacerta oxycephala</i> ), wall lizard ( <i>Podarcis muralis</i> ssp. <i>maculiventris</i> ), western whip snake ( <i>Coluber viridiflavus</i> ssp. <i>carbonarius</i> ) and Balkan whip snake ( <i>Coluber gemonensis</i> )		

Map 27. Distribution of loggerhead turtle

(according to data by N. Tvrtković)



**Box 85. Loggerhead turtle (*Caretta caretta*)**

- Order: *Testudinata (Chelonia)* (turtles)
- Family: *Cheloniidae* (marine turtles)
- Croatian name: glavata želva
- IUCN: endangered (E)
- Protection in Croatia: protected since 1995 under the Nature Protection Act

Of the three marine turtles recorded in the Adriatic the loggerhead turtle is its permanent inhabitant. It is distributed worldwide in all warm seas and often in the coastal sea where it feeds on bottom-dwelling animals – cnidarians, echinoderms, crustaceans, molluscs



Figure 171. Loggerhead turtle  
(photo by N. Patiniotis)

and occasionally fish. In the Adriatic it is often possible to find mature loggerhead turtles that were marked at egg lying on the beaches of Greece and also young specimens only just hatched. For entering into and leaving the Adriatic the loggerhead turtles use the sea currents. The Adriatic is probably the area where they grow and spend winter. In winter they take rest at the sea-bottom. They presumably nest occasionally on sandy beaches of the islands of Mljet and Korčula. The loggerhead turtle has been for a long time listed among the worldwide threatened animals. Their number in the Adriatic is still unknown, but it is estimated that about 2,500 specimens are accidentally caught yearly. The species is threatened (1) by catching for illegal sale of meat to foreign restaurants or for shells as souvenirs, (2) by sea pollution caused by plastic packaging that the turtles swallow, but cannot digest, (3) by making the nesting impossible due to the use of beaches for tourist purposes and (4) by dying of specimens accidentally caught by fishing nets. For the last five years the loggerhead turtle has been legally protected in Croatia and there is the on-going systematic collecting of data about accidental catches and finding of the specimens marked. All beaches where loggerhead turtles might nest have been explored and recorded. There are plans to identify the wintering sites for this species and recommend the use of such fishing tools in these sites that would minimize the accidental catch.

N. Tvrtković



**Birds – I. Priority group**

Action plan	Priority	Possible source of funds
• Action plan for the protection of corncrake ( <i>Crex crex</i> ) and warbler ( <i>Locustella naevia</i> )	PR!	
• Action plan for the protection of imperial eagle ( <i>Aquila heliaca</i> )	PR!	
• Action plan for the protection of lesser kestrel ( <i>Falco neumanni</i> )	PR!	
• Action plan for the protection of common redshank ( <i>Tringa totanus</i> )	PR!	
• Action plan for the protection of snipe ( <i>Gallinago gallinago</i> )	PR!	
• Action plan for the protection of Eleonora's falcon ( <i>Falco eleonore</i> )	PR!	
• Action plan for the protection of levant sparrowhawk ( <i>Accipiter brevipes</i> )		
• Action plan for the protection of red kite ( <i>Milvus milvus</i> )		
• Action plan for the protection of European roller ( <i>Coracias garrulus</i> )		
• Action plan for the protection of bearded tit ( <i>Panurus biarmicus</i> ) and moustached warbler ( <i>Acrocephalus melanopogon</i> )		
• Action plan for the protection of calandra lark ( <i>Melanocorypha calandra</i> )		
• Action plan for the protection of icterine warbler ( <i>Erithatus svecicus</i> ) and bluethroat ( <i>Hippolais icterina</i> )		

