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Territorial Potentials for a Greener Economy

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Sector Report

Vol. 3.2. Sub-Sector Fisheries and Aquaculture sector report

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This basic report exists only in an electronic version.

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1 Explanatory note

The present document is a draft on sub sectors Fisheries and Aquaculture to be included within the framework which could be characterized as *"the sector report on bio economy from a green growth perspective".* Within this framework also agriculture, and to some extent forestry are included.

The idea of characterising the bio economy as a sectorial "framework" and not just a sector is to emphasize that the bio economy have on one hand many common characteristics related to its materiality. They are based on the surrounding nature. But at the same time also to emphasize that the included components and environmentally determining factors are characterized by marked differences. And in the end also showing how they are resulting in different socio-economic and territorial structures.

At this stage the present report covers the main aspects defined in the sectorial guidelines in the GREECO project. The major elements in this respect are the conceptual descriptions of what the green economy is for fisheries and agriculture respectively, and the state of the sector today, both generally and with respect to greening of activities.

The empirical part (including the annexes) of the report includes a large selection of maps and figures showing the state and the trend of the major indicator. The main report includes a number of comments as explanatory text. In addition there are references to some of them in connection with the policy discussions as well as in relation to the drivers and enablers.

A key component in relation to both the policy discussions and the discussion on drivers and enablers is the evolution of the Common Fisheries Policies (CFP). The history of the policy evolution is in many ways the best way of illustrating the challenges to fisheries and how EU has coped with them.

2 Introduction

2.1 Fisheries and aquaculture

Important to take into account already at the offset of the reporting is, that the structures and processes related to Fisheries and Aquaculture respectively are extremely different. This in spite of the communalities between them such as the products may be the same, and the fact that production is dependent on water. When served in a restaurant or at home they may look exactly alike and may be impossible to distinguish from each other. But the way they are produced and managed, and the logics represented by the mode of production and the relationship to the environment cannot be compared. So conclusion regarding the relations to a Green economy in one of the categories may not be applicable to the other!

2.1.1 The global setting

Fisheries and other aquatic products is an important contributor to worldwide food security and general economic activity, including employment and trade. And the importance - especially in relation to food security and nutritional qualities - has been increasing during the last half century.

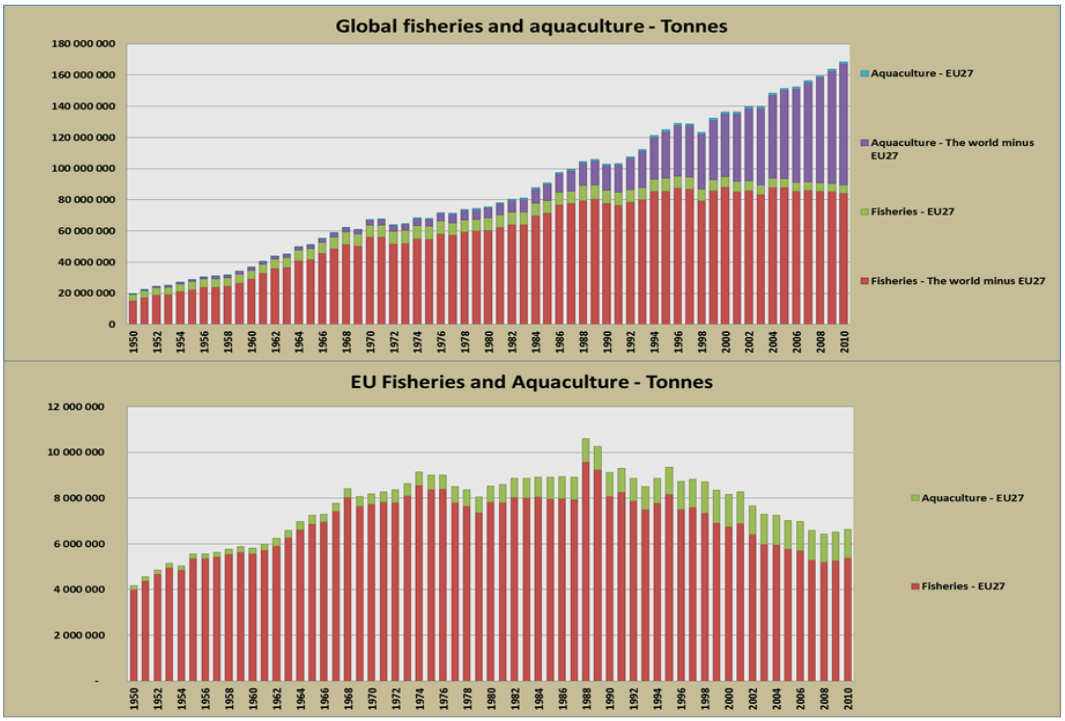

Figure 1: Development of global fisheries and aquaculture (a: above) and development of fisheries and aquaculture (b: below) in the EU-27 countries. Data from FAO FishStatJ version 2012.

According to FAO the last three decades has shown a growth in the number of fishers and fish farmers which has been faster than the world's population and employment in traditional agriculture[1]. It is estimated that the number of people who are directly engaged in the primary production of fish either in capture from the wild or in aquaculture reached 44.9 million in 2008

Fish is a major contributor to food security in many regions of the world, and in several developing countries fish is the major source of protein[2]. Around 80 per cent of the world's fish production is used for human consumption while the rest is mostly processed into fishmeal and fish oil of which a part is consumed directly by humans while the rest is used as feedstuff either for aquaculture or for other animal productions.

As shown on figure 1 a substantial increase in fisheries and harvesting of other aquatic products took off from the 1950ies but stabilized in the late 1980ies and has to some extend experienced a decline during the last decades. Since the 1980ies it has been recognized that around 50 per cent of the world's marine fishery resources were fully fished or fished to the maximum sustainable level (see appendix 8 and chapter 6 for further detail) while another 30 per cent became overfished, depleted, and up till today is registered as recovering from depletion.

Instead of further expansion of fisheries products from aquaculture have increased substantially and stepped in as a major contributor to food security. Since the 1970ies the increase has been on an average annual rate of around 6.6 per cent. With production in 2010 from fishing and harvesting of other aquatic products reaching 95 million tonnes, aquaculture had increased to a level of production of around 80 million tonnes. And it is foreseen[3] that aquaculture within the next 5 to 10 years may overtake capture fisheries and harvesting of other marine products as a source of aquatic food.

While the EU27 contribution to world aquaculture is almost non-noticeable seen in the world perspective the second graph on Figure 1 show the increased importance of aquaculture in an EU-setting. From less than 4% of all aquatic products in 1950 and just below 6% in 1970 a take-off took place from 1980 with 8,4%, 1990 with 11,4%, 2000 with 17,1% and resulting in the situation by 2010 with 18,9% of all aquatic products stemming from aquaculture.

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While the EU27 contribution to world aquaculture is almost non-noticeable seen in a global perspective it becomes clear when looking at the lower diagram on figure 1 that the global pattern is also emerging in Europe. The columns show in the lower part the contribution from fisheries and in the upper part aquaculture. And it is obvious that there is a marked increased importance of aquaculture in an EU-setting. From less than 4% of all aquatic products in 1950 and just below 6% in 1970 a take-off took place from 1980 with 8,4%, 1990 with 11,4%, 2000 with 17,1% and resulting in the situation by 2010 with 18,9% of all aquatic products stemming from aquaculture.

When comparing with the global situation, the role of EU has diminished considerably. The graphs on Figure 2 below show EU27 countries share of global aquaculture and fisheries from 1950 to 2010. And while the share of global fisheries has been reduced from just below 21% to around 6%, the EU27 aquaculture which in 1950 contributed with 25% of world production has declined to 1,6%.

Directly interpretation of these figures should of course be taken with some hesitation because informal fisheries and aquaculture – i.e. fisheries and aquaculture not registered by official authorities and reported to FAO – of course plays a certain role in the development. But the development nevertheless is a clear indication of that especially aquaculture may provide considerable unused potentials in Europe!

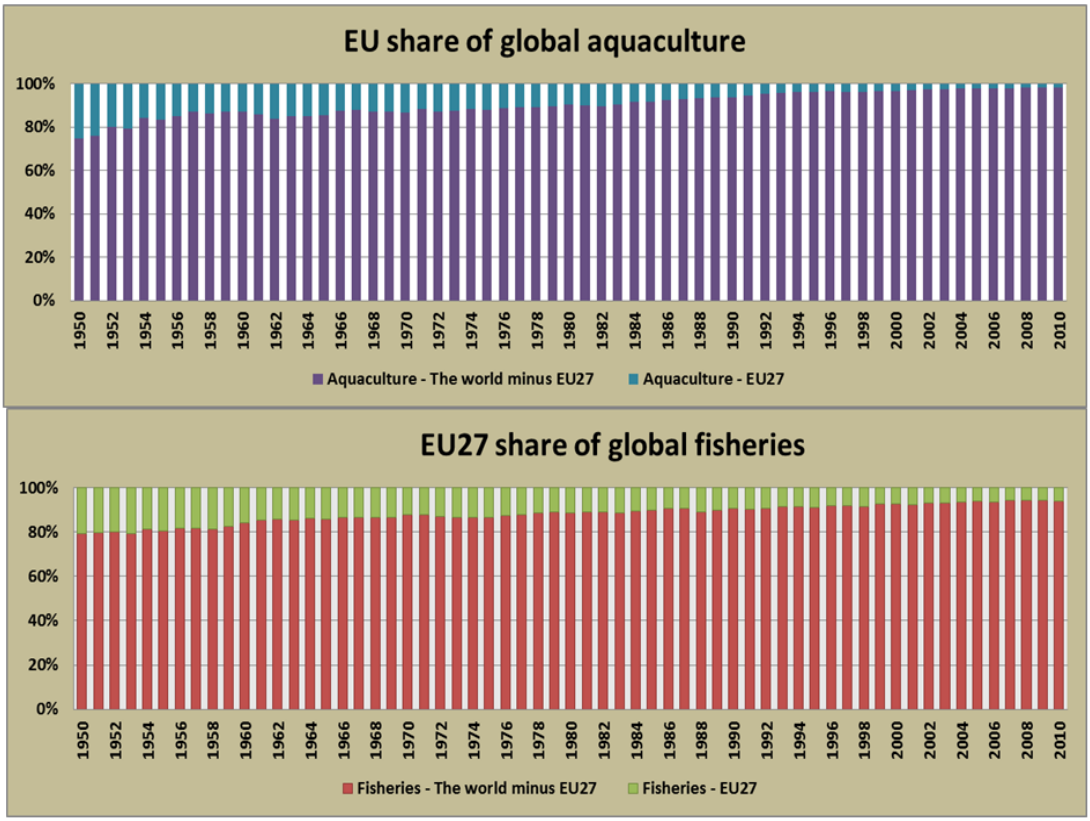


Figure 2: EU share of global fisheries and aquaculture from 1950 to 2010. Data from FAO FishStatJ version 2012

A major factor in the general decline of fisheries is the fact that in many OECD Member countries – and increasingly worldwide - marine resources are over-exploited. According to FAO this is due mainly to management policies that have failed to maintain harvests at sustainable levels. A consequence has been a situation where harvest rates have exceeded the productive capacity of fish stocks, and leading to a situation where reproduction of the stock has been jeopardized thus driving down stock levels to the detriment of fisheries in generally, and especially challenging the fisheries communities.

These challenges were already recognized in the late 19th century in relation to the fish stocks in the North Sea. And as a consequence the International Council for the Exploration of the Sea (ICES) was established in 1902 in Copenhagen[4]. As participants were eight founding nations: Denmark, Finland[5], Germany, the Netherlands, Norway, Sweden, Russia, and the UK. But other nations have later been included. While the Council was an informal entity during the first half century the Council is today

[4] ICES History. www.ices.dk

[5] Finland was at that point of time a "Grand Duchy of Finland" within the Russian Empire, but became a sovereign member of ICES after Finland's declaration of independence in 1917.

recognized by UN as a formal organization including the eight original members plus twelve additional nations: Belgium, Canada, Estonia, France, Iceland, Ireland, Latvia, Lithuania, Poland, Portugal, Spain, and the United States. In addition Australia, Chile, Greece, Peru, and South Africa have observer status, just as the two non-governmental organizations Worldwide Fund for Nature and Birdlife International.

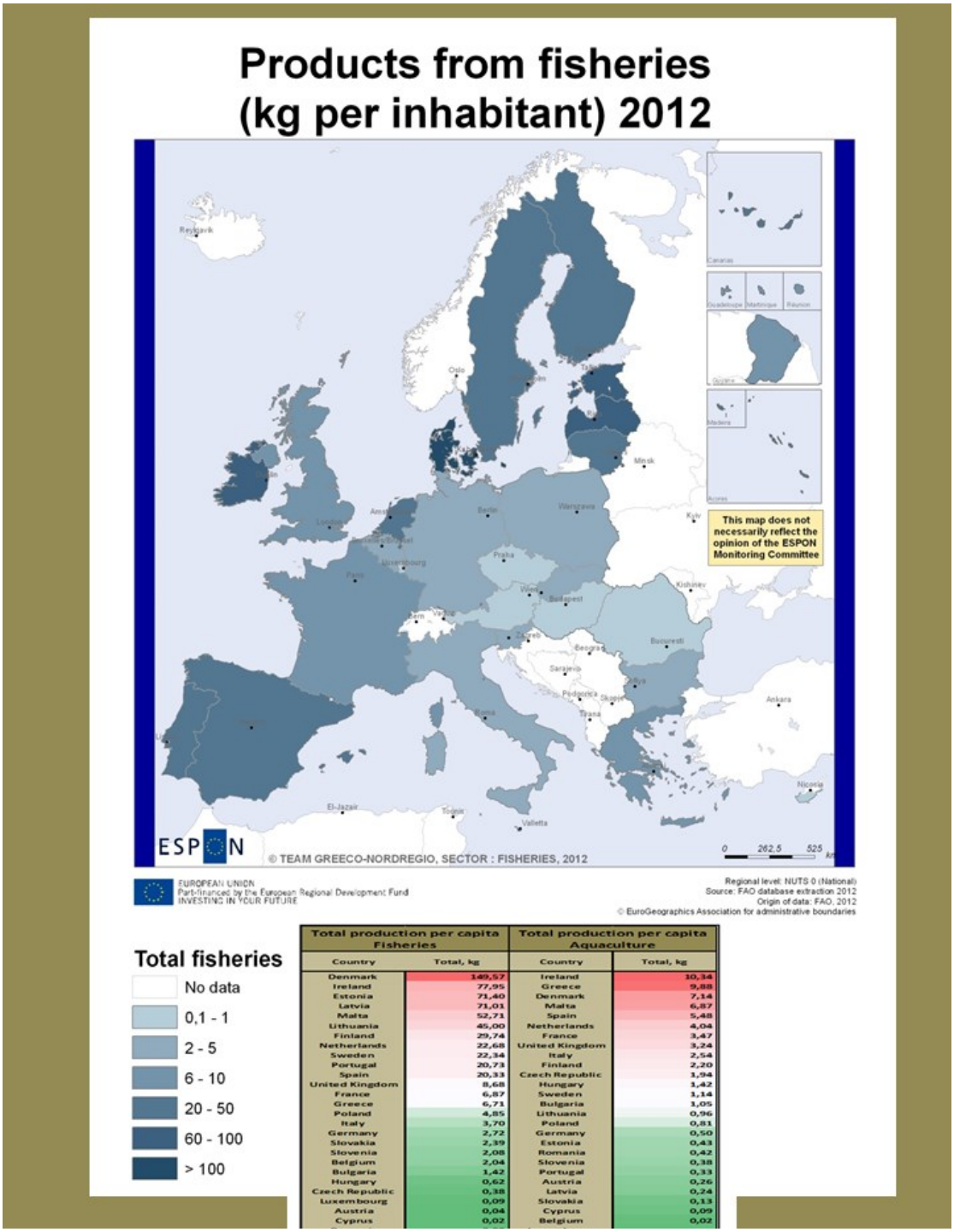
The main reason for overexploitation of the marine resources is often emphasized as being regimes of free access leading to fleet overcapacity in order to ensure national interests through too many fishers and vessels racing after too few fish. A major break-through in connection with regulation of fisheries came with the United Nations Convention on the Law of the Sea (UNCLOS) defining the concept of territorial waters and Exclusive economic zones (EEZ), later on included concepts of Conservation of Living Resources of the High Seas, and lately regulations regarding Conservation and Management of Straddling and Highly Migratory Fish Stocks which has sets out principles for the conservation and management of fish stocks where management must be based on the precautionary approach and the best available scientific information[6]. Management issues of both harvesting of aquatic products and aquaculture are a major issue in connection with the development of Green Growth and exploitation of aquatic environments.

2.1.2 The EU-27 perspective

EU fisheries provide presently around 6 million tonnes of fish and other aquatic harvested products every year and involve around 350.000 persons in fishing and the related processing. Volume-wise most of fisheries take place offshore in salt water, but substantial parts of fisheries are situated in brackish water in coastal zones as well as in inland freshwater lakes and rivers.

The offshore fisheries not only include fisheries within the EEZ of the EU countries but are fished in international water as well as in water where

[6] UNCLOS: United Nations Convention on the Law of the Sea. Un.org .



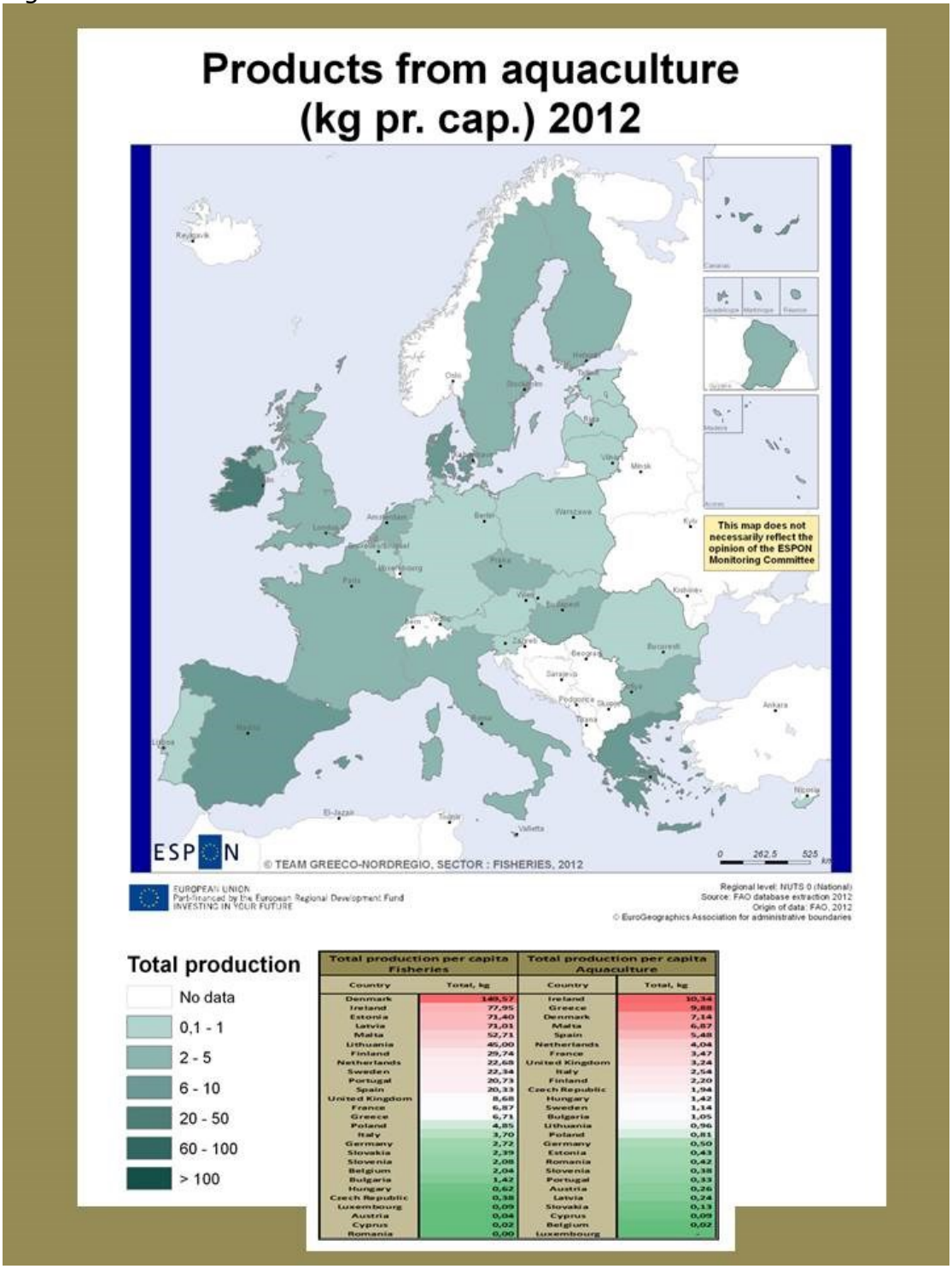
Total production per capita Fisheries		Total production per capita Aquaculture	
Country	Total, kg	Country	Total, kg
Denmark	149,57	Ireland	10,34
Ireland	77,95	Greece	9,88
Estonia	71,40	Denmark	7,14
Latvia	71,01	Malta	6,87
Malta	52,71	Spain	5,48
Lithuania	45,00	Netherlands	4,04
Finland	29,74	France	3,47
Netherlands	22,68	United Kingdom	3,24
Sweden	22,34	Italy	2,54
Portugal	20,73	Finland	2,20
Spain	20,33	Czech Republic	1,94
United Kingdom	8,68	Hungary	1,42
France	6,87	Sweden	1,14
Greece	6,71	Bulgaria	1,05
Poland	4,85	Lithuania	0,96
Italy	3,70	Poland	0,81
Germany	2,72	Germany	0,50
Slovakia	2,39	Estonia	0,43
Slovenia	2,08	Romania	0,42
Belgium	2,04	Slovenia	0,38
Bulgaria	1,42	Portugal	0,33
Hungary	0,62	Austria	0,26
Czech Republic	0,38	Latvia	0,24
Luxembourg	0,09	Slovakia	0,13
Austria	0,04	Cyprus	0,09
Cyprus	0,02	Belgium	0,02

Figure 3: Production from fisheries and other aquatic harvested products among the EU27 countries. Amounts measured in kg per inhabitant. Data from FAO FishStatJ version 2012.

As shown on Figure 3 above there are marked differences in the role of fisheries across the European countries. In the absolute top is Denmark with an output in 2010 of almost 150 kg per capita, followed by Ireland, Estonia, and Latvia with an output around 70-80 kg per capita. And in the bottom of the list are Romania, Cyprus, Austria, Luxembourg, the Czech Republic and Hungary all with an output below 1 kg per capita. Except

Cyprus and Austria these countries are landlocked which means that their fisheries are based on freshwater fishing in rivers and lakes.

Figure 4



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Cyprus	0,02	Belgium	0,02
Romania	0,00	Luxembourg	-

Figure 4: Production from aquaculture products among the EU27 countries. Amounts measured in kg per inhabitant. Data from FAO FishStatJ version 2012.

above show the output from aquaculture in the EU27 countries, and similar to fisheries there are marked differences in output between the countries, with Ireland in top with a production of over 10 kg per capita,

followed by Greece, Denmark, Malta and Spain with production above 5 kilo per capita. And in the bottom of the list is Luxembourg with no registered output from Aquaculture, while Belgium, Cyprus and Slovakia are showing a production in 2010 lower than 200 grams per capita.

According to the most recent official EU statistics on fisheries and aquaculture[7], aquaculture accounts for around one fourth of the European Union's (EU) production of fish, molluscs and crustaceans, while three fourth are provided by fisheries. On an average 23 kg of aquatic products are consumed yearly by each European. And out of his around one tenth is supplied by EU aquaculture.

In addition EU import substantial amount of aquatic products both from fisheries and from aquaculture. Most import from fisheries are bulk fish for processing in the European fisheries industries while imported aquaculture products include salmon (Norway), tropical shrimps (Thailand, Bangladesh and India) and striped catfish (Vietnam).

Both in relation to fisheries and to aquaculture the distribution of the activities indicates the importance of the territorial characteristics of each of the countries in relation both to access to aquatic resources needed for the production, but also to the differences in national policies within the EU policy framework.

Negotiations within regional and international fisheries organizations are intending to ensure that the world's fisheries are managed in a regulated, transparent and sustainable manner and protected from overfishing. And in this connection the key objective formulated in the EU's fisheries policy is sustainable fishing in a Brundtland perspective[8], i.e. a situation where fishing industry needs are met without compromising the fish stocks for future generations. In this context other goals of the policy are a viable marine ecosystem and reasonable living conditions for those who depend on fishing, maintain aquatic products as an important source of food as well as raw material to a large number of industries.

Both fisheries and aquaculture are, however, exposed to a series of challenges which already are – and especially in a Green Development perspective – will become critical issues that needs to be taken care of. Among these problems are for instance problems with energy used in fishing and producing fodder for aquaculture, stock depletion, pollution from aquaculture, risk of invasive species. And not the least the challenge of ensuring a development where value generation and local jobs are maintained in a way that is regionally sustainable.

[7] Eurostat 2009

[8] Brundtland …

3 Conceptual elements of green fisheries and green aquaculture

3.1 Conceptualisation

The objective of this chapter is to identify what aspects, processes, and elements are included/not included in the greening of this sector.

As previously mentioned fisheries and aquaculture have several conditions in common. But at the same time the activities differs considerably. Both systems interact with the surrounding ecosystems. But while fisheries mainly interact with the regional and global ecosystems and are depending on their productivity, the aquaculture is first of all related to more artificial or controlled ecosystem's conditions where productivity is not only depending on the environment but just as much – and often more – on human controlled ecosystems. The conceptualisations - just as the development processes and development conditions – therefore differ, and need to be described individually.

3.1.1 Questions to ask in relation to the exploitation of the fish stocks

It is generally agreed upon that fish and seafood are renewable resources if carefully managed. And furthermore that both are excellent sources of nutrition, rich in vitamins and minerals and a major source of omega-3 fatty acids. As a consequence eating fish can help protect against a range of diseases, from cancer to heart disease, and from depression to arthritis. So there are many reasons for choosing fish as an important contribution to a healthy selection of food. But several conditions need, however, to be taken into consideration if the interaction with the environment should be taken serious:

- Where does the fish come from?
- How has it been caught?
- Is the stock endangered or plentiful?
- Is it the right size when it is caught?
- Are only a few species fished and made available, or is it taken into consideration that many lesser-known species can be more plentiful and therefore less sensitive to overexploitation?
- How has it been transported to the market, and under which conditions?

- Is it marketed with place of origin available, or is it sold as a product with origin unknown?
- Is the above mentioned information available for the consumer so that he or she can make an educated choice?

Both private and National health organisations often produce guides with recommendations in relation to answering the above questions. But it is still very often difficult to get precise information in relation to the above questions when the products are sold on market places or in supermarket's freezers.

The concepts of Green Fisheries and Green Aquaculture is not only about how and under which conditions the products are produced, but just as much about access to these information.

3.1.2 Conditions for the resources

Biological data have traditionally been the main basis for fisheries management decisions. The lack of relevant economic information, which allows for an economic analysis of the consequences of fisheries management measures, was a constraining element in the study. By the same token policy decisions are often taken on the basis of limited economic analysis. This poses a serious concern for countries, which normally base public decision making on a solid information base, and with an increasing emphasis on economic consequences. In this regard the observation and analysis of the outcomes of policies is essential to monitor the performance of management systems.

Biological science has traditionally been the main pillar of fisheries research and the cornerstone for policy approaches. Incorporating economic and social analysis can increase the value of the overall research investment by providing the relevant information to support decisions to achieve better economic performance and to attain social objectives.

In fisheries where resources are limited by the productivity of the ecosystems the question of profit is, when resources are unregulated or regulated by open quotas, defined by how quick an how effective the boats and fish gear accesses the resource. It is often emphasized how the empirical evidence clearly shows that total allowable catch management results in a race-to-fish, with all its attendant effects. Individual quotas are on the contrary taken forward as an effective means of controlling exploitation, of mitigating the race-to-fish[9] and most of its attendant

[9] Argued for instance by making references to the problems within the theoretical framework of "the tragedy of the commons" brought forward by Garrett Hardin (1968) and argued into a fisheries framework by Arnason (1995), and later the advantages challenges by Parzival Copes and Gísli Pálsson (2000).

effects, of generating resource rent and increased profits, and of reducing the number of participants in a fishery[10]. Also, it is clear that time and area closures have not been effective in assuring resource conservation, although conservation might well have been poorer without them.

Experience has clearly shown that regimes which do not limit fishing capacity to a level fitting with the reproductive capacity of the stock may lead to overexploitation. And the sector will eventually be confronted with poor economic performance.

Using means of limiting the catch through control the number of fishing vessels, means of restricting the efficiency of the harvesting sector through technical measures and Total Allowable Catch (TAC), have generally yielded poor results when used in isolation, i.e. without complementary measures[11].

The main reason for the poor results is that these regimes do not give the fisherman the incentive to account for all the costs such as the environmental, social, etc. of his fishing activity. Basically similar to when industries, transport etc. and the population in general are using non-renewable energy resources such as oil and gas and thereby generating CO^2 which has negative impact on the environment without paying for it.

Changes in management regimes towards sustainable and responsible harvesting methods are necessary to overcome these outcomes and thereby greening the sector. The required changes may, however, not be easily accepted or possible in the short term and often require changes at the institutional level.

3.1.3 Conditions for their management

At the individual level the right based management systems such as individual transferable licences, individual quotas, exclusive area user-rights etc. in order to resolve or alleviate fisheries problems and better comply with a goal of sustainable fisheries and fish stock management

Harding, G. (1968): The Tragedy of the Commons, Science, 162(1968):1243-1248.

Arnason, R. 1995. The ITQ fisheries management system: advantages and disadvantages. In S.T.F. Johansen (ed.), Nordiske fiskersamfund i fremtiden (Nordic fishing communities in the future),Vol. 1, 43-70. Copenhagen: Nordic Council of Ministers.

Copes, P. and Páolsson, G. (2000): Challenging ITQs: Legal and Political Action in Iceland, Canada and Latin America. IIFET 2000 Proceedings.

[10] For instance Sutinen, 1999

Sutinen, J.G. (1999): What works well and why: evidence from fishery-management experiences in OECD countries. ICES Journal of Marine Science, 56: 1051–1058. 1999

[11] OECD 1996. This statement and the structure of the following part of the text are elaborated further on in the following text.

OECD(1996): Review of Fisheries in OECD Countries. Organisation for Economic Co-Operation and Development (Author)

might be useful because it enables the owner to have a long term strategy instead of only focusing on a first-come-first-serve strategy[12]. It has been experienced that individual quotas resulted in better economic performance both for the individual fisher as well as for the sector. And furthermore experiences of improved stock conservation, reduction in overcapacity and race-to-fish, has been supported alongside the economy. However – as emphasised by OECD, rights based systems require governments to establish and maintain a legal framework for the rights and may therefore increase the administrative costs. Furthermore, the implementation of such systems may cause structural adjustment consequences, for instance:

- Lower employment opportunities;
- Ownership concentration on still fewer hands;
- Territorial concentration in still fewer harbours;
- Increase of distributional conflicts.

The geographical consequences may be handled by means of territorial restrictions, for instance through Community Quota systems, community based management systems partnering arrangements, and Co-management, which in many cases have proven to be a successful approach to management in certain fisheries. Again *it is emphasized how the increase in the fishers' participation in the process and the transferring of management responsibilities.*

Resources which are not strictly within one nation's jurisdiction, i.e. straddling, Trans boundary and highly migratory stocks, require a high degree of international co-operation for effective management. The effectiveness of management by international organisations is often undermined by the fishing activities of non-contracting parties to such agreements. *There is therefore a need for enhanced international co-operation to ensure that all fishing fleets comply with internationally agreed conservation and management measures*.

3.1.4 General conclusions

Marine living resources are generally recognised as being a public resource and as such should be managed for the long term benefit of the

[12] This approach has been introduced in several countries around the world. And in some cases with good results, but in other situation resulted in for instance the concentration of ownership on only few hands and situated in larger settlements Einarsson (2011); Karlsdottir (2012).

Einarsson, N. (2011): Culture, Conflict and Crises in the Icelandic Fisheries : An Anthropological Study of People, Policy and Marine Resources in the North Atlantic Arctic. University dissertation from Uppsala : Acta Universitatis Upsaliensis

Karlsdottir, A. (2012): In or out of place: women and coastal community transition under privatization regimes in Iceland. PhD thesis, Roskilde University.

community, including the fishers. But the past century has unfortunately shown that there are no universal solutions to the problems facing fisheries. To the extent there is an overarching aim at achieving exploitation levels which will be sustainable in the long run it has clearly shown that a drive to gain short term benefits all too often has been the motivation behind fisheries management actions and has led to the present situation where declining stocks have challenged the durability of them for future generations. So as illustrated above not only one approach but a combination of management instruments are needed in order to take account of the unique combination of biological, environmental, technological, economic and social characteristics making up each fishery.

The number of international fisheries agreements that have been concluded in the past few years and the present strive within EU to create a new political framework for fisheries is clearly an indication that EU recognises the state of marine resources being not only a local but also a global problem. And it is generally recognized that there is a need for continued and increased international cooperation in order to improve the condition of over-exploited fish stocks. ICES has been one of the most important arenas for the international cooperation, and the experiences from this work has been seen as a model for future development in EU.

It is an obvious Green approach to promote responsible and sustainable fisheries. And not just from a fisheries approach but through an integrated fashion, e.g. both the supply and demand side effects from a move towards a responsible fishery should be studied, and it should also look at the interface between fisheries and environment.

3.2 Throughput substitution in fisheries in general: a first picture of the sector

3.2.1 A baseline

As has been emphasized previously, the fisheries sector in EU-27 is an economic sector characterized by diversity and substantial regional differences (Macfadyen and Salz, 2011)[13].

The total value of landings of the fisheries sector is estimated at almost 8 billion Euro, of which 2.1 billion Euro (26%) is from small-scale fisheries

[13] (Macfadyen, G. and Salz, P. (2011): Characteristics of Small-Scale Coastal Fisheries in Europe. Committee on Fisheries. Public Hearing on Small-scale and coastal fisheries. Directorate-General for International Policies).

while the medium and large scale contributes to the economy with close to 6 billion Euro.

Around 90,000 persons are employed in the small scale sector compared to around 78,000 in the medium and large scale sector covering vessels with a size from 12 meter and above.

The small scale fisheries produce around 1/3 the value of landings per person compared to the persons employed in the medium and large scale sector.

In 2001 the EU-27 catch peaked with 6.9 million tonnes of live weight, but since then the total catch has declined year by year (Eurostat 2012[14]). Only four of the EU-27 countries – Denmark, Spain, the United Kingdom and France – were responsible for just over half of all the catches in 2010.

The largest percentage decline in catch between 2001 and 2010 were recorded in Denmark (-45.2 %) and the Netherlands (-44.9 %), while the total catch fell by about one third in France, Poland, Spain and Sweden.

Most of the catches by the EU-27 (71.5 %) were in the north east Atlantic, with the eastern central Atlantic the second largest fishing area (Eurostat 2012).

Aquaculture production has become an important contributor to fish and seafood supply in the EU-27. During the last 10 years the annual output has been between 1.25 and 1.4 million tonnes, and the five largest aquaculture producers among the EU Member States are Spain, France, the United Kingdom, Italy and Greece, accounting for around three quarters (75.2 %) of total aquaculture production in 2010.

3.2.2 Characterization of the sector in general

Like CO^2 has been identified as being among the major challenges for future climate due to the current practice in consuming non-renewable energy resources as the primary source, the overarching challenge in fisheries is how the current practices in fisheries are fishing down the food web[15].

Open Access is a main driver in that connection, but also subsidies aiming at maintain the national fishing industries in spite of the negative effects the large scale fishing fleets adds to the negative consequences.

[14] http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Fishery_statistics. This reference has been the source for this and the following information.

[15] Ben ten Brink (MNP) presentation at the Workshop: The Economics of the Global Loss of Biological Diversity 5-6 March 2008, Brussels, Belgium.

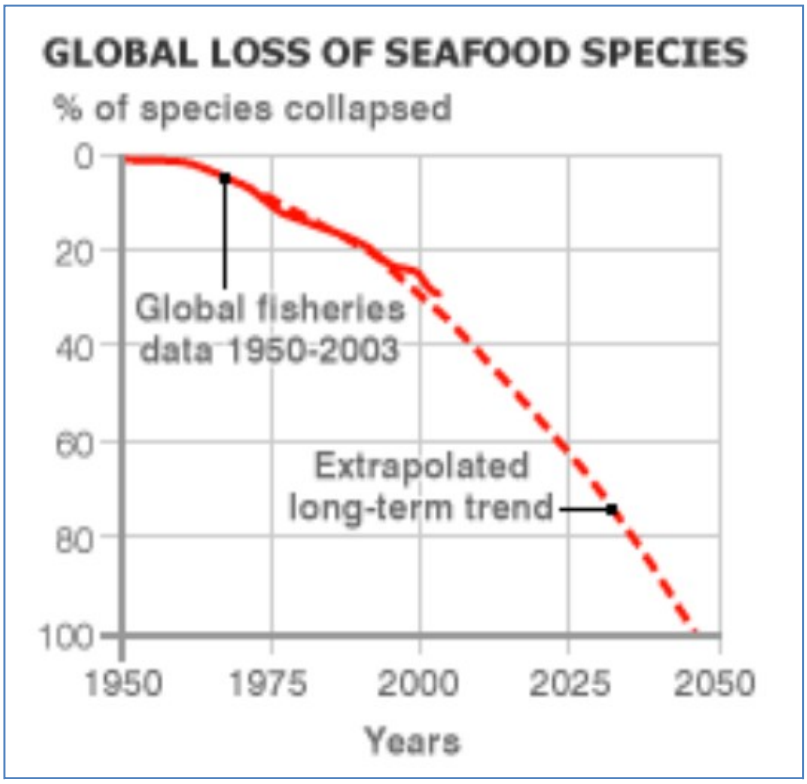

Figure 6: Global loss of seafood species from 1950 to 2050 according to FAO

It is evaluated by FAO that half of the wild marine fisheries are fully exploited, with a further quarter already over-exploited. And extrapolating the trends in global fisheries data since the 1950's in relation to the global loss of seafood species an expected total collapse of all species would be happening around 2050, as shown on figure Figure 6.

In general a greening of the fisheries sector entails a substitution towards more sustainable, renewable or re-usable resources in the entire production processes. This is not a simple task as different types of fisheries are based on different inputs, systems of transports, and market distribution. So beside a more responsible approach to the ecosystems, a varied focus on different sectors in fisheries, and the options of different focus on substitution as well as on resource efficiency would be crucial. And in addition one size may not fit all, so that approaches might differ between countries, and thereby add to the complexity of the situation.

3.2.3 Specific aspects of greening fisheries and aquaculture

One of the main issues of fisheries and aquaculture is that they both are dependent on water. And in order to be green and sustainable water quality and accessibility are fundamentals, just as land is a fundamental characteristic of agriculture. While the spatial and territorial dimensions

are obvious for most people, the fact that both spatial and territorial dimensions are important characteristics of water needs to be considered in order to become sustainable. Furthermore that in relation to the question of water quality being a location specific concern needs to be related to both the activities of the fisher/farmer and the environment, three types of water are related to both aquaculture and fisheries, i.e. Freshwater, Saltwater and Brackish Water.

As emphasized by UNEP[16], a Green Economy is dependent on sustainable development which means an economic development that benefit, not sacrifice, social justice and equity as well as the environment. It is furthermore about making choices according to the full cost – not just the financial cost – of any and all activities. And in this context the fisheries reveals its complexity. In this context the greening of fisheries is situated in a very demanding situation as the complexity of the three dimensions of sustainability – economic, social, and environmental – is fully exposed.

In general a greening of the fisheries sector entails a substitution towards more sustainable, renewable or re-usable resources in the entire production processes. This is not a simple task as different types of fisheries are based on different inputs, systems of transports, and market distribution. So beside a more responsible approach to the ecosystems, a different focus on different sectors in fisheries, and the options of different focus on substitution as well as on resource efficiency would be crucial. And in addition one size may not fit all, so that approaches might differ between countries, and thereby add to the complexity of the problem.

The following issues can be considered which as a minimum needs to be dealt with and managed include issues such as:

Biodiversity is the context of genomes, species, and ecosystems occurring in a geographically defined region (NRC, 1995[17]), fisheries depends on and impact baseline diversity by changing population characteristics (e.g., age distribution, reproduction, stock structure), affect species composition and interactions, and through effects of by-catch, habitat alteration, and altered energy flow, impact the diversity of marine habitats and the function of ecosystems[18].

In this connection the EU Biodiversity Strategy to 2020 has been emphasized as being an ambitious strategy to halt the loss of biodiversity

[16] Green Economy 101, UNEP 2012. http://greenup-unep.org/green-economy/what-is-green-economy.htm?lng=en

[17] National Research Council, 1995: Understanding Marine Biodiversity: a Research Agenda for the Nation. Committee on Biological Diversity in Marine Systems. National Academy Press, Washington, DC, 114 pp.

[18] Boehlert, G.W. (1996): Biodiversity and Marine Fisheries. Oceanography Vol. 9. No. 1,1996

and ecosystem services in the EU by 2020. In the strategy six targets and 20 actions are aiming at preventing further losses, as the biodiversity loss has been enormous with around one in four species currently threatened with extinction and 88% of fish stocks over-exploited or significantly depleted. In this connection there are six targets covering:

- Full implementation of EU nature legislation to protect biodiversity
- Better protection for ecosystems, and more use of green infrastructure
- More sustainable agriculture and forestry
- Better management of fish stocks
- Tighter controls on invasive alien species
- A bigger EU contribution to averting global biodiversity loss

Water quality and availability are determinants for oceanic habitats through water temperature, salinity, dissolved oxygen content, nutrient fluxes, upwelling areas, freshwater plumes, discharges, runoff, erosion, inundation, contaminants, and plankton needed for ecosystem-based management. Marine, lake and river ecosystems are dynamic and complex. These three-dimensional fluid systems function through the complex chemical, geological and biological interactions and processes that change over time and space[19].

3.2.4 Exploiting Ecosystems

Two types of concerns needs to be reflected. On one hand the impact from fisheries and aquaculture on the environment and ecosystems, and on the other hand the impact of the environment on the fisheries on aquaculture. And in this connection three aspects needs to be reflected:

- Ecosystem Approach to Fisheries and Aquaculture (EAF/EAA)
- Carrying capacity evaluation
- Operations Research including impact monitoring and simulations of potential impacts.

"Ecosystems management is an approach to natural resource management that focuses on sustaining ecosystems to meet both ecological and human needs in the future. Ecosystem management is

[19] IOOS Integrated Ocean Observation System. 2013, http://www.ioos.noaa.gov/themes/ecosys_fish_waterquality/welcome.html

adaptive to changing needs and new information. It promotes shared vision of a desired future by integrating social, environmental and economic perspectives to managing geographically defined natural ecological systems"(UNEP)[20]. The UNEP perspective on ecosystem services of importance has been outlined in figure is shown in figure 6 on next page showing a schematic representation of the ecosystem services selected by UNEP, as categorized in the Millennium Ecosystem Assessment. Fisheries are among the selected ones.

And to elaborate the concept related to fisheries and aquaculture an Ecosystem Approach to Fisheries and Aquaculture (EAF/EAA) strives to balance the societal objectives by taking into account the knowledge and uncertainties of biotic, abiotic and human components of ecosystems including their interactions, flows and processes and applying an integrated approach within ecologically and operationally meaningful boundaries[21].

It is in this connection important to emphasize the territorial characteristics of the concept: Any EAF/EAA should apply at the farm level, at the fisheries and aquaculture geographic zone, at the industry and commodity level and at the macro level (policy formulation).

Among the main objectives of the EAF is to improve fisheries sustainability through ensuring exploitation of specific species below the carrying capacity existing in the ecosystem habitat.

[20] UNEP: Ecosystems Management. http://www.unep.org/ecosystemmanagement

[21] National Institute of Agricultural Extension Management: Sustainable Fisheries Development – Sustainable Brackishwater Aquaculture: Issues and Challenges. Ministry of Agriculture, Govt. of India, Rajendranagar, Hyderabad

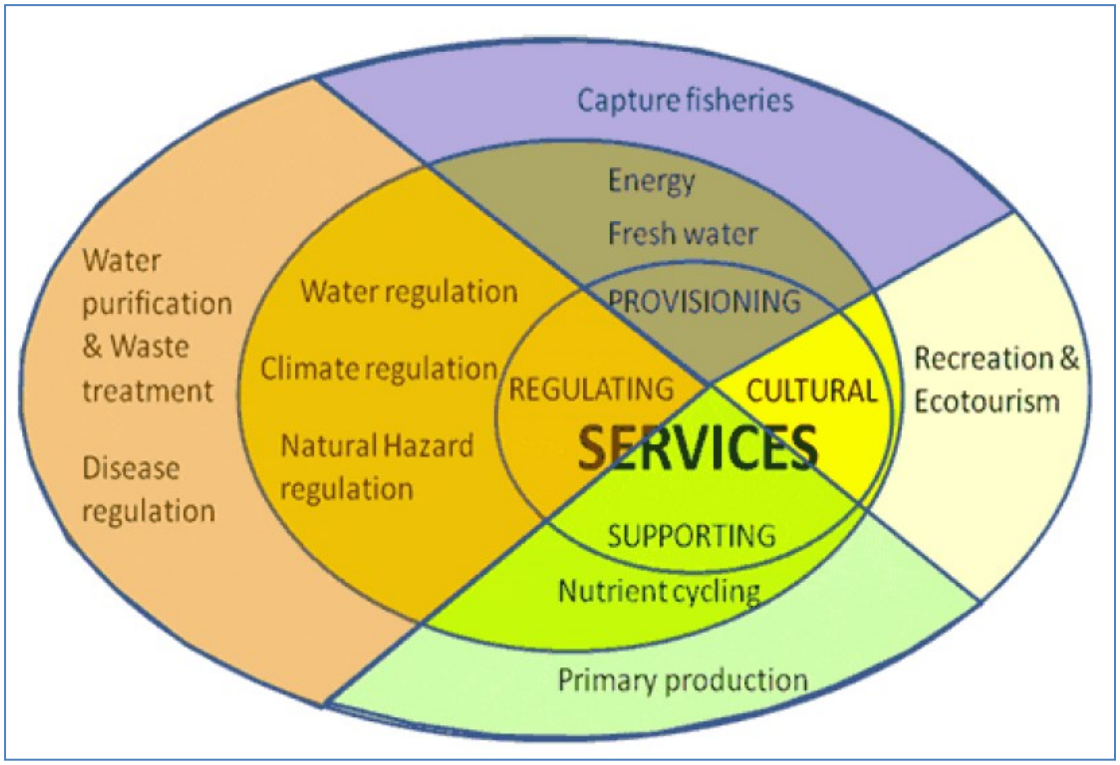

Figure 7: Schematic representation of the ecosystem services selected by UNEP, as categorized in the Millennium Ecosystem Assessment (regulating, provisioning, supporting and cultural services).

Figure 7 above present a schematic representation of the ecosystem services as categorized by UNEP in the Millennium Ecosystem Assessment. In their approach the focus is on the four overall tasks: regulating, provisioning, supporting and cultural services. And among the means in this connection is to manage fisheries in a manner that does not lead to over-fishing, or for those stocks that are over-fished, the fishery must be conducted such that there is a high degree of probability the stock(s) will eventually regenerate. Furthermore the bycatch and by-product species should be limited. And finally fishing operations should be managed to minimise their impact on the structure, productivity, function and biological diversity of the ecosystem and minimize the impact of fishing on the marine environment.

The objectives of the EAA should be to improve aquaculture sustainability through facilitating nutrient cycling while minimizing negative impacts at different intensity levels for example through polyculture/integrated aquaculture (example fish and mussels, fish and seaweeds) also allowing a broader use of ecosystems through enhancing or coupling with other activities such as fisheries (example aquaculture based fisheries) and agriculture (example rice fish farming).

A key issue in relation to the ecosystem management is the complex between capacity – the amount of fish and fish which can be taken out of the ecosystem - and the diversity of the ecosystem.

3.2.5 Maintaining Biodiversity

As already mentioned above one of the most important issues in relation to fisheries is to identify and coordinating high priority science to improve the ability to integrate fisheries into a framework of biodiversity and in that connection facilitate the application of this at the regional, national and subnational scales. In this connection the EU Biodiversity Strategy to 2020[22] has been presented as an ambitious strategy to halt the loss of biodiversity and ecosystem services in the EU by 2020.

In the strategy six targets and 20 actions are aiming at preventing further losses, as the biodiversity loss has been enormous with around one in four species currently threatened with extinction and 88% of fish stocks over-exploited or significantly depleted. In this connection there are six targets covering:

- Full implementation of EU nature legislation to protect biodiversity
- Better protection for ecosystems, and more use of green infrastructure
- More sustainable fishery and aquaculture
- Better management of fish stocks
- Tighter controls on invasive alien species
- A bigger EU contribution to averting global biodiversity loss

Most of the above are reflected already in the previous discussion of EAF/EAA. In relation to aquaculture, however, a major concern is especially the fifth target important as escape from fish cages and farming nets of alien species to a specific environment may result in alteration in species and thereby causing limitations to traditional fisheries. Currently most aquaculture facilities in the marine environment use non-native or alien species, mainly to improve incomes by using fast growing animals and also reduce costs by using readily available research and development outputs. With the rising awareness about the ecological and economic impacts caused by alien species, several international policy instruments are emphasizing the application of the precautionary approach and are discouraging the deliberate introduction of alien species for aquaculture purposes (IUCN 2006)[23].

[22] EU Biodiversity Strategy to 2020 – towards implementation. Available at the website:

http://ec.europa.eu/environment/nature/biodiversity/comm2006/2020.htm

[23] ; Hewitt, M., Campbell, L. and Gollasch, S. (2006): Alien Species in Aquaculture - Considerations for responsible use. IUCN Global Marine Programme

UNEP[24] emphasizes that although not all alien species will become invasive or threaten the environment, a risk of impacts requires a clear policy approach because of its potentially wide-ranging impacts when they do become invasive, and because of the difficulties, including financial costs, in reversing its impacts. As an example they discuss the introduction of the Nile perch into Eastern Africa. With positive economic experiences from some of the countries where it has been introduced, other examples show how it has caused loss of endemic species and basically altered ecosystems.

Similar concerns have been in connection with for instance the farming of Atlantic salmon in fiords in Norway where escaped fish have intruded the rivers and resulted in the replacement of local species by the salmon. In some cases being a short term benefit because of easy access to larger fish, but in most cases seen as a challenge to for instance tourism where visitors often are attracted by the local fish stocks, and don't consider invasive species a boon.

3.2.6 Limiting Energy Use

A critical issue in relation to green development in both fisheries and aquaculture is the amount of energy used in exploiting and producing the resources.

Figure 8 show the average diesel consumption from fisheries in litres per km2 calculated by Tyedmers, Watson and Pauly (2005)[25]. The method has been based on an integration of data representing more than 250 fisheries from around the world and spatially resolved catch statistics for 2000.

By means of this it has been possible to identify the total globally consumption of diesel (or diesel equivalents) used in fisheries to be almost 50 billion litres of fuel in the process of landing just over 80 million t of marine fish and invertebrates. The average rate of fuel consumption to catch output has been calculated to 620 litres per tonnes fish. Based on this they further calculate that fisheries in 2000 accounted for about 1.2% of global oil consumption. And in terms of CO^2 the fleet emits more than 130 million tonnes into the atmosphere.

In the calculations has not been looked into the particle emission, but by using relatively heavy fuels the amount of particles into the environment would be considerable.

[24] Chenje, M. and Mohamed-Katerere, J. (Lead Authors): Invasive Alien Species. Chapter 10 in section 3: Emerging Challenges.

[25] Tyedmers, Watson and Pauly, 2005: Fueling Global Fishing Fleets. Ambio Vol. 34, No. 8, December 2005. Royal Swedish Academy of Sciences

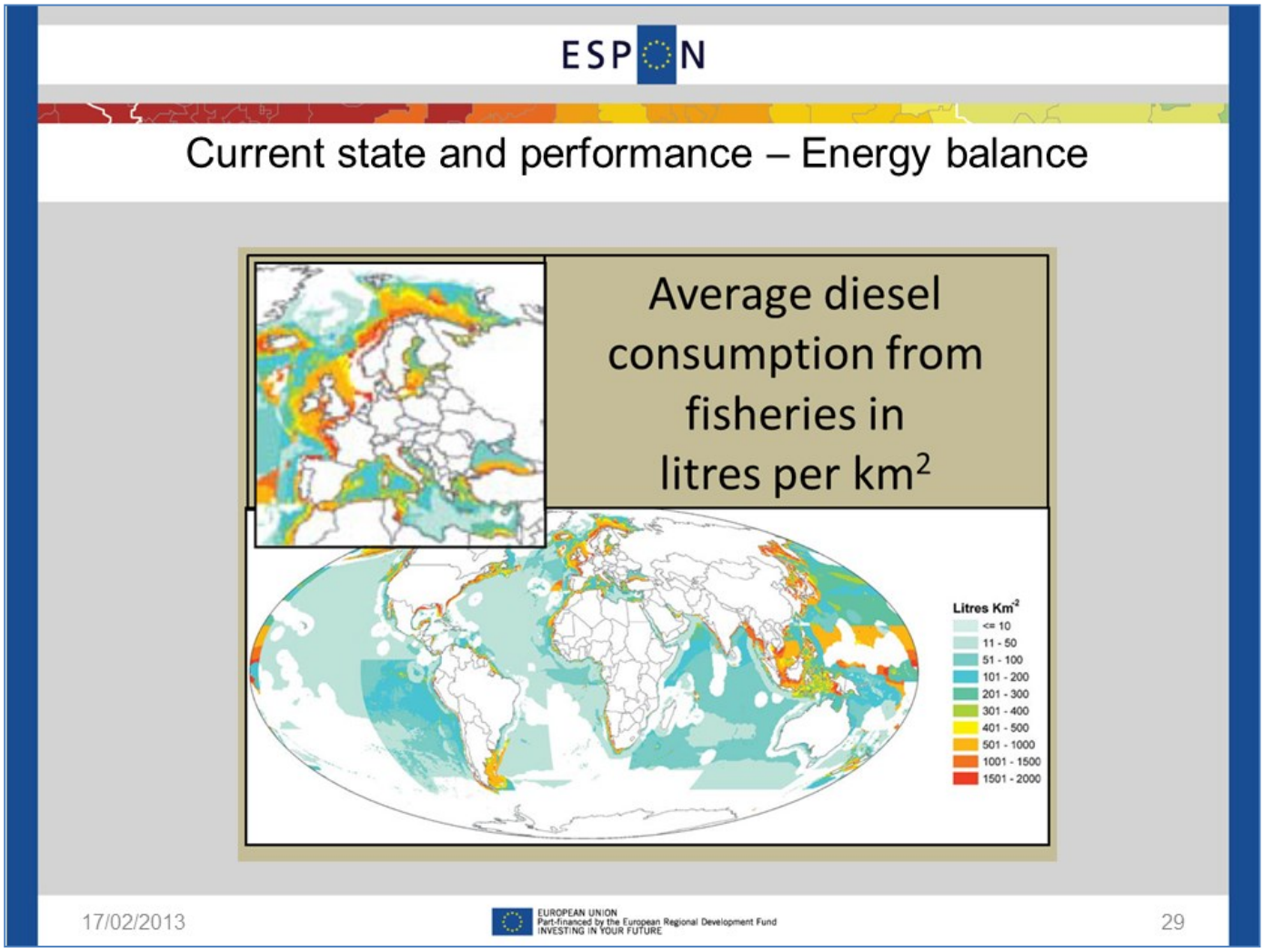

Figure 8: Average diesel consumption from fisheries in litres per km2. From Tyedmers, Watson and Pauly, 2005: Fueling Global Fishing Fleets. Ambio Vol. 34, No. 8, December 2005. Royal Swedish Academy of Sciences

Aquaculture is not to the same extend directly depending on fossil fuels, but indirectly very much depending on it through what is called "the fish meal trap" shown on Figure 9. This is the risk of aquaculture becomes environmentally degrading because increased demand for feed leads to increased fishing effort for the wild species used to produce the feed. This has two consequences:

On one hand it turns fish which has been produced through use of oil into another fish. Even the conversion rate of fish meal is considered to be reasonably good using around 1.2 kilo to produce 1 kilo of fresh fish it would be more advantageous to use the original fish as it would provide a larger amount of meat. The reason that it is seen as acceptable is that the output is often considered being of higher quality fish.

On the other hand it leads to further threatening the viability of the wild fish stocks.

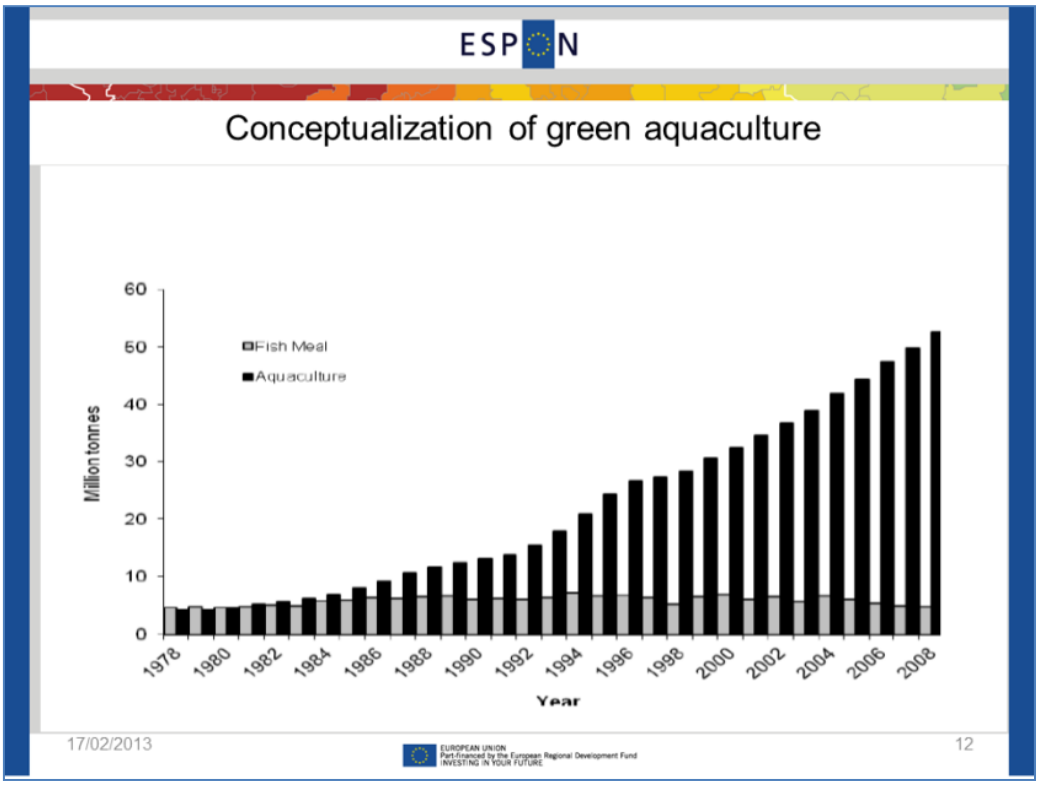

Figure 9: Questioning "The fish meal trap" – Fish meal use versus aquaculture production.

As shown on the figure there is not any clear indications of the fish meal trap when comparing the consumption of fish meal and the production of aquaculture products. The efficiency in the use of the meal has been increasing, and the feedstuff for aquaculture contains other types of proteins and fat needed.

The important thing in this context is – besides the actual energy consumption of the different fish producing activities – how the products compete qualitatively as well as energy-wise when compared with other sources of food. Tyedmers, Watson and Pauly (2005) has collected data regarding different types of agriculture and compared it with their own calculations, resulting in Figure 10 below[26].

[26] Besides data from Tyedmers, Watson and Pauly, 2005: Fueling Global Fishing Fleets. Ambio Vol. 34, No. 8, December 2005. Royal Swedish Academy of Sciences, the numbers in the table stems from:

Troell, M., Tyedmers, P., Kautsky, N. and Rönnbäck, P. 2004. Aquaculture and energy use. In: Encyclopaedia of Energy. Cleveland, C. (ed.). Elsevier, San Diego, vol. 1, pp. 97–108.

Pimentel, D. 2004. Livestock production and energy use. In: Encyclopaedia of Energy. Cleveland, C. (ed.). Elsevier, San Diego, vol. 3, pp. 671–676.

Edible protein energy return in % of input

Edible-protein energy return on investment (EROI) values in %. The value 100% indicate full conversion of energy input to edible protein

Fisheries		Agriculture	
Carp - extensive pond culture	100,0		
Tilapia - extensive pond (Indonesia)	13,0	Chicken (US)	25,0
Carp - extensive pond culture	11,0		
Mussel - Longline culture (Scandinavia)	10,0	Turkey (US)	10,0
Carp - unspecified culture (Israel)	8,4		
GLOBAL FISHERIES	8,0		
Tilapia - unspecified culture (Israel)	6,6	Milk (US)	7,1
Tilapia - pond culture (Zimbabwe)	6,0	Swine (US)	7,1
Mussel - Longline culture (Scandinavia)	5,0		
Catfish - intensive pond culture (US)	4,0		
Tilapia - intensive cage (Zimbabwe)	2,5	Eggs (US)	2,5
Atlantic salmon - intensive cage (Canada)	2,5	Beef - feedlot (US)	2,5
Shrimp - semi-intensive culture (Ecuador)	2,5		
Chinook salmon - intensive cage (Canada)	2,0		
Atlantic salmon - intensive cage (Sweden)	2,0		
Sea bass - intensive culture (Thailand)	1,5	Lamb (US)	1,8
Shrimp - intensive culture (Thailand)	1,4		

Figure 10: Edible protein energy return in % of input. From Tyedmers, Watson and Pauly, 2005

As shown in the table there are marked differences both within fisheries and within agriculture. While Carp production in extensive pond culture has a 1:1 conversion of protein energy return meaning that input of 100 kilo protein results in 100 kilo Carp-protein. At the bottom of the fisheries list show that intensive Shrimp culture in Thailand is as low as 1,4 meaning that 100 kilo of protein input results in 1,4 kilo shrimp protein. And global fisheries show a level of return of 8, i.e. 100 kilo of protein results in 8 kilos of edible fish protein.

When comparing agriculture to fisheries similar variations appear. The highest conversion rate is found in connection with chicken production while the lowest level is found in connection with production of lambs.

What is not taken into account in the table is the quality of the different products. So while the conversion rates are rather similar meaning that the energy use in producing fish versus producing animals in agriculture are within the same ranges, the quality of the output in relation to especially fats show a clear advantage for fisheries. The important thing is, however, that by being more targeting in taking energy conversion rate into account there seems to be considerable potentials for reduction in energy consumption in both sectors.

3.2.7 Responsible Fisheries – Community Involvement

Fisheries Management can be seen as an integrated process which encompasses many different tasks such as information gathering, analysis, planning, consultation, decision making, allocation of resources and formulation and implementation of strategies in relation to govern fisheries activities with the purpose of ensure the continued productivity of the resources and accomplishment of other fisheries objectives.

