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Executive summary

This report shows, by looking at different case studies, how management measures create incentives which influence the behaviour of fishermen in positive and negative ways. This gives important insights for the design of future management measures.

Chapter two deals with the establishment of individual quotas, by the POs, in the Bay of Biscay for common sole fishery. The reasons for the implementation were mainly to avoid penalties for quota overfishing, and to deal with the increasing constraints on quota. The TAC Vessel quotas have changed fishing behaviour in several important ways: 1) Fishing effort reallocation has occurred as a result of landings individualisation, 2) Sole landings are more frequently spread over the year, 3) Days at sea were reduced for the most specialised gillnetters in order not to exceed their quota limits, 4) Some exits from the industry or from sole fishery have been registered, and crew members are more attracted to vessels owning the largest share of sole sub-quotas. Hence, some POs are confronted with a deck-hand turnover between members. High-grading or quota discarding behaviour was also documented in some cases.

Chapter three deals with the implementation of protected areas, which are affecting the small scale German fisheries around the island of Fehmarn. The reason to introduce protective measures in this area was to improve the state of the populations of harbour porpoises and of sea ducks. The management measures mainly aimed at reducing the incentives to fish in certain areas close to the coast which, according to the fishermen, have rich catching opportunities. For other areas, like the ones where sea ducks feed, there was no particular incentive to fish, and they could therefore be more easily avoided. A participation process was set up to incentivate the compliance with the management measures. In addition, the election of an independent institution for the monitoring (the OIC in Eckenförde) was meant to create an incentive to cooperate with the monitoring process. A complicating factor in this case is that only the fishermen in Schleswig-Holstein are being regulated, while in other regions of Germany as well as in the neighbouring country Denmark, fishermen are not regulated. This leaves the fishermen in Schleswig-Holstein with a feeling of unfairness, and diminishes their willingness to comply with the rules.

Chapter four deals with successful management measures implemented in the co-managed clam fishery in the Adriatic sea. This chapter gives an overview of the management measures implemented in the Italian clam fishery. The clam fishery suffered overexploitation, low prices, and low revenues during the seventies, eighties and beginning of the nineties. Management during that time could be characterised as top down. In 1992 a transition towards co-management started, combined with a buy back program. 146 dredges were withdrawn from the industry. Slowly the management system was developed towards Results Based Management in which the general regulations were decided at the central level, while the consortia were able to regulate specific activities through he adoption of internal measures that were more restrictive. In that way the landings value increased, the balance between fishing effort and stock size were improved, and product quality was maximised. Both coercive (e.g. a reduction of one day in the fishing week), financial (e.g. subsidies), economic (e.g. stabilisation of economic performance, and increase in market price), and social incentives (e.g. social control, and increased legitimacy of the management system) have made this possible.
Chapter five deals with the incentives that have stimulated the transition towards a more sustainable Dutch flatfish fishery. Since 2000, but mostly during the last five years, the fishing fleet is becoming more sustainable. A number of incentives have stimulated the shift, like: high fuel prices, decreasing fish prices, the establishment of Natura 2000 areas at sea, subsidies for investments in new techniques and certification schemes, pressure from NGOs (campaigns), and the value chain (mainly supermarkets who demand MSC certification). As a result, the beam trawl has made place for more sustainable fishing techniques, such as: twin trawling, pulse trawlings, sumwing, flyshoot etc. Both social, financial and coercive incentives have played a role in the behavioral change of fishermen:

- Social incentives: societal values have changed. Sustainability is at present considered as “the right thing to do”. NGOs and retailers have played an important role in this shift, however fishermen also increasingly see the value of sustainability. Discarding for example is seen by many fishermen as unethical. With the new discard ban this is confirmed as unethical behaviour. The co-management system in combination with an ITQ system has also stimulated sustainable behaviour. In addition quota uptake became transparent. The race to fish stopped as it was no longer necessary to fish as much as possible as soon as possible, because quota uptake was visible for everyone.

- Financial incentives: Behaving in a more sustainable way leads most of the time to a financial reward. E.g enlarging market access, receiving a subsidy for investing in a sustainable techniques, and diminishing costs (e.g. fuel costs).

