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Freshwater Fisheries in Central & Eastern Europe: the Challenge of Sustainability

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Freshwater Fisheries in Central & Eastern Europe: the Challenge of Sustainability

Overview Report

compiled by
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On behalf of European Sustainable Use Specialist Group
of IUCN/SSC Fisheries Working Group

IUCN Programme Office for Central Europe

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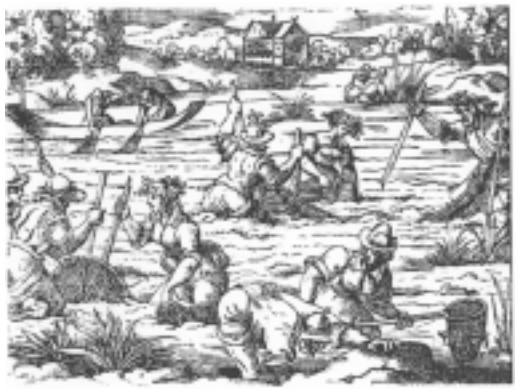

Sustainable development is an idea, or perhaps an ideal,
as much grounded in hope as in reality

Peter B. Bridgewater and Salvatore Arico (2002).
Conserving and managing biodiversity sustainably:
the role of science and society Natural Resources Forum 26: 245–248

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List of Abbreviations

BSRP	Baltic Sea Regional Project
CBA	Cost-Benefit Analysis
CBD	Convention on Biodiversity
CEA	Cost-Effectiveness Analysis
CEE	Central and Eastern Europe
CFP	Common Fisheries Policy
EAA	European Anglers Alliance
EAF	Ecosystem Approach to Fisheries
EAS	European Aquaculture Society
EIFAC	European Inland Fisheries Advisory Commission of Food and Agriculture Organisation of the United Nations
ESUSG	IUCN European Sustainable Use Specialist Group
FAO	Food and Agriculture Organisation of the United Nations
FFPCEE	IUCN Freshwater Fisheries Programme for Central and Eastern Europe
HELCOM	The Helsinki Commission
IBSFC	International Baltic Fishery Commission
ICES	International Council for the Exploration of the Sea
IUCN	The World Conservation Union
IUCN CE	IUCN Programme Office for Central Europe
IUCN/SSC	IUCN Species Survival Commission
OSCE	Organisation of Security and Cooperation for Europe
UNECE	United Nations Economic Commission for Europe

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Robert Aps, Robin Sharp and Tamara Kutonova,
Compilers of the Report

Summary

Experts from nineteen countries of Central and Eastern Europe, i.e. Albania, Belarus, Bosnia & Herzegovina, Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Moldova, FYR Macedonia (further in the text: Macedonia), Poland, Romania, Serbia and Montenegro, Slovakia, Slovenia, and Ukraine were invited to provide a survey and analysis to evaluate the major underlining causes of freshwater fishery-related biodiversity decrease in these countries in transition. Against a background of a rich and diverse freshwater heritage and sound ecological science, the studies showed that currently there is a serious situation in relation to the ecological sustainability of freshwater fisheries in the CEE countries, with similar trends in nearly all of them. Freshwater commercial fishing capacity and the number of recreational fishers in the surveyed countries are creating a situation where the pressures on fish stocks and associated biodiversity are excessive. The position is generally adversely affected by inefficient controls resulting at least in some cases in high illegal and unreported catches, and illegal trade and movement of fish. In general, biodiversity of freshwater fishery ecosystems is threatened by over-fishing, habitat destruction, pollution and mismanagement of aquatic resources resulting from poor integration of interests of the stakeholders.

Consequently, the most urgent measure for all the surveyed countries must be the significant improvement of the efficiency of control regimes, using the Ecosystem Approach, as defined by the Convention on Biological Diversity. The education, training and awareness rising of freshwater fishery stakeholders on biodiversity and sustainable use issues can address the generally rather poor compliance of stakeholders with the relevant conservation measures. Taking into account the trend of a gradual decrease in numbers of professional fishers and increase in numbers of sport and recreational fishers, the latter should be a priority target group for IUCN cooperation. Recreational fishers in effective organizations and with their awareness sufficiently raised could be the force able to change the practices currently leading to overexploitation of freshwater fish diversity in Central and Eastern Europe. The report suggests developing a partnership between biodiversity conservationists and fishers by opening up constructive contacts between IUCN European Sustainable Use Specialists Group (ESUSG) and the IUCN Programme Office for Central Europe on the one hand and the European Anglers Alliance (EAA) and the European Inland Fisheries Advisory Commission of Food and Agriculture Organisation of the United Nations (EIFAC of FAO/UN) on the other.

INTRODUCTION

IUCN Programme Office for Central Europe offered the European Sustainable Use Specialist Group of IUCN/SSC, as the network within IUCN's Commissions bringing together independent experts in the field of sustainable fisheries in Europe, Phase I of a project on Freshwater Fisheries in CEE Countries, funded by the Dutch Government. This Phase has gathered and analysed existing information on the current situation and trends. It also makes suggestions for a more sustainable future for freshwater fisheries, with particular reference to the role of IUCN and its partners in Europe.

The overall aim of this project is identification and elaboration of the principal elements required for a long-term program on sustainable freshwater fisheries in Central European countries, along with elaboration and promotion of effective mechanisms of management of sustainable fisheries.

The project is also intended to facilitate effective decision-making in freshwater fisheries management through joint policy development and institutional strengthening, along with the documentation of best practice and awareness raising in effective fisheries management. The project aims are to be achieved by setting up broad cooperation framework with major stake-holders, in particular by a framework agreement or cooperation agreement with sports angling organizations and mobilizing the pan-European angling community and commercial fishery interests for protection of aquatic biodiversity and fish species in particular.

Using the IUCN and ESUSG membership and other contacts, experts from nineteen countries of Central and Eastern Europe, i.e. Albania, Belarus, Bosnia & Herzegovina, Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Moldova, Macedonia, Poland, Romania, Serbia and Montenegro, Slovakia, Slovenia, and Ukraine were invited to provide a survey and analysis to evaluate the major underlining causes of freshwater fishery-related biodiversity decrease in these countries in transition. It should be noted that ten of these country studies were completed in the first half of 2003, following which a preliminary version of this report was published on the IUCN CE website, and then further nine were commissioned during the last months of the same year. These were presented individually, along with the earlier version of this report, at a Workshop held at Jachranka, Poland on 12–13 December 2003. The present volume contains a synthesis of all nineteen reports and reflects discussions that took place at the Workshop. The country reports as compiled by the national experts are in process of placement at www.iucn-ce.org.pl/fisheriescee – the web page of the relevant project of the IUCN Programme Office for Central Europe.

What these studies tell us is that CEE countries enjoy freshwater resources of enormous variety and interest. Within this context, fisheries, both recreational and commercial, contribute directly to the livelihoods, nourishment and recreation of very large numbers of people, perhaps around 10 million. In most countries recreational fishing is increasing and commercial fishing is declining, although the demand of the public to eat tasty fish is no less than it used to be. The authors of the individual country studies are of the opinion that the resource is now being over-fished, which means that current trends are unsustainable. However there is no reason to think

that management measures cannot be successfully deployed to achieve sustainability with the result that people and nature can both benefit. After all it is in the interests of fishers and conservationists to secure a long term future for freshwater biodiversity, while the required scientific and management know-how clearly exists, even if it is not properly organized.

Another dimension which has emerged from this work is to consider how far the freshwater fisheries situation in Western European countries parallels that of its CEE neighbours. Does it reveal trends, either favourable or unfavourable, which may be expected to occur further east as economies converge through EU enlargement?

The broad picture over the last two decades suggests relative stability in the numbers of people engaged in fishing, with some rises and falls related to changing consumption and leisure patterns (Arlinghaus 2004; Lyons, Hickley & Gledhill 2002; Lyons, Talks, & Hickley, 1999). The important fact for biodiversity conservationists to grasp is that very large numbers of people practice recreational fishing, with estimates of 3.3 million in Germany (Arlinghaus, 2004), 3.9 million in England and Wales (Anon, 2004) and possibly 5 to 6 million in France (Jantzen, 1998). Studies of average expenditure by recreational anglers on tackle, food and accommodation, permits etc yield figures of up to €1,940 per head per year (Arlinghaus, 2004). Though of variable precision these estimates make plausible the recent claim of the European Anglers Alliance that in Europe over 20 million people fish recreationally and contribute at least €20 billion into the economy, notably in rural areas. In its recent stock-taking report *Our Nations' Fisheries*, the Environment Agency has recently declared that a sample survey of representative sites in the rivers of England and Wales has shown that 98% of coarse fish sites and 100% of salmonid sites contained fish, demonstrating a significant improvement over the last decade (Anon, 2004) and almost certainly over the last 100 years (P. Lidgett pers. *comm*.). The only unfavourable assessments in this report relate to salmon and eel, where long term declines are evident, perhaps due as much to changes in the marine environment as to the effects of commercial and recreational fishing. In so far as the EU Water Framework Directive has played a significant role in improving the ecological quality of inland waters in the UK in recent years, it seems probable that similar effects will have occurred elsewhere.

The similarities between the two 'halves' of Europe (which are now happily in the process of coming together in environmental as well as other terms) are therefore much greater than the differences as far as freshwater fisheries are concerned. The chief difference is that much less is known about the socio-economic factors in the CEE region. Even in the West country studies are fragmented and have not so far used a common methodology. If the importance of this major use of wild living resources in Europe to the economy, to European biodiversity objectives and to the quality of life is to be properly realized there is an urgent need for a pan-European survey of socio-economic and ecological factors, leading to the development of common tools for sustainable management within an ecosystem approach.

General challenges for the two 'halves' of Europe are also similar. According to Arlinghaus *et al*. (2002, p. 291) '… the situation in many inland fisheries of industrialized countries comprises: (i) non-existence of integrated ecosystem management and precautionary approaches; (ii) widespread adoption of stocking and introduc-

tion practices without thorough planning and evaluation (which is contradictory to the precautionary approach); (iii) predominance of the management principle 'stocking rather than habitat management'; (iv) lack of adoption of sound scientific (fisheries or ecological) advice; (v) high degree of arbitrariness (e.g. regulations) and (vi) lack of a well-developed fisheries management framework and process to direct traditional inland fisheries management systems and associated practices towards the principles of sustainable management of inland waters'.

Finally it has to be said that IUCN and others in the conservation community have been slow to appreciate the importance of freshwater fishers for the conservation of biodiversity and for their contribution to the economy. Equally perhaps fishers, not least recreational anglers, have been influenced by the nature of their activity to be somewhat cut off from the policy arena, quietly pursuing their livelihood or recreation without making waves. It is high time for the development of a partnership between biodiversity conservationists and fishers, which goes well beyond solving conflicts over cormorants or other fish-eating birds. We are pleased that the Jachranka Workshop, mentioned above, has begun to open up a constructive contacts between European Sustainable Use Specialists Group (ESUSG) and the IUCN CE on the one hand and the European Anglers Alliance (EAA) and the European Inland Fisheries Advisory Commission of Food and Agriculture Organisation of the United Nations (EIFAC) on the other. It is our hope that this will lead to a pan-European approach to further work and action towards common objectives.

1. INFORMATION SOURCES

1.1. A special Questionnaire was developed (Annex I) and the network of relevant international expert correspondents was established (Annex II) to collect the information needed for the further analysis. Annex III contains freshwater fisheries statistics for 1990–2000 (from the European Inland Fisheries Advisory Council of FAO/UN, or EIFAC). The information contained in the completed questionnaires (available at the web page of IUCN Programme Office for Central Europe in Warsaw: www.iucn-ce.org.pl/fisheriescee) was synthesized according to objectives of the project facilitated by the IUCN CE. Actually only a part of the collected information was used for the purpose of this analysis and the set of nineteen completed questionnaires will remain a valuable source of information for future work as well. Other sources of information, including relevant literature and web-sites have also been used to compile this Report.

1.2. The arrangement of the substantive sections of this report is as follows. First a review of up-to-date conceptual understanding of the sustainable use of biodiversity (CBD, FAO, IUCN, etc.) and related international developments is briefly presented in Chapter 2, Annex IV and Annex V. Then the findings relative to the major underlining causes of freshwater fisheries biodiversity decrease and the components of freshwater fisheries, both recreational and commercial, in the nineteen CEE countries and a discussion of them are set out in synthesis and integration of main research findings in Chapter 3 and Annex VI, Tables 1–8. Following this framework for the future role of IUCN in relation to the possible niche – partnership with recreational and commercial fisheries bodies are given in Chapter 4 and Annex VII, while proposals for an IUCN to work on sustainable freshwater fisheries in CEE countries including the recommendations to facilitate progress towards the ecosystem approach in freshwater fisheries management in order to reverse the decline in stocks and the related biodiversity decline by 2010 are presented in Chapter 5 and Annex VIII. Some conclusions are set out in Chapter 6.

1.3. The case studies aim to provide an overview of the current level of support for freshwater fish diversity in Central and Eastern Europe, and to promote fisheries management practices which contribute to the sustainability of this region in transition. The selection of the case studies presented in the publication was to certain extent based on empirical findings and assessment.

2. CONCEPTS WHICH UNDERPIN THE SUSTAINABLE USE OF BIODIVERSITY

2.1. All consideration of the sustainability of freshwater fisheries in the CEE countries needs to be carried out in the perspective of the Convention on Biological Diversity (CBD), to which all the countries concerned are signatories and which is the main over-arching international convention in this area. The principal provisions relevant to this work are the objectives (Art 1) including the sustainable use of biodiversity components, the definitions of biological diversity, biological resources and sustainable use of biodiversity (Art 2), national strategies for conservation and sustainable use of biodiversity and integration of conservation and sustainable use of biological diversity into relevant sectoral or cross-sectoral plans, programs and policies (Art 6) and (Art 10) sustainable use of the components of biological diversity. More details are in the Annex IV along with references to the development of principles of adaptive management.

2.2. The Jakarta Mandate on Marine and Coastal Biological Diversity (1995; COP 2, Decision II/10) elaborated further on the 'ecosystem approach' adopted by the CBD is focusing on protected areas, the precautionary approach, scientific knowledge, indigenous knowledge and stakeholders participation (Garcia *et al.*, 2003). Following the Lilongwe Workshop in January 1998 and the report to the Bratislava CBD Conference of the Parties in May 1998, the Ecosystem Approach and the 12 principles of operational guidance for practical implementation of the ecosystem based sustainable use were adopted by the Convention on Biological Diversity (CBD) at the 5th meeting of the Conference of the Parties (Decision V/6; Nairobi, Kenya, May, 2000). More details are given in Annex IV.

2.3. UN Food and Agriculture Organization (FAO) includes fisheries within its scope and has taken a number of relevant initiatives. One of the most important was the development of the Code of Conduct for Responsible Fisheries (FAO, 1995). The Code is recognized by FAO members as the most complete and operational reference for fisheries management. The Code gives full attention to biodiversity. It promotes its maintenance, protection, safeguarding and conservation, mentioning genetic diversity, the need to minimize fisheries impact on biodiversity and to develop research about fishing gear impact. FAO Technical Guidelines on responsible inland fisheries (FAO, 1977) is also considered as valuable reference source for fisheries managers worldwide (see Annex IV).

Fish ladder in the Beskidy Mountains, Poland

2.4. UN Food and Agriculture Organization (FAO) Fisheries Technical Paper 443 (Garcia *et al.,* 2003) is giving an excellent overview of the Ecosystem Approach to Fisheries (EAF): the evolution of terminology and underlying paradigms; some selected ecosystem characteristics; the impact of fisheries and of other activities with which fisheries compete; the institutional foundations of the approach with the particular role played by the Code; the conceptual objectives and principles of relevance for EAF; selected operational objectives and related measures and actions, and selected implementation issues. One of the most important principles of EAF is Human and Ecosystem Well-being:

Human well-being: A condition in which all members of society are able to determine and meet their needs and have a large range of choices to meet their potential.

Ecosystem well-being: A condition in which the ecosystem maintains its diversity and quality – and thus its capacity to support people and the rest of life – and its potential to adapt to change and provide a viable range of choices, and *Opportunities for the future.*

2.5. The FAO European Inland Fisheries Advisory Commission (EIFAC) has been active in organizing the inland water related Symposia and other relevant meetings:

- EIFAC Symposium on Fisheries and Society, Social, Economic and Cultural Perspectives of Inland Fisheries Budapest, Hungary, 1–3 June 2000;
- EIFAC Ad Hoc EIFAC/EC Working Party on Market Perspectives for European Freshwater Aquaculture Brussels, Belgium, 14–16 May 2001;
- EIFAC European Inland Fisheries Advisory Commission – Symposium on Inland Fisheries Management and the Aquatic Environment. Lake Windermere, UK, 12–15 June 2002;
- EIFAC – Symposium on Aquaculture Development – Partnership between Science and Producer Associations. Wierzba, Poland, 26–29 May 2004.

2.6. EIFAC is not only the main coordinating and advisory body on the European freshwater fishery but also the main source of relevant information including the most relevant statistics (Annex III). 204 different European freshwater fish ery-related reports and other documents are available on an EIFAC web site (www.fao.org/fi/body/eifac/eifac.asp).

2.7. IUCN and its work on sustainable use provide an important policy and conceptual framework with which to address sustainable use issues whether in fisheries or other use of wild living resources (see also Annex V).

2.8. The Common Fisheries Policy (CFP) is one instrument which can influence the use of freshwater fishery resources and their environmental impact mainly trough its structural measures. In addition to the CFP many other policies that affect the use of natural resources and the environment can be mentioned. These include economic, fiscal, agricultural (Common Agricultural Policy), energy and transport policies. Nature conservation policies as expressed in the Birds and Habitats Directives offer strict protection to certain designated water-bodies and aquatic species including fish.

2.9. The Communication from the Commission (EC, 2002a) on the reform of the Common Fisheries Policy ('Roadmap') states that more effective conservation and

management of fisheries resources is a clear priority of the CFP. It is considered to be a precondition for achieving other objectives. The aims of the Commission's new approach to fisheries management are:

- to refocus management on a more long-term approach to securing sustainable fisheries with high yields;
- to manage fishing effort in line with sustainable catching opportunities, which will require an immediate and significant reduction of fishing effort;
- to incorporate environmental concerns into fisheries management, in particular by contributing to biodiversity protection;
- to move towards an ecosystem-based approach to fisheries management;
- to make the best use of harvested resources and avoid waste;
- to support the provision of high-quality scientific advice.

2.10. According to the Communication from the Commission setting out a Community Action Plan to integrate environmental protection requirements into the Common Fisheries Policy (EC, 2002b) CFP should address also the following issues:

- measures set out in the Biodiversity Action Plan for Fisheries and not specifically mentioned in this communication;
- setting up of long-term management plans for the most important and the most vulnerable fish stocks;
- identification of key habitats and biotopes;
- the setting up of temporal and spatial closures including 'no take zones';
- development of guidelines for Best Fishing Practice.

2.11. The Biodiversity Strategy and Biodiversity Action Plans of the European Communities for the 1) Conservation of the Natural Resources (EC, 2001a), 2) Agriculture (EC, 2001b), 3) Economic and Development Co-operation (EC, 2001c), and 4) Aquaculture (EC, 2002c) define policy instruments and actions with the aim of achieving a conservation and sustainable use of natural resources (wild plant and animal species and their related ecosystems and habitats). In the spirit of the Cardiff Integration Process that seeks to increase integration of environmental issues into other policy areas, the Sectoral Action Plans of the Biodiversity Strategy contribute to integrating biodiversity concerns into different policy areas.

2.12. The Commission of the European Communities is developing the Thematic Strategy on the Sustainable Use of Natural Resources (Resources Strategy) which sets decoupling between environmental pressures and economic growth as one of its objectives, aiming among others at a general improvement of the environment and restoring and developing the functioning of natural systems. The Communication from the Commission to the Council and the European Parliament (EC, 2003b) on the Resources Strategy explains that the use of natural resources is influenced by numerous environmental policies, including for example the strategies on the marine environment, biodiversity, climate change, the water framework directive and many others.

2.13. Knowledge gathering, policy assessment and integration are the core elements of a proposed future Resource Strategy (EC, 2003b). It is further stated that in order to support policy decisions on the prioritization of resource related environ-

mental problems the knowledge base will need to include information on data like material flows, the state of ecosystems, land use and aquatic resources. Therefore, in relation to European freshwater fisheries it is necessary to undertake an assessment of other environmental and non-environmental policies to enable policy-makers and other stakeholders to be aware of their potential trade-offs, and to take into account the likely socio-economic effects of those policies. Finally, concrete political decisions will need to be made and the relevant actions of policy integration will need to be taken to assist in addressing key issues while considering all aspects of European freshwater fisheries development.

2.14. Fisheries bio-economics is focusing on a complex process of fisheries management that requires the integration of resource biology and ecology, with socio-economic and institutional factors affecting the behaviour of fishers and policy makers (Seijo *et al.*, 1998). Cost-Benefit Analysis (CBA) and Cost-Effectiveness Analysis (CEA) are important tools to be used in the future for policy-making process including the knowledge gathering, policy assessment and integration (Virani, Graham, 1998). According to Arlihghaus *et al.* (2002) the numerous benefits island fisheries provide to society have to be investigated to make them any intangible benefits to inland fisheries quantifiable and objective. CBA examines the trade-offs in terms of the costs and benefits of a policy while CEA determines the least-cost option of attaining a pre-defined target. CBA and CEA of proposed freshwater fisheries regulations in CEE countries provide a means of comparing alternative fisheries management goals as well as a basis for comparing alternative means of reaching the same goal.

Case study

Aranyponty: a Multi-functional Carp Farm

The Retszilas-ponds Nature Reserve is situated some 100 km to the south of Budapest. The nature reserve was established in 1996 and covers 1,499 ha. The core of this territory is the fishpond system, which was created at the turn of the century, after the regulation of the Sarviz valley river system.

The Aranyponty fishponds in the nature reserve are a private property, so the environmental protection is carried out mostly by the owner. His practices are a good example of how the interests of aquaculture production and environmental protection can be harmonized.

Large lakes and ponds are much-loved by amphibians and aquatic reptiles: great water newts and common newts, fire-bellied toads, edible frogs and marsh-frogs, grass snakes, and European pond-turtles. The Otter *Lutra lutra*, a vulnerable species according to the IUCN Red List (2003), can also be found here.

The biggest value of the Retszilas-ponds Nature Reserve is the bird population: up until now more than 220 species are registered here, which makes up almost 60% of the bird species found in Hungary. The majority of species enjoy protection status at various levels. Some of the birds regis-

tered at the pond are herons, spoonbills, and bitterns; ducks, gulls and geese; sandpipers and curlews, eagles and ospreys. Due to the diversity of bird species and their abundance, the nature reserve was designated a Wetland of International Importance, or a **Ramsar site**, in 1997.

The Aranyponty manager is the initiator of bio-, or **organic fish farming in** Hungary, and was a leading developer of the Hungarian Standards for Organic Fish Farming. At the moment, it is one of the three fish farms in Hungary certified by 'Bio-Kontrol Hungaria'. At present, the pond system consists of 12 big ponds (10–70 ha), 16 small ponds (1–5 ha) and 21 wintering ponds. The production in the Aranyponty fish farm is carried out using 739 ha of surface water. The main fish produced here is carp, grass-carp, silver-carp, pike, pikeperch and trench. Among the ornamental fish there are koi carp and a variety of goldfish. The fish farm possesses a full-scale production line: a marsh-walker, a doser, an excavator, and a workshop.

