UNDER CONTRACT TO THE EUROPEAN ENVIRONMENT AGENCY

# The Water Indicator Report:

## An indicator-based assessment of Europe's water resources

## Final Draft

## February 2003

# The Water Indicator Report:

# An indicator-based assessment of Europe's water resources

## Final Draft

## February 2003

**Authors: S Nixon, Z Trent, C Lallana, C Marcuello**

**Contributions from: A Zenetos, J Grath, A Scheidleder,**

**J Feher, A Lazar, M Joanny, G Ærtebjerg, B Fribourg-Blanc,**

**J Bøgestrand, N Green, K Nygaard**

**EEA Project Managers: Peter Kristensen**

**Anita Künitzer**

**Jock Martin**

**Niels Thyssen**

# Table of content

## 7. Water quantity

7.1 Storyline for indicators

7.2 Indicators used

- → Available water
- → Water exploitation index
- → Trends in total abstraction
- → Water consumption index
- → Trends in sectoral use of water
- → Agricultural water use
- → Water use by households
- → Tourism water demand
- → Overall reservoir stocks
- → Saltwater intrusion
- → Groundwater levels
- → Water prices
- → Water use efficiency
- → Water leakage

7.3 References

**[THIS CHAPTER WILL BE FURTHER EDITED]**

# Executive summary

This report contains an indicator-based assessment of Europe's water, quality and quantity. Europe in the context of the assessment is the European Union, EFTA and EU Accession countries. The European Environment Agency (EEA) is developing a core set of indicators with the EIONET group and other stakeholders. The core set will cover both thematic and sectoral issues, and is being developed to answer broad policy questions. The indicators used in this report are based on the preliminary core set for water, and are formulated around the DPSIR framework. Five water issues are assessed using 60 indicators: ecological quality (seven indicators); eutrophication and organic pollution of water (20 indicators); hazardous substances (15 indicators); aquaculture and fisheries (four indicators); and, water quantity (14 indicators).

The formulation of indicators requires comparable datasets and identified data flows. Some of the data flows are from EUROWATERNET, the EEA's information network for water which entails the collection of specified and comparable information from EEA member countries. The EEA's policy is to use existing sources of information and data where possible, and to that end data has also been obtained from other organisations and institutions such as EUROSTAT, the Joint Research Centre, Marine Conventions and the European Commission's Directorate General for the Environment. Where there are no comparable datasets at the moment, demonstration indicators have been formulated from national or regional examples. It is hoped that these indicators can be produced on a European basis once appropriate data flows have been established.

The main policy objectives are contained in policy documents such as the Commission's Sustainable Development Strategy, Common Fisheries and Agricultural Policies, 6$^{th}$ Environmental Action Programme, and the draft Marine Strategy.  There are also a number of EU Directives relevant to water such as the Water Framework, Integrated Pollution Prevention and Control, Urban Waste Water Treatment, Nitrates, Bathing Waters and Drinking Water Directives. Questions (such as: Are discharges of nutrients and organic matter from socio-economic sectors decreasing?) have been phrased to assess whether or not the broad policy objectives and targets are being achieved, and to indicate where policy gaps maybe occurring. The indicators used in this report attempt to answer the defined policy questions.

The Water Framework Directive came into force at the end of 2000 and will fundamentally change how water is monitored, assessed and managed in many European countries. One of the key concepts it introduces to legislation is ecological status. At the present time it is not possible to obtain an overview of the ecological status of Europe's waters as there are many significant shortfalls and gaps in existing information, monitoring and assessment systems in European countries. However, existing river classification schemes based on biological elements indicate that the water quality in some rivers is improving. In terms of habitats and biodiversity, the introduction of non-native animals and plants to rivers, lakes and marine waters is a threat to the natural ecosystems. In addition there are intense pressures on coastal habitats arising from high population densities and agriculture in coastal zones.

Many policy objectives are being achieved in EU countries notably in the reduction of phosphorus and organic matter from point sources such as urban waste water treatment works, and through the introduction of phosphate-free detergents in some countries. This has led to decreases in the concentrations of these indicators in Europe's rivers and lakes. There have also been associated decreases in riverine and direct discharges to Europe's Sea though these have not generally been reflected in decreases in nutrient concentrations In Europe's seas. The improvement of waste water treatment has also led to an improvement in Europe's bathing water quality. There has been less success in reducing the concentrations of nitrate in Europe's rivers and

groundwater reflecting the large nitrogen surplus in agricultural soils and high livestock densities in EU countries. Nitrate can still be a problem in terms of drinking water and its sources.

There has also been success in reducing the concentrations of heavy metals listed in the Dangerous Substances Directive in some of Europe's rivers. There has been an associated reduction in the loads of these heavy metals and also some organic substances discharged to some of Europe's Seas. There is also evidence that these reductions are leading to the reduction of concentrations of some of these substances in marine biota in parts of Europe's Seas. The reduction in emissions of hazardous substances has largely been achieved through the application of cleaner processes and technology to industry. However, even though the discharges of oil from refineries and offshore installations have decreased, major accidental oil spills still occur too frequently within Europe's Seas. Agriculture is a major source of pesticides. These occur in surface, groundwater and drinking water at levels of potential concern. The presence of endocrine disrupting substances in Europe's waters is an emerging issue of concern with the sexual disruption of aquatic animals being reported by several European countries.

The policy objective of ensuring sustainable fisheries and healthy marine ecosystems is not being achieved as, for example, most fish stocks of commercial importance in European waters appear to be outside safe biological limits. This is being reflected in a change in the ecosystem composition of the North East Atlantic Ocean, the Mediterranean and Black Seas. Fishing also has a significant impact on non-target species such as dolphins, porpoises, turtles and birds. Aquaculture is an additional source of income in many coastal areas, but as any other intensive livestock farming it has several impacts on water quality.

Eighteen percent of Europe's population live in countries that are water stressed or severely water stressed even though in most parts of Europe total water abstractions have decreased over the last decade. Correspondingly there has been a decrease in the use of water by most sectors though there has been a slightly increasing trend in agricultural water use in Southern Western countries and in water abstracted for energy production in Central Accession countries. Over-abstraction of water is a major concern in parts of Europe, and in terms of groundwater, can lead to the intrusion of saltwater into aquifers making the water unsuitable for most purposes. There are a number of measures available to safeguard water supplies during dry periods. Thus, southern European countries retain the highest proportion of their annual freshwater resources in storage reservoirs. There are also measures to control the demand for water and to improve water conservation. In some cases water pricing has reduced domestic water demand, and there are various water saving devices to improve water use efficiency. However, in some countries leakage from water distribution systems can be significant.