**Birds – II. Priority group**

Action plan	Priority	Possible source of funds
• Action plan for the protection of non-nesting bird populations: oystercatcher ( <i>Haematopus ostralegus</i> ), black-winged stilt ( <i>Himantopus himantopus</i> ), avocet ( <i>Recurvirostra avosseta</i> ), bar-tailed godwit ( <i>Limosa lapponica</i> ), whimbrel ( <i>Numerius phaeopus</i> ), slender-billed curlew ( <i>Numerius tenuirostris</i> ), turnstone ( <i>Arenaria interpres</i> ) and dunlin ( <i>Calidris alpina</i> )		
• Action plan for the protection of great bittern ( <i>Botaurus stelaris</i> ), marsh harrier ( <i>Circus aeruginosus</i> ) and short-eared owl ( <i>Asio flammeus</i> )		
• Action plan for the protection of night heron ( <i>Nycticorax nycticorax</i> ), squacco heron ( <i>Ardeola ralloides</i> ), little white and great white heron ( <i>Egretta garzetta</i> and <i>Egretta alba</i> ), purple heron ( <i>Ardea purpurea</i> ), glossy ibis ( <i>Plegadis falcinellus</i> ) and spoonbill ( <i>Platalea leucordia</i> )		
• Action plan for the protection of nesting populations of red-necked grebe ( <i>Podiceps grisegena</i> ) and black-necked grebe ( <i>Podiceps nigrocollis</i> )		
• Action plan for the protection of kentish plover ( <i>Charadrius alexandrinus</i> )		
• Action plan for the protection of greylag goose ( <i>Anser anser</i> )		
• Action plan for the protection of saker falcon ( <i>Falco cherrug</i> )		
• Action plan for the protection of Montagni's harrier ( <i>Circus pygargus</i> )		
• Action plan for the protection of gadwal ( <i>Anas strepera</i> ), red-crested pochard ( <i>Netta rufina</i> ), ferruginous duck ( <i>Aythya nyroca</i> ) and wintering population of teal ( <i>Anas crecca</i> )		
• Action plan for the protection of lanner falcon ( <i>Falco biarmicus</i> ) and peregrine falcon ( <i>Falco peregrinus</i> )		
• Action plan for the protection of Bonelli's eagle ( <i>Hieraetus fasciatus</i> ) and booted eagle ( <i>Hieraetus pennatus</i> )		
• Action plan for the protection of griffon vulture ( <i>Gyps fulvus</i> )		
• Action plan for the protection of white-tailed eagle ( <i>Haliaeetus albicilla</i> )		
• Action plan for the protection of lesser spotted eagle ( <i>Aquila pomarina</i> ) and spotted eagle ( <i>Aquila clanga</i> )		
• Action plan for the protection of little tern ( <i>Sterna albifrons</i> )		
• Action plan for the protection of nesting population of common sandpiper ( <i>Actitis hypoleucos</i> )		
• Action plan for the protection of stock pigeon ( <i>Columba oenas</i> )		
• Action plan for the protection of nesting population of woodcock ( <i>Scolapax rusticola</i> )		
• Action plan for the protection of nesting populations of whiskered tern ( <i>Chlidonias hybrida</i> ), white-winged tern ( <i>Chlidonias leucoptera</i> ) and black tern ( <i>Chlidonias nigra</i> )		

**Figure 172.** Night heron

(photo by G. Robbrecht, the MEPPP files)

**Birds – III. Priority group**

Action plan	Priority	Possible source of funds
• Action plan for preparing the reintroduction of extinct species and populations		
• Action plan for the protection of nesting population of black-winged stilt ( <i>Himantopus himantopus</i> )		
• Action plan for the protection of little crane ( <i>Porzana parva</i> ) and Baillon's crane ( <i>Porzana pusilla</i> )		
• Action plan for the protection of Mediterranean shearwater ( <i>Puffinus yelkouan</i> )		
• Action plan for the protection of pygmy owl ( <i>Glaucidium passerinum</i> ) and Tengelman's owl ( <i>Aegolius funereus</i> )		
• Action plan for the protection of capercaillie ( <i>Tetrao urogallus</i> )		
• Action plan for the protection of golden eagle ( <i>Aquila chrysaetos</i> )		
• Action plan for the protection of great cormorant colonies ( <i>Phalacrocorax carbo</i> )		
• Action plan for the protection of small falcon ( <i>Falco columbarius</i> )		
• Action plan for the protection of stone curlew ( <i>Burhinus oedicnemus</i> )		
• Action plan for the protection of bustard ( <i>Otis tarda</i> )		
• Action plan for the protection of jack snipe ( <i>Lymnocyptes minima</i> )		
• Action plan for the protection of three-toed woodpecker ( <i>Picoides tridactylus</i> )		
• Action plan for the protection of horned lark ( <i>Eremophila alpestris</i> )		
• Action plan for the protection of olive-tree warbler ( <i>Hippolais olivetorum</i> )		
• Action plan for the protection of gull-billed tern ( <i>Gelochelidon nilotica</i> )		
• Mapping and protection of nesting places for birds of prey in coastal and island regions		
• Mapping the nesting grounds and protection of seabirds		





Figure 173. Great cormorant  
(photo by M. Schneider-Jacoby)

Mammals		
Action plan	Priority	Possible source of funds
• Wolf ( <i>Canis lupus</i> ) protection and management plan		
• Inventorying of threatened populations of mammals of the Danube and the Drava basin: ground squirrel ( <i>Spermophilus citellus</i> ), Palestine mole mouse ( <i>Nannospalax (leucodon) syriensis</i> ), pond bat ( <i>Myotis dasycneme</i> ), stepe mouse ( <i>Apodemus uralensis</i> ) and mound-buiding mouse ( <i>Mus spicilegus</i> ) and establishment of a zoological reserve	PR!	
• Monitoring and protection of bats in coastal and island areas	PR!	
• Action plan for the protection/reintroduction of the Mediterranean monk seal ( <i>Monachus monachus</i> )	PR!	
• Lynx ( <i>Lynx lynx</i> ) protection and management plan	PR!	
• Beown bear ( <i>Ursus arctos</i> ) protection and management plan		
• Action plan for the protection of common otter ( <i>Lutra lutra</i> )		
• Determining the dolphin population size and trends and its protection – a pilot marine park		
• Determining the status of threat and reintroduction programme for chamois		



Figure 174.  
Mediterranean monk seal  
(photo files of the MEPPP)

### Box 86. Brown bear (*Ursus arctos*)

- Class: mammals (*Mammalia*)
- Order: carnivores (*Carnivora*)
- Family: bear (*Ursidae*)
- Croatian name: smeđi medvjed
- IUCN: a rare species (R)
- Protection in Croatia: disputable

Various brown bear populations belong to various status categories. Thus populations in the north of North America (Alaska and Canada) and in the north of Europe and Asia belong to the low-risk or merely vulnerable category. All populations living in southern parts of North America and Euro-Asia are threatened, facing extinction or already extinct.