The **fishermen** can enjoy not only angling at recreational ponds but also participating in sport fishing competitions and other social events like the annual St. Peter's Fisermen's day celebration. Those members of the fishers' **families** who do not share the love of angling might appreciate the beauty of the recreational park, cozy accommodation, a camping site, parking, a traditional Hungarian cuisine and excellent wines in a small restaurant, bike rental, and a playground for children.

A former stable is now the country's only **fishing museum**. The impressive past of fishing and angling in Hungary is demonstrated in a unique collection of the fishing instruments, tools and thematic photographs. A pond with ancient fishermen houses and fishing gear make up an open-air part of the exhibition.

Uilisation of the **renewable resources** is another initiative of the Aranyponty fish farm. The reeds are used for covering the roofs and building model traditional fishermen huts; thermal water – a rather wide-spread phenomenon in Hungary – is the basis for warm-water angling, plus it is planned to be used as treatment in a spa in 'wellness' centre.

Various **educational** institutions and nature amateurs come to Retszilas for the sessions of the wetland school, to visit an exhibition pond, to follow the scouting routes, and to enjoy bird-watching. A conference room in one of the buildings at the farm has hosted a number of conferences, including those organised by the European Commission's DG Fisheries.

The pieces of glass, ceramics, bakery, postcards, etc. with the Aranyponty logo and made in a traditional Hungarian style are among the **articles** sold in the souvenir shop.

The Aranyponty managers together with the Hungarian Institute for Fisheries, Aquaculture and Irrigation (HAKI) built an on-site **laboratory** to monitor the state of the environment of the territory, study various aspects of the multi-functionality of the fish farms, and develop unconventional and innovative aquaculture technologies and management techniques. Together with the HAKI, the Ministry of Environment and Rural Development of Hungary, and the Hungarian Anglers' Federation, the Aranyponty provides such **services** as cutting over-grown water plants; mud removal; reconstruction of dams and roads; earthworks; improvement of water quality; biological and chemical examination; consultations on production and marketing, and on multi-functional fish farm management. The farm also cooperates with the Hungarian Ornithological and Nature Conservation Society.

Nowadays there are 55 local people who are engaged in the operation of the farm. Bearing in mind that the farm is located in a rural area and that Hungary is another country in tran-

sition, it is worth mentioning that about 50% of these people used to be jobless before getting their present positions.

The profit gained at the site from angling, fish production, educational tours etc. is invested into the maintenance and further development of the farm. As can be seen, this is a farm where environmental protection, production and social activities co-exist very nicely indeed.

Tamara Kutonova with contributions of Lévai Ferenc, Péter Lengyel and László Váradi

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Lévai Ferenc grew up in a family of fish farmers, and worked as a biologist before he became the Director of the Aranyponty Fish Farm.

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2.15. The International Council for the Exploration of the Sea (ICES) has been active in developing conceptual framework for sustainable use of aquatic biodiversity. Recent years have seen many ICES Study and Working Groups receive terms of reference that have involved consideration of various aspects of the proposed or adopted Ecological Qualities (EcoQs). At the same time it has been underlined that it is not for science to set the Ecological Quality Objectives (EcoQOs), but science has a key role in providing society with the information it needs to make the decision as to what configuration of ecosystem qualities it wishes to see. It must be borne in mind that the EcoQ – EcoQO framework sees these objectives not individually but as a suite (ICES, 2003). ICES Advisory Committee on Ecosystems (ACE) has suggested general measures to mitigate the loss of genetic diversity (ICES, 2002). ICES convened a Symposium in March, 1999 on the Ecosystem Effects of Fishing. It contributed significantly to the understanding of the concept and offers some practical guidance on the application of the ecosystem approach to management of human activities. Relevant information is available on the ICES web site (www.ices.dk).

2.16. Development of Ecological Quality Objectives (EcoQO's) for the Baltic Sea in the process of regional implementation of Ecosystem Approach and European Marine Strategy is one of the priorities of the Helsinki Commission (Anon, 2003). The Helsinki Commission is integrating both the top-down (management) and the bottom-up (science) processes in order to identify problems to be addressed to preserve the Baltic ecosystem's health and integrity. In doing so an urgent need remains to integrate ecology with the dominant top-down component of most freshwater ecosystems – the human dimension and socioeconomics – to understand and manage ecological patterns and processes on a sustainable basis (Arlinghaus *et al.*, 2002).

2.17. There is an urgent need to address the issues of human dimensions of freshwater fisheries and aquaculture as well as the issue of recreational fishing tourism in CEE countries because of importance from the point of view of sustainable use of freshwater biodiversity (see Annex IV).

3. SYNTHESIS AND INTEGRATION OF THE 19 COUNTRY STUDY FINDINGS

3.1. General information on freshwater resources

3.1.1. CEE countries are characterized by a generally rich and complex hydrographic network composed of rivers of all types, lakes both natural and artificial, reservoirs and coastal lagoons (Table AVI 1) and a long tradition of exploiting them.

3.2. Dynamics of freshwater fishery and aquaculture

3.2.1. The total freshwater fish catches of all CEE countries (as reported to and classified by EIFAC) decreased substantially during the last decade of the twentieth century from 475,682 tons in 1990 to 345,336 tons in 2000, a decline of over 27% (Annex III). To a large extent these figures reflect the product of commercial fisheries. They also include Russia which accounts for more than 50% of the total and is not covered by the rest of the present study. Nevertheless the trend reflects the CEE country reports which form the basis of the analysis in this report. The main reason for the decrease is almost certainly the serious depletion of many open access freshwater fishery resources caused by growing fishing over-capacity (too many fishermen fishing for too few fish) and insufficient control and enforcement (illegal and unreported catches do not appear in statistics). In this connection Cox and Walters (2002, p. 106) underline that 'Where recreational fisheries are open to public access, there is a basic pathology in which success breeds failure: development of a quality fishing situation leads to increased fishing effort until quality is reduced to be no better than other situations with comparable costs and difficulties of access.'

3.2.2. The total aquaculture production in CEE countries decreased even more dramatically – from 488,739 tons in 1990 to 206,337 tons in 2000 (EIFAC, Annex III). In this case the main reasons for the decrease were low production efficiency and marketing failure. However this situation may be changing as the economies of CEE countries expand and adopt new production and marketing techniques. In the short term the decrease in aquaculture production has inevitably tended to increase fishing pressure on freshwater fishery resources because of increasing market demand for caught fish.

3.3. Legal and organizational basis of freshwater fishery

3.3.1. A well-developed administrative structure and appropriate legislation are important preconditions for the effective implementation of the CBD. Table AVI 2 shows that in the CEE countries freshwater fisheries are managed, at a state level, by different ministries, boards and departments. They are also regulated by different types of primary and secondary legislation (laws, acts, decrees and regulations), although Bosnia and Herzegovina has only draft legislation developed. New EU member countries have harmonized their legislation, including that concerned with fisheries and the environment, with the EU acquis communautaire, although there are no EU instruments that bear specifically on purely freshwater fisheries. Based on the analysis of the Country Reports it can be concluded that the

necessary general legal basis and administrative structures for freshwater fishery management are in place in the surveyed CEE countries, but there is insufficient control and enforcement, accompanied by a lack of understanding of the seriousness of current trends.

3.3.2. Parties to the CBD have also a responsibility to develop national programmes and action plans to implement the Convention at a national level. These programmes and action plans should include freshwater fisheries and related biodiversity issues. At the same time the integration of biodiversity conservation and sustainable use requirements into national fisheries policies and freshwater fishery-related legal acts is lagging and the timeframe for such an integration is not clear.

3.3.3. According to Welcomme (2001) national fisheries-related legislation bears directly on the relationship between the fishery and society and has a threefold role:

- to ensure that the benefits of the fishery are distributed to the society as a whole,
- to protect the fishery and ensure its sustainability, and
- to protect the fishers by providing the legal framework in which they can operate.

Traditionally these functions have been the responsibility of central governments but modern trends towards decentralization have modified this arrangement in a number of cases.

3.3.4. There is a lack of uniformity with respect to the definition of freshwater fisheries in the various countries. The placing of freshwater fisheries legislation within the national legislative framework also varies. In some CEE countries freshwater fisheries are dealt with in specific legislation while in other countries the general fisheries or nature conservation/animal kingdom law covers the subject. (NB: in some Western European countries the link is with hunting legislation.)

3.4. Management of trans-boundary fishery resources

3.4.1. The management of freshwater trans-boundary fishery resources is an important issue for some CEE countries (e.g. Lake Peipsi shared by Estonia and Russia; Lake Ohrid shared by Albania and Macedonia; Lake Prespa shared by Albania, Macedonia and Greece; Lake Doiran shared by Macedonia and Greece).

3.4.2. For example, the Peipsi lake system is a trans-boundary water body for Estonia and Russia, and the fisheries are regulated according to the Estonian-Russian Fisheries Agreement (1994). Based on the agreement an intergovernmental Estonian-Russian Lake Peipsi Fishery Commission has been established and includes also fishery scientists, fishermen organizations, and control and surveillance authorities. The overall goal of this Commission is to ensure the sustainable use of the Lake Peipsi system fishery resources. A joint scientific group including researchers from Estonia (University of Tartu) and Russia (Pskov Branch of the Russian State Research Institute for Lake and River Fisheries, GosNIORH) is working under the umbrella of the Commission and is responsible for stock assessment, proposals on quota allocations, elaboration of proposals for management measures and other research activities designated by the Commission. Technical measures like minimum and/or maximum mesh sizes, closed areas and seasons are widely used both in Estonia and Russia. Proposals of the intergovernmental Fishery Commission are to be adopted by appro-

priate governmental bodies. In Estonia, changes in fishing rules usually need a decision of the government. Fishing gear allocation by county in Estonia is decided by the Minister of the Environment. A special fee is collected for the fishing license. The means collected are partly used for fishery surveillance, stocking and research.

Case study

Peipsi Lake Case: Estonian-Russian Co-operation in Conservation of Fisheries Resources

Lake Peipsi (3,555 km^2) is the fourth largest lake in Europe, lying in the territories of Estonia and Russia (in Russian it is called Chudskoye Lake); it greatly influences the climate and economy of the neighbouring area. The average depth of the lake is 8 m and maximum depth reaches 15.3 m. The lake consists of three main parts: Lake Peipsi, Lake Pihkva, and Lake Lämmijärv. There are over 200 inflowing rivers, brooks and ditches and only one outflow: the Narva River. There are two Ramsar sites: Emajõe Suursoo (Estonia) and Pskovsko-Chudskaya Lowland (Russia).

Lake Peipsi is very rich in fish, it shelters a total of 37 fish species, and thus it is considered one of the best large fishing lakes in Europe. Usually, Peipsi yields about 7,000 tons of fish per year: half of this quantity is caught by Estonian and the remainder – by Russian commercial and recreational fishers. The main commercial species are the Smelt, the Perch, the Pikeperch, the Roach, the Bream, the Ruffe, the Pike, the Vendace, the Whitefish, and the Burbot. The lake used to be dominated by the Smelt and the Bream, but since the second half of the 1980s it is known rather as a pikeperch lake.

Fishing on the Lake Peipsi system is traditionally seasonal: over 50% of fish is taken in April and May; another increase in catches (about 25% of annual catches) occurs in September-October. The contribution of the winter fishery is about 10% (mostly gill net fishing under ice in December-March). Recreational fishery on the Lake Peipsi system takes place mainly in winter (angling for perch and whitefish). In spite of the fact that the total annual Estonian and Russian commercial landings equal about 8 million euro, research indicates that recreational fishers could generate a lot more combined income than professional fishery in the area. The income comes from the purchase of relatively inexpensive licenses, renting accommodation, and offering catering and other services.

One of the unique features of this case is that this trans-boundary lake is governed in accordance with both the **EU Water Framework Directory** and **legislation of the Russian Federation**. The Lake Peipsi and the Narva River basins are managed according to the Estonian-Russian Agreement on the Lake Peipsi fisheries, the Agreement on Estonian-Russian fisheries relations, the Estonian-Russian Agreement on the protection and sustainable use of trans-boundary water bodies, and the Estonian-Russian Agreement on environmental protection. Four intergovernmental Estonian-Russian commissions: the Intergovernmental Commission on Trade, the Trans-

boundary Water Commission, the Fishery Commission, and the Environmental Protection Commission ensure enforcement of the above-mentioned agreements and work as the conflict-prevention/resolution mechanisms.

The main mission of the intergovernmental **Fishery Commission** (1995) is to ensure the sustainable use of the lake fishery resources. The Commission consists of fishery scientists, fishermen organisations, and control and surveillance authorities; it co-ordinates scientific research, conducts the stock assessment, proposes on quota allocations, management measures, and monitors the implementation of the system of Total Allowable Catches (TAC). The proposals of the Commission are adopted by the governmental bodies of both countries.

The **successful stories** of the two states in sustainable use of the fish resources in the lake include limiting the types of gear and their number, an agreement on the size of fish caught, and on the percentage of by-catch. Thus trawl fishing (except for smelt fishing by Russia) was prohibited in 1958, and the number of Danish seines was reduced to 40 (20 each side) in 1974. The total allowable number of gill nets used in the open water on each side of Lake Peipsi is limited to 3,000, and in the coastal area, 1,000. The number of trap nets is established nationally, except for the number of trap nets for the Vendace which is limited internationally. The by-catch of undersized fish (expressed as fractions of the total catch) is limited to 5–8% in gill and fyke nets, and 15% in Danish seines.

The number of fishing units (e.g. boats) and the fishing gear efficiency parameters are not regulated in Estonia at present.

The current **issues** in the lake are the increasing catch which is constantly heading towards the permissible limit; the application of unfavourable fishing gear (Danish seine, gill nets); eutrophication; the potential impacts of climate change. The eels' natural migratory routes to the catchment of Lake Peipsi system have been cut off by the construction of a hydro-electric power station on the Narva River and thus its catch is based on stock of juvenile fish currently in the lake.

The Transboundary Water Commission have developed the criteria for **emergency situations** in the River Narva and the Lake Peipsi basins.

The Peipsi Center for Transboundary Co-operation (CTC) organises environmental and sociological research and training programmes, seminars and competitions. It has also been promoting communication and information exchange at different levels of government and **all sectors of society** across the border since 1993.

Robert Aps

The Estonian Marine Institute, University of Tartu is a multidisciplinary scientific research institution which has international experience in the fish stock assessment and management advice, as well as the marine and freshwater systems modelling. Marine and freshwater biology studies are also part of the core competence of the institute. The Institute conducts research of the freshwater fish biology and the monitoring of the fishery resources of Lake Peipsi.

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3.4.3. According to the Country Reports of Albania and Macedonia weak international cooperation in managing the trans-boundary fishery resources of the Lake Ohrid, Lake Prespa, and Lake Doiran could be seen as a threat to the biodiversity of these lakes. There are some new international initiatives (Lake Ohrid Conservation Project (LOCP); new tri-lateral project for protection of the Lake Prespa region) but they are clearly not sufficient to meet the challenge of sustainable use of biodiversity really unique water bodies. More international cooperation is especially important because of shrinking the water volume of two natural lakes – Dojran and Prespa due to over-exploitation of the water resources for irrigation. This has tremendously affected the fish fauna with decreasing of their population and destroying of spawning grounds.

3.5. Integrated fishery resource management

3.5.1. Concepts of fishery resource management related to the Ecosystem Approach (see 2.4. and Annex IV) are widespread in the CEE countries studied. However there are not too many examples of full implementation. The position is summarized in Table AVI 3.

3.5.2. The various ecosystem-related concepts (e.g. Fisheries Management, Ecosystem Management, Ecosystem-based Fisheries Management, Ecosystem Approach, and Ecosystem Approach to Fisheries) have a lot in common and relate closely to the already widely accepted concept of integrated management. The latter can be defined as involving comprehensive planning and regulation of human activities towards a complex set of interacting objectives and aims at minimizing user conflicts while ensuring long-term sustainability (Garcia *et al.*, 2003).

3.5.3. Freshwater fishes are considered to be the most threatened group of animals utilized by humans, with 20% either extinct, threatened or vulnerable (Welcomme, 2001) and therefore management of inland waters now must consist of managing the diversity of fish populations in all types of water-body, as well as the previously understood task of simply managing the production yield.

3.5.4. Effective use and protection of freshwater fish biodiversity depends on a clear understanding that the development of policy concerning social and economic issues in this domain is dependent on a comprehensive environmental information and the conflict of use issues are resolved from a position of knowledge (Anon, 2000).

3.5.5. If due consideration is to be given to biodiversity and conservation issues in setting freshwater fisheries management objectives careful discussion with the stakeholders is necessary. According to Welcomme (2001) an integrated management scheme would place priority on the conservation of natural levels of diversity rather on production and employment. Success in conservation of wild fish species can only be achieved by fully involving the fishing communities, through co-management systems transferring of ownership to the people who actually fish the resources and giving them an interest in maintaining the diversity of the fishery.

3.5.6. It is important to underline that the management objectives both economic and ecological are usually multiple. Aiming to strike the balance between the main aspects (ecological, economic, social and political) of the total utility to society, multi-criteria decision-making tools should be applied where appropriate.

Determining the weight to be assigned to different management objectives is considered as one of the main challenges in implementing 'multiple objectives' fisheries management (Le Gallic, Boncoeur, 2003).

3.5.7. Integrated resource management for sustainable freshwater fisheries could be efficiently achieved by involving the major stakeholders in appropriate discussions and the decision-making process. The surveys show (Table AVI 3) that, except for the Albania, Bosnia and Herzegovina and Ukraine, in all countries under consideration several different schemes for fisheries sector co-management are in place or implemented to deal with the use of freshwater fishery resources. At the same time the level of stakeholder involvement in the decision-making process varies considerably from country to country and communication between dialogue partners is considered to be largely insufficient in Bosnia and Herzegovina, Croatia, Macedonia, Montenegro, Romania, Belarus, and Ukraine. By contrast the systems and indicators developed in Poland, Slovenia and Estonia appear to be reasonably sophisticated.

Case study

The Lower Dniester River: Public on the Guard of Biodiversity

The Dniester River is the river of primary importance for Moldova and is the second major river for Ukraine. It starts in the Ukrainian Carpathians, crosses Moldova and flows towards the Black Sea again in Ukraine. The river is recognized as a biological corridor of pan-European importance; its Lower part and the Dniester-Turunchuk Crossrivers Area are designated as Wetlands of International Importance (Ramsar sites). The Dniester Delta, its estuary and wetlands are the most valuable biotopes.

The habitats of the Lower Dniester i.e. the riverbed spawning grounds, the areas of pelagic spawning and habitats providing nursery functions provide a shelter for freshwater migratory fish and for more than 90% of the species of the northern-eastern Black Sea region. The fish fauna of the Dniester River includes 76 indigenous species. 14 Cyclostomata and fish species recorded in the Red Data Book of Moldova (1995) are found in the Dniester. The following species are included in IUCN Red List (2003): Star Sturgeon *Acipenser stellatus (En)*, the Danube Salmon *Hucho hucho (En)*, Beluga *Huso huso (En)*, Sterlet A. *ruthenus (Vu)*, the European Mud-minnow *Umbra krameri (Vu)*, Dace *Leuciscus leuciscus (LR)*, Ide *L. idus (LR)*, Zarte *Vimba vimba n.carinata (LR)*, and the Black Sea Roach *Rutilus frisii (DD)*.

There is a complex of factors which has negatively influenced aquatic biodiversity over the last fifty years: the construction of two dams in 1954 and 1981 and the accumulation of hydro-electric power stations on the Dniester, which blocked the migration of Acipenserids and some Cyprinids; pollution by intensive agriculture during the Soviet period; soil erosion partly triggered by illegal and

over-intensive pasturing on the riversides; gravel extraction from the river-bed; inappropriate reconstruction of the river banks; as well as drainage of wetlands.

The uninformed design of the Novo-Dnestrovskaya Hydropower Station in the neighbouring Ukraine resulted in decreased water temperatures in the middle of the river which consequently triggered the mass resorbtion of fish eggs of the Sterlet *Acipenser ruthenus*, the Barbel *Barbus barbus*, the Vimba *Vimba vimba*, as well as the majority of non-endangered fish and almost complete elimination of the European Mud-minnow *Umbra krameri*. The lower temperatures cause increased transparency of the water, which provokes over-growth of the river bottom plants; also the daily fluctuation of the water temperatures cause the fish eggs to be washed away from their spawning places to the gravel, causing more of them to dry out.

For several years in Moldova there has been a tendency to ban industrial fishing and/or to draft special agreements on fishing with Ukraine but in general, the resistance to wise use of fish resources is strong in both countries. It is linked to the departmental interests of the state water agencies (which prefer to preserve current status quo of their monopoly in river management), and the interests of the fishing mafia which are strong in both countries.

The reintroduction of the indigenous species and the restoration of habitats can mitigate the current state of the Dniester environment. Particularly, the methods of reproduction and conservation of *Vimba vimba* n. *carinata* (Academy of Sciences of Moldova), *Barbus barbus borysthenicus*, *Acipenser güldenstädtii*, *A. stellatus*, and *A. ruthenus* (Fisheries Research Station) have been developed/perfected.

Due to the start of the transformation period in the ex-USSR countries, the first project on reproduction and reintroduction of the endangered *Umbra krameri* (a species which was not registered in the Dniester over the last 28 years) was implemented only in 2000-2002. The methods of **reproduction** of *Umbra krameri* in aquariums, small ponds and basins were developed by an NGO 'Biotica'; in 2000–2003 it **restocked** *Umbra* fry in small water bodies of the Lower Dniester area. 'Biotica' also distributed about 400 artificial nests in the Yagorlyc Reserve – a site where temperature conditions permit native phytophilous Dniester River fish species to spawn efficiently.

Members of 'Eco-TIRAS' Association (including 'Biotica-South' and 'Eco-Tox') studied the influence of poaching on fish stocks. They found that there are two kinds of poachers on the river: rural people for whom it is a survival method for their families, and well-organi sed groups linked to the authorities. Thus the reform of fish protection in both states needs better involvement and communication with these parties. Another necessary action is the identification and the restoration of spawning grounds, particularly in the Lower Dniester meanders. In the framework of Biotica's project on creation of a national park in the region, it has already suggested such sites in the Lower Dniester.

Bearing in mind that neither reintroduction nor restoration can be successful without the application of the **ecosystem approach**, the NGO 'Biotica' and also 'Eco-TIRAS' lobby for adoption of the more specific Integrated River Basin Management (IRBM) concept for the Dniester.

Thus in 1999 'Biotica' drafted 'The Convention on the Conservation of Landscape and Biological Diversity and on Rational Use of the Water and Biological Resources of the Dniester River Basin'. It provides for the establishment of the Joint River Commission involving the principal stakeholders. The situation around the convention is controversial at present: on the one hand in February 2003 the President of Moldova issued the decree to negotiate the Convention with Ukraine; on the other hand the Ukrainian authorities do not see the reasons to develop such a document as a mechanism for sustainable management of the river. Therefore, a project was launched under umbrella of OSCE and UNECE in 2004, to define priorities to implement IRBM for the Dniester River with the participation of the ministries of environment, the water agencies of Moldova and Ukraine, and Eco-TIRAS.