In the EU and EFTA countries policy objectives have largely been achieved through measures associated with national legislation, EU Directives and other international agreements. In the eastern Accession countries, the situation is more complicated because of the major reforms of their political and economic structures during the 1990s. For example, it is not easy to separate improvements in some aspects of water quality/quantity (e.g. reduction of the organic pollution of rivers) resulting from the application of measures (e.g. improvement in waste water treatment) from the effects of reduction in economic activities and recession leading to reduced emissions to water. For example, agricultural water use has declined rapidly post transition because of two factors – reduced demand for agricultural products and the abandonment of oversized irrigation/drainage systems which were built to sustain the output-orientated agricultural system pre-transition. There have also been significant changes in the way water is managed within the eastern Accession countries. Centralised policy and financial planning have been reduced with increasing emphasis on decentralisation and privatisation. As a result the role of local authorities and river basin authorities is increasing as state owned regional water and wastewater companies have been replaced.

The EEA is adopting a top-down approach in developing indicators that will answer specific policy questions. This report clearly demonstrates that this approach is not always possible as the appropriate datasets and dataflows to do so are not always present, available or developed at a European level. EUROWATERNET has been implemented to develop such dataflows and its continued development alongside the operational implementation by countries of the Water Framework Directive and other major policy drivers will ensure that the quality of these indicators improves over time. The harmonisation and development of common policy relevant data flows and data needs for a number of users and policy makers will be a major contribution towards the goal of streamlining reporting on water.

# 1. Introduction

The aim of this report is to present an indicator-based assessment of Europe's water resources. It has been produced by the European Topic Centre on Water on behalf the European Environment Agency. The assessment includes all water categories – groundwater, rivers, lakes, transitional, coastal and marine water, and in terms of quantity and quantity. The report addresses and assesses five water issues using the DPSIR framework, and attempts to answer identified questions about broad policy objectives pertinent to Europe. The five issues are:

- Ecological quality (Chapter 3).
- Eutrophication and organic matter pollution (Chapter 4);
- Hazardous substances (Chapter 5);
- Fisheries and aquaculture (Chapter 6); and,
- Water quantity/water stress (Chapter 7).

Each issue chapter provides a description of the relevant policies and related policy objectives. These lead to specific policy relevant questions which are answered using the identified indicators. A conceptual DPSIR framework is also given for each issue with an indication of where the indicators used in this report fit into the framework. The report also identified areas where new indicators and data flows need to be developed in the future to answer some policy questions.

Europe in the context of this report includes all EEA countries. Regional or country grouping comparisons are made within the report. The two main country groupings used are:

| **EU and EFTA countries** | **EU Accession countries** |
|---|---|
| Austria | Bulgaria |
| Belgium | Cyprus |
| Denmark | Czech Republic |
| Finland | Estonia |
| France | Hungary |
| Germany | Latvia |
| Greece | Lithuania |
| Iceland | Malta |
| Ireland | Poland |
| Italy | Romania |
| Liechtenstein | Slovak Republic |
| Luxembourg | Slovenia |
| Netherlands | Turkey |
| Norway | |
| Portugal | |
| Spain | |
| Sweden | |
| Switzerland | |
| UK | |

Other country groupings have also been made to illustrate specific points or differences. In these cases the actual groupings used are given with the relevant indicator.

**The ‘smiley’ faces for each indicator or group of indicators aim, in this report, to provide the following assessment:**

Positive ☺:

- development of *driving forces* or *responses* in a direction that reasonably should lead to lower environmental pressures
- decreasing *pressures* on the environment
- improvement in the *state* of the environment.

Neutral 😐:

- developments in the *driving force* or in *pressures* on the environment are levelling of
- reductions in the concentration levels/improvement in the *state* of the environment, but targets/guideline values are still exceeded in >15% of the area/ for >15% of the population
- no changes in *pressure* on and *state* of the environment
- mixed developments within the indicator.

Negative ☹:

- *driving force* or *response* development that reasonably should lead to higher environmental pressures
- increasing *pressures* on the environment
- decreasing *quality* of the environment.

# 2. Core set of indicators for water

The former Topic Centres on Inland Waters and Marine and Coastal Environment proposed core sets of indicators for their respective work areas in 1999. On the forming of the integrated Topic Centre on Water both proposals were merged and revised to form a draft core set of indicators for water. This activity is part of the broader EEA initiative to develop, and agree with its stakeholders, a core set of indicators for six environmental issues (air pollution, biodiversity, climate change, terrestrial environment, waste and material flows and water and five sectors (agriculture, energy, fisheries, tourism and transport).

The fundamental principles underpinning the EEA's indicator approach are to establish the policy relevance of the indicators (by linking to objectives and targets), to define the data flows needed to underpin indicator production, to identify institutional responsibilities at the international level for existing data flows, and to show that there is multi-purpose use of the same indicators in many respects. Data are expensive to collect and so it is important that the reasons for collection are explicitly linked to policy objectives.

For the EEA, the core set of indicators is in essence a set of storylines by theme/sector, clusters of indicators by theme/sector grouped by generic and more specific policy questions, and sets of indicator factsheets or description sheets. The storyline for each water issue is given in the introduction to each chapter. Factsheets are available on the EEA's web page (<*URL to be added*>) for indicators that have already been developed; description sheets are being developed for those indicators for which there is a medium to long term timescale (2 to 5 years) for implementation.

The main function of the 'storyline' around each indicator subset or cluster of indicators is to communicate what is the framework within which the indicators will be assessed in broad terms. This text of the storyline, together with the policy questions should serve to improve the discussions with stakeholders on the 'right' focus of the selected indicators.

The core set of indicators includes indicators under development (so called demonstrator indicators), or indicators based on incomplete data sets.

With indicator sets on both environmental issues and sectors there are many overlapping indicators e.g. a pressure from a sector (agriculture) such as nutrient balance is relevant for the water indicator set on eutrophication. The EEA is aiming at a core set of indicators where indicators relevant to more than one theme/sector are not repeated in the different sets, rather they are identified in cross-reading tables showing the interlinkages.

The proposed core set of indicators for water is currently under review by the EIONET group and other stakeholders. This report is based on the proposed set which may be revised in light of the consultation process. The proposed water core set contains 15 indicators on water quantity, 22 on eutrophication and organic matter pollution, 20 on hazardous substances and 10 on ecological quality; a total of 67 indicators.

