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Biodiversity Action Plan

for

Fisheries

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1. INTRODUCTION

1. This document proposes certain management objectives and measures in relation to the conservation and sustainable use of biodiversity in fisheries and aquaculture. The European Community Strategy for Biodiversity includes a requirement for the formulation and implementation of strategies that will enable the 'conservation and sustainable use of biodiversity' across all policy sectors. The fisheries sector, which encompasses aquaculture, impacts marine, coastal, estuarine and partly terrestrial biodiversity in many ways is, therefore, particularly subject to this requirement. The European Community Biodiversity Strategy¹ was adopted by the Commission as a Communication to the Council and the Parliament in February 1998 and this was endorsed by the Council in February and by the Parliament in October 1998.
2. Most of the concerns about fisheries and aquaculture impact on the biological diversity have centred on the effect of over fishing, physical impact on the habitat, overload of nutrient and spread of diseases. Less concern has been raised about possible genetic effects of decades of high and size selective fishing pressure.
3. High fishing pressure over long time has lead to that the spawning stocks for many ground fish stocks are at critical levels and some even close to collapse such as most cod stocks and hake. High fishing pressure may lead to reduced genetic variability and less effective and simplified food-webs where the energy flow in the ecosystem have been severely disturbed. Possible consequences are less resilient and less stability in the ecosystem. In addition such ecosystem may have reduced capacity to adjust to natural changes in the environment.
4. The extent of the seriousness is not fully understood as the actual extent of impacts by fisheries including aquaculture on biodiversity remain poorly understood, particularly in relation to genetic diversity, functional and ecosystem diversity. This poses a risk that serious damage might be incurred unnoticed. The very slow recovery of some stocks in the North Atlantic and lost spawning areas seems to indicate that such changes have occurred.
5. Nevertheless, there is a growing body of research on these and other aspects of biodiversity which is helping to develop our understanding and help inform future fisheries and biodiversity policies. In the following the relevance for and the dependence of the fishing sector of biodiversity as well as its potential threats to biodiversity will be dealt with and actions are proposed to remedy the potential impact caused by fishing and aquaculture.
6. This communication constituted an important step in the process of integrating environmental concerns into the fisheries sector. A further step was described in the Communication on Fisheries Management and Nature Conservation². This describes the main problems with respect to interactions between fisheries and environment and proposing an EC policy framework for delivering sustainable use of fisheries and biodiversity.

¹ Communication from the Commission to the Council and the European Parliament COM(1998)42 final.
² Communication on fisheries Management and Nature Conservation COM(1999)363.

2. THE CONCEPT OF BIODIVERSITY

7. The UN Convention on Biological Diversity³ provides in Article 2 a broad definition of the concept:

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

8. The definition clearly hints to the complexity of biological diversity and rules out over-simplifications such as the number of species in an ecosystem or only those harvested commercially. Biological diversity cannot therefore be restricted to a species concept but should also encompass such concepts as:
- Genetic variability within species,
 - Variability in the size/age structure and reproductive quality of the species
 - Diversity of species
 - Diversity of ecosystems.(community, habitat and functional)
9. Scientific knowledge about these factors is limited, especially with respect to the ability to understand, measure and predict the response of ecosystems to human impact and to natural variations. Whereas considerable knowledge has been accumulated over several decades about the commercially important fish species, hydrography etc, there are short, incomplete or few data for untargeted species or for important parameters that describe the complex functionality and interactions among species and between species and their environment.
10. Recent progress in the formulation of a precautionary approach to management of commercially important fish stocks has shown that in numerous cases where appropriate data and reliable risk analyses exist it is possible to develop an operational concept for single-stock sustainability based on a quantitative framework incorporating biological limits and reference points and management models. In some areas where multi-species models exist, harvest strategies can be developed to include multi-species considerations. Application of the precautionary approach should secure sustainability but it may not necessarily guarantee genetic sustainability.
11. Scientific knowledge has not yet been developed to a stage at which ecosystem sustainability at least in the marine environment can be secured to the same extent as single-stock sustainability. Nevertheless, there is a growing body of research which is helping to develop understanding and to identify what data need to be collected. There is also ongoing work on development of a wider range of ecological objectives (Ecological Quality Objectives) and identification of indicators in relation to environment.

³ The UN Convention on Biological Diversity adopted 5 June 1992, it came into force 29 December 1993.

12. History suggests that ecosystems, or parts of them such as fish stocks, can recover when anthropogenic pressures are reduced provided that the habitat (and most importantly the genetic resources) have not been irreversibly damaged. Most usually, if altered anthropogenic impacts allow conditions to improve, then fish stocks can recover and repopulate previously depleted habitats, although the process can take extended periods of time.
13. The purpose of securing conservation and sustainable use of biodiversity must therefore be the conservation of the natural genetic resources, for current and future use.

3. OVERALL OBJECTIVES OF THE ACTION PLAN

14. The 1998 Commission Communication implies that biodiversity Action Plans should be practical tools to achieve the integration of biodiversity into sectoral and cross-sectoral policy areas. Some of the Action Plans may take the form of legal instruments but should also form an integral part of existing sectoral policies and take account of existing agreements and international undertakings.
15. The overall objective, therefore, should be to define and identify, within the current legislative framework, coherent measures that lead to the preservation or rehabilitation of biodiversity where it is perceived as being under threat due to fishing⁴ or aquaculture activities. In the Commission Communication, four areas were identified as requiring action as regards fisheries:
 - (1) To promote the conservation and sustainable use of fish stocks and feeding grounds through control of exploitation rates and through the establishment of technical conservation measures to support the conservation and sustainable use of fish stocks. Measures available include inter-alia fishing exclusion areas (mainly for the protection of dense aggregations of juvenile fish), and mesh sizes. Each measure should be applied according to its merits and expected conservation effect.
 - (2) To reduce the impact of fishing activities and other human activities on non-target species and on marine and coastal ecosystems to achieve sustainable exploitation of marine and coastal biodiversity.
 - (3) To avoid aquaculture practices that may affect habitat conservation through occupation of sensitive areas, i.e. mangroves in third countries and inter-tidal areas within the Community, pollution by inputs and outputs from fish farms and genetic contamination by possible releases or escapes of farmed species or varieties.
16. In the initial phase clear synergies will emerge between fisheries interest and biodiversity conservation as a moderate reduction in fishing pressure will lead towards more sustainable and more profitable fisheries and improved conservation of biodiversity. By adding limits for non-target species and protection of habitats the fishing rates will not only be adapted to the state of the target species but will also be

⁴ In this context the words fisheries, fishing and fish stocks make reference, where appropriate, not only to fish species but also to crustaceans, molluscs and other aquatic organisms.

determined by the state of other species or habitats. This will lead to less exploitation, less fishing opportunities and lower employment in the fishing sector. Considerable conflicts will occur between objectives implicitly used in the fisheries sector and those imposed by the biodiversity concerns.

17. The limited amount of scientific knowledge on aspects intrinsic to biodiversity and perhaps especially on the impact of fishing on biodiversity naturally restricts the scope of the measures that can be applied at this stage. Within the constraints of the available science, however, a positive and realistic approach is called for. The Action Plan includes proposed measures that will make it possible to achieve the appropriate initial level of protection. In addition, the effects of the measures taken should be measurable and be monitored to allow appropriate evaluation of their effects. Furthermore, the actions taken under the Action Plan will need to be revised in the light of new scientific information and be developed over time. Support for research, monitoring and assessment will therefore be crucial for the wider development of the Plan.
18. It will not be possible to fulfil all the objectives simultaneously but based on the current knowledge important improvements can be achieved. Such actions will pave the way for further steps to be taken when the results from ongoing and proposed research become available. Implementation of biodiversity objectives into the fisheries will require a long-term strategy.
19. There is a more-or-less clear distinction between aspects related to capture fisheries and to aspects related to aquaculture. Section 4 of this document refers to the Action Plan with respect to the capture fisheries and natural environment (wild organisms) while Section 5 refers to the Action Plan with respect to aquaculture. Explanation to numerous acronyms used in the text are provided in Annex 1.
20. This Communication focuses on fishing and aquaculture activities in marine and coastal areas but these activities are also important in the fresh water environment. In addition, some fish stocks migrate between fresh water, coastal and marine areas. Compatible measures should be applied also in fresh water for the species that migrate between marine and fresh water, *inter alia* salmonids and eel. This could most effectively be achieved by management and conservation measures for these species under the CFP. Likewise the actions proposed for aquaculture should apply equally to marine, coastal and freshwater environments.
21. However, for fish species and fisheries that are totally confined to freshwater environments, the development of Biodiversity Action plans should remain under the responsibility of each Member State. The greater geographic isolation and habitat heterogeneity in freshwaters calls for regional or local plans adapted to the specificity of each system. Member States should therefore be requested to revise existing plans or develop their own Action plans for which purpose this Action Plan might be useful as a guideline. A need for a follow up at Community level of the national plans for the fisheries could also be envisaged. The Commission could therefore review such plans developed by Member States.