- Coercive incentives: The beam trawl will be from 2016 onwards no longer allowed in certain areas of the North Sea because of the Natura 2000 regulations. This has stimulated a shift towards other techniques

Chapter six deals with the incentives provided by the allocation system in the Basque country, Spain. Quota allocation to fishing technologies is increasingly being applied in Spanish fisheries. Before that fishermen of licensed vessels had equal access to quota. The use of technology allocations was introduced for the first time for the bluefin tuna fishery in 2008. Thereafter it has also been introduced for pelagic species such as mackerel (2010) and horse mackerel (2012). The allocation system was introduced by the government to provide the following (mainly financial and coercive) incentives: 1) A basis for fair access to fishing possibilities; 2) A basis for enforcement (strict control); 3) A basis for improvement of profitability through prices; 4) Adaptation of allocation management to the fisheries governance system; 5) A basis for adjustment of capacity to fishing possibilities. However in practice fishermen do not consider the allocation as fair, which creates incentives for non-compliant behaviour, especially in the mackerel fishery. There is a tendency to overshoot the quota, because of a lack of quota and competition among the technologies. Other reasons for non-compliance are: low fish prices, short fishing season, and perceived abundance of fish. Enforcement and control are currently increased (coercive incentive).

A key driver for the allocation system to provide the right incentives is the role of POs. They provide moral/social incentives because they are platforms of participation and collaboration for fishermen. Group decisions on group rights are usually respected. Also
the IQ system, currently in operation for the blue fin tunu fishery, seems to provide the right incentives.

Chapter seven deals with management measures implemented in the small pelagic stocks captured by purse seine vessels in the Black Sea (Turkey). Due to heavy subsidies since 1976, the size and power of the fishing fleet quadrupled. After new regulations (2002), the total number of vessels decreased again by almost 20%. There is no effective management system in purse seine fisheries in Turkey.

A number of management measures have created unwanted incentives, such as:

- Subsidies for bigger vessels, fish finders, and navigation equipment, which have led to an increase in effort.
- New entries were allowed until 2001
- Fuel subsidies (to stabilise fish prices) promoted the buying of second and third engines with length extensions
- A decommissioning programme has recently been introduced. However mainly wooden and less effective vessels were removed.
- Ineffective control and enforcement system
- Lack of stakeholder participation
- No quotas, except for bluefin tuna
- No harmonisation at a regional level, no ratification of conventions that stimulate nature conservation

All these reasons encourage fishermen to catch undersized fish or to participate in illegal fisheries of which the catch is sold and processed to fish meal and oil plants at the lowest prices. The Turkish management system applies mainly coercive and financial incentives, what is lacking are social incentives. What is recommended is harmonisation on the policy level between the different regions, stimulation of selective fishing techniques through subsidies or allowing them to enter in certain areas while other areas are closed for non sustainable techniques, stakeholder participation, and the improvement of control and enforcement through social control.

Chapter eight deals with the devolvement of quota management in the UK. The two POs based in the SW UK provide good examples of the operation of the UK’s devolved quota management system which has developed gradually since the beginnings of the CFP’s conservation and management regime in the 1980s. Quota is allocated to POs each year according to the number of quota units (“FQAs”) attached to the licences of individual member vessels. POs can then operate quota pools or allocate individual quotas (IQs) as they choose. Freedom for POs to exchange quota and for licence sales have allowed unofficial quota trading to develop, particularly in the lease market. One of the main reasons for this was to remove incentives to secure quota allocations by artificially inflating track records. Quota swapping has increased due to more relaxed rules on the swapping of quota between POs. Quota can be trasferred without receiving something in return (‘gift’). Quota related discarding incentives are reduced under the current system
to the extent that firms are able to change their landing limits for different species. With the new landing obligation, an option is the use of quota pools for by-catch species.