# 3. Ecological quality

## 3.1 Storyline for indicators

Populations of plants and animals in lakes, rivers and seas react to changes in their environment caused by changes in chemical water quality and physical disturbance of their habitat. Changes in species composition of organism groups like phytoplankton, algae, macrophytes, bottom dwelling animals and fish can be caused by changes in the climate, but also indicate changes in water quality caused by eutrophication and organic pollution, hazardous substances and oil and changes in their habitats caused by physical disturbance through damming, channelisation and dredging of rivers, construction of reservoirs, sand and gravel extraction in coastal waters, bottom trawling by fishing vessels etc. There are also biological pressures on populations, like the introduction of alien species through aquaculture and ballast water from maritime transport, and the stock of rivers and lakes with fish for recreational angling.

It is generally difficult to determine a clear relationship between observed changes in the ecosystem and the various chemical, physical and biological pressures that could have caused the effect. Ecological quality is therefore integrating all pressures and showing the overall status of the ecosystem.

The main policy objectives are:

- Water Framework Directive *which aims at achieving 'good' surface water and groundwater status by 2015; and prevents further deterioration and protects and enhances the status of aquatic ecosystems*; [1]
- Communication on a European marine Strategy with the aim to protect the Marine Ecosystem: One of the actions foreseen in the 6th Environment Action programme is the development of a Thematic Strategy for the Protection and Conservation of the Marine Environment (Marine Strategy). Therefore, the overarching objectives are (*i) sustainable and healthy European seas and their ecosystems and (ii) sustainable exploitation of renewable marine resources of these seas*. [2]
- Green Paper on common Fisheries Policy (Ecosystem approach) – Sustainable Development Strategy: *The Common Fisheries Policy should promote the sustainable management of fish stocks in the EU and internationally, while securing the long-term viability of the EU fishing industry and protecting marine ecosystems*. [3] - Sustainable Development Strategy: *Improve fisheries management to reverse the decline in stocks and ensure sustainable fisheries and healthy marine ecosystems, both in the EU and globally*. [4]
- Biodiversity Convention: *to halt biodiversity decline by 2010.* – Sustainable Development Strategy: *Protect and restore habitats and natural systems and halt the loss of biodiversity by 2010*. [5]

The Water Framework Directive introduces for all surface waters a general requirement for ecological protection, and aims at "good ecological status" for all surface water. Good ecological status is defined in terms of the quality of the biological community based on quality elements such as invertebrate and fish fauna and composition and abundance of aquatic flora, the hydrological characteristics and the chemical characteristics; and are specified as allowing only a slight departure from the biological community, which would be expected in conditions of minimal anthropogenic impact.

---

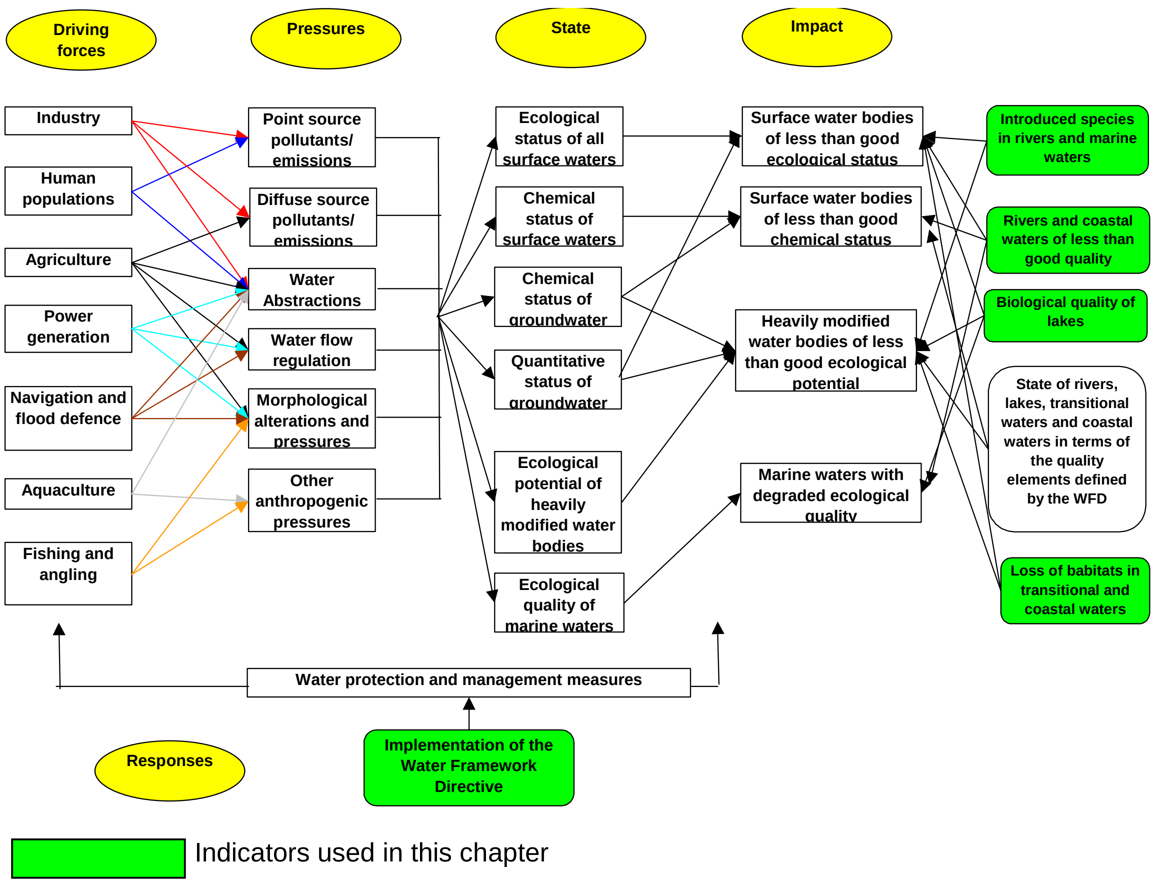
[1] Water Framework directive Article 4
[2] Marine Strategy (COM(2002 539 final)
[3] Sustainable Development Strategy p.6
[4] Sustainable Development Strategy p. 17
[5] Sustainable Development Strategy p.12

As the Water Framework Directive will be implemented over the coming 10-15 years, indicators describing the ecological quality of waters will be available in time. However, much information at the member country level already exists on the biological quality elements such as benthic invertebrates in rivers and phytoplankton in lakes and coastal waters. This information may in the meantime be collated and presented as indicators to illustrate aspects of the ecological quality of European surface waters.