4. ACTION PLAN WITH RESPECT TO CAPTURE FISHERIES.

4.1. Relevance for the fishing sector

22. The present situation, in which a large number of fish stocks are over-fished both in terms of growth potential and, even more alarmingly in terms of reduced recruitment, clearly indicate that current harvest rates are not sustainable for many stocks. The excessive harvests have resulted in spawning populations at historical low levels and which are dominated by only a few spawning year classes. Consequently, production is reduced and only catches well below long-term maximum sustainable yield may be taken. The fundamental problem is the imbalance in capacity between of fishing fleets and the fish resources they exploit.
23. Apart from the direct negative economical or biological effects of over-fishing on target species, concern has been expressed about the effects on other components of the ecosystem. By selective removal of species and by causing changes in the size structure of the populations, predator-prey interactions might be changed and so the pathway of energy flow through the food web could be altered in different ways. The energy flow might not be affected, and no major functional changes may be involved, but it could mean that the structure of the fish communities have changed. This could lead to species with high market value being replaced by less valuable species.
24. In a recent review by ICES, it was found that where such major food web changes occurred, it was not fishing *per se* which caused the changes, but over-fishing usually accompanied by major environmental event. This makes it difficult to isolate the role of over-fishing in causing food web changes. Hence, although environmental factors play an important role in affecting food web structure, robustness of the ecosystem to environmental shocks can be substantially improved by ensuring that resources are not over-fished. The risk of major and irreversible ecosystem effect would be considerably reduced by managing the fisheries in a sustainable manner.
25. Fishing also has physical effect on the habitat. Beam trawling and otter trawling disturbs the seabed, decreasing habitat diversity and causing nutrients sealed in the sediments to be recycled into the water column. This can lead to higher local production and increasing availability of energy to lower levels in the food web. Science suggests that such variations in resource availability may affect the energy transfer upwards and may alter the relative abundance of predator species. The consequences of such changes are uncertain and more research is needed but a risk of unwanted changes in relative abundance of fish species may exist, which might not be beneficial for the fishing sector.
26. Although the effects of short to medium-term impacts can be identified and management actions to remedy such changes can be designed, changes in biodiversity occurring over long periods, such as changes in genetic diversity, may be more difficult to identify and mitigate.
27. There is a growing awareness that decades of excessively high harvest rates may have influenced the genetic diversity of at least some commercially harvested stocks. If such changes have occurred they might be reversible only very slowly or may even be irreversible. There is a potential risk in such cases that stocks will not respond as

expected to management actions or will have an impaired capacity to adapt to natural changes in the environment.

28. The aquaculture sector is also dependent on conservation of biodiversity as a basis for further development and use of new species.
29. Both capture fisheries and fish farms are dependent on the quality of the aquatic ecosystems because both wild and farmed fish are exposed to contaminants in their diet and water. Persistent bio-accumulating contaminants can be a threat to the animals in the food chain, with impact on fish, sea birds, seals, cetaceans and in severe cases they can also limit human consumption. Of the human activities which impact the aquatic environment, fishing activities are among the most important, but other important factors include contamination, habitat changes or losses, eutrophication and the introduction of non-indigenous species.
30. The sustainability and future development of the fishing sector is therefore highly dependant on a sustainable aquatic ecosystem and hence on maintaining its biological diversity and production.

4.2. The legal framework relating to fisheries

4.2.1. The Community legal framework

31. The legal framework of European fisheries policy includes the concept of the conservation of living marine aquatic resources and has evolved in response to accumulated scientific evidence of the effects of fishing on commercially important fish stocks and also to greater understanding of how to implement in a practical manner a policy dealing with such a complex issue.
32. In this context, Article 2 of the basic regulatory instrument for the CFP, Regulation (EEC) No 3760/92⁵, states that “*the general objectives of the CFP are to protect and conserve available and accessible living marine aquatic resources, and to provide for rational and responsible exploitation on a sustainable basis, in appropriate economic and social conditions for the sector, taking account of its implications for the marine eco-system, and in particular taking account of the needs of both producers and consumers*”.
33. Regulation (EEC) No 3760/92 also provides management tools that may be used to introduce further protection to marine biodiversity. In particular, Article 4 of this regulation provides that the Council may:
 - (1) establish zones in which fishing is prohibited or restricted, closed areas or no-take zones;
 - (2) limit exploitation rates (further specification of how limitations can be carried out is set in Article 8 of Regulation 3760/92);
 - (3) set quantitative limits on catches (related to 2) above);
 - (4) limit time spent at sea (related to 2) above);

⁵ Council Regulation (EC) No 3790/92 Establishing a Community system for fisheries and aquaculture O.J.NO L 389 of 31.12.1992 1 p.

- (5) fix the number of vessels authorised to fish (related to 2) above);
 - (6) lay down technical measures regarding fishing gear and its use;
 - (7) set minimum size or weight of individual fish caught;
 - (8) establish incentives, including those of an economic nature, to promote selective fishing;
34. In principle, however, any other measure *"fixing the conditions on access to zones and resources and on the exercises of exploitations activities to ensure the rational and responsible exploitation of resources on a sustainable basis"* can be established by the Council. This includes the taking of measures to protect biodiversity, included in the concepts of "responsible fishing" and "sustainability" as referred to in Article 2 of Regulation (EEC) No 3760/92.
35. Whilst numerous secondary acts of the CFP on quantitative, technical or structural conservation measures aim at implementing these concepts, the basic regulation constitutes an appropriate tool for integrating biodiversity objectives into the EC conservation policy. Moreover, the European Court of Justice has confirmed that measures designed for ensuring the protection of fishing grounds, the conservation and balanced exploitation of resources and the limitation of fishing effort can integrate environmental components to a large extent.⁶ The legal framework of the CFP can therefore support a broad integration of environmental concerns in the fisheries sector as called for in relevant provisions of the EC Treaty as amended by the Amsterdam Treaty (Article 6) and in the so called Cardiff process.
36. The 'Cardiff process' is a mechanism for integrating environmental concerns and sustainable development into Community policies. Within this framework, the Fisheries Council is called on to develop an overall strategy for sustainable development. The fisheries sector is also requested to develop a detailed sectoral strategy and to identify targets and indicators to monitor progress. Consultations on the biodiversity action plan for fisheries provide an early opportunity to contribute to that process and to develop a systematic approach to the integration of biodiversity within fisheries policy.

4.2.2. *The international legal framework*

37. Besides the Convention on Biological Diversity, the Jakarta Mandate and other international wildlife agreements, such as the Bonn Convention, the Community is bound by international provisions on fishing contained in instruments such as the 1982 UN Law of the Sea Convention. It has signed the UN Straddling Fish Stocks Agreement, and has also declared to apply the FAO Code of Conduct for responsible fishing.⁷ References to integration of the protection of biodiversity within the concept of responsible fishing are made in the FAO Code of Conduct for Responsible Fisheries, and in particular, its Article 6. The Community co-operates with a number of regional fisheries organisations such as the IBSFC, NASCO, NEAFC, NAFO and CCAMLR which also deal with matters such as ecosystem

⁶ See Judgment of the Court of 24 November 1993 (Etablissements Armand Mondiet SA v Armement Islais SARL), Case C-405/92, European Court Reports 1993 p. I-6133.

⁷ Code of Conduct for Responsible Fishing, FAO 1995

conservation, biodiversity and the application of the precautionary approach to fisheries. The Community has also been very active within the Agenda 21 process for the Baltic Sea Region⁸ through IBSFC representing the fisheries sector. The Baltic 21 is one of the first attempts to define goals and indicators for achieving sustainable development and conserving biodiversity. Among its guiding principles is “*further integration of fisheries and environmental protection, conservation and management measures, drawing so far as scientific knowledge permits on an ecosystem approach.*” It also actively participates in the development within FAO of international plans of action on sharks and on sea birds⁹ and implements CITES recommendations.