Though the creation of the national parks – an ambition of the naturalists in both states – seems to be a long-term perspective, it is worth mentioning that due to their efforts, these areas have already been recognised as Ramsar sites.

'Biotica' significantly influenced the content of the national Law 'On Wildlife' by updating the list of the Red Data Book species. It also actively participated in creation of the Ichthyological Council, an advisory body under the Ministry of Environment establishing fishery quotas and close periods on a yearly basis.

'Eco-TIRAS' constantly initiates joint actions of Moldovan and Ukrainian authorities to establish proper management of the river. Improvement of the state of the Dniester environment and its biodiversity was a subject of the **conferences** organised by 'Biotica' in 1998 and 1999, and by 'Eco-TIRAS' in 2004. The latter International Conference 'Integrated Management of the Natural Resources in the Transboundary Dniester River Basin' united more than 150 scientists, NGOs and experts in the field.

'Eco-TIRAS' and its NGO-members regularly publish articles in newspapers to popularize the IRBM approach and related issues. They organize lessons and educational events for schoolchildren in the Lower Dniester rural areas and both publish and deliver the associated books to teachers.

Ilya Trombitsky

Environmental NGOs of Moldova and Ukraine operating in the Dniester River basin believe that public participation and co-operation of all stakeholders is a key issue for success. Thus in 1999, they united in the **'Eco-TIRAS' International Environmental Association of River Keepers**. At present 'Eco-TIRAS' unites 44 NGOs in Moldova and Ukraine. Its major aim is to implement the Integrated River Basin Management for the Dniester River.

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www.wetlands.org/RDB/Ramsar_Dir/Ukraine/UA006D02.pdf,
www.ramsar.org/profiles_ukraine.htm

3.5.8. Development and implementation of quantitative indicators reflecting the exploitation and state of aquatic ecosystems as well as the interactions between the ecological and economic systems are of crucial importance. The general objective is to evaluate changes in aquatic ecosystems (both states and processes) from environmental/ecological, socio-economical and political perspective. Indicators should be formulated in mathematical or statistical terms, assessed when values of an indicator are meaningful both statistically and/or subject wise, and applied to specific data sets or the results of fisheries system modelling in order to evaluate their usefulness.

3.5.9. There is a range of management indicators in use – from mainly relying on fisheries statistics (Bulgaria, the Czech Republic, Slovakia and Ukraine) to more complex suites of indicators in Estonia, Hungary and Poland (Table AVI 3). However, the legal basis for the development and regular use of indicators for freshwater fishery management is generally weak or missing. As a result, it is not clear how freshwater fisheries-related indicators, including indicators for ecosystem-based management and the sustainable use of biodiversity, are being developed and/or used.

3.6. Interaction and possible conflict between professional and recreational fishers

3.6.1. According to the country studies, the number of professional and recreational fishers cannot be accurately estimated for the most of the countries under consideration (Table AVI 4) but there is enough information for a broad picture. Also, as is the case for other attempts to provide a pan-European overview (Cowx, 2002; 2003), the national estimates presented have not been based on an agreed or fully-described methodology. What is normally known is the number holding legal fishing licences, rather than those who fish occasionally or illegally without a licence. Exceptionally, these statistics are quite precise for Slovakia, Serbia, Croatia and Romania, while at the same time there is no data on a number of fishers available for Lithuania. The number of professional fishers is not available for Belarus, Bosnia and Herzegovina, Serbia, and Ukraine while the number of recreational fishers is not available for Albania. However, it is possible to conclude that in many countries the number of recreational fishers (still predominantly male) is up to 100 times higher than that of professional fishers and appears to be on an upward trend.

3.6.2. The share of recreational fishermen in the total population is significant and, as mentioned, has a tendency to increase. According to Cowx (1998) the percentage of recreational fishers within the total population of some Central and Eastern European countries was as follows: Bulgaria 2, The Czech Republic 2.7, Hungary 3.2, Poland 5.1, Slovakia 1.7 (but as noted above in 3.5.1 these figures should be treated with caution since the tables from which they are derived offer a total of 2 million fishers in the UK or 3,5% of the population whereas Lyons *et al.* in Pitcher and Hollingsworth 2002 suggest 2.9 million in England and Wales alone, which is 5.7% of the population).

3.6.3. According to FAO (1997, p. 24) recreational fisheries '… present a special case within the set of fisheries in that practitioners do not rely on the activity for their livelihood and that many of the terms in calculating their value lie outside the fishery itself. Recreational fishers are usually prepared to spend considerable sums of money on their sport not only in licenses for access to the fishery but for gear, trans-

port and accommodation. Groups of resource owners, professional assistants, boat owners, etc. may, depend on the recreational fishery for their livelihood and the recreational fishery may thus contribute significantly to local economies through its employment potential. In this way the product of the fishery in terms of fish is only of small significance and other aspects of the fishery such as aesthetic enjoyment and local economics become more important. […] Recreational fisheries tend to drive out purely food fisheries because of their apparent greater value and the greater political influence of the recreational fishery lobby'. While no surveys of how much recreational fishers in CEE countries spend on their sport are known, it is instructive that Lyons *et al.* (2002) estimate that coarse and game fishers together are spending some €5 billion per year in England and Wales, while Arlinghaus (2004) has calculated a figure of €6.4 billion spent similarly by 3.3 million people in Germany, in the meantime sustaining some 52,000 jobs. Even if CEE fishers are spending only 10% of these amounts per head the contribution to economic activity, especially in rural areas, is important. Taking Europe as a whole moneys spent on recreational fisheries will almost certainly represent the greatest economic output from any sectoral use of wild living resources, including marine fisheries.

3.6.4. Different interactions between professional and recreational fishermen are reported for different countries. For example, in Bulgaria mainly private water body owners regulate these interactions while in Croatia the Fishery Management Plan is considered as an important regulatory instrument. According to that Plan the following elements have to be considered: water area and user rights, number of angling licenses; methods and techniques of angling, measures planned for guarding, number of fishery officials/river-watchers; planned fish stockings structure per annum; number of licenses to be sold; business plan and monitoring. The National Association of Fish Producers and the Fishery Product Board pool are particularly concerned with fish production in Croatia, while the Croatian National Angling Union and its associate branches are the organizations of sport anglers. There is competition for the same fishery resource reported for Albania, Estonia, Latvia, Macedonia, Serbia and Ukraine. For the rest of the surveyed countries these interactions seem to be insignificant.

3.6.5. The main tendency, although it is not based on complete statistics, shows a gradual change from professional to recreational fisheries. In Slovakia this process seems to be completed and there the recreational fishers only are making use of freshwater fishery resources. In Moldova the change from professional to recreational fishery is supported also politically. A special management arrangement is implemented in Ukraine dividing freshwater resources into zones for commercial and recreational fishery.

3.6.6. Analysis of the Country Reports and the relevant publications does not provide an unambiguous answer to the question why commercial fisheries in most of CEE countries are so much in decline (according to Annex III Latvia only has increased its freshwater commercial catches in 1990–2000). Nevertheless, it was possible to reveal at least some factors responsible for decrease of commercial freshwater catches in CEE countries such as decline of exploited fish stocks caused by over-fishing, habitat and spawning ground destruction, pollution and mismanagement of aquatic resources. Finally, the freshwater catches at least in some CEE countries are most probably underreported and underestimated because of insufficient enforcement of fishing regulations and poor quality of fishery statistics.

3.7. Socio-economic dimensions of freshwater fishery

3.7.1. Data on the socio-economic aspects of freshwater fisheries in the surveyed countries is not sufficient to provide any precise CBA, since scientific methodology would require analysis of market and non-market values for recreational fisheries, taking account of transaction costs of fisheries management – costs often borne by society as a whole (Rudd, Folmer and van Kooten, 2002). Information on the economics of freshwater fishery is generally non-systematic in the Country Reports. Some data could be found in other relevant sources. For example, the total value of Estonian freshwater catches of 3,878 tonnes has been estimated to be of total value of 2.3 m Euro in 1998 (Vetemaa, Järvalt & Vaino, 1999). The mean value of freshwater fish in Latvia was assessed at approximately 1 Euro/kg (Riekstins, 1999). Assuming that the main marketable freshwater fish value is approximately the same in Lithuania and Poland we can conclude that the catches of 516 tonnes in Latvia, 365 tonnes in Lithuania (Brukliene, 1999) and 8,000 tonnes in Poland (Szczerbowski, 1999) could be estimated to be worth respectively 516,000, 365,000 and 8 m Euro in 1998. The total value of the catch by Czech recreational fishermen of 3,943 tonnes was about 8m Euro in 1994 (Vacha, 1998).

3.7.2. In addition to these direct values the valuation of the ecosystem goods and services could be seen as a further important dimension which is brought into focus when applying the ecosystem-based approach to the European freshwater fisheries management. According to Klaphake, Scheumann and R. Schliep (2001) the most important values of the freshwater ecosystems could be listed as follows:

Direct Values: fishing, fuel wood, building poles, thatch, hunting, wild foods, medicines, agriculture, pasture, transport, recreation, etc.

Indirect Values: water quality, water flow, water purification, groundwater recharge, flood control, storm protection, nutrient retention, micro-climate, etc.

Option Values: future pharmaceutical, agricultural and industrial applications of biological resources, leisure use, water-based development

Non-Use Values: intrinsic, existence, cultural, aesthetic, etc.

Case study

The Gradac River: Water-mills, Trout and Public Awareness

The 'Gradac River Gorge' is a municipal protected area assigned as an Area of Extraordinary Landscape Features, and therefore of national importance. It is situated about 100 km SW from Belgrade, in the vicinity of the city of Valjevo, and comprises about 12 km of the River Gradac gorge. The protected area is fully managed by an NGO, the 'Gradac' Ecological Society, which is a unique case in Serbia.

The Gradac steep-sloped gorge is covered by deciduous forest in the moderate continental climate. 70 karst have been caves discovered in the gorge.The Common Kingfisher *Alcedo atthis*, Grey Partridge *Perdix perdix*, and Wildcat *Felis silvestris* are among the inhabitants of the river ecosystem. The Otter *Lutra lutra*, a vulnerable species according to the IUCN Red List, is abundant along the whole river, even in the city area. The river is suitable for

salmonids and thus provides habitat for the Brown Trout *Salmo trutta*. The indigenous strain of this species is threatened by high level of genetic pollution caused by the trout stocking from both the River Buna (the Adriatic Sea basin), the River Studenica (the River Morava drainage basin), and some hatcheries located in the neighbouring Slovenia. It was the NGO managing the protected area which initiated support for this native strain.

The trout fishing, i.e. fly-fishing and lure-angling, is a significant source of incomes and thus the initial aim of the trout re-stocking was to provide a population large enough for anglers to exploit. However in 2000, utilising the expertise of the University of Belgrade, the Gradac NGO drastically **changed its fisheries management**: gradually, the stocking was not practiced anymore, the fishing effort was harmonised with the natural annual production of the standing Brown Trout stock, Catch and Release practice was launced, and a strict guarding service and monitoring of the natural spawning grounds were introduced.

By its own means, the NGO financed reconstruction of a small-capacity **water-mill** built in the 1960s, which had been left unoperational until the mid 1980s. The water-mill mitigates a negative effect of the early spring torrents on the naturally hatched brown trout larvae by re-direction of the excess water to the mill channels, thus by-passing the river bed. Meanwhile an elderly couple, who were from a traditional miller family, was invited to work and live in the reconstructed water-mill. 'The Gradac' has organized the collection of corn grown by the local population and its transportation to the water-mill. The corn flour is used for baking fragrant bread at a tiny restaurant at the Gradac bank. An eight-bed house for anglers at the river is another contribution of the NGO to development of the local community.

Thus the construction of the water-mill has contributed to all three pillars of sustainable development of the Valjevo region:

- its economic sustainability is guaranteed by the steady income to family farmers selling their corn; water-millers and others participating in the above-mentioned cycle;
- its social sustainability is ensured by creating working places for the local population; raising public awareness and engaging people in conservation of the area;
- its environmental sustainability is manifested in the reintroduction and support to the native strain of brown trout, and efforts to bring it to other Sava River water bodies.

Through its policy of openness and transparency in its activities, the 'Gradac' NGO gained sympathy and support from the citizens of Valjevo and the public media. Together with the state authorities and non-governmental organisations 'Gradac' organizes at least a dozen **events** a year, raising issues related to nature conservation, sustainable management of natural resources, etc. For example, a three-hour discussion entitled 'Angling as a Way of Life' involving various kinds of anglers, a psychologist, a fish biologist and fisheries managers took

place in September 2004. The conservationists' point of view, particularly ending the practice of fish stocking triggered a lively discussion with the skeptical fly-fishermen of Valjevo. However the latter gradually came to the conclusion that sustaining the native brown trout strain is much more feasible in the long-term than stocking the alien strains.

Predrag Simonovic
with contributions of Tamara Kutonova

The Ecological Society 'Gradac' from the city of Valjevo, Serbia, Serbia and Montenegro is an NGO founded in 1986. Its main task is to manage the municipal protected area 'Gradac River Gorge' which was put under protection in 2001, after years of efforts by that NGO. This is the only example in the whole of Serbia where an NGO manages a protected area. In addition to fisheries, the NGO is occupied with devastated forests, game stocks, landscape, ethnologically, culturally and historically rich heritage, and the importance of water for natural and human communities. It promotes and supports the research of young talented students.

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3.7.3. To have more balanced view it is important to mention that recent CBA studies on the recreational fisheries are mainly focused on the value-added components of economic output. Less attention has been paid to the possible negative impacts (environmental, economic, social and political) of recreational fishery. According to Chen et al. (2003, p. 842): 'Negative physical and environmental impacts can include increased traffic densities and reduced accessibility. Negative economic impacts can include escalation in land prices, employment fluctuation, and dependency on a single industry. Negative social impacts can include crowding and congestion caused by increased fishing activity, introduction of undesirable activities, excessive concern for material gain, and loss of cultural identity. Accordingly, we would expect stakeholders to take these negative aspects into account in assessing the impacts of fishery developments and discount expected positive benefits accordingly'.

3.7.4. It seems to be absolutely necessary to focus much more on the socio-economics of the freshwater fisheries in CEE countries in general and to pay special attention to the social and economic aspects of freshwater recreational fisheries in particular. It is especially important in the context of future implementation of the

practical guidelines for the adaptive management and sustainable use in which IUCN is equipped to play a part. 'The economic considerations should play important role in policy design, with Cost-Benefit-Analysis routinely used to account for the economic costs and benefits of particular projects or policy options' (Rudd, Folmer, van Kooten, 2002, p. 35). The current insufficient knowledge of European freshwater fishery socio-economics is a serious weakness in policy dialogue designed to promote freshwater biodiversity conservation.

3.8. Fishing-related causes of biodiversity loss

3.8.1. Referring to the Country reports it is obvious that weak control and insufficient enforcement are contributing to over-fishing and related biodiversity loss of freshwater fishery resources in CEE countries (Table AVI 5). As a result, fishery statistics are not too reliable and the statistics based management indicators could be in some cases misleading. Poor quality fishery statistics could easily jeopardize statistics-based scientific fish stock assessments and science-based management advice. Also the magnitude of catch misreporting is usually not known the threat of over-fishing related biodiversity loss is considered to be serious.

3.8.2. By-catch of non-target species is estimated to vary from insignificant in the Czech Republic and Hungary to significant in Bosnia and Herzegovina, Bulgaria, Moldova, Montenegro, Serbia, and Ukraine (Table AVI 5). Focusing on by-catch of non-target species is extremely important because the consequences of it could be detrimental in some cases (e.g. substantial by-catch of young undersized sturgeon in Bulgaria). It is clear that by-catch of non-target species in such cases may cause considerable threat to biodiversity but the importance of this factor seems to be largely underestimated or even ignored. Better monitoring of by-catch is also important in the case of poorly reported recreational catches.

Case study

Danube Delta Biosphere Reserve: Addressing Illegal, Unreported and Unregulated Fishing

The Danube Delta is one of Europe's greatest wetland, stretching over a huge area of over 5800 km^2, and collecting the water of the whole Danube basin (over 800,000 km^2) before it reaches the Black Sea.

In 1990 the Romanian government declared this territory the Danube Delta Biosphere Reserve (DDBR), and in 1993, this status was recognized by a special law. The area is also designated as a Ramsar site and a World Heritage Site. DDBR is a transboundary Reserve, as it is shared between Ukraine (464 km^2) and Romania (5,800 km^2).

There are 23 types of natural ecosystems and 7 types of the man-made ones in the Reserve. It is a habitat for 125 fish species: 66 freshwater and eurihaline, 6 migratory and 53 marine. Consequently, three types of commercial fisheries have developed in the Danube Delta: freshwater, migratory and coastal-marine fisheries (including aquaculture), as well as sport/recreational fishing activities.

According to the Red Book released by the DDBR, the Orfe *Leuciscus idus*, the Zahrte *Vimba vimba*, the Tench *Tinca tinca*, the Sterlet *Acipenser rhutenus*, the Atlantic Sturgeon *Acipenser sturio*, and the Ship Sturgeon *Acipenser nuduventris* are prohibited for fishing.

A special monitoring of fishing and circulation of sturgeon species, i.e. the Beluga *Huso huso*, the Russian Sturgeon *Acipenser guldenstaedti*, and the Star Sturgeon *Acipenser stellatus* by individual **labelling** of catch has been implemented since 2003. The legally labelled fish circulates from the place it was caught to market bearing this tag. Each individual is recorded by an administrator in the public access data base, which has information on serial number, total length, total weight, sex, eggs and caviar weight, fishermen and enterprise. The yearly catch quota of sturgeon is set up in agreement with countries which share the fishery, including Ukraine.

DDBR pushed for the application of the **Total Allowable Catch**, thus it is an operational index since 1993. Fish stock assessments performed by the DDNI (Danube Delta National Institute) estimate the exploitation stock state and the **Maximum Sustainable Yield** for the principal commercial species. The Maximum Sustainable Yield index is often used for scientific purposes, so that its application for the Danube Delta is unique not only because it is used in this part of the world, but also because it is further applied for management purposes. The Total Allowable Catch is implemented after approval of the Maximum Sustainable Yield by the Romanian Academy. There is criticism for stock assessment due to the quality of data monitoring (distortion via the black market and poaching) but such quota management at least assures the principle control of the fisheries.

Fishing effort management through **fishing capacity control** is applied, complementary to quota management. Thus a limit of 1,500 fishermen for the whole DDBR is the target. For every fisherman there is a maximum number of nets/gears allowed plus these have to be marked with a special tag. In the absence of monitoring fishing effort, fishing capacity control works as a robust input control that prevents overexploitation.

A **stocking** programme for sustaining fisheries is in place for the Pike Perch Sander lucioperca and sturgeons at experimental scale. Stocking nests with 2000–3000 of pike and perch fertilized egg takes place annually in lagoon lakes; a few sturgeon fingerlings are also releazed into the Danube River. A minimal **breeder's scheme** for sturgeon, i.e. a minimal number of males and females for a hatchery from where fingerlings are releazed to natural water, was developed to avoid interbreeding of the species.

Catch and Release (C&A) angling practice was introduced in the areas designated for protection due to concentration of fish in winter but also in other years with

harsh conditions. Fishing protected areas are the former Danube River arms or side arms appeared due to the river regulation. At first this area was declared a sanctuary but for rural tourism development and following a request from the recreational fishermen, a compromise solution to let C&A outside of the close period was reached. The principal target species is the Carp *Cyprinus carpio*.

Thus the application of the above-mentioned management instruments, technical regulation and strengthening of the ecological measures, the DDBR succeeds to mitigate illegal, unreported and unregulated fishing – a hot issue in the countries of Central and Eastern Europe.

Ion Navodaru

Danube Delta National Institute for Research & Development carries out research supporting implementation of national and international conventions related to biodiversity conservation and sustainable development in the Danube Delta and other wetlands of conservation interest in Romania. It is the national focal point for fishery and land cover for the European Environmental Agency (EEA) and the European Environment Information and Observation Network (EIONET). The main research domains are: conservation of biodiversity, sustainable use of natural resources, ecological reconstruction, socio-economic studies, and GIS.

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3.8.3. Scientific evidences of possible depletion of genetically distinct freshwater fish stocks are extremely scarce and in general this indicator is not used in management practice. However, the importance and threat of depletion of genetically distinct fish stocks is clearly recognized in Moldova and Ukraine, while by contrast it is believed to be not so important in Hungary (Table AVI 5).

3.9. Biodiversity loss for reasons other than fishing

3.9.1. The significance of other causes of biodiversity loss, unrelated to fisheries, is presented in Table AVI 6. Physical impacts on habitats represent an important factor in biodiversity loss, mainly because they have resulted in a decrease of natural spawning grounds and habitats for freshwater fish (Pinter, Wolos, 1998). In order to have better economic background for freshwater fish habitat protection the non-market value of preserving environmental quality should be estimated and the preservation benefits be compared to the foregone benefits of the habitat modification.

3.9.2. Information on the importance of persistent contaminants in causing loss of freshwater biodiversity in the countries studied is limited. Persistent contamination is considered to be significant in Bulgaria, Lithuania, Slovakia and Ukraine. For other countries information was not sufficient or not available, which does not mean that there are no problems.

3.9.3. The survey mainly covers densely populated countries with developed agriculture and industry. Therefore the overload of nutrients (eutrophication) is a more or less significant factor for most of the countries (Table AVI 6). Eutrophication levels could be reasonably well measured but the interrelation between nutrient overload and biodiversity loss is poorly understood except the cases of mass kills of fish and other aquatic organisms caused by algal blooms.

3.9.4. The link between increasing nitrogen fertilizer application and the rise of nitrate levels in watercourses and groundwater is well documented and one of the principal side effects of rising nitrate levels in water bodies relates to the phenomenon of eutrophication (Hanley, Spash, 1993). In order to prevent nitrates originating from agricultural sources from entering watercourses several control options are considered. A reduction in inorganic nitrogen fertilizer and in animal manure applications as well as better management of nitrate applications and pattern of land use policy (enforcement of 'protected zones' in sensitive areas) are among the policy instruments.

3.9.5. Information on the spread of diseases as a cause for biodiversity loss is poor but in some countries (Belarus, Bosnia and Herzegovina, Macedonia, Poland, Romania and Ukraine) it is considered to be a significant factor.

3.10. Driving forces of biodiversity decrease

3.10.1. Information available on the driving forces of freshwater biodiversity decrease in the surveyed countries is clearly insufficient. Many data sets produced in CEE countries are never archived or exchanged at all. As a result, comparatively few observations are available within an adequate timeframe to support operational needs, or contribute to planning and research management. The quality of data is often uncertain and, in most cases, critical metadata are not available. Nevertheless, increasing demand from the recreational fishing sector seems to be one of the most important driving forces in this connection (Table AVI 7). It is important to realize that in countries where the economy is in transition increasing demand from recreational fishing is also related to high unemployment rate, especially in rural areas. At the same time there is no short-term prospect of a decrease of fishing pressure with an improving economic and employment situation, because, based on the western experience, the previous practice of fishing for sale or domestic consumption can be predicted gradually to change to fishing for pleasure and sport fishing.