## 3.2 Indicators used

The DPSIR framework for assessing aquatic ecological quality is shown below. The rectangles in green are those indicators used in this chapter.

**Figure 3.1 DPSIR framework for assessing aquatic ecological quality**




Indicators on Driving Forces and Pressures illustrated in Figure 3.1 are presented in the main issues chapters: eutrophication (chapter 4), hazardous substances (chapter 5), over-fishing and impact of aquaculture (chapter 6) and quantity and water stress (chapter 7). These issues are intimately linked with the achievement of good ecological and good chemical status as defined and required by the Water Framework Directive. For example, water abstractions either from surface or groundwaters, emissions of nutrients and hazardous substances from the different socio-economic sectors and fishing can impact surface water ecosystems.

Table 3.1 summarises the assessments that are made in terms of the policy questions using relevant indicators. More detailed information and assessments then follow in the subsequent pages and indicator factsheets. An '✖' in the assessment column indicates that there is no indicator developed or formulated to answer the specific policy question. Some of the indicators demonstrate some of the quality elements of the Water Framework Directive: these indicators will be improved and replaced when the monitoring, assessments and classifications from the Water Framework Directive become available over the coming years.

## Policy question 1: *Are we achieving good surface water ecological status and preventing the deterioration of aquatic ecosystems*

### Table 3.1 Overall assessment of progress in meeting policy objectives in terms of ecological quality

| Policy question | Indicators | Assessment |
|---|---|---|
| **Question 1: Are we achieving good surface water ecological status and preventing the deterioration of aquatic ecosystems?** | | |
| | Lengths of river less than ‘good' quality in national classifications | ☺ According to national classification schemes, river quality in Europe is improving in most countries |
| | Lakes less than ‘good’ quality in national classifications | ☹ The proportion of lakes classified as less than good in national classifications has decreased since the 1980’s<br><br>☺ There are still a significant number of lakes in some of the Accession Countries that are considered as relatively pristine. |
| | Transitional and coastal waters less than ‘good' quality in national classifications | 😐 Based on data from only two countries the majority of transitional and coastal waters are of good quality.. |
| | Proportion of surface water bodies below 'good' ecological status | ✖ |
| | Progress in the implementation of the Water Framework Directive | ☹ There is a large gap between what is required by the Water Framework Directive in terms of monitoring and classification of ecological status, and what is currently undertaken by countries. |
| **Question 2: Are we protecting habitats and natural systems and halting the loss of biodiversity?** | | |
| | Introduced species in rivers and lakes | ☹ The introduction on non-indigenous species poses a major threat to river and lake ecosystems. |
| | Introduced species in transitional and coastal waters | ☺ The rate of introduction of non-indigenous species into Europe’s seas has decreased since the 1970’s (☹) with the exception of the Atlantic Ocean where it is still increasing. |
| | Loss of habitats in transitional and coastal waters | ☹ There are intense pressures on transitional and coastal habitats in Europe due to high population densities and agriculture being a major land use. |
| | Progress to national strategies to ICZM | ✖ |

✖ Indicator to be developed

## Policy question 1: *Are we achieving good surface water ecological status and preventing the deterioration of aquatic ecosystems*

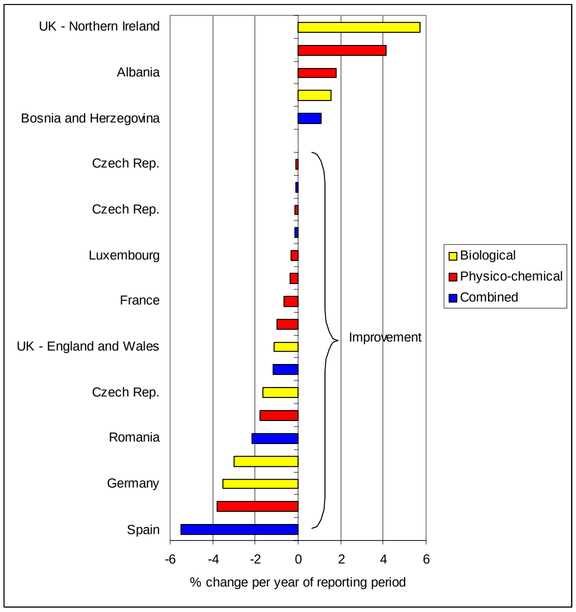
## Lengths of river less than 'good' quality in national classifications

River classification schemes are often designed to give an indication of the extent of pollution. There are many different types of scheme. Some are based solely on chemical and general physico-chemical parameters (e.g. dissolved oxygen, ammonium and biochemical oxygen demand), some on biological indices (usually based on macroinvertebrates) and some on a combination. Although all the countries have different schemes they give a general indication of river quality, particularly whether according to a country's scheme there has been an improvement or not. None of the classification schemes meet the requirements of the Water Framework Directive and hence there is at present no information on the ecological status of any water category including rivers. Different types of schemes cannot be quantitatively compared hence Figure 3.2 is divided into the types (combined, physico-chemical, biological). Some countries have more than one national classification scheme and so results for each scheme are shown separately e.g. England and Wales has a physico-chemical scheme and a biological scheme. This separation into types of scheme also illustrates that whilst one scheme may show an improvement in quality, another may show a deterioration e.g. the UK – Northern Ireland chemical scheme showed an improvement whilst the biological scheme showed a deterioration. This was because biological scheme was also reflecting a degradation in habitat quality as well as changes in water quality. The majority of river classification schemes shown an improvement in quality.

Figure 3.3 shows the percentage of rivers classified as less than good. There are large differences with countries such as Czech. Rep., Latvia and Poland having relatively large, and UK relatively, small percentages less than good quality. However there is a wide variation in the length of national rivers included in classification schemes. The average length of river classified was only about 30% of the total length of river in the country. This may mean that the actual percentage of rivers less than good is lower if it is assumed that the river stretches that were not part of the classification scheme are of good quality.