Chapter nine deals with MSC certification in the Celtic Sea herring fisheries. The Celtic Sea Herring stock has recovered successfully from a recent collapse. The presence of a dedicated co-management forum which allowed the implementation of management measures such as spawning box closures has contributed to the recovery. However governance problems in the fishery created a situation whereby a higher TAC has not translated to economic benefits for the fleet. Specifically a de facto open access regime has resulted in a large increase in the number of participating vessels in both the main and sentinel (small-scale) fisheries. A 2012 ministerial ruling aimed at restricting access to the main fishery has not been successful thus far. In 2012 the fishery was certified by the Marine Stewardship Council as being a sustainable fishery. This certification has created a number of incentives in the fishery. There are strong indications, both direct and indirect, of positive economic benefits to fishermen involved in the MSC scheme. An environmental management plan covering inter alia cetacean bycatch, the use of observers and protection of gravel spawning beds has been developed. This addresses a notable shortcoming in relation to the adoption of the ecosystem approach to management of the fishery. Governance of the fishery has also been improved by clarifying objectives and greater transparency in how the management committee operates. Negative incentives at this early stage, including green washing issues and an escalation of stakeholder conflict, are rather actual and will require more time to be fully assessed.

The case studies show many similarities when it comes to the use of incentives in fisheries policy. Coercive and financial incentives have been dominant. The use of social incentives is slowly increasing, and proves to be very important in positively changing the behaviour of fishermen.
1. Introduction

1.1 Background - why an analysis of current management measures and their incentives?

This manuscript is written within the EU-FP7-SOCIOEC project and provides an overview and critical evaluation of the management measures currently in practice within different fisheries industries in Europe.

The report is based on SOCIOEC project work by project involved scientists where input on the above issues from various stakeholders is also included.

It is to be used in the continued project work on the evaluation of future management measures and in this context to propose and evaluate alternative/emerging management measures and procedures to improve future fisheries management.

The main question to be answered in this report can be stated as follows:

*Which positive and perverse incentives do current management measures create and what can we learn from that?*

1.2 Incentives

Governments, but also NGOs or companies try to influence the behaviour of fishermen by means of incentives. An incentive can be defined as ‘any factor (financial or non-financial) that provides a motive for a particular course of action or counts as a reason for preferring one choice to the alternatives’.

Incentives can be influenced by:
- Markets (e.g. through prices)
- Civil society (e.g. through labels and fish guides)
- Government (through management measures)

We distinguish between three types of incentives:
1. Financial incentives
2. Coercive incentives
3. Social/moral incentives

However, the use of incentives does not always have the desired effect. Fishermen are not just profit seeking, calculating people. The behaviour of fishermen is influenced by many factors, such as: personal norms and values, company values, behaviour of other fishermen, peer pressure, profits, future plans etc. Their ability to calculate and process all relevant information is limited.

See SOCIOEC deliverables 3.1 en 3.2 for further elaborations on incentives.

1.3 Research methods

The data for this report was gathered through literature review (scientific papers, and insights gained from other European projects such as MYFISH, CEVIS, COBECOS)
combined with the input of stakeholders (through semi-structured interviews, and focus groups).

1.4 Outline of the report

Chapter two deals with the implementation of Individual Quota in the Bay of Biscay sole fishery (France), and the role of Producer Organisations in the implementation of this new management measure. Chapter three is about the implementation of protected areas in the Baltic Sea and the effect on the behaviour (incentives) of small-scale fishermen in Germany. Chapter four describes successful management measures implemented in the co-managed clam fishery in the Adriatic sea, and chapter five deals with the incentives that have stimulated the transition towards a more sustainable Dutch flatfish fishery. Chapter six is about the incentives provided by the allocation system in the Basque country, Spain. Chapter seven describes management measures implemented in the small pelagic stocks captured by purse seine vessels in the Black Sea (Turkey). Chapter eight deals with the devolvement of quota management in the UK. The final case study is written in chapter nine, and deals with MSC certification in the Celtic Sea herring fisheries. We end the manuscript with conclusions and recommendations for future fisheries policy.
2. Implementation of individual quotas by vessel in the Bay of Biscay for common sole fishery, France

2.1 Introduction
This chapter deals with the establishment of individual quotas in the Bay of Biscay for common sole fishery. The objective is to identify the key drivers of their implementation. We focus on the reasons behind the introduction of the this management measure focussing on the structure of incentives and the co-management framework.

2.2 Context and incentives
Common sole in the bay of Biscay is subject to an EU TAC and quota system. For common sole and for other EU species, the French quota are shared out into sub-quotas per Producer Organisation (PO) as defined by legal statutes dating from 2006 (JORF, 2006). The distribution allocation between POs is drawn up on a track-record criterion based on the average landings of member producers over the period 2001-2003 (Larabi et al., 2013).