3.10.2. It is reported for some countries (Belarus, Bosnia, the Czech Republic, Lithuania, Macedonia, Serbia, Slovenia and Ukraine) that the threat of increasing demand on water and aquatic environments for purposes other than fisheries is significant. Examples included small hydro-power stations, Danube-Odra-Elbe Canal, polders, agricultural, urban development and the energy sector. For other countries this factor was considered to be insignificant or there was no information available.

3.10.3. Information on the intensive use of freshwater fishery ecosystem resources is rather scarce (Table AVI 7). A decrease in the abundance of non-stocked fishes was indicated for Albania, Croatia, Hungary and Serbia.

3.10.4. Domestic consumption of freshwater fish established historically seems to be comparatively stable for some countries (the Czech Republic, Hungary, and Slovakia) and increasing for other countries in transition. This increase might easily be unreported. Domestic fish trade statistics are poor and it is not possible to draw any quantitative conclusions. Increasing export market demand and good prices for the most valuable freshwater fishes (pike perch, perch, eel, etc.) accompanied by weak enforcement of fishing regulations are leading in many causes to increase in illegal trade and movements of freshwater fish. In general, most of surveyed countries indicated the indirect threat to biodiversity of increasing market demand and, in parallel, of possibly increasing illegal trade and movements of freshwater fish. As a result, the 'black market' share of freshwater fishery is unacceptably high in some CEE countries.

3.11 Measures aimed at protecting biodiversity

3.11.1. An ecosystem-based approach to management of human activities could be seen as the main conceptual framework for the effective conservation, management and sustainable use of freshwater fish biodiversity in CEE countries. Effective implementation of ecosystem-based approach is dependent on an adequate data and information base, from which socially, economically and environmentally sound decisions can be made. According to Arlinghaus *et al.* (2002) a stronger cooperation of commercial and recreational fisheries is needed to bridge the gap of 'economically endangered' commercial inland fisheries and 'ecologically endangered' recreational fisheries which may lead to self-regulated and sustainable fisheries management systems.

3.11.2. A review of measures aimed at protecting biodiversity in the surveyed countries shows (Table AVI 8) that in general the key problem is the lack of efficient enforcement of fisheries- and environment-related legislation. Consequently, the most urgent measure for all the surveyed countries must be the significant improvement of the efficiency of control regimes. This is the main precondition to make management measures aimed at protecting the biodiversity efficient. The same goes for management performance indicators, which must be based on reliable fisheries statistics.

3.11.3. Discussing the measures aimed at protecting biodiversity it is important to realize that biodiversity in freshwater systems is distributed in a different pattern from that in marine or terrestrial systems (Klaphake, Scheumann and R. Schliep, 2001). The authors underline that the freshwater habitats are relatively discontinuous, and many freshwater species do not disperse easily across the land barriers that separate river basins. This has three important implications:

- *Freshwater species must survive climatic and ecological changes in place;*
- *Freshwater biodiversity is usually highly localized, and even small lake or stream systems often harbor unique, locally evolved forms of life; and*
- *Freshwater species diversity is high even in regions where the number of species at any given site is low, since species differ between one site and the next.*

3.11.4. Addressing the generic concerns related to the loss of genetic diversity in freshwater fishes special attention should be given to the measures aimed at preservation of the genetic diversity of the freshwater fish populations. Due consideration

should be given to 1) genetic diversity among populations, 2) population structure and relative abundance, and 3) within population genetic diversity. For these considerations the management objectives could be defined as follows: 1) maintain number of populations, maintain relative size of populations, 2) maintain large abundance of individual populations, and 3) minimize fisheries induced selection (ICES, 2003).

3.11.5. According to Garrod and Willis (2001) the preservation of biodiversity has an opportunity cost. Freshwater fish diversity conservation costs arise primarily because of opportunity costs of freshwater use (*opportunity cost* values the benefits of environmental protection in terms of what is being foregone to achieve it).

3.11.6. It is generally recognized that the global biodiversity is maximized where there is a cooperative outcome and everyone is better off if conservation succeeds (Garrod, Willis, 2001). At the same time the structure of incentives is such that CEE countries are contributing to conservation of freshwater fish biodiversity in their own countries and with very limited contribution to group co-operation and regional conservation. Whilst individual CEE countries in many cases have established priorities for freshwater fish biodiversity, priorities at a regional level remain an issue. This 'free riding' strategy yields a lower payoff for all concerned with freshwater fish biodiversity conservation.

3.11.7. Maintenance of safe minimum stocks of freshwater fish consistent with the resilience of freshwater ecosystems of interest could be effective conservation instrument in effect setting a reserve stock for species and habitats. Further auctioning of the quotas could result in greater efficiency in allocation with the safety of a reserve fish stock. In this connection the important issue for biodiversity-related scientific research could be to evaluate freshwater biodiversity reserves and to determine their appropriate size in relation to risk and uncertainty.

Case study

The Raba River: Trout Fishery and River Keeping as a Pastime

On the Raba River of the Polish Carpathians, there is a 15 km stretch where most of the fishing takes place. Here, the average width of the Raba is 20 m. A road runs parallel to the river, which has at this point has both thick bushy vegetation covering high banks and wide, flat stony beaches. Although the population living along the river is rather large, all the towns upstream of the fishery have sewage treatment plants; many villages are being connected to the treatment plants, and otherwise there is no industrial effluent into the river.

Recently, the river banks were stone-pitched in preparation to route another carriageway close to the river along the existing road to Zakopane. All these regulation works have had a deleterious impact on the river habitat. Cutting down riverside trees and shallowing of the channel has caused water temperature differences between summer and winter and between day and night to become very big. The maximum summer temperature for trout and especially for grayling became too high. The self-sustaining European Grayling *Thymallus thymallus* population is limited to the short stretch below the weir in Myślenice, and the number of Brown Trout *Salmo trutta* in the river is rather low. From the list of 20 fish species recorded in 1964, three species: Pike *Esox lucius*, European Eel *Anguilla*

anguilla, and Bullhead *Cottus gobio* have since become locally extinct, and a fourth one, the Barbel *Barbus barbus*, has become extremely rare. Two additional species which were previously extinct have become re-established: the Salmon *Salmo salmar* and the Sea Trout *Salmo trutta*. The Rainbow Trout *Oncorhynchys mykiss* has always been present in the river, as an escapee from stew-pond fisheries.

From June 1996 the part of the Raba River in Pcim, Stróża and Myślenice, about 40 km from Krakow, was designated as a private-run trout fishery. Fly-fishing by the public is allowed after the purchase of an appropriate fishing permit. The price of the permit includes the deposit, which is returned against the return of a catch record. The only method allowed is fly fishing with barbless hooks, which allows for better conservation of undersized fish. All tributaries of this part of the Raba River (about 140 km of them) are a nature reserve, in which all fishing is prohibited. The number of sizeable fish in the Raba River is maintained on a Put & Take basis at the level which allows catches at all times. The biggest Brown Trout caught by fly-fishing was 67 cm long, weighing 2.7 kg, and the biggest Rainbow Trout was 69 cm, 3.80 kg. Salmon and Sea Trout are occasionally caught as well. The average angler takes one 0.5 kg trout or other salmonid per visit, and the number of visits is about 2,500 a year.

Managing a trout fishery in a highly deteriorated environment of a channelized river is focused on two main objectives: (1) to **supply sizeable trout for anglers**, who support the fishery by purchasing daily and seasonal permits, and (2) to **maintain the survival conditions for all local fish species**, especially salmonids. The first objective is fulfilled by maintaining a Put & Take fishery, mainly with the Rainbow Trout, which is stocked on a weekly basis in proportion to the number of expected anglers' visits. For each visit two Rainbow Trout of an average mass of 0.5 kg are released to the fishery each Thursday. By the end of the weekend most of them are usually gone from the river as anglers prefer to keep them instead of the Brown Trout, which on average is about 0.35 kg each. If Brown Trout or Salmon reared in a stew-pond are released, they are marked by cutting (shortening) of adiposal fin. This leaves the decision on keeping wild fish with the anglers involved.

Fulfilling the second objective of the fishery is part of a series of complex activities which aim to maintain the state of the river at a sustainable level. Permission for these activities can be only requested by the fishery managers from the Water Authority. Activities include restoring river geomorphology and reducing access to construction machinery and transport, as well as restoring riparian vegetation and forests. Restoring water plants and cleaning the gravel of salmonid spawning sites is successfully accomplished by the fishery's management. But the greatest success is within the framework of recovery of local strains of the Brown Trout and the Grayling. The Grayling is not stocked at all, and in this way local population

surviving the high water temperature in the summer is growing stronger. For the Brown Trout, only the local strain is used for spawning, and the stocking is done with very young fry, which are distributed over the tributaries in the spring and fished out in the autumn, to supply parr (several month-old salmon) for the river. Within eight years of following this approach, the anglers' catch of wild salmonids has grown eight times in number, and the dominant age of caught brown trout increased to more than four years.

The interesting aspect of running a Put & Take practice parallel to a 'wild' fishery can be illustrated by the number of trout living together in the stretch of the Raba River. For each 100 Brown Trout (10 to 40 cm long), four freshly stocked 35 cm long Rainbow Trout can be found, and an additional two undersized rainbows, probably escapees from stew-pond fisheries. Despite this outnumbered proportion of Brown Trout (20 to 1), the anglers' catch consists of 80% rainbow trout. This shows how domesticated rainbow trout, being the main objective of anglers' catch, does not interfere with wild local Brown Trout. Moreover, due to the fact that the Raba River is the most northerly border of the Brown Trout habitat in this locality, only adult individuals of the brown and rainbow trout meet, and they do not interfere with each other.

By removing the majority of mature Brown Trout from the tributaries and releasing them into the main channel of the Raba River, most poaching in the tributaries is disabled. Those poachers who live near the river are approached by the fishery managers with the offer to legalize their fishing. Any poacher promising to follow the fishery rules, and having the national fishing license, can be granted a proper fishing tackle and permit, on the condition that he is working voluntarily for the management of the fishery. In this way, many of the local poachers have become legal anglers, indeed some of them have become wardens.

Józef Jeleński

Józef Jeleński is an expert at civil engineering; he worked in Europe, Africa and Middle East in consulting and construction companies, as well as in research and educational institutes. However the hobby of his life has always been the fly-fishing world, in 1990/92 he was a Vice-president of the Fédération Internationale de Pêche Sportive Mouche. The combination of his professional experience with the hobby resulted in the practice of supporting the biodiversity of the Raba River and development of the town he lives in.

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4. FRAMEWORK FOR THE FUTURE ROLE OF IUCN IN RELATION TO COUNTRIES OF CENTRAL EUROPE: FOCUS ON RECREATIONAL FISHERY

4.1. Having looked at the problems, the current policy background in sustainable use and the chief actors relevant to sustainable inland fisheries in CEE countries, we now try to be more precise about potential role of IUCN in working with others to move towards sustainability.

4.2. Comparing the number of up to 10 million recreational fishers with the number of some 18,000 professional fishers in CEE countries it is not difficult to conclude that the recreational fishers are the dominant driving force in the use of freshwater fishery resources. It is also important to take into account the trend of a gradually decreasing the number of professional fishermen and an increasing number of recreational and sport fishermen. Therefore the recreational fishers could be a priority target group for IUCN to focus on. Recreational fishers in effective organizations and with their awareness sufficiently raised could be exactly the force which are able to change the practices currently leading to unsustainable use of CEE freshwater biodiversity.

4.3. Improved organization of recreational fishermen is one important factor which could be used to regulate the often unlimited access of recreational fishers to the fishery resources in CEE countries. The survey has shown that in some countries under consideration recreational fishers are relatively well organized. Fishers' organizations from the Czech Republic, Hungary, Latvia and Poland are also members of the European Anglers Alliance. In the remaining countries, however, the recreational fishers are much less organized, especially at the national level. For example, in Estonia there is a number of recreational fishers' organizations at the county level but there is no central body that could represent the interests of about 50,000 recreational fishers at the national and international levels.

4.4. Supporting and guiding certain aspects of the process of organizing the large numbers of recreational fishermen in the CEE countries around the practical implementation of sustainable use principles within the CBD context could be seen as tremendous possibility for IUCN to support real action in the area of European freshwater fisheries. It would also be a great challenge for IUCN to test how the principles and guidelines for sustainable use of the freshwater fishery resources could be implemented in practice within the huge area of Central and Eastern Europe. Engaging with recreational fishers organizations could open the forum to discuss the practical aspects of sustainable use of freshwater resources involving all the most important stakeholders.

5. PROPOSALS FOR AN IUCN PROGRAMME ON SUSTAINABLE FRESHWATER FISHERIES IN CEE COUNTRIES

Participants of an international workshop 'Sustainable Management of Freshwater Fisheries and Nature Conservation in Central and Eastern European Countries' held in Jachranka, Poland on 12–13 December, 2003 by IUCN Programme Office for Central Europe drafted the objectives and pragmatic priorities of IUCN for working on the freshwater fish diversity and fisheries issues in Central and Eastern Europe (further in the text: the Priorities) as follows.

5.1. Objective

To work with existing stakeholders, including commercial and recreational fishers and experts of EIFAC and ICES, to facilitate progress towards the ecosystem approach in fisheries management in order to reverse the decline in stocks and the related biodiversity decline by 2010, taking account of the social and economic importance of freshwater fisheries.

In the longer term, the objective is to ensure a sustainable use of biodiversity resources and stocks through control of fishing mortality and the conservation of freshwater natural habitats.

5.2. Pragmatic priorities

IUCN in developing the Priorities should involve all major stakeholders representing the nature/biodiversity conservationists, commercial and recreational fisheries as well as the aquaculture production. Development of the Priorities should be accompanied by the creation of the coherent project portfolio.

The ecosystem approach to fisheries (EAF) activities should be considered as a basic principle in developing the Priorities, and sustainable use of freshwater fishery resources should be seen in broader context of rural and regional development. Most important considerations and success criteria for the Priorities – both globally and locally – should refer to the socio-economic benefits and growth potential for various uses of the fish stocks and waters.

The Priorities should be implemented by establishing a network of excellence consisting of relevant institutions, experts and appropriate case studies.

Implementation of Priorities should be based on strategic partnership approach, broad cooperation and agreements set up with all relevant partners linking research, policy and practice.

Implementation of the Priorities should be accompanied by efficient communication and dissemination of the results through active participation and contribution to major relevant local, national, regional and international events whenever possible.

In course of implementation of the Priorities the CEE governments should be assisted where appropriate in developing national strategies for the conservation and management of freshwater resources as well as in harmonizing national legislation with the EU acquis communautaire and in capacity building for absorbing international support.

5.3. Recommendations

Participants in the workshop 'Sustainable Management of Freshwater Fisheries and Nature Conservation in Central and Eastern European Countries' (Jachranka, Poland, 12–13 December 2003) drafted Recommendations to facilitate progress towards the ecosystem approach in freshwater fisheries management in order to reverse the decline in stocks and the related biodiversity decline by 2010 (see Annex VIII) consisting of:

1) Guiding principles for CEE governments, fishery managers and aquaculture producers for a sustainable use of freshwater fishery resources, and
2) Recommendations to CEE governments on legal, financial and economic instruments

5.4. Potential topics of pan-European importance

IUCN could pursue dialogue with the relevant partners on some additional potential species based topics of pan-European importance as listed below.

5.4.1. Conservation of wild Baltic Salmon

5.4.1.1. According to ICES (2003) scientific advice to the International Baltic Fishery Commission (IBSFC) status of the Baltic Salmon wild stock as a whole, although improved, remains uncertain because the survival of smolt to adult is unknown. Based on the most recent estimate of the biomass ICES still classifies the weakest wild stocks as being outside safe biological limits.

5.4.1.2. The IBSFC's 21st Annual Session in 1995 adopted a Resolution I on management objectives for Baltic salmon and a Resolution II concerning a moratorium on salmon fishing in all rivers and river mouths with wild salmon stocks. These Resolutions were passed because of the need to stop further degradation of wild salmon stocks and to rebuild the population of wild salmon in the Baltic Sea. These two resolutions paved the way for the development and adoption of the Baltic Salmon Action Plan during the IBFSC's Extraordinary

Commercial fishing in Lake Peipus, Estonia

Session in February 1997. According to this Action Plan, the long-term objectives (to 2010) are:

(1) To prevent the extinction of wild populations, any further decrease in the numbers of naturally produced smolt should not be allowed.
(2) Production of wild salmon should be stimulated gradually, to attain for each salmon river by 2010 a natural production of wild Baltic salmon of at least 50% of the best estimated potential within safe genetic limits, in order to achieve a better balance between wild and reared salmon.
(3) Wild salmon populations should be re-established in potential salmon rivers.
(4) The level of fishing for salmon should be maintained as high as possible, and only restrictions necessary to achieve the first three objectives should be implemented.
(5) Reared smolt and earlier life stage releases should be closely monitored.

5.4.2. Conservation of European Eel

5.4.2.1. ICES has provided advice already in 1998, 1999 and 2001 that the Eel stock is outside safe biological limits and current fisheries not sustainable. It is recommended to develop an international recovery plan for the whole stock, and to reduce exploitation to the lowest possible level until such a plan is agreed upon and implemented (ICES, 2001). Advice on management: actions that would lead to a recovery of the stock are urgently required. Management of eel fisheries requires coordinated action at the scale of catchment areas and higher, commonly spanning multiple jurisdictions. Uncoordinated management actions in isolated areas are not likely to lead to a recovery of the stock. Because of the length of the life cycle, it will take 5–20 years before positive effects can be expected.

5.4.2.2. According to the Communication from the Commission to the Council and the European Parliament on the Development of a Community Action Plan for the management of European Eel (EC 2003a) 'The eel stock is seriously depleted as evinced by the recent very low recruitment. Furthermore, due to the high price of eels (especially glass eels), there are very strong economic incentives to continue fishing down to the last few recruits. The long time-lag between recruitment and spawning also suggests that profitable fishing can continue even when the stock is at an extremely depleted level. This means that the eel stock is in an extremely high-risk situation'.

5.4.2.3. The European Community is planning to develop and implement the rebuilding plan for eel, and to establish local targets for conservation and management (EC, 2003a) in order to ensure that the productive potential of river basins with respect to eel be utilised, and the sufficient glass eel are recruited to the upstream areas. The Community is planning to establish an annual settlement target, expressed in terms of the numbers of glass eels per hectare of eel habitat. It is further stated that the local management actions to reach this target would include:

- Management of the local glass eel fishery to allow sufficient escapement;
- Construction of passes in dams to allow elver migration upstream;
- Restocking using glass eels from nearby estuaries.

5.4.2.4. ICES recommends that an international recovery plan be developed for the whole stock on an urgent basis and that exploitation and other anthropogenic mor-

talities be reduced to as close to zero as possible, until such a plan is agreed upon and implemented. A range of management measures is documented by ICES in its advice from 2001 and in the report of the ICES/EIFAC Working Group on Eel.

5.4.2.5. The European Anglers Alliance (EAA) during its general assembly, in Leipzig in April 2003, stated that eel stocks across Europe have shown a continued decline for many years in all European waters (EAA, 2003). One contributing factor is the increasing pressure from commercial exploitation by netting, often illegally, at all stages of the life-cycle to supply the international trade across Europe and the Far East in both elvers and eels. The decline has been accelerated with increased pressures on breeding stocks from loss of habitat, obstruction to migration and the possible effects of parasites (*Anguillicola crassus*). If measures are not implemented rapidly the long-term survival of the species will be threatened.

5.4.2.6. The EAA held its 10th General Assembly on 26–28 March 2004 in Pont-a-Lesse, Dinant, Belgium, discussed the serious decline of the European eel in European waters, and adopted resolution 'Save the European eel from extinction in large parts of Europe'. EAA calls for designation of the European eel under Annex II or IV of the Habitat Directive arguing that only such a substantive measure can give the eel the protection this species deserves on Europe-wide basis.

5.4.3. Conservation of Sturgeon (Acipenser sturio)

5.4.3.1. General Fisheries Commission for the Mediterranean (GFCM) reviewed a proposal for the setting up of a Joint EIFAC/GFCM Working Group on Sturgeon (Acipenser sturio) and endorsed it (GFCM, 2001). GFCM encouraged active participation in the Joint EIFAC/GFCM Working Group on management of sturgeon. It is important that a number of CEE countries are members of GFCM: Bulgaria, Croatia, Romania, Slovenia, Serbia and Montenegro.

5.4.3.2. In order to fulfill CITES recommendation on protection of sturgeon stocks, the Black Sea and Azov Sea range countries (Bulgaria, Romania, Russia, Ukraine, Turkey and Yugoslavia) met in Sofia, Bulgaria, October 2001 and established the Black Sea Sturgeon Management Action Group (BSSMAG), a permanent working body aiming to co-ordinate and jointly implement the necessary management measures. It was decided that the all Black Sea Rim countries should jointly agree on precautionary catch limits.

5.4.4. Minimizing the harmful effects of introducing of non-native species or genetically modified aquatic organisms

5.4.4.1. From the point of view of conservation and sustainable use of biological diversity it would be important regularly evaluate potential effects on biodiversity:

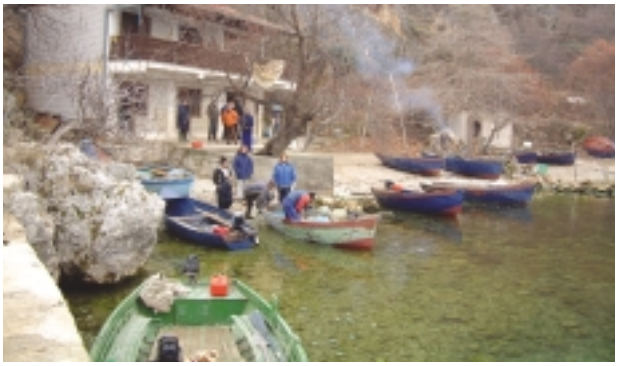
1) of new non-indigenous species to aquatic environment and promote the application of ICES/EIFAC Code,
2) of the use of genetically modified aquatic organisms.

5.4.4.2. EIFAC and the European Aquaculture Society (EAS) could be the most appropriate forums to co-operate in developing measures to minimize the harmful effects of introducing of non-native species or genetically modified aquatic organisms.

5.4.5. Mitigate against fishery – related loss of genetic diversity

5.4.5.1. The ICES Advisory Committee on Ecosystems (ACE) suggested four general measures to mitigate against the loss of genetic diversity (ICES 2002a, pp. 58–59):

- *Fishing mortality should be kept sufficiently low to maintain large populations;*
- *From a genetic perspective the harvest should be widely distributed geographically and among all the recruited populations, so that the risk of local depletion and fragmentation of population and selective removal or modification of particular traits is kept low.*
- *Genetic considerations would usually favor an overall reduction of fishing effort over alternative management approaches that result in fisheries becoming even more selective on only parts of a population, either spatially or by some life characteristics.*
- *The alternative management options have to be evaluated on a case specific basis. For example, in establishing closed areas to protect a stock from over-fishing, it often could be concluded that the benefits of protecting at least a part of a population exposed to fishing may outweigh the risks of reducing genetic diversity in the part of the population still exposed to fishing.*



Fishermen at Lake Ohrid, FYR Macedonia

5.4.5.2. Ensuring of implementation of these measures for European freshwater fisheries, including recreational fisheries could be of great importance for implementation of principles of sustainable use. EIFAC and EAA could be the most appropriate and important forums to cooperate in order to minimize the fishery related loss of biodiversity.