38. There are also other conventions concerned with protecting the environment and ecosystems in three European regional seas, the Baltic Sea, the Mediterranean Sea and the North East Atlantic. For example, the Convention for the Protection of the Marine Environment of the Northeast Atlantic (OSPAR Convention) and of the Baltic (HELCOM) requiring parties to protect, conserve and restore the ecosystems and biological diversity of the maritime area by controlling and reducing other human influence than fishing in the marine area.

4.3. Measures aimed at protecting biodiversity

39. In practice this Action Plan should lead to the application of the precautionary principle as laid out in the Communication on precautionary principle and arrangements of multiannual TACs¹⁰ and the provisions in the FAO Code of Conduct for Responsible Fisheries. The Plan could also apply relevant provisions as laid out in the Communication on the precautionary principle¹¹. Central to these arrangements is the avoidance of irreversible damage such as reduced genetic variability of a population. Central to the concept is also that lack of full scientific knowledge cannot be invoked to delay action deemed necessary, where preliminary objective scientific evaluation indicates reasonable grounds for concern about potentially irreversible effects on the environment. The application of the precautionary principles has been labelled the precautionary approach (PA) to fishery management. This approach has clearly gained momentum and considerable experience has been accumulated both within EU and internationally within regional fisheries organisations. Based on these experiences it is clear that the PA offers a suitable instrument to achieve the objectives set out in this Communication.
40. The resultant actions can include:
 - the adoption of management objectives in accordance with the precautionary approach for commercially important fish stocks, non-target species and habitats;
 - measures to avoid depletion of local, genetically distinct stocks;

⁸ Report from the Extraordinary Session “Baltic 21” Sector fisheries, Warsaw 16-20 February 1998

⁹ International plan of action for reducing incidental catch of sea-birds in long line fisheries, and International plan, of action for the conservation and management of sharks. FAO 1999.

¹⁰ Communication from the Commission on the application of the precautionary principle and multiannual arrangements for setting TACS. COM(2000) 803 final 01.12.2000.

¹¹ Communication from the Commission on the precautionary principle. COM(2000) 1 final 2.2.2000.

- strengthening the implementation of existing and developing new technical conservation measures to reduce fishing impacts on those components of ecosystems which are of little or no commercial importance;
- basic research to support, inform and advance the integration of biodiversity consideration into fisheries policies;

41. In addition it is also important to:

- improve the level of coherence between CFP instruments and environmental instruments and their implementation;
- ensure that fisheries policies and instruments do not cause damage to the environment of third countries or areas beyond the limits of national jurisdiction and assisting third countries to achieve conservation and sustainable use of biodiversity;
- enhance involvement of fishers in habitat restoration and in reducing persistent contaminants and excess of nutrients into rivers, estuaries and seas;

42. Each of these actions is discussed in the text below.

4.3.1. *Conservation and Sustainable Use of Commercially Important Fish Stocks by overall reduction in fishing pressure*

Motivation

Commercially exploited fish stocks

43. Various factors affect possibilities for conservation and the sustainable use of fish stocks, but the most important outcome is the level of fishing intensity and the nature of fishing which eventually takes place. Reduced fishing pressure will, for an initial period, yield catches that are lower than those at present. In the medium and long term, reduced fishing pressure will lead to fish stocks consisting of, on average, a greater proportion of older, larger individuals and a larger biomass. This should also lead to enhanced genetic diversity within each of these fish stocks. It will furthermore lead to more stable catches with economical benefits for the fisheries and hence support sustainable development.

Other organisms and habitats

44. An overall reduction in fishing pressure will contribute to the protection of other elements of marine ecosystems since it will be of benefit not only to the commercially important species but also to species of little or no commercial importance captured together with them. For example, a reduction in fishing pressure by fishing gears towed across the seabed will lead to less impact on bottom-living organisms and their habitats by reducing the frequency of passage of such fishing gears. Some habitats and species, however, are extremely fragile, rare or representative and may be severely impacted despite a general reduction in fishing effort. It is therefore necessary to identify appropriate areas in order to protect habitats and some species, in line with the requirements of the Habitats Directive. The Action plan will therefore draw from the development of the NATURA 2000 process to achieve this objective.

45. Closed areas or “no-take zones” have been used for a long time within fisheries management both within the EU and elsewhere. It is important to recognise what is the intended purpose of such closures, as they will differ depending on whether the closure is for traditional fisheries management purposes or for ecological purposes. Within the fisheries management ambit, closures are used primarily for the following purposes:
- in emergency situations, to prevent high fishing mortalities being exerted when fish are highly vulnerable because of forming dense aggregations.
 - to enhance protection of juvenile fish when gear selection do not provide enough protection.
 - only means to protect local spawning from depletion or extinction
46. In such situations it is believed that closures are effective although the relevant scientific evidence is only weakly supportive. This would also apply to non-target or by-catch species.
47. The experience gained with closures is that the effects are very difficult to evaluate and “no-take zones” are no panacea to all fisheries management and ecological problems. Closures are less effective in reducing the overall fishing pressure than effort reductions because the effect can be to redistribute fishing effort to areas or time periods that are still open. To overcome such effects the closed areas have to cover a very large portion of the distribution of stocks they are intended to protect, which calls into question whether the use of other management tools (lower TAC, improved selection etc.) or combinations thereof would be more effective and less discriminatory towards those fishermen close to the closed area.
48. There is less experience with closures applied for ecological purpose in the marine environment although several closures have been in place for many years. Some of these were intended to protect single stocks, but there have also been extended closures in place around some marine installations, such as oil and gas, where fishing is prohibited.
49. It is important to note that compared to terrestrial organisms, marine organisms are relatively more mobile and closures might therefore be more appropriate in regards of protection of sensitive or representative habitats such as coral reefs and important feeding areas for seabirds during breeding seasons.
50. It is however generally perceived that if closed areas are well defined, they can be a useful additional tool to enhance protection of stocks and of sensitive habitats. The plan therefore proposes use of closed areas for the protection of fish and habitats but it will be necessary to define clearly the objectives and to justify the biological basis for any such closures. Equally important is to promote research to assess and monitor the effects and pilot studies therefore need to be initiated as an integrated part of this action.
51. It is widely perceived that the high exploitation pressure on commercially important fish stocks has more widespread effects, leading to diminished food webs of decreased complexity and, generally speaking, less “biodiverse” ecosystems. Marine habitats are also affected. Although the reversibility of these effects may be

questioned in cases of large alterations from the “pristine” situation, it is generally believed that a decrease in fishing pressure on commercially important fish stocks would contribute in the mid-term to increase the overall biodiversity of the marine ecosystems.

52. In some cases, however, the effect of fishing operations on the environment may be considered as positive effects on some populations or resulting in increased productivity. For example, high rates of discarding fish in some areas has led to increases in populations of scavenging seabird species. The reduction in abundance of dominant predatory fish by fishing may allow an increase in abundance of prey fish species. Additionally mild physical disturbance can enhance biodiversity and ecosystem productivity. These effects may be considered positive as long as fishing has not been so severe that the populations lose their ability to recover. It should be borne in mind, therefore, that the effects of changes in fishing practices and distribution should be considered fully, without prejudging the positive or negative implications.