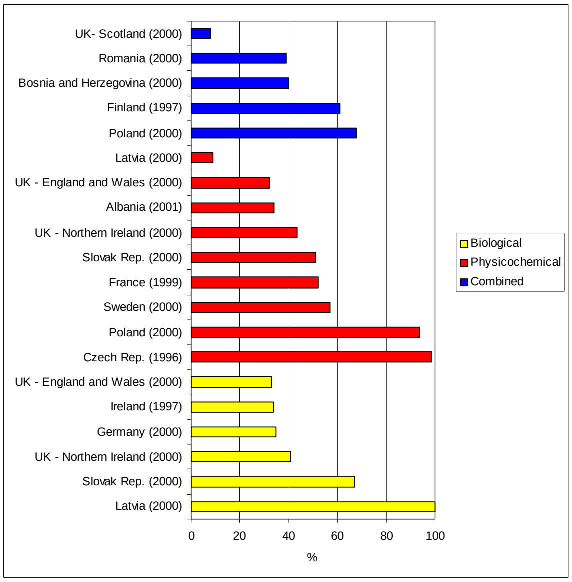
Key message:
☺ According to national classification schemes, river quality in Europe is improving in most countries.

**Figure 3.2 Rate of change in rivers classified as less than good as a percentage of the total rivers classified**




Note: Data shown are for different types of classification scheme (biological, physico-chemical and combined) by country.
Sources: Compiled by ETC-WTR from national reports and questionnaire returns from NRCs

**Figure 3.3 Percentage of river classified as less than good by country (year in brackets)**




Source: Compiled by ETC-WTR

## Policy question 2 *Are we protecting habitats and natural systems and halting the loss of biodiversity.*

**Note: Demonstration indicator**

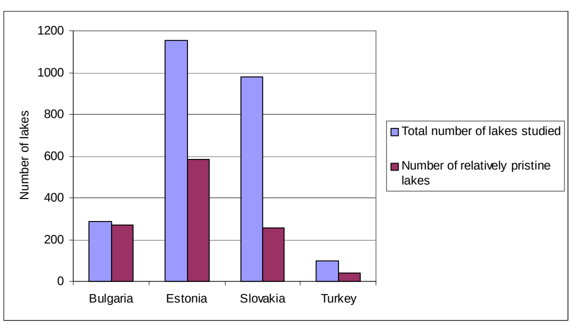
## Lakes less than 'good' quality in national classifications

Some countries have developed national classification schemes for their lakes. These are generally based on nutrients (mainly phosphorus) and on chlorophyll a concentrations. None of the schemes comply with the requirements of the Water Framework Directive. Even though the national classifications are NOT comparable with other country classifications, useful information is obtained by comparing the proportion of lakes that are considered and reported nationally to be of less than 'good' quality.

Figure 3.4 is based on examples of current national lake classification schemes. In the cases of Ireland and Switzerland there has been significant improvements in lake quality since the 1980's in terms of lake surface area (Ireland) and numbers of lakes (Switzerland). Norway and Finland have many thousands of lakes with Norway in particular having a very small proportion considered as being of bad or very bad quality.

An ecological assessment of 19 lakes in 5 of the Accession Countries (Bulgaria, Hungary, Slovakia, Estonia and Turkey), was recently carried out by the World Wide Fund for Nature. Mountain lakes with minimal human pressures scored "high" ecological status and even some large lake systems like lake Peipsi in Estonia appear to be in a relatively "good" ecological state. Unfortunately, some of the lakes are under pressure from pollution, over fishing, or water use for irrigation, industry and drinking.

**Figure 3.5 Ecological quality of lakes in four Accession countries.**

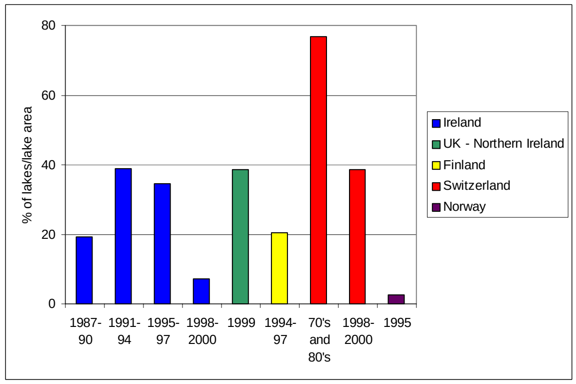



Source Water and Wetland index (WWF, December 2000)

Key messages:

☺ The proportion of lakes classified as less than good in national classifications has decreased since the 1980's

**Figure 3.4 Proportion of lakes of less than good quality as defined by national classifications**




Notes: Ireland, 307 lakes classified according to trophic status (e.g. chlorophyll a concentrations). Percentage of surface of lakes worse than eutrophic. Source: Environment in Focus 2002 – Key Environmental Indicators.
UK – Northern Ireland: Number of eutrophic lakes based on total phosphorus concentrations in 13 lakes. Source: http://www.afsni.ac.uk/Research/P_sources/sld008.htm.
Finland: Based on water quality classification of 2061 lakes >1 $km^2$. Source: http://www.vyh.fi/eng/environ/sustdev/indicat/vesilaat.htm
Switzerland: Based on the total phosphorus concentrations in 13 lakes, less than good equating to concentrations less than 35 µg P/l. Source: http://www.umwelt-schweiz.ch/buwal/de/fachgebiete/fg_gewasser/gewasserrubrik/unterseite5/index.html
Norway: classification of 1800 lakes based on concentrations of phosphorus and nitrogen. Source: http://www.environment.no/Topics/Water/eutrophication/eutrophication.stm#A

Key message:

☺ There are still a significant number of lakes in some of the Accession Countries that are considered as relatively pristine.

Further information on the quality of lakes is given in the eutrophication chapter (4) of this report.

## Policy question 2 *Are we protecting habitats and natural systems and halting the loss of biodiversity.*

**Note: Demonstration indicator**

## Transitional and coastal waters less than 'good' quality in national classifications

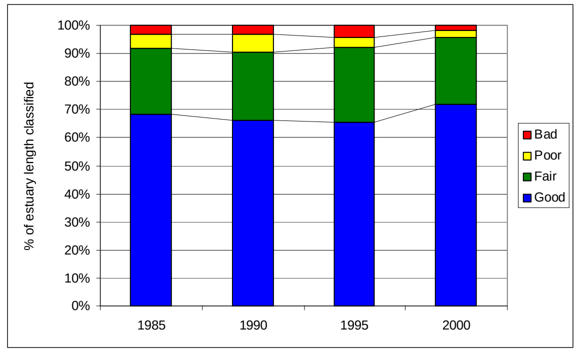
Key message:
☹ Based on data from only two countries the majority of transitional and coastal waters are of good quality.

There are far fewer national classification schemes for transitional and coastal waters than there are for rivers. Those that are used are often based on a combination of chemical, biological and aesthetic measures.