In Croatia the brown bear is a hunting species and as such managed by the Act on Hunting, which to a certain extent collides with the Bern Convention according to which all species of great carnivores in Europe should be protected. According to the Red List of Mammals in Croatia the brown bear has been given the status of a rare species.

Croatia is inhabited by a part of the population of the Dinaric massif, which is the second greatest in Europe after the Carpathians. In the West Europe the brown bear has been practically exterminated and represents therefore the top value of Croatia's natural heritage. In Croatia brown bears live on an area of 10,000 km<sup>2</sup> of primarily wooded space in the Dinaric Alps – in Gorski kotar and Lika, from the mountains of Snježnik and Risnjak over Velika and Mala Kapela to the mountains of Plješivica and Velebit. They

Figure 175. Brown bear  
(photo by Đ. Huber)



appear also on Ćićarija, Učka and Žumberak mountains. The size of population is estimated to about 400 specimens. Immediately after the World War II the number of brown bears was several times smaller and was growing until some fifteen years ago when it reached the habitat capacity and since then remained seemingly stable. The limited size of the habitat available and a great area needed for the life of each brown bear make any further population growth impossible and are responsible for the status of a rare species. About 40 bears are killed yearly as a result of the hunting management and other causes.

Brown bears are the largest mainland carnivores. In Croatia mature females

weigh on average 100 kg and males 150 kg, with some specimens reaching as much as 300 kg. Although real carnivores by their bodily structure, they cover about 95% of their nutritional needs by vegetable food. In January females give birth to 1 to 4 youngs (2.4 on average) who stay about 1.5 year with the mother. They reach the sexually maturity at the age of 3 – 4 years and in the nature may live to be 10 or 20 years, with the average age of our population managed by the Act on Hunting being about 5 years. For their life they need wide open spaces, because males can cross the area of 200 km<sup>2</sup> and females 100 km<sup>2</sup>. Preservation of habitats and natural food are basic preconditions for a lasting survival of brown bears.

Đ. Huber



## IV. Protection of genetic diversity of domesticated taxa

### 10. Strategic objective – protection of genetic diversity of domesticated taxa

To preserve the existing genetic diversity of native and threatened domestic animal breeds and cultivated plants by appropriate conservation methods (*in-situ*, *ex-situ*, *inter situ*).

#### Strategic guidelines

1. to undertake inventorying of native and threatened domesticated taxa
2. to implement priority action plans for all critically threatened domesticated taxa.



Figure 176. Istrian cattle

(photo by M. Schneider-Jacoby)

#### Action plans for protection of domesticated taxa

Action plan	Priority	Possible source of funds
<b>Protection of taxa</b>		
• Action plan for the protection of domestic animals in-situ: the island pony	PR!	SB
• Action plan for the protection of domestic animals in-situ: donkeys	PR!	SB
• Action plan for the protection of domestic animals in-situ: the ruda (Dubrovnik) sheep	PR!	SB
• Action plan for the protection of domestic animals in-situ: the pig of Turopolje	PR!	SB
• Action plan for the protection of domestic animals in-situ: the black Slavonian pig	PR!	SB
• Action plan for the protection of domestic animals in-situ: “buša” cattle of Lika	ST	SB
• Action plan for the protection of domestic animals in-situ: the horse of Međimurje	ST	SB
• Action plan for the protection of domestic animals in-situ: goats (the Croatian white and the Croatian spotted goat)	ST	SB
• Action plan for the protection of domestic animals in-situ: the Istrian cattle and Slavonian podolian cattle	ST	SB
• Action plan for the protection of domestic animals in-situ: the horse of Posavina	ST	SB
• Action plan for the protection of domestic animals in-situ: the Istrian sheep	ST	SB
• Action plan for the protection of domestic animals in-situ: the tzigai sheep	ST	SB
• Action plan for the protection of domestic animals in situ: the turkey of Zagorje	ST	SB
• Action plan for the protection of domestic animals in situ: the Croatian hen	ST	SB
• Action plan for the protection of genetic diversity of bees in Croatia	ST	SB
<b>Research and banks of genes</b>		
• Establishment of the Croatian Bank of Plant Genes	PR!	SB, IF
• Setting up a genetic diagnostics laboratory for domestic animals	PR!	SB
• Construction of a seed-production laboratory	ST-MT	SB, IF
• Arrangement of an experimental plot for the Croatian Bank of Plant Genes in Maksimir	MT	SB, IF
• Establishment of a bank of domestic animal genes	MT	SB, IF

Figure 177. The horse of Posavina

(photo by M. Schneider-Jacoby)

## V. Protection through sectors

### 11. Strategic objective – protection through other sectors

To ensure the sustainable use of biological resources in Croatia through cooperation of all competent sectors.