As shown in figure 2.1, compliance with the TAC was difficult to achieve until the mid-2000s. In 2006, some POs exceeded their sub-quotas on common sole, and incurred penalties. The penalty system applied by the French administration to POs is based on 2009 EEC regulations establishing a Community control system for ensuring common fisheries policy rules compliance.

Figure 2.1: Comparative Evolution of TACs and sole landings in the Bay of Biscay (DPMA-Ifremer)

According to Article 105, once the Commission has established that a Member State has exceeded its allocated quotas, the Commission shall enforce deductions from future quotas of that Member State. The deductions in the following year or years from the annual quota are established using a multiplying factor as shown in the following table.

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Table 2.1. Deduction of quotas according to EC regulation article 105

2.3 Implementation of IQ in the Bay of Biscay sole fishery

POs gradually imposed individual vessel quotas for common sole on their members for two main reasons: to avoid penalties for quota over-fishing, and in response to increasing constraints on quota linked to stock recovery and constant TAC. A survey on the nine POs working with the Bay of Biscay Sole was conducted in the framework of SOCIOEC (see D6.1) to describe working issues regarding stakeholders for quota management, the evolution of the system and the drivers and consequences of these changes. The first two POs implemented their own quota system in 2006 (From Bretagne and PROMA\(^2\)), with a third (OPOB) in 2008. As indicated in table 2, six out of nine POs (PMA, OPOB, From Sud-Ouest, La cotinière, Arcacopp and Capsud) decided to set up individual vessel quotas in 2011 following high quota consumption at the beginning of the year. The remaining POs (Noirmoutier\(^3\), Vendée and Yeu) continued to manage their sub-quotas collectively because their uptake ratio was lower.

The issue of exceeding quota was first considered by the PO’s even though The Department for Marine Fisheries and Aquaculture (DPMA) is responsible for allocating and controlling national quotas on behalf of the Ministry of Agriculture and Fisheries. In all cases, the decision to establish individual vessel quotas was taken by the PO advisory board. In some cases, ad-hoc commissions were established within the most important POs to discuss quota allocation rules.

Considering the relatively high number of vessels involved in the fishery (400 in 2010), limits were initially applied to the biggest producers, generally the larger netters. The new PO system’s rules and constraints evolved over time in response to changing fishing opportunities. Vessel quota allocations were defined according to specific POs rules described in Lagière (2013) and Macher et al. (2013).

\(^2\) The POs From Bretagne and PROMA decided to merge in 2008 with a 3 year transition period

\(^3\) The number of vessels in the Noimoutier PO is low and limited to only one harbor meaning that the PO can make the decision quickly to stop vessels fishing when sub-quota consumption is reached
Table 2.2: Quota management system by PO for the sole in the Bay of Biscay and allocation criteria in 2012

In some cases, historical vessel track records as defined by the 2006 regulations were used to calculate vessel quotas. In other cases, allocation rules were drawn up using historical landings references, vessel or crew size, the métier type (net or trawl) and possibly the degree of dependence of the vessel on common sole. In some cases, quota was allocated equally between vessels of the same type.

Organisation of POs in France

In France the state has gradually transferred authority for TAC and quota species management to the POs (Larabi et al., 2013). Under the management of sub-quotas by POs, new tools, such as landings limits per vessel have been developed. These were gradually introduced by the POs in order to meet sub-quota and viable fishing opportunities for their members. In some POs this system has been associated with internal management rules, such as so-called contracts between POs and vessel owners which define the main authorised fishing métier for the vessel. This internal regulation can be considered a license aimed at controlling the transfer of effort from one fishery to another. Under the 2010 modernization law for Agriculture and fisheries (Larabi 2013), the management of European fishing permits for their members was transferred to POs. Globally speaking, the arguments put forward by POs is that the knowledge of their members allows them to match the vessel quota to each specific situation, improve the acceptability of the regulations decided by the POs and consequently the capacity to enforce regulations, especially vessel quotas.