Measures to achieve overall reduction in fishing pressure

53. Reduction in fishing pressure may be attained by:
- (1) setting catch limits of commercially exploited species at appropriate levels or
 - (2) reducing fishing capacity (fleet/gear size and effectiveness) or
 - (3) reducing fleet activity or
 - (4) any combination of a), b) and c).
54. Catch limits in the form of Total Allowable Catches have been implemented within the Common Fisheries Policy since 1983. In practice, however, and until recent years, the TAC's were often selected in response to year-to-year fluctuations in stock size with little consideration of reduction in fishing pressure to sustainable levels. In 1996, catch limits based on long term management plans drawn up in accordance with the precautionary approach were first introduced for a few stocks exploited by the European Union. Since then about 11 stocks have been addressed and this process will continue in the framework of the Action Plan. Increasingly TACs will be set within a multi-annual approach in accordance with the objective of sustainability as defined by limits and reference points.
55. Similarly, a succession of Multi-Annual Guidance Programmes (MAGPs), have been implemented to reduce fishing capacity and limits to fleet activity have also been decided for the western part of Community waters (ICES Sub-Areas VI to IX). In spite of these efforts over-capacity is still a fundamental problem with respect to sustainable development of the fishing sector.¹² Over capacity creates control and enforcement problem, too high exploitation rates, and in consequence both declining spawning stocks and a reduced size structure in the populations. Over capacity is therefore a threat to biodiversity. The CFP has proven capable of stabilising the fishing mortality rates but at a too high level. Consequently more than half of EU

¹² Report from the Commission to the Council Preparation for a mid term review of the Multi-annual Guidance Programmes (MAGP); COM(2000) 272 final 10.5.2000.

fish stocks are still exploited above the long term potential and several stocks such as the cod stocks are in a critical state. It has been possible to prevent lasting stock collapses and rebuild stocks but not to prevent crises reappearing. This situation cannot continue and the fishing pressure must be permanently reduced by applying catch limitations and a reduction of the capacity through available instruments. The review of the MAGP in 2001 offers a possibility to address the capacity problem in the short and the medium term perspective and to re-establish the intended balance between capacity and resources.

56. Based on the review of the legal instruments it can be concluded that the following actions can be applied and could be expected to achieve the objectives if adequately implemented and enforced. The ongoing revision of the CFP in 2002 will however provide an opportunity for considerations about the need for further strengthening the existing instruments, including financial instruments, or the development of a wider range of management instruments in a different structural or institutional framework.

Action I - Overall reduction in fishing pressure to promote conservation and sustainable use of commercially important fish stocks

Implementation of long-term management plans in accordance with the Precautionary Approach for commercially harvested stocks:

- definition of precautionary limit and reference points in terms of fishing mortality rate and stock biomass;
- where insufficient data are available to establish precautionary levels for a given stock, rules for the exploitation of these stocks should be established which would take into account the history of exploitation, yield and the likely biological outcomes of exploitation;
- establish associated remedial management actions where required;
- whenever possible, integrate multi-species considerations into the management plans;
- wherever possible avoid local depletions of fish stocks that may be functionally separate units in genetic or behavioural terms;
- reduction of over-capacity and effort in fishing fleets

4.3.2. Technical measures for commercially exploited fish stocks

Motivation

57. Technical measures, such as the definition of required mesh sizes of fishing gears and the establishment of areas closed to fishing, are widely used as additional tools to regulate exploitation and enhance the conservation of commercially important fish and shellfish species. Such measures are currently defined for Community waters in Council Regulation 850/98,¹³ which is a major revision of pre-existing regulations

¹³ Council Regulation (EC) No 850/98 for the conservation of fishery resources through technical measures for the protection of juveniles of marine organisms. O.J. L 125, of 27.04.1998 1 p.

and which became applicable on 1 January 2000. Similar measures are defined for the Baltic¹⁴ and the Mediterranean¹⁵ areas. The improvement of such measures are an ongoing process and the Action Plan will continue to press for further improvements.

58. The primary aim of these measures is to protect juvenile and spawning fish and hence reduce discarding, through restrictions on the types of gears that can be used, definition of the characteristics of nets that can be used and the locations where species can be targeted, and setting minimum landing sizes for commercially fished species as well as targeted area closures (real time, seasonal or permanent) to eliminate unwanted mortality of juveniles and spawning fish. This constitutes a logical addition to the long-term management of fishing on commercial stocks to the benefit of conservation of biodiversity and the sustainable use of the resources.
59. Some stocks are managed using principally TAC and quota regulations which apply to a group of species or to a group of populations which are known to be distinct sub-populations. An additional aim is to maintain genetic and functional diversity in such cases by avoiding local depletions of such sub-populations. Measures such as area restrictions on catches and closed areas and seasons will be used towards this end.

Action II - Technical measures with the objective of improving the conservation and sustainable use of commercially exploited fish stocks.

- improved size selectivity with the aim to reduce discards of juvenile fish;
- improved species selectivity;
- temporal or spatial closures to enhance survival of juveniles or spawning concentration, including sub-populations;
- as appropriate, new or amended minimum landing sizes for fish and shellfish;
- temporal or spatial closures to enhance survival of local populations in order to maintain genetic diversity.

4.3.3. Technical measures in relation to other organisms and habitats

60. All fishing activities have ecosystem impacts. However, the severity and the probable time required to reverse the effects of such impacts on non-target species is often not well defined.
61. Ecosystem effects fall into four broad groups:
 - (1) the effect of fishing on the demographics of commercially exploited fish stocks (dealt with in the section above)
 - (2) disturbance and physical damage to marine organisms
 - (3) physical damage to seabed and associated structures

¹⁴ Council Regulation (EC) No 88/98 laying down certain technical measures for the conservation of fishing resources in the waters of the Baltic Sea, the Belts and the Sound. O.J. L 9, of 15 01 .98 p.1

¹⁵ Council Regulation (EC) No 1624/94 laying down certain technical measures for the conservation of fishing resources in the Mediterranean. O.J.L 171, of 6.07.97, p.1

(4) disturbance to marine food webs.

62. Given that a reduction in fishing effort and mortality is the intended effect of several existing aspects of the CFP, it is self-evident that a reduction in the environmental impact of fishing will occur even in the absence of any other measures. However, additional measures to further reduce the potential impact on non-target species and habitat should be considered. Special attention should be paid to diminishing the impact on species listed in the directives 79/409 EC (Birds) and 92/43 EEC (Habitats).

Action III - Technical measures with the objective to reduce impact on non-target species and habitat.

- introduction and promotion of the use of selectivity devices that reduce or eliminate by-catches of non-target species;
- introduction and promotion of fishing methods that have a reduced physical impact on the environment;
- when appropriate institute temporal and spatial closures to enhance protection of species or habitats, including “no-take” zones;
- introduction, as appropriate, of limits on by- or incidental catches especially for species listed in environmental legislative instruments

63. The FIFG already offers opportunities to fund experimental fishing projects aiming at the protection of resources and at the use of more selective techniques (Article 17 of Council Reg. 2792/1999). These types of actions need to be encouraged as they will in addition serve as instruments for providing increased information and awareness as well as furthering involvement of the industry into the process.

4.4. Research, indicators of performance, monitoring and assessment

4.4.1. Research and integrated advice

64. The CFP is probably one of the EU policies that relies most on scientific advice. For its work the Commission is very dependent on scientific advice of good quality and that advice could be provided in a timely manner. The main advisory bodies used by the Commission are ICES, NAFO Scientific Council and the ICCAT. In the Mediterranean the GFCM is expected to increase its function as provider of advice. The advice from these organisations is evaluated and complemented by the view of STECF. Traditionally the advice is focused on single species considerations but in some cases also includes multi- species considerations.

65. The development of integrated advice in which environmental, economic or social consequences are included has been slow. Mainly this is explained by the complexity of such advice but also by the lack of an appropriate framework and by deficient methods and necessary data to provide such advice. Clearly there is a need to improve integrated advice to support a development towards an ecosystem-based management. This could best be done by the existing scientific advisory organisation and by greater co-ordination of existing research and information between fisheries and environmental disciplines.

66. Fisheries research is very expensive and there is a need to justify this public expenditure. In order to safeguard research for the benefit of the future CFP, there is an increasing need to provide value for money and consequently to improve definition of research priorities. Already to date there is an apparent trend towards assigning a lower priority to fisheries research. Correspondingly, the scientific community shows a diminishing interests in this area because other research areas are perceived as more rewarding or challenging.
67. The routine operation of the CFP requires continuous monitoring of the state of the commercially important fish stocks, including data collection and routine assessment. It is an obligation of the Member States to support such activities, who also receive support from the Commission. The long time series of research surveys and other data collected to support traditional fisheries research have only recently started to be used to address questions in relations to biodiversity such as changes in species community and structure. It is therefore important also from the biodiversity point of view to secure traditional fisheries monitoring and assessment.

Action IV - Research priorities to secure traditional support for the CFP.

- Research on methods for improved more efficient (cheaper) assessment and sampling programmes;
- Research on more selective fishing methods with smaller environmental impacts;
- Research on alternative management systems, including other control and enforcement measures.