#### Strategic guidelines

1. to incorporate measures of protection and sustainable use of biological resources into all sectors by which they are managed or affected
2. to prepare plans for the protection of biological and landscape diversity beyond protected areas in conjunction with other competent sectors
3. to revise the evaluation of space from the aspect of biological and landscape diversity and to incorporate the results into physical plans
4. to strengthen the principles of the protection of biological and landscape diversity in the process of evaluating the environmental impact studies



5. to solve systematically problems related to all forms of the soil, air and water pollution
6. to reduce the application of chemicals in agriculture and forestry
7. to strengthen the efforts in combating poaching.

*Figure 178. Trond fishpond on the spring of River Krka (Krčići) – formerly a frequent undertaking at river springs*

(photo by M. Mrakovčić)



#### Action plans for protection through other sectors

Action plan	Priority	Possible source of funds
<b>Forestry</b>		
• Incorporation of measures for the protection of biological diversity into forestry, including revising of laws and regulations	ST	SB, IF
• Investigation of the optimal way of using machinery in forests	ST-MT	SB, IF
<b>Hunting</b>		
• Incorporation of measures for the protection of biological diversity into hunting	ST	SB, IF
<b>Agriculture</b>		
• Incorporation of measures for the protection of biological and landscape diversity into farming	ST-MT	SB, IF
• Implementation of the pilot-project for application of measures for the protection of biological diversity into farming	MT	SB, IF
• Action plan for promotion of traditional agriculture and agriculture allowing the survival of a comparatively diverse and rich living world, including the extensive and semi-extensive cattle-breeding	ST	SB
• Encouragement and development of ecological agriculture and provision of a more natural floral composition of agrophytocenoses	ST-LT	SB
<b>Freshwater fisheries</b>		
• To enable the survival of semi-intensive and/or extensive pisciculture in carp fishponds as a precondition for preservation of their ornithological value	PR!	SB, IF
• Incorporation of measures for the protection of biological diversity into freshwater fisheries	ST	SB
<b>Marine fisheries</b>		
• Incorporation of measures for reasonable and long-term sustainable exploitation of biological resources of the sea into marine fisheries	ST	SB, IF
<b>Water management</b>		
• Analysis of existing water utilisation plans and plans for regulation and utilisation of watercourses, including incorporation of measures for the protection of biological and landscape diversity	ST	SB, IF
<b>Physical planning</b>		
• Evaluation of the space based on mapping and evaluation of habitats and significant species, including incorporation of the results into physical plans	ST-MT	SB, CB
<b>Biotechnologies</b>		
• Incorporation of biological safety measures into biotechnologies	PR!	SB, IF

*Figure 179. Carp fishpond are extremely significant for the protection of waterbirds in Croatia – the photo showing Lipovljani fishponds*  
(photo by V. Dumbović)



## VI. Strengthening of legislative and institutional framework

### 12. Strategic objective – legislative framework

To complete the national legislation and harmonise sectoral laws and regulations in order to ensure in the most efficient manner the implementation of the Convention on Biological Diversity in Croatia.

#### Strategic guidelines

1. to accede to all international conventions in the field of protection of biological and landscape diversity
2. to bring national legislation in line with international conventions in the field of protection of biological and landscape diversity (not relevant any more)
3. to pass a new Nature Protection Act based on the principles contained in the Convention on Biological Diversity, including its enforcement regulations arising from the same



**Action plans for legislative framework strengthening**

Action plan	Priority	Possible source of funds
• Passage of a new Nature Protection Act	PR!	SB
• Passage of individual laws on ratification of international conventions in the field of protection of biological and landscape diversity, such as the CITES, the Bern Convention, the Bonn Convention*	PR!	SB
• Proclamation of new protected parks of nature: Mrežnica, the lower Neretva, the island of Lastovo, the Elafiti islands, Hrvatsko Zagorje, Bjelolasica-Stijene, Lička Plješivica Mt., part of the Kupa basin, rivers Zrmanja and Krupa	PR!	SB
• Proclamation of new protected nature parts in other categories	PR!	SB, CB
<b>Enactment of new legislation</b>		
• Act on the protection of genetic diversity of indigenous domestic animals and cultivated plants	PR!	SB
• Act on genetically modified organisms	PR!	SB
<b>Preparation of a programme of amendments to laws regulating specific issues related to the protection and utilisation of biological resources</b>		
• Adoption of enforcement regulations based on the new Nature Protection Act and international conventions	ST	SB
• Revision of the list of legally protected taxa based on Red Lists	ST	SB
• Preparation of regulations on incentive measures for the protection of nature and environment	ST	SB
• Preparation of regulations on financial mechanisms in the field of nature protection	ST	SB
• Adoption of methods and criteria for nature evaluation and, accordingly, revision of protected areas	ST-MT	SB

\* all relevant Conventions ratified in 1999 and 2000

4. to revise the overall national legislation related to the protection and utilisation of biological resources.