5.5. IUCN potential partner organizations

The major international organizations IUCN could seek observer status or pursue dialogue with listed below are described in more details in Annex V of this Report. They are as follows:

- European Inland Fisheries Advisory Commission (EIFAC)
- International Council for the Exploration of the Sea (ICES)
- The Helsinki Commission (HELCOM)
- International Baltic Sea Fisheries Commission (IBSFC)
- European Angling Alliance (EAA), other international and national angler/recreational fishermen organizations
- European Aquaculture Society (EAS)
- The Baltic Sea Regional Project (BSRP)
- The Istanbul Commission

6. CONCLUSIONS

A number of conclusions on the adverse trends in the biodiversity of freshwater fish in the countries of Central and Eastern Europe may be drawn from this first analysis of the country reports and other published information:

6.1. Analysis in this report shows a serious situation in relation to the ecological sustainability of freshwater fisheries in the CEE countries, with similar trends in nearly all of them, a lack of related coordinated socio-economic and ecosystem information and a low priority afforded to management action to remedy the problems. At the same time there is a resilient underlying wild living resource, a history of relevant scientific and management institutions, much valuable knowledge of freshwater biodiversity and millions of citizens engaged in the growth of recreational fisheries and its economic potential. Together these factors offer a strong motivation for bringing stakeholders together in the pursuit of sustainability.

6.2. The effective conservation, management and sustainable use of the freshwater fish diversity resources are largely dependent on an adequate data and information base, from which socially, economically and environmentally sound decisions can be made. Biodiversity data are collected by a wide range of organizations and individuals for a multitude of purposes as a result of scientific or educational studies, donor-funded projects, monitoring activities and environmental impact assessments, and sometimes at remarkably high cost. In general, the collection, quality assurance, management, interpretation, exchange and dissemination of data on biodiversity generally is poorly coordinated, inadequately resourced and generally given a low priority and this applies in equal measure to freshwater biodiversity.

6.3. Whereas considerable knowledge has been accumulated over a long time about the biology and a stock dynamics of many commercial freshwater fish stocks there are insufficient data on non-targeted fishes and ecosystem-related complex interactions. The definition of biological diversity-related research priorities is rather poor.

6.4. Freshwater commercial fishing capacity and the number of recreational fishers in surveyed countries are creating a situation where the pressures on fish stocks and associated biodiversity are excessive. The situation is generally made worse by inefficient control resulting at least in some cases in unacceptably high illegal and unreported catches and illegal trade and movement of fish. Excessive fishing capacity adversely affects the relevant economic and social aspects of the freshwater fisheries sector. High fishing pressure over long time has decreased the stocks and the catches of many valuable freshwater fishes, and may have led to reduced genetic variability and less effective food webs. The possible consequences of these changes are poorly understood and there is a real threat of biodiversity and stability reduction in the freshwater ecosystems.

6.5. The biodiversity of freshwater fishery ecosystems is threatened by habitat destruction, pollution and mismanagement of aquatic resources, resulting from insufficient and ineffective management integration which produces a failure to take into account the complex interests of all the relevant stakeholders.

6.6. The driving forces and main factors of biodiversity decrease revealed by this analysis should be addressed when developing the national measures aimed at sustainable use of biodiversity. The main tendencies are common for all countries under consideration, e.g. overfishing and loss of spawning grounds because of physical impact on habitat. At the same time there are more specific factors such as illegal trans-boundary trade characteristic for some countries only.

Poachers net in the Dniester River, Ukraine

6.7. In the process of developing and implementing national Biodiversity Action Plans, which remain under responsibility of the states concerned, insufficient attention has been paid to greater geographic isolation and habitat heterogenity in freshwater ecosystems and to the species that migrate between marine and fresh water (e.g. salmonids and eel). At the same time these species are often the most endangered ones or have suffered the greatest recent declines.

6.8. The education, training and awareness rising of freshwater fishery stakeholders on biodiversity and sustainable use issues requires more attention. One of the consequences of that is generally poor compliance of stakeholders with the relevant conservation measures. It is of fundamental importance to raise the awareness of all stakeholders with regard to the sustainable use of freshwater fishery resources and corresponding related biodiversity, and to secure a closer involvement of stakeholders into discussions and the decision-making process.

The authors of this report, while acknowledging that it may not have done full justice to the nuances of the individual country studies and that there are important remaining information gaps, nevertheless hope that together with the availability of those studies on the internet, it will serve as a useful source of information and ideas to stimulate the action needed to halt negative trends in and to promote the ecological, economic and social sustainability of freshwater fisheries in the CEE region.

ANNEXES

Annex I

Questionnaire

IUCN ESUSG
FISHERIES WG

Freshwater fisheries: principles, mechanisms and elements of fishery management, which contribute to decrease of biodiversity of freshwater ecosystems and the unsustainable use of inland fishery resources

Country

Consultant
Name
Position
Address
Telphone
Fax
E-mail

NB For each heading mention main data source or sources or indicate if your answer is an informed guess or extrapolation.

1. Country Profile

Describe the inland water fishery in your country both commercial and recreational:

1.1. General information about inland waters (length of rivers, number and size of lakes)
1.2. Legal and organizational basis of inland water fishery management
1.3. Participation of fishers and fishery administration in integrated resource management for sustainable inland fish production
1.4. Indicators for management of inland water fishery
1.5. Fishery in inland water(number of sport fishers and commercial jobs and catch statistics, including commercial values, other socio-economic aspects)
1.6. Interaction between commercial and recreational fishery
1.7. Influences from other sectors and limitations on inland water fishery
1.8. Conflict between aquatic resource user groups
1.9. Environmental aspects of inland water fishery
1.10. Physical modifications of the aquatic habitat
1.11. Rehabilitation of lakes and reservoirs for fish
1.12. Bio-manipulation, stocking and introductions
1.13. Fish diseases and their control
1.14. Aquatic environmental hazard assessment (persistent bio-accumulating contaminants e.g. dioxin issue)
1.15. Inland water fishery research
1.16. Education and training in inland water fishery

1.17. Main problems and future development
1.18. Other

2. Concept of biodiversity applied

If applicable, does the concept of biodiversity applied to inland water fisheries management in your country include the following:

Genetic variability within species

2.1. Variability in size/age structure and reproductive quality of the species
2.2. Diversity of species
2.3. Diversity of ecosystems (community, habitat and functional)

3. Major underlining causes of biodiversity decrease

Describe the most significant causes of inland water fishery and aquaculture related biodiversity decrease characteristic for your country:

3.1. over-fishing
3.2. by-catch of non-target fishes
3.3. depletion of local genetically distinct stocks
3.4. physical impact on the habitat
3.5. persistent contaminants in inland water ecosystem and fishes
3.6. overload of nutrient
3.7. spread of diseases
3.8. Other

4. Driving forces of biodiversity decrease related to inland water fishery

Describe the most important and characteristic for your country driving forces of biodiversity decrease related to inland water fishery, indicating the relevance of the following:

4.1. Increasing demand on recreational fishing possibilities due to transition from commercial to recreational fishing
4.2. Increasing demand on water and aquatic environments for purposes other than fisheries
4.3. Increasing demand for angling opportunity provided through stocking and intensive management of the fishery ecosystem
4.4. Increasing trade, market demand and consumption in freshwater fish and fish products
4.5. Increasing illegal trade and movements of freshwater fish
4.6. Other

5. Measures aimed at protecting biodiversity

Outline the most important and related to inland fishery measures aimed at protecting biodiversity in your country, including any of the following:

5.1. Adoption of management objectives in accordance with precautionary approach (commercial fish stocks, non-target fishes and habitats)
5.2. Measures to achieve overall reduction in fishing pressure
5.3. Technical measures with the objective of improving the conservation and sustainable use of inland water fishery resources
5.4. Measures to reduce fishing impacts on those components of ecosystems which are of little or no commercial importance

5.5. Measures to develop basic research to support, inform and advance the integration of biodiversity consideration into fisheries policies
5.6. Measures on habitat restoration and reducing persistent contaminants and excess of nutrients into inland waters
5.7. Limit introduction of new non-indigenous species to aquatic aquaculture and promote the application of ICES/EIFAC Code
5.8. Other measures

6. Management challenges

Describe the status of implementation of the ecosystem based approach to fisheries management in your country. Do any of the following apply?

6.1. Adoption an ecosystem approach to inland fisheries management
6.2. Clear definition and articulation of strategic and operational objectives within a systematic ecosystem based inland fisheries management framework
6.3. Selection and adoption of a practical set of indicators based on agreed objectives, goals and priority setting
6.4. Determine research strategies and needs to adapt the ecosystem based approach to inland fisheries management

7. Previous IUCN activities on sustainable inland fisheries

Please give any information you have on the previous involvement of IUCN, its members and commissions in inland fisheries issues in your country.

Annex II

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Annex III

Freshwater fishery and aquaculture statistics for Eastern Europe in 1990–2000

Source: EIFAC. 2002. Analysis of European Catch and Aquaculture Statistics, 1990–2000. Twenty-second Session. Windermere, United Kingdom, 12–19 June 2002.

EIFAC at its 22nd Session in Windermere, United Kingdom, 12–19 June 2002 compiled the comprehensive freshwater fishery catches and aquaculture production statistics for 1990–2000. EIFAC statistics is widely used by researchers, planners and policy makers.

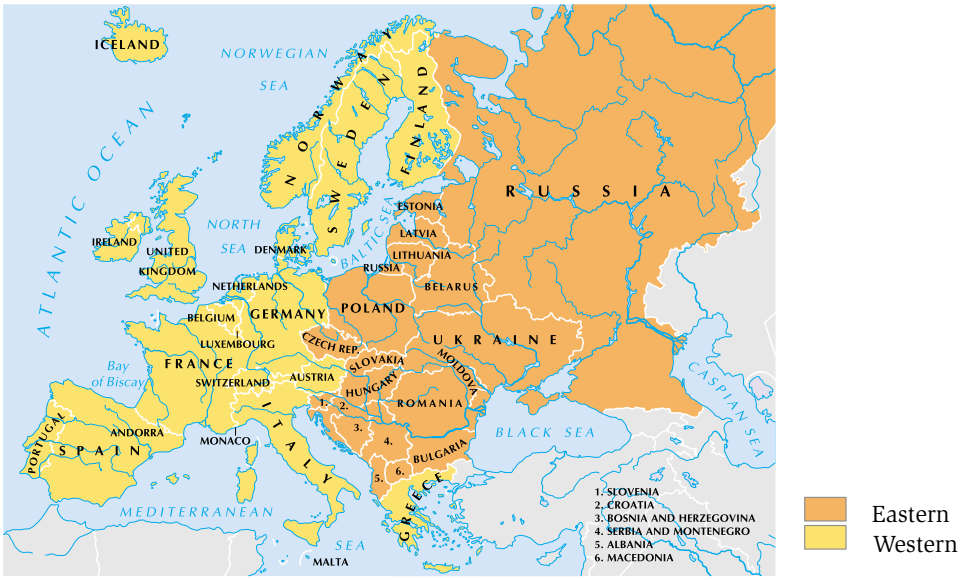

Figure AIII 1. EIFAC regions of Europe

Table AIII 1. List of countries constituting Eastern and Western Europe

Eastern	Western
Albania	Austria
Belarus	Belgium
Bosnia and Herzegovina	Cyprus
Bulgaria	Denmark
Croatia	Finland
Czech Republic	France
Estonia	Germany
Hungary	Greece
Latvia	Iceland
Lithuania	Ireland
Macedonia, FYR	Israel

Eastern	Western
Moldova	Italy
Poland	Luxembourg
Romania	Netherlands
Russian Federation	Norway
Slovakia	Portugal
Slovenia	Spain
Ukraine	Sweden
Yugoslavia, FR	Switzerland
	Turkey
	United Kingdom

Table AIII 2. Total freshwater catches and aquaculture production (t) in Eastern Europe by countries in 1990 and 2000

Country	1990	Country	2000
Russian Federation	609,999	Russian Federation	365,880
Ukraine	117,132	Poland	53,338
Romania	48,186	Ukraine	35,219
Poland	45,000	Czech Republic	24,129
Hungary	33,834	Hungary	19,987
Czechoslovakia	26,630	Romania	14,623
Yugoslavia, SFR	24,447	Belarus	7,269
Belarus	19,626	Bulgaria	4,505
Lithuania	10,636	Lithuania	3,907
Bulgaria	9,476	Croatia	3,808
Moldova	9,472	Yugoslavia, FR	3,508
Estonia	5,401	Estonia	3,415
Latvia	2,368	Slovakia	3,142
Albania	2,214	Bosnia and Herzegovina	2,500
		Macedonia, FYR	1,834
		Moldova	1,319
		Slovenia	1,293
		Albania	1,060
		Latvia	937
Total	964,421	Total	551,673

Table AIII 3. Total freshwater catches (t) in Eastern Europe by countries in 1990 and 2000

Country	1990	Country	2000
Russian Federation	356,114	Russian Federation	292,368
Ukraine	35,493	Poland	17,543
Poland	18,600	Hungary	7,101
Hungary	16,234	Romania	4,896
Romania	13,236	Czech Republic	4,654
Yugoslavia, SFR	12,404	Ukraine	4,260
Lithuania	5,970	Estonia	3,190
Estonia	4,552	Bosnia and Herzegovina	2,500
Czechoslovakia	4,304	Slovakia	2,255
Belarus	2,988	Lithuania	1,911
Moldova	2,331	Albania	955
Albania	1,696	Bulgaria	861
Bulgaria	1,627	Yugoslavia, FR	672
Latvia	133	Latvia	612
		Belarus	553
		Croatia	417
		Slovenia	229
		Macedonia, FYR	208
		Moldova	151
Total	475,682	Total	345,336

Table AIII 4. Total aquaculture production (t) in Eastern Europe by countries in 1990 and 2000

Country	1990	Country	2000
Russian Federation	253,885	Russian Federation	73,512
Ukraine	81,639	Poland	35,795
Romania	34,950	Ukraine	30,959
Poland	26,400	Czech Republic	19,475
Czechoslovakia	22,326	Hungary	12,886
Hungary	17,600	Romania	9,727
Belarus	16,638	Belarus	6,716
Yugoslavia, SFR	12,043	Bulgaria	3,644
Bulgaria	7,849	Croatia	3,391
Moldova	7,141	Yugoslavia, FR	2,836
Lithuania	4,666	Lithuania	1,996
Latvia	2,235	Macedonia, FYR	1,626
Estonia	849	Moldova	1,168
Albania	518	Slovenia	1,064
		Slovakia	887
		Latvia	325
		Estonia	225
		Albania	15
Total	488,739	Total	206,337

Table AIII 5. Total freshwater catches and aquaculture production (t) in Eastern Europe by countries in1990–2000

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Albania	2,214	999	1,032	965	802	292	430	187	839	919	1,060
Belarus	19,626	15,543	9,922	10,011	7,720	6,178	6,859	4,821	5,184	5,803	7,269
Bosnia and Herzegovina	...	...	2,000	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
Bulgaria	9,476	9,254	9,743	9,572	7,095	5,112	5,812	7,251	6,496	10,155	4,505
Croatia	...	...	6,336	4,442	4,753	3,796	2,813	3,133	3,605	3,717	3,808
Czech Republic	...	...	...	23,427	22,610	22,608	21,724	20,881	21,183	22,965	24,129
Czechoslovakia	26,630	26,346	28,485	–	–	–	–	–	–	–	–
Estonia	5,401	2,937	4,042	2,575	2,170	2,531	2,633	2,699	4,138	3,308	3,415
Hungary	33,834	22,879	22,908	17,378	18,206	16,674	15,686	16,740	17,487	19,461	19,987
Latvia	2,368	3,229	1,192	892	1,055	1,039	916	889	926	1,078	937
Lithuania	10,636	7,254	5,421	4,053	3,061	2,974	2,832	3,229	3,253	3,365	3,907
Macedonia, FYR	...	...	1,209	1,235	1,230	1,505	989	1,009	1,388	1,804	1,834
Moldova	9,472	5,171	3,345	2,905	1,920	2,110	1,670	1,771	1,620	1,136	1,319
Poland	45,000	48,000	51,150	50,000	52,000	50,000	49,737	42,512	43,027	47,586	53,338
Romania	48,186	40,518	34,510	29,662	30,998	28,878	20,045	15,742	14,244	14,334	14,623
Russian Federation	609,999	400,201	378,108	307,221	291,437	273,304	284,765	278,201	333,426	375,823	365,880
Slovakia	–	–	–	2,773	3,550	3,636	2,410	2,688	2,062	2,263	3,142
Slovenia	...	...	1,005	950	1,001	1,019	1,009	1,070	1,006	1,330	1,293
Ukraine	117,132	84,500	91,468	79,044	57,802	41,815	41,777	36,028	33,217	38,344	35,219
Yugoslavia, SFR	24,447	12,200	–	–	–	–	–	–	–	–	–
Yugoslavia, FR	...	...	7,410	6,169	6,492	6,166	6,543	6,986	8,752	4,255	3,508
Total	964,421	679,031	659,286	555,774	516,402	472,137	471,150	448,337	504,353	560,146	551,673

Table AIII 6. Total freshwater catches (t) in Eastern Europe by countries in 1990–2000

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Albania	1,696	802	916	850	700	252	357	180	823	814	955
Belarus	2,988	793	1,507	2,993	786	715	821	499	457	514	553
Bosnia and Herzegovina	...	...	2,000	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
Bulgaria	1,627	1,456	1,611	1,675	995	762	1,127	1,881	2,336	2,475	861
Croatia	...	...	198	284	340	364	434	408	400	410	417
Czech Republic	...	...	...	3,185	3,955	3,929	3,524	3,321	3,952	4,190	4,654
Czechoslovakia	4,304	4,300	4,350	–	–	–	–	–	–	–	–
Estonia	4,552	1,870	3,509	2,411	1,909	2,366	2,361	2,439	3,878	3,108	3,190
Hungary	16,234	8,445	8,678	7,886	8,307	7,314	7,606	7,406	7,265	7,514	7,101
Latvia	133	544	551	553	495	514	536	544	501	610	612
Lithuania	5,970	2,462	1,522	1,146	1,187	1,260	1,295	1,713	1,737	1,715	1,911
Macedonia, FYR	...	...	195	164	196	208	78	130	131	135	208
Moldova	2,331	47	410	630	708	709	603	569	491	129	151
Poland	18,600	18,500	20,950	31,391	27,500	24,889	22,037	13,832	13,236	13,875	17,543
Romania	13,236	10,988	9,890	8,562	10,598	9,048	6,145	4,574	4,630	5,336	4,896
Russian Federation	356,114	289,331	275,125	216,866	217,950	212,874	233,272	227,091	271,311	307,823	292,368
Slovakia	...	...	...	1,185	1,689	2,019	1,456	1,434	1,414	1,391	2,255
Slovenia	...	...	293	297	317	292	265	280	251	226	229
Ukraine	35,493	31,252	24,801	13,189	14,786	6,847	9,468	6,215	4,885	4,538	4,260
Yugoslavia, SFR	12,404	6,000	–	–	–	–	–	–	–	–	–
Yugoslavia, FR	...	...	5,111	3,797	3,912	3,803	3,653	3,500	2,200	828	672
Total	475,682	376,790	361,617	299,564	298,830	280,665	297,538	278,516	322,398	358,131	345,336

Table AIII 7. Total aquaculture production (t) in Eastern Europe by countries in 1990–2000

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Albania	518	197	116	115	102	40	73	7	16	105	105
Belarus	16,638	14,750	8,415	7,018	6,934	5,463	6,038	4,322	4,727	5,289	6,716
Bulgaria	7,849	7,798	8,132	7,897	6,100	4,350	4,685	5,370	4,160	7,680	3,644
Croatia	...	...	6,138	4,158	4,413	3,432	2,379	2,725	3,205	3,307	3,391
Czech Republic	...	...	...	20,242	18,655	18,679	18,200	17,560	17,231	18,775	19,475
Czechoslovakia	22,326	22,046	24,135	–	–	–	–	–	–	–	–
Estonia	849	1,067	533	164	261	165	272	260	260	200	225
Hungary	17,600	14,434	14,230	9,492	9,899	9,360	8,080	9,334	10,222	11,947	12,886
Latvia	2,235	2,685	641	339	560	525	380	345	425	468	325
Lithuania	4,666	4,792	3,899	2,907	1,874	1,714	1,537	1,516	1,516	1,650	1,996
Macedonia, FYR	...	...	1,014	1,071	1,034	1,297	911	879	1,257	1,669	1,626
Moldova	7,141	5,124	2,935	2,275	1,212	1,401	1,067	1,202	1,129	1,007	1,168
Poland	26,400	29,500	30,200	18,609	24,500	25,111	27,700	28,680	29,791	33,711	35,795
Romania	34,950	29,530	24,620	21,100	20,400	19,830	13,900	11,168	9,614	8,998	9,727
Russian Federation	253,885	110,870	102,983	90,355	73,487	60,430	51,493	51,110	62,115	68,000	73,512
Slovakia	–	–	–	1,588	1,861	1,617	954	1,254	648	872	887
Slovenia	...	...	712	653	684	727	744	790	755	1,104	1,064
Ukraine	81,639	53,248	66,667	65,855	43,016	34,968	32,309	29,813	28,332	33,806	30,959
Yugoslavia, SFR	12,043	6,200	–	–	–	–	–	–	–	–	–
Yugoslavia, FR	...	...	2,299	2,372	2,580	2,363	2,890	3,486	6,552	3,427	2,836
Total	488,739	302,241	297,669	256,210	217,572	191,472	173,612	169,821	181,955	202,015	206,337

Table AIII 8. Species composition of aquaculture in Eastern Europe in 2000

Species	Species	Thousand t
Cyprinoidei	Cyprinids	174
Salmonoidei	Salmonids	23
Acipenseriformes	Sturgeons	2
Miscellaneous	Others	7

Table AIII 9. Species composition of freshwater catches in Eastern Europe in 2000

Species	Species	Thousand t
Clupeoidei	Diadromous clupeoids	121
Cyprinoidei	Cyprinids	93
Salmonoidei	Salmonids	65
Percoidei	Perches	11
Esox lucius	Northern pike	10
Siluroidei	Freshwater siluroids	8
Miscellaneous	Others	38

Table AIII 10. Contribution of introduced aquatic organisms to European freshwater fish production in 2000

Status	Western		Eastern	
	Capture	Culture	Capture	Culture
Introduced	3.3%	70.1%	15.3%	30.6%
Native	96.7%	29.9%	84.7%	69.4%

Table AIII 11. Major introduced species in European freshwater fish catches

Species name	Scientific name
Rainbow trout	Oncorhynchus mykiss
Silver carp	Hypophthalmichthys molitrix
Pink (=Humpback) salmon	Oncorhynchus gorbuscha
Chum (=Keta=Dog) salmon	Oncorhynchus keta
Sockeye (=Red) salmon	Oncorhynchus nerka
Bighead carp	Hypophthalmichthys nobilis
Goldfish	Carassius auratus
North African catfish	Clarias gariepinus
Grass carp (=White amur)	Ctenopharyngodon idellus
Red swamp crawfish	Procambarus clarkii
Coho (=Silver) salmon	Oncorhynchus kisutch
Brook trout	Salvelinus fontinalis
Black bullhead	Ameiurus melas
Chinook (=Spring=King) salmon	Oncorhynchus tshawytscha
Tilapias nei	Oreochromis (=Tilapia) spp
Signal crayfish	Pacifastacus leniusculus
Channel catfish	Ictalurus punctatus
Masu (=Cherry) salmon	Oncorhynchus masou

Selected international biodiversity-related concepts

1. Convention on Biological Diversity (CBD)

Objectives

Article 1

... The objectives of this Convention, to be pursued in accordance with its relevant provisions, are the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies, and by appropriate funding.