Talking about community involvement centres the tasks towards primarily managing local conditions, and in this context it is basically directed towards small scale activities.

FAO emphasise in their International Guidelines for Securing Sustainable Small-scale Fisheries[27] that worldwide the small scale fisheries employ over 90 percent of the world's capture fishers and fish workers. At the same time the small-scale fisheries sector is characterised as being a diverse and dynamic sector and its characteristics vary from one location to another, strongly anchored in local communities reflecting their traditions and values. This situation is clearly confirmed when travelling around in Europe where the diversity of the coastal communities adds to the attraction of tourists and at the same time ensures accessibility of fresh fish. Small-scale fisheries generate income, provide food for local, national and international markets and make important contributions to nutrition.

Involving the communities in managing the fisheries is a desired task for many communities, and the fishing communities have a clear economic interest in fishery management. This interest has been expressed traditionally as community control over fishing in near-shore space and it is generally consider important, but at the same time also necessary to recognize that management which include the above list of tasks entails a complex set of tasks aimed at ensuring that the optimal benefit are obtained for the local users, state or regions from the sustainable utilization of the living aquatic resources to which they have access.

In practice it means:

• Setting of policies and objectives for each fishery or stocks to be managed, taking into account the biological characteristics of the stock, the nature of existing or potential fisheries and other activities related to or impacting the stock and the potential economic and social contribution of the fishery to national or local needs and goals.

[27] FAO (2012): International Guidelines for Securing Sustainable Small-scale Fisheries.

• Determine and implement actions necessary to enable the management authorities, the fishers and other interest groups, to work towards the identified objectives (consultation is required with all interested groups).

• Consult and negotiate with users or interest groups concerned with resources and from areas not directly related to fishery activities but which impact on fisheries.

• Provides for the consultation with the users, regularly reviewing the management objectives and measures to ensure they are still appropriate and effective.

• Reporting to governments, resource users and the public on the state of resources and management performance.

Susan Hanna[28] emphasizes in this connection that community fisheries management depends, like any other form of management on the effectiveness and efficiency with which it conducts basic management functions. The future role of fishing communities in fishery management therefore depends on effectiveness with which communities can address the classic organizational problems.

In Australia the delegation of management responsibility to communities have had a reasonably long tradition. And the Australian government emphasizes that a management regime does not have to be a formal statutory fishery management plan as such. It could include mandatory management arrangements or management policies and programs[29]. But it is also stressed that the regime should:

• be documented, publicly available and transparent;

• be developed through a consultative process providing opportunity to all interested and affected parties, including the general public;

• ensure that a range of expertise and community interests are involved in individual fishery management committees and during the stock assessment process;

• be strategic, containing objectives and performance criteria by which the effectiveness of the management arrangements are measured;

• be capable of controlling the level of harvest in the fishery using input and/or output controls;

[28] Hanna, S.: Community Fisheries Management. Fisheries and Aquaculture. Encyclopedia of Life Support Systems vol V.

[29] Australian Government- Department of the Environment and Water: Guidelines for the ecologically sustainable management of fisheries - 2007

• contain the means of enforcing critical aspects of the management arrangements;

• provide for the periodic review of the performance of the fishery management arrangements and the management strategies, objectives and criteria;

• be capable of assessing, monitoring and avoiding, remedying or mitigating any adverse impacts on the wider marine ecosystem in which the target species lives and the fishery operates; and

• require compliance with relevant threat abatement plans, recovery plans, the National Policy on Fisheries Bycatch, and bycatch action strategies developed under that policy.

How such requirements would translate into European management practice might be a new approach in that could become a step closer to the intensions behind the Ecosystem Approach in management which has become a central issue in the new Fisheries policies.

3.2.8 A green growth strategy for fisheries in a bio economy context

Cross-cutting issues brought forward by UNEP and OECD in relation to the specific aspects of greening fisheries and aquaculture show both similarities and differences. Many of these relates to how the specific situations are, but a few of them also points towards elements that can be seen as input to a discussion on a green growth strategy for fisheries, aquaculture, and for the bio economy as such. The following overview is not a comprehensive list but pointing towards some important elements to be included in future discussions.

According to UNEP greening the fisheries sector requires:

- Reorienting of public spending to strengthen fisheries management, and finance a reduction of excess capacity
- Stop overfishing by means of adequate control mechanisms
- Rebuild overfished and depleted fish stocks
- Promote small scale fisheries
- Improve selective and less damaging fishing gear

It would enable:

- Advantages through increased resource rent
- Enable a boosted recreational fisheries as well as multiplier and non-market values that are likely to be realised

- Enable the inclusion of marine protected areas (MPAs) which can be beneficial under specific conditions

According to OECD further issues need to be included:

- Management approaches where the potential contradiction between sound long-run policies requires short term investments and therefore jeopardizing short-term objectives.
- The economic waste in many fisheries is substantial, an issue that requires new policy approaches, especially in relation to discard:
- EU discard policies give strong incentives not to target fish that cannot be landed, but by not allowing it to be landed also create strong incentives to discard such bycatch when it is caught.
- ITQ programmes indicates that while the number of people employed may be reduced the number of hours worked are not, and accordingly, the transformation has provided more fulltime jobs.
- Control measures like port control are not uncontroversial, but needed

While the aquaculture sector has some obvious development options, *UNEP* is in many ways critical to aquaculture.

In order to "greening" the sector needs to:

- be organised to ensure minimal environmental degradation
- stop the farming of carnivorous fish such as salmon, bluefin tuna and seabass due to requirement of animal proteines until non-wild fish sources of fish meal are developed;
- adopt integrated technologies that would make fish farming as selfcontained as possible
- develop reliable management systems for green aquaculture practices

OECD adds to the previous by emphasizing:

- Development of new technologies that are enabling the increased aquaculture production to interact better with the environment, for instance reduce the use of antibiotics, prevent interaction between cultured and wild animals

- Generate an increasing control of the production process through productivity-enhancing innovations
- Prevent the "fish meal trap" – the risk of aquaculture becomes environmentally degrading because increased demand for feed leads to increased fishing effort for the wild species used to produce the feed and thereby threatens the viability of wild fish stocks

4 The current state and performance

In a report released in 2012 by the Dutch consultancy Framian BV[30] it is emphasized that EU's fisheries has been in continuous decline over the past 15 years, and that the fishing industry could be heading towards ruin without robust regulatory reforms. One of the main points in the report is, that unless reforms are made the fishing fleets in the EU in their evaluation will land 1.4 million tonnes, or 30%, less fish by 2022 compared to 2009 figures, which of course will be a serious blow to the food supply in Europe. It will furthermore have serious consequences for employment, and they are forecasting a loss of 50,000 jobs in fishing by 2022.

The European Parliament has during several years been looking towards a major overhaul of the Common Fisheries Policy (CFP), and it is expected to become materialized within the upcoming years. The question of whether this is too late in order to maintain the supplies has however been brought forward. For instance by WWF who suggests that fish populations should be allowed to grow back into levels that can support maximum sustainable yield (MSY[31]) by 2015.

4.1 General states and performance

4.1.1 Introduction[32]

In connection with fisheries and seafood production eight different categories of resources are dealt with in international statistics.

The group of fish include the *demersal fish* which are species of fish living and feeding on or near the bottom of the oceans and lakes, p*elagic fish* being species living and feeding in the open water column, and d*iadromous fish* which are species where migration between fresh water is an important part of their life cycle. In some statistics *Freshwater fish* is often separated as a separate category irrespective of whether the species are Demersal or Pelagic. If this is the case the Freshwater and Diadromous species are usually categorised together.

Besides the categories of fish the statistics operates with *Molluscs*, *Crustaceans* and *Cephalopods* as categories and *Aquatic plants* are furthermore included as a category.

[30] Pavel Salz, Framian BV (Netherlands), October 2012: Socio-Economic Benefits of a Bold EU Fisheries Reform. http://static.euractiv.com/sites/all/euractiv/files/Socio-economic%20study%20Low%20Res%2016.10.12.pdf

[31] MSY describes the maximum yield of a specified species of fish that can be fished year after year without harming the fish stock.

[32] Further details are available in chapter 9 appendix 1 (fisheries) and 2 (aquaculture)

4.1.2 Fisheries

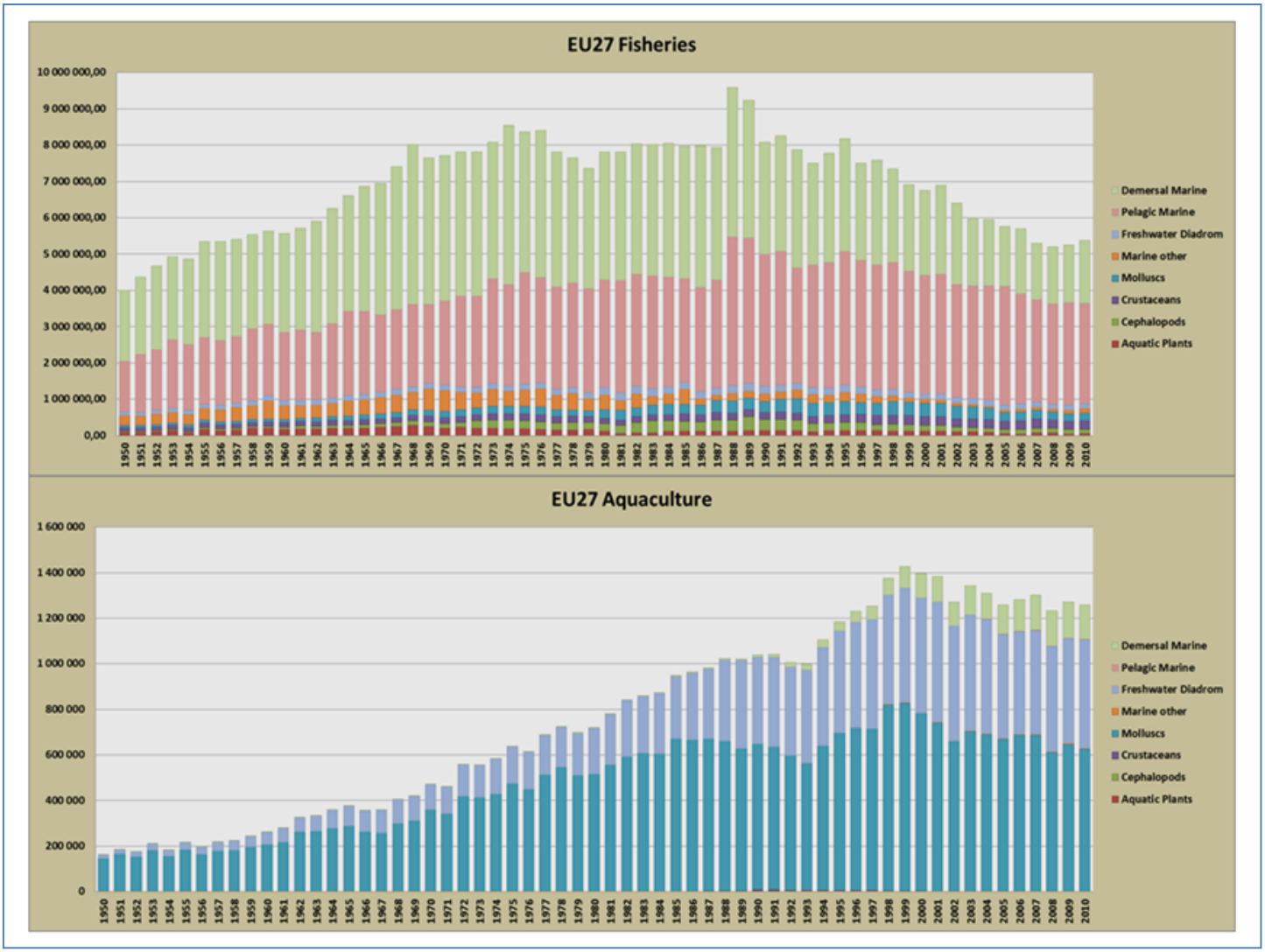

Figure 11: Development of the EU27 countries fisheries and aquaculture from 1950 to 2010

The graphs on Figure 11 above indicate the role of the different categories in fisheries from 1950 to 2010. Please be aware that details for both countries and species are available in annex 1 and 2 in chapter 9.

The graphs are showing two very different paths in fisheries and aquaculture respectively. In fisheries there has been a general increase from a level of 4 million tonnes in 1950 to 8 million tonnes in the 1970ies where the level stabilises until the 1990s and then exposed to a general decline to the present level of around 5 million tonnes. Whether this trend of decline will continue in the next decades will probably be depending on to what extend the negotiations regarding the future management of the resources will be successful.

The bulk of fisheries have been based on saltwater fisheries clearly dominated by the Demersal and pelagic marine resources with very different territorial characteristics.

A major part of the Demersal fisheries is situated mainly in coastal waters on or near the continental slope and therefore easy accessible but also more vulnerable to for instance which technologies are in use. A major problem has been the use of instruments such as trawls which may harm the bottom conditions, and especially heavy instruments such as boom trawls which intentionally is impacting the bottom conditions in order to bring fish, crustaceans and molluscs hiding at or in the bottom into the nets. As a consequence the increase in this fishery was the highest up till the 1970ies but since then exposed to stagnation and then dramatic decline up till today. Besides the characteristics of both species and technologies used in the Demersal fisheries the fact that most of this takes place within the 200 miles EEZ has prevented foreign vessels from entering into national waters, but thereby also limited the area-wise expansion of the national fisheries.

The development of the pelagic fisheries differs first and foremost from the Demersal by the fact that pelagic species are much more mobile than the demersal species. Another issue related to the territorial characteristics is, that this mobility means that fisheries moves out of the national waters and therefore enables the industry to go for expansion options in international waters. As a consequence this fishery expanded up till the 1990s and has been exposed to a much slower decline rate compared to the demersal fisheries. But with the result that marked increase in energy consumption becoming an important factor influencing both the economy and the sustainability of this fishery.

Volume-wise the other categories included in the statistics are very small compared to the Demersal and pelagic fisheries. But as will be discussed later the values and especially the local roles of these species are substantial and therefore also key factors in relation to a greening of the fisheries.

4.1.3 Aquaculture

While fisheries have been exposed to first increases and later on declines during the 60 years shown by the statistics the aquaculture has been in a process similar to the global trend: a remarkable increase. From a total production around 200,000 tonnes by the EU27 countries in 1950 to the present production which is six times larger situated around 1.2 million tonnes in 2010. And from a situation where aquaculture generated around 5% of the total fish output it now cover more than 20%.

The major part of the production stems from molluscs which in 1950 already contributed with by far the largest part, but freshwater and diadrom species has become a substantial larger part of the aquaculture sector during these 60 years. Farmed salmon – an example of a diadrom

species – has been responsible for a major part of this development. And during the last 10-15 years the demersal marine aquaculture has added to the production. This partly as a compensation for fish species being part of the consumption culture in Europe which has been challenged by the declining of output from fisheries which used to be covering the demand for these species.

4.1.4 National differences

As mentioned before further details regarding both species and countries involved in aquaculture and fisheries are available in annex 1 in chapter 9. In these graphs it is possible to trace the development during the last 60 years for each of the groups as the scales are adjusted according to the maximum volumes caught for each group. And it is furthermore possible to follow the development paths for each of the EU27 countries.

At this point, however, the following tables and maps provide easier overview of the situation as of 2010 both in relation to fisheries and aquaculture.

The top part on Figure 12 shows products from fisheries in kg per capita as of 2010. And as seen there are major regional differences and immediate visible due to the colour coding. So only some of the major differences should be commented on here. And the distributions are shown on the two maps on Figure 13 as well.

The top producer in fisheries is Denmark with a production of 149.57 kilo per capita which is almost double as much as number two on the list, Ireland. The Danish production is mainly based on pelagic and demersal fisheries with demersal fisheries on top with more than half of the total production from this sector. Some molluscs and crustaceans are produced, while the other categories are almost absent.

The major of fisheries categories in the next country in the list, Ireland, are basically the same as in the case of Denmark, but with a major difference. Ireland is the European country where aquatic plants for instance for starch, medical use and cooking are produced. Only Estonia and France have noticeable productions of this category.

Products from fisheries and aquaculture

Products from fisheries, kg pr. cap. 2010

Country	Freshwater fisheries	Pelagic fisheries	Demersal fisheries	Molluscs fisheries	Crustacean fisheries	Cephalopod fisheries	Aquatic plants	Total
Denmark	0,12	56,33	85,18	5,26	2,66	0,01	-	149,57
Ireland	0,03	37,31	27,01	3,04	3,92	0,05	6,60	77,95
Estonia	3,39	57,32	3,62	-	6,74	0,06	0,26	71,40
Latvia	0,73	66,40	3,44	-	0,44	-	-	71,01
Malta	0,11	3,00	0,95	-	48,41	0,25	-	52,71
Lithuania	0,41	41,72	2,63	-	0,25	-	-	45,00
Finland	7,50	21,97	0,21	-	0,06	-	-	29,74
Netherlands	0,15	16,30	5,58	0,20	0,42	0,03	-	22,68
Sweden	0,34	16,82	5,16	0,01	-	0,00	-	22,34
Portugal	0,01	12,36	6,50	0,50	-	1,31	0,05	20,73
Spain	0,10	9,58	7,79	0,30	1,60	0,96	0,00	20,33
United Kingdom	0,04	4,48	2,88	1,08	-	0,21	-	8,68
France	0,05	2,36	2,69	0,83	0,27	0,32	0,35	6,87
Greece	0,22	2,99	2,47	0,11	0,37	0,55	-	6,71
Poland	0,56	3,47	0,76	-	0,06	-	-	4,85
Italy	0,06	1,54	0,80	0,45	0,44	0,39	0,02	3,70
Germany	0,20	1,37	0,92	-	0,24	0,00	-	2,72
Slovakia	0,30	-	-	-	2,10	-	-	2,39
Slovenia	0,08	0,28	0,06	0,00	1,63	0,02	-	2,08
Belgium	0,05	0,00	1,61	0,11	0,21	0,06	-	2,04
Bulgaria	0,15	0,58	0,05	0,64	0,00	-	-	1,42
Hungary	0,62	-	-	-	-	-	-	0,62
Czech Republic	0,38	-	-	-	-	-	-	0,38
Luxembourg	-	-	-	-	0,09	-	-	0,09
Austria	0,04	-	-	-	-	-	-	0,04
Cyprus	0,02	-	-	-	-	-	-	0,02
Romania	-	-	-	-	0,00	-	-	0,00

Products from aquaculture, kg pr. cap. 2010

Country	Freshwater aquaculture	Pelagic aquaculture	Demersal aquaculture	Molluscs aquaculture	Crustacean aquaculture	Cephalopod aquaculture	Aquatic plants	Total
Ireland	3,77	-	-	6,56	-	-	0,00	10,34
Greece	0,30	0,01	7,59	1,99	-	-	-	9,88
Denmark	6,69	-	0,00	0,45	-	-	-	7,14
Malta	-	2,39	4,48	-	-	-	-	6,87
Spain	0,39	-	0,89	4,19	0,00	0,00	0,00	5,48
Netherlands	0,39	-	0,02	3,63	-	-	-	4,04
France	0,65	-	0,08	2,74	0,00	-	0,00	3,47
United Kingdom	2,72	-	0,01	0,51	-	-	-	3,24
Italy	0,64	0,00	0,22	1,67	0,00	-	-	2,54
Finland	2,20	-	-	-	-	-	-	2,20
Czech Republic	1,94	-	-	-	-	-	-	1,94
Hungary	1,42	-	-	-	-	-	-	1,42
Sweden	0,99	-	-	0,15	0,00	-	-	1,14
Bulgaria	0,95	-	-	0,09	0,00	-	-	1,05
Lithuania	0,96	-	-	-	-	-	-	0,96
Poland	0,81	-	-	-	0,00	-	-	0,81
Germany	0,44	-	-	0,06	-	-	-	0,50
Estonia	0,43	-	-	-	0,00	-	-	0,43
Romania	0,42	-	-	-	-	-	-	0,42
Slovenia	0,32	-	0,02	0,04	-	-	-	0,38
Portugal	0,00	0,03	0,21	0,09	0,00	-	-	0,33
Austria	0,26	-	-	-	-	-	-	0,26
Latvia	0,24	-	-	-	0,00	-	-	0,24
Slovakia	0,13	-	-	-	-	-	-	0,13
Cyprus	0,09	-	-	-	-	-	-	0,09
Belgium	0,02	-	-	-	-	-	-	0,02
Luxembourg	-	-	-	-	-	-	-	-

Figure 12: Production from fisheries and aquaculture. Kg per capita in 2010.

Several countries are producing cephalopods, but amount-wise at a low level. Portugal is the main producer with a production per capita of 1.31 kilos but with Spain at a close race at 0.96 kilos and other Mediterranean countries such as Malta, Italy, Greece and France following through.

Crustaceans are produced in most of the European countries with access to saltwater and with Malta on top with almost 50 kilos per capita. Besides

this the major producers have a yearly production per capita around 1 to 7 kilos, for instance Estonia, Denmark, Ireland, Spain, and Slovenia.

The major producers of molluscs are Denmark on top of the list with 5.26 kilos per capita followed by Ireland with 3.04 kilos. Also UK is above 1 kilo per capita while all other countries are below.

In relation to freshwater fisheries Finland is on top with 7.5 kilos per capita followed by Estonia with 3.39 kilos. All other countries except Luxembourg and Romania have been registered with freshwater fisheries, but with rather small amounts.

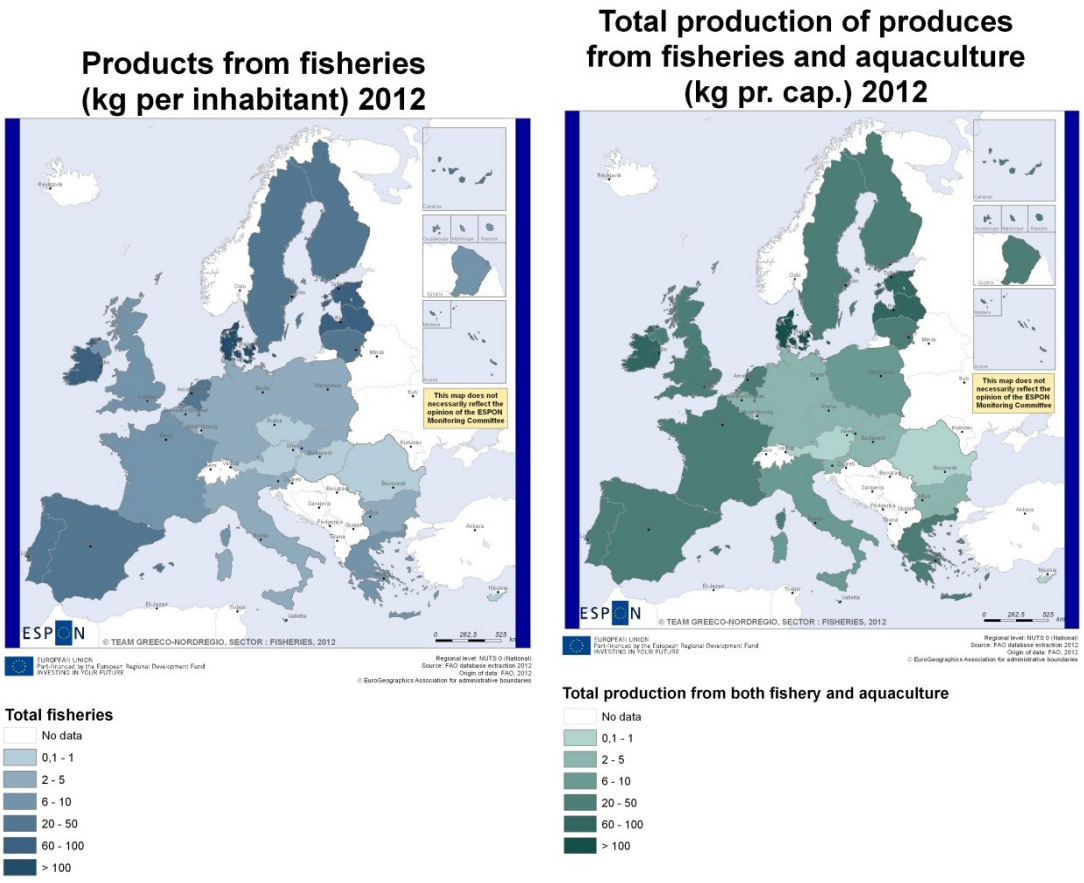

Figure 13: Maps of products from fisheries and aquaculture in 2010. Kg per capita.

In aquaculture the top producer is Ireland with a total production of 10.34 kilos per capita, followed closely by Greece at 9.88 kilos, and then a bit lower Denmark, Malta and Spain between 5 and 7 kilos per capita. In the low end 13 countries are producing less than one kilo per capita, and Luxembourg is registered with no production and Belgium with 0.02 kilos per capita.

Both Ireland and Denmark are on top in relation to freshwater aquaculture with 3.77 and 6.69 kilos respectively. And most countries show some freshwater aquaculture with Malta and Luxembourg as the exemptions.

Only 4 countries have pelagic aquaculture, and with Malta on top with 2.39 kilos per capita while Greece, Italy and Portugal produces very limited amounts of this group. It is tuna which at this point of time is on an experimental stage, but there are probably options for expansion in the years to come.

Demersal aquaculture is a major contributor to fish production in Greece and Malta with productions of 7.59 and 4.48 kilos per capita. A few other countries have this production as well, but at much lower levels.

4.1.5 Consumption

The consumption patterns of fish and seafood products are shown on three illustrations below.

Consumption of fish and seafood products pr. capita 1961-2009

Country	1961	1971	1981	1991	2001	2002	2003	2004	2005	2006	2007	2008	2009	Index change 2001-2009	Increase 2001-2009 kg/Cap
Portugal	55,7	65,0	29,7	61,6	54,9	54,7	52,6	53,6	53,5	56,2	61,2	61,1	61,1	111,3	6,2
Spain	25,9	30,5	32,1	34,8	44,4	43,7	44,0	41,8	40,6	45,1	43,3	42,9	42,9	96,6	(1,5)
Lithuania					41,8	42,3	36,8	40,9	37,7	35,3	40,5	40,7	40,7	97,4	(1,1)
Finland	17,5	23,0	28,4	32,1	31,7	32,1	32,6	34,6	31,9	33,0	36,9	36,7	36,7	115,8	5,0
France	18,0	20,9	25,7	31,1	33,6	33,8	34,0	33,1	34,8	35,2	33,9	33,7	33,7	100,3	0,1
Sweden	26,0	28,1	25,0	27,7	29,4	30,8	32,7	31,8	32,2	31,6	32,3	32,0	32,0	108,8	2,6
Malta	10,7	11,1	20,1	18,1	29,4	29,0	30,4	30,5	30,0	30,7	30,8	30,7	30,7	104,4	1,3
Luxembourg					26,9	27,0	28,8	26,0	24,4	27,1	27,1	26,5	26,5	98,5	(0,4)
Belgium	18,0	17,8	19,0	19,3	22,3	21,9	25,0	24,7	24,7	24,4	25,5	25,4	25,4	113,9	3,1
Italy	12,0	13,6	13,8	23,1	24,4	23,5	24,7	23,3	24,6	25,2	24,8	24,6	24,6	100,8	0,2
Ireland	7,1	10,3	14,6	11,7	24,6	20,5	21,6	23,3	22,6	20,4	22,7	22,4	22,4	91,1	(2,2)
Denmark	16,5	19,8	21,1	22,6	21,3	20,5	23,0	23,2	24,5	23,0	22,0	21,9	21,9	102,8	0,6
United	19,8	19,6	17,7	18,2	20,2	20,1	19,5	20,2	20,6	22,1	21,2	21,0	21,0	104,0	0,8
Greece	16,2	15,2	17,3	20,2	22,0	20,6	21,1	19,8	20,5	21,3	20,5	20,4	20,4	92,7	(1,6)
Netherlands	10,8	13,1	13,7	11,1	21,7	19,4	19,6	19,2	19,4	20,5	19,7	19,6	19,6	90,3	(2,1)
Latvia					9,4	9,0	9,0	13,0	13,7	13,4	17,4	17,5	17,5	186,2	8,1
Europe Average	14,0	18,5	20,3	19,9	16,1	17,8	16,6	13,6	13,4	11,3	16,4	16,4	16,4	101,9	0,3
Germany	9,6	11,5	11,4	13,8	15,4	14,1	14,3	13,8	14,8	15,2	15,3	15,3	15,3	99,4	(0,1)
Austria	7,0	7,8	6,1	9,2	10,9	10,3	11,0	12,0	13,5	13,3	15,2	15,2	15,2	139,4	4,3
Poland	6,8	12,1	12,4	9,2	9,7	8,6	8,8	9,5	9,7	9,8	10,9	10,8	10,8	111,3	1,1
Slovenia					7,4	7,6	8,3	9,3	9,0	9,9	10,1	10,0	10,0	135,1	2,6
Czech republic	7,4	8,2	5,3	5,6	9,7	9,2	9,5	9,7	10,0	9,5	9,8	9,7	9,7	100,0	-
Slovak republic					6,5	6,8	7,3	7,6	7,8	8,9	8,0	8,0	8,0	123,1	1,5
Romania	2,5	6,1	8,1	4,0	3,2	3,4	3,9	4,2	5,2	5,6	5,4	5,4	5,4	168,8	2,2
Hungary	2,0	3,5	4,0	3,3	4,3	4,4	4,6	5,1	5,2	5,3	5,1	5,1	5,1	118,6	0,8
Bulgaria	2,5	8,5	6,1	2,9	3,2	3,9	4,6	3,5	4,1	5,6	4,6	4,6	4,6	143,8	1,4

Figure 14: Consumption of fish and seafood products per capita 1961-2009.

Figure 14 above show the changes in consumption patterns from 1961 to 2009 while Figure 15 and Figure 16 show maps of these patterns for 2001 to 2009. Lack of data for Lithuania, Luxembourg, Latvia, Slovenia and the Slovak Republic before 2001 limits the options of showing all EU27 countries on the maps except for the period from 2001 to 2009, so these two years have been chosen as the years to focus on.

Besides the yearly consumption in kg per capita Figure 14 also show the changes in consumption from 2001 to 2009 as well as index values for the changes with 2001 as basis.

The list of countries have been sorted according to the magnitude of consumption of fish and seafood products per capita in 2009, and the overall pattern of consumption is quite clear.

On top of the list Portugal is situated with a per capita consumption of 61.1 kg way above other European countries. And this pattern has been persistent throughout the whole time period from 1961 to 2009 only deviating by a few kilos. The only real deviation was in 1981 but whether this low number only half of the yearly consumption in all other years is due to a real situation or due to data registration problems is unclear.

As second comes Spain which also show a persistent high consumption of 42.9 kg in 2009 and similar consumption from 2001 to 2009. From 1961 to 2001 there has been an increase of a total of 80% in a continuous flow.

Lithuania is in third place with consumption from 2001 to 2009 consistent at a level above 40 kg per capita. But due to missing data it is impossible to say whether this pattern show permanence or has been a recent situation.

The list of countries with consumption from 30 to 40 kilos per capita include Finland, France, Sweden and Malta, and for all of them where data exists before 2001 the patterns are quite similar – increases from 1961 to 2001 and then a stable situation.

The following group with consumption between 20 to 30 kilos show some surprises. The group encompasses Luxembourg, Belgium, Italy, Ireland, Denmark, UK and Greece, and include the two top producers – Denmark in fisheries and Ireland second in fisheries and first in aquaculture. High production does obviously not result in high levels of consumption!

The second lowest consumption level from 10 to 20 kilos includes Latvia, Germany, Austria, Poland and Slovenia. And the European average of 16.4 kilos per capita is situated here.

Finally the lowest group below 10 kilos per capita include the Czech Republic, the Slovak Republic, Romania, and Hungary, and Bulgaria in the

bottom with 4.6 kilos which is only 10% of the Spanish consumption and just around 7% of the Portuguese consumption.

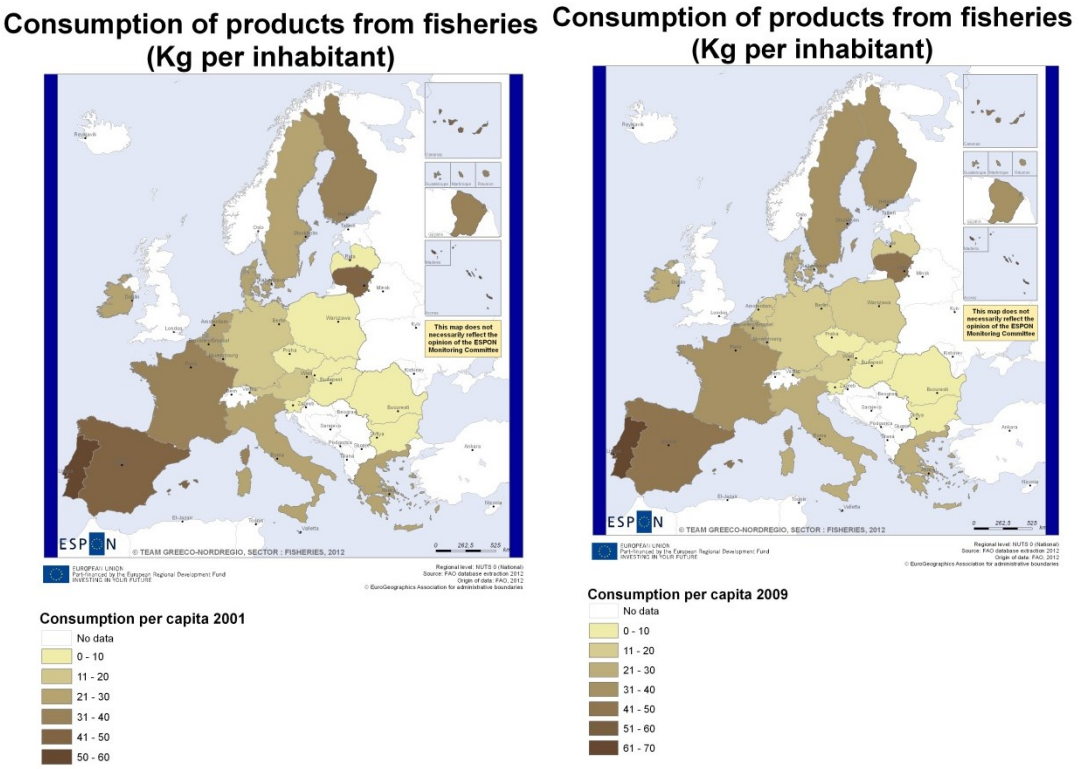

Figure 15: Map of consumption of products from fisheries and aquaculture. In Kg per inhabitant.
Data from Portugal has dropped out - needs to be added to the maps!

Changes in consumption between 2001 and 2009 show increases as much as 8.1 kg per capita in Latvia, and increases around and above 5 kg in Portugal, Finland, and Austria.

In the low end declines in consumption has a group of countries where consumption has been reduced between one to two kilos. Netherlands has experienced the largest decline of 2.1 kilos, but also Ireland, Greece, Spain and Lithuania has experiences marked declines from one to two kilos.

While the absolute numbers show how many kilos the average consumption has increased or declined from 2001 to 2009 the indexed values show changes in per cent. And it identifies a series of countries where the consumption pattern has been relatively constant or even declining. This group include Estonia, Lithuania, Germany, Ireland, Spain and Greece.

In the Nordic countries with a relatively high consumption level increases has also been high kilo-wise, but only limited when calculated in per cent. The countries with the relatively highest levels of increase are the new members of EU Romanian and Bulgaria.

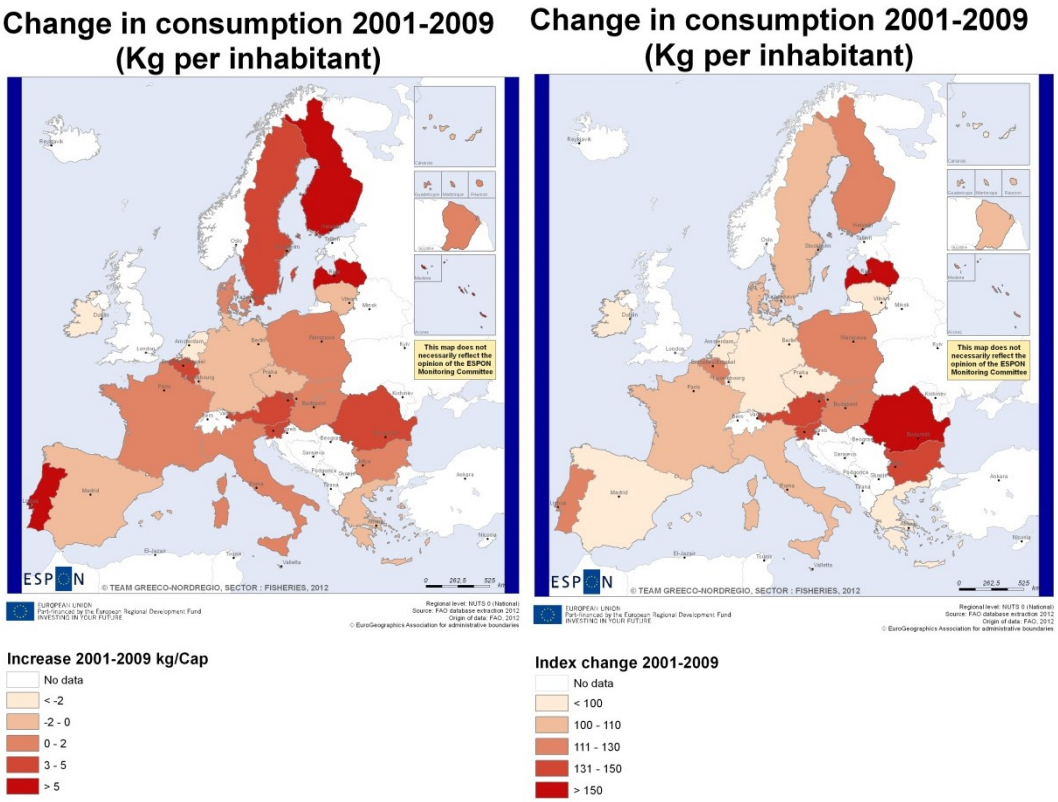

Figure 16: Change in consumption of fish and aquatic products from 2001 to 2009. To the left in absolute numbers, and to the right in change indexed with 2001as base

		Consumption		
		Low	Medium	High
Production	Low	Bulgaria Czech Hungary Poland Romania Slovak Slovenia	Austria Belgium Germany Italy	Luxembourg
	Medium		Greece Netherlands UK	France Portugal Spain Sweden
	High		Estonia Denmark Ireland Latvia Malta	Finland Lithuania Malta

Figure 17: European countries in relation to performance of production and consumption of fish and aquatic products

Figure 17 show an overview of the performance of all EU27 countries according to production and consumption of fish and aquatic products. Both production and consumption have been subdivided in three categories: low, medium and high, and by that indicating countries of common characteristics – and thereby probably also with common interests. These interests will be influential on which policies will be promoted when green initiatives will influence the distribution of quotas and future price development. And at the same time it raises the question of where and how the resources are generated.

4.1.6 Waters and environments

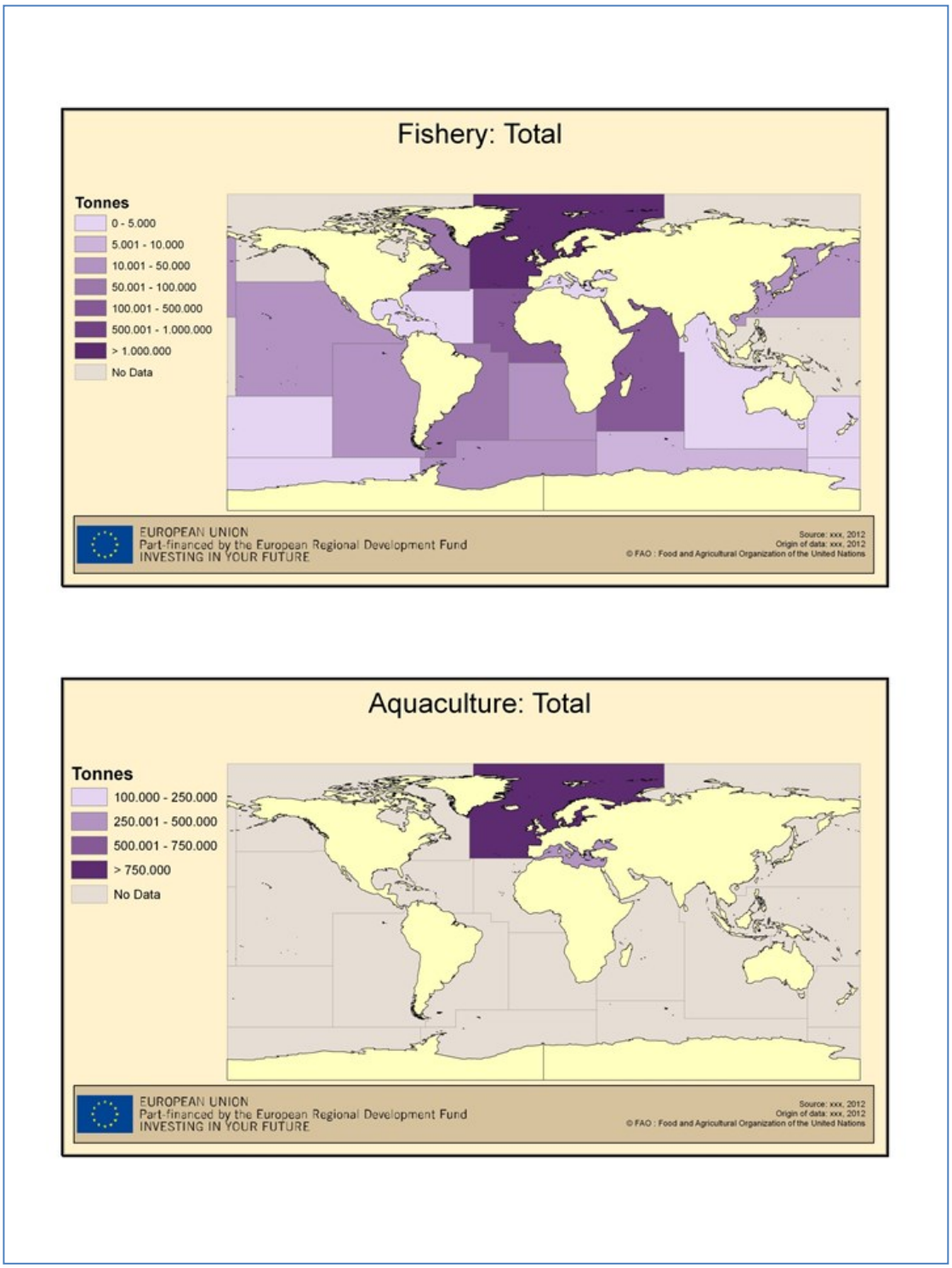

Figure 18: Distribution of EU fisheries in 2010 according to FAO Fishing Areas overview

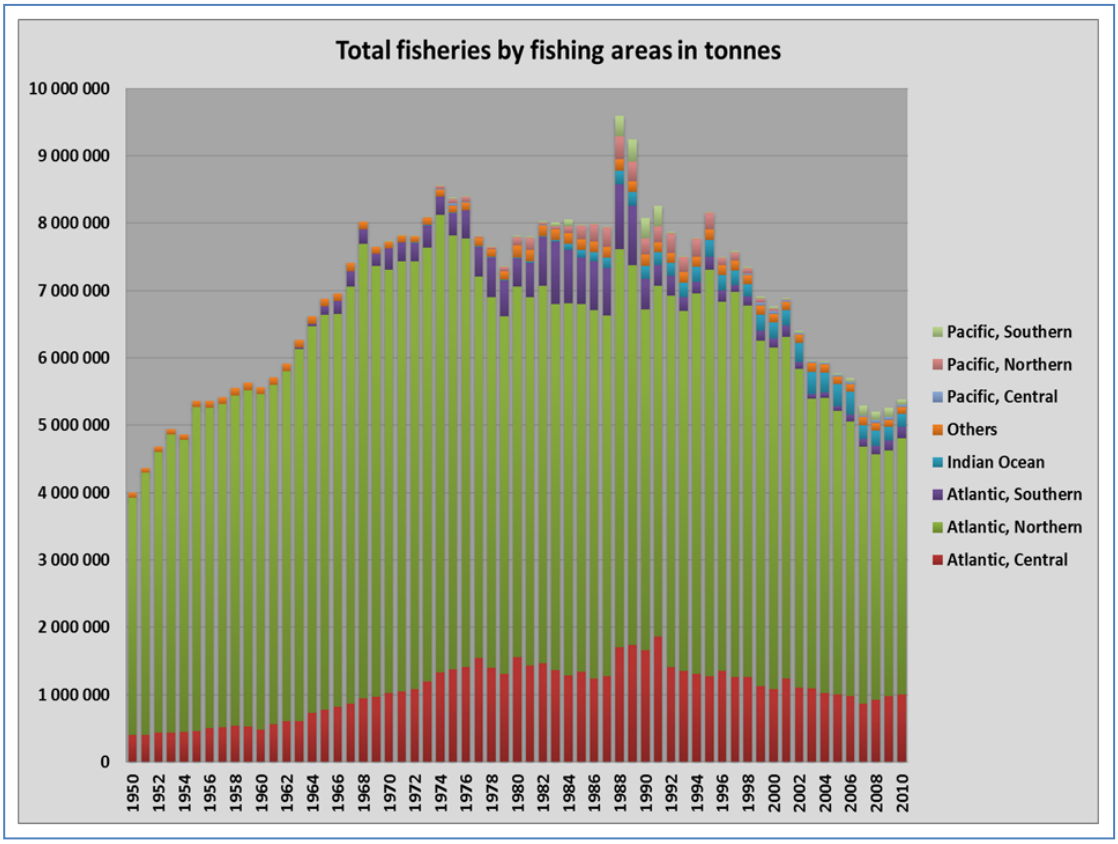

Figure 19: Total fisheries by fishing areas in tonnes in 2010.

Figure 17, 18 and 19 show maps of total fisheries by fishing area (figure 17), graph of total fisheries by fishing areas (figure 18) and graphs of total fisheries by fishing areas and by groups of aquatic products (figure 19). Further details are available in chapter 9 appendix 3.

It is quite clear from the maps (figure 17) that the major fishing activities takes place in the Northern Atlantic region, just as the aquaculture activities are concentrated here. It is, however, also clear that EU was, and to some extend still is, highly dependent on distant fisheries, especially from the central Atlantic and the Indian Ocean.

The graph on figure 18 shows the same pattern, but also that the Southern Atlantic was an important contributor to the EU27 countries during the 1970s and 1980s. A look at chapter 9 appendix 3 dataset 21 and 25 show the marked reduction from 2000 to 2010 in these overseas fishing activities. And the graphs on figure 19 illustrate both changes over time in which species have been fished in the different fishing areas and mix of fisheries between the ocean areas.

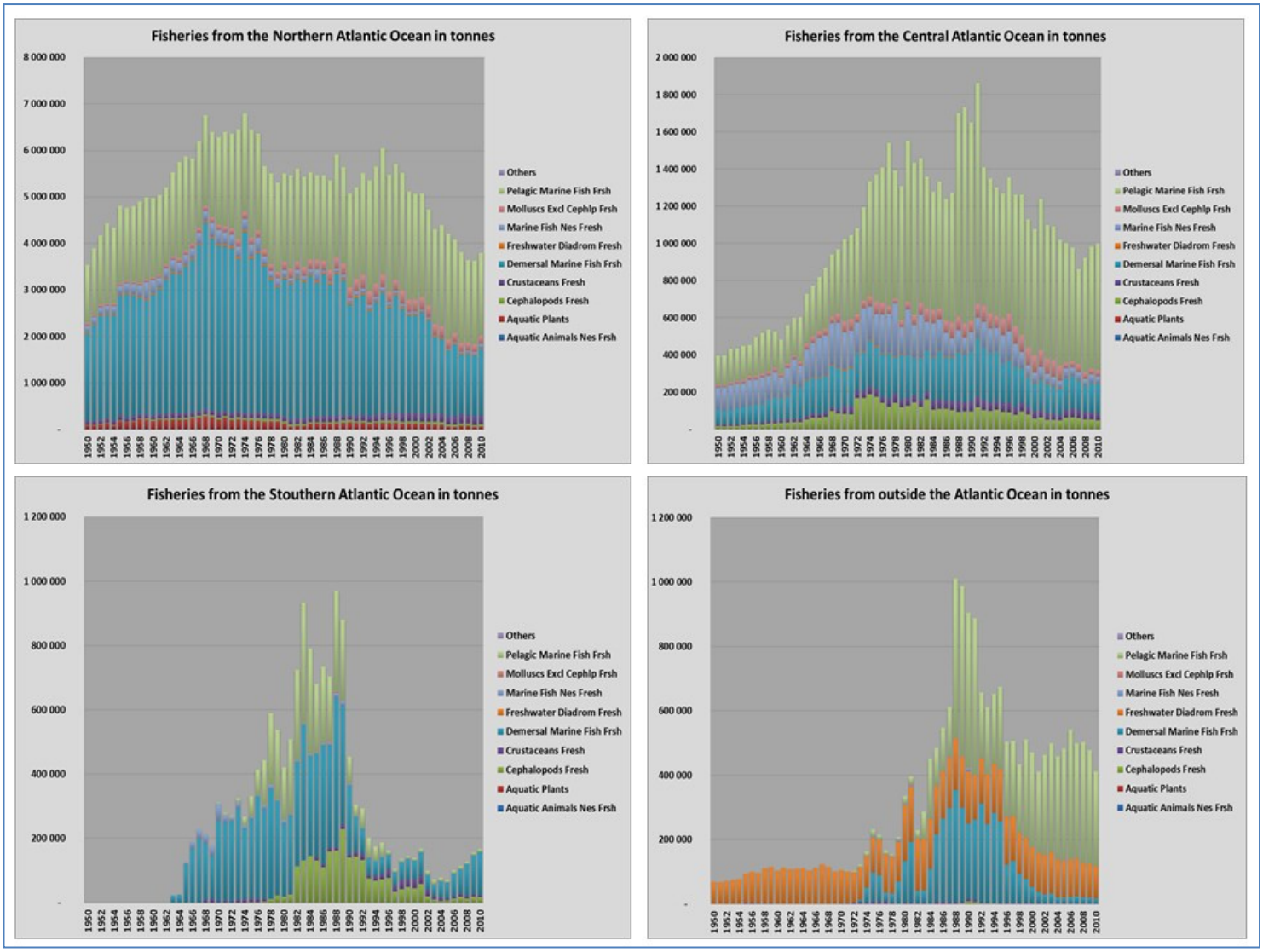

Figure 20: Fisheries from the four most important fishing areas subdivided in types of aquatic products.

For instance how the demersal marine fish has been dominating in both the northern and the southern Atlantic Ocean while the pelagic marine fish has been the dominant group in the central Atlantic Ocean. And furthermore how increases in distant fisheries from the 1950s led to the peaks in the early 1990s and after that basically declines in relation to all Ocean areas.

Several issues have been at stake in relation to these changes.

On is about the national fishing interests in the countries bordering these oceans. While their interests during the 1970ies and the 1980ies was primarily related to the coastal zone due to their limited capacity for more off-shore fishing activities and they therefore allowed or licensed other nations to fish within their EEZ, the expansion of their own fleet capacity limited the accessibility from European fisheries.

Another issue was related to the expanding global aquaculture which provided cheaper products to the world market, many of them novel and attractive for the expanding European market, and therefore also contributed to a limiting of the energy consuming distance fisheries.

4.1.7 Markets and trade

Trade with fish and aquatic products is important for many countries in EU27. Figure 20 showing the European countries in relation to performance of production and consumption of fish and aquatic products illustrates the situation where to find surplus and deficits in supply. In chapter 9 appendix 5 are show details on the main trade characteristics – export, import and net export for the major groups of fish and aquatic products. Details can be found there while the net export results for the major categories are shown below on figure 20.

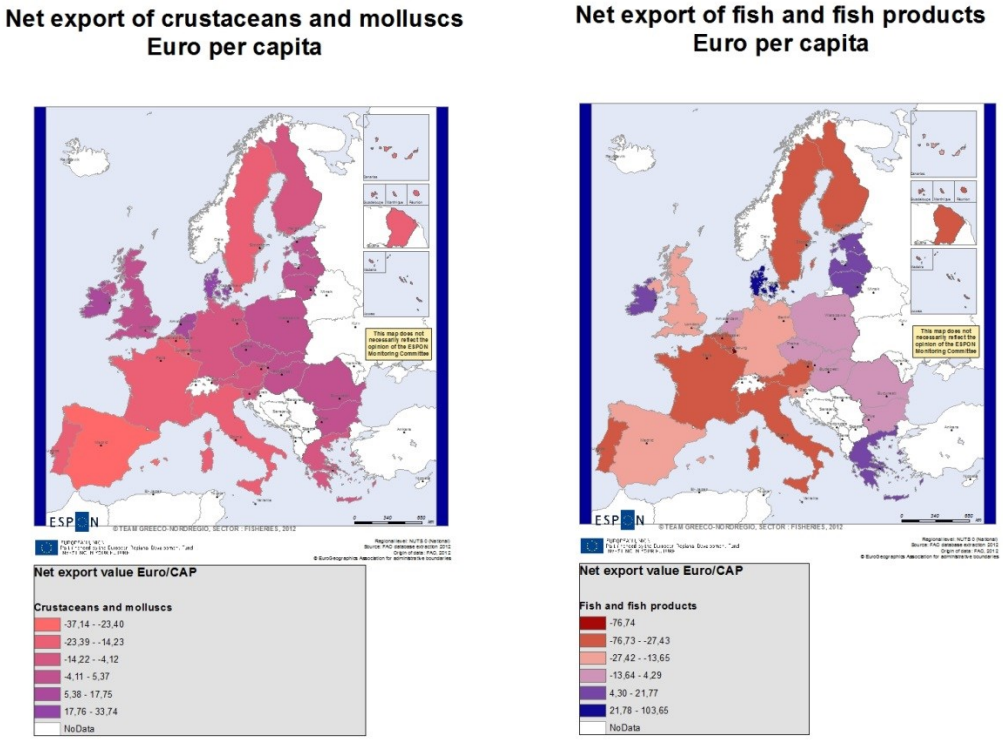

Figure 21: Trade with aquatic products - Net export for Crustaceans and Molluscs (to the left) and Net export of Fish and Fish products (to the right). Both are showing trade balance in Euro per capita.

The colour ramps used on figure showing trade with aquatic products indicate with red colour a trade deficit while purple and blue colours indicate trade revenues.

In relation to crustaceans and molluscs East Europe, UK, Holland and Denmark are the main net producers while most of the Mediterranean countries are in situations with clear deficits. And Germany is situated in a balanced situation.

In relation to fish products the patterns are similar to the trade with crustaceans and molluscs, only enhanced considerably more as the scale for Crustaceans and Molluscs goes from-37€ to +33€ per capita the interval in relation to fish and fish products has a minimum of -76€ and a maximum of 103€ per capita.

4.1.8 The fleet

The distribution of the fishing fleet according to number of vessels tells about how many boats are involved while distribution of the tonnage tells more precisely about how the fishing capacity is distributed.

It is quite clear how the small scale segment of the fleet constitutes by far the largest part when counting numbers. The graph has been sorted according to the distribution of the different segments, and it is quite clear how fisheries in Belgium and the Netherlands is dominated by a number of very large boats while the small boat segment is a major contributor to the fleet in almost all other countries.

When calculation the distribution according to tonnage a few very large boats generates a substantial impact on the distribution, and it becomes clear that a group of countries – Cyprus, Slovenia, Bulgaria, Finland, Romania and Greece – only to a limited extend makes use of larger boats. It indicates that fisheries in these countries are primarily local.

Fisheries in Italy and Malta are also dominated by the small boat segment, but more vessels are able to aim at distance fisheries outside the Northern Atlantic. Between these countries and the four countries Belgium, Lithuania, the Netherlands and Latvia is a large group of countries with combinations of small boats for local fisheries, medium size boats for regional fisheries, and large boats able to go to international waters. And finally the previous mentioned four countries almost totally depending on the large scale international fishing activities due to their focus on very large boats.

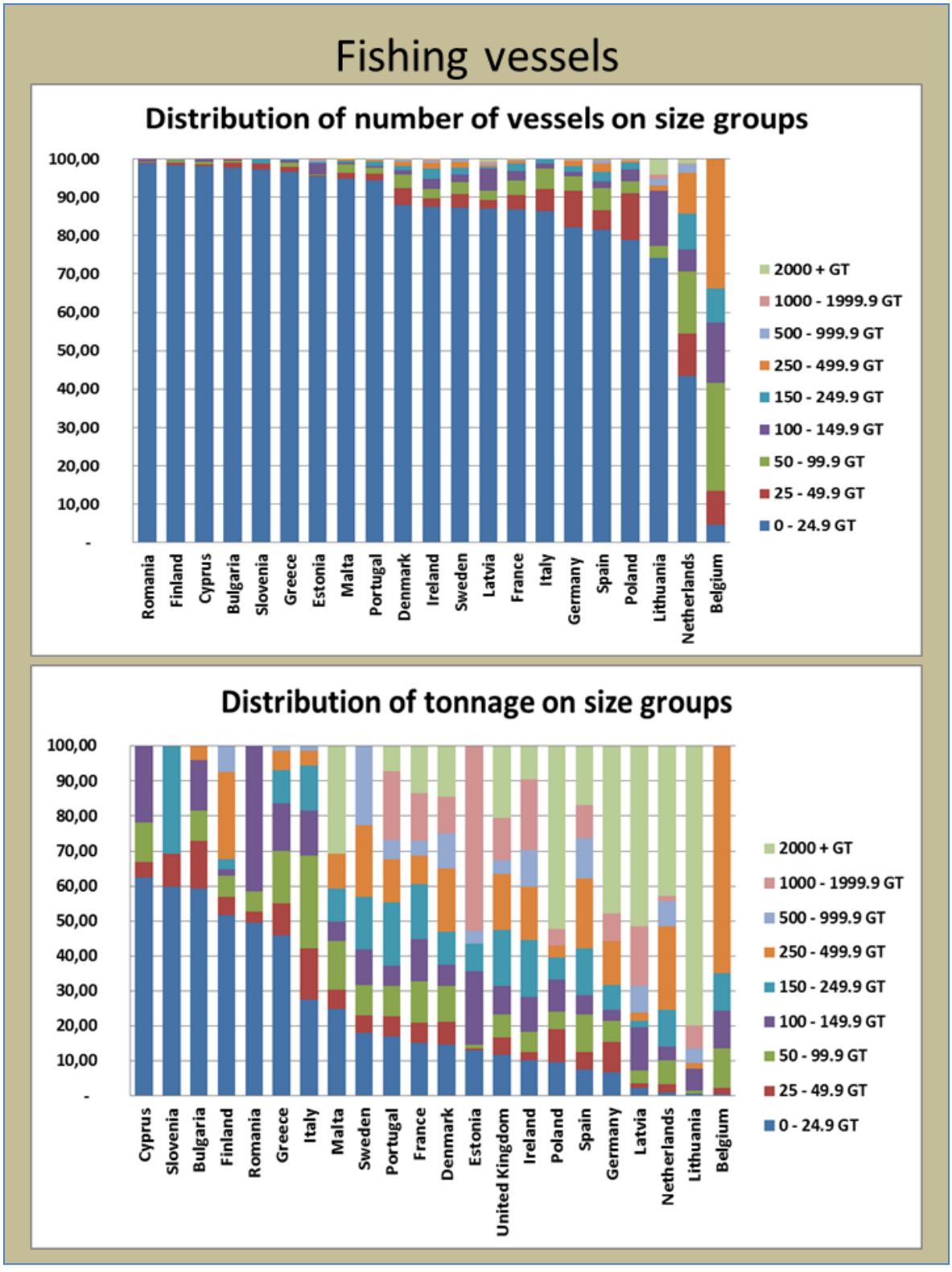

Figure 22: Fleet structure in EU27 in 2010, above according to number of vessels, and below according to tonnage.

A more detailed overview of the territorial distribution of the fleet is shown in chapter 9 appendix 6 where the number of vessels in the coastal zone

is shown by means of a colour ramp. A revised version will be prepared for the next version of the report.

4.1.9 Labour force

Fishing provides jobs for more than 350.000 people, and is within the industry itself considered as an important sector[33]. Figure 23 below puts the numbers into a national perspective showing the employment in % of the national labour forces. The colour ramp indicates values from zero to levels around or just above ½% which show that fisheries only plays a minor role workwise looking at the labour market as such.

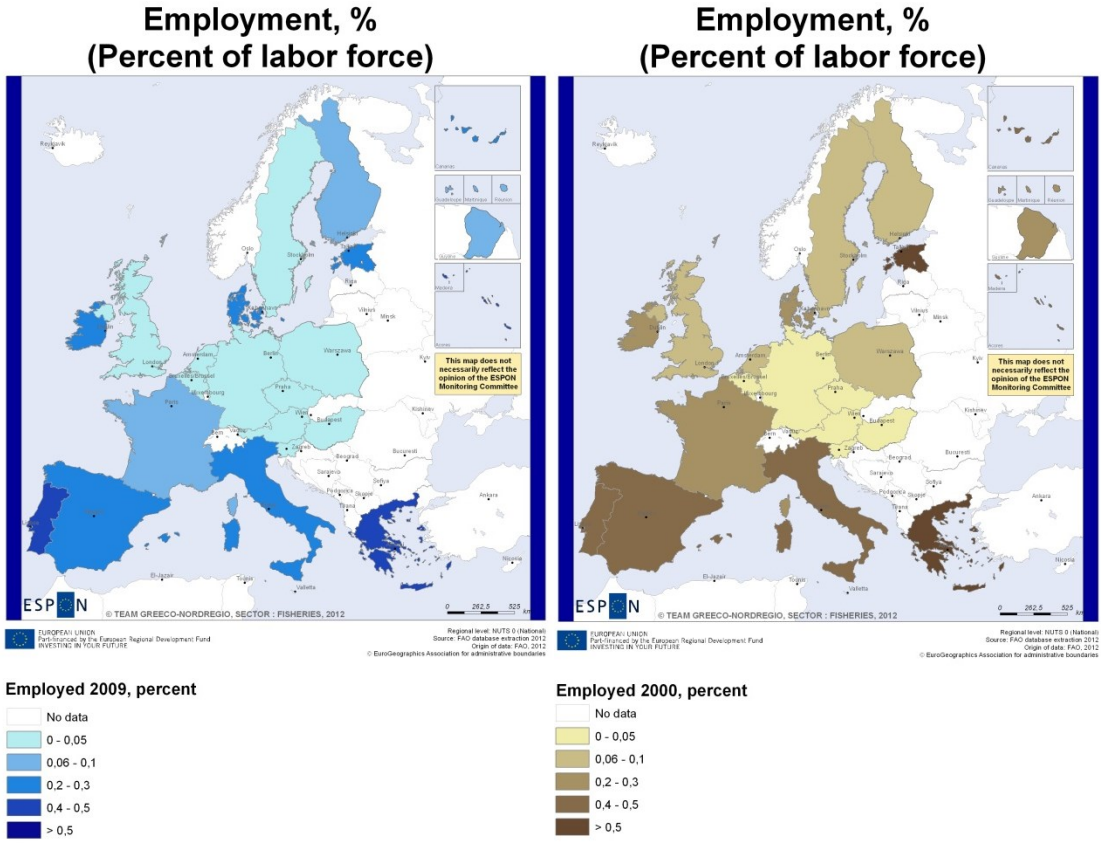

Figure 23: Employment in fisheries in 2000 (to the right) and in 2009 (to the left). The numbers show the percentage of the total labour force employed in fisheries.