### 13. Strategic objective – institutional framework

To develop stronger and more complete institutional frameworks in the government and non-government sector with the aim to achieve the highest possible effectiveness of efforts in the field of biological and landscape diversity protection.

#### Strategic guidelines

1. to raise the organisation of government bodies responsible for the protection of nature and environment to the ministerial level (not relevant any more)
2. to strengthen institutionally the nature and environment protection bodies at all levels, including substantial strengthening of the inspection and expert supervision services
3. to institutionalise the systematic compiling, storing and processing of collected data on biological diversity in Croatia
4. to incorporate the role of governmental institutions, the public and non-governmental organisations into joint efforts in the field of biological and landscape diversity protection.



*Figure 180. National parks are the only among protected nature parts that are managed by public institutions for a longer period of time now – directors of all national parks in the Schlosser's mountain hut at the top of Risnjak Mt. on the occasion of celebrating the 40th anniversary of the Risnjak National Park in 1993*

(photo by A. Frković)

**Action plans for institutional framework strengthening**

Action plan	Priority	Possible source of funds
• Setting up the National Commission for NSAP Implementation Monitoring	PR!	SB
• Preparation of a programme of institutional and organisational strengthening of authorities responsible for biological and landscape diversity protection at the national and county levels, including nature and environmental inspection services	PR!	SB, CB
• Establishment of public institutions for the protected nature parts management	ST	SB, CB
• Establishment of an expert and scientific institution for systematic compiling, storing and processing of the collected data on biological diversity in Croatia	ST	SB
• Preparation of a programme of a more effective control of the compliance with the Nature Protection Act and the Environmental Protection Act, including programmes for education of police and customs officers, as well as marine pollution inspectors	ST	SB
• Setting up a system of compiling genetic samples of endemic taxa in the museum collections and in other institutions	ST-MT	SB

## VII. Improvement of the scientific base

### 14. Strategic objective – research and monitoring

With a purpose of an efficient protection, to raise the basic level of quality information on biological and landscape diversity in the shortest time possible, including substantial efforts in strengthening the necessary scientific and research staff.

#### *Strategic guidelines*

1. to improve the knowledge and data base on biological diversity
2. to ensure permanent research and preparation of the analytic flora, mycofauna and fauna

3. to pay special attention to education, financing, provision of scholarships and employment of researchers in the field of biological diversity, particularly with regard to the unexplored groups of invertebrates
4. to map habitats and distribution of species significant for preservation of biological diversity and peculiarity
5. to ensure monitoring and management of threatened species and habitats
6. to publish a comprehensive list of flora, mycoflora and fauna in Croatia
7. to encourage publication of additional data on the wealth of biological and landscape diversity by the regional principle
8. to support and encourage the adequate keeping of material proof on biological diversity (botanical and zoological collections and genetic material)
9. to develop a local volunteer network for compiling biological diversity data.

#### Action plan for research and monitoring

Action plan	Priority	Possible source of funds
<b>Area and ecological systems research and monitoring action plans</b>		
• Research and monitoring in protected areas	PR!	SB, IF
• Preparation of a vegetation map for Croatia	ST	SB, IF
• Preparation of a biodiversity map for Croatia	ST	SB, IF
• Preparation of regional inventories of well-investigated areas to enable monitoring of biodiversity	ST-MT	SB, IF
• Continuous study of plant and animal communities of wetland and aquatic ecological systems, including monitoring on the most important sites	ST-LT	SB, IF
• Preparation of the research and monitoring programme for specially threatened karst sites	ST	SB, IF
• Systematic study of underground waters (primarily in caves) and detection of sources of organic pollution in the catchment area of cave-related ecological systems	ST	SB, IF
• Recording the fauna in the area between the rivers Sava and Drava	ST-MT	SB, IF
• Basic study of unexplored or insufficiently explored parts of the Adriatic, including identification of permanent stations (sheets) with the aim to monitor the state of biological diversity: river mouths, the sea around offshore and open sea islands, low-water land, beaches, underwater caves, estuaries, bathyal	ST-LT	SB, IF
• Preparation of regional inventories of marine areas significant for economical or other reasons, with the aim to monitor changes in pelagic and benthic ecological systems	ST	SB, IF
• Monitoring the state of biological diversity of forests on experimental plots of scientific institutions	ST-LT	SB, IF
• Research into the use of particular pesticides in forests	ST	SB, IF
<b>Action plans for research and monitoring of taxa</b>		
• Plan for a continuous research and monitoring of populations of threatened species, including proposals of necessary protection measures according to the priority list	PR!	SB, IF
• Identification of distribution of rare and endemic fish	PR!	SB, IF
• Project of underground fauna inventorying	PR!	SB, IF
• Research into the distribution and status of threatened plant and animal species related to wetland and aquatic habitats	ST-MT	SB, IF
• Research into the distribution, density, biology and ecology of populations of endemic, rare and evidently threatened marine plant and animal taxa, for the purpose of their efficient protection	ST-MT	SB, IF
• Inventorying the flora of Croatia	ST	
• Mapping the flora of Croatia	ST-MT	SB, IF
• Preparation of the Croatian Flora database	ST-MT	
• Preparation of the national database and the accompanying GIS on the floral and vegetation diversity	ST-MT	SB, IF
• Inventorying and identification of ranges of individual species of freshwater fish to get a general insight into the distribution of freshwater fish communities in Croatia	ST-MT	SB, IF
• Overall inventorying and identification of ranges of individual species to get a general insight into the distribution of amphibians and reptiles	ST-MT	SB, IF
• Revision of the taxonomic status, distribution, population status and ecology of plant and animal endemics and subendemics of coastal and island regions	ST-MT	SB, IF
• Research into peculiarities, the populations status and direct actions for the protection of indigenous breeds and cultures of coastal and island regions	ST-MT	SB, IF
• Monitoring programmes and target research of the Adriatic ichthyofauna	ST-MT	SB, IF
• Research into the ichthyofauna of the deeps of South Adriatic	ST-MT	SB, IF
• Research into the fauna composition, frequency and distribution of invertebrates in mainland and aquatic habitats	ST-MT	
• Monitoring the state of biological diversity of marine invertebrates in permanent stations, particularly in unexplored or insufficiently explored parts of North and Central Adriatic and in the area of all open sea islands	ST-LT	SB, IF
• Inventorying mammals in the south of Croatia	ST-MT	SB, IF
• Ecology of threatened animal species in the area of Dubrovnik	ST-MT	SB, IF