On the basis of the CBD a number of national strategic and policy documents as well as corresponding action plans should be developed, adapted and implemented.

CBD explains the terms *biological diversity* and *biological resources* in a broad general way.

Article 2

'Biological diversity' means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.

'Biological resources' includes genetic resources, organisms or parts thereof, populations, or any other biotic component of ecosystems with actual or potential use or value for humanity.

CBD covers conservation and sustainable use of biological diversity both in the wild and for domesticated or cultivated forms, as well as societal activities and processes which directly or indirectly are influencing the biological diversity.

CBD national strategies and plans

Article 6

Each Contracting Party shall /…/

Develop national strategies, plans or programs for the conservation and sustainable use of biological diversity or adapt for this purpose existing strategies, plans or programs which shall reflect, inter alia, the measures set out in this Convention relevant to the Contracting Party concerned…

Sectoral and cross-sectoral nature of the Convention

Article 6

Each Contracting Party shall /…/

(b) Integrate, as far as possible and as appropriate, the conservation and sustainable use of biological diversity into relevant sectoral or cross-sectoral plans, programs and policies.

Obligations of the Convention

Main national obligation under the CBD is in identifying the components of biological diversity in need of protection and the processes which threaten biological diversity.

Article 7
Each Contracting Party shall /…/

(a) Identify components of biological diversity important for its conservation and sustainable use having regard to the indicative list of categories set down in Annex I; /.../

(c) Identify processes and categories of activities which have or are likely to have significant adverse impacts on the conservation and sustainable use of biological diversity, and monitor their effects through sampling and other techniques;

Conservation and sustainable use of biodiversity – this should embrace the impact assessment of the main actions based on comprehensive monitoring both of biological diversity as such and the processes potentially threatening to biodiversity.

Article 7
Each Contracting Party shall /…/

(b) Monitor, through sampling and other techniques, the components of biological diversity identified pursuant to subparagraph (a) above, paying particular attention to those requiring urgent conservation measures and those which offer the greatest potential for sustainable use.

Obligations concerning research, education and information.

Article 12
Each Contracting Party shall /…/

(b) Promote and encourage research which contributes to the conservation and sustainable use of biological diversity /.../

Article 13
(a) Promote and encourage understanding of the importance of, and the measures required for, the conservation of biological diversity, as well as its propagation through media, and the inclusion of these topics in educational programs;

Sectoral activities should be based on the precautionary approach with aim to maintain biological diversity through a combination of conservation and sustainable use. Sustainable use is considered of utmost importance. This should lay on the principle of critical loads. Special attention should be paid to such factors as pollution, alteration of physical environment including harvesting of natural resources, and the modification and release of organisms.

2. Adaptive management

A key to the CBD approach lies in a proper understanding of adaptive management. Some of the latest thinking on this much-used but little understood term is to be found in the output of a recent CBD Workshop: The Fourth Open-Ended Workshop on Sustainable Use of Biological Diversity (Addis Ababa, 6–8 May 2003). This Workshop has developed the Addis Ababa Principles and Guidelines for the Sustainable Use of Biodiversity including those concerning adaptive management (CBD, 2003). These were put into final form and adopted by

the 7th Conference of the Parties to the CBD at Kuala Lumpur in February 2004.

Principle 4:
Adaptive management should be practiced, based on:
(a) Science and traditional and local knowledge;
(b) Iterative, timely and transparent feedback derived from monitoring the use, environmental, socio-economic impacts, and the status of the resource being used; and
(c) Adjusting management based on feedback from the monitoring procedures.

Guidelines
(a) Ensure that for particular uses adaptive management schemes are in place;
(b) Require adaptive management plans to incorporate systems to generate sustainable revenue necessary for successful implementation;
(c) Provide extension assistance in setting up and maintaining monitoring and feedback systems;
(d) Include clear descriptions of their adaptive management system, which includes means to assess uncertainties;
(e) Design monitoring system on a temporal scale sufficient to ensure that information about the status of the resource and ecosystem is available to inform management decisions to ensure that the resource is conserved.

According to the Workshop report (CBD 2003, p. 24) adaptive management '… is the most appropriate approach toward the management of biological resources because of its ability to deal with the uncertainty and natural variation, its iterative nature of monitoring biological resource through the management cycles, and the feedback/decision-making mechanisms to alter the management. Adaptive management can be applied at each of the recognized components of biological diversity, where the scale of management (and adaptive-management needs) is determined by the component being used. Adaptive management systems should operate within the context of national policies concerning the use of biological resources.'

Principle of adaptive management could be considered as a way forward in the freshwater fisheries management. Adaptive management could be seen as a practical tool to implement the ecosystem based approach to fisheries management in general. Adaptive management is inclusive also to principles of precautionary approach and responsible fisheries.

The Fourth Open-ended Workshop on the Sustainable Use of Biodiversity (CBD, 2003) has invited Parties, other Governments and relevant organization to initiate a process for the implementation of the draft Addis Ababa principles and guidelines at the national and local levels, including the development of pilot projects, with a view to integrating and mainstreaming the principles and guidelines into national legislation and other regulations, sectoral and cross-sectoral plans and programs addressing consumptive and non-consumptive use of biodiversity.

3. The Ecosystem Approach and the 12 principles of operational guidance for practical implementation of the ecosystem based sustainable use

In a Workshop on the Ecosystem Approach (Lilongwe, Malawi, 26–28 January 1998), whose report was presented at the Fourth Meeting of the Conference of the Parties to the Convention on Biological Diversity (Bratislava, Slovakia, 4–15 May 1998, UNEP/CBD/COP/4/Inf.9), twelve principles/characteristics of the ecosystem approach to biodiversity management were identified.

The Ecosystem Approach and the 12 principles of operational guidance for practical implementation of the ecosystem based sustainable use were adopted by the Convention on Biological Diversity (CBD) at the 5th meeting of the Conference of the Parties (Decision V/6; Nairobi, Kenya, May, 2000).

These 12 principles of operational guidance for Ecosystem Approach are as follows:

1) *The objectives of management of land, water and living resources are a matter of societal choices.*
2) *Management should be decentralized to the lowest appropriate level.*
3) *Ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems.*
4) *Recognizing potential gains from management, there is usually a need to understand and manage the ecosystem in an economic context.*
5) *Conservation of ecosystem structure and functioning, in order to maintain ecosystem services, should be a priority target of the ecosystem approach.*
6) *Ecosystem must be managed within the limits of their functioning.*
7) *The ecosystem approach should be undertaken at the appropriate spatial and temporal scales.*
8) *Recognizing the varying temporal scales and lag-effects that characterize ecosystem processes, objectives for ecosystem management should be set for the long term.*
9) *Management must recognize the change is inevitable.*
10) *The ecosystem approach should seek the appropriate balance between, and integration of, conservation and use of biological diversity.*
11) *The ecosystem approach should consider all forms of relevant information, including scientific and indigenous and local knowledge, innovations and practices.*
12) *The ecosystem approach should involve all relevant sectors of society and scientific disciplines.*

4. Ecosystem approach to fisheries

The term 'Ecosystem Approach to Fisheries' (EAF) was adopted by the FAO Technical Consultation on Ecosystem-based Fisheries Management held in Reykjavik on 16–19 September 2002 as follows (Garcia *et al.*, 2003): 'purpose of an ecosystem approach to fisheries is to plan, develop and manage fisheries in a manner that addresses the multiplicity of societal needs and desires, without jeopardizing the options for future generations to benefit from a full range of goods and services provided by marine ecosystems'. Therefore, 'an ecosystem approach to fisheries strives to balance diverse societal objectives, by taking account of the knowledge and uncertainties about biotic, abiotic and human components of ecosystems and their interactions and applying an integrated approach to fisheries within ecologically meaningful boundaries'.

5. Rebuilding Ecosystems

According to Garcia *et al.* (2003) considering the present state of fishery resources, their recovery and that of the ecosystem in which they normally live should be a strong priority objective which in practice may imply a suite of complex interventions to, *inter alia*:

- reduce fishing harvest (if only in the short term) and capacity;
- stop habitat degradation and rehabilitate macrohabitats;
- reestablish freshwater flows and regimes;
- reestablish the original species composition;

- reduce pollution and depollute bottoms from accumulated contaminants (if appropriate);
- enhance productivity (e.g. through artificial installations and/or restocking).

6. Maintaining productive capacity

Ecosystem Approach to Fisheries (EAF), just as conventional fisheries management, will aim at preserving and, where appropriate, rebuilding the reproductive capacity of the target resources and their recruitment, preserving simultaneously ecosystem nurseries, feeding and spawning grounds in optimal state. Reproductive biomass of the target species needs to be maintained at a sufficient level by (Garcia *et al.*, 2003):

- limiting fishing pressure to ensure sufficient survival until spawning age;
- directly protecting spawners' concentrations from targeted fishing;
- controlling fishing regimes (i.e. mortality-at-age) through effective enforcement of mesh-size regulations, by-catch limitations, minimum size at landing, market controls prohibiting trade of larval or juvenile fish, including in restaurants, zoning (to protect growing areas);
- ensuring availability of food for growth to adulthood, protecting stocks of preys;
- prohibiting destructive practices (e.g. dynamite or cyanides);
- adopting highly reactive (adaptive) management schemes (e.g. with harvest control rules);
- actively campaigning against land-based pollution (e.g in the context of Integrated Coastal Area Management);
- combating habitat degradation, e.g. though preventive or corrective measures which may include: biodiversity reserves, artificial habitats and zoning of fishing gear and practices.

7. Integrated ecosystem-based advice and management

ICES is continuing the development of a framework for the provision of integrated ecosystem-based advice, and considering how this could be operationalized in the near future.

The reports and initiatives nationally, regionally, and globally that were reviewed by ICES bring out a number of features of an integrated ecosystem approach that are common across these initiatives. These include (ICES 2003a, pp. 187–188):

'Inclusive, participatory governance and decision making, with an informed citizenry is featured in nearly every discussion of integrated ecosystem approaches.

Past treatments of the advisory framework by ICES also acknowledge this as an important feature of ecosystem approaches.

It is human activities that are managed, and the not the ecosystem. Many decisions are perceived as risk-risk choices among competing uses, not just balancing the intensity of use with protection of the environment. Not only are human activities the ecosystem properties that are managed, but of the impediments and components of the way forward listed in the Køge Stakeholders Conference report (ICES, 2003b), eight of thirteen cannot be addressed without society making value-based choices among competing potential human activities.

Almost every initiative and document gives a prominent role for the social sciences in identifying goals, developing management approaches, and evaluating the consequences of management actions. Over half the points in the Køge Stakeholders Conference report […] required a moderate or high degree of social science input in order for any meaningful progress to be made.

Specification of higher-order management objectives is required, although these are usually highly conceptual and additional work is needed to make them operational. These characterize nearly every initiative reviewed in ICES (2002b), and form the core of the approach endorsed at the Køge Stakeholders Conference.

Indicator-based approaches, often with explicit operational objectives and reference points, are the basis for operationalizing the conceptual objectives. This is particularly prominent in the Bergen Declaration from the Fifth North Sea Conference and associated documents, the approach adopted by the Monitoring and Assessment Group (MONAS) for HELCOM, and the Køge Stakeholders Conference report.

Most proposals stress a reliance on the Precautionary Approach (PA) in advice and decision-making.

Advice on single resource uses needs to include consideration of the status of not just the resource being used, but other ecosystem components interacting with or influencing the resource, and other human activities that affect the resource or interact with the resource use. This is most often specified for fisheries, where it is argued that assessments should consider more environmental influences on stock status and dynamics, and advice should be more fleet-based and consider the ecosystem effects of the entire fishery.

Monitoring covers many ecosystem components and is conducted in integrated programmes. Many of the international organizations around the North Sea and Baltic Sea (The Convention for the Protection of the Marine Environment of the North-East Atlantic, or OSPAR; International Baltic Fisheries Scientific Commission, or IBFSC; Baltic Marine Environment Protection Commission, or HELCOM) or more regionally and globally (Intergovernmental Oceanic Commission, or IOC; Scientific Committee on Oceanic Research, or SCOR; and other sponsors of the Global Ocean Observing System, or GOOS; Global Ocean Ecosystem Dynamics, or GLOBEC, etc.) feature this point.

Regional assessments that integrate all major ecosystem components and human activities in the regional seas are conducted and reported periodically. This is given prominence in the Bergen Declaration, many of the Baltic initiatives, and in past treatments of the topic by ICES.

Management that is integrated and adaptive, rather than piecemeal and rigid, is required. This need is acknowledged the Bergen Declaration and the Køge Stakeholders Conference report. Various organizations and jurisdictions are undertaking discussions both officially and informally with regard to coordinating their management approaches more effectively.'

8. Integrated Management

The ecosystem-related concepts mentioned above (Fisheries Management, Ecosystem Management, Ecosystem-based Fisheries Management, Ecosystem Approach, Ecosystem Approach to Fisheries) have a lot in common and relate very closely to the already widely used concept of integrated management. The latter involves comprehensive planning and regulation of human activities towards a complex set of interacting objectives and aims at minimizing user conflicts while ensuring long-term sustainability (Garcia et al., 2003).

9. FAO Code of Conduct for Responsible Fisheries

According to Garcia et al. (2003) the Code provides 'the conceptual basis and institutional requirement for, inter alia, ecosystem and habitat protection; accounting for environmental

factors and natural variability; reducing impacts of fishing and other activities; biodiversity conservation; multispecies management; protection of endangered species; accounting for relations between populations; reducing land-based impacts and pollution; integration in coastal area management; elimination of ghost-fishing; reduction of waste and discards; precautionary approach; delimitation of ecosystem boundaries and jurisdictions, as well as adapted institutions and governance.'

10. FAO Technical Guidelines on Responsible Inland Fisheries

The value of Technical Guidelines on Responsible Fisheries – Inland Fisheries is first of all in providing the definitions of the most common terms on the responsible use of the freshwater fishery resources (FAO 1997, p. 4):

Inland fisheries: any activity conducted to extract fish and other aquatic organisms from inland waters.

Capture fisheries: the removal of aquatic organisms from natural or enhanced inland waters.

Culture based fisheries: capture fisheries which are maintained by stocking with material originating from aquaculture installations.

Enhanced fisheries: (also include culture-based fisheries): activities aimed at supplementing or sustaining the recruitment of one or more aquatic organisms and raising the total production or the production of selected elements of a fishery beyond a level which is sustainable by natural processes.

Precautionary approach: a set of agreed cost-effective measures and actions, including future courses of action, which ensures prudent foresight, reduces or avoids risk to the resources, the environment, and the people, to the extent possible taking explicitly into account existing uncertainties and the potential consequences of being wrong.

Recreational fisheries: fisheries conducted by individuals primarily for sport but with a possible secondary objective of capturing fish for domestic consumption but not for onward sale.

Wild fisheries: fisheries based on natural production and recruitment.

Sustainable development: in both marine and inland fisheries, there has been a long tradition among biologists to use the term 'sustainable' with reference to the yield which can be removed from a fish stock in perpetuity. The sustainability of a fish stock is, in addition, also affected by its habitat and its interrelationship with other plant and animal species. In inland fisheries, however, with the increasing use of enhancement techniques the term sustainable takes on a more agricultural connotation implying the continuance of given levels of yield under particular regimes on input without damage to the surrounding environment. In this context a broad definition for sustainable agricultural and rural development is offered by FAO as '... the management and conservation of the natural resource base, and the orientation of technological and institutional change in such a manner as to ensure the attainment and continued satisfaction of human needs for present and future generations. Such sustainable development (in the agricultural, forestry and fishery sectors) concerns land, water, plant and animal genetic resources, is environmentally non-degrading, technically appropriate, economically viable, and socially acceptable.

Conceptual understanding of the nature of inland fishery resources provided by FAO (FAO 1997, p. 7) is also very important to keep in mind:

Fundamental differences exist between fisheries in lakes and reservoirs compared to those in rivers. Lake fisheries tend to be more independent of short term climatic effects, to be based on a relatively small number of target species and to be located in closed systems. Rivers are highly influenced by year-to-year variations in rainfall, the fisheries are based on large numbers of species and the systems are open. Reservoirs cover a range of possibilities intermediate between rivers and lakes. Management strategies should reflect these differences.

According to FAO Technical Guidelines (FAO 1997, p. 3) four current strategies in the use of inland waters for fisheries can be distinguished.

Firstly, food fisheries on wild stocks depending on natural reproduction and fertility continue in most of the larger rivers and lakes of the world. Such fisheries are generally at or exceed the limits of maximum sustainable yield and corresponding shifts in fish community structure are occurring with risks of diminished production and damaged stocks.
Secondly, food fisheries in smaller water bodies in some countries are increasingly being subject to enhancements to raise productivity of selected species above natural levels. This type of management is spreading and the technologies are being adopted by other countries.

Thirdly, recreational fisheries are becoming more common in many areas of the world and, where they develop, tend to supplant commercial food fisheries. Recreational fisheries may contribute to food supply as in many cases they are of a subsistence or artisanal nature.

Fourthly, locally very intense exploitation of juvenile or small adult forms for stocking into other water bodies and aquaculture ponds or for the ornamental fish trade.

Three components of the current fishery management for the environment/fish/fishery system of inland waters can be distinguished (FAO 1997, p. 14):

- *Management of the fishery – regulation oriented activities concerning the activities of the fishers and their social and economic context such as licensing, control of mesh size, setting of closed seasons, control of markets, subsidies, etc.*
- *Management policies here should be aimed at: a) limiting access to the fishery so that excess effort is avoided; and b) limiting the use of destructive and harmful fishing gears*
- *Management of the fish –control over the magnitude and size of the fish population by stocking, introduction of new species and other enhancement techniques as appropriate. Management here is aimed at establishing the most cost-effective approaches for enhancement.*

Management of the environment – this is pursued at two different levels: a) negotiating and arranging for adequate environmental conditions of water quality, quantity, timeliness of flow, habitat diversity, etc.; and b) promoting physical improvements to improve the support capacity for fish.

11. Human dimensions of freshwater fisheries and aquaculture

11.1. Modern trends in fisheries management suggest the introduction of social definition of a 'fishery' that includes not only fish but also anglers and all other businesses and related infrastructure involved in the provision of recreational fishing opportunities (Ditton 1996; Chen *et al.*, 2003). According to human dimension researchers anglers seek a diversity of fishing experiences which can be satisfied by providing for that diversity through variations in the fishing grounds and settings (lakes, rivers, streams and ponds) and by focusing on species that flourish in those waterbodies (Chen *et al.*, 2003).

11.2. Recreational fishing is considered as a form of tourism when anglers cross the borders to go fishing and is promoted in the name of economic development (Ditton *et al.*, 2002). It is stated further that a stakeholder approach reveals that the non-resident angler issue is quite complicated and there are many questions on perspectives of fishing tourism. For example, what can be done to make sure that the benefits of non-resident fishing tourists do not exceed the costs for resident anglers and the fishery resource, and what are environmental, economic, social and political impacts of fishing tourism.

11.3. Recreational fishing tourism in a form of eco-tourism could be considered as one of the promising ways forward. According to Ditton *et al.* (2002) 'In these cases, fishing is practiced on a catch-and-release basis and provides positive economic benefits for local communities (employment, importation of new revenues, etc.), and direct financial support (e.g. license sales, park entrance fees, sales of local crafts) in the local area. Even more importantly, it seeks to foster ethical behaviours that protect and sustain fish populations, provide political support for clean water and local conservation initiatives, promote a respect for nature and natural settings, and encourage a stewardship ethics'.

Annex V

IUCN selected fish diversity-related activities in CEE

1. Policy Statement on Sustainable Use of Wild Living Resources

The IUCN Policy Statement on Sustainable Use of Wild Living Resources was adopted at the IUCN World Conservation Congress in Amman, October 2000.

Having analyzed the uses of wild living resources in a number of different contexts IUCN concludes that:

a) Use of wild living resources, if sustainable, is an important conservation tool because the social and economic benefits derived from such use provide incentives for people to conserve them;
b) When using wild living resources, people should seek to minimize losses of biological diversity;
c) Enhancing the sustainability of uses of wild living resources involves an ongoing process of improved management of those resources; and
d) Such management should be adaptive, incorporating monitoring and the ability to modify management to take account of risk and uncertainty.

2. Analytic Framework for assessing factors that influence sustainability of uses of wild living natural resources

The Technical Advisory Committee of the IUCN SSC Sustainable Use Specialist Group has developed extremely important tool 'An Analytic Framework for Assessing Factors that Influence Sustainability of Uses of Wild Living Natural Resources' (IUCN 2001). Analytic Framework is contributing to a better understanding of the factors that affect sustainability of the use of living natural resources based a multidisciplinary approach from biological, ecological, social, economic, political, cultural and historical points of view.

3. Fishing for a Living: the ecology and economics of fishponds in Central Europe

The European Program of IUCN supported by the Dutch Ministry of Agriculture, Nature Management and Fisheries has published the results of the project 'Environmental/economic appraisal of commercial fish pond operations in four Central European countries (The Czech Republic, Hungary, Poland and Slovakia)' (IUCN 1997). The great value of this publication is in synthesis of both natural and economic values of the fishponds so necessary for balanced consi eration of the conservation and the commercial regimes required ensuring the sustainable use of natural goods and services which they provide.

4. IUCN ESUSG Fisheries Working Group

The IUCN ESUSG Fisheries Working Group (FWG) including over 30 eminent fisheries and marine experts from 24 countries in the pan-European region was established in December

1997 as one of the thematic working groups of the European Sustainable Use Specialist Group (ESUSG) of IUCN – the World Conservation Union. ESUSG is one of several regional groups, which together make up the global Sustainable Use Specialist Group within IUCN's Species Survival Commission.

The Aims of the Fisheries Working Group are to (IUCN, 1999):

a) Identify and evaluate the principles, mechanisms and elements of management, which contribute to enhancing the conservation of the biodiversity of marine ecosystem and the sustainable use of living aquatic resources.
b) Increase the conservation advantages accruing from such use by assisting policy makers, regulators, users, the general public and researchers to work together for an integrated and equitable approach to sustainable use of living aquatic resources in Europe and elsewhere.