But it also shows that there are substantial national differences in level of employment. While Central Europe is characterised by employment in the sector below 1 per mille the littoral states in the Mediterranean region show employment from and above ¼%, and the countries characterized by a large section of small boats goes above the ½%. In the North it is Ireland, Denmark and Estonia showing relatively high percentages of employment.

[33] "The EU fishing industry is the fourth largest in the world. It provides some 6.4 million tonnes of fish each year. Fishing and fish processing provide jobs for more than 350,000 people". EU Information Service: http://europa.eu/pol/fish/index_en.htm

The difference between the overall evaluation and the sector perception relates to the fact that fisheries and aquaculture show very distinct territorial characteristic. And this becomes clear when working at an administrative level below the national. In chapter 9 appendix 7 dataset 49 it is shown how the role of the primary sector is in the coastal zone by means of indexes of employment. And even the primary sector encompasses also agriculture it is quite clear how fisheries and aquaculture are closely linked to the coastal zone and thereby showing a distinct territorial characteristics compared to most of the other sectors34. In most national settings the primary sector show index values of 140 and above in the coastal zones, and in regions of high fisheries intensities the sector covers 5-10% of the total labour force.

In the coastal zone there is competing demands upon both the lands and the waters – obviously on the land side for agriculture, industry, commerce, residential development, recreations, extraction of resources and generation of energy. And just as obvious on the water side harvesting of fish, shellfish, and other living marine resources through fisheries and aquaculture.

But also due to the fact that many activities are related and depending on a land-water continuum because some activities are tied to the water side, for instance pumping of gravel and sand from the bottom of the sea, and then storage and processing of the products on the land side. And in this connection land uses in the coastal zone, and the uses of adjacent lands which drain into the coastal zone, may significantly affect the quality of coastal waters and habitats, and efforts to control coastal water pollution from land use activities cannot be separated but need to be integrated in policies and action. Similarly the proximity to and reliance upon the ocean and its resources, the coastal zone as well as the coastal states have substantial and significant interests in the protection, management, and development of the resources of the EEZ, both in relation to fisheries and aquaculture, and in relation to energy and mineral exploitation35.

4.1.10 Economy

[34] Timothy Beatley,David J. Brower,Anna K. Schwab (2002): An Introduction to Coastal Zone Management. Second edition. Island Press. New York.

[35] National Oceanic and Atmospheric Administration (2005): Coastal Zone Management Act of 1972 as amended through Pub. L. No. 109-58, the Energy Policy Act of 2005. U.S. Department of Commerce.

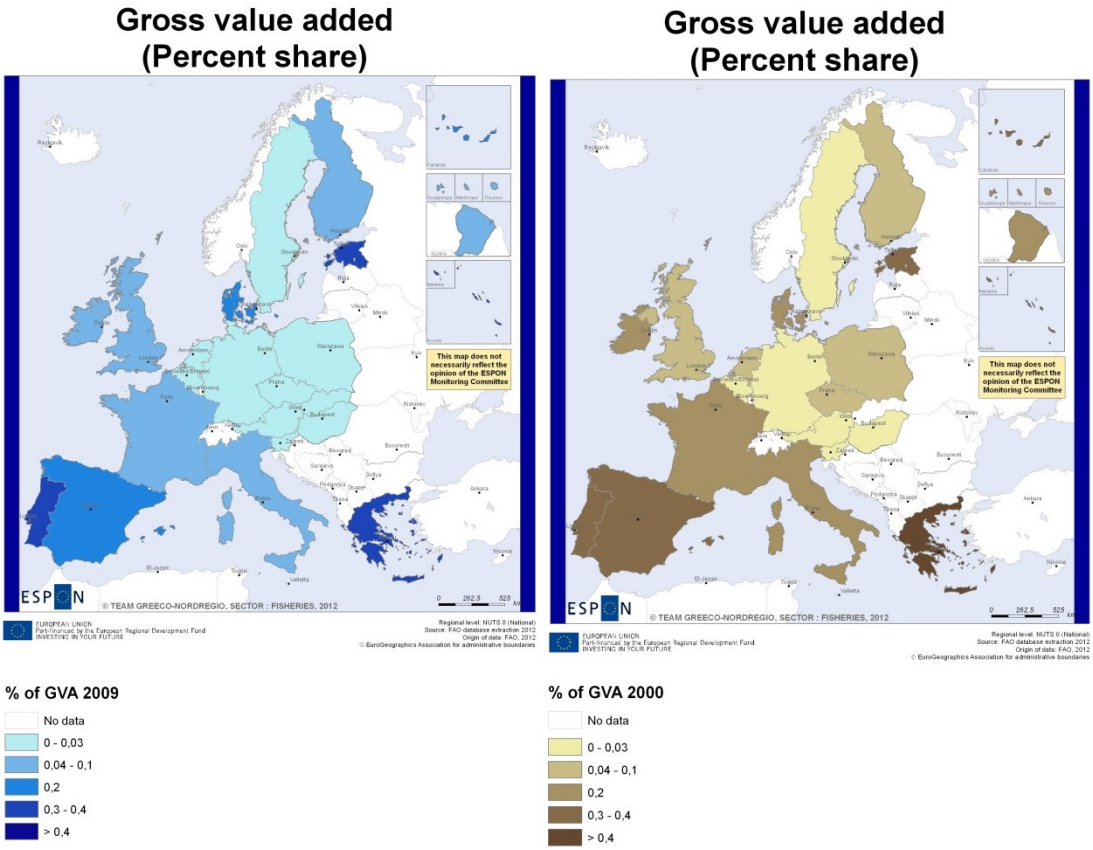

Figure 24: Fisheries in national accounting as per cent share of Gross value added in 2000 and 2009.

The economic importance of fisheries shown on Figure 24 above resembles in many ways the above characteristics described in connection with employment. The share of GVA at the national level show more or less the same patterns and the same levels of contribution to the national economies, i.e. from levels below one per mil to around or just above ½%. And in this connection it is first of all Greece, Spain and Portugal in the Mediterranean region, and Denmark and Estonia in the north where the economic contribution at the national level are substantial. Looking back ten years (the year 2000 values) the pattern was very similar to the employment pattern, but during the last years a clearer division between the top and the bottom of the economic performers have developed.

The territorial perspective related to performance differences in coastal zones compared to the general national values of course also applies in relation to the economic performance. What is very important in this context is the general low economic performance of the coastal zones compared to the national values as shown on the map I chapter 9 appendix 9.1 dataset 45 showing the GDP for the coastal zone in Europe. In some parts of Europe the coastal zone is at even with the national levels, typically those where for instance tourism plays an important role. And a few places show GDP above the national average, typically those

where other issues such as base stations for offshore energy extraction are situated, as well as some of the major fishing ports. The overall low level of GDP in the coastal zone which include many places below 60% indicates at the same time the importance of fisheries and aquaculture as important contributors to otherwise meagre economies.

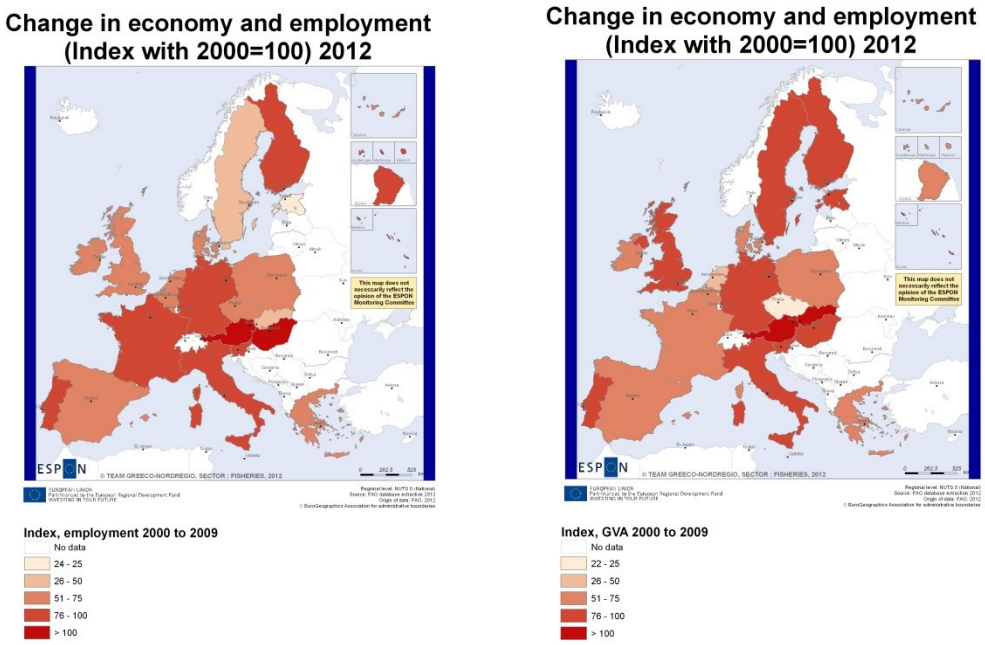

Figure 25: Change in employment and economy from 2000 to 2009 shown as index with 2009=100.

While the maps on Figure 24 show some difference in national performance the changes in economy and employment from 2000 to 2009 shown on Figure 25 show important information regarding the changes in performance. First of all that almost all countries show considerable declines both in employment and in fisheries economic contributions to the national economies. Only in non-literal countries such as Austria, Hungary and the Czech and the Slovak countries both employment and economic contributions have increased. And in all cases the increase has been in connection with freshwater activities typically related to increase in aquaculture. But also increases from a low level which does neither mean very many new jobs nor substantial contributions to the national economies. But still plays an important role locally.

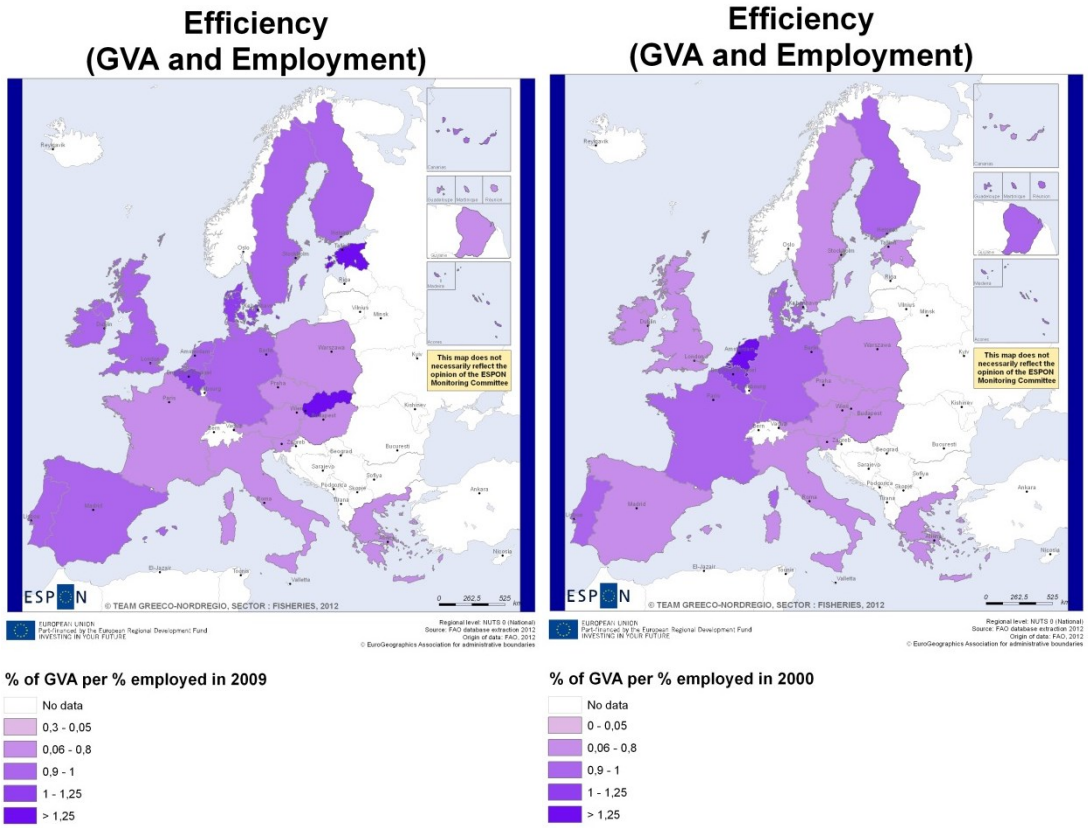

Figure 26: Efficiency of fisheries measured as % of GVA per % employed in 2009 (left) and 2000 (right)

A number of countries maintain both their labour force and economic performance position, but for the really large performers such as Ireland, Portugal, Spain, Denmark and Greece both employment and economics are in decline.

Due to the differences between the listed countries in relation to for instance fleet structure and types of fisheries the effects are different. But it is a clear indication of that countries where fisheries has a position as niche production (Austria, Hungary etc.) are expanding, while the countries where fisheries plays a role as a main activity – especially in the coastal areas – are exposed to the consequences of a long term over-exploitation of the resources. Only expansion of aquaculture enables these countries to create jobs as well as net profits in the immediate future.

Reduction in labour force is primarily related to the increased replacement of human labour by technological means, and a general concern within the fisheries sector has - being an important source of livelihood for many coastal households – been confronted with the challenge of competing not only nationally within the sector and with other food generating sectors, but also in relation to the world market.

And in that connection poor and inefficient fishing gears and vessels as well as lack of capital have been issues to cope with, and basically resulting in a level of technological capacity which has led to a reduced work force, in many cases an over capacity which should be paid for, and eventually an over-exploitation of the resources which need to be taken care of in the future.

One of the major factors in this connection has been world market prices for the most defined outside Europe. And due to the previously shown increase in aquaculture (Figure 1) competing with the world market prices has been a critical issue for most of the European fisheries.

The result has been a divide in Europe between countries in relation to labour force efficiency defined as share of GVA per employee. This has been illustrated on the maps on Figure 26 showing the situation in 2000 and 2009 respectively, and on Figure 27 showing the change in efficiency between these two years.

The question of efficiency, competitiveness and resource depletion are some of the major questions in the European fisheries. Results have traditionally shown that the efficiency of individual fishing households is positively associated with fishing experience, distance to the fishing ground, and potential market integration have been decisive for the large scale fisheries segment. Other rationales such as connection to local markets, maintaining small scale fisheries as a way of life etc. have been important for small scale fisheries. Future policies aiming at targeting conservation-development issues in fishing communities should be concerted to provide mechanisms, which improve the access to less destructive fishing tools and ensure market conditions where comparable living conditions in the sector can be maintained.

The challenges in fisheries are in many ways comparable with those characterising Agriculture: In agriculture the share of total food expenditures going to agricultural producers has declined even stronger, with increasing share going to processing and marketing[36]. This raise the important policy issues regarding the optimal policy mix and policy attention to various elements in the CAP. And the question of taking this into account – i.e. providing safe and high quality food for future population[37] means that future CAP adjustments need to reconsider the expenditures under the CAP going to traditional objectives, i.e. market

[36] Pierre H. Boulanger and Patrick A. Messerlin, eds.(2010): 2020 European Agriculture: Challenges and Policies. The German Marshall Fund of the United States. Washington DC.

[37] Swinnen, JFM. (2008). The perfect storm: The political economy of the Fischler reforms of the common agricultural policy. Brussels: CEPS publications.

and income support, and instead decouple most support from specific production.

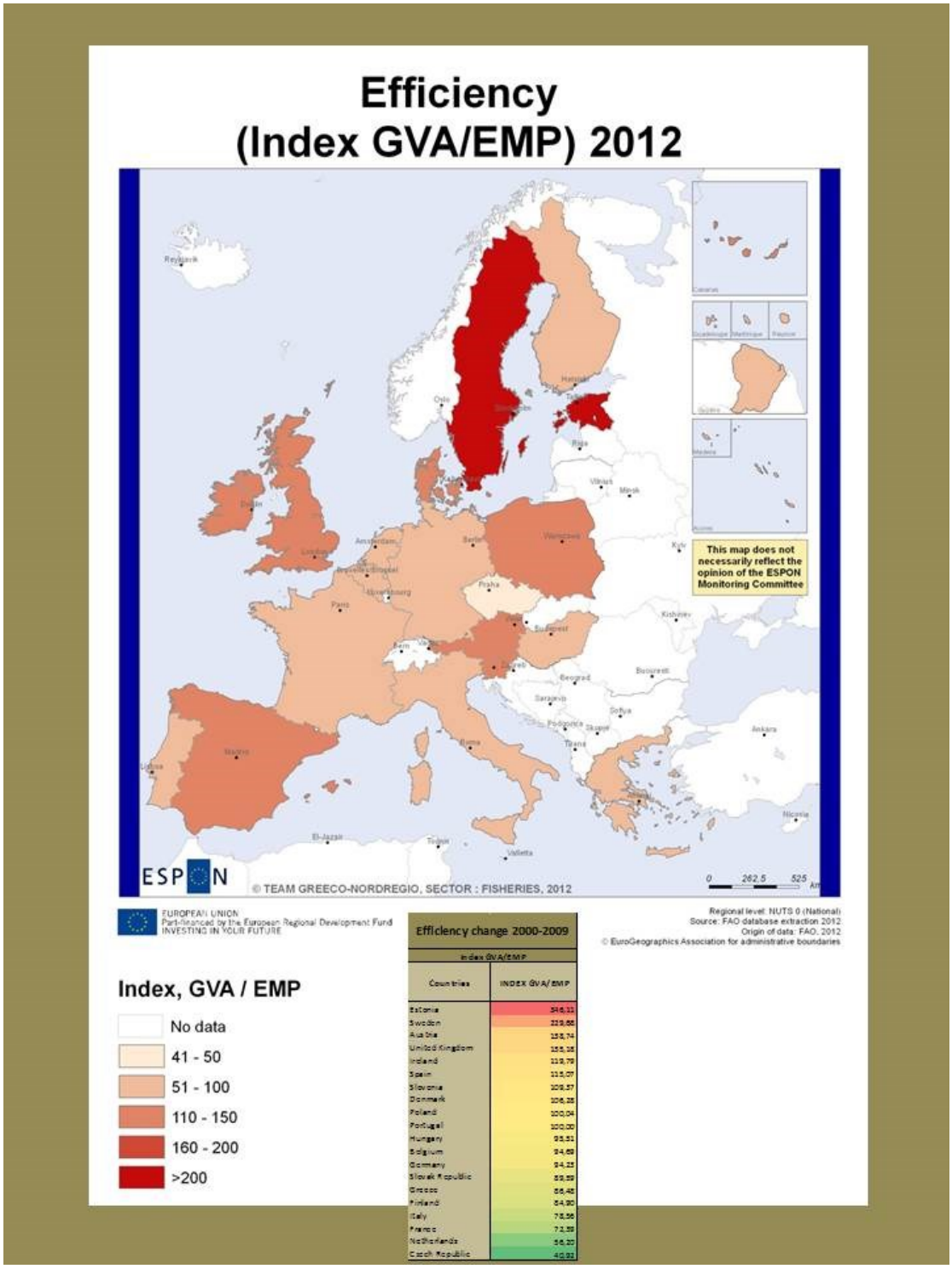

Figure 27: Index of change in efficiency 2000-2009. In this version there are divergence between the numbers to the right and the map to the left – Needs to be corrected!

5 Drivers and Enablers

5.1 The global conditions

While other sectors are mostly managed through national or trans-national policies the fisheries – and to some extend also aquaculture are situated in a set of global policies and regulations that should be outlined at first, because they are structuring the conditions for EU and national regulations within EU. Only the main principles determining the right to fisheries and aquaculture will be mentioned.

5.1.1 The Law of the Sea

The Third United Nations Convention on the Law of the Sea, or UNCLOS III, was adopted in 1982. Its purpose is to establish a comprehensive set of rules governing the oceans and to replace previous U.N. Conventions on the Law of the Sea, one in 1958 (UNCLOS I) and another in 1960 (UNCLOS II), that were believed to be inadequate.

The outlining of the treaty started in the 1970s in response to several nations need of introducing protective measures for national fisheries by introducing access rights to fishing waters and regulations in relation to fish stock.

5.1.2 Access right

In the treaty it is emphasized that the sovereignty of a coastal State extends, beyond its land territory and internal waters as well as its archipelagic waters. It is furthermore stated that every State has the right to establish the breadth of its territorial sea up to a limit not exceeding 12 nautical miles, measured from their baselines. Subject to the Convention, ships of all States, whether coastal or land-locked, have the right of innocent passage, i.e. traversing the sea or straits.

The most important provision of the law is The exclusive economic zone (EEZ) which is an area beyond and adjacent to the territorial sea, subject to a specific legal regime under which the rights and jurisdiction of the coastal State and the rights and freedoms of other States are governed by relevant provisions which means that in the exclusive economic zone, the coastal State has sovereign rights for the purpose of exploring and exploiting, conserving and managing the natural resources, whether living or non-living, of the waters superjacent to the seabed and of the seabed and its subsoil, and with regard to other activities for the economic exploitation and exploration of the zone, such as the production of energy from the water, currents and winds. In the exclusive economic zone, all

States, whether coastal or land-locked the freedoms of navigation and overflight and of the laying of submarine cables and pipelines, and other internationally lawful uses of the sea.

5.1.3 Protective measures

Within the agreement there are a set of provisions which were introduced in 1982 relating to the Conservation and Management of Straddling and Highly Migratory Fish Stocks by setting out principles for the conservation and management of those fish stocks based on the precautionary approach and the best available scientific information. The Agreement states that States should cooperate to ensure conservation and promote the objective of the optimum utilization of fisheries resources both within and beyond the exclusive economic zone. It provides for the rights and obligations of coastal and other states whose nationals fish for these species. Although no operational definition of "highly migratory" is given in the Convention, an agreed list of species considered highly migratory during elaboration of the Convention. It includes species with wide geographic distribution, both inside and outside the 200-mile zone, and which undertake migrations on variable distances across oceans for feeding or reproduction. The list includes 11 tuna, 12 billfish species, pomfrets, 4 species of sauries, dolphinfish (Coryphaena spp.), oceanic sharks and cetaceans (both small and large). Mammals are also included but treated in a separate section of the Convention while a number of species with migratory patterns in their life cycles are under discussion in relation to be included.

5.2 Fisheries

Two key issues in connection with management and greening of fisheries in EU are related to the questions of bio-diversity and overfishing. The EU2020 Bio-diversity strategy[38] defines targets of halting the loss of biodiversity and the degradation of ecosystem services in EU by 2020, and restoring them in so far as feasible, while stepping up the EU contribution to averting global biodiversity loss. Fisheries have a key role in this connection, and in addition the strategy emphasizes that combat overfishing and ensuring a more sustainable ecosystem-based management of fisheries resources is needed.

5.2.1 Ensuring a sustainable fisheries

Reforms to the EU's Common Fisheries Policy in 2002 stressed that most of Europe's commercial fish stocks seemed to remain over-exploited as the vessels were catching more fish which could be safely reproduced.

[38] (EU-BS, 2002)

Both the quantity and the technical and physical power of the fleet was clearly seen as a main factor in the exhausting of the individual fish stocks and not only threatening the marine ecosystem due to overfishing, but also through impacting the bottom of the sea where both spawning and a large variety of fish species were crucial for maintaining a healthy ecosystem. Please consult Appendix 8, datasets 55 to 61 showing the stock status for the waters of EU and surroundings.

Another issue impacting the sustainability of the fisheries was the rate of discards which means the dumping of dead, unwanted, undersized fish and other marine organisms. With regulations some species were allowed to be caught while other were protected and therefore could not be landed legally. So instead of making use of a catch which consisted of both allowable and non-allowable species the fisher was required to discard the illegal species which, with very high probability, would have died and therefore not contribute to maintain a healthy stock of fish.

The discarded fish could be unacceptably high, representing up to 20–60% of the total catch weight in certain fisheries and causing untold damage to the marine ecosystems. Yet, despite these warning signs, decisions on catch levels remain dominated by short-term thinking, and the catching capacity of the European fleet remains more than twice what is needed to harvest the fish stocks sustainably.

It was, at that point of time, considered that on an average three out of four stocks were overfished, varying from as much as 82% in the Mediterranean to 63% in the Atlantic.

This is not only a problem for the marine ecosystem but is also a severe situation for the fishermen themselves. And similarly it has become a problem for all the associated industries depending on the output from fisheries. The shrinking catches, rising costs and the need to travel further and fish longer to catch fewer and often less valuable fish mean that, in some sectors of the industry, many boats are in the situation that they operate at, or close to, a loss.

In recognition of the important relationship between commercial fisheries and the health of Europe’s marine ecosystems, the new strategy places special emphasis on improving the management of fished stocks and ensuring that these are restored to healthier, more productive, levels. The latest reform of the EU Common Fisheries Policy (CFP) proposed by the European Commission in July 2011, and the new Common Fisheries Fund (2014–2020), will be CFP-aims to put an end to the depletion of fish stocks and instead to promote a more coherent ecosystem-based approach for all fisheries. Further comments on this will be presented at a later point of time.

What is critical is to ensure long-term management plans for all major fish stocks in line with the principle of 'maximum sustainable yield' (MSY). This is defined as the highest catch that can be safely taken year after year whilst maintaining the fish population size at maximum productivity. Action is also foreseen to eliminate adverse impacts of commercial fishing on other marine species and habitats, and entire ecosystems, for instance by phasing out of discards and by providing financial incentives for fishermen to adapt their fishing activities. The latter will be designed to encourage fishermen to use more selective fishing gear, diversify their activities and play a more active role in helping to manage and conserve Europe's marine biodiversity. The new Biodiversity Strategy will also support the implementation of the Marine Strategy Framework Directive which aims to bring all EU marine waters into a good environmental status by 2020.

5.2.2 Sustainable use of fisheries resources

The challenges in Achieving the Maximum Sustainable Yield (MSY) by 2015 are to:

- Achieve a population age and size distribution indicative of a healthy stock;
- Combat Invasive Alien Species
- Ensure fisheries management with no significant adverse impacts on other stocks species and ecosystems;
- Achieve Good Environmental Status by 2020, as required under the Marine Strategy Framework Directive.

In relation to improving the management of fished stocks the immediate target is to maintain and restore fish stocks to levels that can produce MSY in all areas in which EU fish fleets operate, including areas regulated by Regional Fisheries Management Organisations, and the waters of third countries with which the EU has concluded Fisheries Partnership Agreements.

As supporting mechanism the Commission and Member States are expected to develop and implement long-term management plans with harvest control rules based on the MSY approach. An important prerequisite in this connection is the need to collect data to support implementation of MSY as the scientific advice has to be based on ecological considerations in the definition of MSY by 2020.

Furthermore the elimination of adverse impacts on fish stocks of discards it is an important measure to avoid the by-catch of unwanted species. and to preserve vulnerable marine ecosystems in accordance with EU legislation and international obligations.

5.2.3 Positioning fisheries in a territorial strategy

While ensuring biodiversity and viable and productive resources can be seen as an initial step towards green and sustainable fisheries, it is furthermore important to develop actions to improve monitoring and reporting into EU legislation on nature, to the extent feasible. And in this connection Cohesion Policy would help assess the regional impacts of these policies on biodiversity. The Commission will continue its work to fill key research gaps, including on mapping and assessing ecosystem services in Europe, which will help improve our knowledge of the links between biodiversity and climate change, and the role of soil biodiversity in delivering key ecosystem services, such as carbon sequestration and food supply. Research funding under the new Common Strategic Framework could further contribute to closing identified knowledge gaps and supporting policy. Finally, the EU will remain closely involved in and contribute actively to the new intergovernmental science-policy platform on Biodiversity and ecosystem services (ipBes), particularly to work on regional assessments, for which an EU-level mechanism may be required to reinforce the science-policy interface.

According to the 2011 EFP39 a healthy marine environment is an important source of biological diversity which provides a wide range of economic, social and environmental benefits. It is also the source of nutritious and safe seafood enjoyed as an important part of the diet. And furthermore the background for many Coastal communities, where fishing plays an important role with their lifestyles, cultures, tradition and knowledge accumulated over time – depend on fisheries-related jobs – in the fishing fleet, in aquaculture, in the food processing sector or fishing ports.

The EU is – according to the policies - committed to achieving sustainable, ecosystem-based management of its fisheries. Following a comprehensive review, the Commission will propose a radical reform of the Common Fisheries Policy40 which is expected to lead to fundamental changes in the way fisheries are managed in order to ensure the sustainable exploitation of fish resources and the future of fisheries in Europe. This reform is expected to be accompanied by a major reorientation of funding for the Common Fisheries Policy and Integrated Maritime Policy. This is expected to be including:

[39] (2011 European Policies and Politics Policies.eu.org POLICY)

[40] A CFP revision 2013

Re-deployment of inefficient direct fleet subsidies in line with the objectives of the Europe 2020 Strategy, including the provision of incentives for the fishing industry to reform, to innovate and to fish sustainably;

Closing the innovation gap between fisheries and other sectors of the economy, allowing EU fishing fleets to became viable and competitive and to contribute to growth and jobs in fisheries dependent communities;

Facilitation of the transition towards low impact fisheries, with the elimination of discards and low impact on marine ecosystems;

Contribution to sustainable management of marine ecosystems and ecosystems dependent on aquaculture;

Reinforced support to collective actions including marketing and production, with a strong role for Producers Organisations;

Increased focus on the viability of coastal and inland communities depending on fishing, including through adding more value to fisheries-related activities and diversification towards other sectors of the maritime economy;

Competitive and sustainable aquaculture providing EU consumers with healthy and high nutrition products.

Reinforced control and data collection, thus ensuring better compliance and a fully-fledged knowledge-based policy

An Integrated Maritime Policy focused on promoting sustainable growth in maritime sectors and regions.

The instruments that are expected to be introduces will be centred on a new European Maritime and Fisheries Fund (EMFF), which will be structured around 4 pillars:

Smart, Green Fisheries (shared management) to foster the transition to sustainable fishing which is more selective, produces no discards, does less damage to marine ecosystems and thus contributes to the sustainable management of marine ecosystems; and to provide support focused on innovation and value added, making the fisheries sector economically viable and resilient to external shocks and to competition from third countries.

Smart, Green Aquaculture (shared management) – to achieve economically viable, competitive and green aquaculture, capable of facing global competition and providing EU consumers with high nutrition value products.

Sustainable and Inclusive Territorial Development (shared management) – to reverse the decline of many coastal and inland communities dependent on fishing, through adding more value to fishing and fishing related activities and through diversification to other sectors of the maritime economy.

Integrated Maritime Policy (direct centralised management) to support those cross cutting priorities which have real potential to generate savings and growth but which the Member States will not take forward on their own – such as marine knowledge, maritime spatial planning, integrated coastal zone management and integrated maritime surveillance and adaptation to the adverse effects of climate change on coastal areas.

The policy will be complemented by two international instruments:

Fisheries Partnerships Agreements (FPAs) which establish a legal, economic and environmental framework for fishing activities carried out by EU fishing vessels in the waters of third countries which are not in a position to fully exploit their fish stocks sustainably by themselves.

Regional Fisheries Management Organisations (RFMOs), which are international bodies composed of States, Regional Economic Integration Organisations (the EU) and fishing entities established to ensure the conservation and sustainability of fishery resources in the high seas.

6 Potentials

"The most important barriers to implement greener policies in fisheries management seem to be the classical tension of green growth policies in that sound long-run policies require short term investments and may contradict short-term objectives. In some cases, there are also disagreements with respect to what is the right course"[41].

The maps (dataset 55-61) in appendix 8 tell a very clear story. Even intensions and policies in relation to a green development of fisheries have evolved throughout EU policy during the last decade the starting point for this development is clearly negative in the sense that the renewable resource which should be the basis for a green development require an intensive focus on rectifying the traces of the past management.

As seen on figure 28 showing the situation for the North East Atlantic in general it is quite clear that the number of stocks available has been diminishing during decades.

[41] Asche, F.(2012): Green Growth in Fisheries and Aquaculture Production and Trade. Contribution to OECD Synthesis Report on Green Growth.

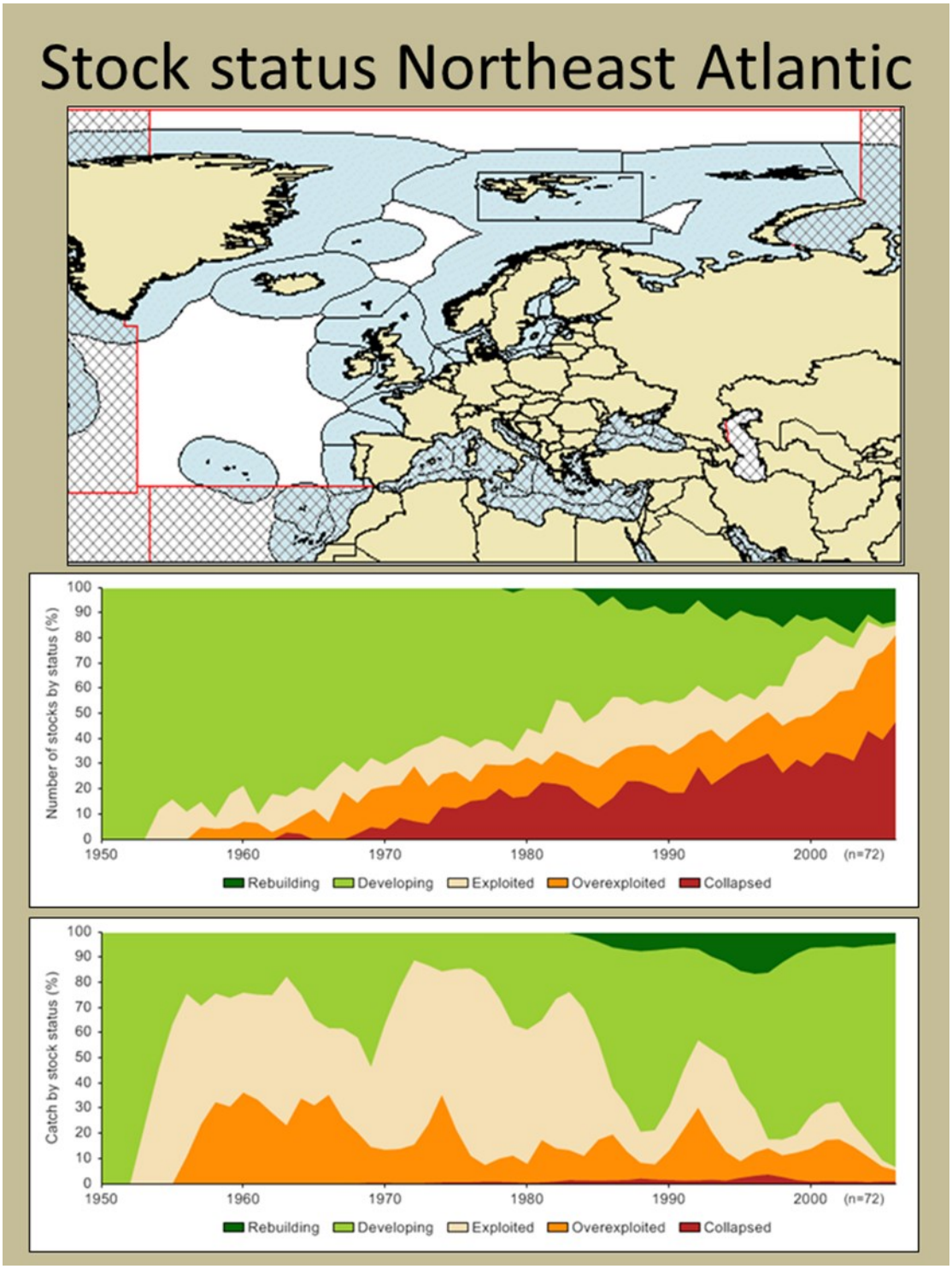

Figure 28: Stock Status of the North East Atlantic.

Rectification of this unsustainable use demands decades of proper future management. And in this connection three aspects needs to be in focus:

- Ecosystem Approach to Fisheries and Aquaculture (EAF/EAA)
- Carrying capacity evaluation

- Operations Research including impact monitoring and simulations of potential impacts.

And in this connection Ecosystem Management is the most important task to pursue. As emphasized by UNEP, Ecosystems management is an approach to natural resource management that focuses on sustaining ecosystems to meet both ecological and human needs in the future. Ecosystem management is adaptive to changing needs and new information. It promotes shared vision of a desired future by integrating social, environmental and economic perspectives to managing geographically defined natural ecological systems.

7 Non-policy green growth factors within sector FISHERIES

Please fill-in the following table:

Factor	*Interaction/impacts with/on/from other sectors*
Description	In the report, Green Economy in a Blue World (UNEP 2012), it is argued that the ecological health and economic productivity of marine and coastal ecosystems can be boosted by shifting to a more sustainable economic approach that taps their natural potential - from generating renewable energy and promoting eco-tourism, to sustainable fisheries and transport (FAO 2013). These regions are according to the report currently in decline around the globe, but their livelihood which are limited to only a few factors tend to become less sensible to both economic and social stress when human depending economic activities enter the regions. And with as much as 40 per cent of the global population living within 100 kilometres of the coast, the world's marine ecosystems (termed the 'Blue World' in the report) provide essential food, shelter and livelihoods to millions of people. This situation creates both positive and negative interactions which may become important to consider in relation to green growth and green economy.
Specificity for the green economy	Several relevant sectors could be mentioned, but as an illustration the symbiosis between fisheries - especially small scale fisheries - and tourism could be brought forward. The tourism economy represents 5 per cent of global GDP and contributes 6 to 7 per cent of total employment. Estimates are that more than one-third of travellers favour environmentally friendly tourism. There is therefore considerable potential for creating more green jobs in the tourism sector as tourism is human-resource intensive. And sourcing local products (from sustainable farming and fishing) and safeguarding local culture are examples of where green investments could be targeted.
Provable impact on the green economy spheres	Efficiency improvements, local hiring, sourcing local products and safeguarding local culture and environment can reinforce employment potential. As stressed by Guyader et al (2012) results from a number of case studies show that (as compared with large-scale fleets, their main competitor) small-scale fleets: (i) are composed of smaller vessels and, consequently, travel lower distances to fishing grounds, and are more reliant on coastal areas; (ii) have smaller crews (although the global employment figure is similar to that of large-scale fleets in Europe); (iii) use mostly, but not exclusively, passive gears; (iv) use multi-purpose fishing approaches, and can change the fish species they target during the year; (v) have lower extraction rates; (vi) have lower total capital investments (including fishing rights), turnover and costs; and (vii) have lower fuel consumption, making them less sensitive to changing oil prices. Dependence on subsidies is lower (viii). Involvement in fisheries management is variable,

	conservation and access regulation measures are largely local in origin. For the selected case studies, the most significant competitors are large-scale fleets, and recreational fisheries, but other sources of interaction (water quality, invasive species, etc.) cannot be ignored. The development of local food systems for tourism can generate jobs in sustainable farming and fishing. And when returning they often bring food habits with them related to fisheries – an activity which brings along several benefits: On the demand side, more than a third of travellers favour environmentally friendly experiences. The share of spending in the local economy determines local economic effects of tourism. Increasing involvement of local communities in the value chain can contribute to the development of local economies and poverty reduction. Positive impacts can stem from engaging local supply chains and increasing "green services" in energy, water and waste management efficiency. Tourism's impacts on local communities are complex and demand careful planning (UNEP 2012).
Trade-offs: mixed +/- impacts on green economic spheres?	An important issue in a greening of the food sector is to reduce the needs for transport of products in order to save energy. And tourists bringing back food habits from short or long term visits in other regions may create a demand for imported food, and thereby a situation where an increase in energy consumption may become the result and therefore generate a negative impact. The opposite may be the situation, however, when experiences from visits in other regions creates a demand for local fishery resources in the visitors home regions.
Externalities: impact on other sectors / case studies	The processing of fish often creates a distinct odour which may be considered being a menace in relation to other activities. The process to dry fish generally involves gutting, washing, soaking the fish in brine or a salt solution and letting it dry. Liquid and solid wastes are generated during the separation of the fish from the by-products (skin, bones and other parts). Odour can occur from microbial decomposition at several steps of the fish drying process, and depend on several factors such as the quality and freshness the fish to be processed, solid and liquid waste disposal, temperature, and storage conditions (Global Community Monitor, 2012. Dry fish has been one of the most common preserved foods used by peoples of all cultures. However, fish processing such as drying may cause environmental contamination, not only by the odours generated, but the wastes generated are a potential source of environmental pollution (water, soil) that may affect public health Sucker K et al. (2001) emphasize how it may be needed to provide field measurements with panels and dispersion modelling in order to determine what may be thresholds for the determination of odour loads. Similarly the disposal of waste may create similar responses and thereby impact the same effects.
Interactions with	Cultural codes on taste, smell, presentation etc. differs very much

other factors	which makes it very difficult to adjust common policies accordingly. The most famous/infamous case is probably the “Surströming” produced in the Baltic Sea region. It is a fermented Baltic herring and has previously been considered a staple of traditional northern Swedish cuisine. Species of 'Haloanaerobium' bacteria are responsible for the in-can ripening. These bacteria produce carbon dioxide and a number of compounds that account for the unique odor: pungent propionic acid, rotten-egg hydrogen sulfide, rancid-butter butyric acid, and vinegary acetic acid (McGee, 2004). According to BBC NEWS several major airlines (such as Air France and British Airways) İn April 2006 banned the fish citing that the cans the fish come in can be classified as potentially explosive due to the fact that the natural fermentation process cause the cans to be pressurised. The sale of the fish was subsequently discontinued in Stockholm's international airport. Those who produce the fish have called the airline's decision "culturally illiterate," claiming that it is a "myth that the tinned fish can explode." However, they did admit that t the fish can emit a foul smell. http://news.bbc.co.uk/2/hi/europe/4867024.stm
Causal level of operation (proximate/direct versus underlying/indirect factors)	A systematic survey (Fernandes et al, 2012) for articles published from 2003 and May 2011 on the key words: fish, food intake, omega-3 fatty acids, fatty fish, benefits, risk, and consumption resulted in 25 articles on possible benefits, 61 on risks and 10 studies that assessed the "risk/benefit" relation. Of the 25 works, 14 suggested a preventive effect of fish consumption related to cardiovascular diseases, depression, cataract and some types of cancer. Evidences of a relation between exposure to mercury and an increase in the risk of neurological disorders, but not of cardiovascular diseases, were also found. Given the importance of fish consumption, it is important to conduct more longitudinal studies that assess both the benefits and risks of fish consumption for the human health.
Spatial level of operation (internal versus external factors)	As discussed in the fisheries sector report the divergent interests of small scale versus large scale fisheries cause problems. Not only is the resource base of the small-scale fishery limited by its fishing range and natural productivity, but often it has to compete for this limited resource with other fisheries using more advanced technology. Often the resource available to a coastal fishery is also exploited in offshore waters, whether this involves or not clear displacements perpendicular to the coast of different age groups (spawners, juveniles, etc.) of the stock. Large-scale fisheries operating offshore may thus reduce the fish available to small-scale fishermen. Similarly, small-scale fishermen's operations may reduce the recruitment to the offshore stocks. Small-scale fisheries are further handicapped by their dispersion and remoteness which precludes economies of scale in the marketing of catch and procurement of inputs which may only partially be compensated by their low opportunity costs and low capital and fuel costs. Although in social terms small-scale fishermen often may be low-cost producers, in private terms their unit cost may be relatively high because of inadequate infrastructure, and high cost of borrowing.

	The reverse, of course, might be true of large-scale fisheries if the capital subsidies (explicit or implicit) are removed and capital and foreign exchange (imported machinery, fuel) are shadow-priced at their true social costs. (FAO 1982).
Type of market force involved	A general challenge for fisheries is the competition from other protein sources in connection with the diet. As shown in the sector report on Fisheries there are marked regional differences in consumption patterns throughout Europe. Even seafood is emphasized due to its health qualities the limitations of fish demand research through the development of a variation of the almost ideal demand system model for disaggregate fish products at the retail level. Price and expenditure elasticities, as well as elasticities of substitution between fish products and other protein commodities, determined from this work may be used in the context of fisheries management and market development and promotion. Results indicate that with the exception of shellfish, demand for the various fish products is relatively inelastic. Cross-price elasticities are generally moderate while expenditure elasticities are large and positive for fresh fish and shellfish. Demographic effects, especially geographical division, season, race, occupation, age–sex household composition, and price–income interaction, as a proxy for quality, are highly significant variables.
Policy recommendations: making the link between policy and non-policy factors	It is important in policy development in relation to green fisheries development to take into account the fact that regional differences both in fishing technology, fishing economy and fishing cultures are both diverse and distinct. So even policy measures tend to provide equality in relation to the usual policy measures there will be important differences which may be difficult to put exact measures on to take into account as well.
Possible indicators	

FAO 2013: Green investments in the marine sector can bring tide of economic and social benefits. http://www.fao.org/news/story/jp/item/120936/icode/
UNEP, FAO, IMO, UNDP, IUCN, World Fish Center, GRIDArendal, 2012: Green Economy in a Blue World. www.unep.org/greeneconomy and www.unep.org/
O. Guyadera, *, P. Berthoub, C. Koutsikopoulosc, F. Alband, S. Demanècheb, M.B. Gaspare, R. Eschbaumf, E. Fahyg, O. Tullyh, L. Reynali, O. Curtild, K. Frangoudesd, F. Maynoui (2012): Small scale fisheries in Europe: A comparative analysis based on a selection of case studies. Fisheries Research Volume 140, February 2013, Pages 1–13,2012 Elsevier B.V.
Sucker K et al. (2001) "Adverse effects of environmental odours: reviewing studies on annoyance responses and symptom reporting" Water Science Technology 44(9):43-51
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8 Territorial factors

Are the following *territorial factors* important in relation to greening of FISHERIES sector:		
INTRODUCTION	***It has been chosen within each factor category to show two different characteristics. On one hand how the different territorial factors has influenced the PRESENT SITUATION. And on the other hand what territorial characteristics of the different territorial factors may be enhanced with a greening sector. This subdivision is not something you have to operate with. It has been considered easier to fill out the table by having these two aspects up front as it enables thinking the factors into "procedures", i.e. into the dynamic characteristics of the different factors in relation to the Fisheries sector.*** ***As can be seen the reporting has been responded with a Y for each territorial factor as the case of Fisheries it is a sector which is among the most complex sectors due to that basically all imaginable territorial structures are impacting the development. Furthermore the fact that the development towards aquaculture generates changes that took place on-land a couple of thousand years ago, bringing the sector from "hunting" to "farming". As may be seen the concept of "land based" has been changed to "water based".***	
1. ***Settlement types***	***y/n***	***Why? Why Not?***
i. Urban areas	***Y***	***What is the present situation?*** - Large scale off-shore fishing fleets account for a majority of the industry and are mostly based in larger coastal urban areas with fisheries as a special production. - As increasing parts of off-shore fisheries involves fish processing on-board, these vessels are less dependent on on-land processing capacities.

		- At the same time, a substantial increase in aquaculture has moved the focus away from large scale off-shore fisheries for consumer fisheries towards industrial fisheries producing fodder for aquaculture which in the end produces high quality products for consumption. - Aquaculture products from Asia and the Americas have become important competitors to the local/regional based products because of low production costs, fast growth rates of the products, and questionable production methods. The largest markets and the importers of these products are generally situated in the larger urban settlements. In this connection the very big fish markets in most capital areas and larger cities offers this global variation of products and the urban areas becomes trendsetters in connection with the consumption patterns. - A substantial part of the fresh-fish mongers disappeared during the 1980's and 1990's and the distribution system primarily based on frozen products. During the last decades the large supermarket chains with their main stores situated in urban areas have become among the largest distributors of fresh fish, and aquaculture has become the most important supplier for these demands. - Considering that urban areas used to be the largest consumers, during the last decades important shifts have taken place as still more processing takes place in larger national urban centers in order to be close to markets and thereby being able to respond to changes in consumer's behavior. ***What may be enhanced with a greening sector?*** - On one hand increase in access to fresh fish distributed through the larger supermarket chains and consequently an increased dependency on fast and flexible transport systems. - Aquaculture has become the major source for deliveries of fresh fish. - At the same time, the frozen product market moves towards increased focus on place of origin and methods of fishing in order to respond to consumer demands. - In both cases an increased focus on **quality (freshness)** as well of **origin (= territoriality)** and **methods and management (=responsibility)** of fisheries. - While territoriality used to be an economic problem due to transport, accessibility etc. it has become an important factor of attraction in the distribution system.
ii. Rural areas	***Y***	***What is the present situation?*** - Rural/Coastal areas is the base for small and medium scale fisheries and thereby the origins of substantial amounts of products from close-to-shore fisheries. - Distribution systems used to be depending on fresh fish mongers in large and middle-size towns bringing in fresh products from nearby fisheries towns. ***What may be enhanced with a greening sector?*** - Distribution of products is on one hand through supermarket chains, mainly with frozen products with increased focus on place of origin and methods of fishing. And the larger supermarkets making fresh products available, replacing the former specialized fish

		mongers. - A major market share has been taken over in areas of tourism where fresh fish products have become an attraction and an important source of income.
iii. Urban-rural interactions	***Y***	***What is the present situation?*** - The question of accessibility has been an important issue as distances limit the accessibility to fresh products and has turned the sector into bulk producer of frozen products with large scale industrial methods being a cornerstone in the supply system. ***What may be enhanced with a greening sector?*** - Further focus on access to fresh products with issues of: quality (freshness), place of origin (=territoriality) and methods of fishing (=responsibility) being keywords and identifiers of a greening of the sector.
2. ***Water and water-based resources***	***y/n***	***Why? Why Not?***
i. Water area consumption or dependence	***Y***	***What is the present situation?*** - Four main types of fisheries and aquaculture with their individual spatial and territorial characteristics exists, and reflected through their management regimes: - **Freshwater** where management of the freshwater resources both in relation to fisheries but also in relation to other freshwater resource utilizations. Major conflicts between for instance sports fisheries and freshwater aquaculture, but also with agriculture as one of the major activities impacting the quality of freshwater. - **Brackish water** where management of the freshwater resources as well as the coastal zone management interacts. - **Salt water within the national EEZ** is primarily dependent on the national strategies for coastal zone management within the 200 miles EEZ. But due to the Law of the Sea's regulations regarding straddling stocks the management of the resource has become dependent on international agreements. - **Salt water international fisheries** is dependent on the Law of the Sea in relation to straddling stocks, and in that context first of all dependent on agreement with countries where the straddling stocks interact with national conditions within the 200 miles EEZ. - While the period from the 1950s to the 1980s was highly influenced by the industrialization of both fisheries and aquaculture, the 1990s was impacted by the globalization of fisheries and substantial increases in aquaculture worldwide. The increase in international management regimes for fisheries has after 2000 turned the focus on national and cross-border management regimes as basis for a sustainable fisheries and aquaculture. ***What may be enhanced with a greening sector?*** - In fisheries a general trend towards focus on quality, origin, and methods combined with recognition of fish and aquaculture products being important for health and quality of life has

		turned the question of territoriality into a central issue in relation to a sustainable development of the sector. - Recognition of proper management regimes for the four types of fisheries, and especially recognition of marked differences between the four regimes has been increasingly accepted. In practice it means that management theory and practice has evolved into on Ecosystem Based Management. Previously management was based on individual species and what was considered to be healthy stocks. Out of a specific stock a quota was defined, but it did not take into consideration what impact a take-out from one stock might have on other species within an ecosystem and within specific territorial units. Through closure of fisheries in specific areas during for instance spawning, an attempt to take into account the territorial and seasonal characteristics has been useful. But does still not take into account the impact on the ecosystems as such. But through the Ecosystem Based Management Systems both the territorial, the temporal, and the system characteristics are included.
ii. Material Consumption or dependence	***Y***	- The question of quick access to resources has been the major driver in the development of salt water fisheries during centuries, and especially after the Law of the Sea provided an overall management framework for the regional and international fisheries. As a consequence a substantial over-capacity in both equipment and fleet has become a major economic challenge. Regional and international agreements on fisheries provide fleet and equipment structures that are adjusted to available resources in order to establish more sustainable resource exploitation and at the same time prevent unnecessary capacity challenges. This reduces material consumption, and adjusts the territorial capacity to the available resources. Also, in aquaculture, over-capacities has been a challenge pollution-wise, but both national and regional management schemes tend to focus on a structure less polluting and more economically sustainable.
iii. Energy consumption or dependence on specific energy types or systems	***Y***	***What is the present situation?*** - Long distance industrial fisheries and energy intensive aquaculture has been important drivers in the present globalized fisheries and global aquaculture. Crucial for this development has been access to low fuel prices. However, just like land based transport systems the incentives towards renewable energy systems as a future basis are limited. ***What may be enhanced with a greening sector?*** - In both freshwater and brackish water aquaculture the focus is increasingly on species less dependent on aquatic proteins which enables the production of fodder which is much more energy efficient and may become more integrated with local marine and land based production systems. - Recognition of place of origin and methods of fisheries and aquaculture promotes the inshore small and medium scale fisheries which are less energy dependent and more focused on what can be characterized as quality characteristics. - Increased focus has been on energy saving methods (for instance changes in equipment for instance in trawling, use of automated long-line systems etc.)

iv. Management of ecosystem services (types of ecosystems; spatial characteristics of ecosystems; options for maintaining and developing these services)	***Y***	- While the management of resources has generally been distributed to national authorities (due to agreement such as the 200 miles EEZ) the need of international agreements relating to the territorial characteristics of fish and fish stocks behavior (which in no way abide by human administrative boundaries) has become crucial. For example, the regulation of fisheries in relation to straddling and highly migratory stocks has become an important part of the Law of the Sea, and therefore also influential on the fisheries. Therefore, while single species regulations have been the cornerstone of international management approaches, regional and national resource management authorities have been deeply involved in new ecosystem-management approaches. This not only includes the overall question of management challenges in relation to sustainable ecosystems, but also the involvement of stakeholders at different territorial levels as important players in both exploitation, monitoring, and managing of the resources.
3. ***Market relations (Production; consumption; export, import) and innovation***	***y/n***	***Why? Why not?***
i. Local/regional markets	***Y***	- Production and production capacities differ substantial throughout Europe with coastal zones being the major producers while inland habitations being major and important consumers. Regional production has maintained patterns relating to the local availability of specific stocks and species, and has to a large extend been challenged by the industrialized high sea fisheries and the growing aquaculture in Asia and the Americas, which has been dominating the low priced market for frozen products distributed through the supermarket chains. In order to respond to the large scale activities local/regional markets have adjusted by providing bulk products for these supermarket chains, thereby adding the "place of origin" as an important dimension of the local market for fish. While one may mistake this "new" diversification of the distribution system being the **outcome** of the greening of the distribution and market system the fact is that there has been a parallel process of closing the small fresh fish shops shows that making the fresh fish available in the larger supermarkets has had the purpose of attracting customers more than promoting a greening of the sector. Nevertheless, the capital rationales of the large companies taking any opportunity to new market opportunities is a factor which combined with making the customers aware of alternatives to unfair and non-green trade may result in a greening of the fish sector.
ii. National markets	***Y***	- National cultures – and thereby national markets – have previously been important in determining the consumption patterns. However, the globalization of the fish sector and especially of bulk import from high sea fisheries and large scale aquaculture has reduced the national characteristics of the markets for fish and fish products. Therefore a greening of the sector will increase focus on local and regional cultural characteristics has increased the importance of the national characteristics as well as the consideration of what resources are

		accessible within a daily basis in order to respond to the increasing demand for fresh products distributed through the larger supermarket chains.
iii. EU markets	***Y***	- The major part of the European consumption of fish and fish products relates to fisheries and aquaculture within EU, even though this pattern has to some extend been challenged by the high sea fisheries in global waters of both EU and other countries. The challenges imposed on the EU fisheries has to some extend been met by changes in consumption patterns aiming at recognizing the qualities of local/regional sources where methods, qualities, and responsibilities are known.
iv. Global markets	***Y***	- Global import of fish and fish products has been increasing as a supply option for Europe. Access to "exotic" species has gone hand-in-hand with increased focus on fish and fish products as basis for more healthy lifestyles. The registration of products in relation to healthy ecosystems, use of methods for responsible fisheries and aquaculture may become important trademarks also for the part of the global fisheries and thereby maintain a sense of "responsibility" among the EU consumers. The challenge, however, is similar in fisheries as in other meat production sectors, namely that low prices from irresponsible production may override the goals of ensuring sustainable development.
4. ***Inter- and intra-territorial relations***	***y/n***	***Why? Why Not?***
i. Within territories (place based; local cultures; relating to territorial/national policies)	***Y***	- Issues of place based, recognizable cultural characteristics and territorial/national policies continue to drive green development of fisheries and aquaculture.
ii. Between territories (networks; competition)	***Y***	- A focus on the healthy qualities of for instance the Mediterranean food where fish and olive oil playing an important role has spread to other parts of Europe. For instance the focus on "New Nordic Food" illustrates how cooperation between territories are striving at making local/regional resources able to compete with low price bulk products generated on a global scale. Similar initiatives as the above mentioned Nordic one takes place in other parts of EU.
iii. Across territories (cross-border supply and demand)	***Y***	- In terms of the market, cross-border supply and demand is clearly a central issue for the sector. On one hand, for instance where mussels area "national" food characteristics of Brussels but depend on fresh supply from France and The Netherlands. But also in terms of the global market where the attempt to have products comply with identifiable measures of quality, responsibility and territoriality are obscured by the global marketplace where price is the only determinant for market access. - In terms of governance ant policy, as mentioned, new relations are required in terms of ecosystem management, territorial cooperation across administrative borders shall focus on common eco-system characteristics, lifestyles etc. not bound by national administrative characteristics.

5. ***Place-based factors***	***y/n***	***Why? Why Not?***
i. Competitiveness through strong local economies		- As described above regions which have become weak by losing their competitive advantages to low wages, irresponsible fisheries and aquaculture may instead gain regional competitive advantages due to identifiable local qualities and ensuring what has been emphasized several times above: Responsibility, Quality and identifiable Origin
ii. Multi-functionality	***Y***	- Maintaining of for instance fisheries as a basis for local economy used to be based solely on one sector and its economic performance. The multi-functionality perspective, however, helps to accentuate convergences between sectors. The fact that local fisheries provide fresh products which are high in demand and at the same time show local cultural characteristics that are attractive for tourists, second home owners etc. ensures coverage of several functions adding to the local economy and thereby a less vulnerable economy.
iii. Tacit/experiential knowledge	***Y***	- Recognition of local knowledge is necessary in relation to ecosystem management of fisheries and fish resources has become central for both FAO and ICES in their endeavor towards ecosystem management as basis for future management schemes. And in this connection the involvement of stakeholders representing different knowledge systems and interests are emphasized as crucial for the development process.
iv. PROXIMITY	***Y***	***What is the present situation?*** - As emphasized above in relation to Ecosystem Management approaches to fisheries management the question of proximity on the producer's side are obvious. Similarly the proximity to the consumer's side is crucial. ***What may be enhanced with a greening sector?*** - The concept of Territorial Cohesion needs to be able to reflect on the above (point I to iv) means and measures. These aspects are only very slowly entering into the conceptualization because the concept is basically a top-down invention more than the result of the summary of bottom up experiences.
6. ***Consumer relations***	***y/n***	***Why? Why Not?***
i. Are development and innovation consumer-demand driven?	***Y***	***What is the present situation?*** - The development in the fisheries sector has to a large extend been depending on consumers expecting fish and fish products being low price frozen products. As a consequence the supply has been based on low cost bulk products removing the basis for local fishmongers selling fresh products. ***What may be enhanced with a greening sector?*** - Increasingly the sector is driven by consumers demanding higher quality and more responsible fisheries. As a consequence the large scale supermarket chains have taken over what was previously products for specialized fishmongers and become one of the major

		factors in providing access to fresh products.
ii. Are development and innovation producer driven?	***Y***	***What is the present situation?*** - The competitive challenge for the producers has been to get access to resources and keep production costs as low as possible. In this context the low energy prices has resulted in energy consumption being the major factor in relation to global competitiveness. In this context the innovations have been producer driven with focus on the wholesale market. - BUT in order to become competitive in relation to new market demands in relation to for instance traceability of the fish, issues such as ID-tags showing origin and producer has become one among several important improvements. ***What may be enhanced with a greening sector?*** - The greening of the sector relates to issues such as quality and identification whereby the role of for instance energy consumption and distribution through wholesale become reduced. Instead innovations in relation to consumption of fresh products become much more in focus and requiring local responses to first of all the retail sector. And as mentioned above the "first come" issue in connection with responding to demands from consumers or retail shops the industry is an important player.
iii. Are development and innovation based on well-defined territorial conditions or on open access?	***Y***	***What is the present situation?*** - Used to be open access which in fisheries is about **the process of industrialization of fisheries during the last century which was based on technological development in relation to large scale production and distribution based on general knowledge** (taught by means of general introduction to industrial fisheries' methods: trawls, gillnets, seiners; locating fish by means of sonars etc..) which has taken away fisheries from small scale local activities (=away from being a "situated" activity), while the greening of the sector seems to be based on issues such as adjustment to local cultures, specialized products, recognition and easier acceptance of less harmful methods, among other things promoted through interaction with tourism and other local activities (=being "situated") etc. ***What may be enhanced with a greening sector?*** - As indicated above increasingly directed towards **well defined territorial conditions because territory becomes a trademark**!
7. ***Accessibility and mobility***	***y/n***	***Why? Why Not?***
i. Transport connections (transport of materials; transport of labor)	***Y***	***What is the present situation?*** - Transport as a physical characteristic related to the production side which first and foremost relates to the harboring and processing of the fish and the thereby related rationales. The industrialization of fisheries has first and foremost based on transport of frozen products with limited time constraints.