Action plan	Priority	Possible source of funds
• Research into ornithofauna, herpetofauna and invertebrates of the off-shore islands	ST-MT	SB, IF
• Taxonomy, distribution and ecology of the fauna of the karst underground	ST-MT	SB, IF
• Monitoring the number of species and preservation of the food pyramid in forests	ST-MT	SB, IF
• Monitoring modifications of the flora and vegetation caused by natural changes and anthropogenic influence	ST-MT	SB, IF
• Inventorying micro-organisms	ST-MT	SB, IF
<b>Action plans for data publication</b>		
• Establishment of a National Scientific Board for Flora and a National Scientific Board for Fauna and securing the finance for their activities	PR!	SB
• Preparation and publication of the fauna list at the level of the entire Croatia or by regions, depending on the exploration status of individual groups	PR!	SB
• Capacity building and ensuring regular financial support for the magazines <i>Natura Croatica</i> , <i>Acta Adriatica</i> , <i>Acta Botanica Croatica</i> and <i>Larus</i>	ST	SB
• Setting up a database on biodiversity in the Adriatic	ST-MT	SB

*Figure 182. Bird marking as one of the most frequently used method of their study*

(photo by D. Radović)



*Figure 181. Gathering of terrestrial cave animals in the Čekrk cave near Pucareva staja, Glušci – Metković*

(photo by B. Jalžić)



## VIII. Improving public education and information

### 15. Strategic objective – education

To encourage all methods of education in the field of biological and landscape diversity protection at all levels of the schooling system.

#### *Strategic guidelines*

1. to improve the state of natural sciences at all levels of education
2. to revise the curricula
3. to make more investments in further training of teachers in the field of natural sciences
4. to pay special attention to education of researchers in the field of biological diversity
5. to pay special attention to education on protected area management
6. to develop a local volunteer network for extra-institutional education of the general public.



*Figure 183. A poster "We investigated – we carried out – we propose", a work of pupils within the ecological quizz named "Our beautiful homeland" held in Kaštela in 1998*

(photo by T. Novaković)

**Action plans for improvement of public education**

Action plan	Priority	Possible source of funds
• Provision of biodiversity topics in all schools and at all levels	PR!	SB
• Revision of all existing curricula and their harmonisation with the objectives and tasks of biodiversity education	PR!	SB
• Establishment of the Croatian Government Commission for Biodiversity Education with the aim to prepare education materials (reading-books on the native country, brochures and monographs, handbooks for teachers)	ST-MT	SB
• Education of a greater number of biologists-taxonomists at the Faculty of Science in Zagreb in the field	ST-LT	SB
• Organising county offices for education and culture as places to co-ordinate activities related to projects of biodiversity education with regard to peculiarities of the region	ST-MT	SB
• Programme for foreign training of young researchers	ST-LT	SB, IF
• Education of Wetland Managers	MT-LT	SB, IF
• Education of Protected Area Managers	MT-LT	SB, IF
• Procurement of recent literature on flora and fauna needed for education of young scientists	ST	SB, IF

**16. Strategic objective – public information**

To promote all methods of public information regarding the issues of the protection of biological and landscape diversity and to encourage participation of the public in protection activities.

*Strategic guidelines*

1. to improve and raise the level of education and public awareness of biological and landscape diversity and to intensify the participation of the public in protection activities
2. to establish a mechanism of international exchange of data on biological diversity
3. to incorporate the role of government institutions, the public and the non-governmental organisations into joint protection efforts
4. to encourage and secure finance for protection activities and ecologically sustainable use of individual species, habitats and regions through public competition
5. to print manuals to educate a greater number of amateurs.