5. Freshwater and Aquaculture Subgroup of the IUCN ESUSG Fisheries Working Group (FWG FAS)

Freshwater and Aquaculture Subgroup of the IUCN ESUSG Fisheries Working Group (FWG FAS) has been established at the Fisheries WG Meeting in Brussels, 25–27 March 2004. Sustainable use of freshwater biodiversity and the implementation of ecosystem approach to management of human activities will be among the first priority issues for FWG Freshwater and Aquaculture Subgroup.

6. IUCN/SSC Freshwater Biodiversity Assessment Programme

The Programme is integrated into the IUCN Water and Nature Initiative (WANI), and it aims to put in place a factual underpinning to support efforts to conserve and manage freshwater biodiversity. Inter alia its activities are focused on developing the methodology for identifying important freshwater biodiversity sites at local and regional scales, building an experts network, preparation of a Red List training module for use in regional workshops, etc. IUCN/SSC and Wetlands International are setting up a collaborative initiative the Global Freshwater Fish Specialist Group.

Annex VI

Summary tables of synthesis and integration of main research findings

Table AVI 1. Main characteristic elements of freshwater resources in CEE countries

Source: Country reports

Country	Characteristic elements of freshwater resources
Albania	Rivers: Drini, Buna, Mati, Shkumbini, Semani, Vjosa, Erzeni, Ishmi, Bistrica and Pavllo Lakes Shkodra, Ohrid and Prespa (Lake Prespa drains to Lake Ohrid via an underground stream) Lagoons are in the Adriatic sea, except Butrinti (Ionian)
Belarus	20,000 rivers of the Black sea and the Baltic sea basins; 10,000 lakes
Bosnia and Herzegovina	11 main river basins, all of them belong to Black Sea and Adriatic Sea basins: Sava, Neretva, Una, Verbas, Bosna,Drina, Cetina. Just a few lakes
Bulgaria	Inland water area is about 36,000 ha, Danube is the largest river. Total length of the rivers is about 21,000 km with an estimated 9,000 ha catchment area. Reservoirs in connection to the dams
Croatia	Danubian, Black and Adriatic watersheds. Rivers: Danube, Sava, Drava, Mura, Kuba, Neretva, Una, Bosut. The longest coastal rivers are the Mirna and the Rasa in Istria and Zrmanja, Krka and Cetina in Dalmatia. 7 lakes (Vrana, Prokljan, other 5 – artificial), 16 reservoirs, 12,500 fish ponds
Czech Republic	Rivers: Elbe (Lave), Morava (tributary of Danube), and Oder (Odra) 5 glacier lakes, 98 reservoirs, 8,000 ponds
Estonia	420 rivers in Estonia but only 10 longer than 100 km. Peipsi lake system which consists of three lakes – Peipsi, Lämmi and Pihkva and Lake Võrtsjärv
Hungary	Rivers: Danube (417 km Hungarian section) and Tisza (600 km Hungarian section). Lakes: Balaton 60,000 ha, Fertõ 7,000 ha (Hungarian part), Velencei-tó 2,500 ha
Latvia	12,500 rivers, most under 10 km long; 17 longer than 100 km (Daugava, Lielupe, Venta, Aiviekste, Gauja). Lakes Lubana – 8,200 ha, Razna – 5,800 ha and Engure – 3,800 ha
Lithuania	Rich in water bodies: 30,000 rivers, streamlets, brooks and canals, largest river is Nemunas. 3,000 lakes. The largest freshwater water body in Lithuania is a lagoon of the Baltic Sea – Curonian lagoon. About 650 reservoirs
Macedonia	Rivers: Vardar, Strumica, Crni Drim, Juzna Morava. Tectonic lakes: Ohrid, Prespa and Dojran
Moldova	Rivers: Yalpug, Dniester, Prut, Reut, Botna. 3,532 lakes
Montenegro	Rivers: Tara, Morča, Bojana, Lim, Ćehotina, Piva Three types of lakes: lowland, mountain and artificial accumulation lakes. Lake of Skadar
Poland	Rivers: Vistula and the Oder (Baltic and Black sea basins)
Romania	Rivers: Danube, Prut, Tisza. 450 lakes, 63% natural and 27% artificial). Most important are the lagoon, the Black sea coast and the Danube bank lakes
Serbia	50–60 natural lakes, 150 reservoirs and ponds
Slovenia	Water from 80% of Slovenian territory drains East to the Black sea or Danube river basins. The largest are Sava, Drava and Mura. The rivers Soča, Dragonja and Rižana comprise the Adriatic basin. 1,271 registered standing waters
Slovakia	Rivers: Danube and Dunajec, Morava, Váh, Nitra, Hron and Ipel', also Bodrog, Slaná and Hornád rivers. Drainage and irrigations canals, supply canals and intakes and shipping channels. 118 lakes, 60 large water reservoirs, 300 small water reservoirs and ponds. 107 glacier mountain lakes
Ukraine	73,000 rivers the Baltic, Black, Azov seas basins, reservoirs at the Dnieper, South Bug and Siverskyi Donets. 20,000 lakes

Table AVI 2. Legal and organizational basis of freshwater fishery management in CEE countries

Source: Country reports

Country	Responsible Authority	Legal Act
Albania	Directorate of Fisheries under the Ministry of Agriculture and Food	Law No. 7908 'On Fisheries and Aquaculture' (1995) as amended in 2002
Belarus	Ministry of Natural Resources and Environment Conservation	Laws 'On Conservation and Use of Fauna' (1996), 'On Environment Conservation' (1992), 'Commercial Fisheries Regulations' (1998), 'Recreational Fisheries Regulations' (1998)
Bosnia and Herzegovina	Federal Ministry of Physical Planning and the Environment, Environmental Steering Committee	Draft Law on the Protection of the Environment, Draft Law on the Protection of the Waters, Draft Law on the Protection of the Nature, Draft Law on Waste Management, and Draft Law on the Protection of the Air
Bulgaria	Ministry of Agriculture and Forestry, National Agency of Fisheries and Aquaculture	Fisheries and Aquaculture Act (2001)
Croatia	Ministry of Agriculture, National Association of Fish Producers, Fishery Product Board Pool, Croatian National Angling Union	Freshwater Fisheries Act (2001)
Czech Republic	Ministry of Agriculture	Act on Fisheries 1963/2000
Estonia	Ministry of the Environment	Fishing Act (1995)
Hungary	Ministry of Agriculture	Act (1997) and Decree No 78 (1997) on Fisheries and Angling
Latvia	National Board of Fisheries	Fishing Act (1995), Regulations on Commercial Fishing in Inland Waters of the Republic of Latvia (1998)
Lithuania	Ministry of Agriculture	Law on Fisheries
Macedonia	Ministry of Agriculture, Forestry and Water Management, Ministry of Environment and Physical Planning	Law on Fisheries (1993)
Moldova	Ministry of Environment	Animal Kingdom Act (No 439–XIII, 1995)
Montenegro	Ministry of Agriculture, Forestry and Water Management	Law on Freshwater Fisheries
Poland	Ministry of Agriculture and Rural Development	Inland Fisheries Act (1985), amended and enforced in 1999
Romania	Ministry of Agriculture, Forest, Water, and Environment, Danube Delta Biosphere Reserve Authority	Law no. 83/1993, Law on Fisheries (2001), Protection Environmental Law (1995), Water Law (1996)
Serbia	Ministry of Natural Resources and Environment Protection	Law on Fisheries (1994), Act on Fisheries Districts Announcement (1994), Act on the Closed – Season Period and Minimal Allowed Size for Catch on the Fisheries District or its Part (2003), Act on Fishing Methods, Tools and Gears (1994), Act on the Announcement of Natural Spawning Areas (1994)
Slovakia	Ministry of Agriculture	Law on Fisheries (2002)
Slovenia		Freshwater Fishery Act (1976), Animal Husbandry Act (1986), Veterinary Service Act (2001), Marine Fishery Act (2002), Environment Protection Act (1996), Nature Conservation Act (2001), Water Act (2002)
Ukraine	State Department of Fisheries, Ministry of Agricultural Policy of Ukraine	Animal Kingdom Act (1993)

Table AVI 4. Number of professional and recreational fishers, interaction and possible conflict between professional and recreational fishers

Country	Number of professional fishers	Number of recreational fishers	Interaction between professional and recreational fishers	Conflict between professional and recreational fishers
Albania	900	N/A	Significant, increasing competition	Significant, increasing, especially in lakes Ohrid and Prespa caused by competition for the decreasing fishery resource
Belarus	N/A	1,000 000	Regulated (administrative approaches)	Significant but controlled and regulated
Bosnia and Herzegovina	N/A	35,000	Insignificant	Significant
Bulgaria	2,000 highly seasonal	180,000*	Regulated by private water bodies owners	Insignificant
Croatia	35	57,221	Temporary conflicts, Gradual replacing of commercial fishery by recreational one	Significant
Czech Republic	2,600	281,000*	Co-operation, commercial fishery supports sport clubs	Insignificant
Estonia	500	50,000	Competition for the same resource	Less significant
Hungary	3,000	328,000*	Gradual replacing of commercial fishery by recreational one	Insignificant
Latvia	2,500	120,000	Competition	Insignificant
Lithuania	N/A	1,000 000	N/A	N/A
Macedonia	120 (Lakes Dojran and Ohrid)	5,000	Significant (competition for the same resource)	Significant (tourism, irrigation, hydropower generation related water level drastic fluctuations disrupting the spawning grounds)
Moldova	613	500	Insignificant	Conflict of political nature: recreational fishery has priority
Montenegro	120–150	2,500	No interactions	Significant (gravel and sand extraction, water for electricity production), controlled
Poland	6,000	2,000 000*	No particular interaction	Insignificant
Romania	1,600	105,837	Insignificant	Significant (potentially in conflict)
Serbia	N/A	88,197	Temporal and spatial competition	Significant, (forestry, gravel extraction, water-supply)
Slovakia		149,896	Insignificant	Insignificant
Slovenia	None	> 14,000	None	None
Ukraine	N/A	5,200 000 (broad estimate)	Competition	Regulated, zones for commercial and recreational fishery

* Cowx (1998)

Table AVI 5. Fishing-related causes of biodiversity loss

Source: Country reports

Country	Over-fishing	By-catch of non-target fishes	Depletion of genetically distinct stocks
Albania	Significant (illegal fishing with illegal fishing tools, inefficient control and enforcement)	Less significant (e.g. by-catch of young undersized koran *Salmo letnica* in Ohrid lake)	Threat of depletion of genetically distinct stocks in the case of restocking natural lakes with common carp from different origin (local, Chinese and Hungarian).
Belarus	Significant (caused by recreational fishery)	Significant (by-catch of young fish, unlimited catch and by-catch of fishes that play an important role in freshwater ecosystems; catch and by-catch of rare and endangered fish species)	Significant
Bosnia and Herzegovina	N/A	Significant	Significant
Bulgaria	Significant	Significant (by-catch e.g. of young sturgeon)	N/A
Croatia	Significant (decrease of spawning grounds, growing fishing efforts)	Less significant (larger lakes)	N/A
Czech Republic	Significant (compensated by continuous stocking)	Insignificant	N/A
Estonia	Significant but under control	Less significant	N/A
Hungary	Significant (partly compensated by stocking)	Insignificant	Insignificant
Latvia	Moderate (catches under control)	Insignificant (catches under control)	N/A
Lithuania	Significant (especially salmon and trout in Curonian Lagoon)	N/A	N/A
Macedonia	Significant (*Salmo letnica*, trout belvica *Achantholingua ohridana*, native carp)	Less significant	No data
Moldova	Significant	Significant	Significant
Montenegro	Significant	Significant	Insignificant
Poland	Significant	Less significant	N/A
Romania	Significant	Significant (risk of disturbing habitats of protected species)	Significant (pollution, over-fishing)
Serbia	No reliable data	Significant	Significant
Slovakia	Significant	N/A	N/A
Slovenia	Significant (tried to be solved)	Insignificant (released immediately)	Less significant
Ukraine	Significant	Significant	Significant

Table AVI 6. Biodiversity loss causes other than fishing

Source: Country reports

Country	Physical impacts on habitat	Persistent contaminants	Overload of nutrients	Spread of diseases
Albania	Significant (decrease and loss of natural spawning grounds and habitats, barrages)	Significant (industrial untreated liquid discharges)	Significant (eutrophication)	Insignificant
Belarus	Significant (drainage reclamation, hydraulic engineering construction)	Significant (chlorides, sulphates, organic matters, mineral oil, phosphates, ammonium nitrogen, nitrates, nitrites, copper, chromium, zinc, ^{137}Cs, ^{90}Sr)	Significant (isolated lakes, slow running waters)	Significant (swim-bladder nematode Anguillicola crassus), decreasing
Bosnia and Herzegovina	Significant (dams, flood protection facilities)	Less significant, decreasing	Significant (eutrophication)	Significant (Enteritic red mouth disease, Bacterial kidney disease, Furunculosis salmonis, Erythrodermatitis cyprini)
Bulgaria	Most significant (reduction of natural spawning habitats)	Significant (general pollution)	Significant (eutrophication)	Insignificant
Croatia	Significant (hydroelectric power plants, constructed barrages, changes in riversides, interrupted fish migration routes)	Significant (organic wastes, nutrients, pesticides, metals, poisons, suspended solids and cooling water from urban, industrial and agricultural sources)	Significant (sewage)	Insignificant
Czech Republic	Significant (dams, weirs, decrease of natural spawning habitats)	N/A	Significant (eutrophication)	Insignificant
Estonia	Significant (dams, decrease of natural spawning habitats)	N/A	Less significant	Insignificant
Hungary	Significant for rivers (constructions), less significant for still-waters	Less significant, decreasing	Less significant	Insignificant
Latvia	Insignificant	N/A	N/A	N/A
Lithuania	Significant (dams, polders, reduction of natural spawning sites)	Significant (general pollution)	Significant (eutrophication)	Insignificant
Macedonia	Significant (digging sand from the riverbeds, drying the wetlands, destroying the reed belts, diversion of some rivers and streams, disrupting the spawning habitats with dripped nets, shoreline urbanization)	No data (organochlorine pesticides in Lake Ohrid)	Significant	Less significant (freshwater crayfish Astacus only)

Country	Physical impacts on habitat	Persistent contaminants	Overload of nutrients	Spread of diseases
Moldova	Most significant (reduction of natural spawning habitats)	Less significant	Significant (eutrophi-cation, accidental sewage spills)	Insignificant
Montenegro	Significant (dams)	Significant (during low water level in summer, pollution)	Significant (destruction of the balance)	Insignificant
Poland	Significant (dams, decrease of natural spawning habitats)	N/A	Significant (eutrophication)	Significant (infection of eel with bladder parasite)
Romania	Significant (canal, dike, reservoir construction, gravel extraction, interruption of the fish migration)	Uncertain (heavy metals, pesticide in fish flesh)	Significant (eutrophication)	Significant but not sufficiently documented
Serbia	Significant (hydropower plants, draining activities, dams)	Less significant (emission of pollutants from the copper mining, metal-processing facilities)	Significant	Insignificant
Slovakia	Significant (dams, barrages, decrease of natural spawning habitats)	Significant (PCB contamination)	Insignificant	Insignificant
Slovenia	Significant (dams, speeding up river flow, building dikes for flood protection, decrease in fish biodiversity)	Insignificant	Significant (fertiliser and manure, sewage)	Insignificant
Ukraine	Significant (dams and reservoirs, decrease of natural spawning habitats)	Significant (PCB, heavy metals, arsenic)	Significant (especially for reservoirs causing mass kills of aquatic organisms)	Significant but not sufficiently documented

Table AVI 7. Driving forces of biodiversity decrease

Source: Country reports

Country	Increasing demand from recreational fishing sector	Increasing demand on water for purposes other than fishery	Increasing intensive use of fishery ecosystem	Increasing market demand and consumption	Increasing illegal trade
Albania	Significant (unemployment-related illegal fishing)	Less significant (hydr-oelectric power stations, artificial reservoir used for irrigation, tourism)	Significant, (decreasing abundance of non-stocked fishes)	Significant (stable for the freshwater, increasing for marine and lagoon species)	Significant (good prices for freshwater fish, inefficient control and enforcement)
Belarus	Significant (low incomes, unemployment-related illegal fishing)	Significant (dams, digging, navigation, hydropower stations, pond fish farms, recreation, waters from drainage network, sapropels extraction	Insignificant	Significant (Increasing trade and internal market demand)	Significant (illegal commercial catch and poachers' catch)

Country	Increasing demand from recreational fishing sector	Increasing demand on water for purposes other than fishery	Increasing intensive use of fishery ecosystem	Increasing market demand and consumption	Increasing illegal trade
Bosnia and Herzegovina	Significant	Significant (tourist activities, rafting, and use motor engine boats, hydro power plants)	Significant (lack of proper regulation)	Less significant but stable	Significant
Bulgaria	Significant (unemployment-related illegal fishing)	N/A	N/A	Significant	Significant
Croatia	Uncertain	Less significant (extraction of water for human use, mass tourism, speedboats and jet skis, waves, ships' pollution, Sava – Dunav connection), controlled	Significant (disappearance of non-stocked species)	Significant (through super- and hypermarkets)	Significant (non-declared catch on large rivers and floodplains)
Czech Republic	Insignificant	Significant (small hydro-power stations, Danube-Odra-Elbe Canal)	Insignificant	Insignificant	Less significant but increasing
Estonia	Significant (unemployment-related illegal fishing)	Insignificant	Moderate	Significant	Less significant but stable
Hungary	Uncertain	Insignificant	Significant (decrease in abundance of non-stocked fishes)	Insignificant	Moderate (trade in illegal fish, high value species in lakes and border rivers)
Latvia	Insignificant	Insignificant	Moderate	Insignificant	Insignificant
Lithuania	Significant (unemployment-related illegal fishing)	Significant (polders)	Insignificant	Significant	Significant
Macedonia	Significant	Significant (Lakes Dojran and Prespa)	Less significant	Significant (Lake Ohrid trout)	Significant (Lake Ohrid trout)
Moldova	Significant (unreported recreational fishing)	Insignificant	Insignificant	Significant (Moldova and Ukraine fish markets)	Significant (inefficient control)
Montenegro	Insignificant	Significant (small mountain lakes)	Significant	Significant (holidays)	Significant, decreasing
Poland	Significant (unemployment-related illegal fishing, increasing tourism)	N/A	N/A	N/A	N/A
Romania	N/A	N/A	N/A	Illegal trade and poaching	Significant
Serbia	Preservation of the commercial fishing, recreational fisheries constant	Significant (streams and rivers in summer, building dams)	Significant (gravel holes)	Significant (orthodox sacral holidays)	Less significant

Country	Increasing demand from recreational fishing sector	Increasing demand on water for purposes other than fishery	Increasing intensive use of fishery ecosystem	Increasing market demand and consumption	Increasing illegal trade
Slovakia	Significant (overcapacity of recreational fishers)	Insignificant	Insignificant	Insignificant	Insignificant
Slovenia	Insignificant (only sport fishing)	Significant (irrigation, hydroelectric plants, aquaculture, industry)	N/A	Significant	N/A
Ukraine	Significant	Significant (agricultural, urban, energy sector)	Uncertain	Significant	Significant

Table AVI 8. Measures aimed at protecting biodiversity

Country	Precautionary approach and reduction in fishing pressure	Technical conservation measures	Integration of biodiversity consideration into fisheries policies	Habitat estoration and reducing water contamination	Limit introduction of new and non-indigenous species
Albania	Implement the Law on Fishery and Aquaculture, development and implementation of the management plans (Law enforcement issue is the mot critical one)	Close seasons and areas minimum mesh size of fishing gear; type of fishing gear; legal minimum fish size for commercial species	Not specifically integrated	Priority issue (preservation, rehabilitation and restoration of inland water bodies, restoration of the spawning areas, creation of the artificial fish 'path ways')	Require a special permission of the Ministry of Agriculture and Food based on a opinion of the ministry of Environment
Belarus	Development of the draft of Law 'On Fishery', regulations by the State Inspection	Implement 'Commercial Fishery Regulations', prohibit the electro fishing for commercial use	Not implemented	Not implemented Implementation of Regulations for protected zones and riversides of the small rivers	Implementation of Regulations concerning introduction and acclimatization of fishes and other hydrobionts, ICES/EIFAC Codes
Bosnia and Herzegovina	Prohibition of fishing for all endemic species, establishment of closed areas, size restriction, monitoring of fish catching, education, establishment of separate department at the Ministry of Agriculture, Water Management and Forestry	Adaptation of the legislation, installation of the filters on fish farms, strengthening of the de-mining activities	Creation of the suitable conditions for joint research, improvement of the communication and information exchange, inspectorate for the fishery	Implementation of provisions from the Law on Waters in practice, construction of waste water treatment plants, organic agriculture (reduction of nutrient overload)	Necessary to apply ICES/EIFAC Codes

Country	Precautionary approach and reduction in fishing pressure	Technical conservation measures	Integration of biodiversity consideration into fisheries policies	Habitat estoration and reducing water contamination	Limit introduction of new and non-indigenous species
Bulgaria	Implement Fisheries and Aquaculture Act and secondary legislation	Implement range of technical measures under Fisheries and Aquaculture Act	Implement Biological Diversity Law (2002), CITES recommendations (sturgeon)	Restoration of spawning grounds, fish 'path ways', restocking, water purification	Implement ICES/EIFAC Code of Practice, 'genetic certificate' of fish origin
Croatia	Implement Act on freshwater fishery, Act on Nature conservation, Act on Water Management	Implement range of technical measures (closed seasons, mesh size, etc.)	Ministry of Agriculture, monitoring programs 2002, 2003, preparation of the EU water framework directive	Few programs, planning of the sewage system	Implement present legislation
Czech Republic	Implement Act on Fishery and Act on Waters	Implement Act on Fishery and Act on Waters	Implement Act on Fishery and Act on Waters	Implement Act on Fishery and Act on Waters	Implement restricted introduction
Estonia	Implement Fishing Act and relevant secondary legislation	Implement Fishing Act and the Fishing Rules	Implement Fishing Act, Sustainable Development Act, Sustainable Environmental Action Plan, Estonian Biodiversity Strategy and Action Plan	Implement National Plan of IBSFC Salmon Action Plan, Water Act	Implement Fishing Act, Estonian Biodiversity Strategy and Action Plan, ICES/EIFAC Code of Practice
Hungary	Implement county level 5 year management plans	Technical conservation measures are the part of county level management plans	Recent efforts are focusing on the relevant research	Habitat restoration measures are the part of county level management plans	Implement introduction restrictions, culture of non-indigenous species is not limited
Latvia	Implement the Fishing Act and relevant secondary legislation	Implement the Fishing Act and relevant secondary legislation	Recent efforts are focusing on the relevant research	Restoration of spawning grounds of migratory fish in some small rivers	Implement the Fishing Act and relevant second-ary legislation
Lithuania	Implement Law on Fisheries and secondary legislation	Implement Law on Fisheries and secondary legislation	Recent efforts are focusing on the relevant research	Implement Law on Fisheries, Law on Wildlife and secondary legislation	Implement Law on Fisheries, Law on Wildlife and secondary legislation
Macedonia	Preparing of the National Biodiversity Conservation Strategy, signing trans-boundary joint fishery plans, scientific recommendations, Order of the Minister of Agriculture, Forestry, and Water Management	Implement Fishery Law, scientific recommendations	Revision of Fishing Law, integration of the biodiversity concept	Revitalization of some lake habitats	Implement Fishery Law

Country	Precautionary approach and reduction in fishing pressure	Technical conservation measures	Integration of biodiversity consideration into fisheries policies	Habitat estoration and reducing water contamination	Limit introduction of new and non-indigenous species
Moldova	Implement adopted relevant legislation, limit the catches and number of fishing licenses	Implement relevant regulation	Raising public awareness (creating national park, publishing book)	Restoration of mouths of small rivers	Implement relevant limitations
Montenegro	Increasing the awareness of citizens, changing of fishing methods and equipment, protection of spawning grounds	Implement secondary legislation, drafting of a new law, participation of police officers and citizens	Regular monitoring, intensive consultations of experts and interested users	Implementation of ecological principles, extraction of gravel and sand, installation of purification filters, recommendations and training of farmers	Not planned for the near future
Poland	Implement catch regulation and mandatory management plans	Implement technical conservation measures according to legislation	Recent efforts are focusing on the relevant research	Implement mandatory management plans	Implement relevant limitations
Romania	Implement control of input strategy by limitation and decreasing of fishing capacity, first and second fishing effort	Implement Fisheries Law	Research and training programs on sustainable management	N/A	Implement Law on Environmental Protection and consequent Ministerial Order, ICES/EIFAC Code
Serbia	Implement legal obligations, Fisheries Law, drafting of the new Law on Fisheries, the Fisheries Strategy	Establishment of registered hatcheries and their licensing for work, establishment of the CITES-proscribed system	Draft of the new Law on Fisheries, educational activities	Fisheries district managers, preparation for implementation of the E.C. Water Framework Directive	Approved by the relevant Minister
Slovakia	Full enforcement of Law on Fisheries (2002) and Law on Waters (2002)	Full enforcement of Law on Fisheries (2002) and Law on Waters (2002)	Implement the Action Plan of the Convention on Biological Diversity	Full enforcement of Law on Fisheries (2002) and Law on Waters (2002)	Full enforcement of Law on Fisheries (2002) and Law on Waters (2002)
Slovenia	Anglers' societies	Fish paths, regulation of allowed fishing tools (limited number of fishing rods, barb-less hook, only certain type of bait)	N/A	Construction of water cleaning plants	Implement Nature Conservation Act, written order from Ministry of Environment, Physical planning and Energy
Ukraine	Development precautionary approach related legislation, more efficient fishery regulation	Better regulation on fishing net material and construction to achieve necessary selectivity	Gap between research, policy statements and management measures to protect biodiversity	Creation of protected areas along river banks	Fully enforce the Animal Kingdom Act

Annex VII

Details of major international organisations IUCN could seek observer status or pursue dialogue with

1. European Inland Fisheries Advisory Commission (EIFAC)

European Inland Fisheries Advisory Commission was established in 1957 (Resolution of FAO Council under Article VI–1 of FAO Constitution) with the Headquarters in Rome, Italy. EIFAC's area of competence is inland waters of Europe.