68. The CFP needs to be developed to meet future challenges such as the integration of environmental, economical and social concerns. The CFP currently includes obligations to respond to the needs of the society, which includes environmental integration such as biodiversity, sustainable development, eco-system management, but also to the demand from consumers for products of guaranteed quality from fisheries and aquaculture. The new challenges increase the demand for evaluation of cost implications, environmental effectiveness, economic and social side effects. This will invoke greater demands for collection of new data and their analysis.
69. To address effectively the aquatic biodiversity issue, research into and application of, existing molecular techniques is needed to study the natural genetic resources. This will help in evaluating potentially irreversible genetic consequences of management actions and allow improved conservation of such resources. With the use of such methods it would be possible to monitor the variation in stocks over time and space and hence significantly improved management and conservation could be expected. There is a vast amount of biological samples preserved and it seems possible that such analysis could be extended backwards several decades to address questions about potential changes in genetic variability.
70. The immediate effects of fishing on organisms other than the commercially important fish species are not yet well defined or quantified. There is a need for quantitative assessment of both direct and indirect impacts of fishing on food-web interactions. In addition, the effects of anthropogenic pressures such as pollution, eutrophication, and habitat destruction are not well defined, either for commercially important fish stocks or for other organisms.

71. The following research priorities are intended to provide a better understanding of the genetic variability in time and to improve the provision of integrated advice in support of biodiversity conservation.

Action V. Research to provide enhanced knowledge related to biodiversity.

- Development and application of molecular techniques to stock identification, quantification of its genetic variability and inter/intra-population changes and monitoring of genetic changes;
- Development of quantitative models of the effects of anthropogenic pressures on populations of species of little or no commercial importance including the effects of destruction of habitats;
- Development of biodiversity indicators of marine ecosystem health, both of fish stocks and other species. These indicators could serve as benchmarks or reference standards for management, against which the impact of fishing or other human activities on the environment could be assessed;
- Identification of new data to be collected on a routine basis;
- Identification of key habitats and biotopes and the conservation and management measures which would be necessary to minimise the impacts of fishing upon them;
- Study of the interaction between species, and predator prey relationships to better understand the impacts of fishing activities.

72. Some of these research priorities are included in the 5th Framework Programme. The Programme addresses these research priorities in the thematic Programme 1, “Quality of Life and Management of Living Resources”, key action 5, “Sustainable agriculture, fisheries and forestry and integrated development of rural areas including mountain areas”. Important research priorities with relevance to the understanding of biodiversity are also listed under Thematic Programme 4: “energy, environment and Sustainable Development” under Key Action 3 “Sustainable Marine Ecosystems.”

73. It is too early to evaluate the full results of the 5th Framework Programme but it is likely that additional strategic research will still be needed to support the Action Plan. The development of the 6th Framework Programme which has started will provide additional opportunities to review progress achieved and strengthen the research priorities in support of the Action Plan.

4.4.2. Data collection

74. The Commission has recognised a need to secure the collection of the basic data to support the CFP. The Council on the proposal from the Commission decided in June 2000 on a framework for data collection and management of such data in support of the CFP.¹⁶ The new framework for the collection and analysis of biological and

¹⁶ Establishing a Community framework for the collection and management of the data needed to conduct the common fisheries policy. Council Reg; (EC) No 1543/2000 OJ L 176 of 15.07.2000. p.1.

economic data will primarily focus on commercial fish stocks and fishing vessels. The new collection programme will be implemented during 2001.

75. Environmental data are not covered by this regulation. It is also essential that data sets and survey material are standardised, so that data are compatible and comparable. Information such as this is crucial for evaluating the environmental impacts of fisheries policies and the effectiveness of efforts to promote environmental integration. The Action Plan therefore proposes that review of the data collection framework should be carried out in 2003. In the mean time it will be important to evaluate which additional data should be collected.

4.4.3. *Indicators, monitoring and assessment*

Commercially exploited fish stocks

76. The effect of fishing activities on the most important target species has been studied for many years within European waters. By continue to monitor and assess the status of the target species, trends in biomass and fishing mortality, it will be possible to evaluate the effect of the actions proposed in the plan. These target species could therefore be used in conjunction with other long term data series such as research surveys and possibly benthos series as proxies for the wider effects before more specific indicators become available. It is therefore absolutely necessary that these studies should continue and be expanded.
77. The intensity of fishing activity is measured as a removal rate, referred to as the fishing mortality rate, which is directly related to the numerical proportion of the stock removed each year by fishing. Fishing mortality rate is related to the total fishing effort (defined within Community legislation as kilowatt-days' fishing) generated by the fleets and hence is an appropriate indicator of fishing pressure.
78. Fishing mortality rates are evaluated each year for a large number of fish stocks within (and outside) EU waters by scientists working within the International Council for the Exploration of the Sea (ICES) and other scientific organisations. In conjunction with the estimation of mortality rates, estimates of the biomass of mature fish (spawning stock biomass) and juvenile fish are also produced. This information is available for the stocks which constitute the main catch volume or which generate the main revenue from fishing.
79. Any current estimate of fishing mortality rate or spawning stock biomass can be compared with reference points designated scientifically as precautionary levels. According to this procedure, fish stocks have been classified within Council Decision 97/413/CE of 26 June 1997 as:
- (1) ***Under-exploited*** if long-term gains in yield could be achieved at higher fishing mortality rate provided that, at these higher rates, the biomass of mature fish will remain above levels at which replenishment of the stocks is imperilled implying low impact on biodiversity;
 - (2) ***Fully exploited*** if no substantial long-term gains [or losses] in yield will accrue if fishing mortality rate is moderately increased and the biomass of mature fish will remain above levels at which replenishment of the stocks is imperilled implying moderate impact on biodiversity;

- (3) ***Over-exploited*** if moderate to substantial gains in long-term yield will accrue if fishing mortality rate is reduced, and if such a reduction will significantly reduce the probability that the biomass of mature fish will fall to levels at which replenishment of the stocks is imperilled implying possible impact on biodiversity;
- (4) ***Depleted*** if fishing mortality rate is so high that the biomass of mature fish is already at levels, or is in the near future very likely to fall to levels, at which replenishment of the stocks is imperilled implying a threat to biodiversity.

80. However, other equally legitimate classifications based on precautionary reference points are also conceivable. The Scientific, Technical and Economic Committee for Fisheries gives certain guidelines for classifying stocks in its 10th report.¹⁷

Action VI - Monitoring and assessment of state of commercially important fish stocks

- Monitoring of key parameters of important fish and shellfish stocks, including a continuation of surveys;
- Evaluation of time trends in such stocks

Other organisms and habitats

- 81. The European Environmental Agency is developing a European-wide system for monitoring the status of and trends in biological diversity. In addition, a recent report drafted under the FAO Code of Conduct for Responsible Fisheries provides a relatively comprehensive assessment of ongoing international work on fisheries indicators, including social, environmental and economic indicators. The report emphasises the need for sustainability indicators going beyond traditional single stock data, and underlines the limited developments in this area so far. The Action Plan aims to benefit from these developments. However in the meantime other indicators are needed to monitor potential impact and to follow the performance of action taken under the Action Plan as discussed above.
- 82. The collation of statistics on the distribution of these (fishery, eutrophication, pollution, habitat destruction etc.) impacts in EU waters would lead to a more objective and quantitative approach to prioritising measures to conserve biodiversity.

¹⁷ The 10th Report of the Scientific, Technical and Economical Committee for Fisheries. (SEC(2000), in prep) 3-7 April 2000.

Action VII - Monitoring of other organisms and habitats.

- Monitoring of biodiversity indicators (as identified by EEA) of marine ecosystem health, both of fish stocks and other species. These indicators could serve as benchmarks or reference standards for management, against which the impact of fishing or other human activities on the environment could be assessed;
- Continuation of traditional fisheries surveys with increased sampling of non-commercial species;
- Long-term monitoring of environmental and climate change and their effects on fish populations, habitats and communities;

5. AQUACULTURE

5.1. Introduction

83. The European Environment Agency's second environmental assessment report entitled "Environment in the European Union at the turn of the century" states that:

"Marine aquaculture is an expanding industry in the coastal zone where biodiversity is high (estuaries, coastal marshes) and where human pressures are increasing and complex. Though initially judged negligible, the impact on biodiversity through feeding (additional nutrients), pests and escaping species (with consequent genetic change in wild populations) is considered severe locally."