*Figure 184. Presentation of the special edition of the "Ecological Herald" dedicated to the Risnjak National Park (photo by A. Frković)*

**Action plans for improvement of public information**

Action plan	Priority	Possible source of funds
• Action plan for public information through all mass media	PR!	SB, CB, BS
• Establishment of a mechanism for information exchange within the Convention on Biological Diversity (Clearing-house Mechanism) through the Internet	PR!	SB, IF
• Development of the information system for biological diversity of Croatia	PR!	SB
• Structuring the network of NGOs under the guidance of expert and scientific NGOs in the field of protection of biological and landscape diversity, to cover the entire territory of the country	PR!	SB, BS
• Establishment of funds at the national level to finance through competition the NGO projects beneficial for preservation of biological and landscape diversity	PR!	SB
• Programme of including the NGOs into the protection of biological and landscape diversity at the local level (particularly the level of municipalities and cities)	ST	SB, CB
• Publication of handbooks for identification of various flora and fauna groups with the purpose to educate a greater number of amateurs (field-guides)	ST-LT	SB, IF, BS
• Nature education programme for representatives of local government and self-government units, tourist communities and others	ST-LT	SB, CB
• Education programme for governmental authority employees (police and customs officers)	ST-LT	SB

## IMPLEMENTATION OF THE NATIONAL STRATEGY AND ACTION PLAN

The National Strategy and Action Plan for the Protection of Biological and Landscape Diversity lays down a number of strategic guidelines and action plans for the protection. They reflect the activities required, but it is difficult to forecast the

feasibility of their implementation. The programme as stated is extremely difficult to execute in full. Therefore the action plans are listed by their priorities and that is also the sequence in which they should be implemented, taking account of the defined general objectives and action plans.

The major obstacle to implementation of the NSAP will be the shortage of funds and the insufficient institutional framework for the protection of nature and environment. It should be particularly emphasised that the concept of



preservation and sustainable use of the overall biological and landscape diversity of Croatia is still in the initial stage, showing the prevalence of the 'conservative' approach that gives priority to protection of individual valuable regions in relation to the protection of the diversity of biological taxa and communities.

### Participants in the NSAP implementation

The NSAP implementation authorities are the Government of the Republic of Croatia, the Ministry of Environmental Protection and Physical Planning and other competent governmental authorities, as well as competent authorities of

local self-government and government units. The Ministry of Environmental Protection and Physical Planning (MEPPP) provides for the implementation of annual action plan programmes and reports to the Government of the Republic of Croatia. Viewing the amount of work it is necessary to foresee 2 – 3 employees of the MEPPP to dedicate their time to the activities in question (Table 31).

Apart from the competent government and local self-government and government authorities the NSAP implementation will include other participants as well – from scientific institutions and the business sector, through non-governmental organisations to local communities in the broader sense.

Table 31. Participants in implementation of the NSAP

	Croat. Govern.	MEPPP	Comm. for NSAP implem.	Govern. bodies	Local govern. and self-gov.	Scientific institutions	NGO	Bussines sector	Mass media	Internat. org.	Public
Co-ordination of NSAP implement.		☑									
Preparation of annual action plans		☑	☑								
Funding	☑	☑		☑	☑	☑		☑		☑	
Preparation of action plans		☑		☑	☑	☑	☑				
Implement. of action plans		☑		☑	☑	☑	☑				☑ ?
Supervision of action plans implement.		☑	☑	☑	☑	☑	☑	☑			☑
Information		☑		☑	☑	☑	☑	☑	☑		☑
Education		☑		☑	☑	☑	☑		☑		☑
NSAP revision	☑	☑	☑								