The quality of estuaries in England and Wales showed little improvement between 1985 and 1995 (figure 3.6). However between 1995 and 2000, the proportion of good quality estuaries increased and the proportion of poor and bad decreased. The quality of estuaries in Scotland remained relatively constant between 1996 and 1999 (Figure 3.7).

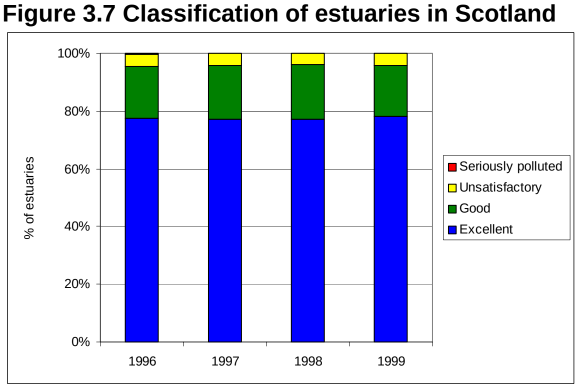
Figure 3.8 shows the general classification of Finnish coastal waters based on water quality data from 1994 to 1997. The results indicate that only 12 % of their waters are considered to be of less than good quality. The poorer quality waters are generally because of eutrophication, hazardous substances or hygienic bacteria. Thus for example, coastal waters close to large municipalities such as Helsinki were often classified as poor or passable.

**Figure 3.6 Classification of estuaries in England and Wales**



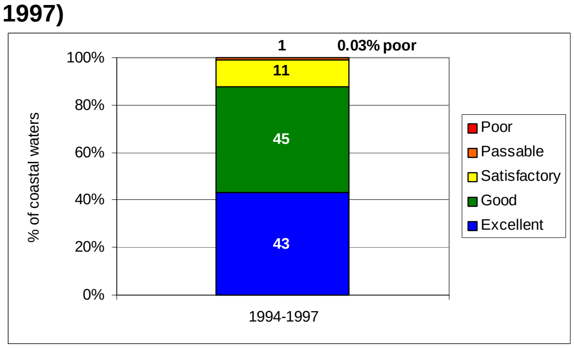

Source: Environment Agency of England and Wales web page

**Figure 3.7 Classification of estuaries in Scotland**




Source: Scottish Environment Protection Agency web page

**Figure 3.8 General classification of Finnish coastal waters based on water quality data (1994-1997)**




Source: Finnish Environment Institute

## Policy question 2 *Are we protecting habitats and natural systems and halting the loss of biodiversity.*

**Progress in the implementation of the Water Framework Directive.**

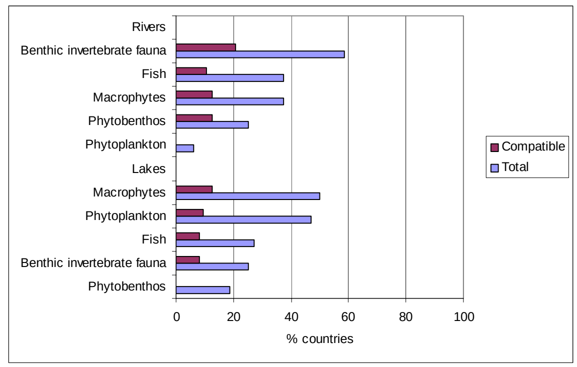
EU Member States are required to implement monitoring programmes to establish a coherent and comprehensive overview of the ecological and chemical status of surface waters within each river basin district. The monitoring results must also permit the classification of water bodies into five ecological status classes and into two chemical status classes. The monitoring results programmes have to be operational by 22 December 2006. The Directive details the biological, physico-chemical and hydromorphological quality elements and the pollutants that must be monitored for, and used in the subsequent classifications. Traditionally EU Member States have focused on the monitoring of general physico-chemical (e.g. dissolved oxygen and pH) quality elements, nutrients (nitrogen and phosphorus) and specific pollutants (e.g. mercury and cadmium) rather than on the biological and hydromorphological components of aquatic ecosystems.

Many countries do not monitor or classify all the quality elements required by the Water Framework. In addition, most existing national monitoring and classification schemes also do not meet the requirements of the Directive. Thus the Directive will require most Member States to develop and extend their present monitoring and classifications schemes for all surface water categories -–rivers, lakes, transitional and coastal waters.

Figure 3.9 summarises the biological quality elements that are currently used in national classification schemes for lakes and rivers, with an assessment (by national experts) as to whether the scheme is compatible with Water Framework Directive requirements. At the moment not all EU Member States (and Norway) have national classification schemes for the biological quality elements for lakes and rivers. In terms of rivers the most commonly used biological quality element is benthic invertebrate fauna and the least commonly used is phytoplankton. For lakes, macrophytes are most frequently used in classification schemes. It is also clear that only a few of the present classification schemes for rivers and lakes are compatible with the requirements of the Directive.

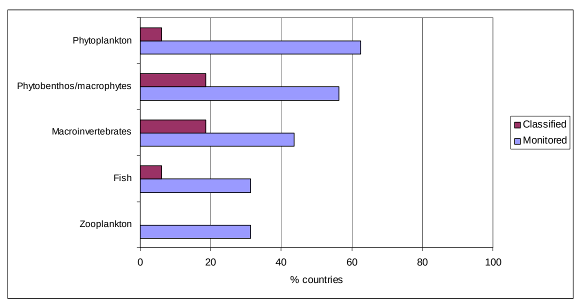
Key message:
☹ There is a large gap between what is required by the Water Framework Directive in terms of monitoring and classification of ecological status, and what is currently undertaken by countries.

**Figure 3.9 Biological quality elements used in river and lake classification systems in EU (and Norway) and compatibility with Water Framework Directive**




Source: Compiled by ETC/WTR from contributions to the Common Implementation Strategy Working Group 2.3 (REFCOND). Information from 16 countries.

**Figure 3.10 Biological quality elements monitored and classified in transitional and coastal waters in EU (and Norway)**




Source: Compiled by ETC/WTR from contributions to the Common Implementation Strategy Working Groups 2.4 (COAST) and 2.7 Monitoring . Information from 14 countries with a coastline
Note that the monitoring of zooplankton is not required by the Water Framework Directive..

In terms of transitional and coastal water again not all countries monitor for the required biological quality elements and fewer use the results in national classification schemes (Figure 3.10). The most common biological elements monitored and classified are phytoplankton and phytobenthos/macrophytes, and the least common are fish and zooplankton.