		What may be enhanced with a greening sector? - Much more dependent on day-to-day delivery in order to comply with consumer's demand for fresh products.
ii. Regional Accessibility (access to markets; access to supply of materials; access to public services)	***Y***	***What is the present situation?*** - As indicated above the challenge of responding to market requests for fresh products is a challenge for the regional accessibility. Markets are accessed by means of other qualities than just cheap proteins. The shift from local/regional production >20 years ago towards frozen bulk products took away the incentives of maintaining regional accessibility links. ***What may be enhanced with a greening sector?*** - The present change towards the role of identity and freshness of products has re-introduced the question of regional accessibility as a major driver in the sector.
iii. Information connections (use of communication and information services; need of interaction; questions of consumer and producer cultures)	***Y***	***What is the present situation?*** - Trade systems have been highly depending on communication and information services because producers would be depending on on-time accessibility of raw materials. With the increased focus on off-shore fisheries and on-board processing the production became less depending on time frames as the on-board processing had immediate access to the fresh resources and are landing processed frozen products. ***What may be enhanced with a greening sector?*** - With consumer's increased focus on access to fresh products access to information on products, producers, production time and place etc. has become crucial information requested by the consumers, and therefore also critical issues for the whole chain from producer to consumers.
8. ***Policy and governance by territorial level***	***y/n***	***Why? Why Not?***
i. Scale of sector-based policy support		
• From the EU Level	***Y***	***What is the present situation?*** - Overall EU resource distribution policy through the Common Fisheries Policy where Total Allowable Quotas on species are distributed between the European Countries. Attempts to limit the overfishing tendencies have been introduced for instance in relation to reducing the catch capacity and discarding the unnecessary fleet. ***What may be enhanced with a greening sector?*** - Furthermore – and with increasing importance – EU based initiatives in relation to for instance fleet structure. Furthermore with EU as basis for a future policy and regulation of fisheries based on ECO-system based management of the resource.
• From the national level	***Y***	***What is the present situation?***

		- National adjustments of overall EU regulations to comply with specific national objectives which mean a re-distribution of the catch quotas to the different fleet segments and specific regions. ***What may be enhanced with a greening sector?*** - With increased focus on eco-system based management national conditions have to be adjusted because the eco-systems don't comply with for instance the 200 miles EEZ
• From the regional level	***Y***	***What is the present situation?*** - As mentioned above, the role of policy initiatives in multi-functional settings going beyond the sector-based interests. ***What may be enhanced with a greening sector?*** - As above
• From the local/municipal level	***Y***	***What is the present situation?*** - As mentioned above, the role of policy initiatives in multi-functional settings going beyond the sector-based interests. ***What may be enhanced with a greening sector?*** - As above
ii. Role of other EU policies with territorial dimension	***Y***	***What is the present situation?*** - As mentioned previously the EU territorial policies are dominated by top-down aspects of economic development only limited related to specific local conditions. ***What may be enhanced with a greening sector?*** - The inclusion of bottom-up aspects are highly needed in order to open up for local and regional response in relation to potentials otherwise forgotten
iii. Private versus public sector – led development. Are consumer organizations advocating for developing the green economy. At what political scale are they located?	***Y***	***What is the present situation?*** - There is a divide in the private sector between the large scale activities aiming at providing competitiveness globally and small and medium size local and regional activities aiming at surviving in a situation where influx of low price, low quality and irresponsible fisheries and aquaculture. ***What may be enhanced with a greening sector?*** - In this context as well local, regional, national and cross-border public initiatives have generated positive results that contributes both to advances in the fisheries and aquaculture sector and in relation to maintain job opportunities in otherwise challenged regions.

Territorial outcomes of greening the sector:	
Inter- and intra-	Increasing relations in order to respond to the major consumer demands as well as demands

territorial relations	from regions depending on fisheries. For instance when products from sustainable fisheries and organic farmers is available as a from-producer-to-your-door delivery based on web-ordering which has resulted in supply systems with new types of distribution channels and centers. In Denmark fish and agricultural products are transported from communities in Western Jutland to Zealand and delivered on a weekly based. Similar systems are found in for instance UK, Germany, Holland and probably also other countries. The Danish system is connected to both the Dutch and the German systems ensuring that a larger variety of products has become available. At the same time new types of fish and vegetables has become available together with recipes developed by persons promoting local cooking variations.
Settlement types	Maintaining smaller settlements in the coastal zone otherwise challenged by losing jobs and other economic activities. And thereby maintaining attractions for tourists, second homes, catering etc. that would otherwise disappear
Water and water based resources	Focus on access to products with issues of quality (freshness), place of origin (=territoriality) and methods of fishing (=responsibility) being keywords and identifiers of a greening of the sector which has become cornerstones in marked changes in relation to both sector characteristics and in relation to activities in other sectors.
Market relations (Production; consumption; export, import) and innovation	From bulk production which was characterizing the industrialization of fisheries up till the 1990's and 2000's where a shift is underway with an increased focus on the above issues of methods, quality and origin. It has added to changes in both production systems, consumption patterns, connections (information, transport) and innovations
Place-based factors	Important identifier of products and very important in relation to the advance of ecosystem-based management approaches. And thereby enabled maintaining productions that would otherwise be lost due to global competitiveness
Accessibility and mobility	While the industrial development of fisheries emphasized an increase in mobility and concentration both for business and for labor force the ongoing changes in fisheries and not the least aquaculture is based on more stability and dispersed activities which at the same time creates increased demands in relation to accessibility. In many ways reflecting similar

	intensions as those discussed in relation to the new policies in relation to the CAP.
Policy and governance by territorial level	Recognizing the need of territorial involvement in the development process in order to comply with both sector and general interests. This is for instance the main point in the shift in OECD's abolition of the "New Rural Paradigm" in its original form because the original definition had its starting point in a top-down vision of every rural region providing a lot of undiscovered potentials, while their present approach (among other things after the case studies from the project on Renewable Energy as a driver in Rural Development) recognizes the fact that many regions (or other territorial units) for many reasons have limited or no potentials, and therefore depending on for instance transfers in order to maintain existing sectors (=sector interests) and ensure acceptable living conditions (=general interests)

9 Policy factors within sector FISHERIES

Four important policy steps have shaped the present EU fisheries, and on-going changes to the policy are important factors in shaping the characteristics of fisheries in the upcoming years. The following tables will outline the major policy factors which have shaped the evolution of policy in relation to fisheries.

TERRITORIAL RIGHTS – UN LAW OF THE SEA

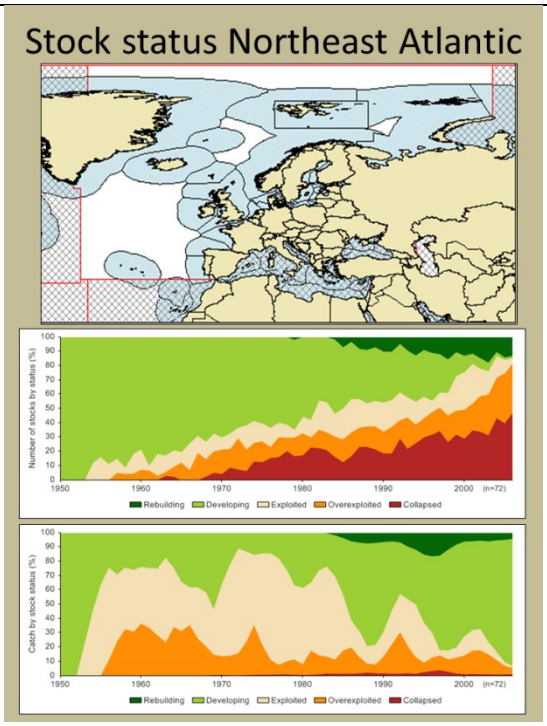
Type of policy and hierarchy	In the early 1970s the goal in fisheries management was to avoid conflict between nations. A major step in this connection was the definition of the territorial waters by establishing the Exclusive Economic Zones (EEZs) which was an extension to 200 nautical miles from their baseline or – between countries where distances were less than 2x200 nautical miles - to establish the mid-lines between the countries (UN Law of the Sea 1). In addition to the definition of zones another important question was the managing of straddling stocks and highly migratory fish to prevent out-fishing of such species during their temporary moving within EEZs in their lifecycles (UN Law of the Sea 2).	
Name	UN Law of the Sea	
Description	• Defines what territorial water is and what kind of access is allowed by setting 200 nautical miles from baselines as national waters. • Furthermore restricts fisheries of straddling and highly migratory species as they are not defined as private property within the EEZ but common property which is managed by international authorities such as ICES and NEAFC.	
Targets	• Ensure national rights to exploitation of resources within the national waters, and to prevent overfishing of what can be considered common resources.	
Territorial implication	**Characterisation**	Defining territorial rights
	Description	• Define what is private and what is common property rights both to waters and to specific species
Indicators		
Distance to target (Graph or map should be provided in support of the distance to target analysis)	Within EU waters is ensured by the international regulation and the national interpretations of the regulation. National inspection of territorial waters ensures both national and EU interests within the national boundaries.	
Policy effectiveness	**Characterisation**	*Generally effective*
	Description	The combination of international definitions of access and ownership the principles were accepted, but the question of control required measures of control.
Transformative character of policy	**Characterisation**	*Slow*
	Description	A basic step towards greening of the sector but was challenged by the path dependency of the sector
Green economy implication	**Characterisation**	*Generally good*
	Description	• Differences in interpretation of fish stock management within national territorial boundaries may interfere with common interests

OVERALL MANAGEMENT – ICES, NEAFC and CFP

Type of policy and hierarchy	The question of how to divide fishing opportunities up into national quotas took off by the setting of the first catch limits affecting EU fleets by the North East Atlantic Fisheries Commission (NEAFC) in 1975 and followed by the Hague Declaration of 1976. (NEAFC 1975; The Hague Declaration 1976). The key criteria used for distributing of the catch capacities were catches during the reference period (1973-78) in combination with preferences for certain fleets in Scotland and Ireland (and Greenland, which was then still a member of the European Community), and compensation for losses in third country waters. Relative stability was first applied in practice with the adoption of the CFP in 1983 where total Allowable Catches (TACs) for each fish stock were distributed between the Member States of the EU according to a fixed allocation key based on their historic catches (EU CFP 1983). The CFP in 1983 provided Total Allowable Catches (TACs) for each fish stock shared between the Member States of the EU. The Member States agreed to grant free mutual access to each other waters, so that each nation's traditional fishing grounds and practices could be preserved.	
Name	*Fisheries capacity and TAC*	
Description	• Fishing fleet and Total Allowable Catches distributed between the EU countries	
Targets	• Ensure a viable fishing capacity and a distribution of the catch in order to prevent over-fishing.	
Territorial implication	**Characterisation**	Quota control
	Description	• National and distance fisheries was developed parallel. In order to compensate for expansion possibilities in national and EU waters the fleet moved into international water.
Indicators		
Distance to target (Graph or map should be provided in support of the distance to target analysis)	Three directions developed. On one hand: a better management of the fish resource within EU waters enabled fisheries which became adjusted to the stocks. Secondly: In order to get as large as possible part of the quota large investments in fishing capacity took off and fisheries became less profitable due to the large investments. And thirdly: Expansion of fisheries in distant international water resulted in large investments and increasing dependency on energy for transport.	
Policy effectiveness	**Characterisation**	*Effective to some extend*
	Description	• The first approaches to both quota and technology definition and management system was developed but required firm control. Especially issues such as catches of immature fish and by-catches required control both on sea and in harbours.
Transformative character of policy	**Characterisation**	*Slow*
	Description	• The fisheries sector has had problems in adjusting to the new conditions, and the regulation therefore required considerable measures of control.
Green economy implication	**Characterisation**	*Limited*
	Description	• The challenges of over-fishing were expanded by over-investments. The negative consequences of the policies were first and foremost due to a focus on quantity instead of quality.

COMMON MANAGEMENT OF CAPACITY – CFP REVISION 2002

Type of policy and hierarchy	The decline of stocks in European waters called for new policies. The annual EU regulations setting Total Allowable Catches (TACs) and quotas for the most important commercial species could no longer simply be mechanism for dividing up a common resource. A step towards this goal was taken in 2002, when a major reform of the Common Fisheries Policy addressed a number of specific problems. The European fleet had grown far too large; Too many management decisions at both EU and national level were short-term measures, often taken under political pressure, and were not backed up by any coherent long term strategy. And regulations and rules there were often not respected, some because they were too difficult to enforce, and in others because the will and means to enforce them were not there (TAC REFORM 2002). At the core of all these failings lay a lack of trust between stakeholders and regulators. The 2002 reform addressed these issues in four main ways: • It promoted greater involvement of stakeholders in all aspects of policy, and through a major new exercise in permanent consultation – the Regional Advisory Councils (RACs); • Subsidies were redirected to support the life of coastal communities while the industry restructures and fleet capacity was reduced; • Regulations were simplified to reduce the burden on both fishers and administrators; • Annual decisions on TACs and quotas became increasingly subordinate to long-term strategic commitments, through the establishment of multi-annual plans.	
Name	CFP REVISION 2002	
Description	• Reduction of fleet and fishing capacity; promotion of distribution of management involvement	
Targets	• Reduce fisheries capacity to an adequate size defined by the fish resource • Ensuring a community-rationale instead of a capital-rationale • Involvement of fishers in the management	
Territorial implication	**Characterisation**	*Community focus*
	Description	• A decrease in capacity and a focus on healthy and viable communities provided a change in focus from quantity to quality
Indicators		

<table>
<tr><td>Distance to target (Graph or map should be provided in support of the distance to target analysis)</td><td colspan="2"> 

As indicated on the map above the target of a healthy stock is quite distant in the Northeast Atlantic in general. But improvements have also taken place. While most of the stocks are under very unhealthy conditions – half of them collapsed and only 15-20% rebuilding – most of the catches are in stocks that are either rebuilding or developing, and only a small proportion are in overexploited or collapsed stocks.</td></tr>
<tr><td rowspan="2">Policy effectiveness</td><td>Characterisation</td><td>Improving</td></tr>
<tr><td>Description</td><td>• As the above graphs of stock status it is quite obvious that the EU policies since 1983 have added to an improving of the situation for fisheries. But also that there is still a long way to go before the fish stocks in the Northeast Atlantic can be characterised as stabilized.
• The involvement of stakeholders and communities in the management may become an important factor in the future.</td></tr>
<tr><td rowspan="2">Transformative character of policy</td><td>Characterisation</td><td>From top down to top-down and bottom-up integration</td></tr>
<tr><td>Description</td><td>• At the core of many of the failings so far is a lack of trust between stakeholders and regulators combined with a dominant focus on short term versus long term policies.</td></tr>
<tr><td rowspan="2">Green economy implication</td><td>Characterisation</td><td>Diversity in fisheries</td></tr>
<tr><td>Description</td><td>• The improvements in the North East Atlantic fish stocks have opened up for a more diverse fisheries, and focussing on communities in the management moves the policy aspects a further step towards focus on qualities parallel to quantities.</td></tr>
</table>

COMMON MANAGEMENT OF ECOSYSTEMS – CFP REVISIONS 2013:

Type of policy and hierarchy	A general problem so far has been the practice of discards and in able to promote a more sustainable development trawlers will have to land their entire catch, an issue which both means better technology and a management system focusing on an ecosystem basis with a fisheries based on "maximum sustainable yield" (MSY) with a limit to the catch for each species based on its reproduction rate (CFP REFORM 2013 1). A new funding mechanism will be set up for 2014-2020 called the European Maritime and Fisheries Fund (EMFF) with part of that fund will help support small-scale coastal fleet, member states being able to restrict fishing in a zone within 12 nautical miles of the coast, up to the year 2022. And the large fleets should be allocated transferable catch shares (concessions) which they would be able to trade, in response to local conditions (CFP REFORM 2013 2).	
Name	CFP REVISION 2002	
Description	• As indicated above several issues are focused on in the revision:	
Targets	• Recovering of the stocks; A fleet adjusted to the resources; Increased diversification in both fleet and catches; Focus on community development.	
Territorial implication	**Characterisation**	Diversity and delegation of responsibility
	Description	• The diversity is related to both fleet structure, large scale as well as local scale fisheries, responsible fisheries taking into account resource management through an ecosystem approach, and first and foremost the delegation of responsibility in order to make stakeholders aware of their action being a key issue.
Indicators		
Distance to target (Graph or map should be provided in support of the distance to target analysis)	The previous map of the status of ecosystems in the North East Atlantic could be used here as well. The target is the same as above, while the means are focusing on delegation of responsibility. In this connection making use of the whole spectrum of seafood and thereby requesting a close connection between users, producers, and management.	
Policy effectiveness	**Characterisation**	Reaching the target?
	Description	Too early to say what the outcome will be, but it is quite evident that many of the included issues are recognized as important to include in a sustainable development.
Transformative character of policy	**Characterisation**	Reaching the target?
	Description	Also here it is obviously too early to say, but the argumentation from above could be repeated here.
Green economy implication	**Characterisation**	The greening of fisheries
	Description	• As discussed in the sector report the proposed policy is clearly pointing in the directions which have proposed from many parties involved in discussing the future of fisheries.

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- NEAFC 1975: Declaration on the Interpretation and Implementation of the Convention on the Future Multilateral Cooperation in North-East Atlantic Fisheries
- The Hague Declaration 1976
- EU CFP 1983: THE EUROPEAN COMMUNITYS FISHERY POLICY. European Documentation. Periodical 1 / 1985
- CFP REFORM 2002: HOUSE OF LORDS, European Union Committee, 21st Report of Session 2007–08: The Progress of the Common Fisheries Policy Volume I published 22 July 2008 Published by the Authority of the House of Lords
- Marine Policy, 2003, vol. 27, issue 6, pages 545-554
- CFP REFORM 2013 1: Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on the Common Fisheries Policy COM (2011) 425 2011/0195/COD
- CFP REFORM 2013 2: On the proposal for a regulation of the European Parliament and of the Council on the Common Fisheries Policy. (COM(2011)0425 – C7-0198/2011 – 2011/0195(COD));

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11 Appendices

This chapter contains data – maps and graphs – that provide further details to the material presented throughout the report. As listed below the chapter is subdivided in 8 themes. Within each theme there are a varied number of graphed or mapped datasets, in most cases available as spread-sheets.

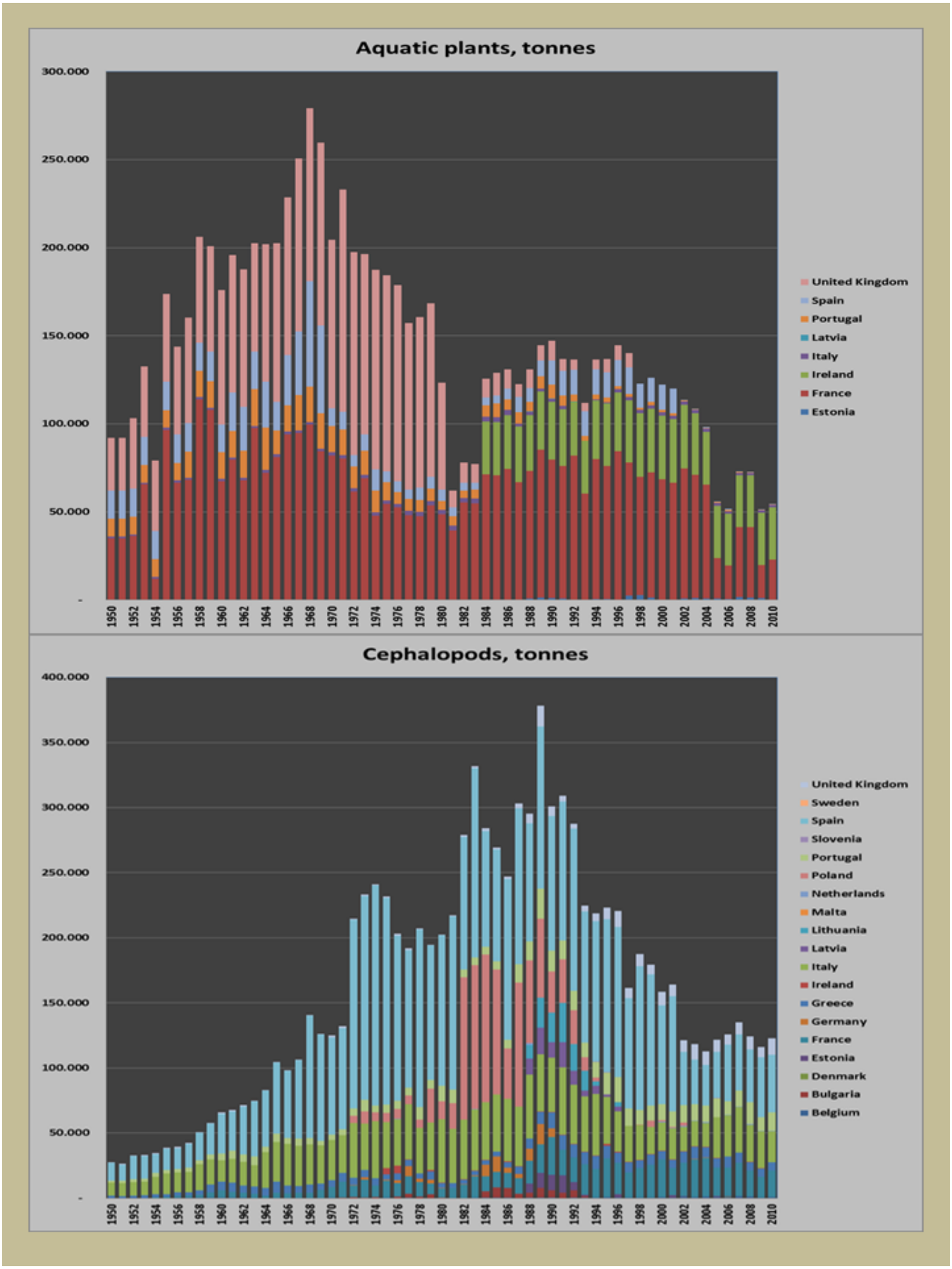
Content:

11.1 Appendix 1 – Fisheries

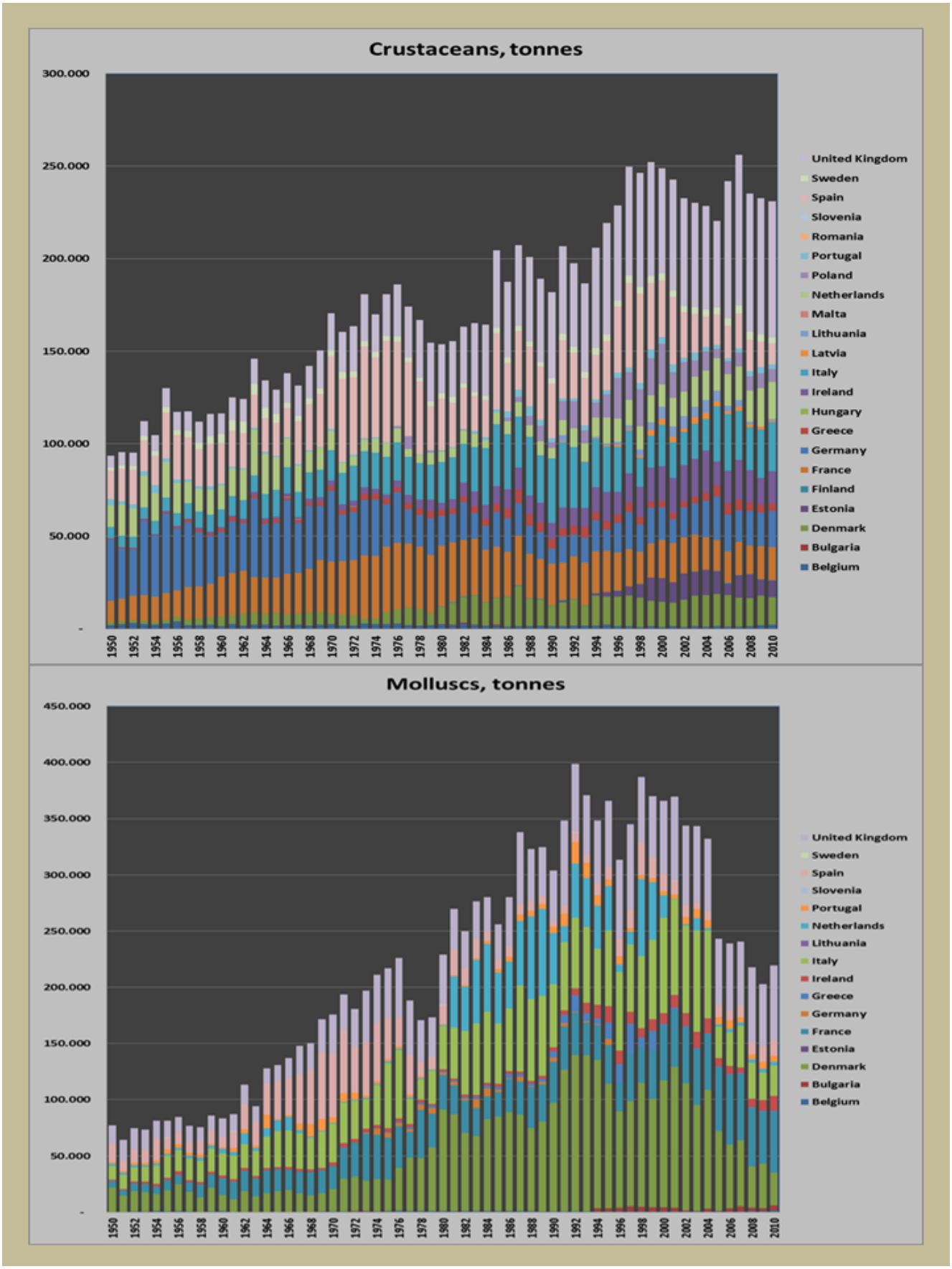
Content:

- Dataset 1: Fisheries – Aquatic plants and cephalopods 1950-2010. Tonnes
- Dataset 2: Fisheries – Crustaceans and Molluscs 1950-2010. Tonnes
- Dataset 3: Fisheries – Pelagic and Demersal 1950-2010. Tonnes
- Dataset 4: Fisheries – Freshwater fish and freshwater fish from aquaculture. Tonnes
- Dataset 5: Products from fisheries – Aquatic plants and Cephalopods, kg per inhabitant
- Dataset 6: Products from fisheries – Crustaceans and Molluscs, kg per inhabitant
- Dataset 7: Products from fisheries – Pelagic and Demersal fish, kg per inhabitant
- Dataset 8: Products from fisheries – Freshwater fish, and total fisheries, kg per inhabitant

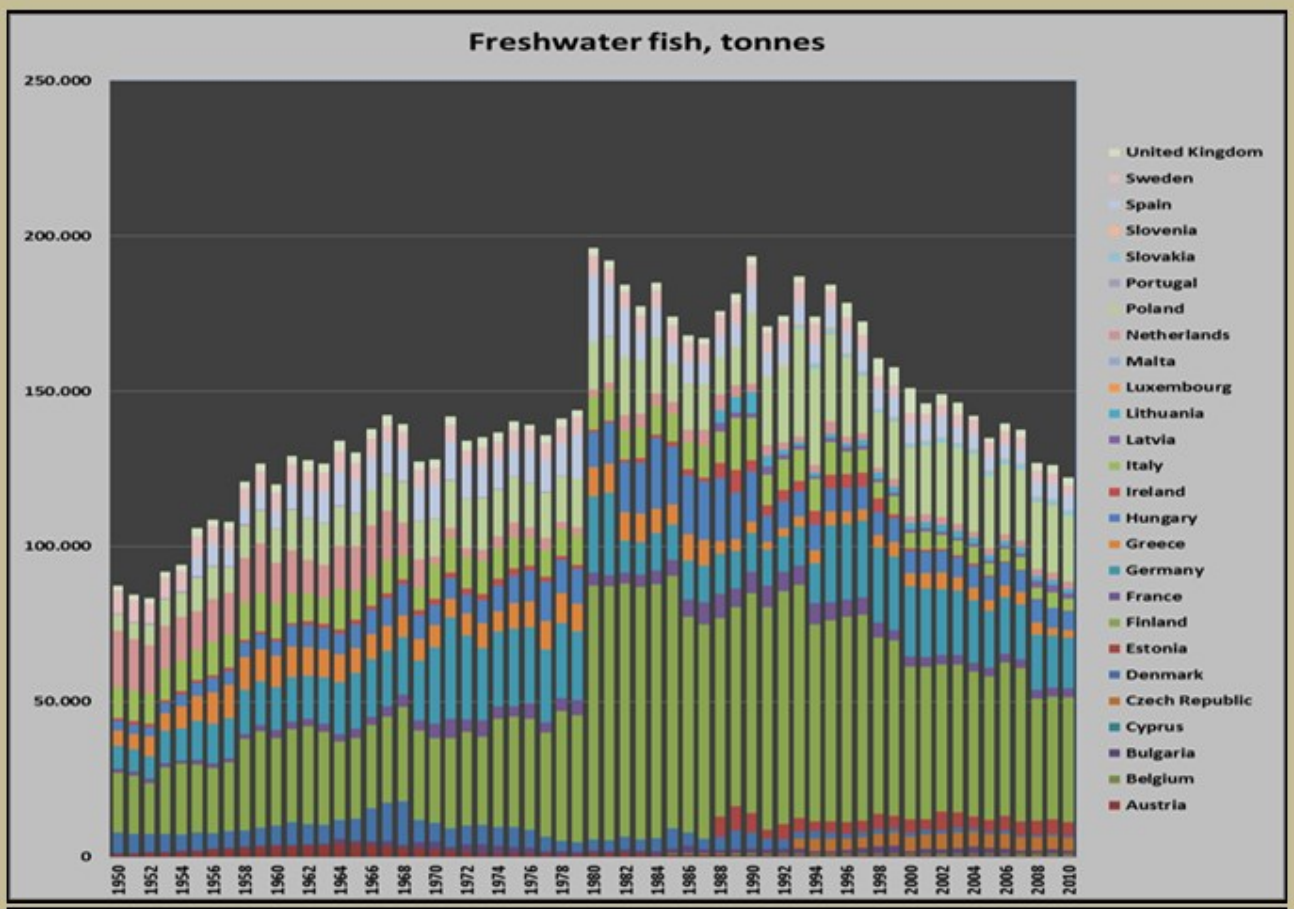
Source: Generated by means of FAO

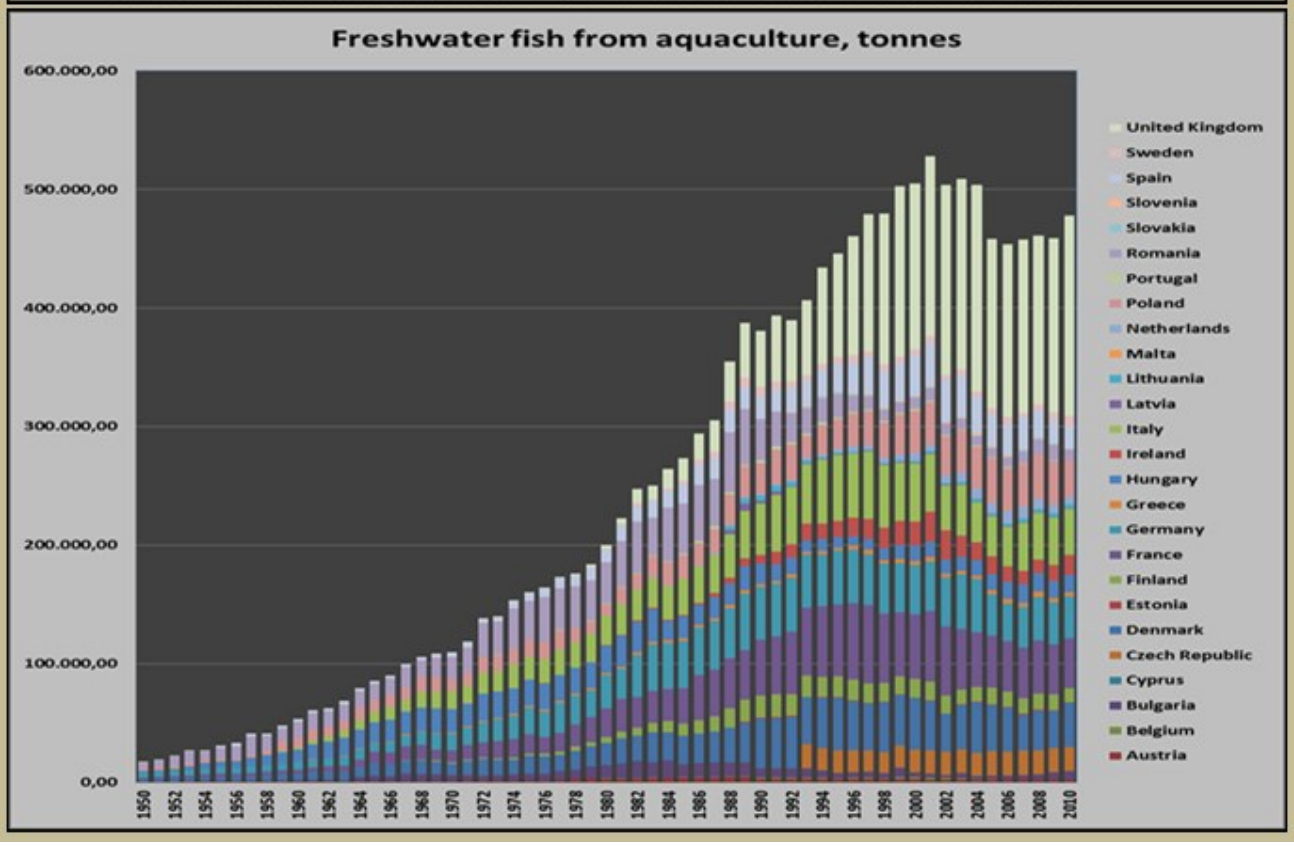


Dataset 1: Fisheries – Aquatic plants and Cephalopods 1950-2012. Tonnes



Dataset 2: Fisheries – Crustaceans and Molluscs 1950-2012. Tonnes

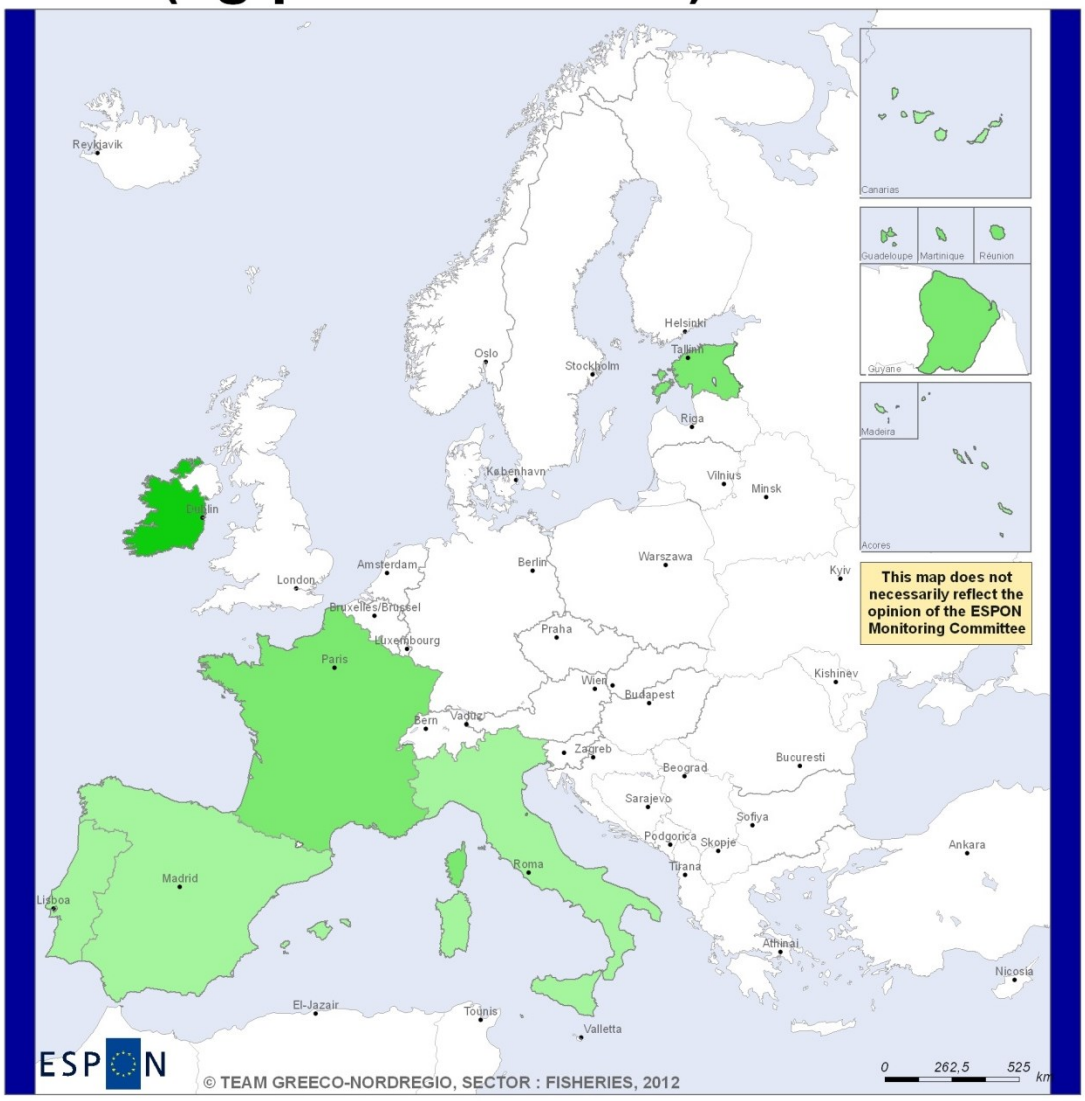




Dataset 3: Fisheries – Pelagic and Demersal 1950-2012. Tonnes

Dataset 4: Fisheries – Freshwater fish and freshwater fish from aquaculture, Tonnes

Products from fisheries (kg per inhabitant) 2012



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Regional level: NUTS 0 (National)
Source: FAO database extraction 2012
Origin of data: FAO, 2012
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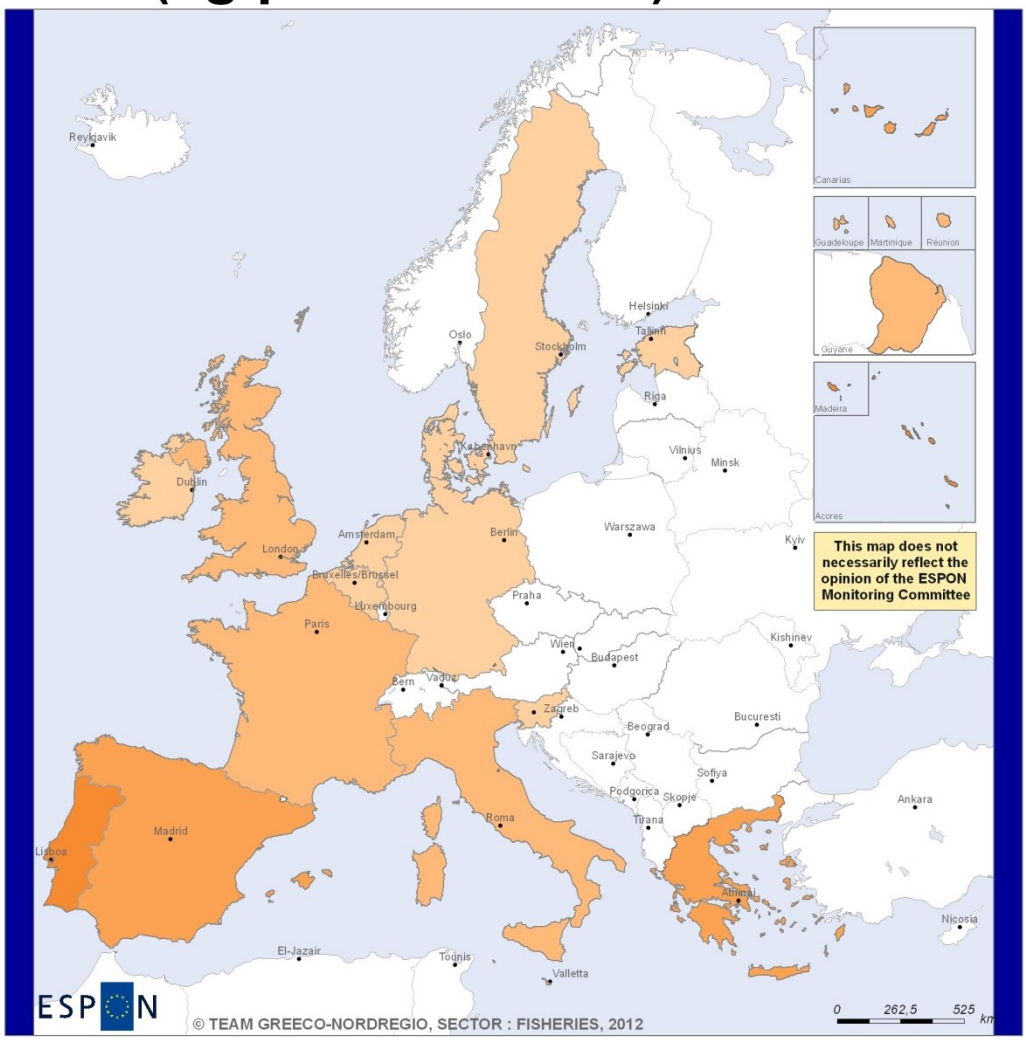
Aquatic plants

- No data
- 0,1 - 0,2
- 0,3 - 0,5
- 0,6 - 1
- > 1

Products from fisheries (kg per inhabitant) 2012



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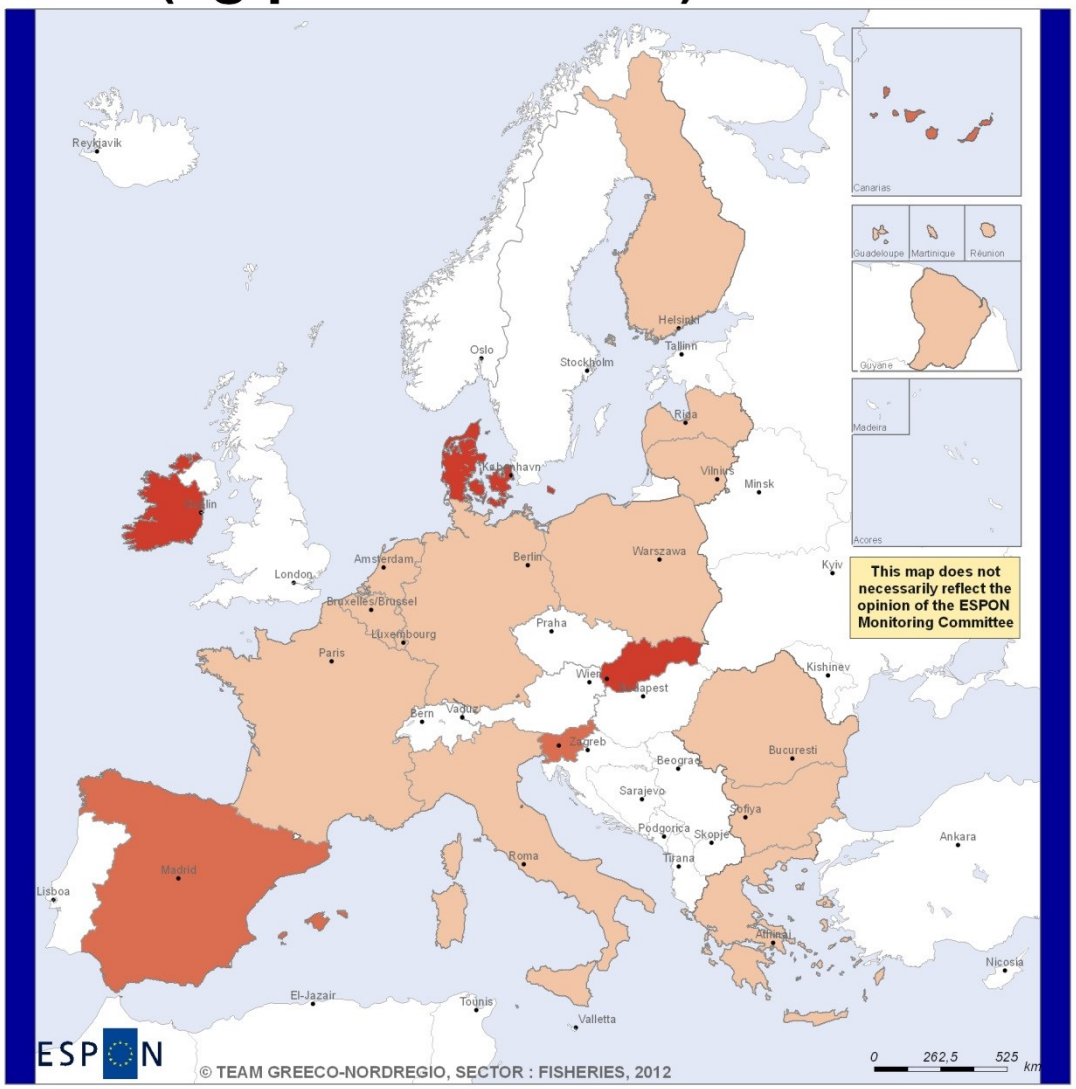
Cephalopod

- No data
- 0,1 - 0,2
- 0,3 - 0,5
- 0,6 - 1
- 2 - 3
- > 2,5

Dataset 5: Products from fisheries – Aquatic plants (above) and Cephalopods (below), kg per inhabitant

Products from fisheries (kg per inhabitant) 2012



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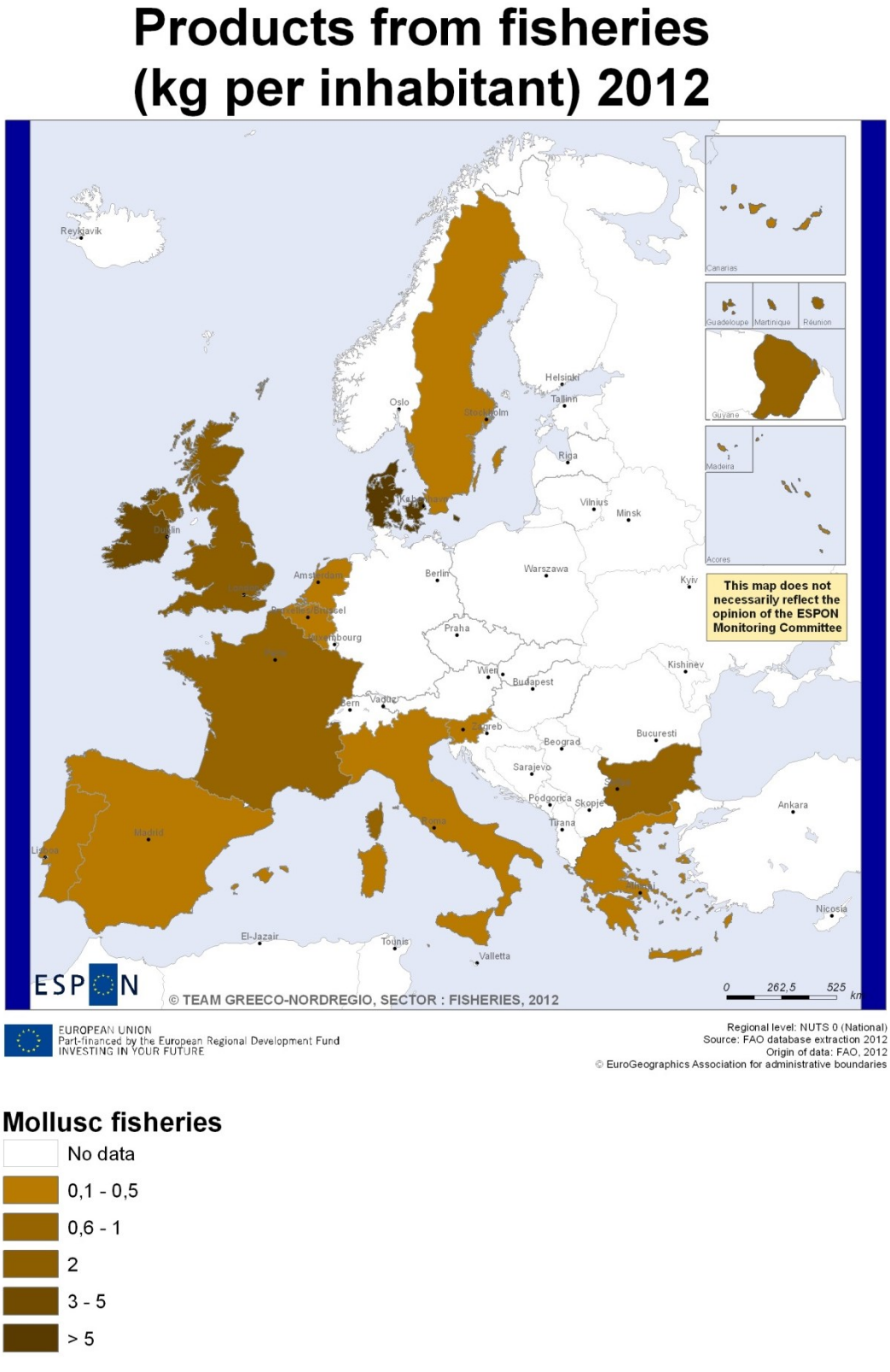
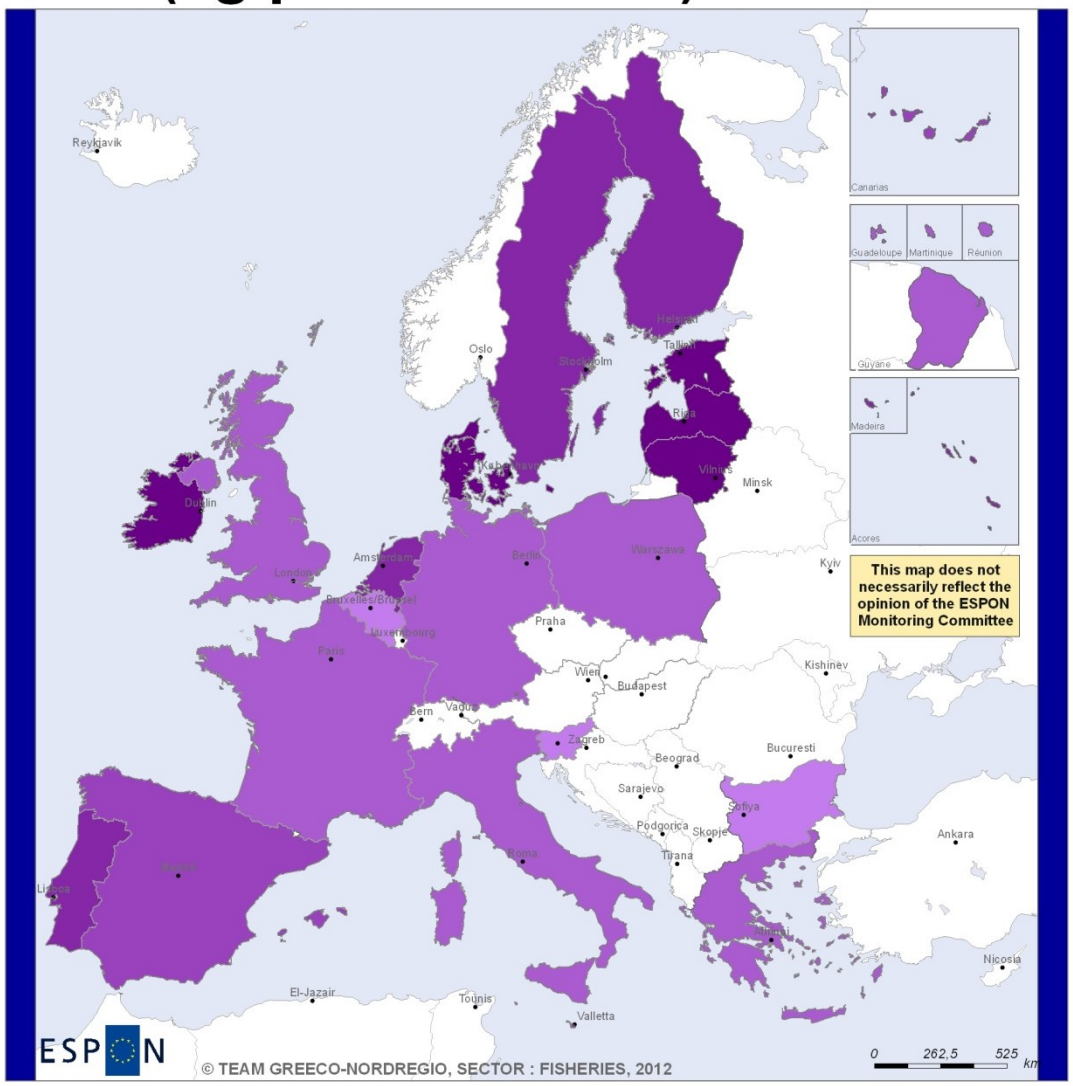
Crustacean

- No data
- 0,1 - 0,5
- 0,6 - 1
- 2
- 3 - 5
- > 5



Dataset 6: Products from fisheries – Crustaceans (above) and Molluscs (below), kg per inhabitant

Products from fisheries (kg per inhabitant) 2012



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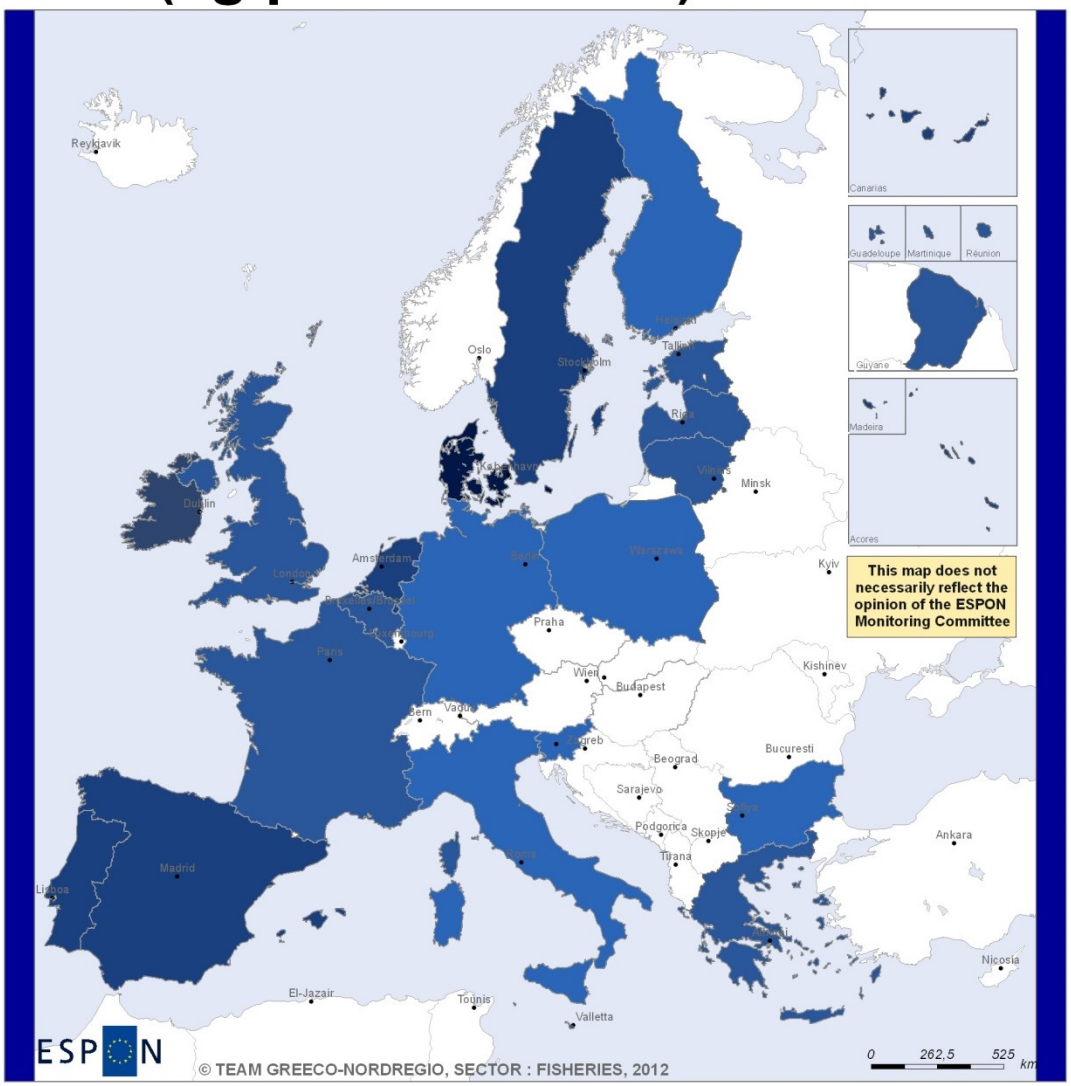
Pelagic fisheries

- No data
- 0 - 1
- 2 - 5
- 6 - 10
- 11 - 25
- > 25

Products from fisheries (kg per inhabitant) 2012



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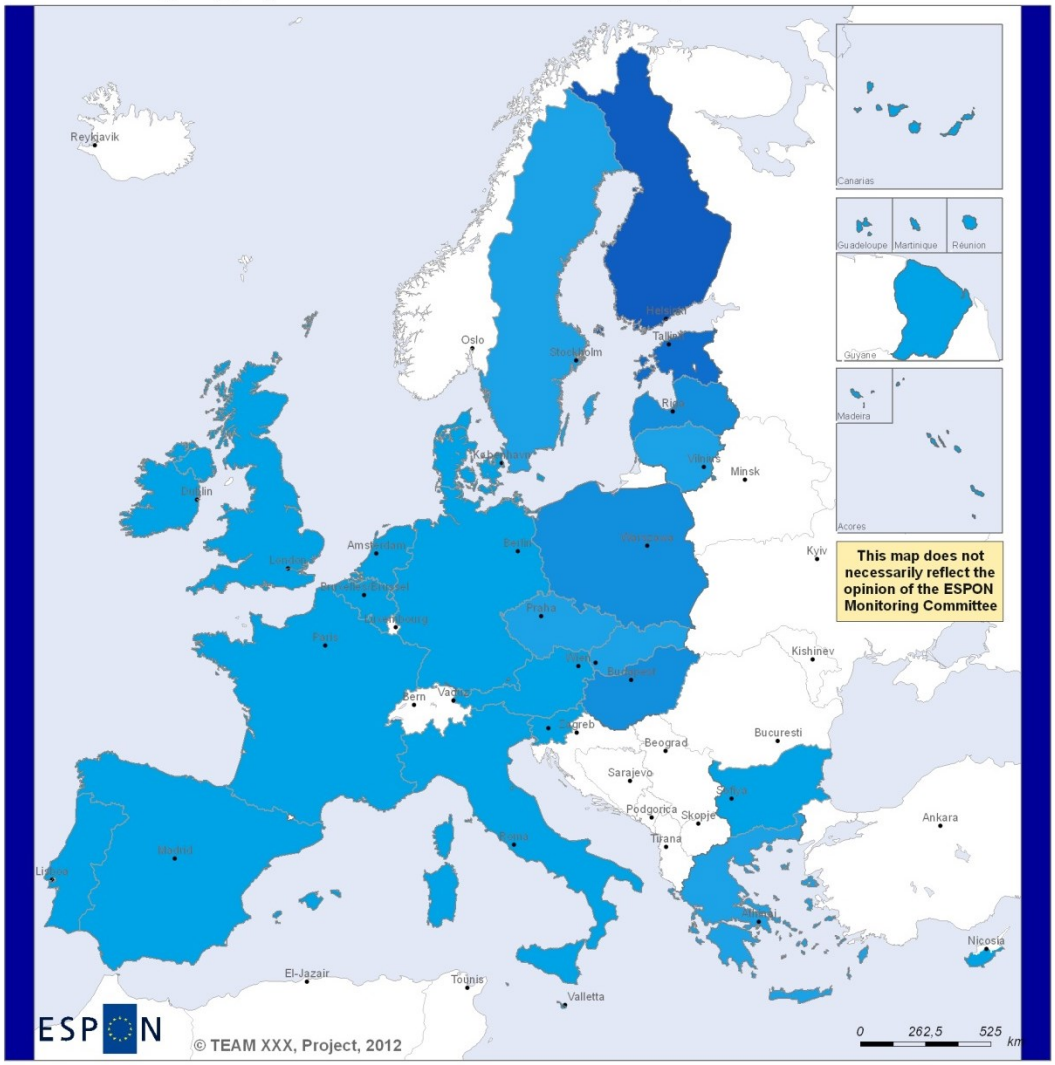
Demersal fisheries

- No data
- 1
- 2 - 5
- 6 - 25
- 26 - 50
- > 50

Dataset 7: Products from fisheries – Pelagic (above) and Demersal (below) fish, kg per inhabitant

Products from fisheries (kg per inhabitant) 2012



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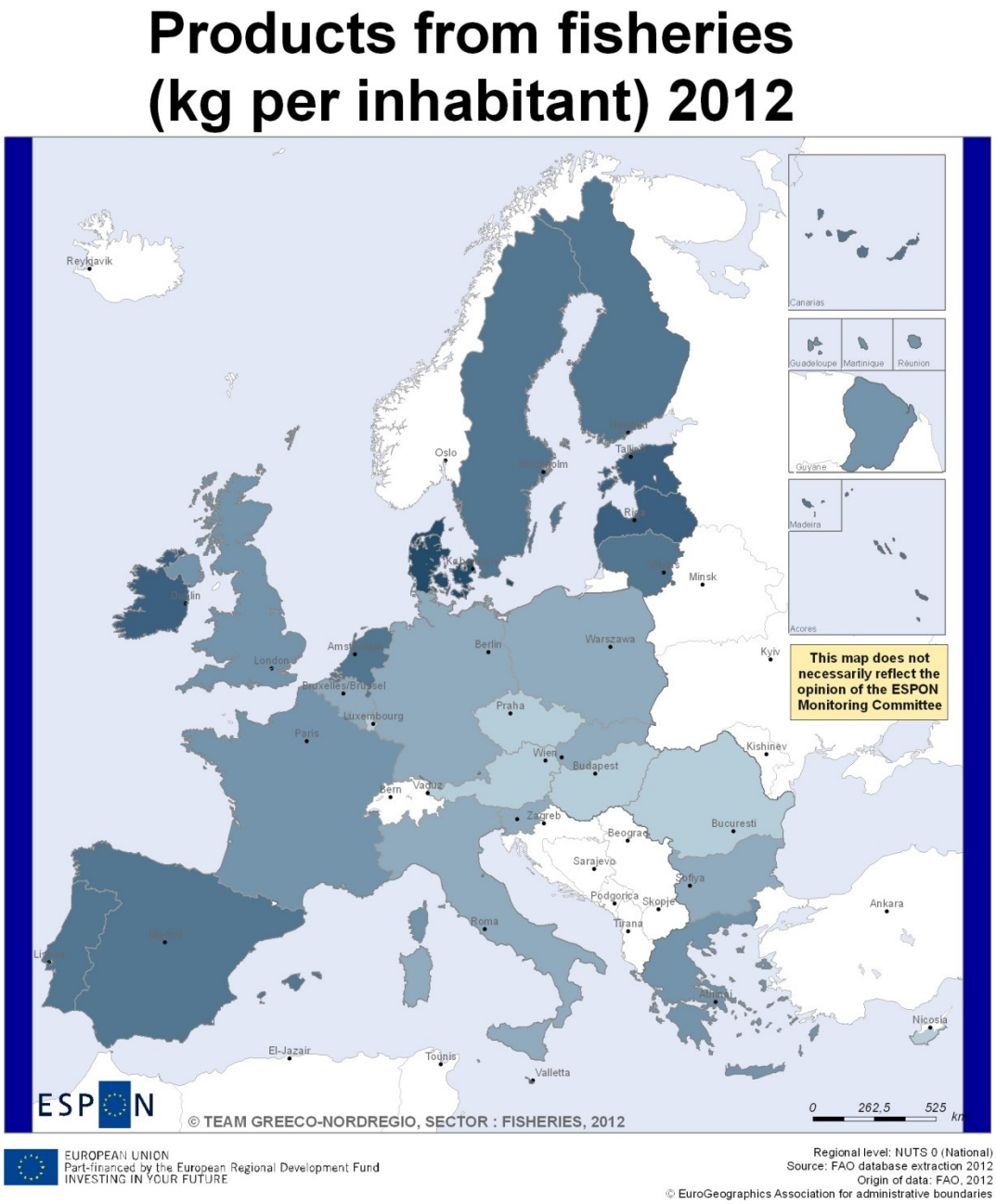
Freshwater fisheries