84. Aquaculture¹⁸ production takes place mainly in inshore areas and in fresh waters. It ranges from intensive production in cages or even in closed environment to extensive aquaculture of natural shellfish and sea ranching as with salmon in the Baltic. Although the nature of potential impact varies the following are among the main environmental impacts:

- physical impacts on habitats, changes of natural or semi-natural habitats;
- chemical impact on water and sediments including eutrophication, oxygen depletion and from the use of medical and anti-fouling products;
- introduction of disease organisms, including viruses, bacteria, fungi and parasites;
- introduction of non-indigenous or possibly genetically modified organisms;

85. Most of the physical impact by aquaculture is restricted to local disturbance in the vicinity of the site. Similarly the effect of nutrient release to the environment from fish farms is local and of little importance compared to the regional natural turnover of nutrients in open water masses. Consequently the effect this may have on biodiversity is localised to the farm area and its immediate surroundings. The total impact is therefore dependent of the number, the extension of the sites and its

¹⁸ According to the definition of aquaculture given by Council Regulation (EC) No 2792/1999 sea ranching is not defined as aquaculture but for the purpose of this Communication sea ranching is included.

locations. Generally these impacts could be mitigated by integration of aquaculture into coastal and catchment area management and effective utilisation of the feed. In this context it should be acknowledged that considerable effort has been devoted to reduce the amount of feed used and hence to reduce the leakage of nutrients to the environment.

86. More environmental concern surrounds the effect of escapees and spread of disease and parasites. Particularly in salmon aquaculture there exist diversity threats to the multitude of river stocks of Atlantic salmon which are partly mixing with and partly being replaced by farm escapees. However, escapees seem to have lesser reproductive success than wild fish.
87. Another important threat to salmonids abundance in salmon farming areas is sea-lice from fish farms in salmon farming areas, as the young wild fish of migratory species (mainly of sea trout) can be heavily infected by these ectoparasites. It should however be stressed that the reduction in wild salmonids abundance is certainly also linked to other factors such as over-fishing, pollution and climate changes, which have no link with fish farming activities. The relative importance of each factor is still unclear.
88. Introduction of foreign species to Europe for cultivation has led to biodiversity threats, either through the introduction of diseases (*Bonamia* in oyster; *Gaffkemia* in lobster) or through competition (e.g. spider crab and king crab in the Barents sea).
89. Aquaculture can also have beneficial impacts on biodiversity by, for example, providing the market with farmed fish and shellfish species at a price and quality which has the result of reducing fishing pressure on the same wild species. The contribution to the reduction in over-fishing can help counteract one of the threats to marine biodiversity. On the other hand the growth of aquaculture production has increased the demand for feed and by that increased the demand for raw materials of fish origin (even if aquaculture is still a minor consumer of the overall production of fishmeal). The proposed actions indicated below reflect both the positive and the negative aspects of fish and shellfish farming.

5.2. The legal framework relating to aquaculture

5.2.1. The Community legal framework

90. Specific European legislation relevant to limiting the effects of aquaculture on biodiversity is less well established than for capture fisheries. Among the relevant Community legislation is that on aquatic animal health,¹⁹ and the Environmental Impact Assessment (EIA) legislation,²⁰ a useful reference publication is "Aquaculture and the Environment in the European Community" which was published by the Commission in 1995 (CU-88-95-993-EN-C).
91. Most aquaculture concerns are regulated by national legislation which is influenced by a number of horizontal Community Directives governing water (for example the

¹⁹ Council Directive 91/67/EEC as amended

²⁰ Council Directive 85/337/EEC of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment (OJ L 175, of 5.7.1985, p. 40). Directive as amended by Directive 97/11/EC (OJ L 73, of 14.3.1997, p. 5).

legislation on emissions to water is being consolidated and updated in the Water Framework Directive), habitat and bird life. Following from these directives it is required that developing projects, including new fish farms, should be subjected to prior assessment if they are likely to have significant effect on the environment. As a means of assisting the implementation of this Action Plan it is noted that the Financial Instruments for Fisheries Guidance, when financing aquaculture development, requests stricter provisions in terms of EIA than those envisaged by Council Directive 85/337/EEC¹⁸ and that a higher rate of public aid (up to 10% more) can be paid to aquaculture projects where investments concern the use of techniques that substantially reduce the environmental impact.²¹

92. Directive 90/220/EEC on the deliberate release into the environment of genetically modified organisms covers release of live genetically modified organisms for both experimental purposes and the placing on the market, which would include releases of genetically engineered fish or shellfish (their use as food would require authorisation under the Novel Foods Regulation, R. 258/97 of the Parliament and Council). Directive 90/219/EEC covers the contained use of genetically modified micro-organisms although the majority of Member States have extended the application of the Directive to cover plants and animals in their resultant national laws.

5.2.2. *The international legal framework*

93. There are several international conventions e.g. Oslo-Paris Convention (OSPAR), Bern Convention, Helsingfors Convention (HELCOM) which include provisions in relation to aquaculture. In addition, the Community is committed to the principles of the Precautionary Approach, the guidelines for aquaculture in the FAO Code of Conduct for Responsible Fisheries (Article 9 of which covers Aquaculture Development) and other international arrangements or guidelines such as ICES Code of Practice on the Introductions and Transfers of Marine Organisms. NASCO and also the industry itself are addressing issues in relation to biodiversity. These protocols and resolution are not legally binding but they serve as useful guidelines for “best environmental practices” such as FEAP’s²² Code of Conduct, the NASCO initiatives and the Oslo Resolution. The latter also addresses introduction and transfers as well as transgenic fish. The FEAP’ Code explicitly condemns the use of GMOs in aquaculture.

5.3. **Measures aimed at protecting biodiversity**

94. The action plan for aquaculture shall apply as appropriate a precautionary approach.
95. The main precautionary measures with respect to aquaculture concern:
 - guidelines for aquaculture outputs which encompass chemical, physical and biological criteria;
 - guidelines on use, containment and transport of farmed organisms;

²¹ Council Regulation (EC) No 2792/1999

²² FEAP: Federation of European Aquaculture Producers

- the integration of aquaculture into catchment and coastal area management as one of several sectoral users of natural resources;
- utilisation of thorough EIA procedures governing location of farming operations;
- increasing the efficiency of resource use and productivity in general at the farm level, thus reducing potential effects;
- assessment of impact.

5.3.1. *Reduction of environmental impact*

96. Actions are required to reduce localised problems (such as the anoxic layer on the sea bed which can cause locally severe reduction in biodiversity) and promoting measures to reduce to a minimum the use of veterinary medicinal products in aquaculture (taking account of animal welfare considerations).
97. Preventative measures may be eligible for public aid for the cost of collecting information on the environment. For instance, the FIG can support the costs of data collection and modelling for the development of Integrated Coastal Zone management plans. It can also finance the cost of the EIA where this is requested prior to the authorisation of an aquaculture project.
98. The restoration of natural shellfish beds where fishing effort is limited to sustainable levels will result in amelioration of eutrophication of coastal waters caused by man's activities; this type of shellfish cultivation combined with the expansion of cultivation of marine algae will increase the nitrogen-scooping effect which can in turn limit the occurrence of harmful algae blooms.
99. The elements of the Action Plan to enhance harmonisation between aquaculture development and environmental conservation as a means of promoting biodiversity are as follows:

Action VIII - Reduction of environmental impact

Promote measures to reduce direct impact on the environment of waste products from aquaculture installations

- Promote best practice for EIA for aquaculture projects with the requirement that fish-farming projects be subject to EIA provisions;
- Promote shellfish cultivation and restoration of natural shellfish beds. Shellfish cultivation requires neither supplementary feeding nor a direct energy input to support growth.
- Promote environmentally friendly methods of harvesting shellfish beds.
- Promote the development of secure offshore technology and water re-circulation systems