Box 2.1: Organisation of POs in France

The limits of smaller producers, such as small trawlers harvesting sole incidentally, correspond more often to a "package" that facilitates the management and reduces enforcement costs. In the event that some vessels have a history of incomplete landings, these vessels may be considered priorities to some POs. The limits thus calculated may...
however be adjusted to specific situations (breakdown, temporary decommissioning etc.).

2.4 Quota monitoring and compliance
All the POs have protocols for monitoring quota uptake. The majority of them refer to members’ logbooks partly for species subject to quotas, or completely for all species. The goal is to collect their own statistics to monitor internal consumption, to dispose of data sources and to cross-validate with official data as appropriate. As underlined in a recent report (Toussain et al. 2012), this system could be improved. Each PO has its own set of rules and sanctions concerning quota overfishing and the recent modernisation law for Agriculture and fisheries (2010) strengthened PO capacity of sanction. If common regulations are not respected, a Producer Organisation can apply sanctions in line with the procedures set up by management rules: for example, non-compensation for withdrawals, seizure of fishing catches, non-renewal of fishing licenses, exclusion from membership.

The nine POs involved in the common sole fishery include almost all vessels operating in this fishery. Over the past decade, the share of non-PO vessels in the fishery has decreased (by 92% between 2001 and 2010 see Figure 2.2). The dynamics of POs membership is complex but the adhesion phenomenon is mainly due to the closure of common sole fishery, which mostly affected the-non PO vessels in the mid 2000s. The share of quota allocated to non-PO vessels being low, their sub-quota was consumed before of the end of the year leading to the sub-quota closure. Membership in the POs then was limited due to a lack of quota availability within POs.

Even if non PO vessels remain, the relative high degree of membership to POs is viewed as positive as it reduces free rider situations in terms of quota overfishing and improves the “controllability” and quota compliance in the fishery.

![Figure 2.2 Evolution of PO and PO members in the bay of Biscay common sole fishery](image)

2.5 Impacts of the implementation of individual quotas on fishing behaviour
Vessel quotas have also changed fishing behaviour in several important ways. The stakeholder interviews carried out in 2012 (Lagière 2013) declared that fishing effort
reallocation has occurred as a result of landings individualisation. Sole landings are more frequently spread over the year. Other changes have to do with a reduction in days at sea for the most specialised gillnetters in order not to exceed their quota limits. Some exits from the industry or from sole fishery have been registered. Another crucial issue addresses fishermen. Crew members are more attracted to vessels owning the largest share of sole sub-quotas. Hence, some POs are confronted with a deck-hand turnover between members. These interviews showed that compliance with sub-quotas and national quota can be improved by strengthening the monitoring and management system of the fishery and by more individualised production management within POs. High-grading or quota discarding behaviour was also documented in some cases.

2.5.1 IQ implementation and quota consumptions
The vessel quota system established by POs under a co-management system cannot be assessed without considering the multiannual management plan implemented in 2006 (EC No 388/2006) and other CFP measures regarding compliance and capacity adjustment. The fishery has gone from a situation where national quotas were regularly exceeded to a situation where the national quota is met with an adjustment of fishing mortality. As shown in Figure 2.3, the consumption rate of PO sub-quotas were adjusted and from this point of view the introduction of quotas by vessel can be considered positive.
Figure 2.3. Quota consumption rate of the French POs for common sole in the Bay of Biscay (DPMA)

- a. For POs introducing IQ in 2008 and 2006
- b. For POs introducing IQ in 2011
- c. For POs that have not introduced IQ systems
2.6 Conclusion

It is evident that the system of penalties for exceeding quotas covered by EU regulation and relayed nationally has had a very positive effect. Other regulatory measures like decommissioning schemes implemented since 2003 and/or Community fishing licenses have also permitted adjustment of nominal fleet capacity. These measures have allowed POs to implement individual quotas per vessel, leaving freed allowances to be allocated to the remaining vessels. In terms of organisation framework, the central administration has gradually transferred the allocation procedures of quotas to POs, as a co-management by delegation. This was a key issue in the establishment of individual/vessel quota in a context of a relative high degree of membership to POs. This is viewed as positive as it reduces free rider situations in terms of quota overfishing and improves the “controllability” and quota compliance in the fishery.
References

Journal Officiel de la République Française (JORF) n°301 du 29 décembre 2006 page 19953 texte n°104: Arrêté du 26 décembre 2006 établissant les modalités derépartition et de gestion collective des possibilités de pêche (quotas de captures et quotas d’effort de pêche) des navires français immatriculés dans la Communauté européenne. NOR: AGRM0602585A.