- No data
- 0,1 - 0,2
- 0,3 - 0,5
- 0,6 - 1,0
- 1,1 - 2,0
- 2,1 - 5,0
- > 5



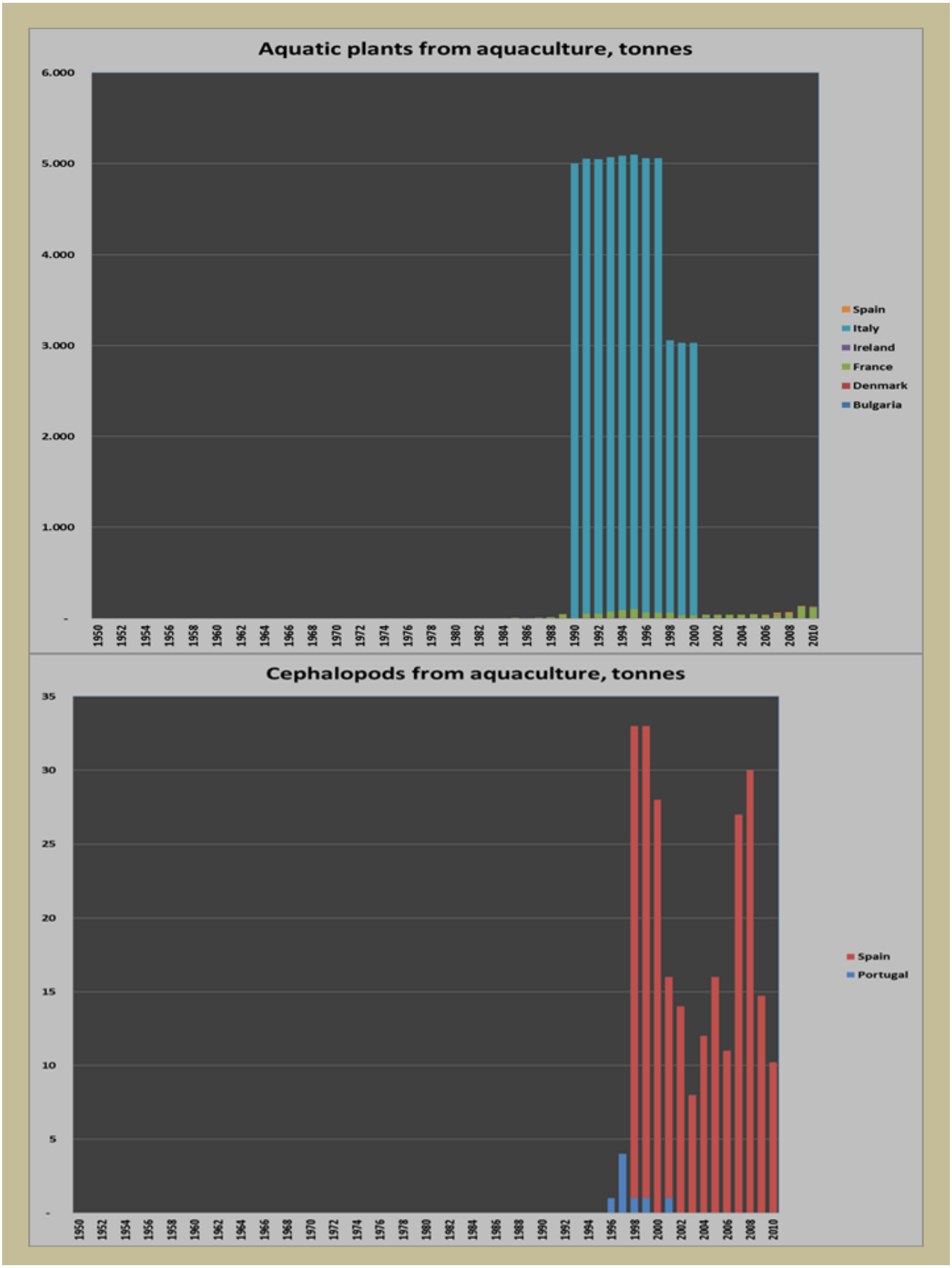
Dataset 8: Products from fisheries – Freshwater fish (above), and total fisheries (below), kg per inhabitant

11.2 Appendix 2 – Aquaculture

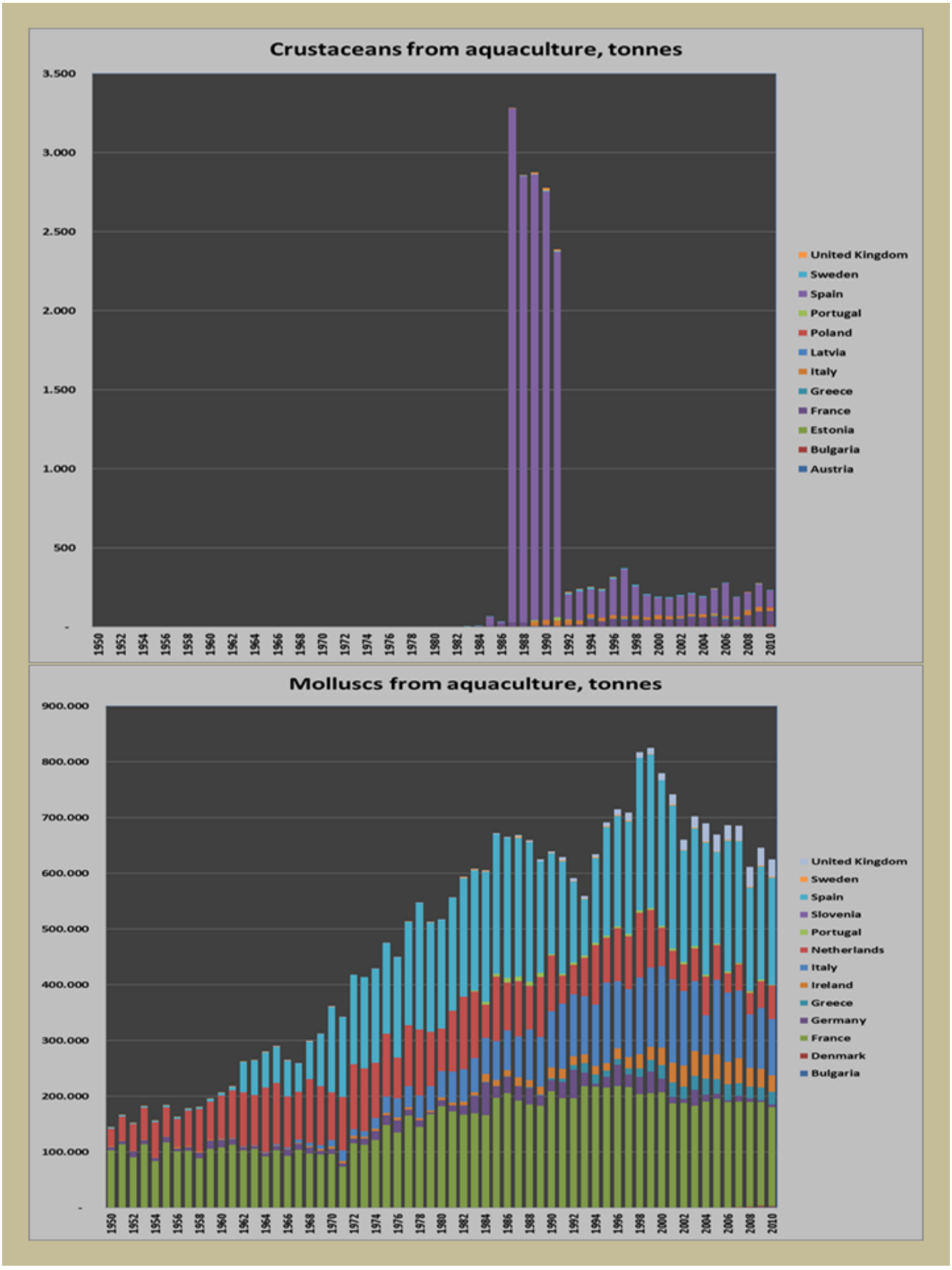
Content:

- Dataset 9: Aquatic plants and cephalopods, tonnes 1950-2010
- Dataset 10: Crustaceans and Molluscs from aquaculture, tonnes 1950-2010
- Dataset 11: Pelagic and Demersal fish from aquaculture, tonnes 1950-2010
- Dataset 12: Freshwater fish and freshwater fish from aquaculture, tonnes 1950-2010
- Dataset 13: Cephalopods and aquatic plants from aquaculture, kg per capita
- Dataset 14: Molluscs and crustaceans from aquaculture, kg per capita
- Dataset 15: Demersal and pelagic fish from aquaculture, kg per capita
- Dataset 16: Freshwater fish and total production from aquaculture, kg pr. capita
-

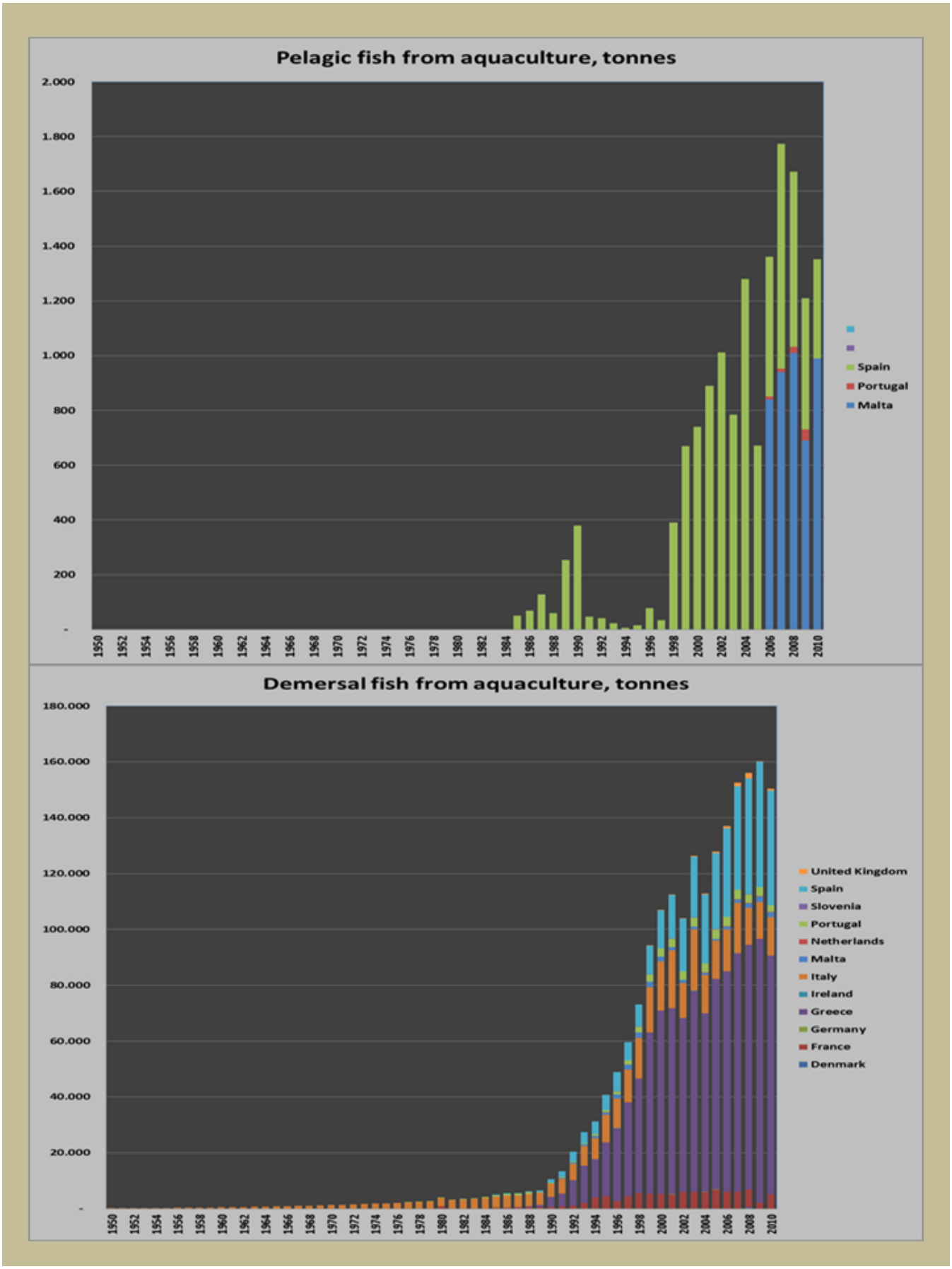
Source:



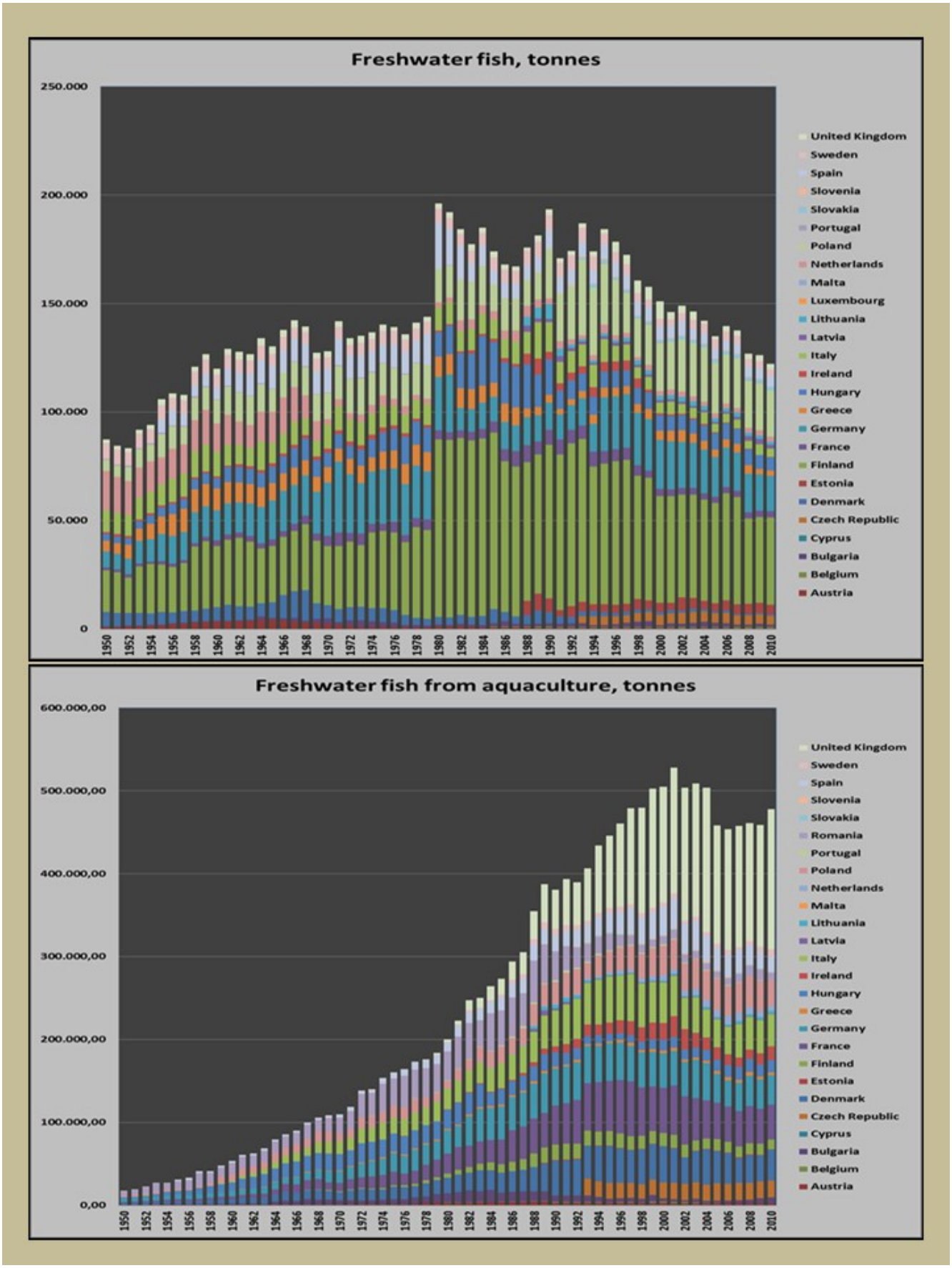
Dataset 9: Aquatic plants and cephalopods, tonnes 1950-2010.



Dataset 10: Crustaceans and Molluscs from aquaculture, tonnes 1950-2010.



Dataset 11: Pelagic and Demersal fish from aquaculture, tonnes 1950-2010



Dataset 12: Freshwater fish and freshwater fish from aquaculture, tonnes 1950-2010

Products from aquaculture (kg pr. cap.) 2012

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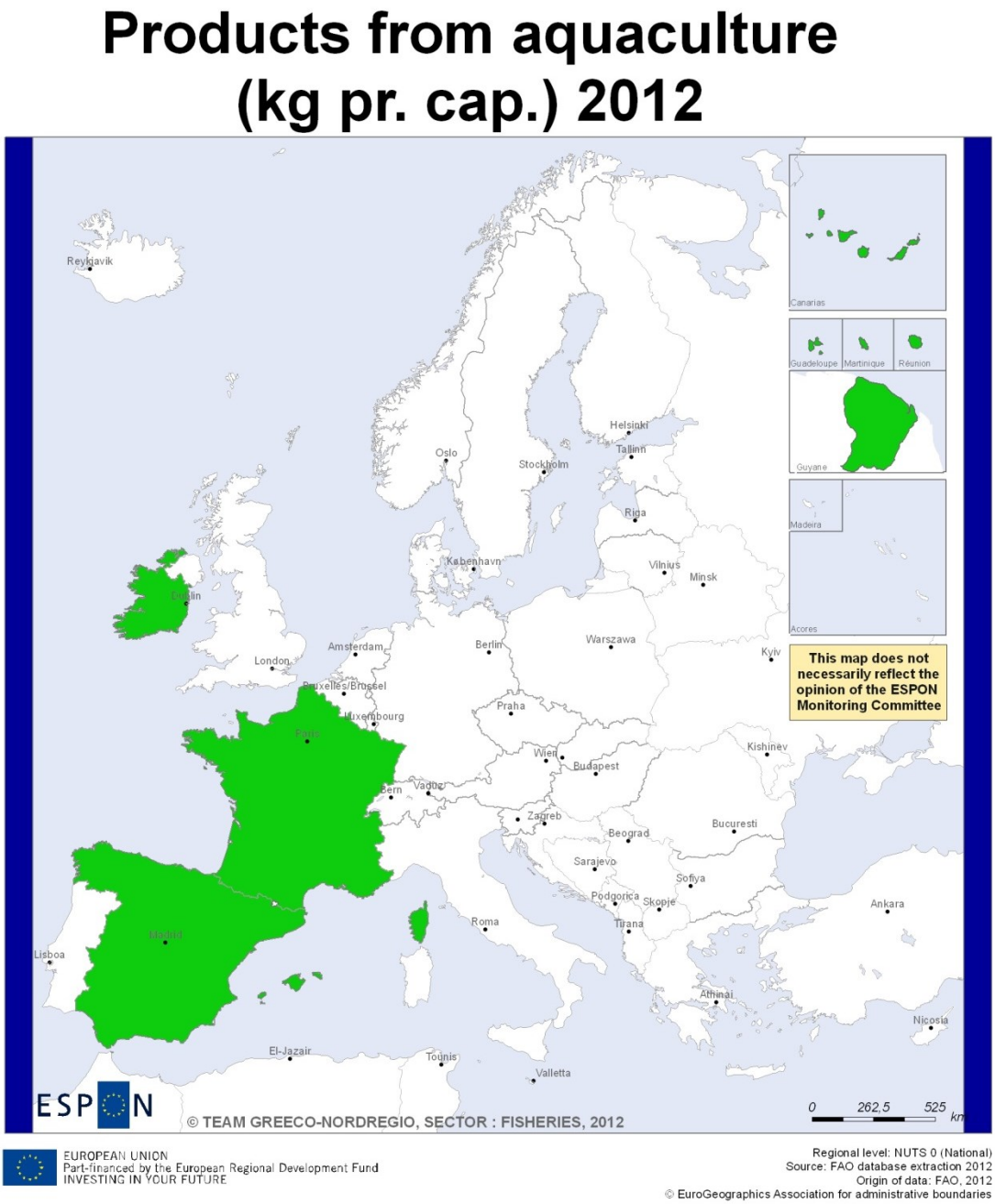
Cephalopod

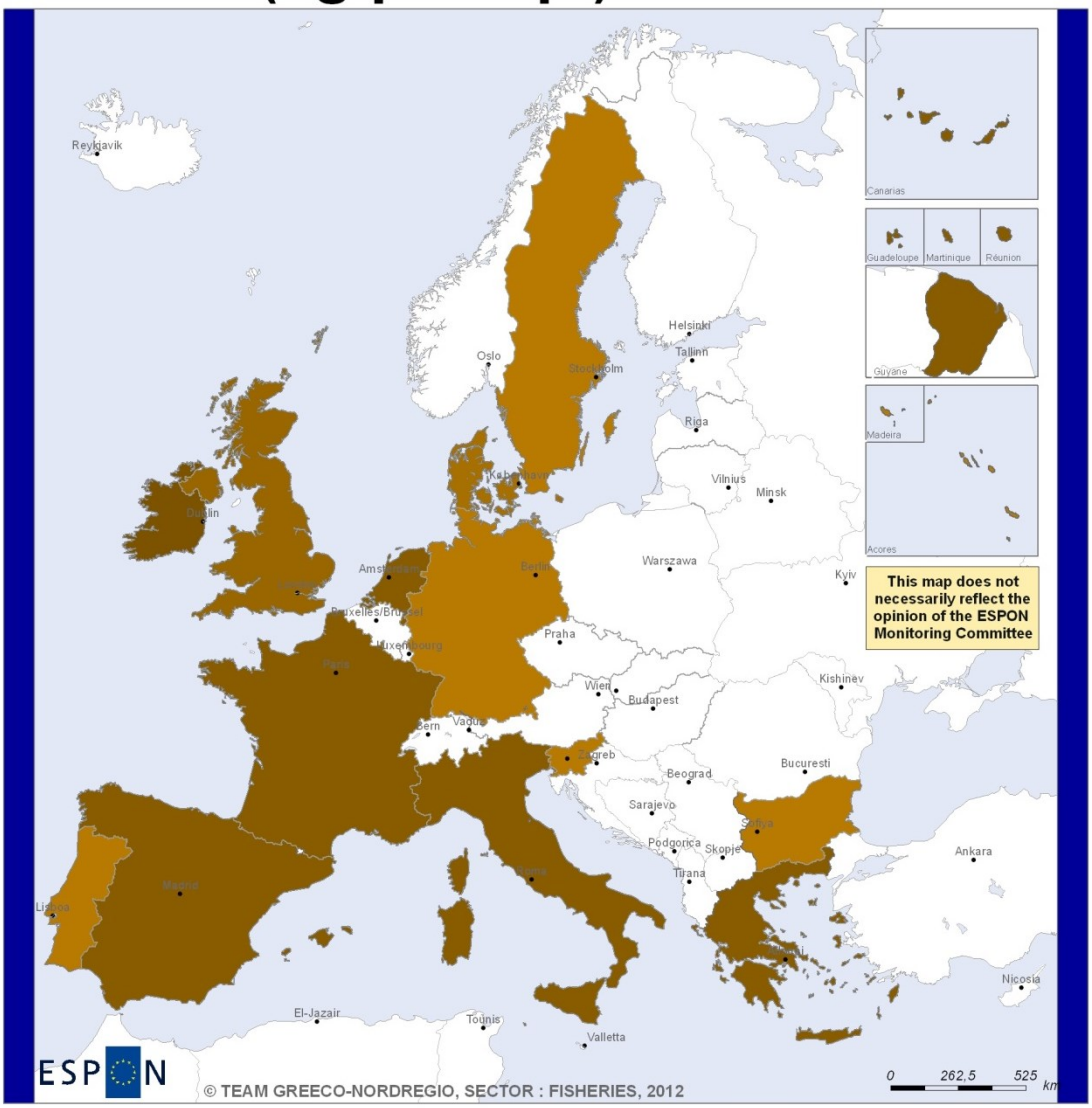
No data

Production less than 0,01 kg per inhabitant



Dataset 13: Cephalopods (above) and aquatic plants (below) from aquaculture, kg pr. Capita.

Products from aquaculture (kg pr. cap.) 2012



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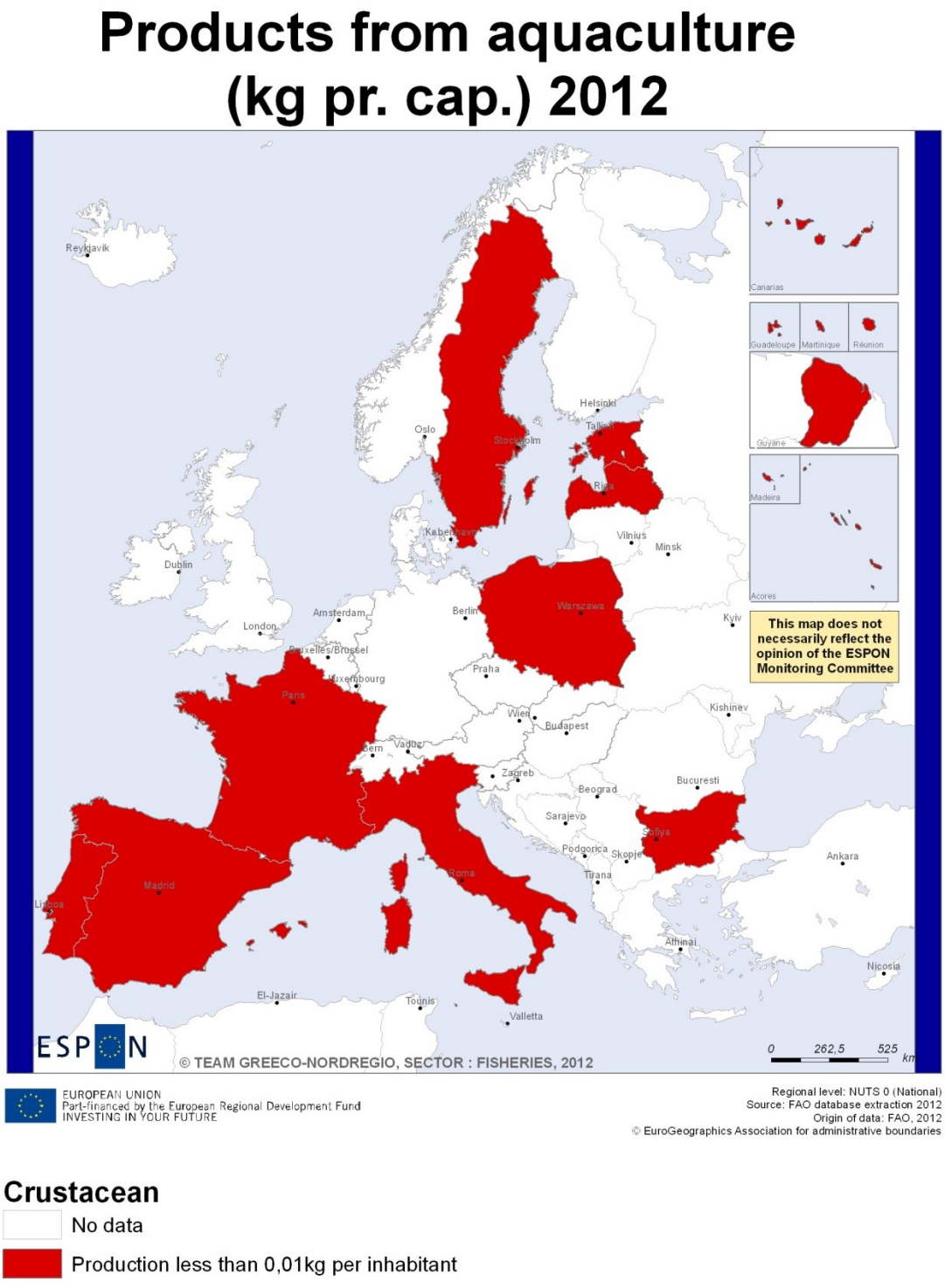
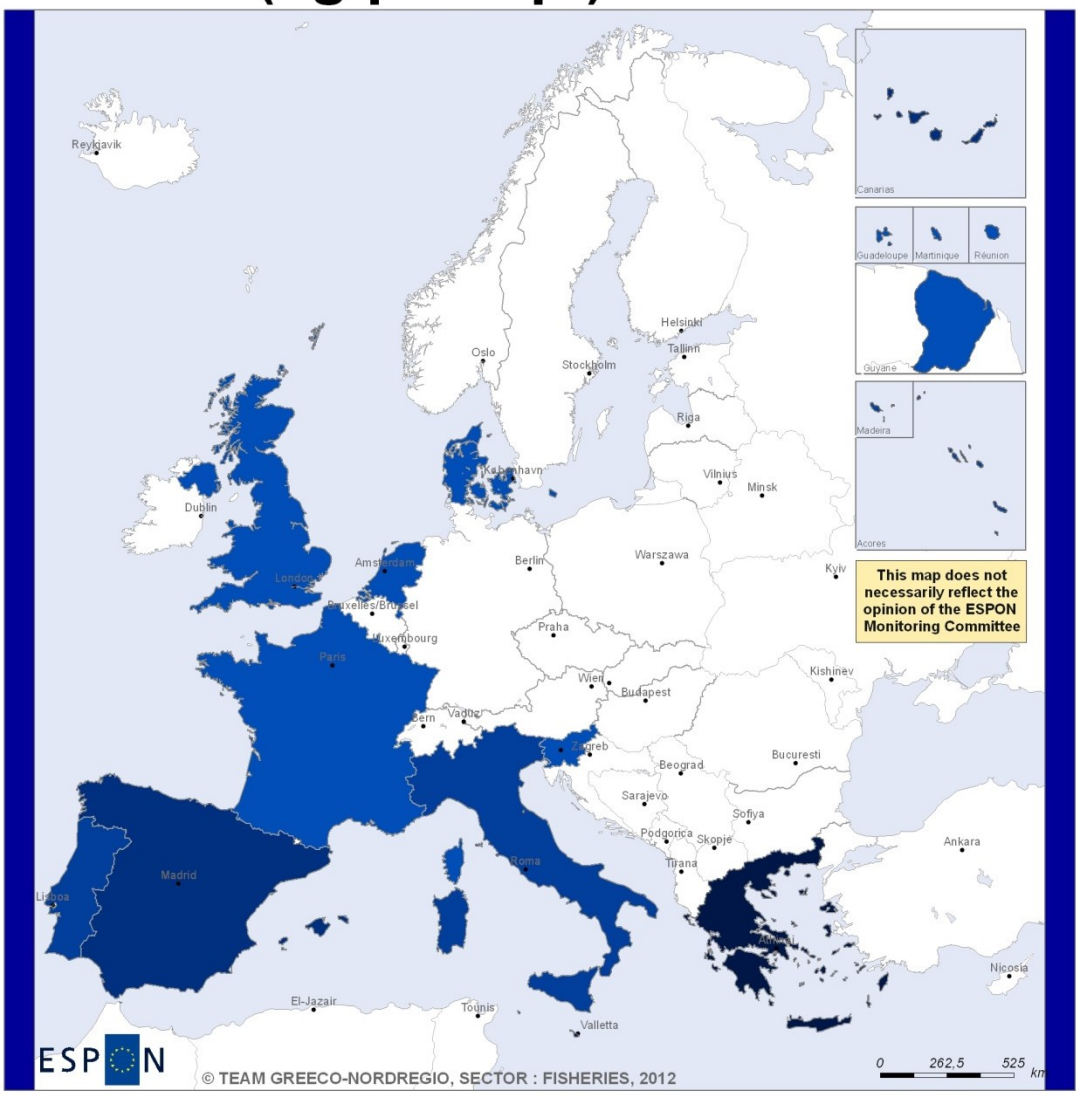
Molluscs

- No data
- 0,1 - 0,2
- 0,3 - 0,5
- 0,6 - 1
- 2 - 5
- > 5



Dataset 14: Molluscs (above) and crustaceans (below) plants from aquaculture, kg pr. Capita.

Products from aquaculture (kg pr. cap.) 2012



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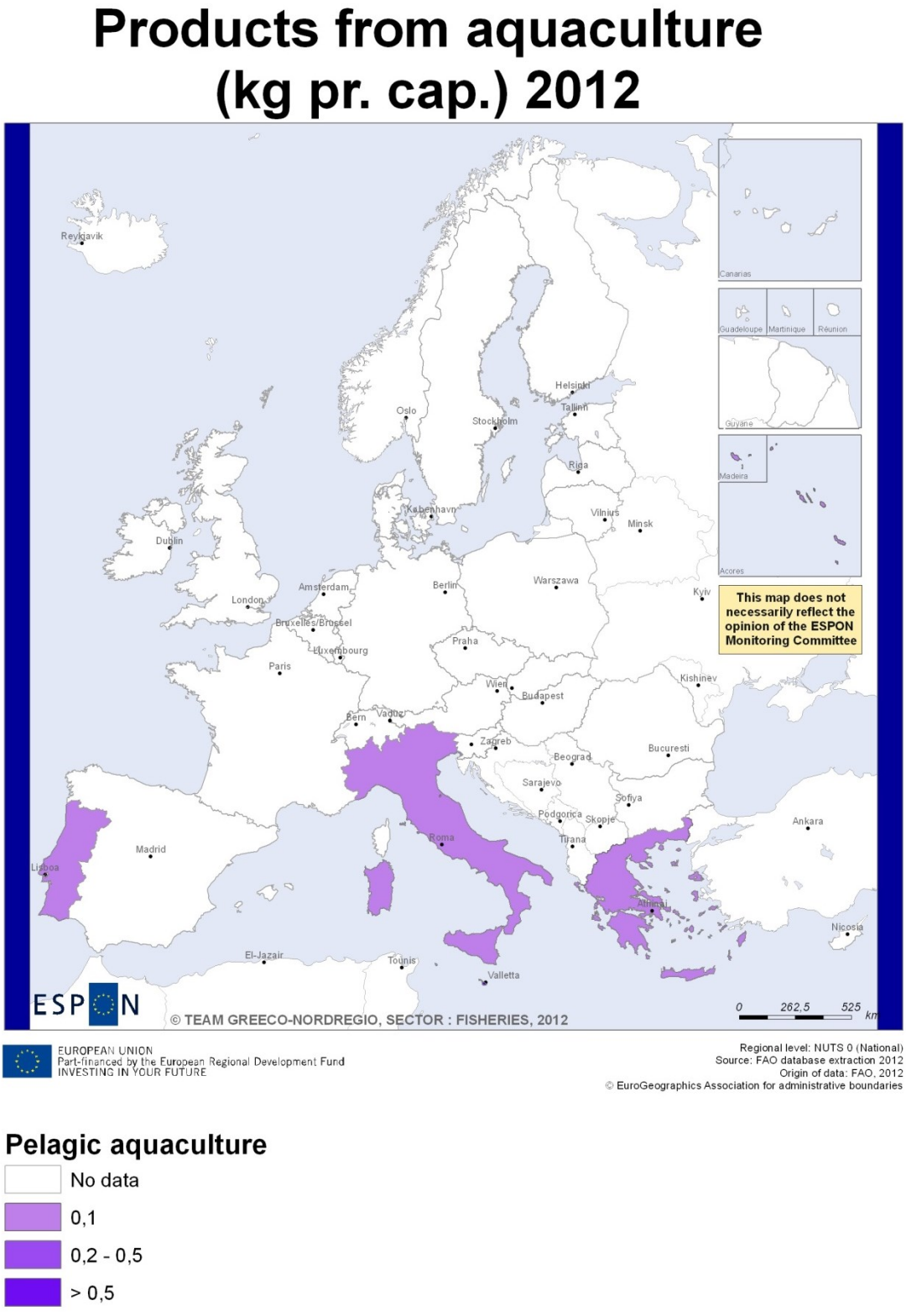
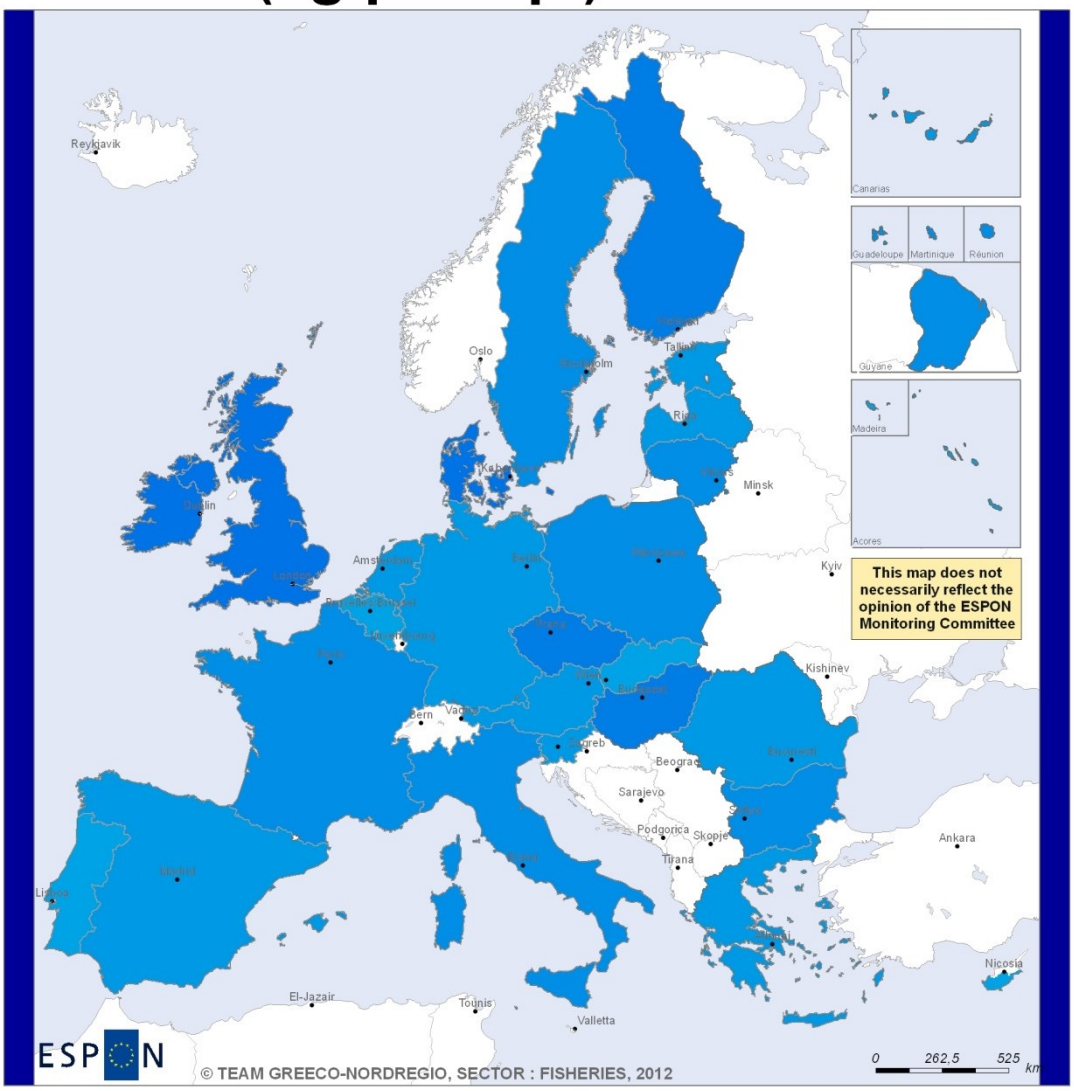
Demersal aquaculture

- No data
- 0,1 - 0,2
- 0,3 - 0,5
- 0,6 - 1
- 2 - 5
- > 5



Dataset 15: Demersal (above) and pelagic (below) fish from aquaculture, kg pr. Capita.

Products from aquaculture (kg pr. cap.) 2012



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Regional level: NUTS 0 (National)
Source: FAO database extraction 2012
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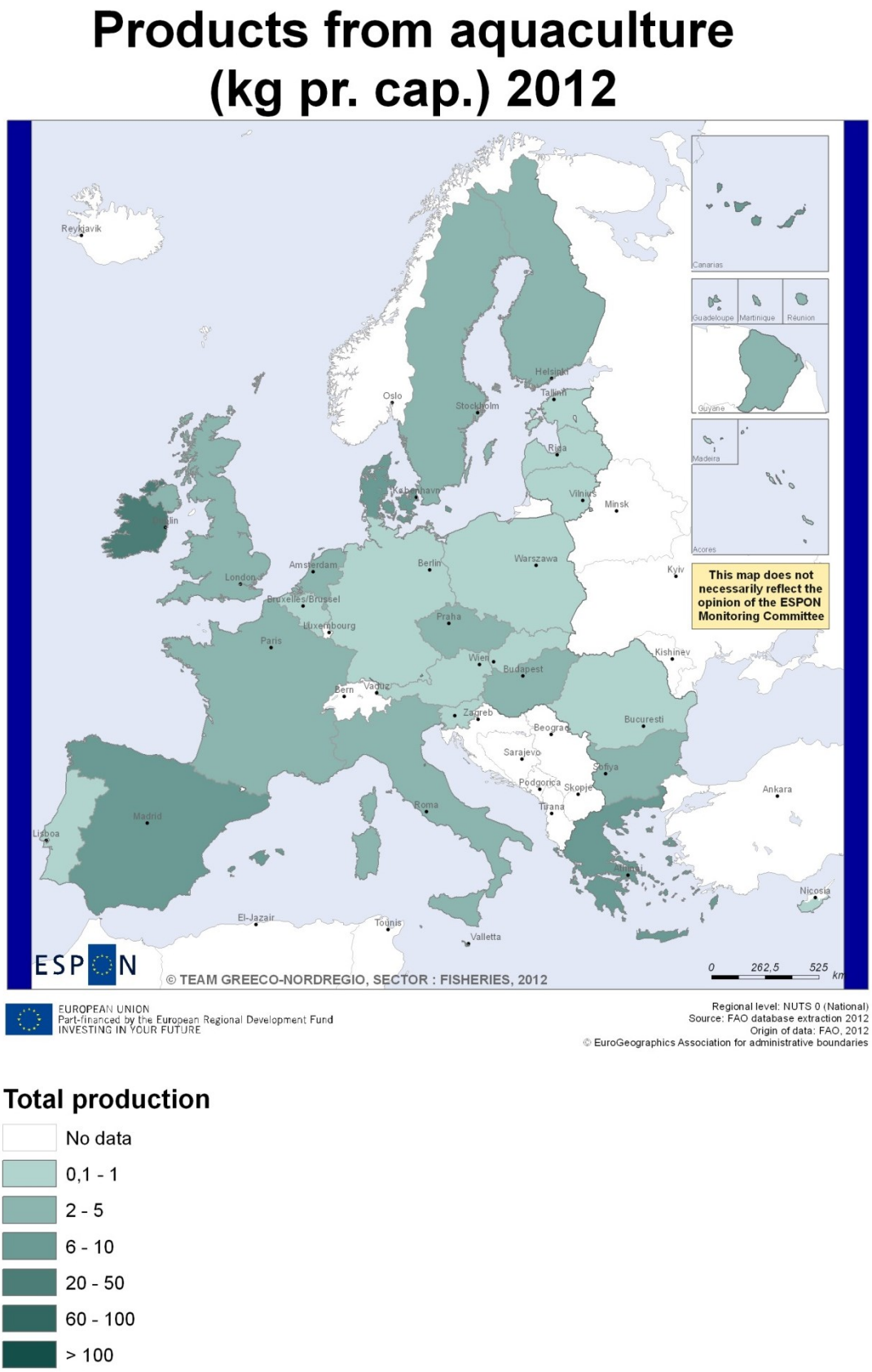
Freshwater aquaculture

- No data
- 0,1 - 0,2
- 0,3 - 0,5
- 0,6 - 1
- 2 - 3
- > 2,5



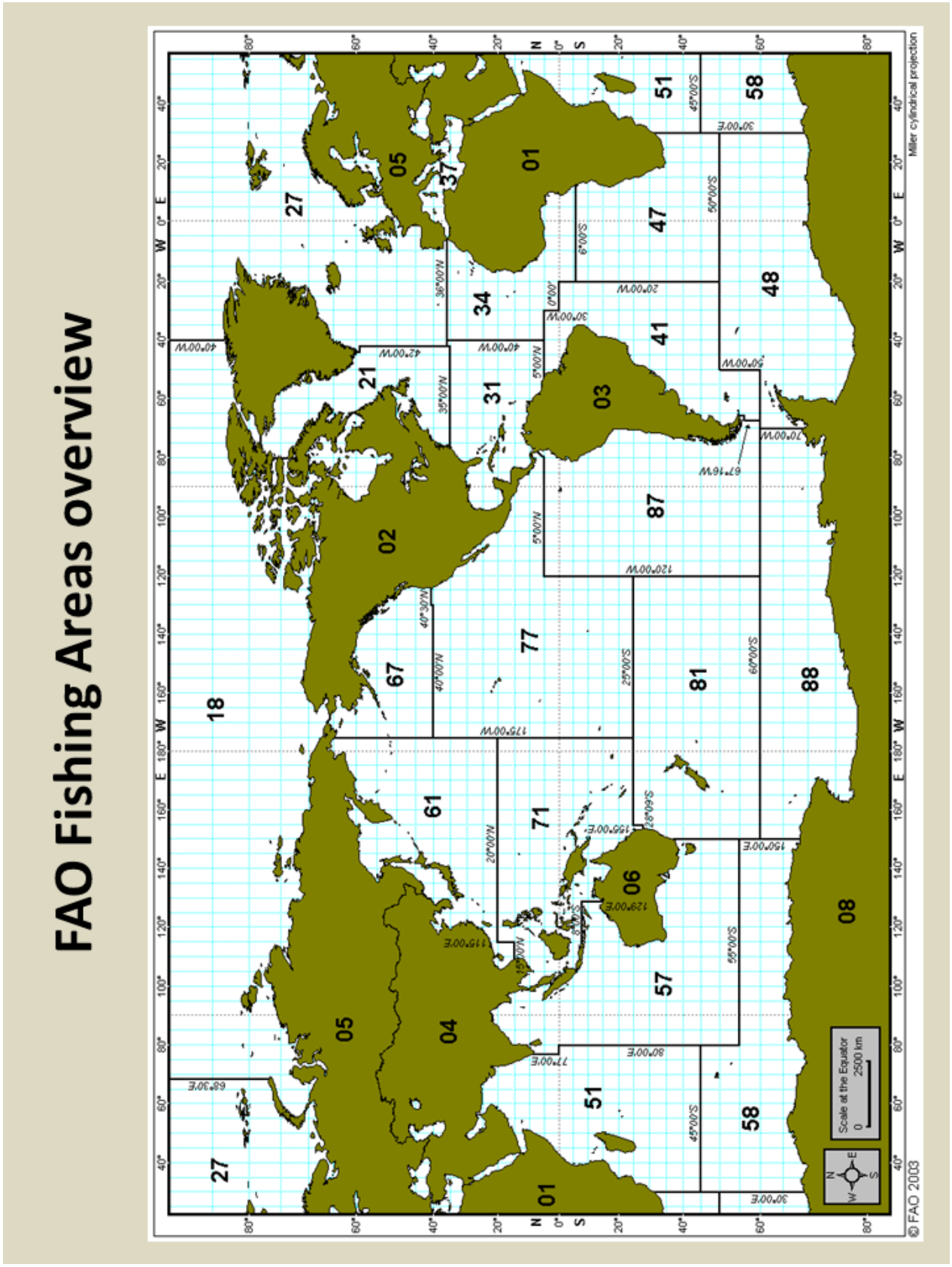
Dataset 16: Freshwater fish (above) and total production(below) from aquaculture, kg pr. Capita.

11.3 Appendix 3 – Waters

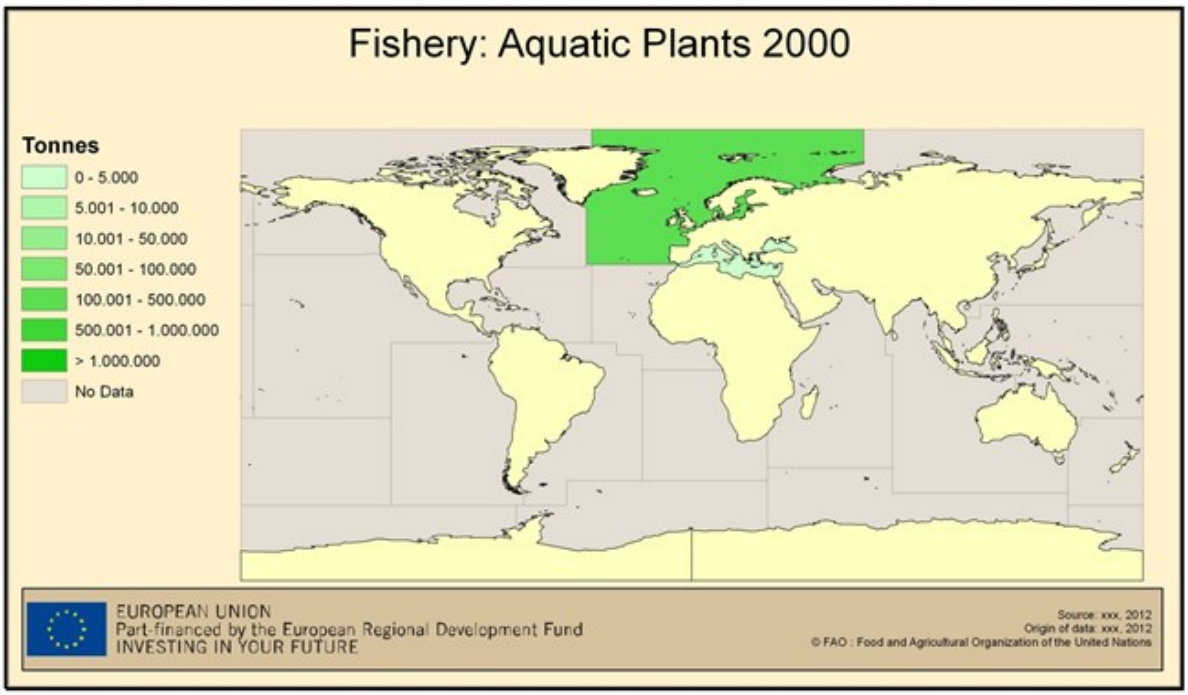
Content:

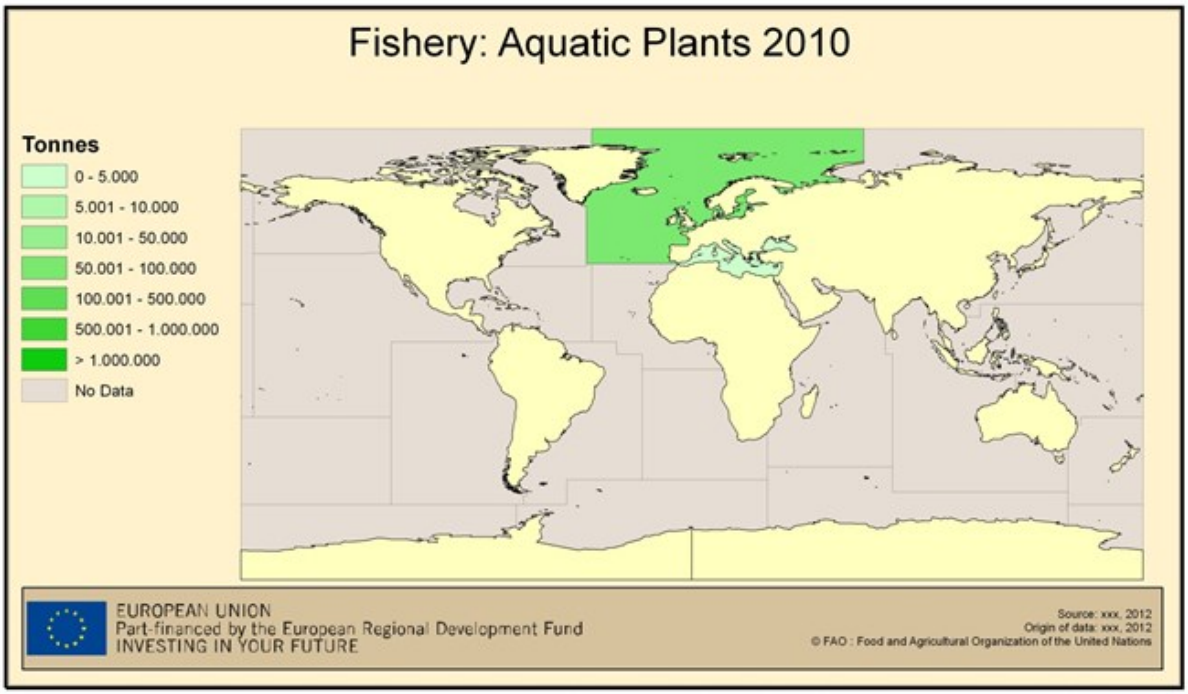
- Dataset 17: FAO Fishing Area overview
- Dataset 18: Fisheries areas and EU fisheries in 2000 and 2010 – Aquatic plants
- Dataset 19: Fisheries areas and EU fisheries in 2000 and 2010 - Cephalopods
- Dataset 20: Fisheries areas and EU fisheries in 2000 and 2010 - Crustaceans
- Dataset 21: Fisheries areas and EU fisheries in 2000 and 2010 – Demersal fish
- Dataset 22: Fisheries areas and EU fisheries in 2000 and 2010 – Freshwater fish
- Dataset 23: Fisheries areas and EU fisheries in 2000 and 2010 – Other marine animals
- Dataset 24: Fisheries areas and EU fisheries in 2000 and 2010 – Molluscs¨
- Dataset 25: Fisheries areas and EU fisheries in 2000 and 2010 – Pelagic fish
- Dataset 26: Fisheries areas and EU fisheries in 2000 and 2010 – Total fisheries and total aquaculture
- Dataset 27: Aquaculture produces according to region and water environment 1950-2010 in tonnes, and 1984-2010 in value, US$
- Dataset 28: Fisheries in tonnes from the four areas: Northern Atlantic, Central Atlantic, Southern Atlantic, and from outside the Atlantic Ocean.
- Dataset 29: Total fisheries in tonnes from the main ocean areas.