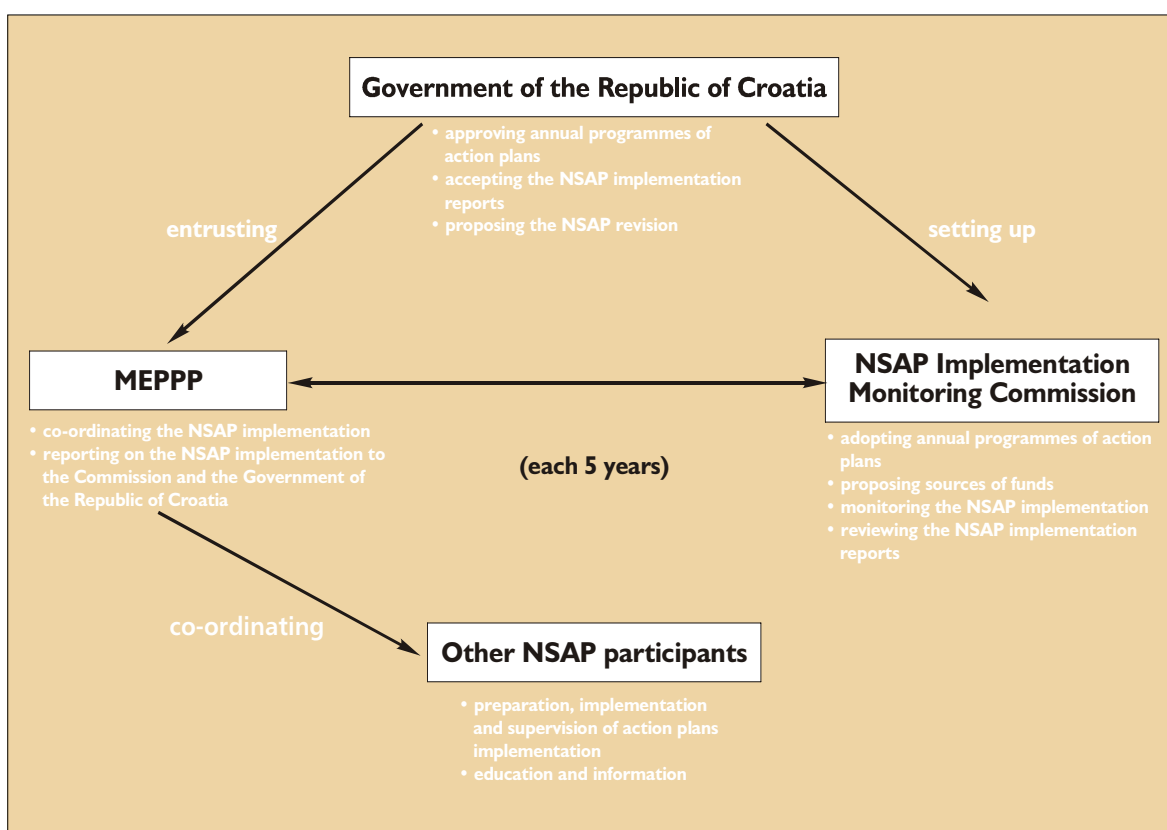


Table 32. The NSAP implementation chart

### NSAP implementation monitoring commission

All further work in this problem area will be co-ordinated and administration and organisation tasks related to the NSAP implementation performed by the Ministry of Environmental Protection and Physical Planning, under supervision of a special NSAP Implementation Commission to be set up by the Government of the Republic of Croatia. The Commission would consist of the representatives of competent government bodies, scientific institutions, non-governmental organisations and the business sector. This would ensure the continuation of the participatory principle taken into consideration when preparing the NSAP. Each year the Commission would draw up an annual action programme for the following year and a fund raising plan for implementation (Table 32). It will also ensure co-ordination among sectoral government bodies with respect to implementation of specific action plans and formulate action plans and projects to be offered to international level funding.

### Financing the NSAP implementation

Regarding the heterogeneity of problems and action plans it is impossible to estimate realistically the total funds needed for the NSAP implementation. When considering the financial indicators one should take into account the following:

Action plans are to be executed in order of priority, depending on the financial and organisational capacities. Execution of the priority (PR!) action plans should start immediately, i.e. they should be completed in the course of the following two years. Short-term plans should need to be started within the following five years. Medium- and long-term action plans may, depending on the possibilities, be executed even after five years.

A large portion of action plans will be executed through regular activities of the competent authorities, and require no additional funding. Exceptionally, work of certain expert commissions will have to be funded, which need not take up too high financial resources. The purpose of including such action plans into the NSAP is to ensure that they are treated as matters of priority and urgency. This particularly applies to enactment of certain new laws and regulations, revision of the existing legislation, introduction of biological and landscape diversity protection measures into various sectors, and ensuring priority in financing a segment of scientific research programmes.

Although funding of the most of action plans should be the obligation of the national budget, a large number of

projects is also eligible for international funding; however, the likelihood of the realisation of this possibility is difficult to determine as it depends on various factors, particularly on the admission of the Republic of Croatia into the PHARE programme.

The national budget should contain a special item – Funds for NSAP implementation, to ensure at least minimum finance required for this activity. The annual funding level can be determined as a lump sum (fixed amount) based on a proposal for annual work programme, which is to be enacted by the NSAP Implementation Commission, or as a certain percentage of the overall national budget funds.

Apart from the earmarked funding, all the NSAP participants should ensure a portion of resources within their respective duties, depending on their shares in respective action plans. Funding will also be partly provided through business sector sponsorships.

It is of particular importance to develop action plans of international significance for which international funding will be solicited.

### Elaboration of County SAPs

A portion of activities within the NSAP implementation should be systematically directed to the local level, which is likely to gain prominence in time.

Upon adopting the NSAP at the national level the counties and the City of Zagreb should start preparing the adequate local level implementation programmes to be enacted by county assemblies and the City of Zagreb Assembly, with the approval of the Ministry of Environmental Protection and Physical Planning. In that manner the protection and preservation of biological and landscape diversity of local significance, as well as the local level implementation of numerous national objectives would be properly ensured.

### Revision of the NSAP

Based on permanent monitoring of the NSAP implementation, after each five years it is necessary to subject the NSAP to a revision or rather to check which elements of the plan have been realised, whether there are any new moments or whether the priorities have changed, and to prepare a new list of action plans.

Revision of the NSAP is in charge of the Ministry of Environmental Protection and Physical Planning and the NSAP Implementation Commission. The revised NSAP is to be adopted by the Croatian Parliament.