EIFAC Member Countries are: Albania, Austria, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, The Czech Republic, Denmark, Estonia, European Community, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Latvia, Lithuania, Luxemburg, Netherlands, Norway, Poland, Portugal, Romania, Slovak Republic, Spain, Sweden, Switzerland, Turkey, and the UK.
The objectives and functions of EIFAC have been defined as follows (EIFAC/XVIII/94/Inf.3):

The objectives and purposes of the Commission shall be to promote improvements in inland fisheries and to advise member Governments and FAO on inland fishery matters;

The functions of the Commission shall be:

(a) to assist in the collection and dissemination of pertinent information;
(b) to propose and assist in the organization of appropriate symposia;
(c) to promote liaison and cooperation among governmental organizations;
(d) to advise on the evolution of an organized approach among interested governments of this region toward the development of inland fisheries as may seem desirable and feasible; and
(e) to advise on any other matters appropriate to the promotion of the development and utilization of the inland fisheries within the competence of the Organization.

EIFAC is lacking any regulatory function and enforcement power. IUCN could seek observer status with EIFAC.

2. International Council for the Exploration of the Sea (ICES)

ICES is the organization that coordinates and promotes marine research in the North Atlantic. This includes adjacent seas such as the Baltic Sea and North Sea. ICES acts as a meeting point for a community of more than 1,600 marine scientists from 19 countries around the North Atlantic.

ICES has been active in developing the practical guidelines and advice on the conservation and sustainable use of aquatic biodiversity, including biodiversity related ecological quality elements (EcoQs) and ecological quality objectives (EcoQOs).

IUCN could pursue dialogue with ICES.

3. The Helsinki Commission (HELCOM)

The Helsinki Commission, or HELCOM, works to protect the marine environment of the Baltic Sea from all sources of pollution through intergovernmental co-operation between Denmark, Estonia, the European Community, Finland, Germany, Latvia, Lithuania, Poland, Russia and Sweden.

HELCOM is the governing body of the 'Convention on the Protection of the Marine Environment of the Baltic Sea Area' – more usually known as the Helsinki Convention. Convention on the Protection of the Marine Environment of the Baltic Sea Area, 1992 (entered into force on 17 January 2000). HELCOM on cooperation with International Baltic Sea Fishery Commission (IBSFC) is active to aid the wild Baltic Salmon to recover from its depressed state. HELCOM is also active in implementation together with ICES and IBSFC the Baltic Sea Regional Project (BSRP) – one of the most important recent developments in the Baltic Region covering the whole catchment area of the Baltic Sea.

IUCN could pursue dialogue with HELCOM.

4. International Baltic Sea Fisheries Commission (IBSFC)

The International Baltic Sea Fishery Commission was established pursuant to Article V of the Convention on Fishing and Conservation of the Living Resources in the Baltic Sea and the Belts (the Gdansk Convention) which was signed on the 13th September 1973. Today, there are six Contracting Parties: Estonia, the European Community, Latvia, Lithuania, Poland and the Russian Federation. The IBSFC competence is defined as follows in Article 1 of the Convention: 'The Contracting States shall co-operate closely with a view to preserving and increasing the living resources of the Baltic Sea and the Belts and obtaining the optimum yield, and, in particular to expanding and coordinating studies towards these ends, ...'

The IBSFC has been appointed as lead agency to develop an Agenda 21 for the Fishery Sector of the Baltic Sea. In February 1997, the IBSFC, at its first Extraordinary Session since its establishment, adopted a Resolution VI on an 'Agenda 21 for the Baltic Sea Region' and established a Working Group to draft such an Agenda to cover the fish resources and the associated impact of fisheries on the Baltic Sea environment.

The IBSFC contribution to Baltic 21, as it became known, was discussed at its 23rd Annual Session in 1997. Following its designation as Baltic 21 lead agent for fisheries, the IBSFC was requested to include coastal aquaculture and river and lake fisheries, all of which were normally outside its competence. The IBSFC was also asked to consider cross-sectoral issues, including the influence of environmental conditions on fisheries and vice versa.

An important freshwater fishery related issue for IBSFC is the protection of biodiversity of the migratory fish – wild Baltic Salmon. The main goal is to restore wild Salmon populations, the target being to increase the production to at least 50% of the potential capacity of each river in the Baltic Region by the year 2010. An important aim by that is to achieve self-sustaining populations with no need for human intervention such as release of fish.

5. European Anglers Alliance (EAA)

The European Anglers Alliance, launched in 1994, is a pan-European organization located in Brussels. It was founded to act as an interlocutor for the authorities (European Parliament in Strasbourg, European Commission in Brussels) and various other organizations. It represents

18 countries with 5 million affiliated anglers in membership and acts to protect the interests of 25 million anglers across Europe. It cooperates closely with the European Fishing Tackle Trade Association, and together supports a combined business of 25 billion euros.

Today the Alliance brings together 19 nations (Macedonia and Latvia are new members), and in Brussels it has an office and a general secretary. Its activities include lobbying (presence, handing in of files, etc.) the European Commission and members of the European parliament.

The Alliance has taken an interest in the salmon in the Atlantic and the Baltic whose populations have severely declined over the last 40 years. The causes are well-known and the Alliance supports the steps of specialized associations for the protection of this fish (NASCO), and in particular the consequences of industrial aquaculture, gill nets, etc. The conservation of the sea trout also figures highly on the agenda of the EAA. The problems of eel fishing and elvers show that the species is endangered in numerous European countries. Economic importance of angling: studies carried out all over Europe have shown the economic weight of angling in fresh water.

EAA has been contacted by IUCN to discuss the possibility of promoting the practical implementation of the principles and guidelines of sustainable use at national and international levels.

6. European Aquaculture Society (EAS)

The European Aquaculture Society was established in 1976 as an international, non-profit association, with the principal objective of being the European forum for contacts and information exchange for those having an interest in European aquaculture. EAS currently has members in 59 countries worldwide, working in all fields related to aquaculture. Membership is open to anyone and no membership qualifications are required.AquaFlow is a well-established network of leading aquaculture institutions in Europe, which has been under development since January 1998 as a FAIR project (FAIR-CT97-3837) and currently a Concerted Action (Q5CA-2000-30105) of the European Commission. AquaFlow is co-coordinated by EAS and its management partner is the Federation of European Aquaculture Producers (FEAP).

The network disseminates technical leaflets, in 16 languages across 19 European countries to an estimated 150,000 aquaculture SME end-users. Each technical leaflet contains aquaculture RTD information summarizing EU-funded or National research projects written in an accessible, easy to read, producer-oriented language. Important freshwater fishery issues in relation to aquaculture and possible IUCN activities in the field of European freshwater fisheries, to list some of them, could be:

- Potential impact of new non-indigenous species to aquaculture;
- Genetic impact on wild populations of escapees and release both accidental as well as for restocking, from farming activity;
- Transfer of diseases and parasites between farmed and wild populations.

7. Baltic Sea Regional Project (BSRP)

The overall aims of the project are to improve the Baltic marine environment, to promote sustainable use of the area, and to maximize economic benefits for coastal communities (information from the ICES web site).

The long-term objective of the BSRP is to introduce ecosystem-based assessments to strengthen the management of Baltic Sea coastal and marine environments. This will be achieved through regional cooperation and targeted, cost-effective trans-boundary coastal, marine and watershed activities.

The total budget for the five-year project (2003–2008) will be in the region of US$ 40 million of which a GEF grant will provide US$ 18 million to the recipient countries, Estonia, Latvia, Lithuania, Poland, and the Russian Federation. Additional funding will come from various grant programs of the European Union and bilateral assistance from cooperating countries; Denmark, Finland, Germany, Sweden, Norway and USA.

IUCN could pursue dialogue with BSRP in order to coordinate the efforts especially in the area of sustainable use of freshwater fishery resources (socioeconomic issues, freshwater part of the life cycle of salmon, trout and eel).

8. The Istanbul Commission

The Commission functions in accordance with the Convention on the Protection of the Black Sea Against Pollution (the Bucharest Convention). Its main task is to implement the Convention Strategic Action Plan for the Rehabilitation and Protection of the Black Sea. Activities of the following Advisory Groups of the Commission are relevant to the current IUCN work in the filed: Advisory Group on the Conservation of Biological Diversity (coordinated by a centre in Batumi, Georgia) and Advisory Group on the Environmental Aspects of the Management of Fisheries and other Marine Living Resources (coordinated by a centre in Constanta, Romania).

Annex VIII

Recommendations to facilitate progress towards the ecosystem approach in freshwater fisheries management to reverse the decline in stocks and the related biodiversity decline by 2010

Developed by the participants of International Workshop 'Sustainable Management of Freshwater Fisheries and Nature Conservation in Central and Eastern European Countries'
(Jachranka, Poland, 12–13 December, 2003)

1. Guiding principles for CEE governments, fishery managers and aquaculture producers for a sustainable use of freshwater fishery resources

1.1. General

1) Implement the ecosystem approach to management of freshwater fishery and aquaculture-related human activities based on ecosystem indicators and benchmarks.

2) Apply the precautionary principle to fisheries management: i) to achieve conservation of exploited populations and their sustainable development by control of fishing mortality rate, and ii) to minimize the impact of fishing activities on freshwater ecosystems, and in particular non-target species and sensitive habitats.

3) Ensure that other uses of habitats, fish stocks and waters will do little or no harm to freshwater fishery and aquaculture or the implementation of the ecosystem based management approach.Ensure that proper methodology is available and used for measurement and comparison of socio-economic outcomes from various uses of freshwater fishery resources in order to ensure a sensible basis of information for decision-makers on complex problems.

1.2. Fisheries

1) Improve environmental sustainability and human well-being and equity through proper management and non-exhaustive use of the freshwater fishery resources in their aquatic environment for efficient and effective delivery of food, economic wealth and recreation. These should particularly be realized through development and implementation of long- and short-term planning at national and local levels and definition of the socio-economic strategy for fisheries development.

2) Ensure that stakeholders are more closely associated to the biodiversity conservation and ecosystem management process, in data collection, knowledge building, option analysis, decision making and implementation.

3) Integrate the management of freshwater fisheries and other relevant uses of fish and waters, and develop functional connections among nature/biodiversity conservation organisations, freshwater fisheries management institutions, other sectoral institutions, and business.

4) Apply 'the user-pays' principle. Allocate freshwater fishery resources user rights ensuring that authorized users should pay for the exclusive privilege granted to them to use a public resource. It is of a particular concern in countries where anglers' associations are underdeveloped.

5) Apply the precautionary principle, where there are possible threats of serious or irreversible damage to freshwater ecosystems.

6) Ensure that freshwater fishery is conducted in a manner that does not lead to over-fishing and depletion of other aquatic resources through revision and development of the legislative, management, economic and educational tools.

7) Ensure that potentially irreversible risks of changes to the freshwater ecosystems are minimized (e.g. construction of passages for migratory species at dams) and depleted fish populations are restored (either in-situ or ex-situ).

8) Minimize the impact of freshwater fishery on the structure, function and biological productivity of the freshwater ecosystem (i.e. resource use must be below the sustainability threshold to limit negative impact on the ecosystem). Revision of the legislation on closed seasons and closed areas, quota and size of fish for catch, number and size of fishing gear is to be exercised to meet the recommendation.

9) Consider species interactions, maintain ecological relationship between harvested, dependent and related species, minimize by-catch and discards from commercial and some recreational fishing (with nets) and acknowledge angler's Catch & Release as a useful tool in sustainable management plans.

10) Maintain ecosystem integrity ensuring: i) maintenance of biodiversity at biological community, habitat, species and genetic levels; and ii) maintenance of the ecological processes that support both biodiversity and resource productivity.

11) Ensure compatibility of management measures across the freshwater fishery resource range (across jurisdictions and management plans).

12) Utilise principles and best practices of Integrated Coastal Zone Management (ICZM) in freshwater fisheries.

1.3. Aquaculture

1) Promote best practice for Environmental Impact Assessment (EIA) for aquaculture projects with the requirement that intensive fish-farming projects be subject to EIA provisions.

2) Limit introduction of new non-indigenous species to aquatic aquaculture and promote the application of International Council for Exploration of Sea's (ICES) Code of Practice on the Introductions and Transfers of Marine Organisms of and FAO's European Inland Fisheries Advisory Commission's (EIFAC) Code of Conduct for Responsible Fisheries.

3) Develop research to provide enhanced knowledge related to aquaculture including knowledge on genetic impact on wild population of escapees from farming activity.

4) Promote technological improvement of farming facilities to reduce escapement from aquaculture activities.

5) Promote financial, economic and educational measures to reduce direct impact on the environment of waste products from aquaculture installations.

6) Avoid aquaculture installations and practices that may affect habitat conservation through occupation of sensitive areas.

7) Avoid aquaculture installations and practices imposing negative impact on the activities of other fish resource users referred to in the FFPCEE.

2. Recommendations to CEE governments on legal, financial and economic instruments

2.1. Recommendations to CEE governments on legal instruments

1) Evaluate and identify the gaps in national legal and enforcement instruments relevant to ecosystem approach to fisheries (EAF) and liaise with the IUCN Freshwater Fisheries Program for Central Europe (FFPCEE).

2) Review and evaluate the status of implementation of the Convention on Biological Diversity (CBD) in CEE in relation to EAF.

3) Facilitate the explicit recognition of EAF principles reflected mainly in voluntary instruments such as the Rio Declaration, Agenda 21, FAO Code of Conduct for Responsible Fisheries, and the Reykjavik Declaration in the instruments of regional fisheries organisations and arrangements.

4) Facilitate EAF integration into existing national legal instruments and the practices of other sectors that interact with or impact on freshwater fisheries and ensure that adjustments to those instruments and practices are considered in all relevant sectoral policies.

5) Facilitate development of more complex sets of national rules or regulations that recognize the impacts of fisheries on other sectors and impact of those sectors on fisheries.

6) Facilitate development of national legislation specifying consultation and cooperation among the specific fisheries agency, institutions dealing with other fisheries and with other interacting sectors including nature/biodiversity conservation institutions and organizations.

7) Ensure that the national primary legislation should specify the functions, powers and responsibilities of government and other institutions involved in fisheries management as well as include the geographical area and the interested parties.

8) Ensure involvement of the broad public and stakeholders in all stages of policy development and implementation to fulfill the IUCN FFPCEE.

9) Promote sub-regional fisheries legislation and management for shared trans-boundary resources. It is of a special concern in the countries of the Danube, the Dnieper, and the Dniester catchments, Ohrid and Prespa lakes.

10) Improve catch statistics, particularly though introduction of obligatory reports by anglers' associations and fishermen to address volume of unreported fishing characteristic in the majority states of the CEE region.

2.2. Recommendations to CEE governments on financial instruments

1) Identify financial instruments and sources of funds available to enable all relevant stakeholder organisations to work with governments to shift to the sustainability of freshwater

fisheries and aquaculture. Stakeholders (through their organisations), IUCN and its members should specifically assist in:

2) Developing the national strategies/policies/programs and Fishery Management Plans under the ecosystem approach to fisheries (EAF) aimed at sustainable use of freshwater fishery resources;

3) Developing the national research programs on (i) ecosystems and fishery impact assessments, (ii) socio-economic considerations, (iii) assessment of management measures, (iv) assessment and improvement the management process, and (v) monitoring and assessment;

4) Raising awareness of the role and responsibilities of the stakeholders regarding EAF management and management regime that encourages high levels of compliance and strong self-regulation;

5) Capacity building of the governmental agencies through revising the number of the officials and its increase if necessary, conduction of specific training courses, and examining of the staff;

6) Assessing costs and benefits of EAF based e.g. on a system of integrated environmental and economic accounts (SEEA).

2.3. Recommendations to CEE governments on economic instruments

1) Define the user groups of freshwater fishery resources (e.g. full-time and part-time commercial fishers, leisure fishers, anglers, sports fishers, etc.).

2) Define and enforce user rights of different groups of freshwater fishery resources in order to provide incentives in such a way that the benefits to the holders of the rights are linked to the productivity of the fishery resources.

3) Assign rights to shares of freshwater fishery that are specified by the nature of the fishery, the type of entities that hold rights and rules about transferability and enforceability of rights (shares that are specified as fishing effort units, or fishing areas and time permits may be more acceptable to fishers, easier to enforce and not so dependent on scientific advice).

4) Where appropriate, assign user rights in the local community which then takes responsibility for further allocation and monitoring of the use of the freshwater fishery resource.

5) Where appropriate, establish eco-labelling schemes to create market based incentives for environmentally friendly freshwater fishery products and fishing technologies in order to provide consumers with the opportunity to express their environmental and ecological concerns through their choice of products.

6) Contribute to communication, education, training and awareness rising of the main stakeholders in order to improve the quality of the societal choices in relation to strategic and operational ecological and economic objectives.

7) Promote the application of the adaptive management practices in order to shift to sustainable way of management integration, which take into account the complex economic interests of all the relevant stakeholders.

8) Facilitate the removal of subsidies leading to excess fishing pressure (high fishing pressure over long time has decreased the stocks and the catches of many valuable freshwater fish-

es, and may have led to reduced genetic variability and less effective food webs). Introduce subsidies and low taxes to fisheries associations and fish farms exercising sustainable practices.

9) Facilitate the removal of excessive non-sustainable fishing capacity, which adversely affects the relevant economic and social aspects of the freshwater fisheries or the implementation of eco-system based management.

10) Revise the penalties rates relevant to fisheries and consider their increase as a tool to address illegal and unreported fishing – a common, and in some countries developing phenomenon in the CEE region.

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IUCN – THE WORLD CONSERVATION UNION

Founded in 1948, The World Conservation Union brings together states, government agencies, and a diverse range of non-governmental organisations in a unique worldwide partnership; over 1000 members in all, spread across some 140 countries.

As a union, IUCN seeks to influence, encourage and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable.

The World Conservation Union builds on the strengths of its members, networks and partners to enhance their capacity and to support global alliances to safeguard natural resources at local, regional and global levels.

EUROPEAN PROGRAMME 2005–2008

The IUCN European Programme mission is to contribute to a sustainable Europe by influencing policy development and implementation for biodiversity and landscape conservation, restoration and sustainable use inside and outside Europe. In practical terms, the mission translates into the following objectives:

Supporting the Union in Europe and the EU – Improved support framework for the global work of IUCN through the EU and other European partners; improved European membership services, including capacity building

Understanding the main drivers of biodiversity change – Improved knowledge of biodiversity change and effective conservation measures at landscape, ecosystem, habitat and species levels

Financing nature conservation – Efficient incentive frameworks for biodiversity conservation and sustainable use are available and understood

Linking education, science, policy and practice – National and supranational (EU) policies, multilateral agreements, processes and institutions are more supportive of biodiversity conservation and ecologically sustainable use

Managing our natural heritage – Ecosystems are managed in a sustainable manner, reconciling social, economic and biodiversity objectives

The European Programme seeks to make IUCN's voice heard through providing authoritative information and policy products, whilst applying the expertise in the European constituency of IUCN. These will be the result of integrating the diverse expertise of the Commissions, members and the worldwide IUCN secretariat to address the key drivers of biodiversity loss. The IUCN European Programme provides the platform for bringing the expertise together, coordinating development of the products and obtaining financial resources.

The IUCN Programme Office for Central Europe – current fields of activities

The IUCN Programme Office in Warsaw has a ten years experience in providing information on current topics related to biodiversity management. The office's expertise in compiling and disseminating information to key societal actors currently serves four major fields of activities:

- Ecological Networks – development of the ecological network in Ukraine. Uniting world experience to support a Global ECONET
- Agriculture – integrating environmental and consumer organisations of the CE region into the discussion of the European agricultural policy reform, and Integrating biodiversity protection concerns into the development of rural areas by linking instruments of the future Natura 2000 sites with Rural Development Plans in the CE region
- Forestry – raising awareness and building capacity among private forest owners in the CE region, developing nature conservation guidelines for afforestation projects
- Fishery – promoting sustainable management of freshwater fisheries in 19 countries of Central and Eastern Europe

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The World Conservation Union

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