Source:

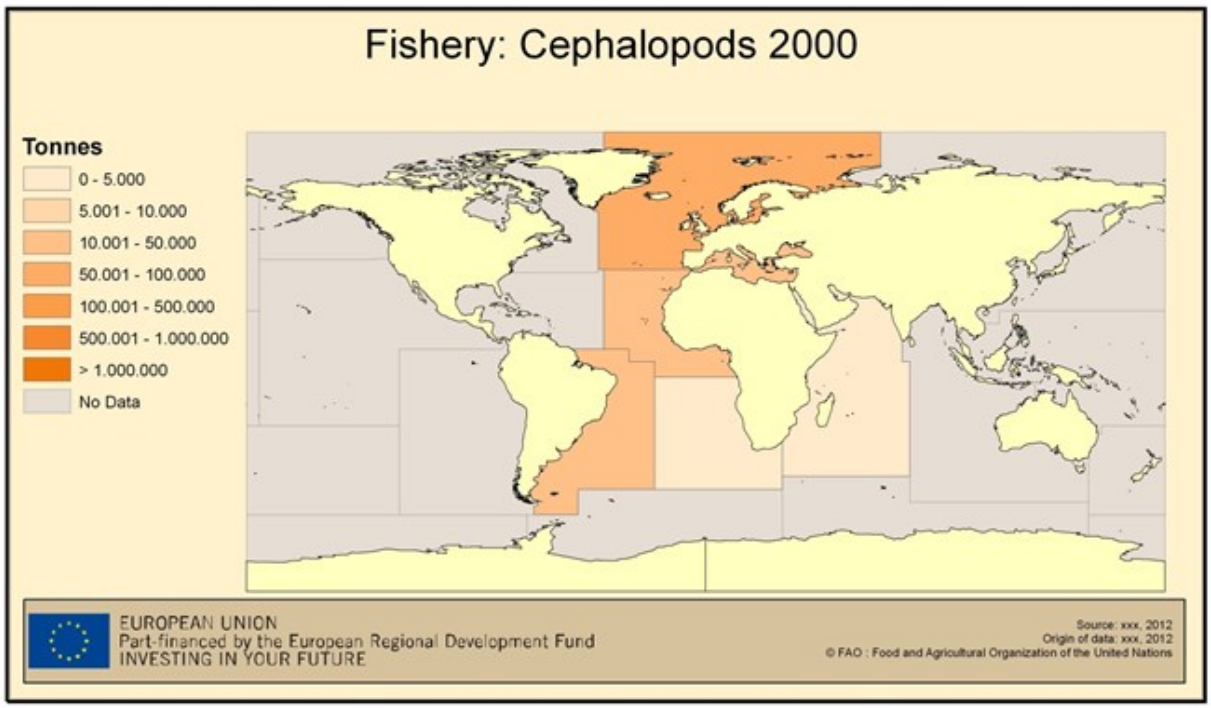


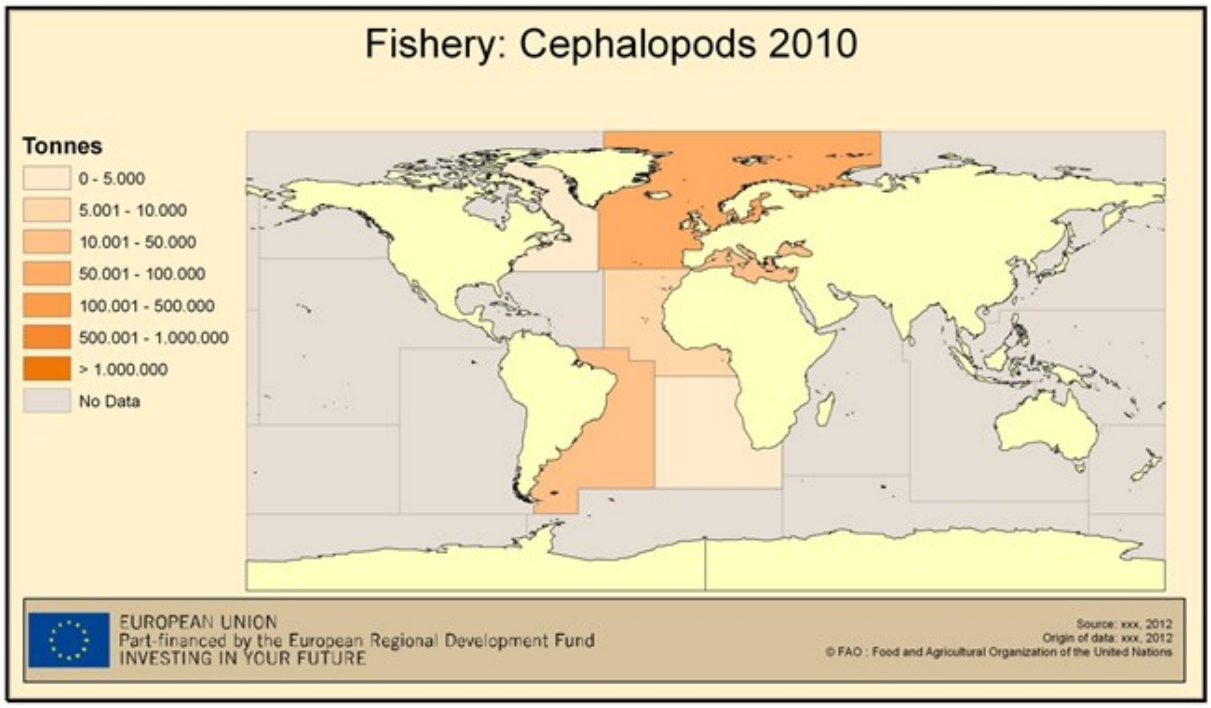
Dataset 17: FAO Fishing Areas overview



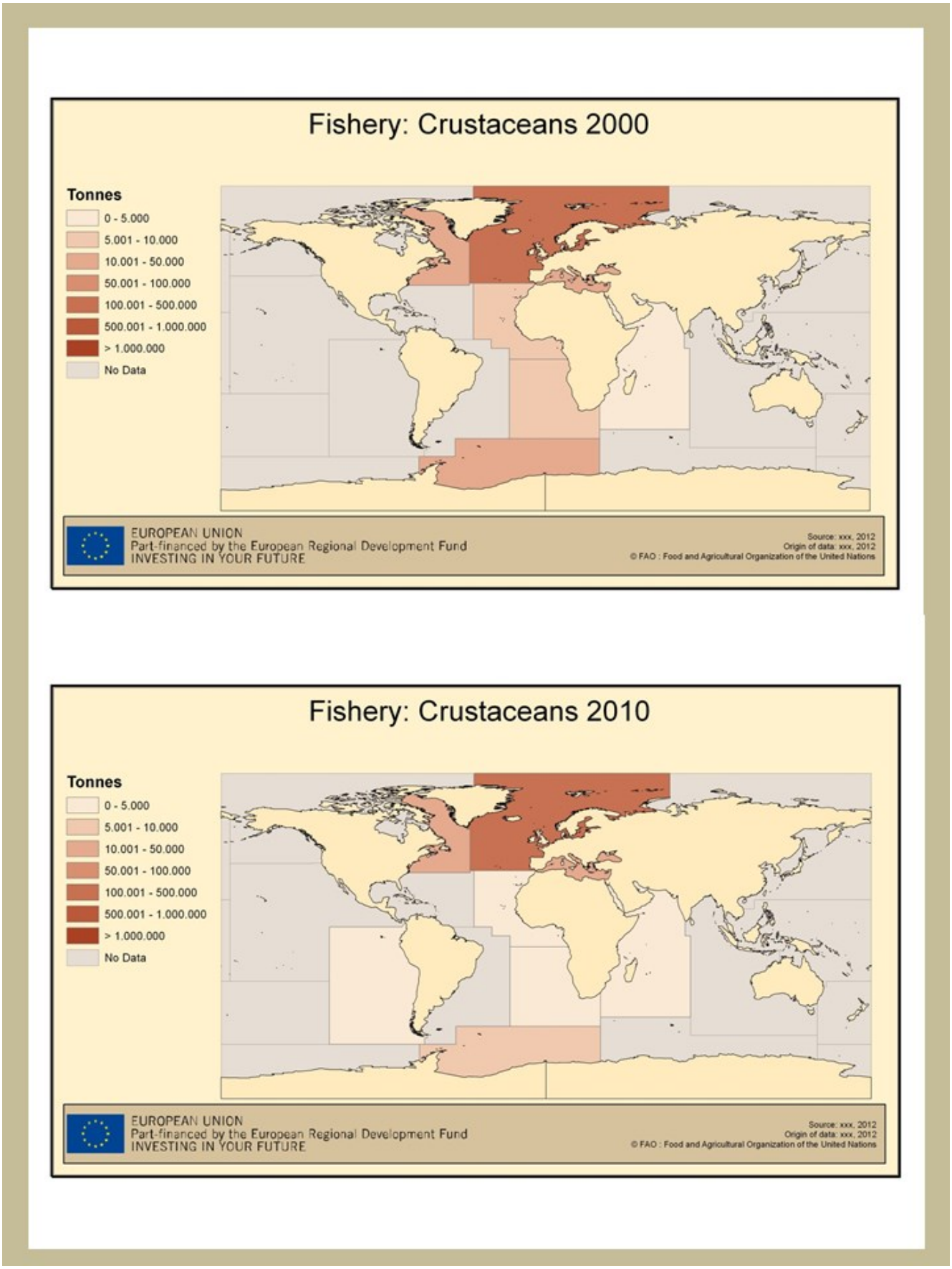


Dataset 18: Fisheries areas and EU fisheries in 2000 and 2010 – Aquatic plants

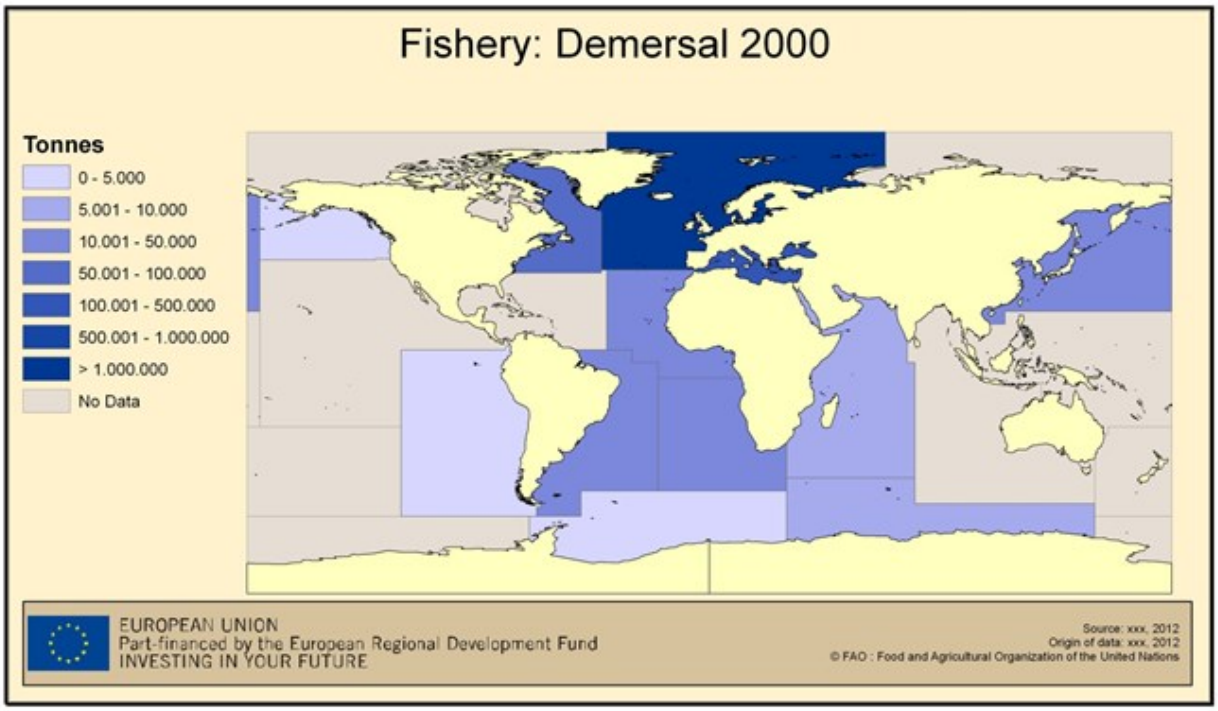


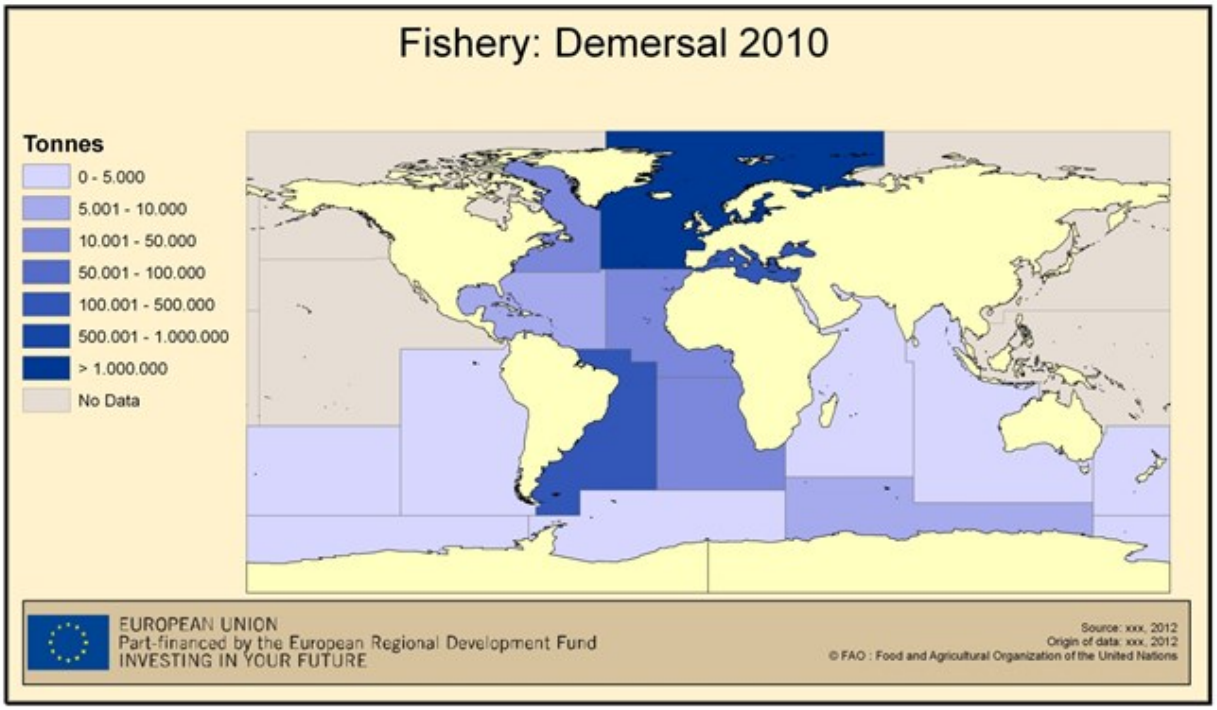


Dataset 19: Fisheries areas and EU fisheries in 2000 and 2010 – Cephalopods

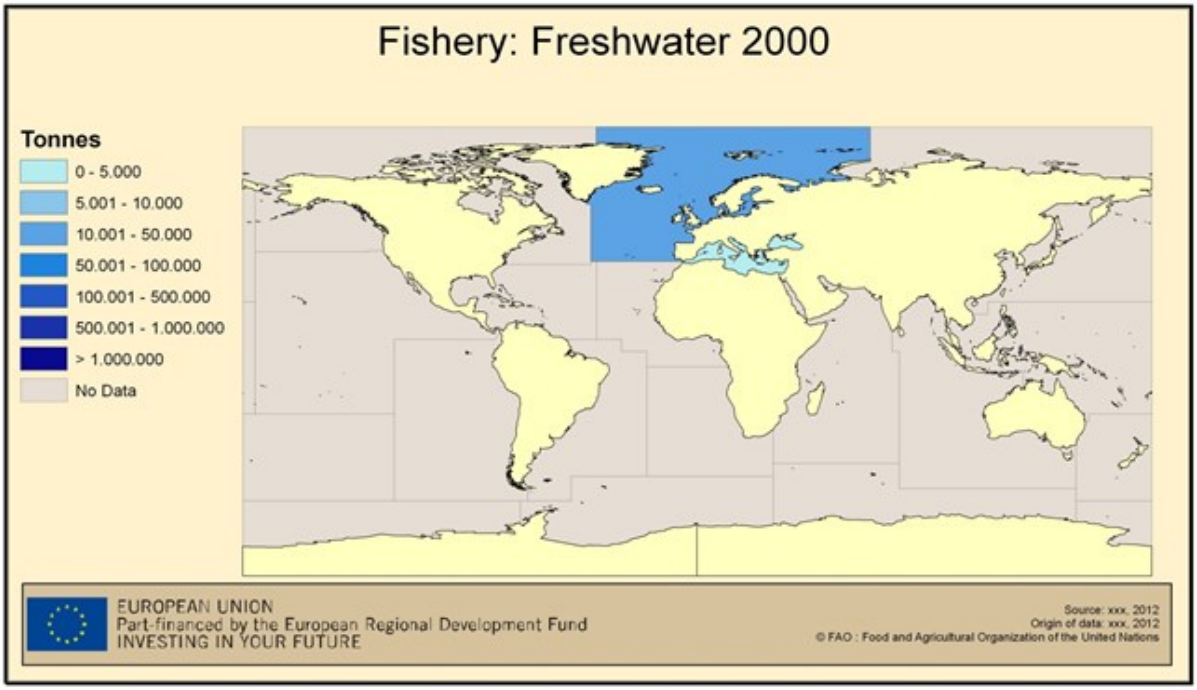


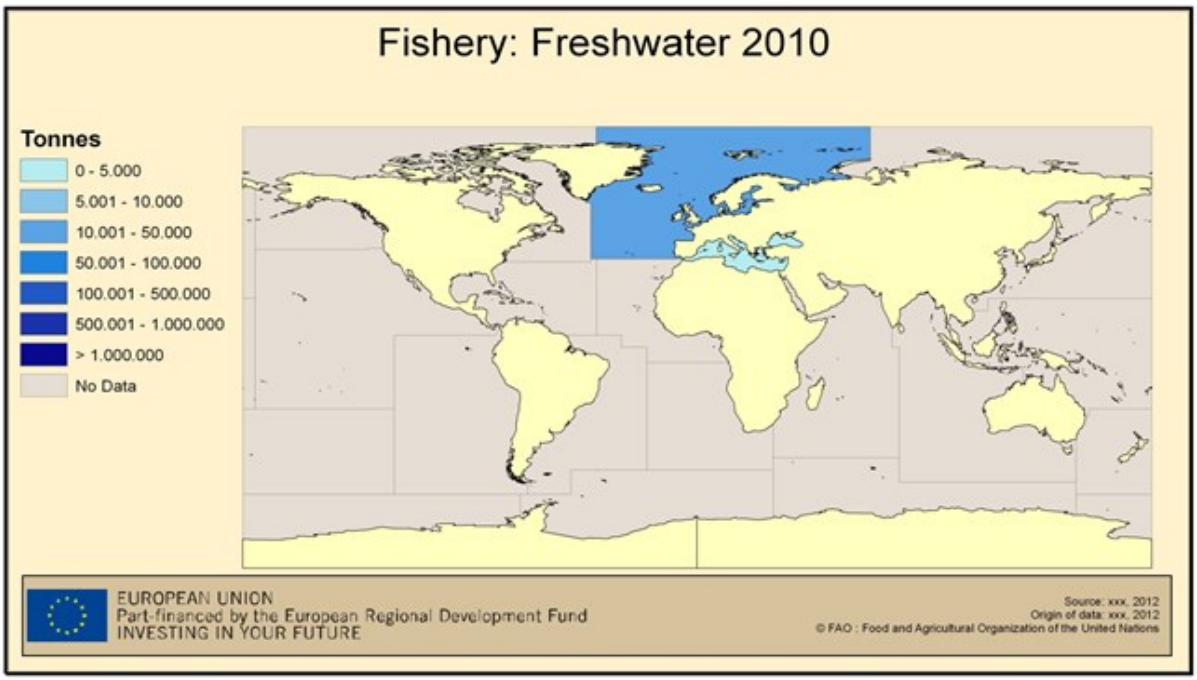
Dataset 20: Fisheries areas and EU fisheries in 2000 and 2010 – Crustaceans



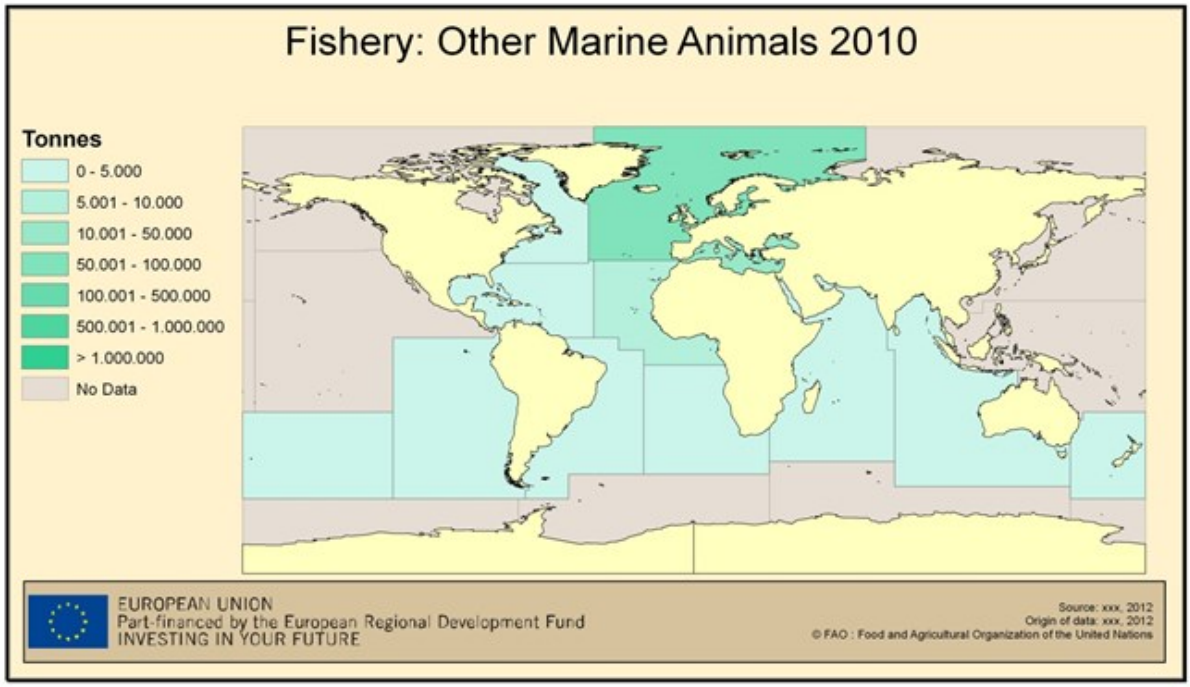


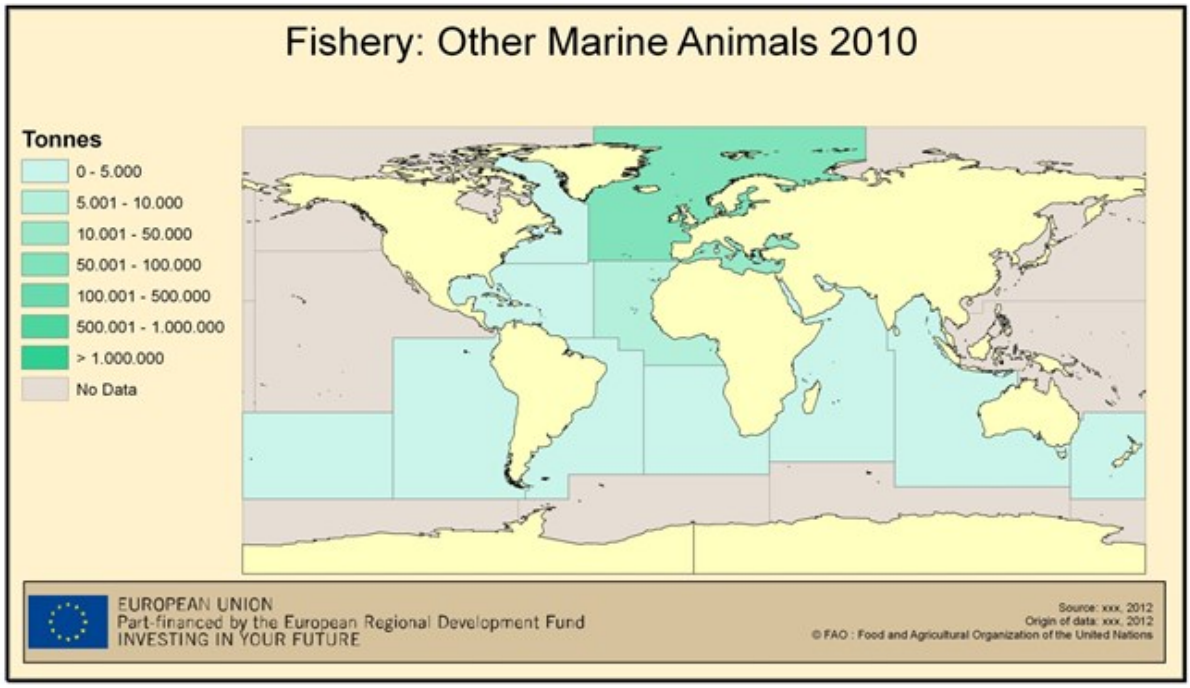
Dataset 21: Fisheries areas and EU fisheries in 2000 and 2010 – Demersal fish



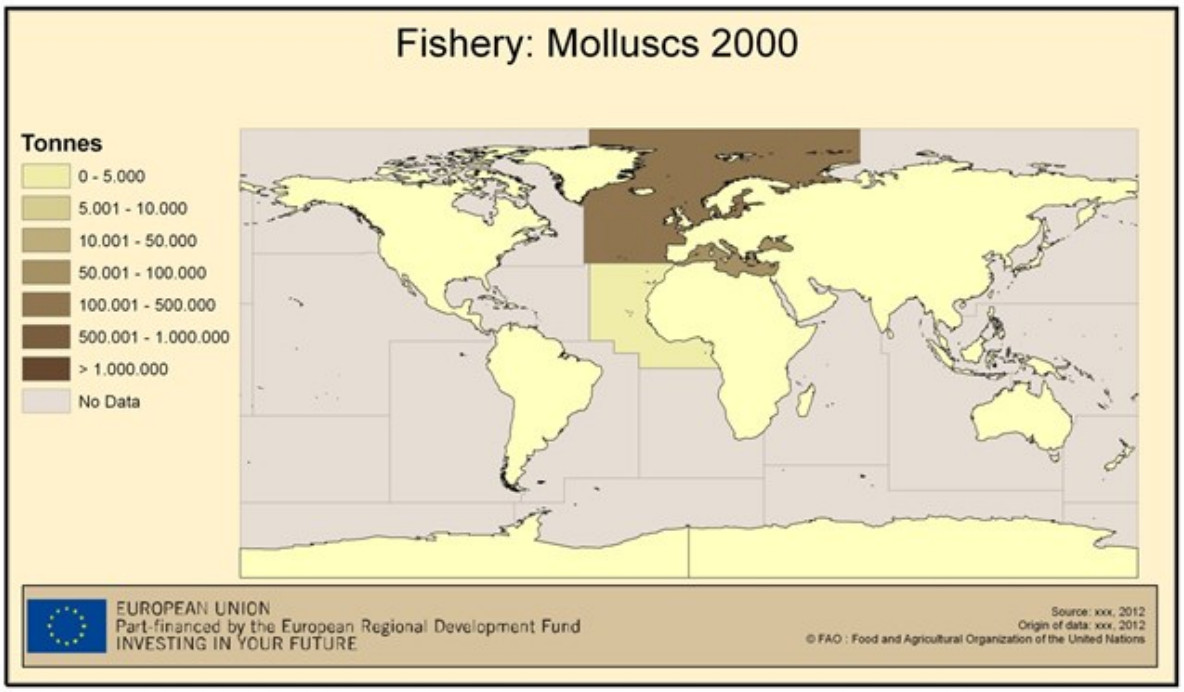


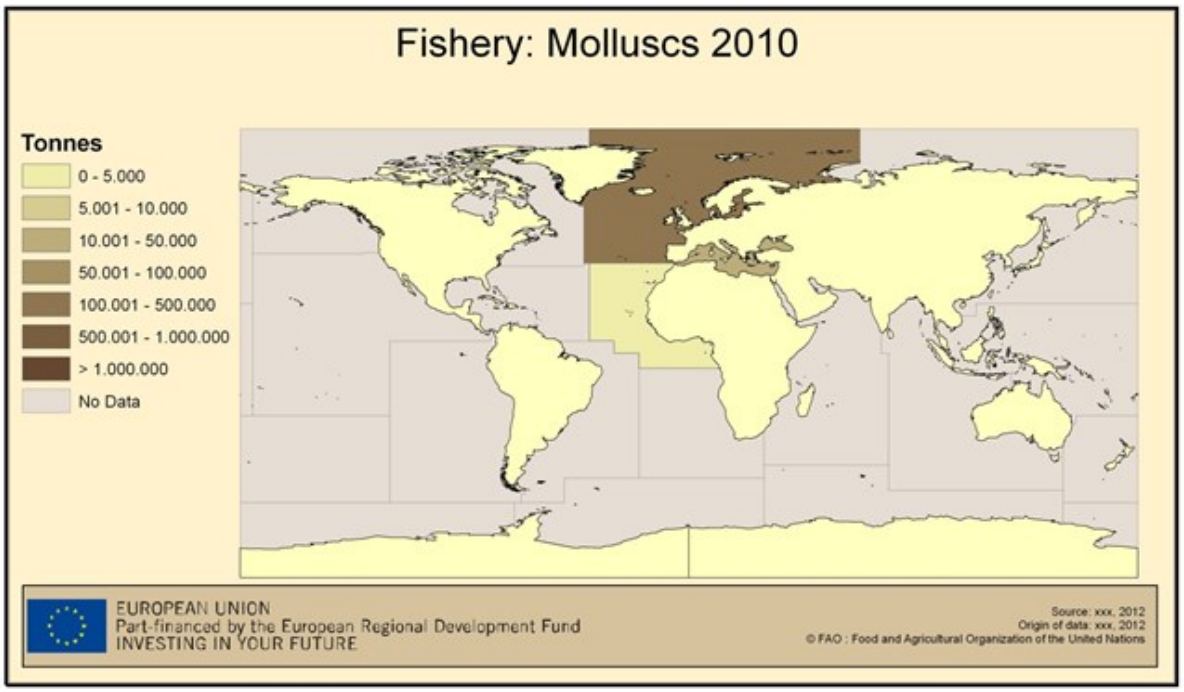
Dataset 22: Fisheries areas and EU fisheries in 2000 and 2010 – Freshwater fish



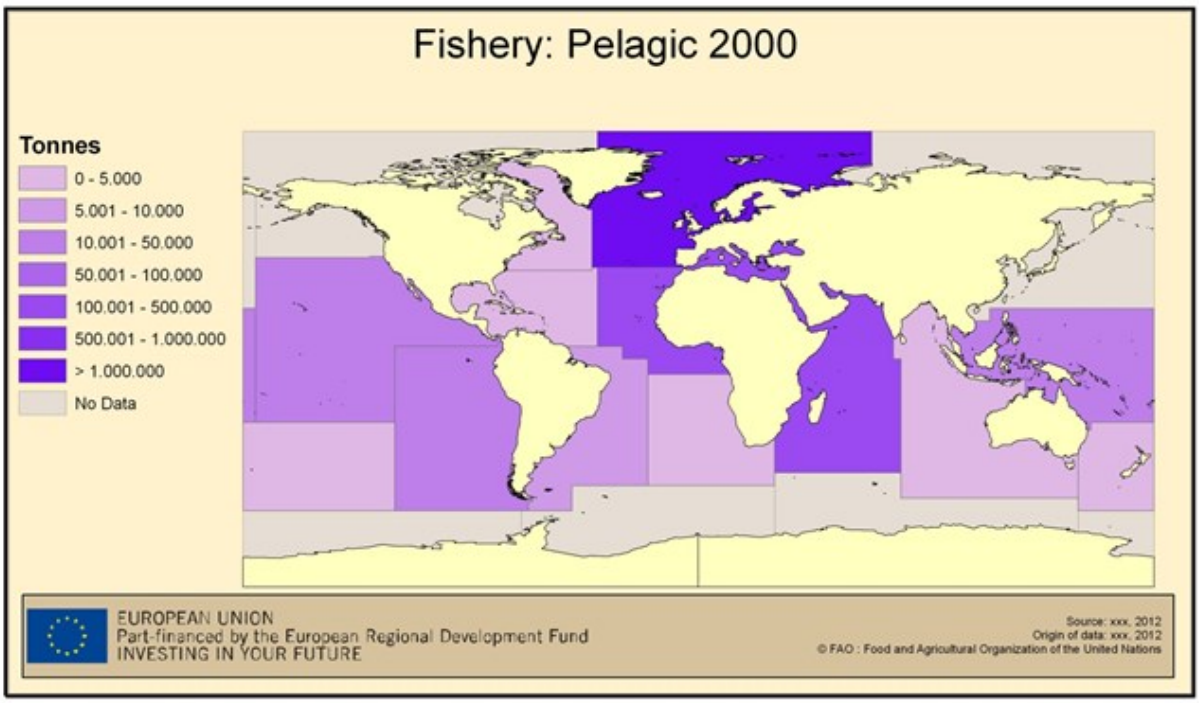


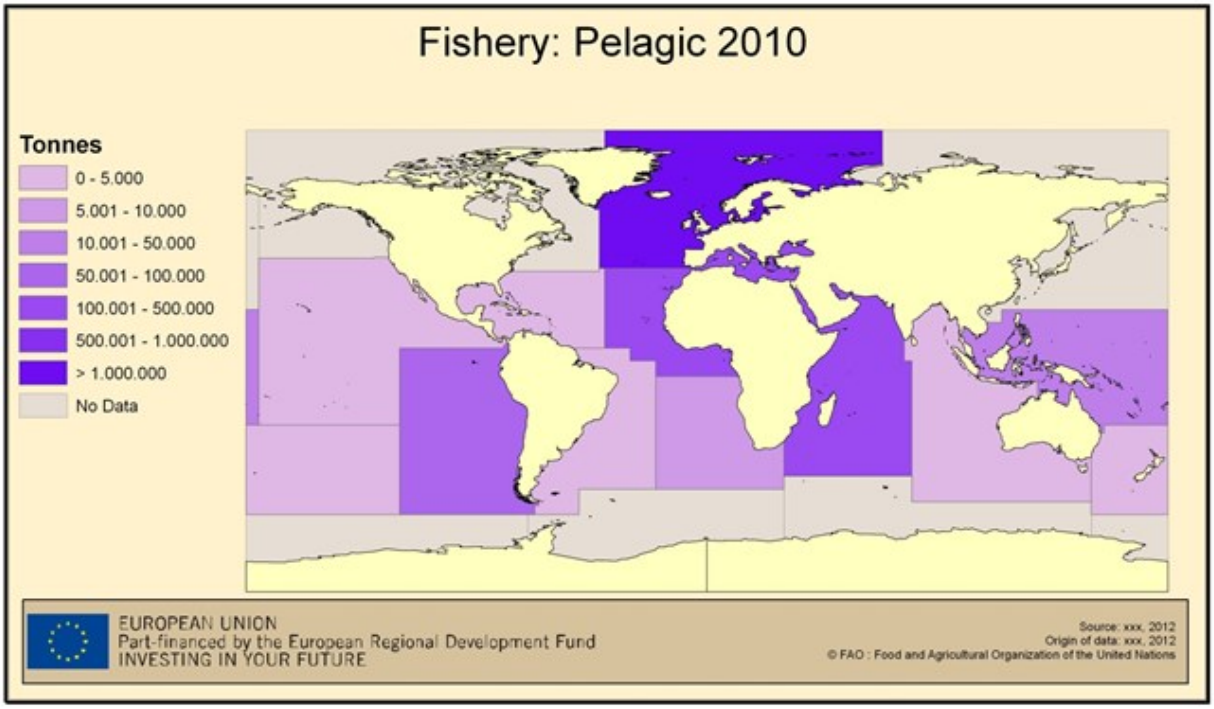
Dataset 23: Fisheries areas and EU fisheries in 2000 and 2010 – Other marine animals



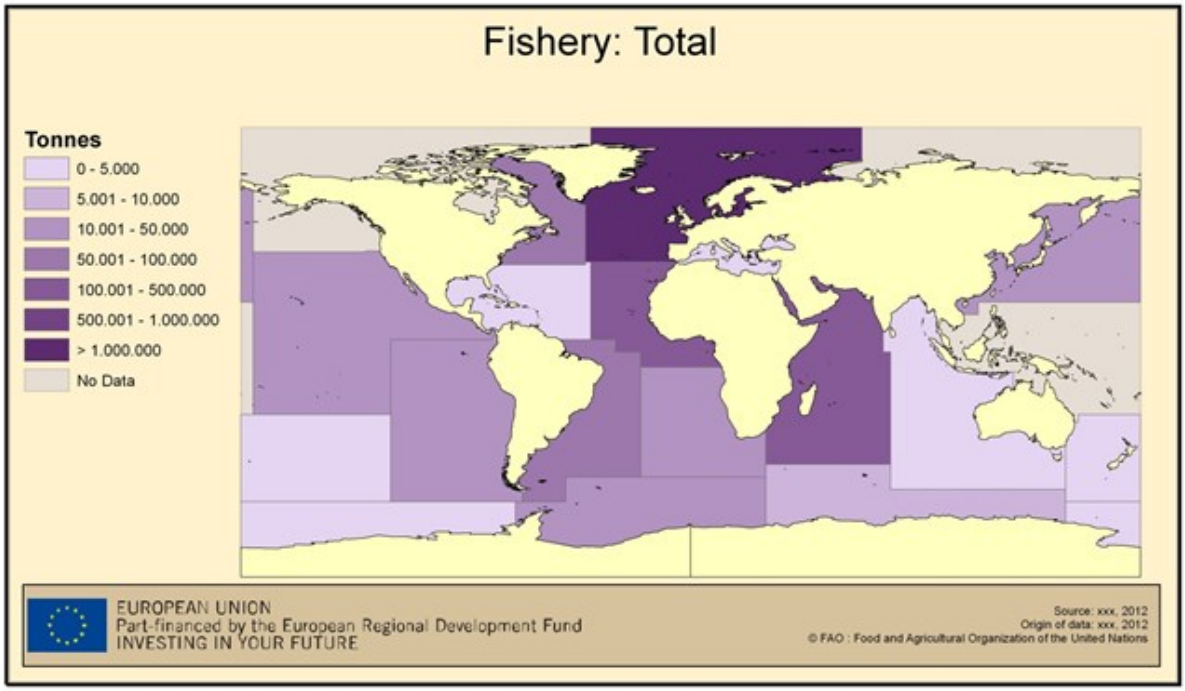


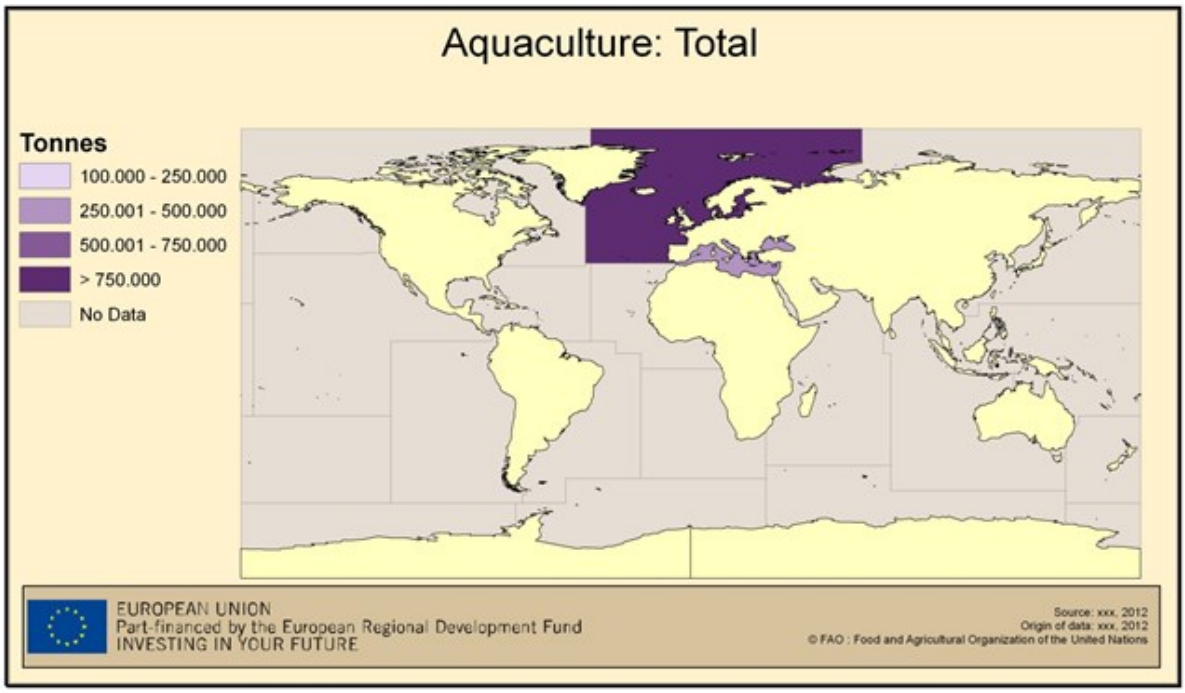
Dataset 24: Fisheries areas and EU fisheries in 2000 and 2010 – Molluscs





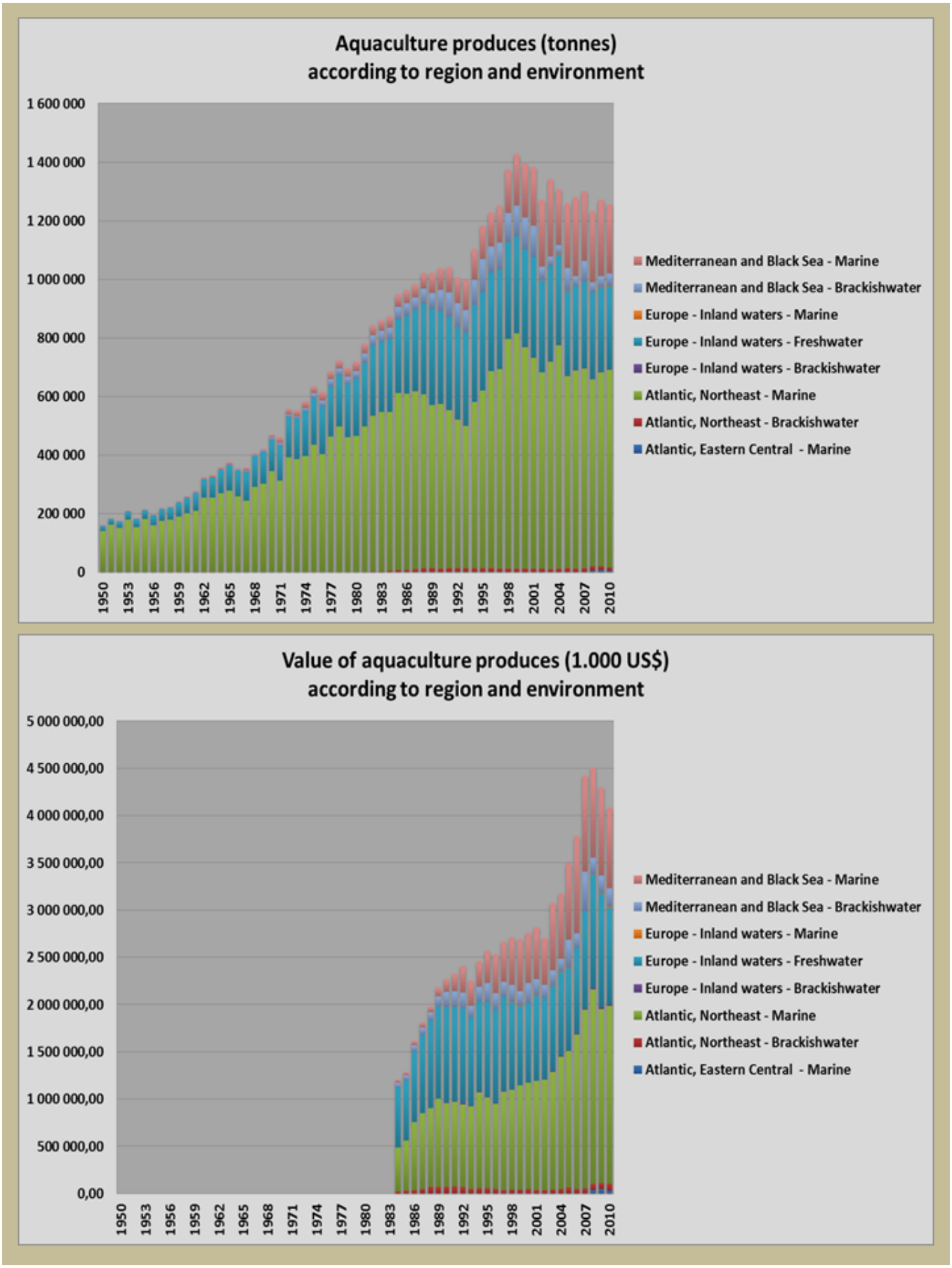
Dataset 25: Fisheries areas and EU fisheries in 2000 and 2010 – Pelagic fish





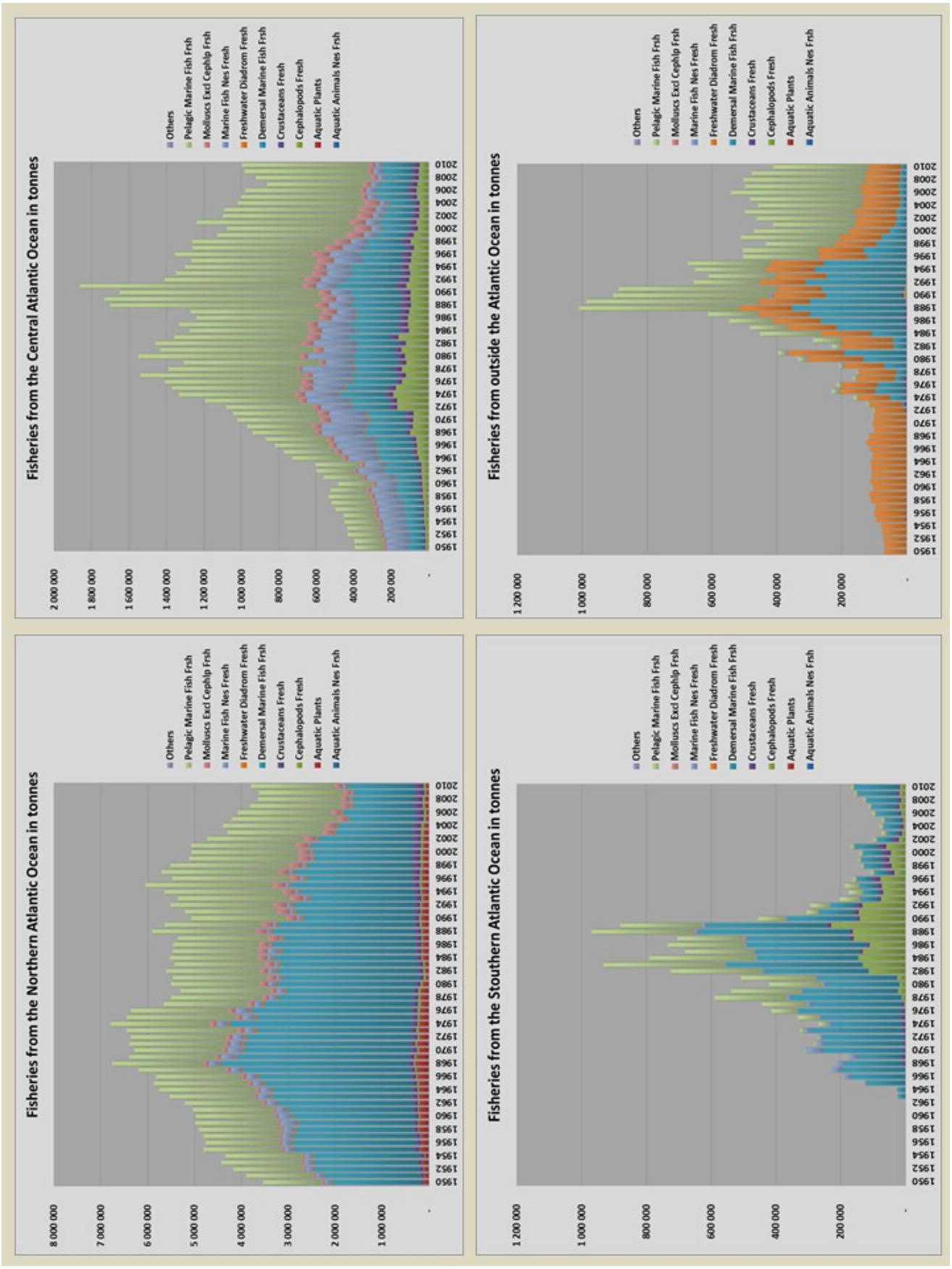
Dataset 26: Fisheries areas and EU fisheries in 2000 and 2010

– Total fisheries and total aquaculture

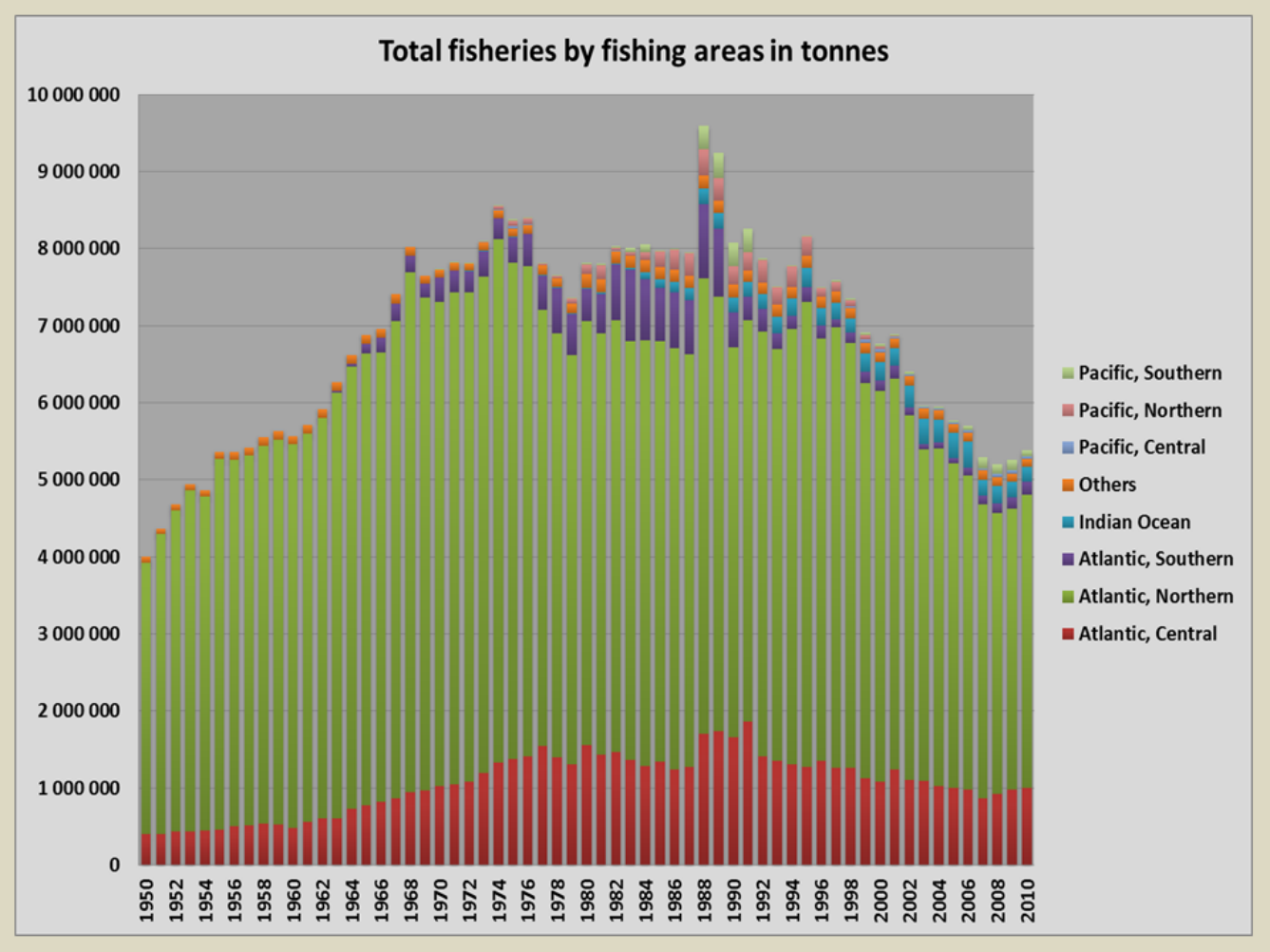


Dataset 27: Aquaculture produces according to region and water environment

1950-2010 in tonnes, and 1984-2010 in value, US$



Dataset 28: Fisheries in tonnes from the four areas: Northern Atlantic, Central Atlantic, Southern Atlantic, and from outside the Atlantic ocean.



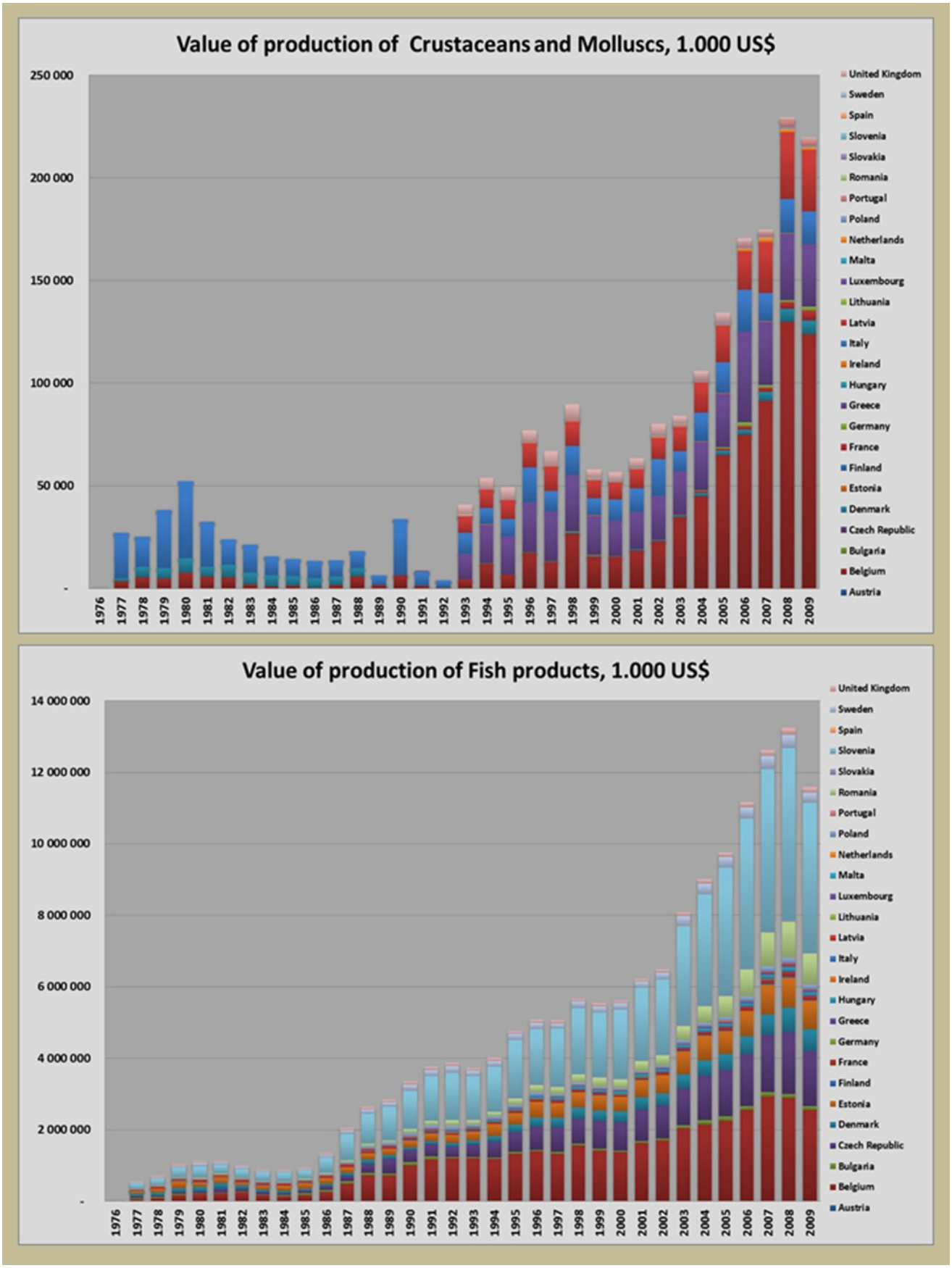
Dataset 29: Total fisheries in tonnes from the main ocean areas

11.4 Appendix 4 – Production

Content:

- Dataset 30: Value of production of products from 1977 to 2009. Above Molluscs and below Fish.

Source:



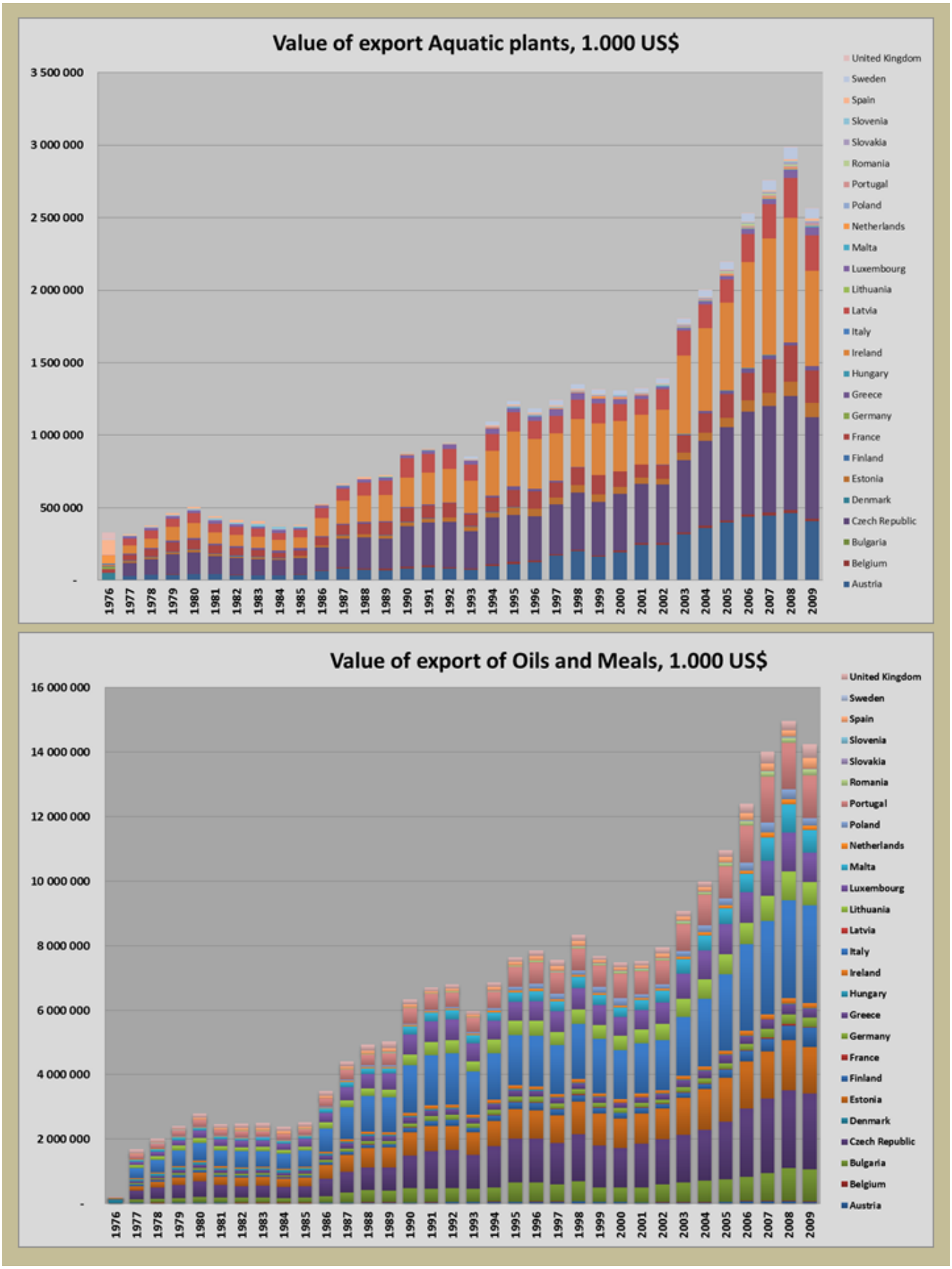
Dataset 30: Value of production of products from 1977 to 2009. Above Molluscs and below Fish

11.5 Appendix 5 – Trade

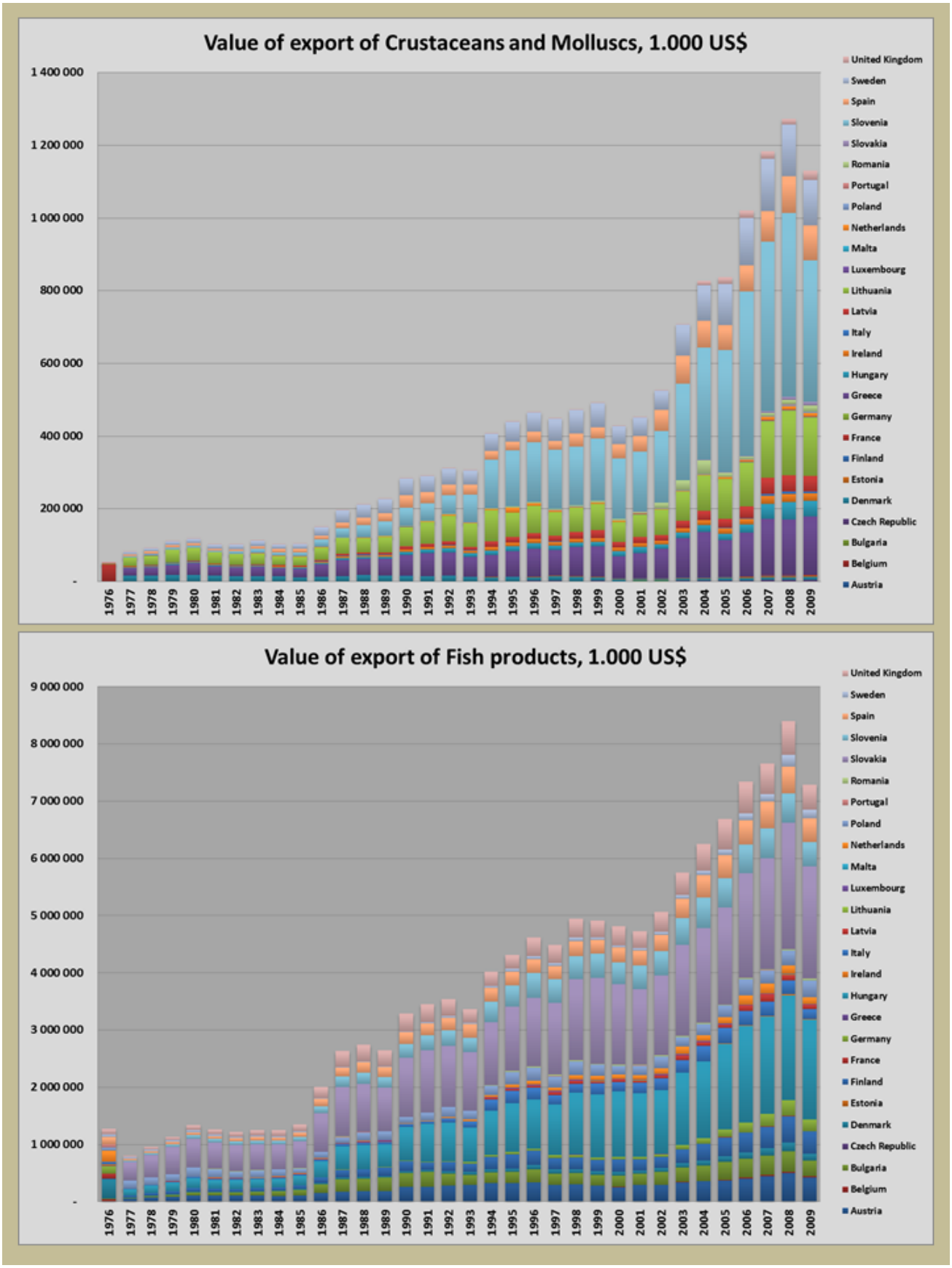
Content:

- Dataset 31: Value of export of Aquatic plants, oils and meals 1976-2009 in 1.000 US$
- Dataset 32: Value of export of crustaceans, molluscs and fish products 1976-2009 in 1.000 US$
- Dataset 33: Value of import of Aquatic plants, oils and meals 1976-2009 in 1.000 US$
- Dataset 34: Value of export of crustaceans, molluscs and fish 1976-2009 in 1.000 US$
- Dataset 35: Export and import 2010 of aquatic plants, Euro per capita
- Dataset 26: Export and import 2010 of crustaceans and molluscs, Euro per capita
- Dataset 37: Export and import 2010 of fish and fish products, Euro per capita
- Dataset 38: Export and import 2010 of inedible products, Euro per capita
- Dataset 39: Export and import 2010 of meals and oils, Euro per capita
- Dataset 40: Net export 2010 of sponges, shells, corals, and aquatic plants, Euro per capita
- Dataset 41: Net export 2010 of fish and fish products, and crustaceans and molluscs, Euro per capita
- Dataset 42: Net export 2010 of inedible products, meals and oils, Euro per capita
- Dataset 43: Net export 2010 of all aquatic products, Euro per capita.