## Policy question 2 *Are we protecting habitats and natural systems and halting the loss of biodiversity.*

### Introduced species in rivers and lakes

Key message:
☹ The introduction oF non-indigenous species poses a major threat to river and lake ecosystems.

An introduced species (also known as alien, exotic, invasive, non-indigenous, non-native) is an organism in an ecosystem other than the one in which it evolved. Because it did not evolve there, it may cause havoc in its new environment, for example, by predating on and competing with native species, and disrupting food webs and introducing diseases. Introduced species enter new ecosystems by being either intentionally or accidentally transported and released by man or by extending their geographical range following natural or man-made changes in the environment e.g. the construction of the Suez Canal.

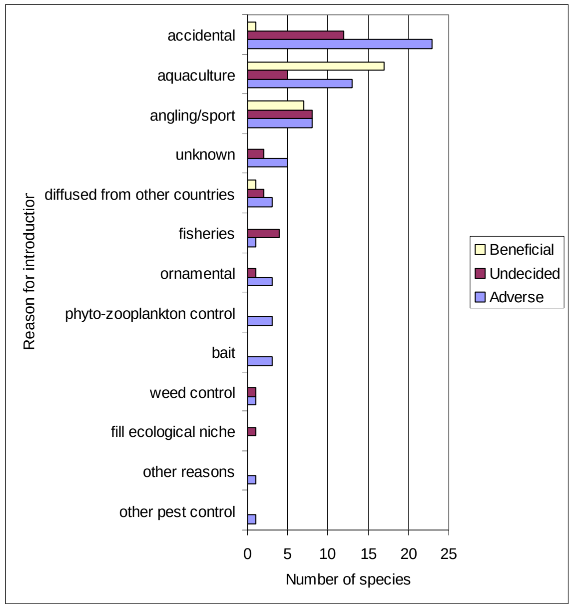
The majority of non-native species in inland waters have been introduced accidentally, for aquaculture or for angling (Figure 3.11). For many species the ecological effects are unknown but of those having a known impact on the ecosystem, the effects have mainly been adverse. France (42), Hungary (40) and Italy (36) have the most recorded introduced freshwater species.

These human-mediated invasions, often referred to as "ecological roulette" or "biological pollution", represent a growing problem due to the unexpected and harmful impacts they cause to the environment, economy and human health. The introduction of alien species is ranked as the second most important threat to biodiversity (World Conservation Union) (the first being habitat destruction).

Preventing future accidental introductions is the most difficult to tackle since it involves placing restrictions on the transfer of goods and people but introductions for aquaculture and angling could be more strictly controlled.

There are numerous examples of the ecological devastation that the introduction of alien species can cause. For example, Chinese Mitten Crabs (*Eriocheir sinensis*), originally from East Asia, now have a European distribution from Finland to Southern France (Clark *et al*., 1998). It is predominantly a freshwater species but migrates to the sea to breed and is believed to have arrived in the Thames in the ballast water of ships. They cause riverbank erosion and destabilise unprotected engineering earthworks since they can burrow deeply into them.

**Figure 3.11 Number of introduced freshwater species which have an ecological effect**




Source: ETC/NC. Countries included: Austria, Belgium, Croatia, Czech Rep. Slovak Rep. Denmark, Estonia, Finland, France, Germany, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Malta, Netherlands, Norway, Poland, Portugal, Romania, Spain, Sweden, Switzerland, UK*.*

They can also cross dry land to invade other river systems where they cause damage to the freshwater community. In the UK, for example, they prey on the native crayfish, *Austropotambius pallipes,* which is already under threat from other non-native crayfish.

## Policy question 2 *Are we protecting habitats and natural systems and halting the loss of biodiversity.*

**Introduced species in transitional and coastal waters.**

About 660 non-indigenous marine species have been introduced into European coastal waters through shipping, aquaculture and other man-made activities. The Mediterranean Basin has received about 500 such species, mostly via the Suez Canal (opened in 1869), while less than a hundred are known to have arrived in the Atlantic, North Sea and Baltic Sea coasts.

The rate of introduction has shown some signs of decreasing over the last two decades in the Mediterranean, Baltic, Black and North Seas. Introduction in the Atlantic ocean of alien macroalgae and macrobenthic organisms appear to have been as accompanying species with stocks imported for aquaculture (Figure 3.12).

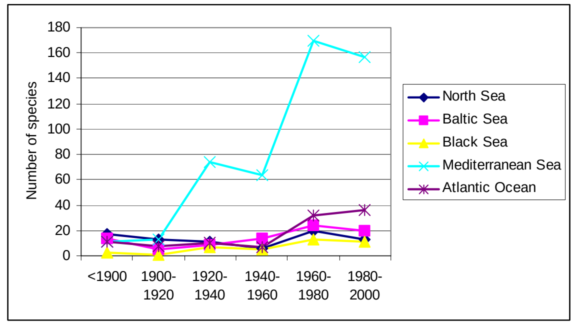
The primary mode of introduction in European Seas is shipping (154 species) with aquaculture coming next (124 species). The mode of introduction varies among the regional Seas (Map 3.1)*. Shipping and aquaculture contribute equally to the number of introduced species in the Black Sea and the Baltic, whereas shipping is the major vector of introductions in the North Sea and aquaculture in the Atlantic Sea respectively. Introduced unicellular algae and zooplanktonic organisms, mainly introduced with ballast waters have reduced after 1980 in the Atlantic Ocean, North, and Mediterranean Seas, presumably due to some preventative measures, whereas they have slightly increased in the Baltic and Black Seas. In the Eastern Mediterranean Sea most invertebrate and fish aliens originate from the Indo-Pacific and Red Sea. Through the total rate of introductions in the Mediterranean shows some sign of reduction those via the Suez Canal are still increasing (Golani *et al*., 2002; Galil *et al* 2002; Zenetos *et al*.. 2002).

---

Key message:
☺ The rate of introduction of non-indigenous species into Europe's seas has decreased since the 1970's (☹) with the exception of the Atlantic Ocean where it is still increasing.