- 5.3.2. *Introduction of new species, security of animal health and genetically modified aquaculture animals*
100. The FAO Code of Conduct foresees the need to conserve genetic resources and to minimise the harmful effects of introducing non-native species or genetically altered stocks used for aquaculture. (Article 9.3.1).
 101. By promoting strict adherence to the ICES Code of Practice on the Introduction and Transfer of Marine Organisms (1994 or future revisions) these actions aim at preventing coincident movement of harmful organisms, reducing ecological and environmental impact and adverse genetic impact; they also promote best practice for quarantine facilities used in this context. The ICES-Code allows for the control of transfers of stocks within regions. However the disease listed for monitoring might be too limited to prevent the transfer of disease and pests within Europe. Such a list might therefore not fully recognise the geographic variation within Europe. Transfer of live animals that are farmed in open aquatic systems (sea, lake, and rivers) has and will result in the increase of disease and pests. These unwanted organisms might have negative impact on natural biodiversity at local and region level. A review of aquatic animal health legislation needs therefore to pay particular attention to prevention of transfer of pests and parasites with aquaculture species which can otherwise be moved within the Community.
 102. Very little is finally known about the disease risk caused by cultured fish to the wild fish. Strong indications of harmful effect exist for some parasites (*Gyrodactylus*, *Martelia refringes*, sea lice), and the veterinary legislation may have to be brought up to date. However, more often it seems to be the other way round –wild fish are disease carriers, so the diseases does not seem to affect them too badly -but when these wild fish come to feed by the fish nets the ‘stressed’ cultured fish develop the diseases.
 103. Loss of genetic diversity at multiple levels in wild species can be exemplified by salmonids which have well distinctive local genotypes. Over-fishing, pollution, climate changes, dam building and hatchery restocking programmes have all resulted in the loss of genetic diversity in these fish. To prevent further loss of genetic diversity of Atlantic salmon, a precautionary approach should be applied in the drawing up of guidelines to minimise aquaculture escapees. The process embarked on in February 2000 by NASCO and the North Atlantic salmon farming industry to develop such guidelines is particularly worthy of support.
 104. In the EU applications for deliberate releases of GMOs under Directive 90/220/EEC require, as a pre-requisite, a comprehensive assessment of risks to human health and the environment and are considered on a case-by-case basis. For deliberate releases of fish, this would clearly include an assessment relating to the type of environment (waters) in which they are intended to be released. An authorisation would only be granted on the basis that there is no reason to believe that the release will have an adverse effect on the environment or human health. To date, there have been no applications for such releases of genetically modified fish or shellfish for the purpose of placing on the market and no consents for such have been considered or granted.
 105. Directive 90/220/EEC is currently being revised and it is proposed to introduce a number of new provisions that should allow for a more effective, efficient and transparent regulatory framework for the deliberate release of GMOs into the

environment. These new provisions, when adopted and transposed into national laws, will apply to releases of GMOs, for both experimental purposes and the placing on the market, including genetically modified fish or shellfish.

106. The EU legislation is comprehensive and is based on the principle that you can do what in principle is safe. As aquatic organisms are difficult to retain in captivity, especially in the marine environment, it is likely that the risk assessment procedure would preclude the deliberate release into the environment of GMO fishery products.

Action IX - Limit introduction of new species and secure animal health

- Thoroughly evaluate the potential impact of new non-indigenous species to aquatic aquaculture and promote the application of ICES/EIFAC Code.
- Review existing Community aquatic animal health legislation with a view to ensuring its updating to assist the maintenance of biodiversity in the aquatic environment.
- Promote the development of guidelines on containment of farmed fish in aquaculture.

5.4. Research in relation to aquaculture.

107. The 5th Framework Programme addresses research needs in relation to aquaculture in the thematic Programme 1, “Quality of Life and Management of Living Resources” key action 5, “Sustainable agriculture, fisheries and forestry and integrated development of rural areas including mountain areas”. Important research priorities with relevance to the understanding of biodiversity are also listed under Thematic Programme 4: “energy, environment and Sustainable Development” under Key Action 3 “Sustainable Marine Ecosystems.”
108. The research will focus on methods and strategies to assess or reduce where undesirable, the effects of the interactions between environment, fisheries and aquaculture. Its general aim is to improve the understanding of the impact of environmental changes (whether induced by human activities or not) on the dynamics of commercially harvested living resources and on aquaculture, with particular emphasis on the effects of toxic algae. As for aquaculture, it will focus on the effects of farm effluents and on the interactions between wild and farmed and ornamental fish with special emphasis on genetics, including GMOs, and diseases.
109. The Programme also gives priority to multidisciplinary research encompassing various fields of aquaculture genetics, including the corresponding genetic bases and heritability. By the development of tools to facilitate the identification of suitable source populations with profitable traits including the application of genome mapping, benefits could also be expected in relation to conservation and sustainable use of biodiversity.
110. In addition to the research activities mentioned above the Action Plan stresses the need for improved knowledge about the following:

Action X - Research to provide enhanced knowledge related to aquaculture.

- Genetic impact on wild population of escapees and release both accidental as well as for restocking, from farming activity
- Quantitative modelling of transfer of diseases and parasites amongst farmed and between farmed and wild populations
- Improved husbandry practices to reduce stress and to further minimise the need of medical treatment;
- Technological improvement of farming facilities to reduce escapement from sea (including offshore) and land-based aquaculture activities.
- Alternatives to fish meal/oil in fish nutrition
- Research is needed to examine the potential effects on biodiversity of the use of genetically modified aquaculture animals.

111. In addition to the ongoing research activities under the 5th Framework Programme the development of the 6th Framework Programme which has started will provide additional opportunities to strengthen the research priorities in support of the Action Plan.

6. INFORMATION EDUCATION, TRAINING AND AWARENESS.

112. Education, training and awareness raising are important and essential to ensure the success of the action proposed in the plan. In fisheries, there is a particular need to raise awareness of the benefits both to the fishing industry and the environment associated with conservation and sustainable use of biodiversity. There are various needs in this area, including public awareness exercises, and improving technical expertise around fisheries and biodiversity issues, within the scientific and administrative communities, as well as within industry and environmental organisations.
113. There is also clearly a need to define and explain what is the content of the precautionary approach, sustainability, sustainable development, biodiversity and ecosystem management etc to the sector and the general public.
114. Some action has already been started to address the need of objective and clear information. DG Fisheries has already made improvements to the way in which policies are developed, notably by increasing information to the public and including environment and development NGOs in the official consultation process. However, there is a need to increase the flow of information between policy makers, stakeholders and other interested parties. The following represent some policy options that may be applied:
- funding information campaigns and other awareness raising exercises concerned with fisheries and the environment;

- enhanced use of IT to bring out information and motives for management action and integration of environmental concern in the CFP;
 - a communication on the application of the precautionary approach to fisheries management;
 - encouraging professional training and education, to improve awareness/capacity building to enhance ecosystem management; and
 - improving capacity for monitoring and assessment, including resources, training and exchange of expertise between different technical groups.
115. DG Fisheries is involved in the Commission work on developing an overall strategy for a Community Sustainable Development. This Action Plan will form an important element in such process.

7. IMPLEMENTATION AND TIME FRAME.

116. The proposed actions under the plan focus on a short to medium strategy that could bring about significant improvement in the conservation of biodiversity based on the present knowledge about fisheries and the marine ecosystem.
117. It has also identified the need to develop integrated advice and important research priorities to support the development of strategy leading to a more holistic approach. Limits and reference points will have to be defined also for non- target species and habitats in order to provide acceptable guarantees for safeguarding the structure and function of the ecosystem. The action plan therefore foreshadows a gradual development that could move towards an ecosystem management system. The application of the precautionary approach in the first phase to commercially important species and subsequently for non-target species will constitute a central tool to achieve the wider scope of the plan.
118. The basic regulation and secondary acts of the CFP already provide the appropriate instruments to implement most of the proposed actions under this Action Plan. The main obstacles for implementation are therefore not the lack of management tools but the lack of awareness and lack of scientific knowledge. There is a growing understanding of the basic processes underlying species interactions, natural variation and the impact of fishing on non-target species and environment. However, the advisory bodies concerned have not yet been able to incorporate such knowledge into operational advice for fisheries managers. It is to be hoped that greater scientific knowledge would strengthen the basis for decision-makers to make use of the tools already available and to devise new tools for ecosystem management.
119. The possibility of performing realistic and useful environmental impact assessments (EIA) to guide fisheries managers does not therefore match the wider scope of the plan. In addition, the absence of methods for monitoring and evaluating the effect of measures taken with respect to biodiversity such as the ecological effect of maritime and coastal no-take zones proposed under NATURA 2000 will require gradual implementation within realistic priorities and time frames. It is therefore of high priority that such areas be identified and selected for pilot studies.