3. Description of the implementation of protected areas in the Baltic Sea and the effect on the behaviour (incentives) of small-scale fishermen in Germany

3.1 Introduction
This chapter deals with the implementation of protected areas, which are affecting the small scale German fisheries around the island of Fehmarn. The fleet operating in the area consists of around 70 vessels of less than 12m of length, fishing almost exclusively with gillnets. The main target species is cod, with other important species being flounder, plaice, dab, herring, turbot and eel. The catches are often sold locally, whereby the emphasis is put on the local product rather than on certification (as neither herring nor western cod are certified). Most fish sold at the local restaurants is sourced from local fleets, and this adds a quality factor to the tourism in the area, in addition to its seaside landscapes and beaches. The income of the fishermen is improving thanks to some innovative initiatives as the new fish restaurant of the producer organisation in Heiligenhafen (privately funded by the PO) or the “Fisch vom Kutter” initiative of direct marketing.

The closures are not introduced for fisheries management reasons (as protecting spawning areas) but for other external reasons, as the protection of by-catch species and the introduction of a new transport infrastructure. The case has been selected because of its importance for Natura 2000 and other kinds of frameworks that aim to protect and potentially close areas for the purpose of nature conservation (RAMSAR, natural parks etc.). In addition there are plans for the construction of a tunnel to unite the island of Fehmarn (Germany) with that of Lolland (Denmark), which is currently under study (FeBEC 2013a,b).

Despite not being their direct purpose, these protected areas influence the spatial behaviour of the fishermen and in certain cases limit their fishing opportunities, especially when these regional and national protected areas overlap or are located so close to each other that they form a continuum. This is also the case for the German and Danish protected areas.

This chapter focuses on the incentives created by protected areas for conservation purposes. It deals with the German case and refers to small scale fisheries, which is the most important fleet in the area. It leaves out the case of the transport infrastructure as no management measures affecting fisheries have been planned yet. Within the German case we will focus on a particular regional protected area, around the Fehmarn island, where an interesting process of participation has taken place.

3.2 Protected areas affecting the small scale German fisheries around the island of Fehmarn
There are at least two different types of protected areas affecting the German fisheries around the island of Fehmarn, 1) the Natura 2000 designated areas at national (federal) level, and 2) the Natura 2000 designated areas at regional (länder) level. The latter comprise maritime areas inside the 12 mile zone while the former cover the rest of the exclusive economic zone (EEZ), Next to the Natura 2000 designated areas at the federal
level, other Natura 2000 areas exist in the immediately adjacent Danish EEZ. The regulatory setting is still not clear for the national level protected area, as the management plan has not yet been approved. On the other hand, the regulation of the regionally managed protected areas which we will study here has been put into force since December 2013 (Freiwillige Vereinbarung 2013).

The reason to introduce protective measures in this area was to improve the state of the populations of harbour porpoises and of sea ducks (under the birds directive, Council Directive 2009/147/EC on the conservation of wild birds) as well as certain types of seabed (under the habitats directive, Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora). The harbour porpoises and the sea ducks get entangled in the gillnets (Zydelis et al 2009) though the degree to which this occurs varies across studies (Nordic Council of ministers 2011). As the measures mostly refer to the gillnet, which is the main gear used by the German small scale fisheries in the area, the issue of protecting the seabed is not relevant for this study. The main gears, which have an impact on the seabed are trawlers, however, they do not have enough incentives to fish closely to the coast, because the catch is not so abundant there, and it is even forbidden to fish in some areas. A map of the different types of protected areas declared around the island of Fehmarn can be seen in Figure 3.1 below.