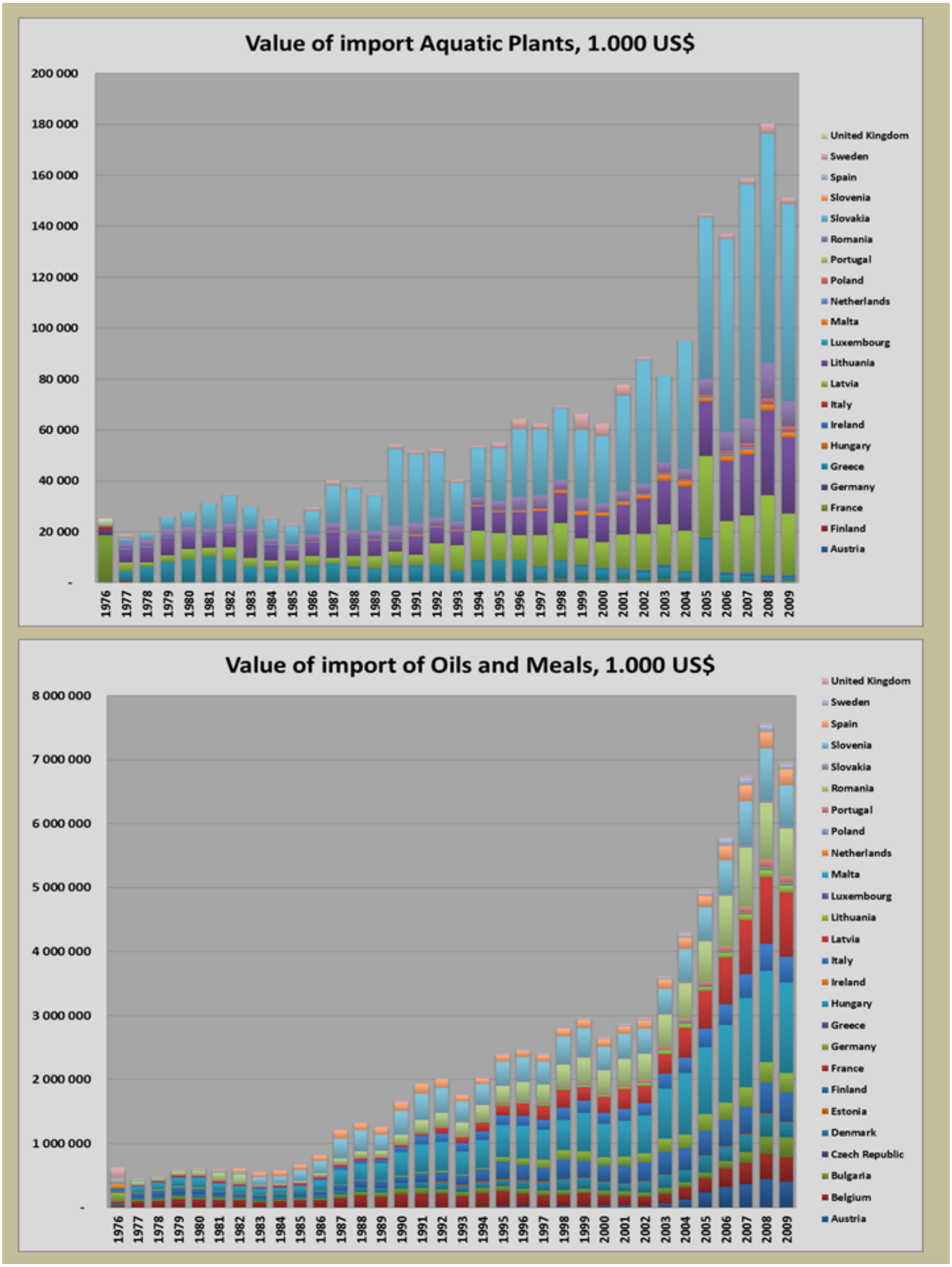
Source:



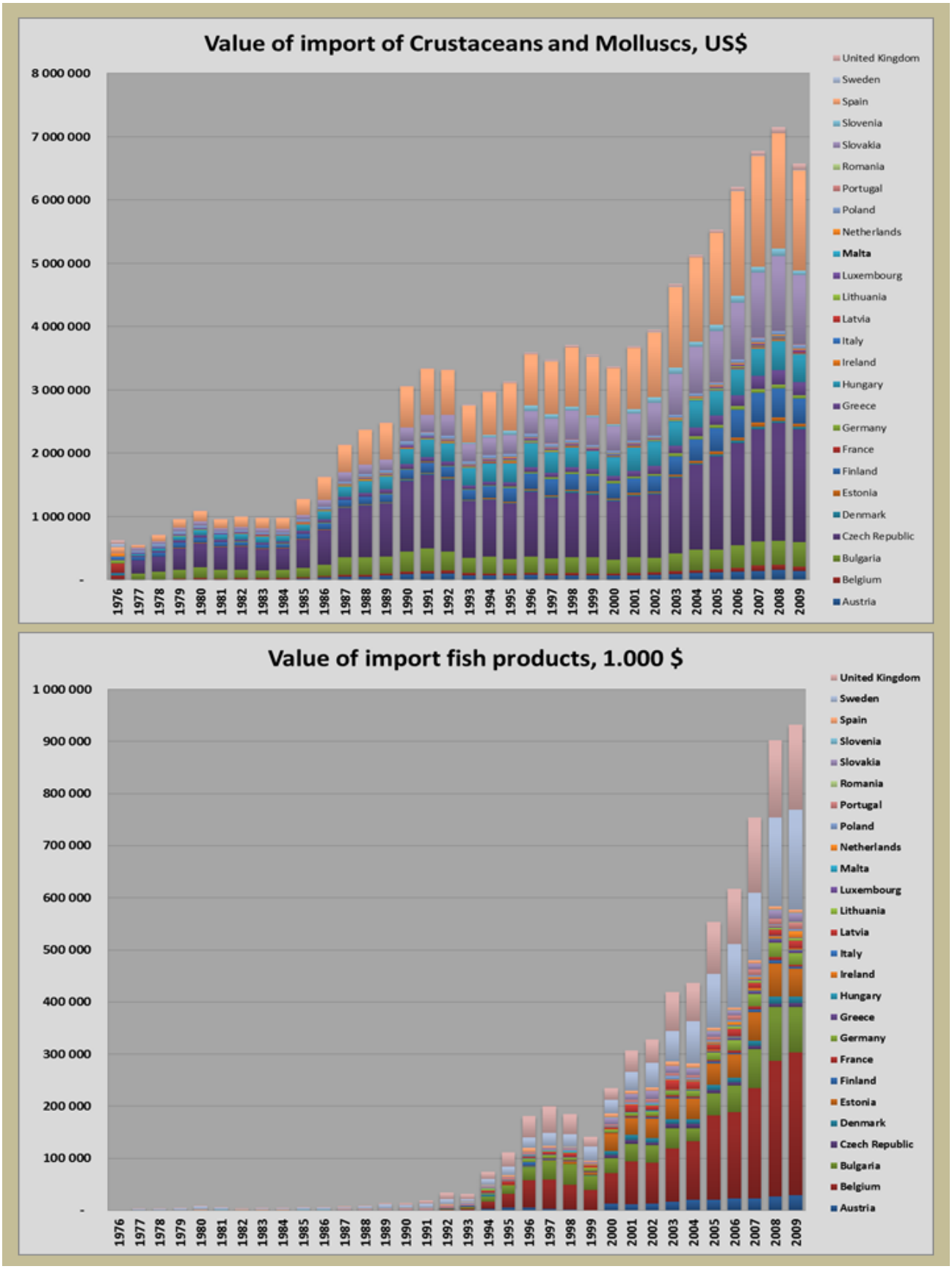
Dataset 31: Value of export of Aquatic plants, oils and meals 1976-2009 in 1.000 US$



Dataset 32: Value of export of crustaceans, molluscs and fish products 1976-2009 in 1.000 US$

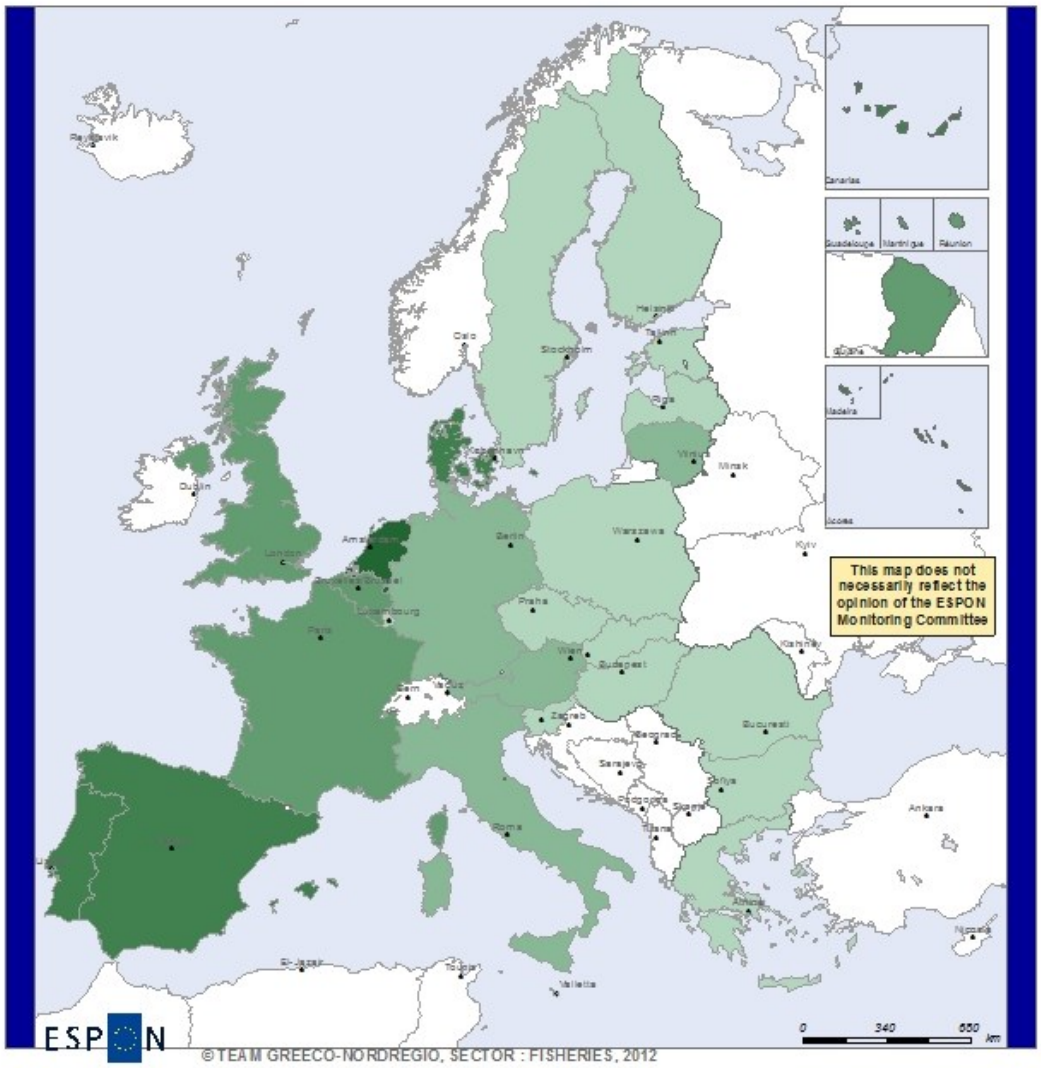


Dataset 33: Value of import of Aquatic plants, oils and meals 1976-2009 in 1.000 US$

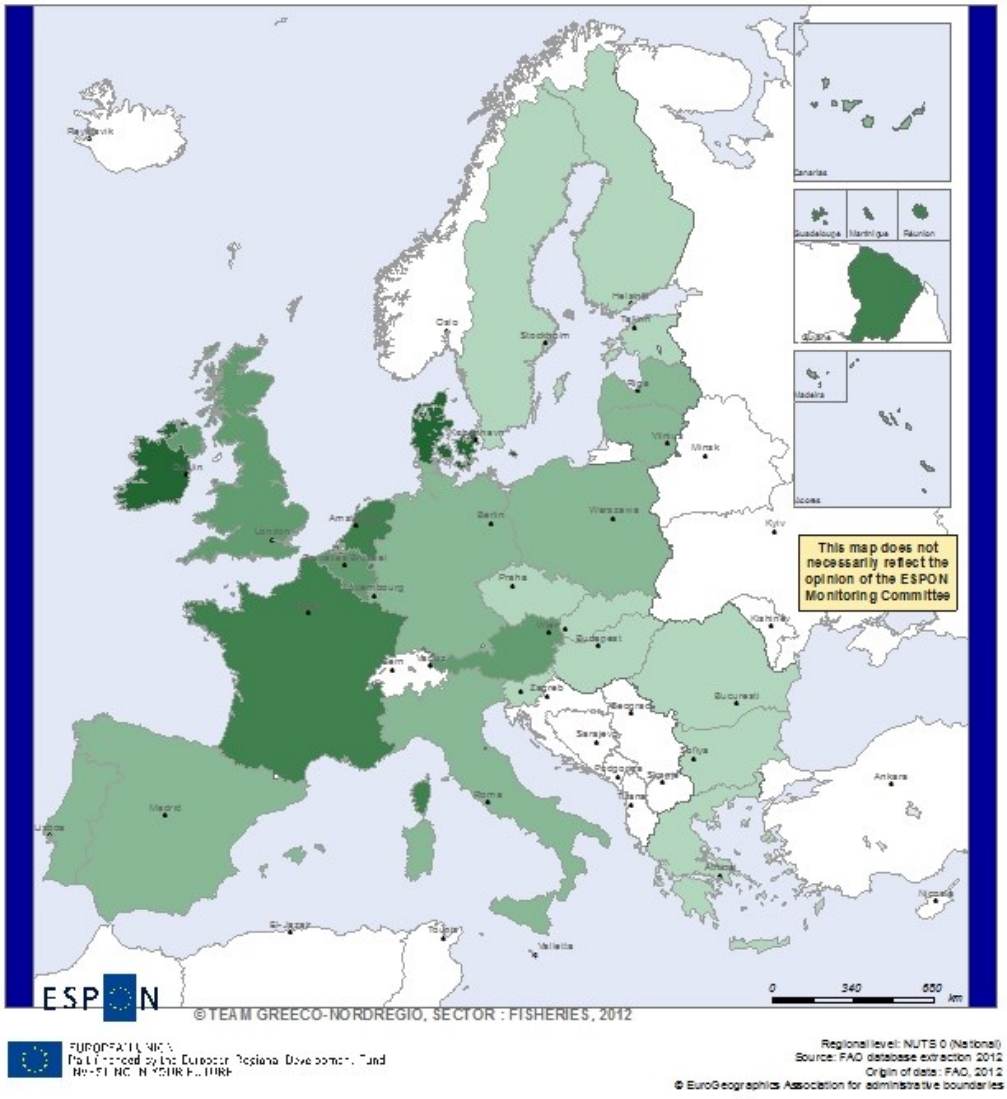


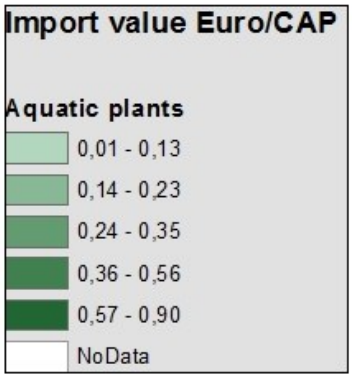
Dataset 34: Value of export of crustaceans, molluscs and fish 1976-2009 in 1.000 US$

Export of aquatic plants
Euro per capita



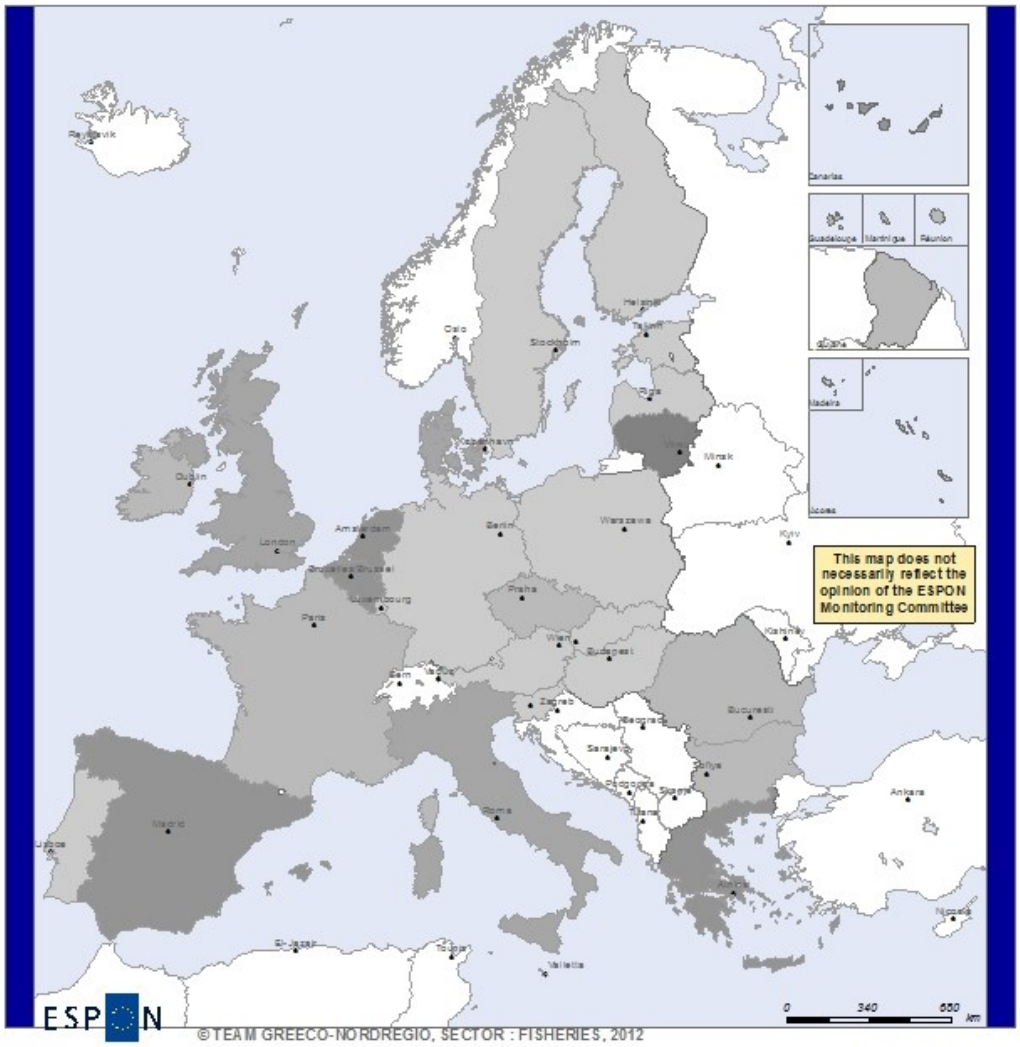
Import of aquatic products
Euro per capita

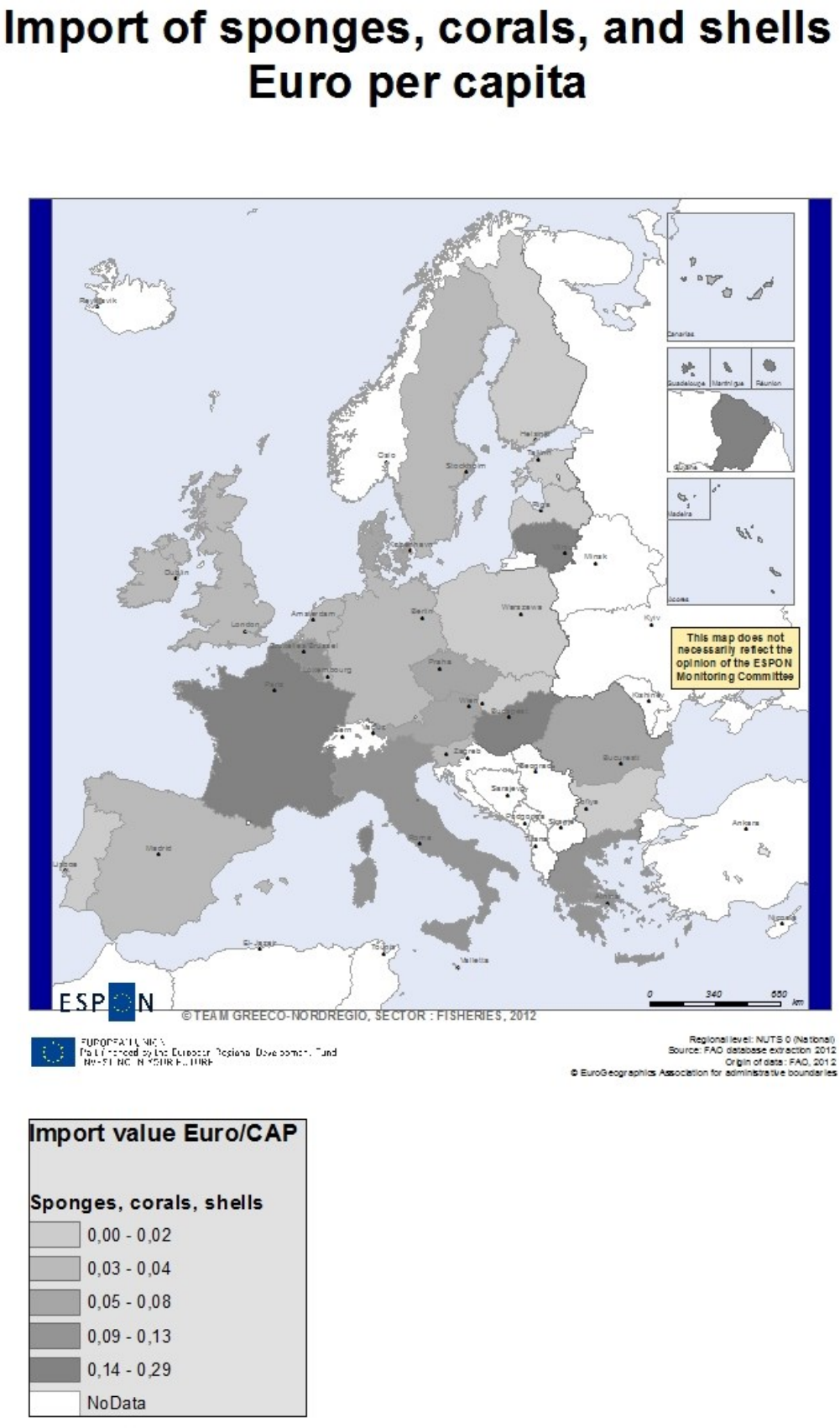




Dataset 35: Export (above) and import (below)2010 of aquatic plants, Euro per capita

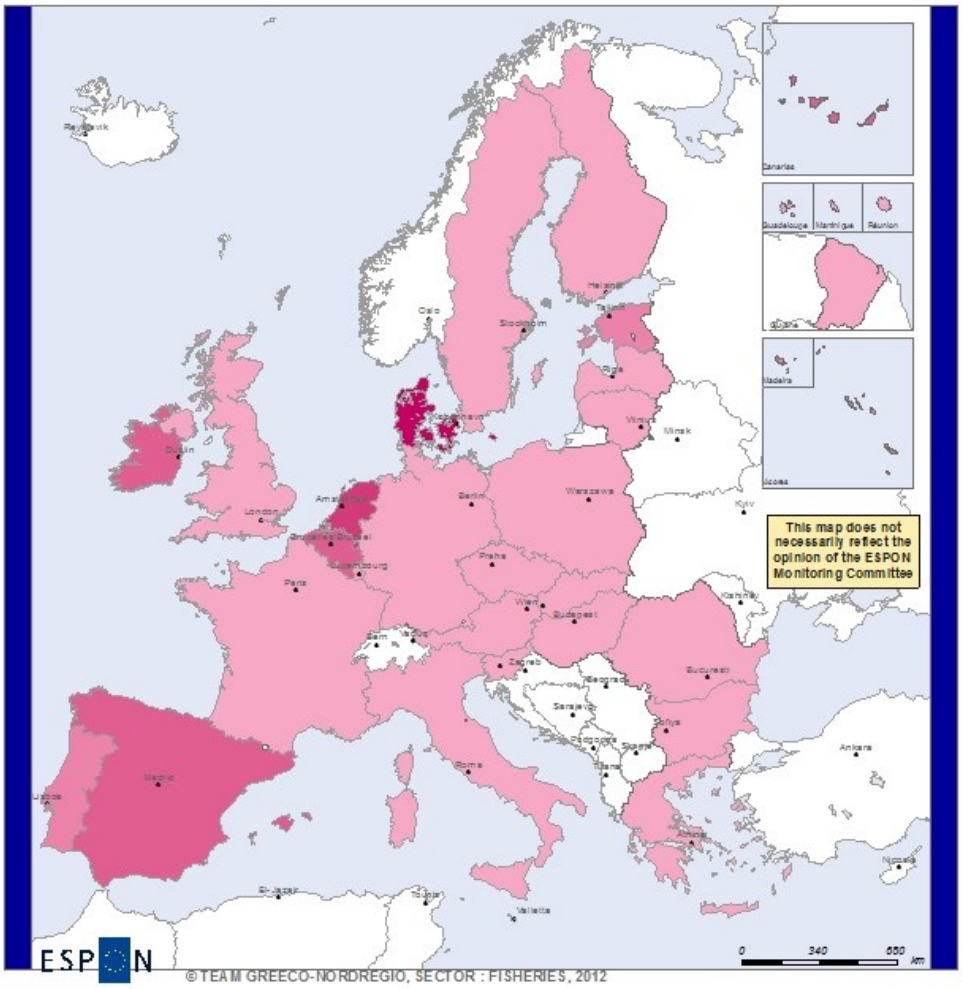
Export of sponges, corals, and shells Euro per capita



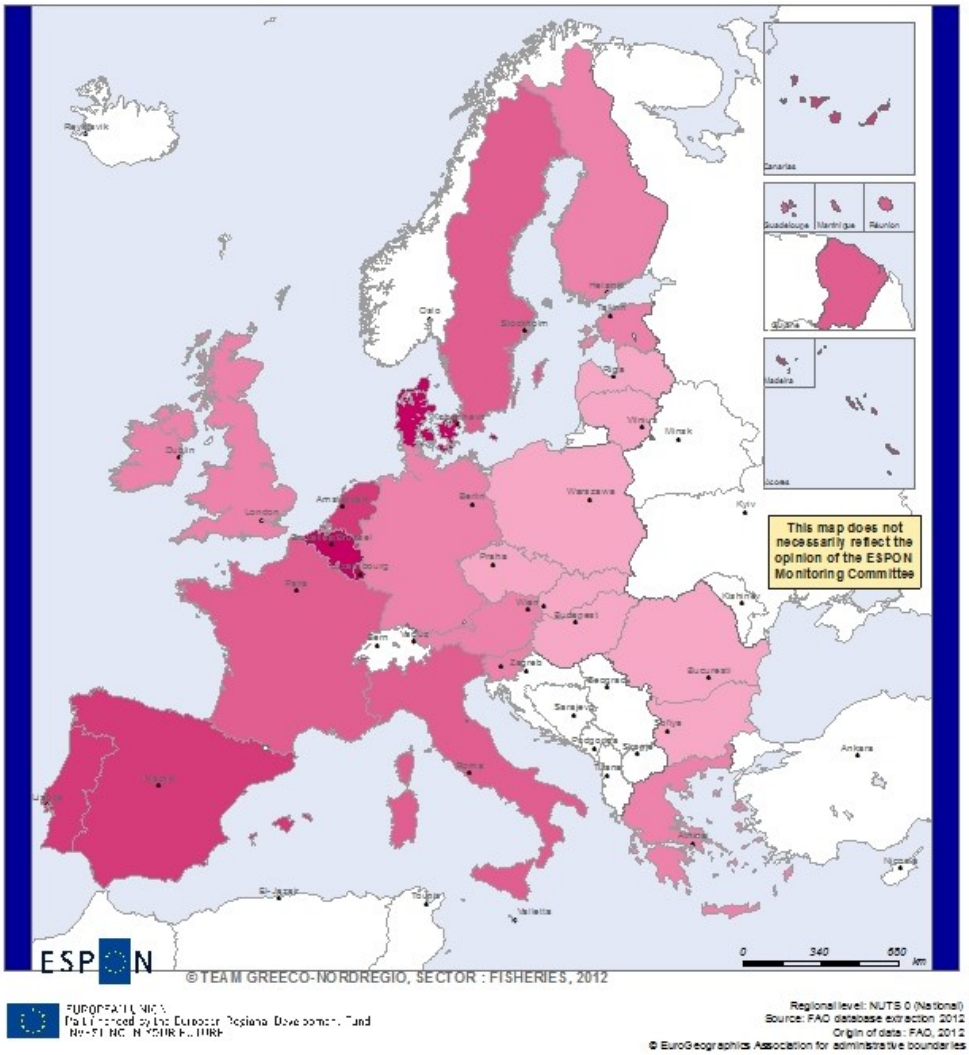


Dataset 36: Export (above) and import (below) 2010 of crustaceans and molluscs, Euro per capita

Export of crustaceans and molluscs Euro per capita

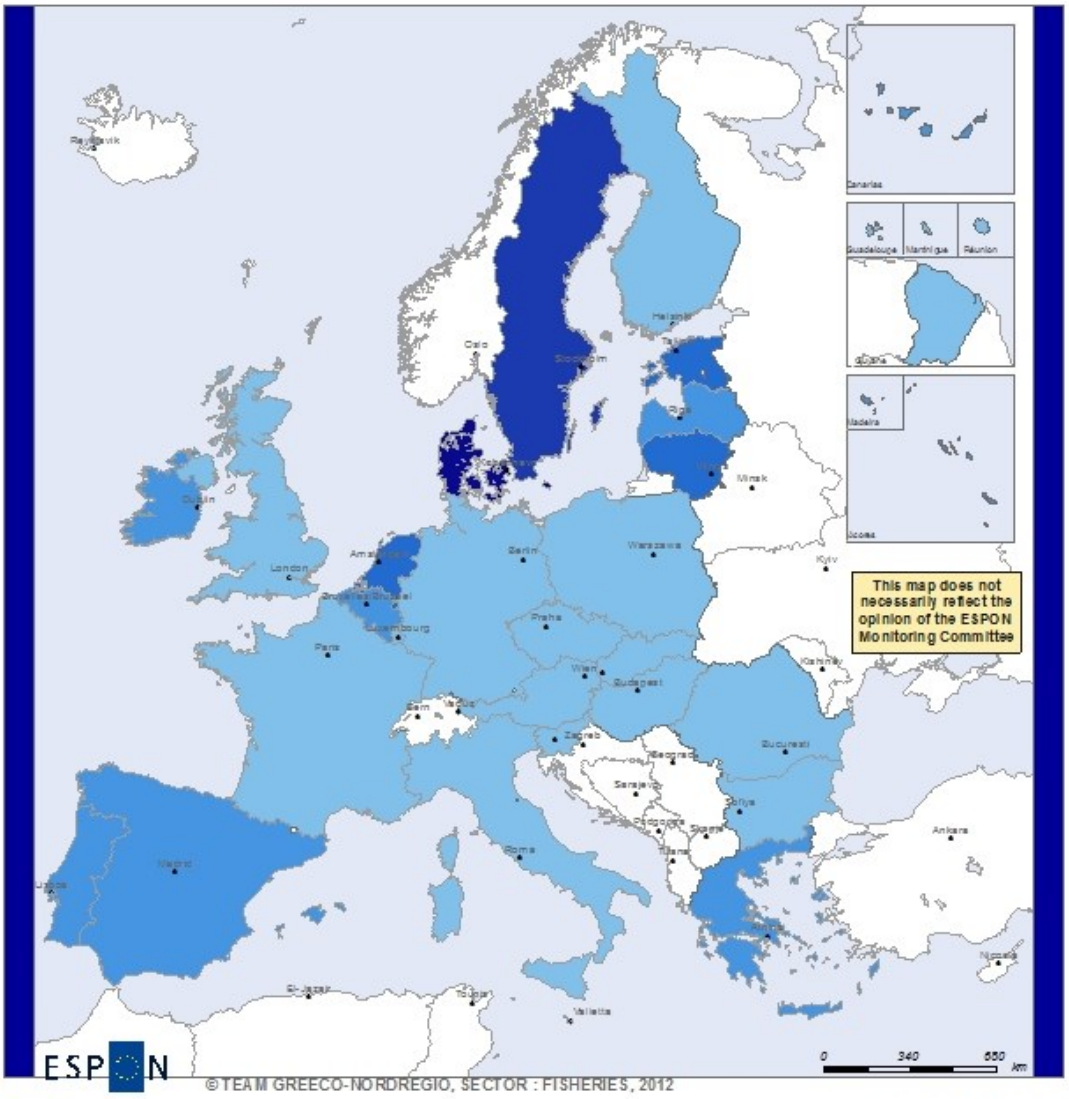


Import of crustaceans and molluscs Euro per capita

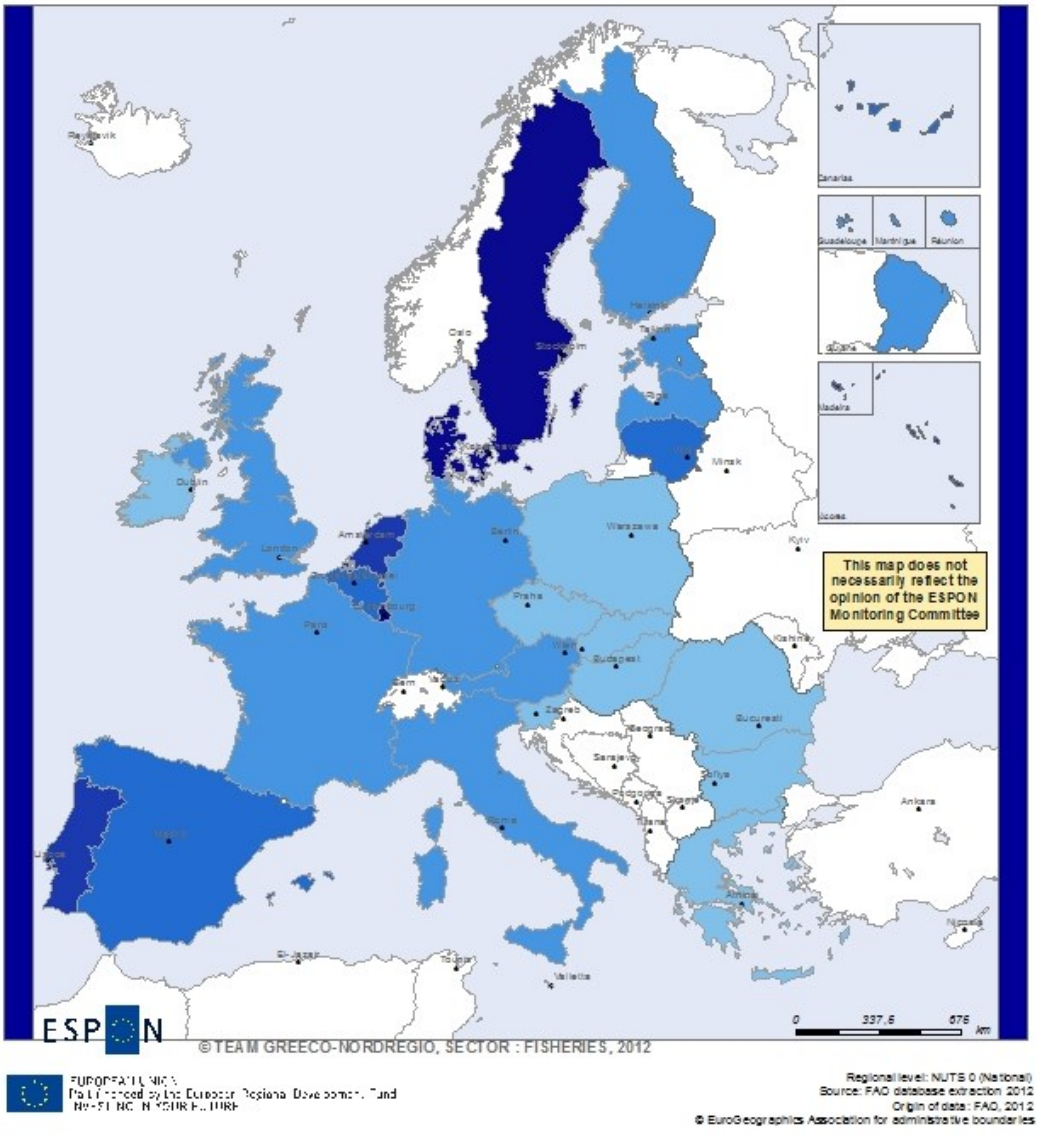


Dataset 37: Export (above) and import (below) 2010 of fish and fish products, Euro per capita

Export of fish and fish products
Euro per capita

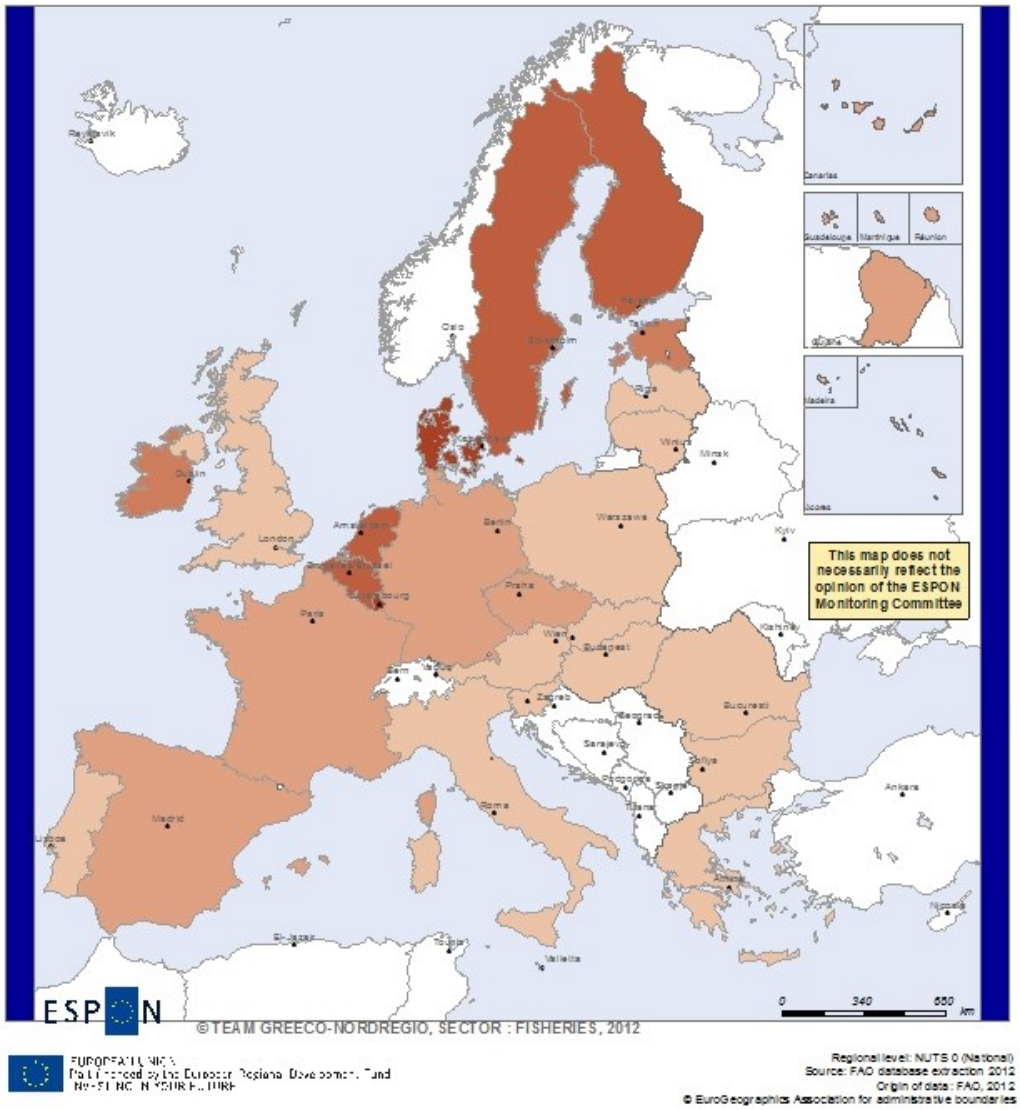


Import of fish and fish products
Euro per capita



Dataset 38: Export (above) and import (below) 2010 of inedible products, Euro per capita

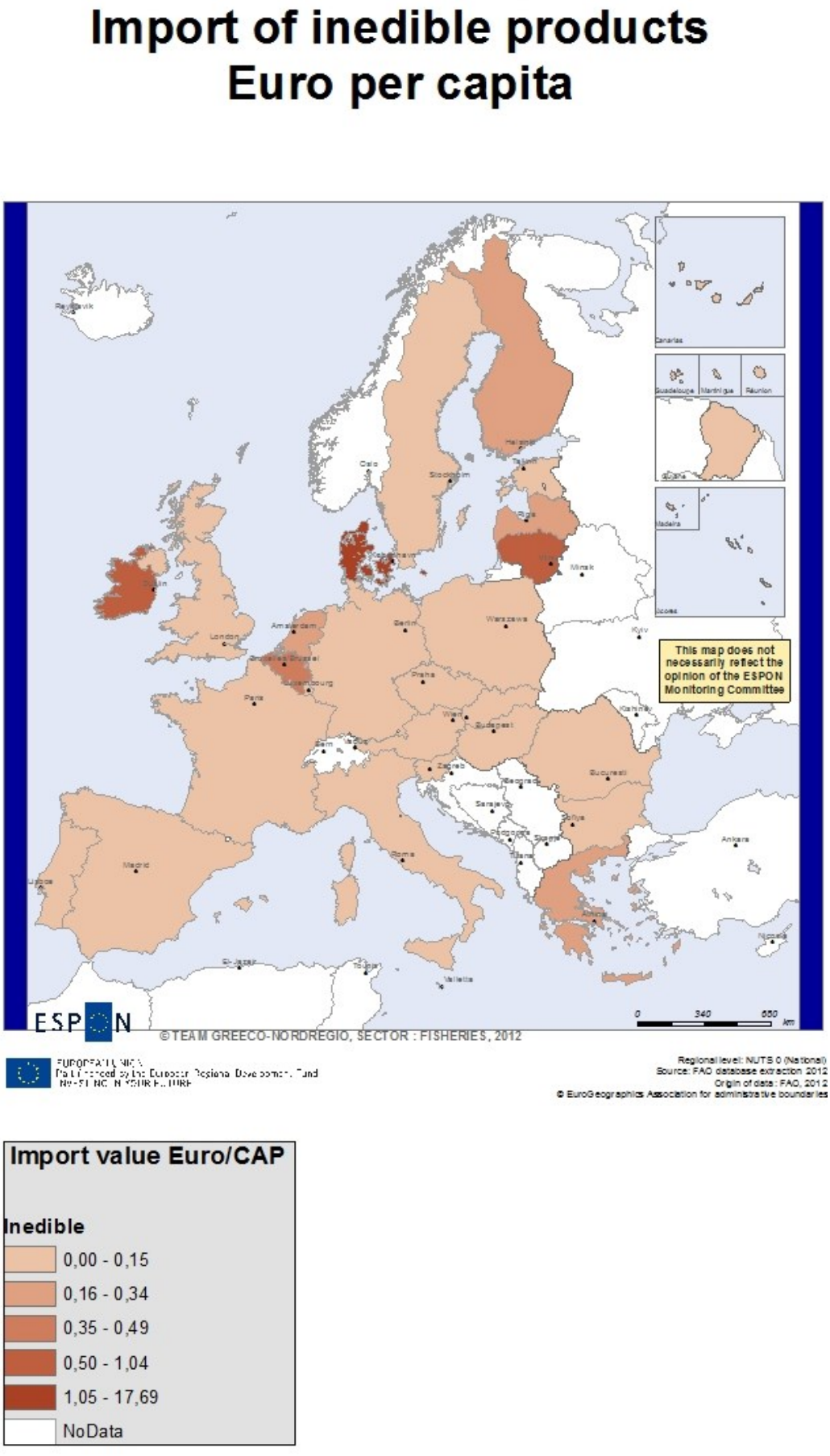
Export of inedible products
Euro per capita



Export value Euro/CAP

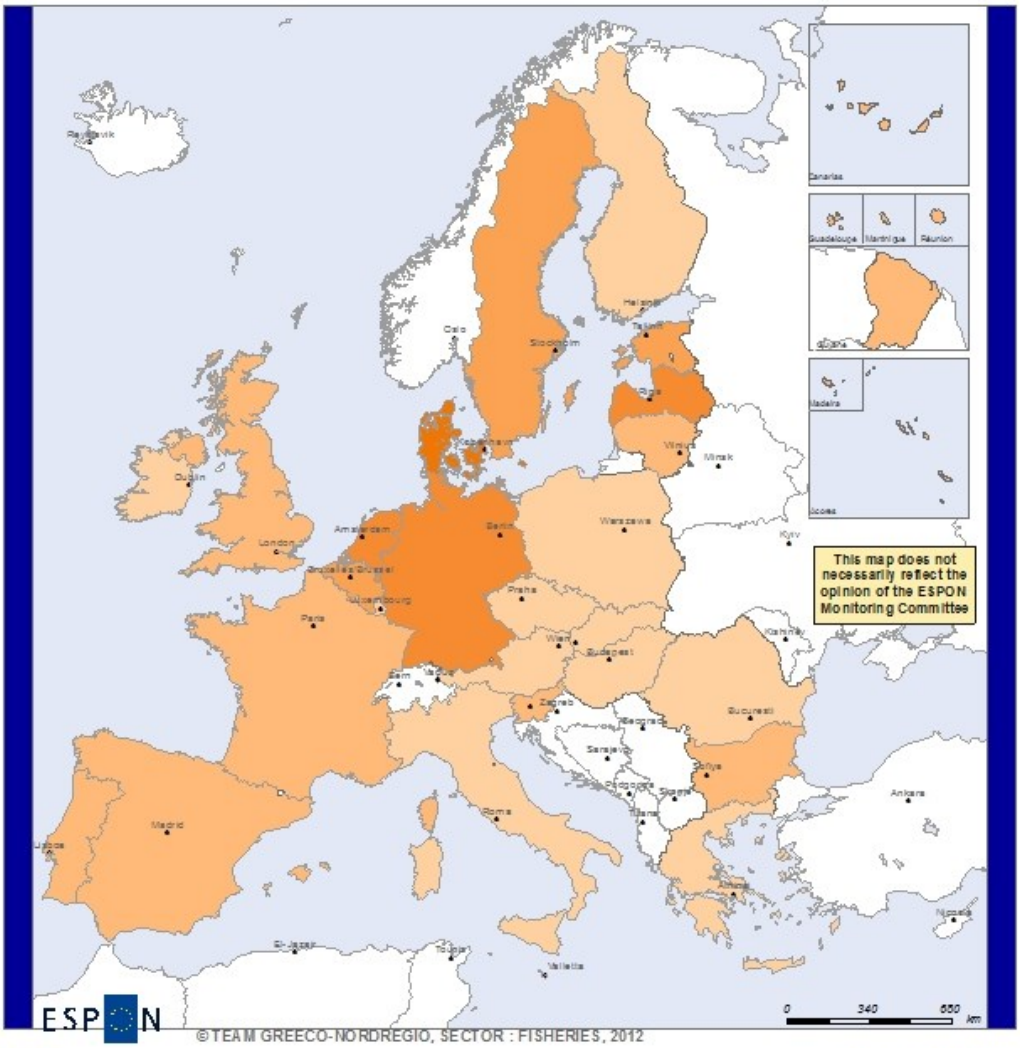
Inedible

- 0,00 - 0,04
- 0,05 - 0,08
- 0,09 - 0,29
- 0,30 - 0,62
- 0,63 - 2,45
- NoData



Dataset 39: Export (above) and import (below)2010 of meals and oils, Euro per capita

Export of meals and oils
Euro per capita



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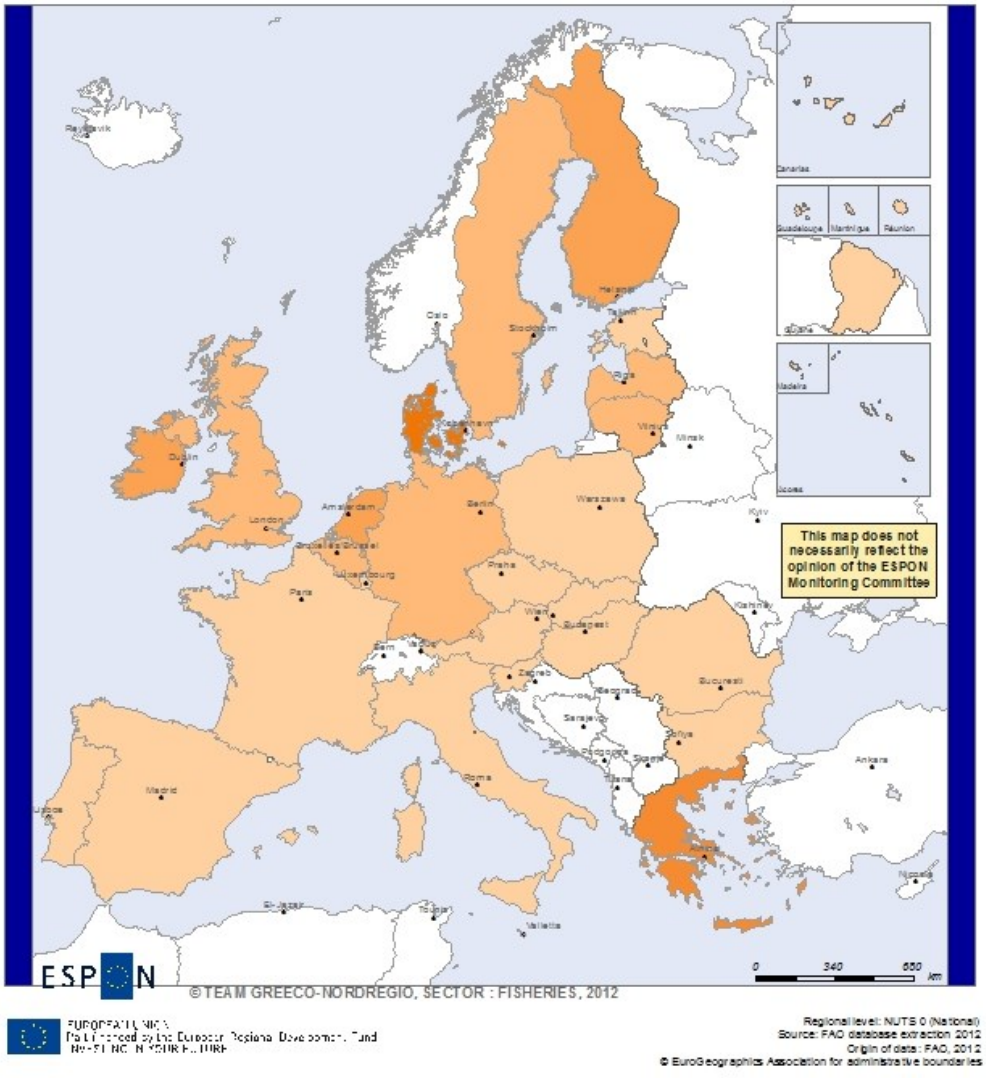
Regional level: NUTS 0 (National)
Source: FAO database extraction 2012
Origin of data: FAO, 2012
© EuroGeographics Association for administrative boundaries

Export value Euro/CAP

Meals and oils

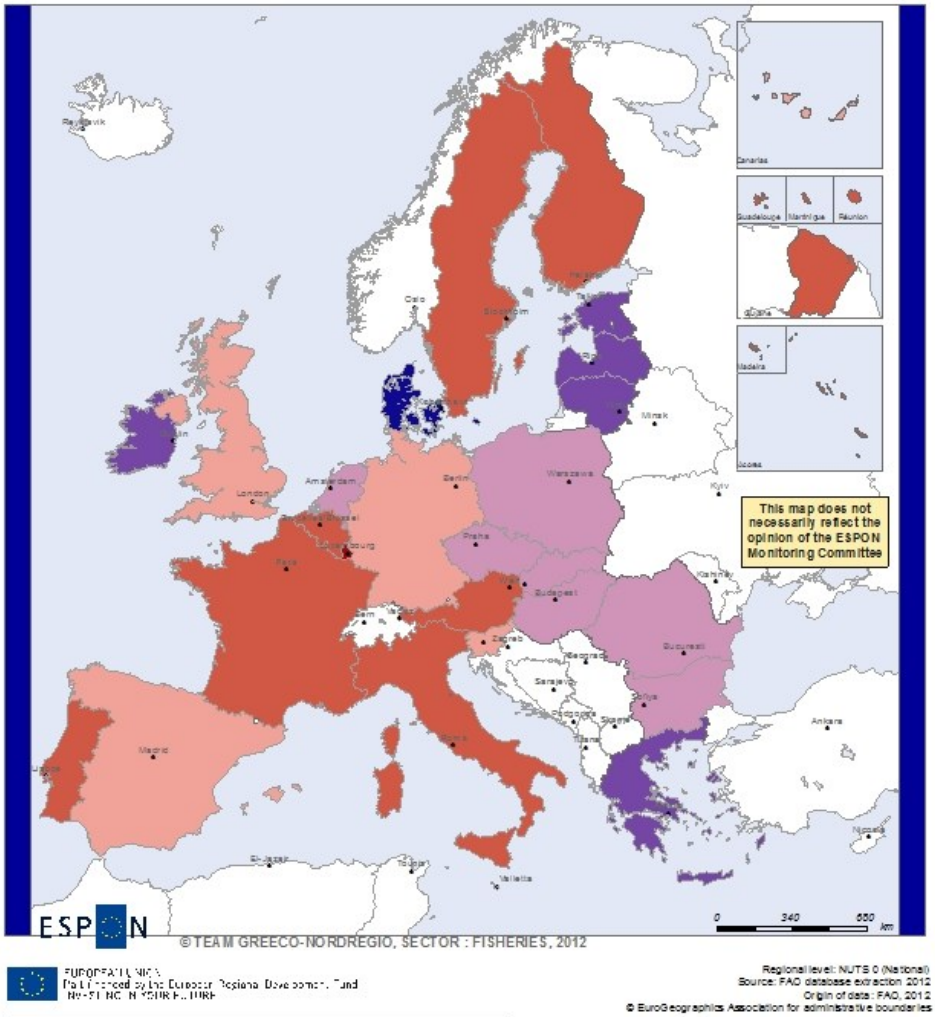
- 0,00 - 0,38
- 0,39 - 1,14
- 1,15 - 2,19
- 2,20 - 3,61
- 3,62 - 57,95
- NoData

Import of meals and oils
Euro per capita

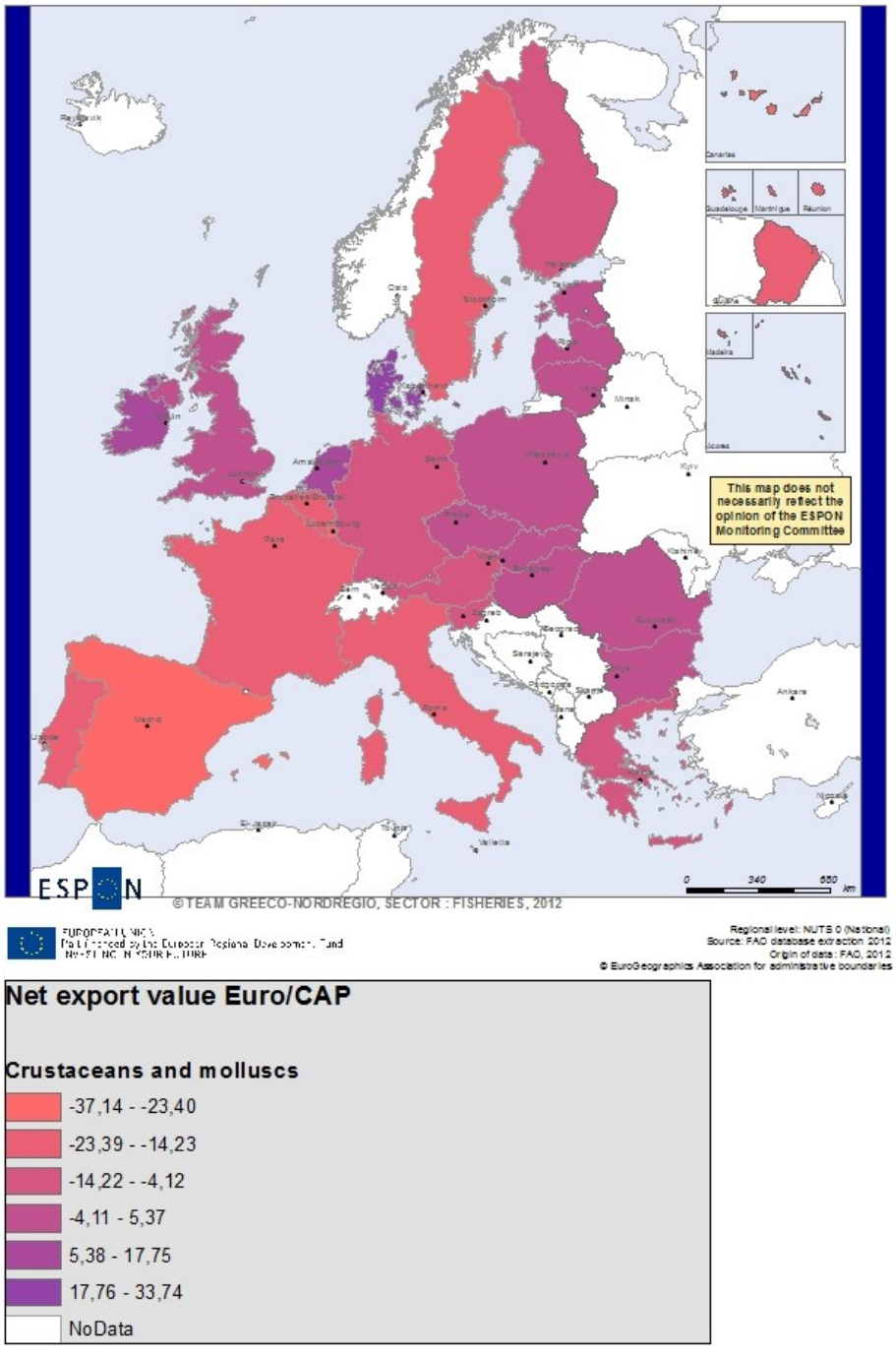


Dataset 40: Net export 2010 of sponges, shells, corals, and aquatic plants, Euro per capita

Net export of fish and fish products
Euro per capita

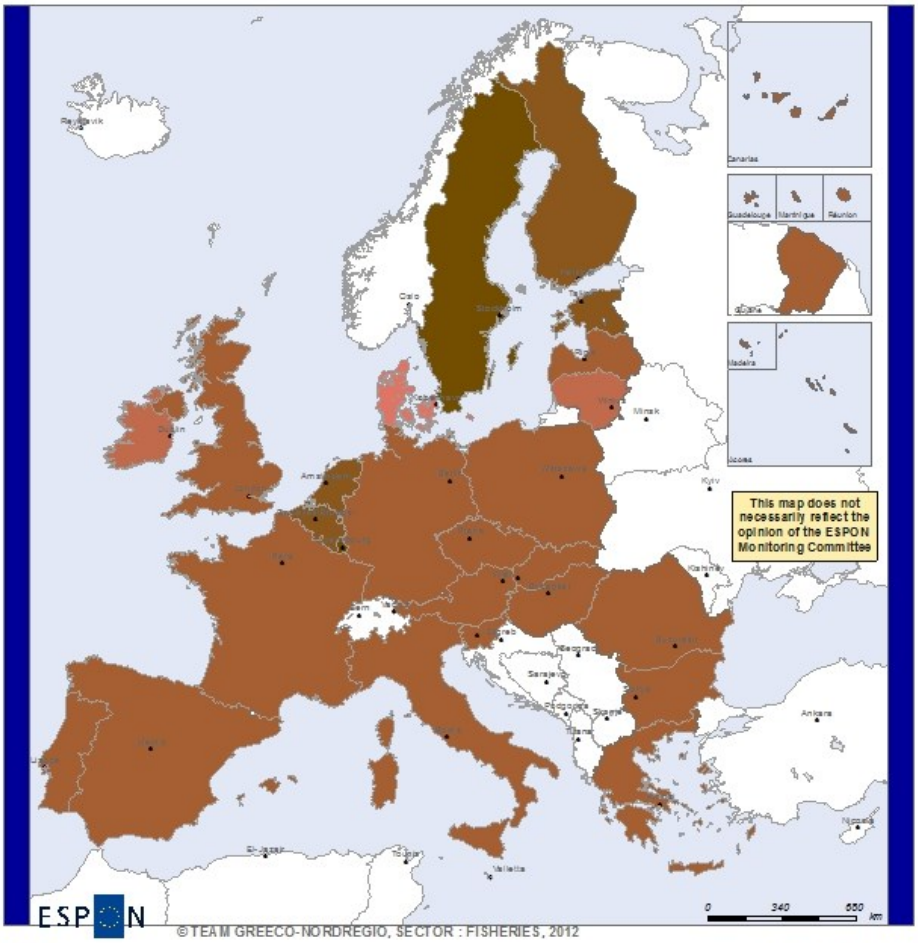


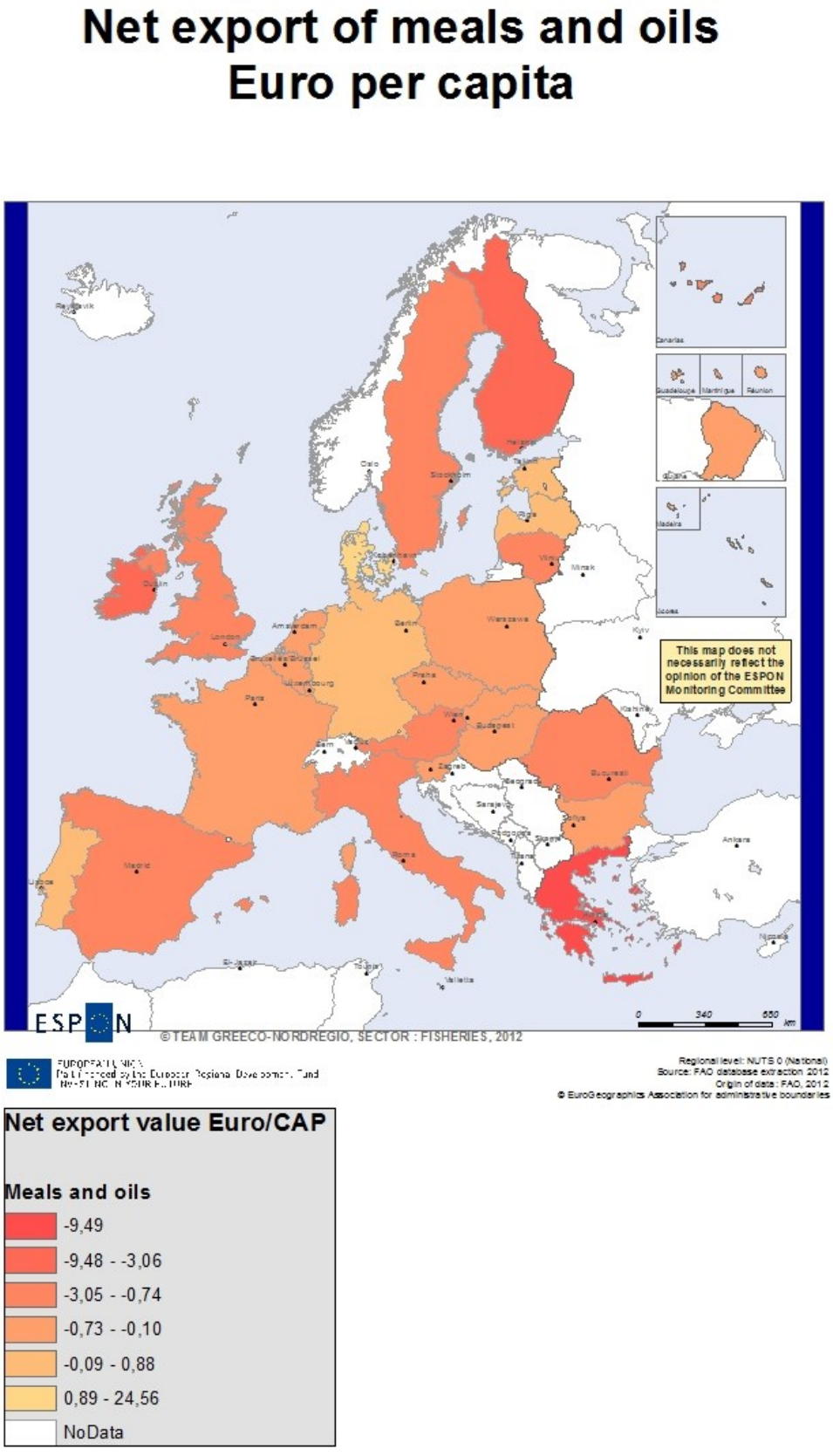
Net export of crustaceans and molluscs Euro per capita



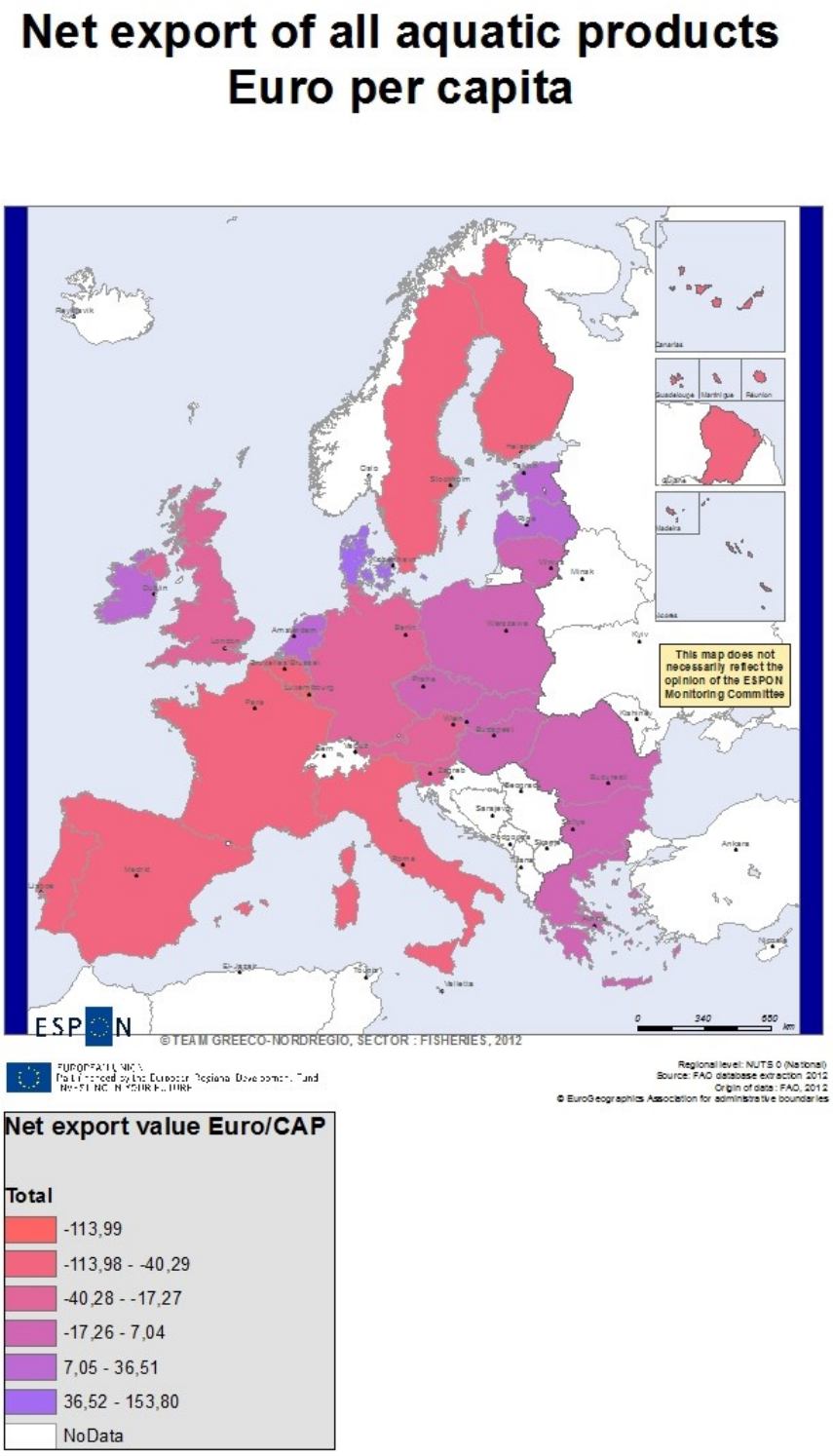
Dataset 41: Net export 2010 of fish and fish products (above), and crustaceans and molluscs (below), Euro per capita