120. However a better co-ordination of existing knowledge would provide sufficient scientific basis for increased use of temporary or permanent closed areas to protect fragile, sensitive or representative habitats and species. The plan therefore proposes that such measures be more frequently used to enhance the protection and conservation of non-target species and habitats. The conditional closure for certain fisheries in an area off the UK coast in order to enhance the breeding success of sea birds is one such example. In addition ICES has been requested to evaluate the environmental impact of fishing activities in deep waters and to advise on possible measures to reduce or eliminate such effects.
121. There is, however, indisputable evidence (both biological and economic) that the fishing pressure is too high on several fish stocks and a significant permanent reduction is needed. As described above in Section 4.3.1 such actions would result in enhanced biodiversity in a wider sense as well as improved sustainability for the fishing sector.
122. The first priority is therefore to create more long-term management plans for EU exclusive stocks and to continue the process started in the international framework within NEAFC, IBSFC and in bilateral agreements. Such management plans have been put in place for about 11 stocks. The ambition of the Action Plan is to develop long-term management harvest plans within 5 years for all major stocks, including salmonids and eel.
123. In addition the reduction of the fleet capacity needs to be more ambitious in order to support such management plans by permanent removal of excess capacity. The review of the MAGP proposed for 2001 is in this context a very important opportunity. Reduction of fleet capacity can not be achieved in the short term perspective but will be of major importance in the medium term strategy to reduce the fishing pressure and hence the impact on the environment.
124. The second priority is to apply the precautionary approach to non- target species and define limit and reference points in a similar way as for commercially important stocks. The application will have to include definition of best fishing practice and possibly restrictions of unacceptable fishing methods. The agreement on phasing out the certain drift net fishing is one such example. The time frame for such action is difficult to define but within the next 5 years science would possibly be in the position to provide sufficient information that further measures could be applied especially for species and habitats identified in the Habitat directive.
125. Furthermore the experience gained in the CFP confirms that different combinations of management tools will be needed to achieve a reduction in fishing pressure. Closed areas or no-take zones will not provide a panacea for all ecological and fisheries problems. Experience also reveals that drastic changes in management systems over short time periods are likely to fail and to create additional enforcement problems. The measures must be case-specific, based on the specificity of the species biology and the fisheries. Hence, the time needed to bring the harvest rates down to sustainable levels will vary.
126. In order to assist such measures other complementary tools will have to be used. The strong commitment to improve selectivity is an ongoing process and further improvements of gear selectivity can be foreseen when results of some research activities already in progress become available. Furthermore it is proposed to make

increased use of the existing opportunities to provide financial support for experimental fishing with the aim of introducing more selective fishing methods and gears.

127. The proposed actions will result in significant reductions in fishing pressure and will have major impacts on the fishing sector in terms of the intensity and nature of existing fisheries with respect to short-term profitability and employment. The reduction of fishing pressure will at least initially result in lower catches before the stocks have recovered and catches become more stable at sustainable levels. By introducing additional ecosystem objectives it is very likely that an even lower fishing pressure will be needed. A reasonable balance has to be found between biodiversity concerns and the fisheries interests. In order to struck this balance it will be necessary to evaluate not only the environmental effectiveness but also the economical and social side effects of the actions.
128. The structural and financial changes needed for the necessary adjustments for the future CFP is the subject for ongoing review process, CFP 2002. These issues are therefore more appropriately address in that process.
129. A summary of the proposed actions is provided in Annex 2.

Annex I: List of abbreviations used in the Action Plan

CCAMLR	Commission for the Conservation of Antarctic Marine Living Resources
CFP	Common Fisheries Policy
EIA	Environmental Impact Assessment
FAO	Food and Agriculture Organisation UN
FIFG	Financial Instrument for Fisheries Guidance
FEAP	Federation of European Aquaculture Producers
GMM	Genetically Modified Micro-organisms
GMO	Genetically Modified Organisms
HELCOM	Helsinki Commission Baltic Marine Environment Protection Commission
ICCAT	International Commission for the Conservation of Atlantic Tunas
ICES	International Council for the Exploration of the Sea
IBSFC	International Baltic Sea Fisheries Commission
MAGP	Multi-Annual Guidance Programmes
NAFO	Northwest Atlantic Fisheries Organisation
NASCO	North Atlantic Salmon Conservation Organisation
NEAFC	Northeast Atlantic Fisheries Commission
NGO	Non Governmental Organisation
OSPAR	Oslo and Paris Convention for the Prevention of Marine Pollution
STECF	Scientific, Technical and Economic Committee for Fisheries
TAC	Total Allowable Catch

Annex II: Implementation of measures necessary for the achievement of action plan priorities: targets and timetable

Sector/horizontal objectives	Priorities	Relevant instrument/measures	Targets and Indicators	Time table
Conservation and sustainable use	Revision of Common Fisheries Policy	A Green Paper on Common Fisheries Policy A communication on Precautionary approach to commercially fished stocks Review of the Basic Regulation 3760/92 and secondary acts	Further integration of economic, social and environmental objectives and enhanced transparency of the general objectives to support sustainable development	2000 2001 Review of CFP 2002
	Reducing the fishing pressure on commercially exploited species	Basic Regulation 3760/92	Long-term management plans for all major stocks TAC, multi-yearly approach;	Ongoing to be review in the CFP 2002
		Council Decision 97/413/EC Mid-term review of existing MAGP IV Adoption of new MAGP V Financial Instruments for fishery guidance (FIFG) Regulation 2792/1999	New more ambitious targets for reduction of over-capacity and effort in fishing fleets linked to management plans for the fish stocks	2002

Sector/horizontal objectives	Priorities	Relevant instrument/measures	Targets and Indicators	Time table
		Technical measures Amendments of Council Regulation 850/98	Flanking technical measures to improve species and size selectivity, temporal or spatial closures to enhance survival of juveniles and spawning concentration including enhanced survival of local populations	Ongoing
	Reducing the impact by fisheries on non-target species and habitats	Technical measures with the aim of protecting non-target species and habitats. New Council Regulation Financial Instruments for fishery guidance (FIFG) Regulation 2792/1999 Habitat Directive	Introduction and promotion of the use of selectivity devises that reduce or eliminate by-catches of non target species and have reduced impact on the environment. Institute temporal and spatial closures to enhance protection of species or habitats, including “no-take” zones Definition of Best Fishing Practise	2003
Research, indicators of performance, monitoring and assessment	Research priorities to secure traditional support for the CFP.	Under the obligations of the Community and the Member States The 5 th and 6 th Framework Programme Community funding of relevant studies	Framework for data collection and management of such data in support of the CFP Research on assessment methods; more selective and environmental fishing methods; alternative management systems, including control and enforcement.	Review in 2003

Sector/horizontal objectives	Priorities	Relevant instrument/measures	Targets and Indicators	Time table
	Research to provide enhanced knowledge related to biodiversity.	<p>The 5th and 6th Framework Programme</p> <p>EEA/ICES to propose indicators</p>	<p>Identification of key habitats and biotopes and the conservation and management measures which would be necessary to minimise the impacts of fishing upon them</p> <p>Development and selection of biodiversity indicators of marine ecosystem health, both of fish stocks and other species</p> <p>Evaluation of environmental data to be collected on routine base; Review of the framework</p>	<p>Natura 2000 process 2002</p> <p>Review of data collection in 2003</p>
Aquaculture	Reduction of environmental impact	<p>Water Framework directive</p> <p>Environmental Impact Assessment (EIA) legislation.</p> <p>Financial Instruments for fishery guidance (FIFG) Regulation 2792/1999</p>	Promote measures to reduce direct impact on the environment of aquaculture.	
	To limit introduction of new species and secure animal health	ICES/EIFAC Code	Promote strict control of introduction of new species and secure animal health.	Ongoing

Sector/horizontal objectives	Priorities	Relevant instrument/measures	Targets and Indicators	Time table
	Research to support aquaculture	5 th and 6 th Framework Programme		
Information, education, training and awareness.		EC-Biodiversity Strategy	Further develop an information and transparency process to promote awareness of biodiversity concern; Support of EC Clearing House Mechanism	Ongoing