Figure 3.1 Types of Natura 2000 protected areas around the island of Fehmarn (German Federal Agency for Nature Conservation, European Environmental Agency)

3.3 Management measures in the protected area
Initially, the regional management measures (proposal of June 5th 2013) aimed at reducing the fishing activities of gillnetters in certain areas in the seasons that were believed to show more presence of harbour porpoises and sea ducks. These seasons amounted to eight months a year, from November 15th to April 15th and from June 15th to September 15th. In addition to the seasonal closures, vessels in some areas are obliged to apply a coustic deterrent devices (pingers) so that harbour porpoises can detect them.
After a period of consultation with the fishermen and environmental NGOs the restrictions were reduced, instead of an eight months closure the surface of the nets would be reduced during two months (1st July to 31st August) to protect the harbour porpoise and additional seasonal closures in sea ducks feeding areas are to be set based on scientific evidence. These additional areas and the duration of the closures would be decided by an independent institution, the Baltic Sea Info Center from Eckenforde (OIC) and would be communicated periodically to the fishermen. At the same time the fishermen promised to collaborate in the monitoring of both species.

The fact that harbour porpoises and sea ducks get entangled in gillnets and die is well known, however the population of those species are not yet well assessed and the possibility of alternatives to the prohibition of fishing activity does not yet give convincing solutions. The population of harbour porpoises in the Western Baltic Sea is believed to be intermediate, lower than that in the North Sea but higher than that in the rest of the Baltic (ASCOBANS 2013) while at least certain species of sea-ducks are considered to be within a safe level in Denmark and are even subject to hunting (see below). Alternatives to the prohibition of gillnets as a tool to avoid harbour porpoise suffocation are being explored at the moment, for example with different types of pinger devices (ASCOBANS 2012).

3.4 The actors in the management of the protected areas

The effects of the gillnet fisheries on the harbour porpoises and sea ducks are not perceived in the same way by all affected stakeholders. Environmental NGOs have launched strong campaigns to inform on these effects, and to a certain extent this is also a priority for the regional Ministry of Energy transition, Agriculture, Environment and Rural Areas of Schleswig-Holstein. The recently elected regional government, whose ministry englobes environmental and fisheries interests, is from the green party, and seems to perceive this environmental issue as a priority. On the other hand the neighbouring regions of Lower Saxony and Meckemburg Vorpommern do not see the need to have any particular management measure to tackle this issue, even though in the Saxony region harbour porpoises are also present and in the Pommeranian region an equal amount of gillnetters are active. Nor do the Danish regulate gillnet fisheries with respect to harbour porpoises, which leaves the Schleswig-Holstein fishermen in an unequal position.

The fishermen’s perception is that their effect on harbour porpoises is minor. The fishermen try to avoid sea ducks, for their own benefit. They have no incentive to catch seabirds as this would significantly increase the effort that is needed to clean the nets, which in turn would prevent the fishermen from achieving their target catch. The fishermen also have a clear incentive to clarify the species of seaducks that are endangered. This is because the state of some of the species is very different in the neighbouring area of Denmark than in Germany. For example in Denmark many sea ducks are abundant and are hunted in large numbers, (Skov et al. 2011) including Long Tailed Duck (1000-4000), Goldeneye (12000) and Common Eider (60000), while in the German coast there is no hunting and fishermen are punished for involuntarily causing the death of seabirds This gives the impression of an unfair treatment of the German fishermen. This perception of unequal treatment may lead to the practice that the fishermen see the management measure to protect the sea ducks as unfair and therefore mistrust the managers. Despite a more recent review paper on the Baltic (Zydelis et al 2009) the fact that the only available scientific studies on the seaducks
bycatch in the Fehmarn area are outdated (Kirchoff 1982 and Metjes and Gabriel 1999) does not contribute to improving the acceptance of the scientific basis for the protective measure. Moreover, both Kirchoff and Metjes point at the Common Eider as the main bycatch species of the German gillnetters, with 64% of the estimated bycatch. As this is the same species mainly hunted in Denmark, the lack of more up to date science contributes to the perception of inequality of the measure. With a rough estimated bycatch of Common Eider of around 10000 (Kirchoff 1982) as compared to the 60000 hunted in Denmark (Skov et al 2011) and only another bycatch species identified, the Common Scoter with 18% of the estimated bycatch there is a need to clarify the current state of the population. Therefore the OIC, which will be the scientific partner of the agreement, has a strategic role in the management process.