Net export of inedible products Euro per capita





Dataset 42: Net export 2010 of inedible products (above), meals and oils (below), Euro per capita



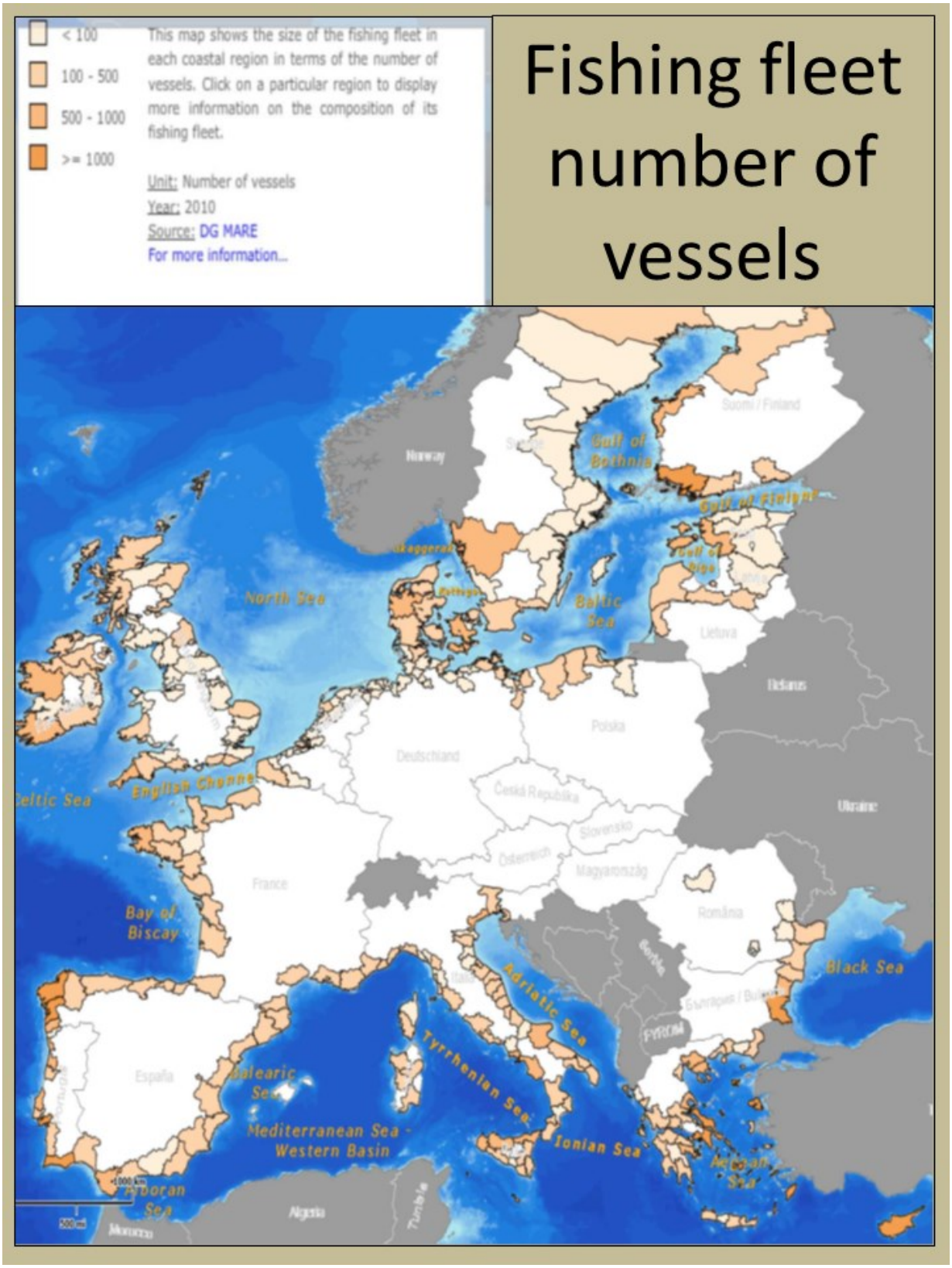
Dataset 43: Net export 2010 of all aquatic products, Euro per capita

11.6 Appendix 6 – Technology

Content:

- Dataset 44: Fishing fleet number of vessel in the coastal zone

- Source: Atlas of the Sea, http://ec.europa.eu/maritimeaffairs/atlas/maritime_atlas



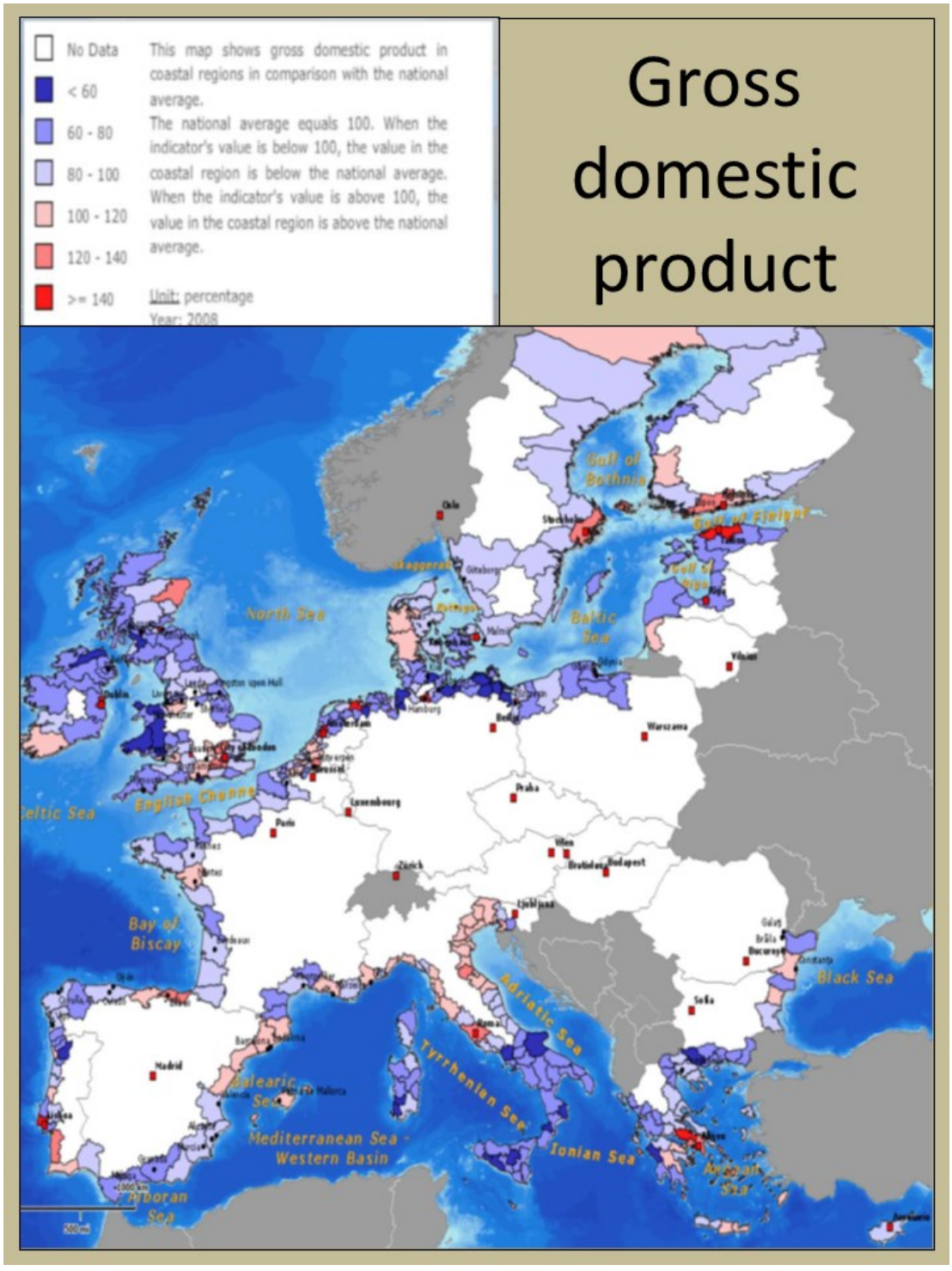
Dataset 44: Fishing fleet number of vessels in the coastal zone

11.7 Appendix 7 – Community

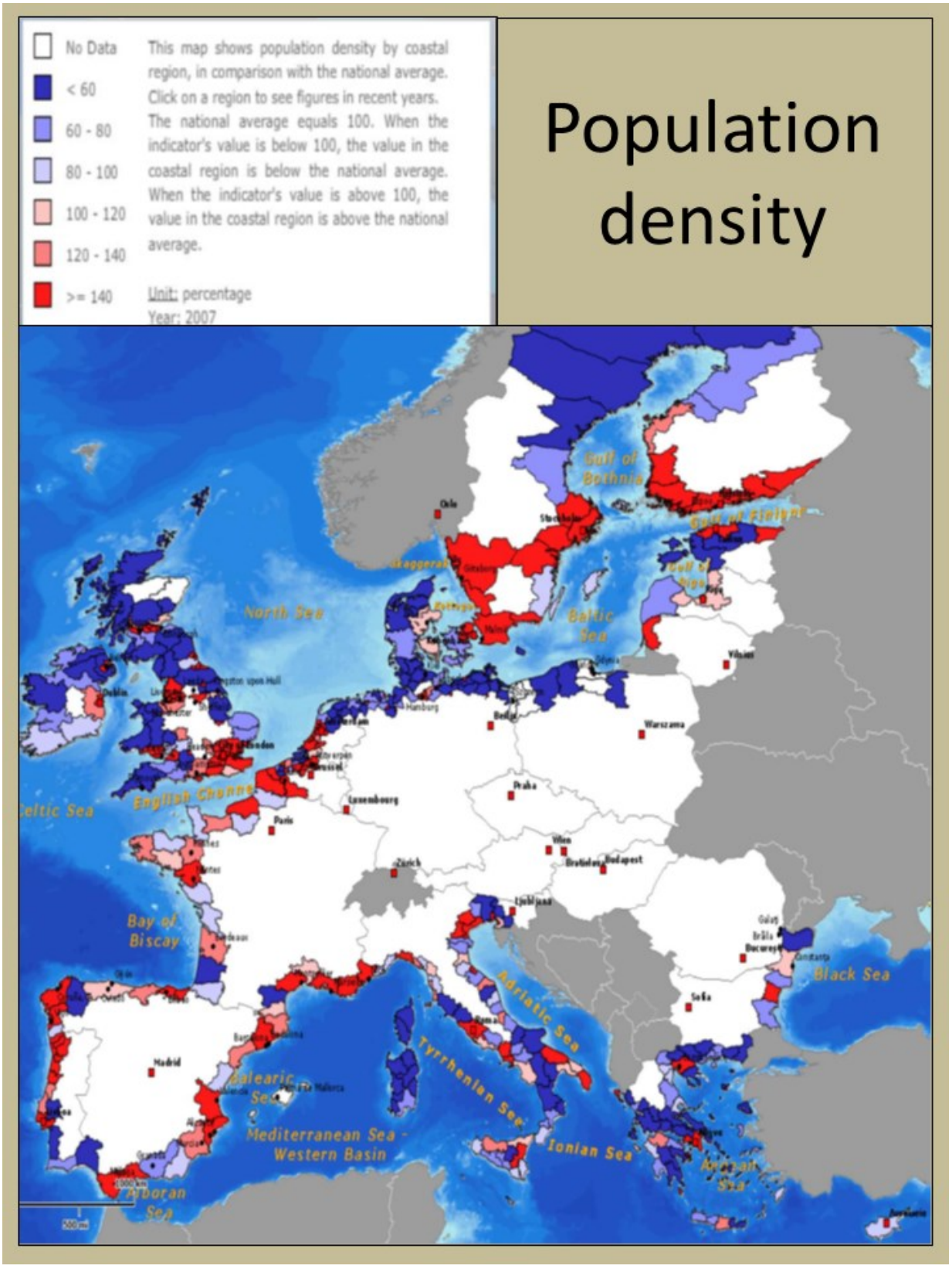
Content:

- Dataset 45: Gross domestic product in the coastal zone
- Dataset 46: Population density in the coastal zone
- Dataset 47: Coastal population in the coastal zone
- Dataset 48: Unemployment in the coastal zone
- Dataset 49: Primary sector in the coastal zone
- Dataset 50: Water quality in the coastal zone
- Dataset 51: Tourism beds per km^2 in the coastal zone
- Dataset 52: Drainage bassins and the coastal zone
- Dataset 53: Expected sea level rise in the coastal zone
- Dataset 54: Erosion in the coastal zone

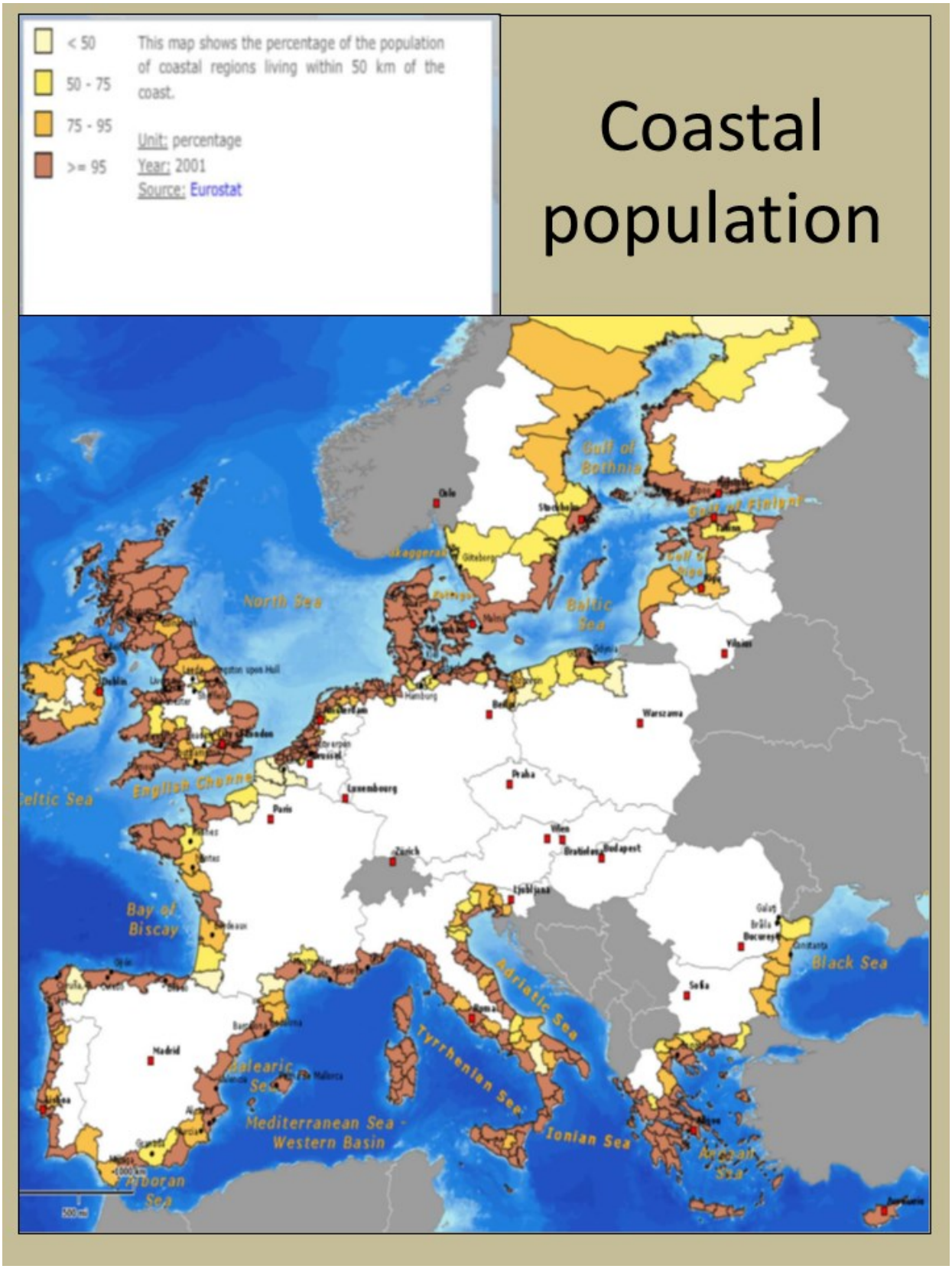
- Source: Atlas of the Sea, http://ec.europa.eu/maritimeaffairs/atlas/maritime_atlas



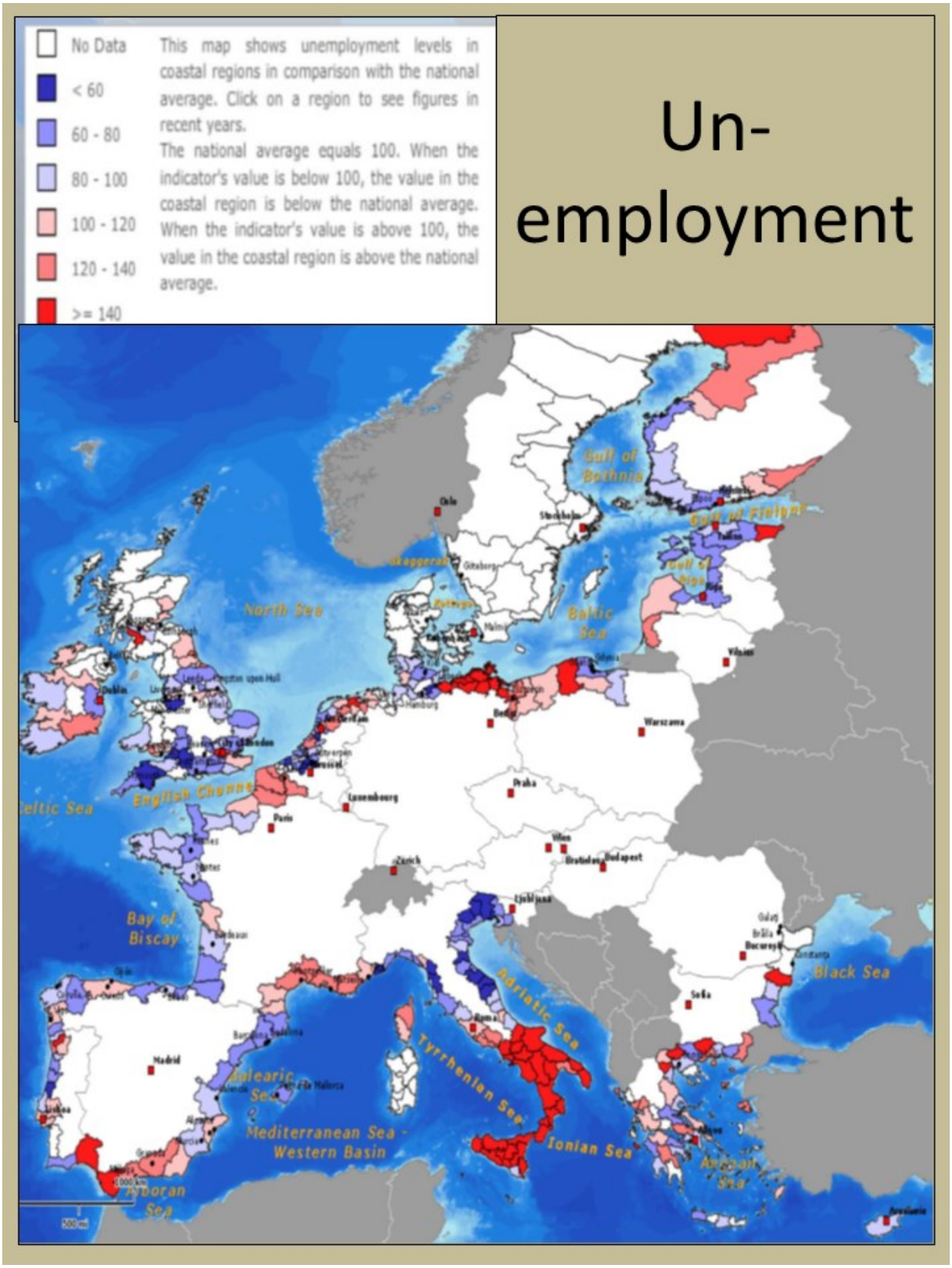
Dataset 45: Gross domestic product in the coastal zone



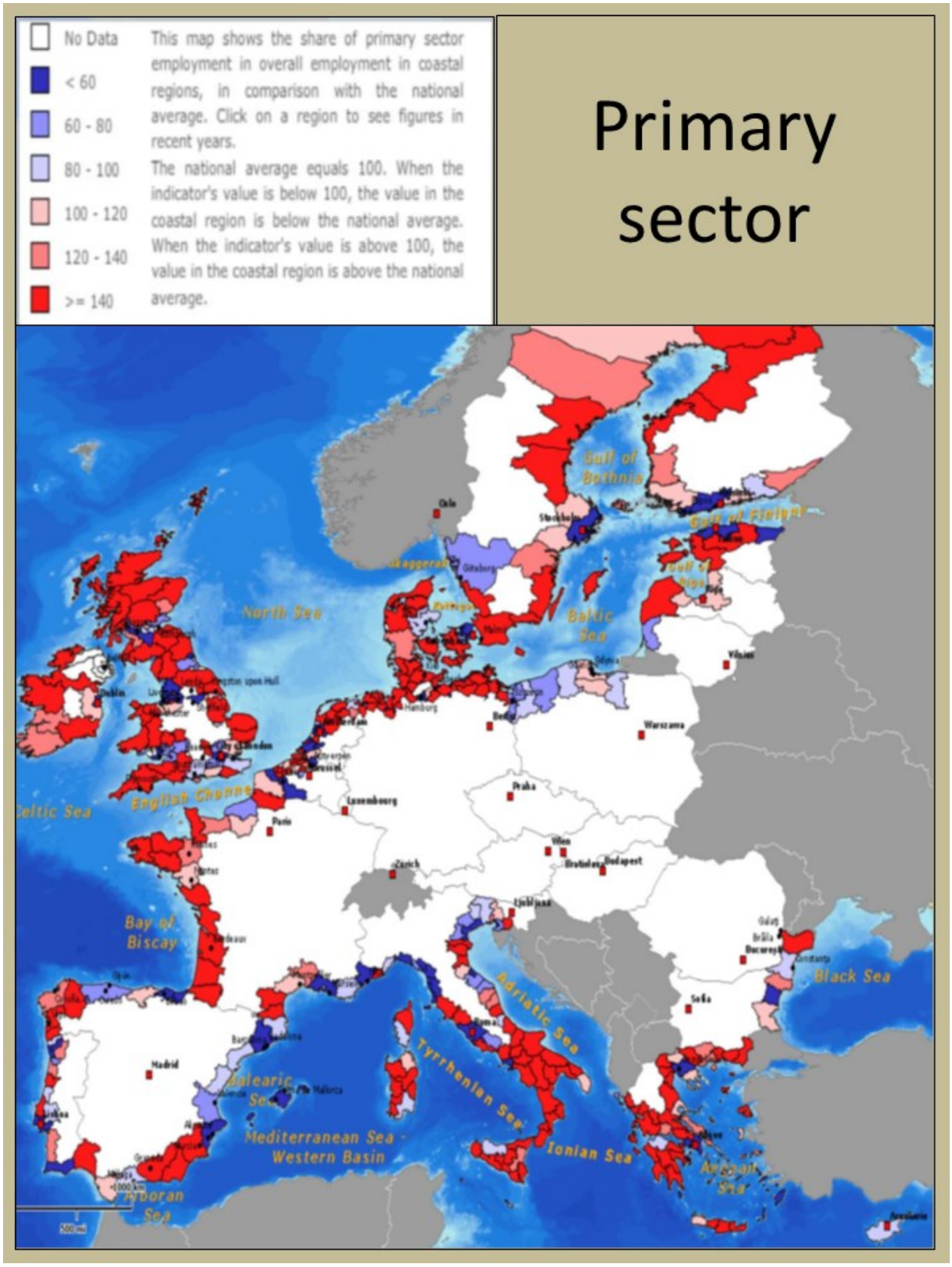
Dataset 46: Population density in the coastal zone



Dataset 47: Population in the coastal zone



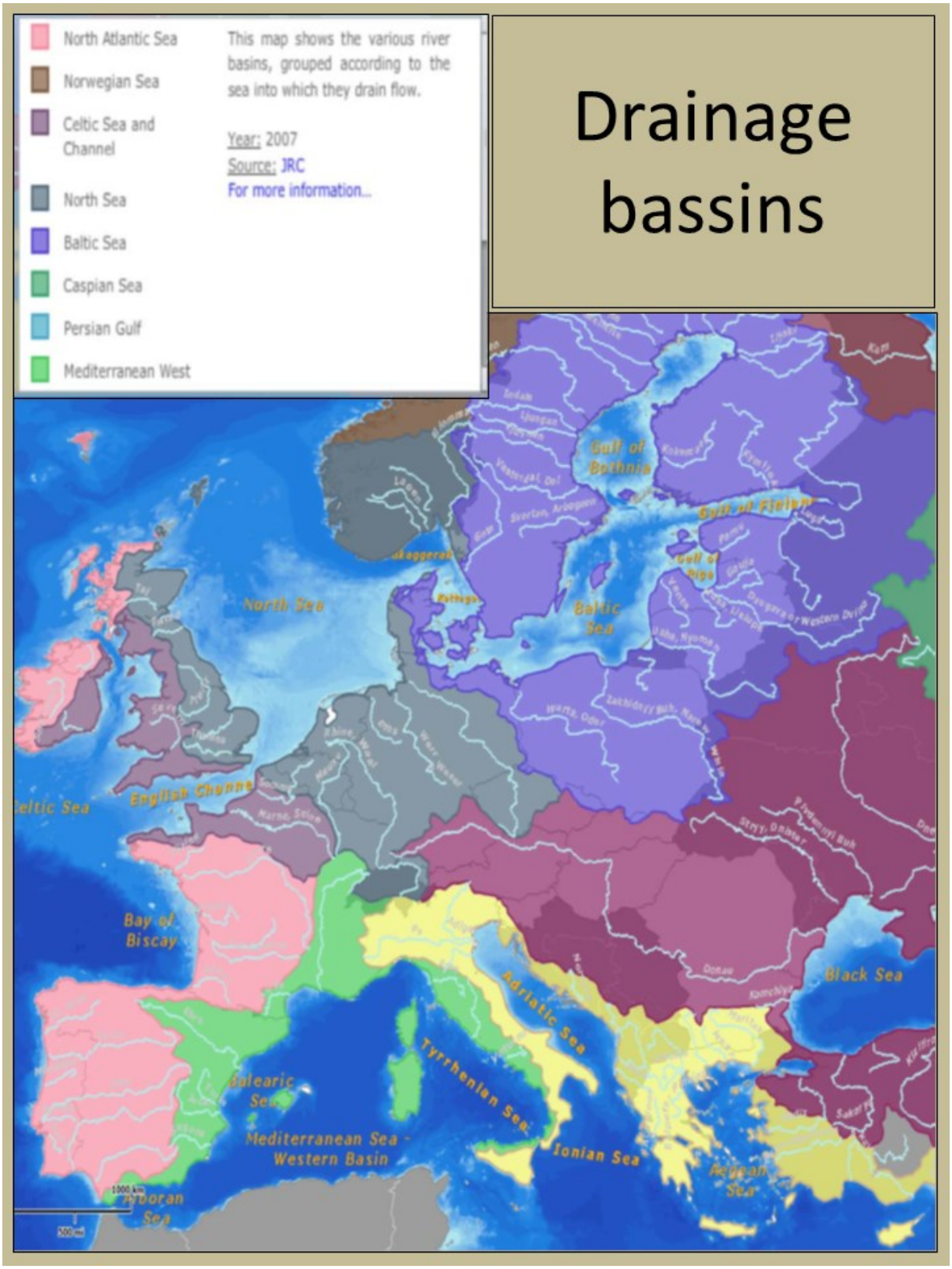
Dataset 48: Unemployment in the coastal zone



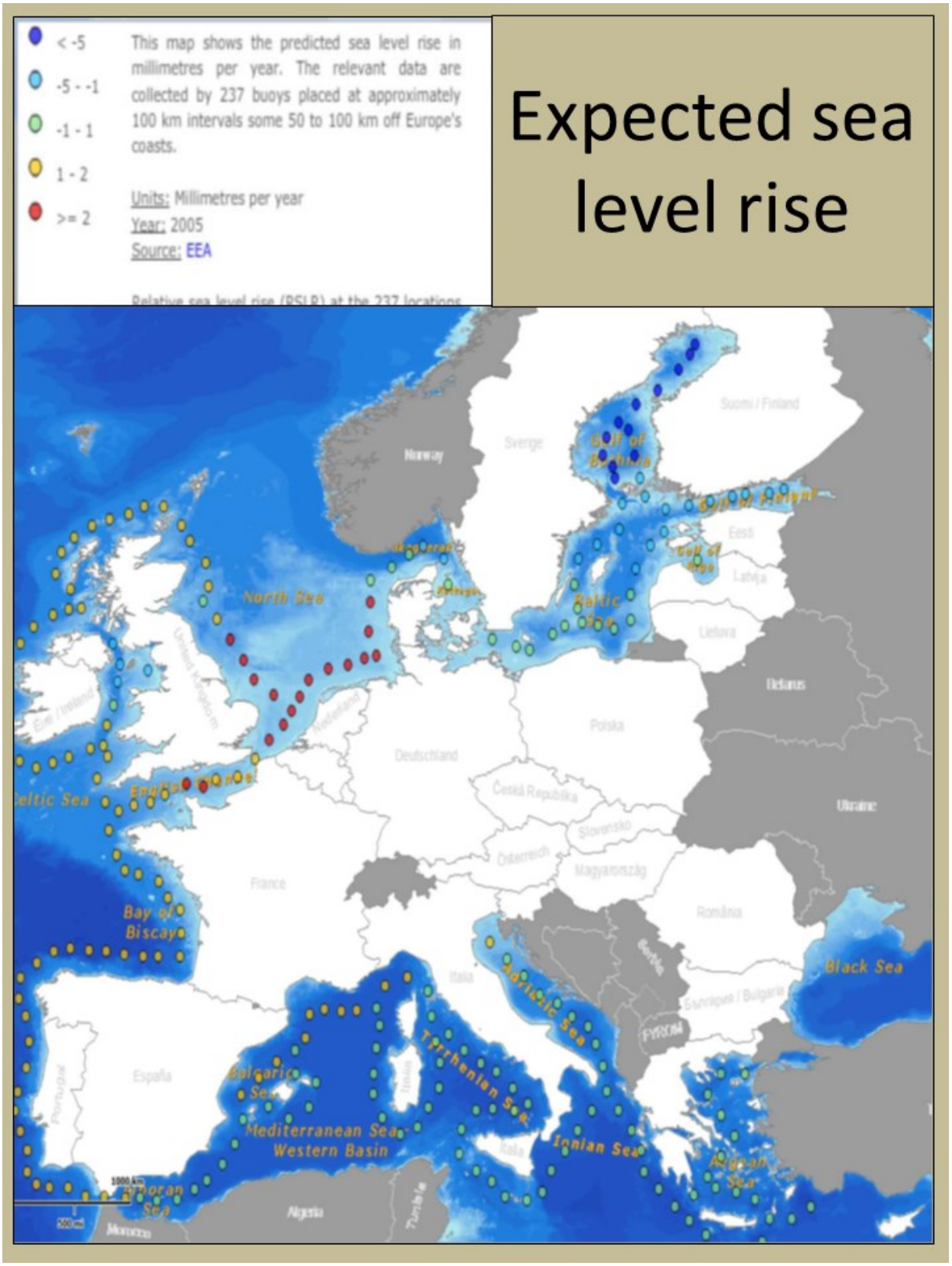
Dataset 49: Primary sector in the coastal zone

Dataset 50: Water quality in the coastal zone

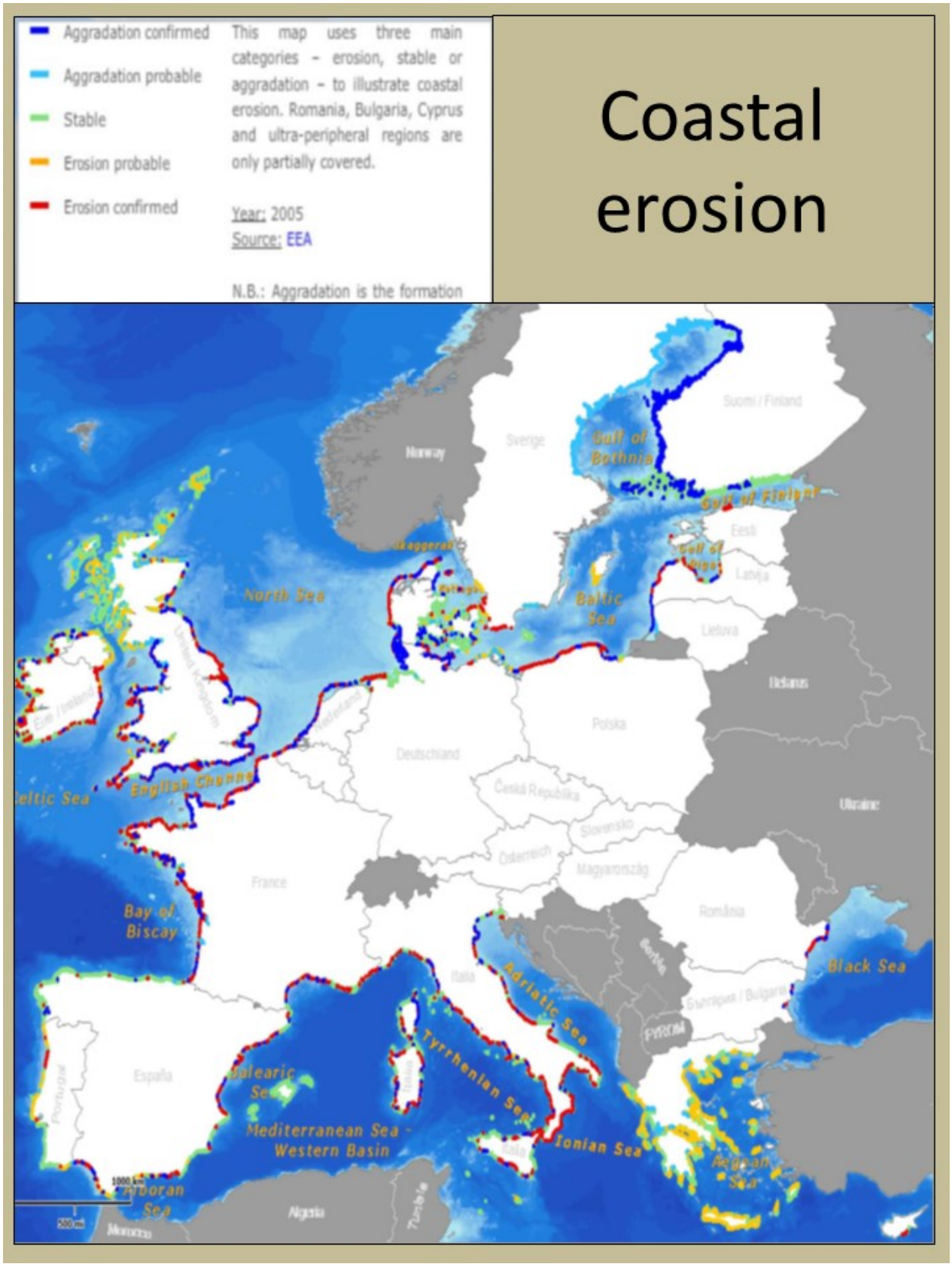
Dataset 51: Tourism, beds per km^2 in the coastal zone



Dataset 52: Drainage bassins in the coastal zone



Dataset 53: Expected sea level rise in the coastal zone



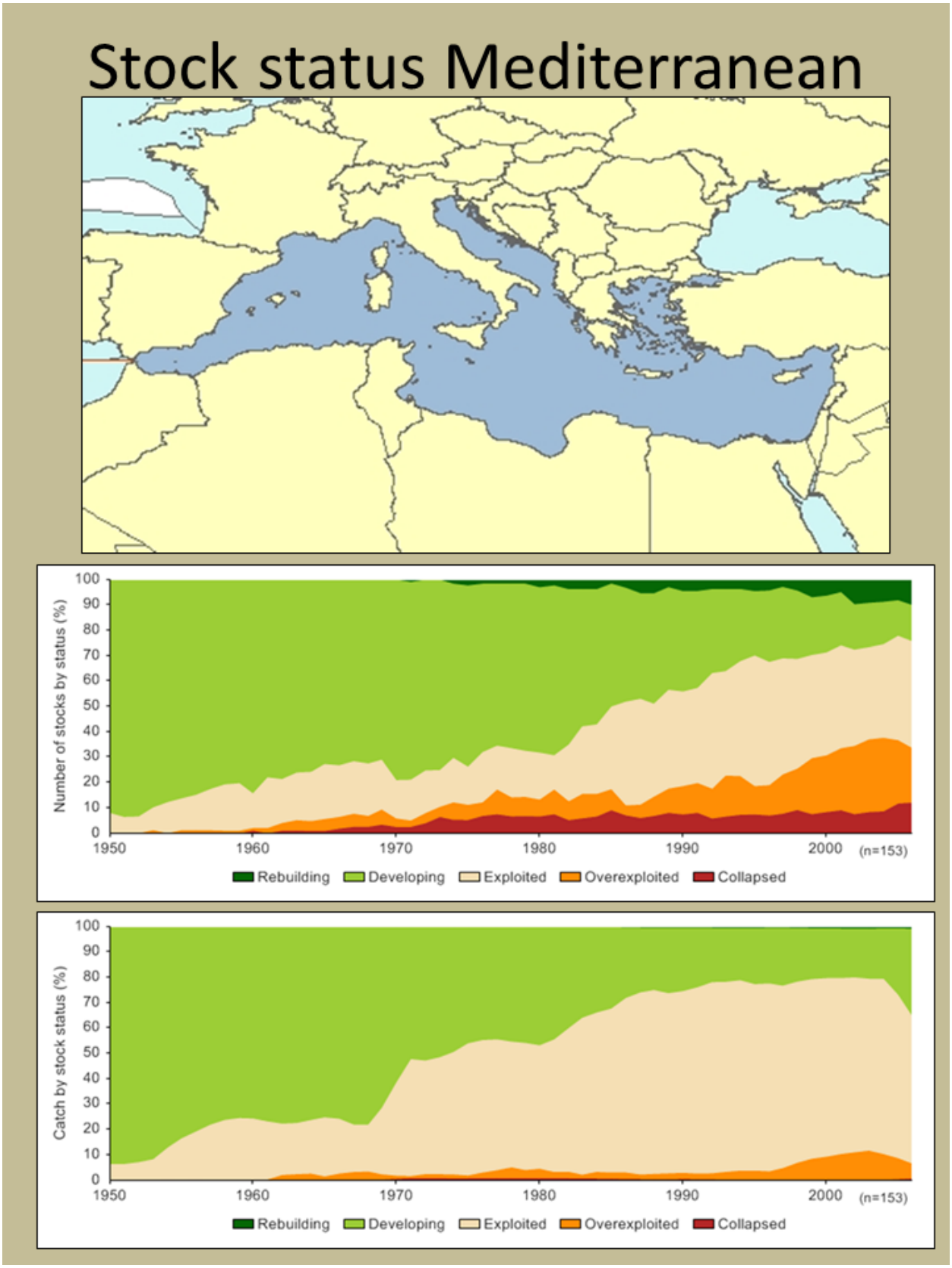
Dataset 54: Coastal zone erosion

11.8 Appendix 8 – Potentials

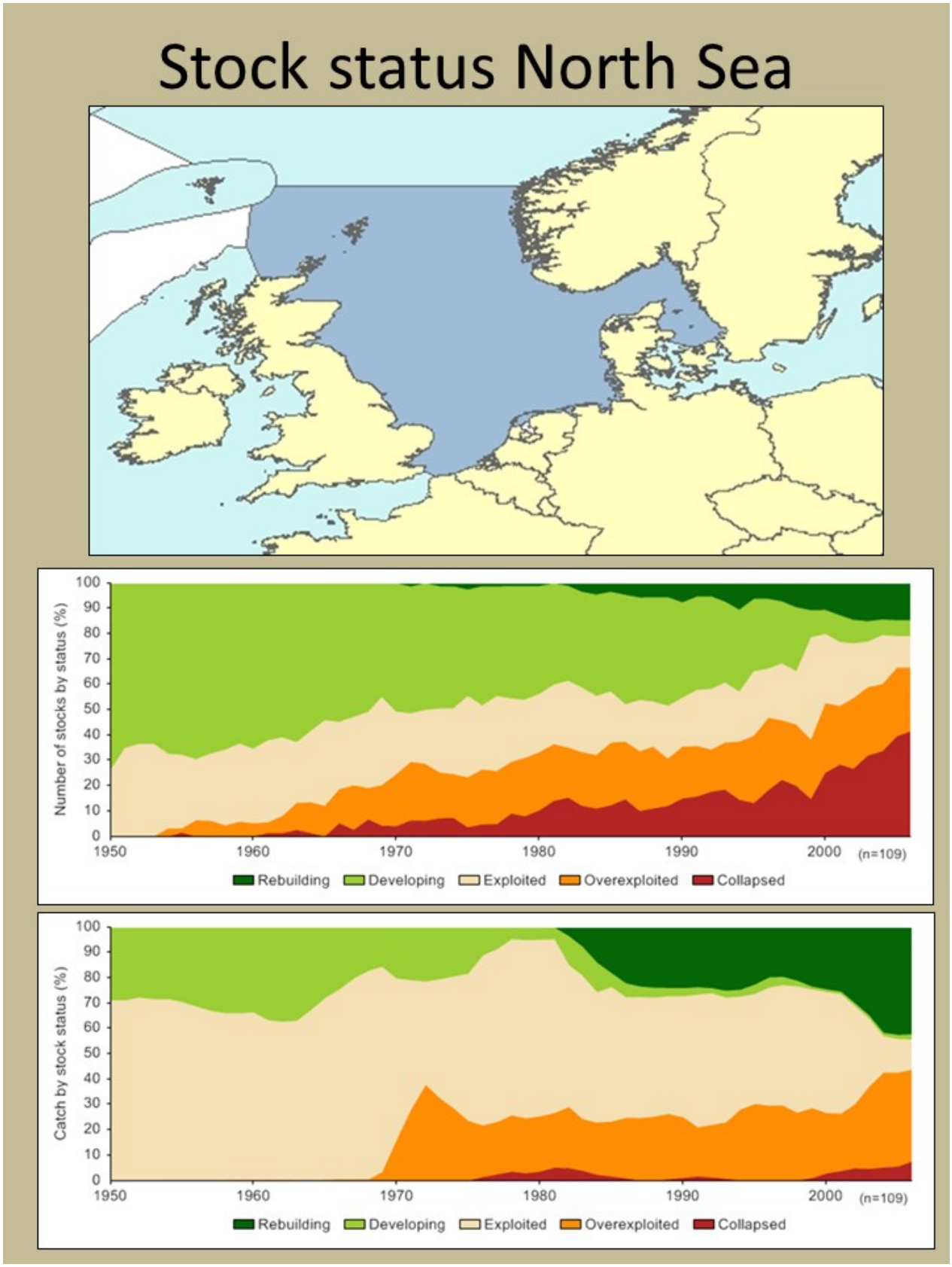
Content:

- Dataset 55: Stock status, Mediterranean
- Dataset 56: Stock status, North Sea
- Dataset 57: Stock status Baltic Sea
- Dataset 58: Stock status Black Sea
- Dataset 59: Stock status Celtic-Biscay
- Dataset 60: Stock status Iberian Coast
- Dataset 61: Stock status Northeast Atlantic

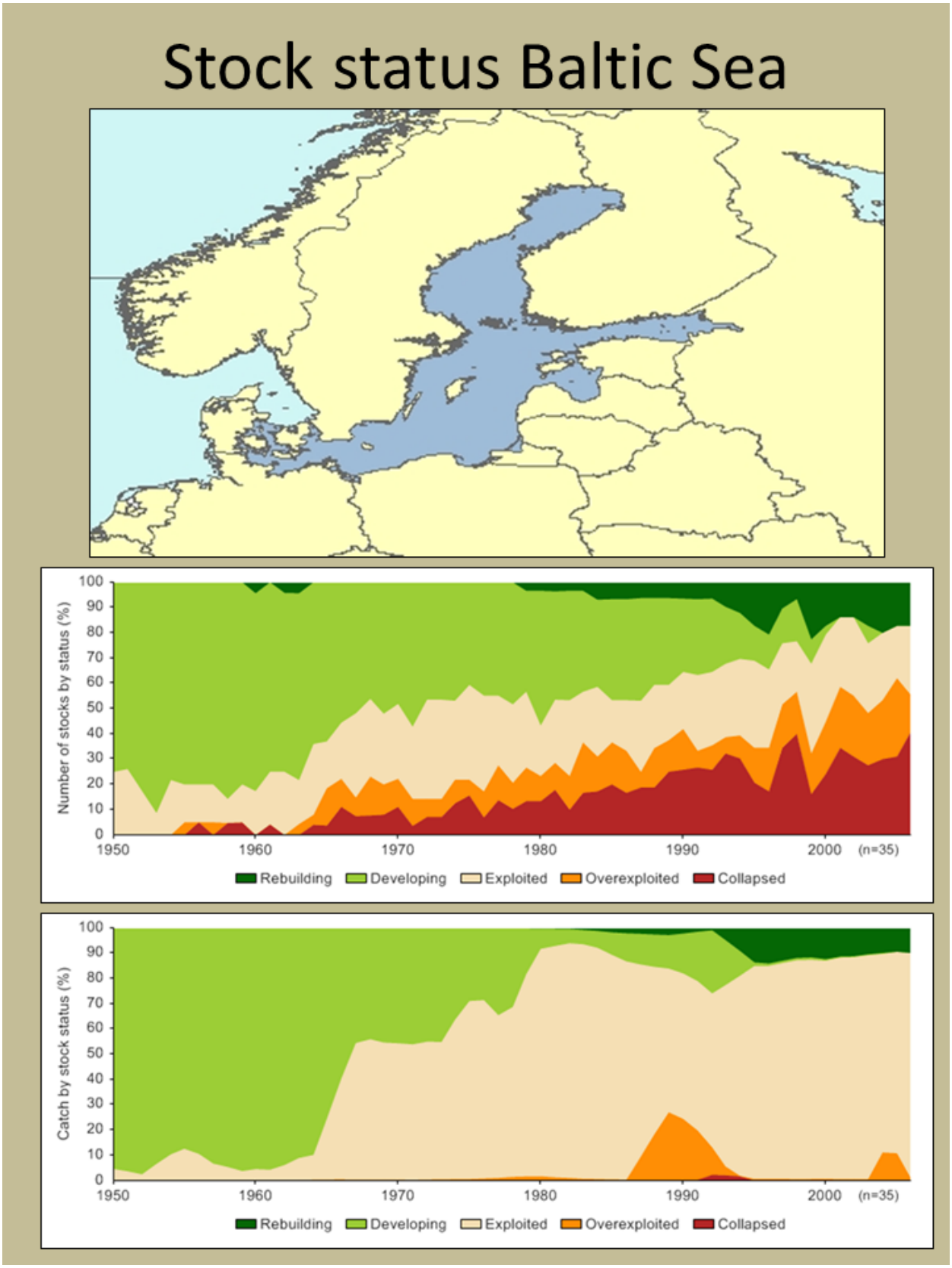
- Source: Sea around us Project. http://www.seaaroundus.org/



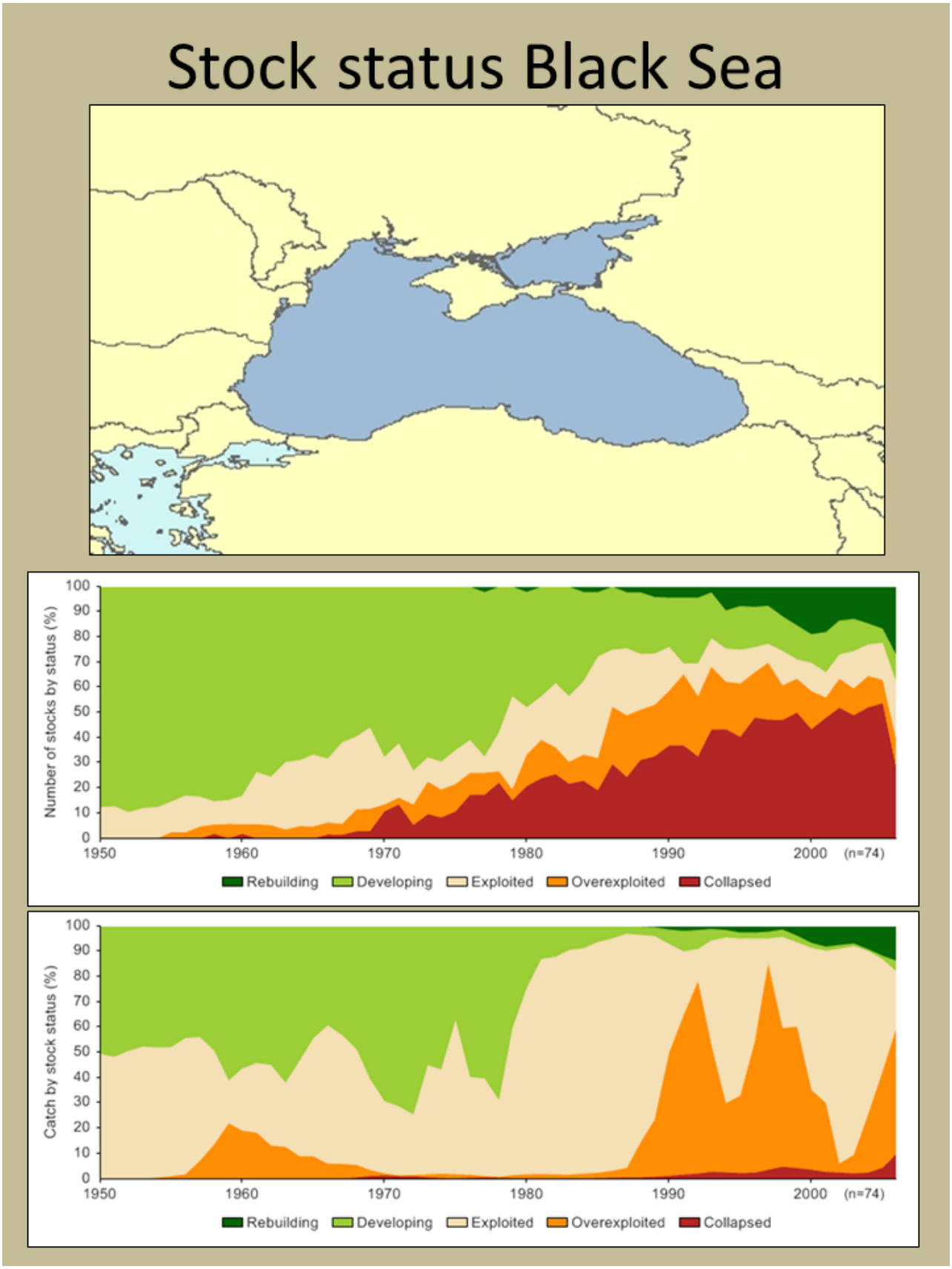
Dataset 55: Stock status Mediterranean



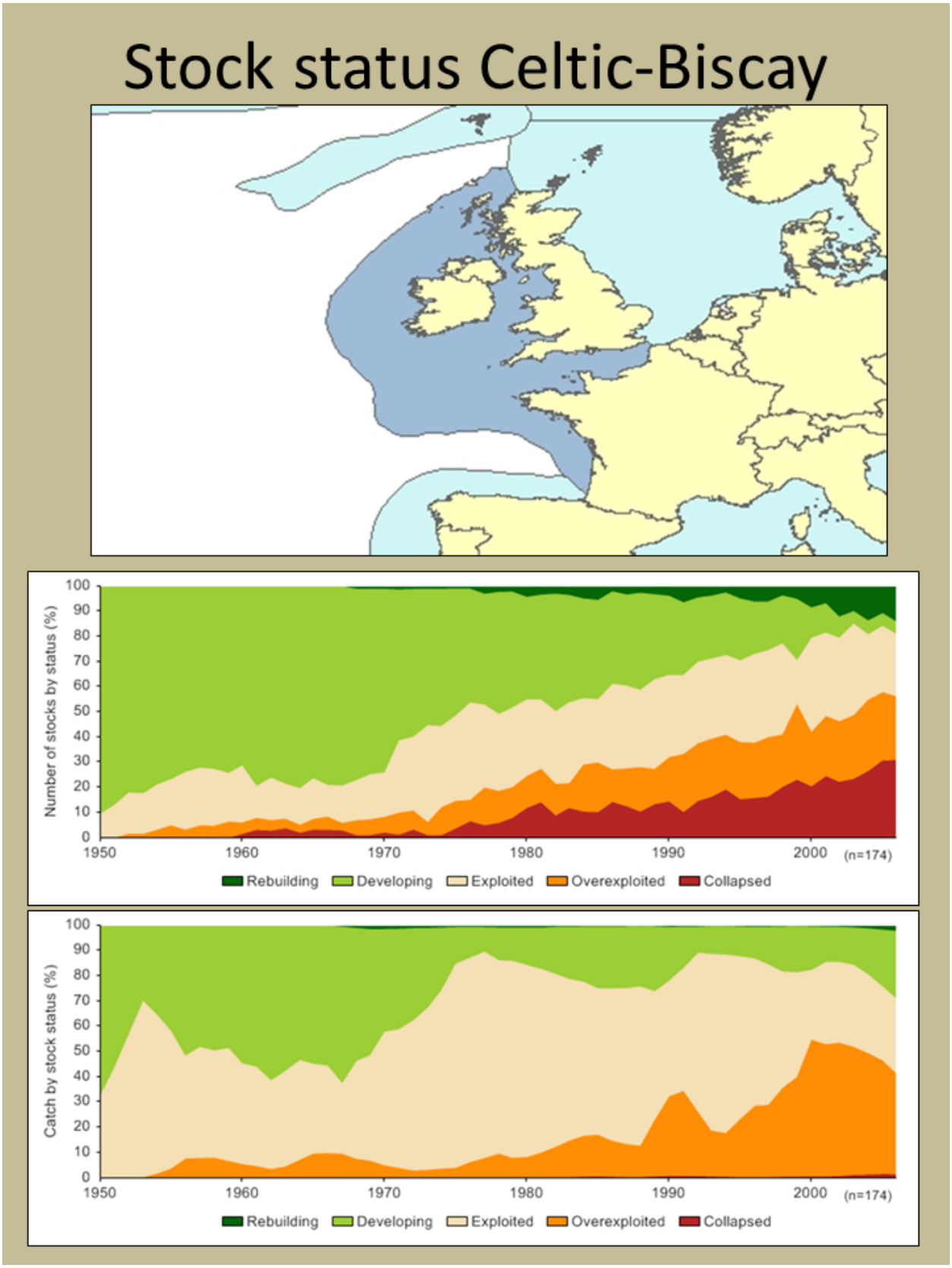
Dataset 56: Stock status North Sea



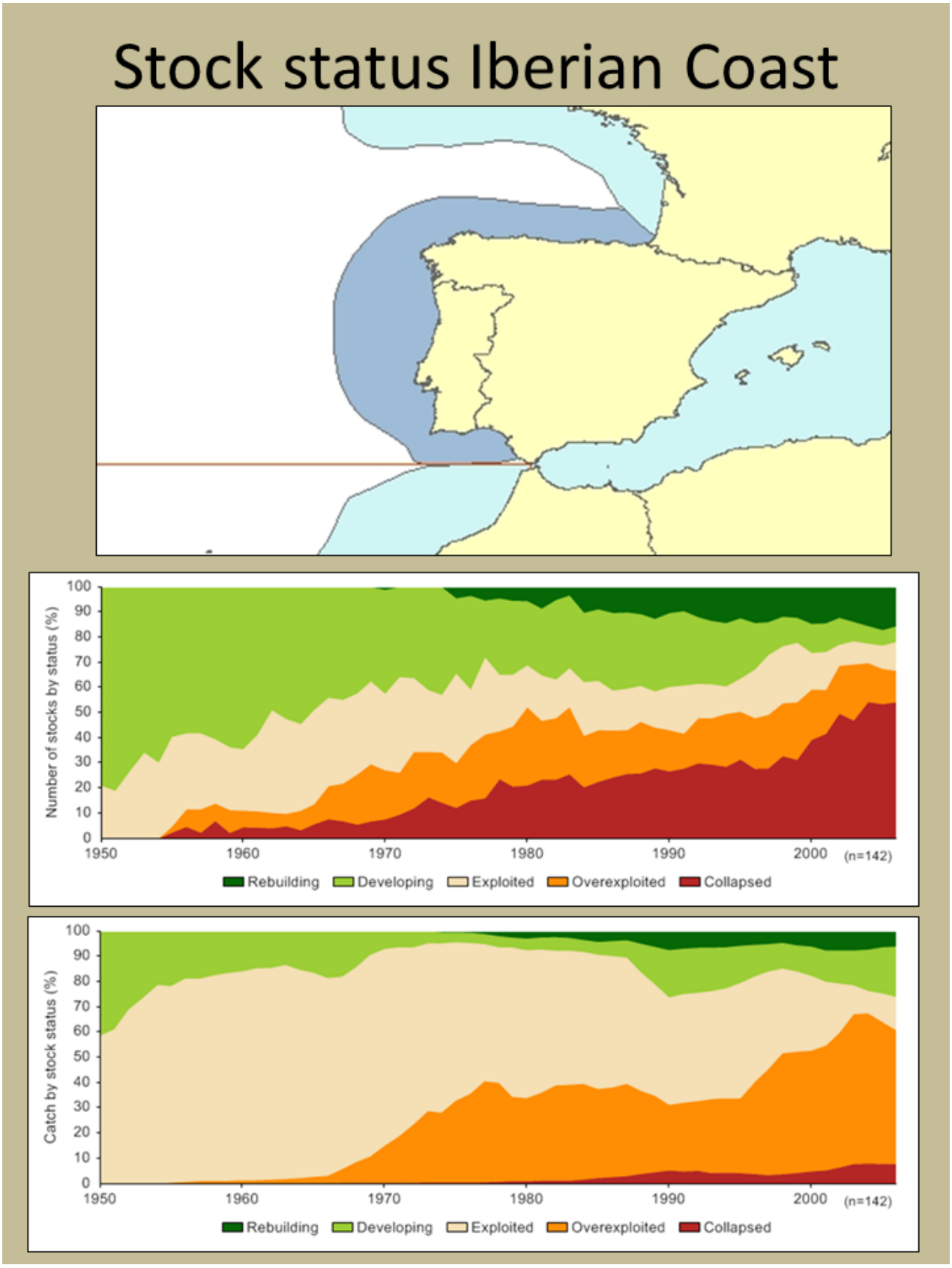
Dataset 57: Stock status Baltic Sea



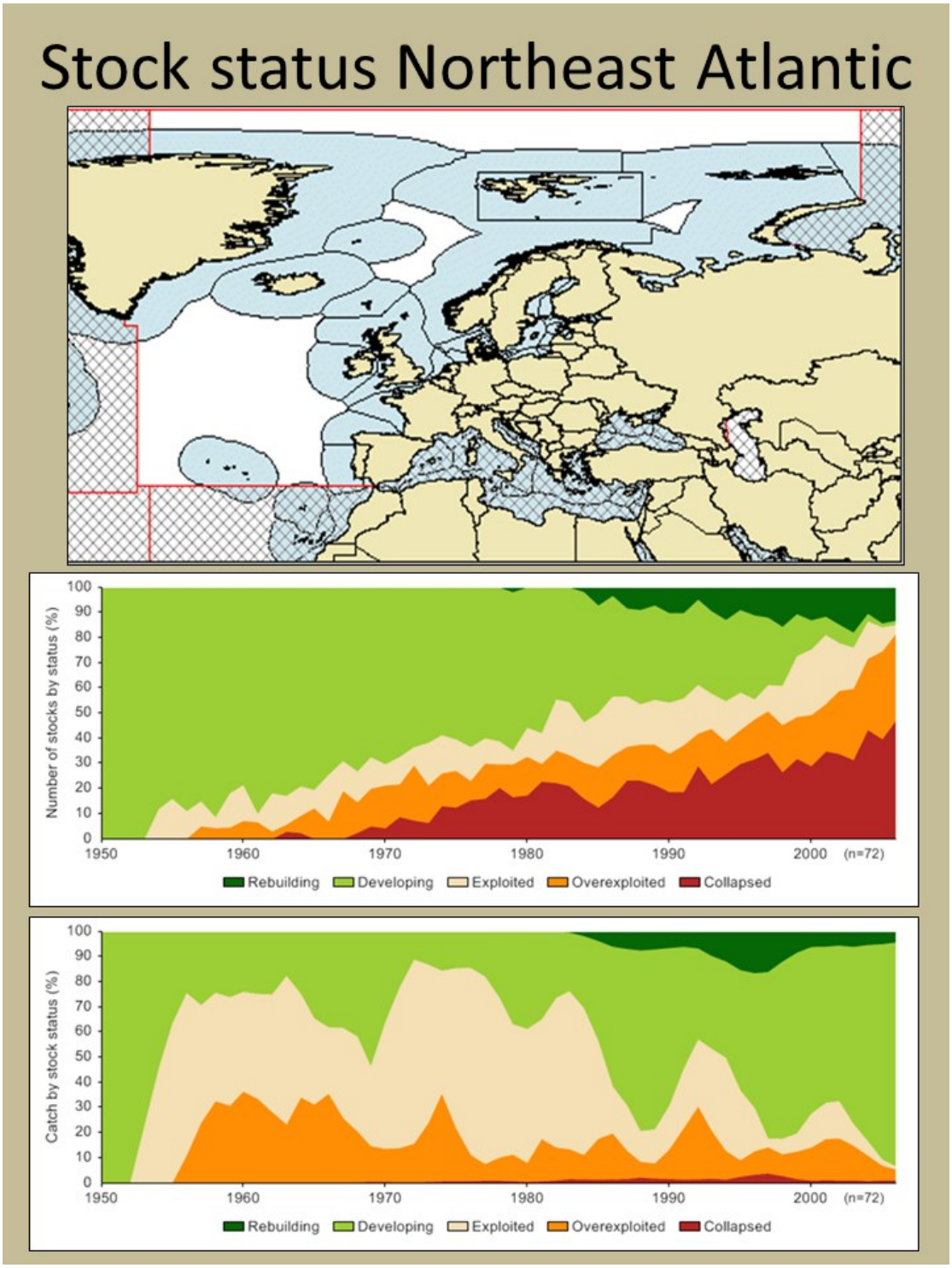
Dataset 58: Stock status Black Sea



Dataset 59: Stock status Celtic-Biscay



Dataset 60: Stock status Iberian Coast



Dataset 61: Stock status: Northeast Atlantic

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