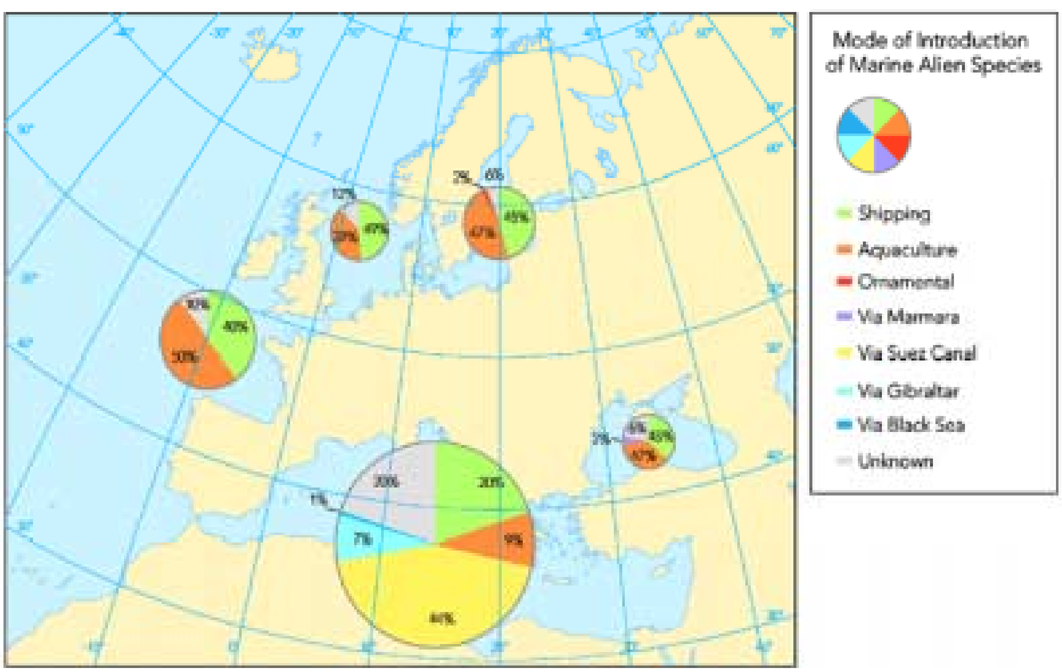
---

**Figure 3.12 Rate of introduction of non-indigenous marine species into European Seas**




Source: NCMR and ETC/WTR

**Map 3.1 Mode of introduction of non-indigenous species into regional seas**




**Source: Data from ETC Water, compiled by EEA**

## Policy question 2 *Are we protecting habitats and natural systems and halting the loss of biodiversity.*

**Note: Demonstration Indicator.**

### Loss of habitats in transitional and coastal waters

The pressure on coastal zones is particularly great as a wide range of human activities take place there (e.g. industry, tourism, fishing, aquaculture) and population densities are high. Within the EU Habitats Directive, 14 of the 65 priority habitats are in the coastal zone. Data is not yet available to examine the change in area of these habitats over time.

The EU coastline is approximately 89 000 km and all around it the interface between the land and the sea provides a diverse range of habitats for many organisms that are specifically adapted to cope with the conditions there. However, the size of these coastal and transitional habitats are small in area and their continued depletion could result in a rapid decrease in biodiversity. Many coastal habitats also have important functions as nutrient sinks and also prevent coastal erosion.

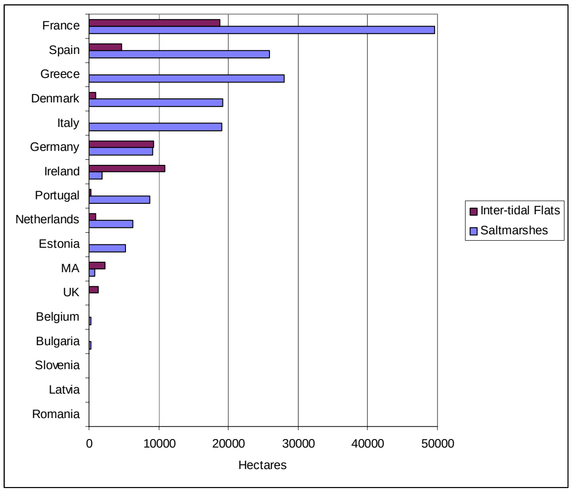
Figure 3.13 shows the areas of 2 selected coastal habitats in the EEA countries. When the data is updated it will be possible to see if and where increases and decreases have occurred.

Figure 3.14 gives a national example from the UK where changes in coastal habitats in England have been predicted. For most habitats a net loss is predicted through coastal management practices and development by expected sea level rises. However the managed realignment of coastal defences is expected to result in a net increase in area of saltmarshes, mudflat and sandflats.

Key message

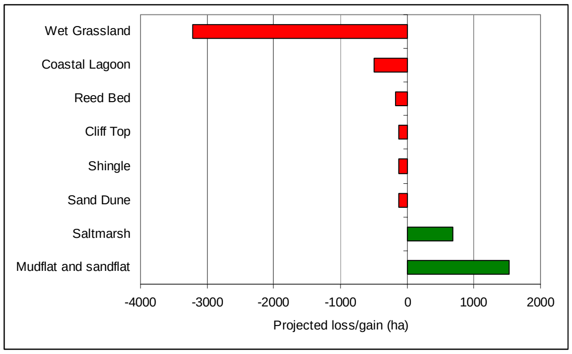
☹ There are intense pressures on transitional and coastal habitats in Europe due to high population densities and agriculture being a major land use.

**Figure 3.13 Area of inter-tidal flats and saltmarshes by country**




Source: EEA Natlan

**Figure 3.14 Predicted changes in selected coastal habitats in England by 2050 as a result of coastal management practices and projected sea level rise**




Source: English Nature (2002)

## 3.3 References

Clark, P. F., Rainbow P. S., Robbins, R. S., Smith, B., Yeomans, W. E., Thomas, M., Dobson, G. (1998) **The alien Chinese mitten crab, Eriocheir sinensis (Crustacea: Decapoda: Bra**

EEA NATLAN:
http://dataservice.eea.eu.int/dataservice/available.asp?type=search&search=NATLAN&i=1

Galil, B., Froglia, C.,Noel, P.Y., and M. Turkay (2002) **CIESM Atlas of Exotic Species in the Mediterranean, Crustacean Decapods and Stomatopods**

Golani, D., Orsi-Relini, L., Massuti, E and J.P Quingnard (2002) CIESM **Atlas of Exotic Species in the Mediterranean, Fishes** F. Briad (Ed) Ciesm Publishers Monaco 254pp

WWF (2000) **Water and Wetland Index** – Results for five accession countries (5/12/2000) http://www.panda.org/news_facts/publications/europe/index.cfm?uPage=16

Zenetos, A., Gofas, S., Russo, G., and J. Templado, (2002**) CIESM Atlas of Exotic Species in the Mediterranean, Vol.3. Molluscs** http://www.ciesm.org/atlas/molluscsintro.html