For the stakeholder participation process to be successful several actors were involved, although to different degrees. The involved actors included: representatives from the regional government of the federal state of Schleswig Holstein, including its minister; representatives from the regional fishermen organisations Landesfischereiverband Schleswig Holstein, and the small scale gillnetters association Fischereischutzverband; the scientific institution that will monitor the compliance with the agreement as well as the state of the stocks; and finally representatives from environmental organisations that were involved in the consultations. Actors that indirectly influenced the process include: the scientists whose works were cited; additional organisations from other geographical areas, as well as fleets that supported the fishermen; the Danish authorities that provided additional input on relevant scientific sources and the media.

3.5 The incentives created by the protected areas
The management measures mainly aimed at reducing the incentives to fish in certain areas close to the coast which, according to the fishermen, have rich catching opportunities. For other areas, like the ones where sea ducks feed, there was no particular incentive to fish, and they could therefore be more easily avoided.

At the beginning the closed areas were intended to be implemented in a top down manner, by modifying the regional state fisheries law (Küstefischereiverordnung or KÜFO). Nevertheless the regional government held talks with certain stakeholders, including fishermen representatives and environmental NGOs. Scientist were consulted specifically to write the justification of the legal text.

In a first round of conversations (22nd November 2012 in Heiligenhafen) the regional minister showed his preoccupation with the state of the harbour porpoise and the sea ducks. He proposed to launch a new study and involve the fishermen in it, commented on a study that was already taking place with alternatives for the gillnet and finally presented the option to close the fishery for a certain number of weeks in the summer. He transmitted the interest to include the fishermen in the negotiation on the management of the resource, both he and the fishermen showing their intention to talk with all the parties involved.

The regional government presented then on a second round (5th December 2012 in Eckenförde) including also environmental stakeholders, and made an additional proposal. It included a six months closure, without considering the input from the fishermen (at least in the perception of the fishermen). Afterwards the fishermen gave their proposal which included a shorter period of closure. The proposal of the regional government finally went into open public consultation until August 2013.
At this stage the fishermen constituted an ad hoc interest group to gather support from other stakeholders (a "Fisheries emergency group"), reaching the support, among others, of fishermen in the neighbouring German region in the Baltic. Further support was reached from the farmers and hunters associations in the region, with a compromise to work together on sustainability in the primary sector (the Hörnumer declaration in August 2013). This move was broadly covered in the local and specialised press. The Danish fishermen representatives were also consulted on their situation.

Finally the fishermen proposed to meet again. The meeting took place, and after a negotiation the regional government accepted the final agreement involving two months of effort reduction in summer to protect the harbour porpoises and another period in the winter to protect the sea ducks. The regional government also allocated funding for the implementation of the agreement.

A number of resources were employed throughout the whole participation process. A first example is human resources, as the representatives of the producer organisations and environmental organisations were mobilised in addition to the employees of the ministry. Social capital, under the form of the support from other fishermen and local communities was extensively mobilised.

Secondly, financial resources, including EU funds coupled with regional/federal funds to implement, monitor and control the management process were made available at a later stage. This was not being considered at the beginning of the process, and it created an incentive for the fishermen to participate, as it would benefit them, because they are interested in avoiding the bycatch.

Finally, the last resource that was deployed was knowledge, both scientific knowledge and local knowledge from the fishermen. Knowledge played an important role because of the uncertainty about the state of the stocks of the endangered species. It also played an important role in measuring how the closure would affect the fishermen and in calculating the length of the closure that they could economically withstand. Finally the knowledge from other scientific approaches in Denmark was made available by the Danish Agrifish agency.

The management measures were designed with an implicit set of incentives from the start. The incentives created were not only to preserve the endangered species, but also to comply with the measures and to cooperate in their monitoring, as it is to the interest of the fishermen to prove that the agreed solution can work. In the words of the president of one of the fishermen associations that signed the agreement "I encourage the members [...] to comply with the agreed rules. Only in this way can it be avoided that, if we do not succeed, (which is what the environmental organisations expect) another regulation will come that surely will affect us much harder than what we have agreed upon". It also created incentives to further collaborate with the government in the process of policy design, to develop the social capital already available, and to explore management measures in other regions as well as further scientific evidence.

The incentives to preserve the two bycatch species, ducks and harbour porpoises were intended, as this was the main objective of the measure. The participation process was also set to incentivate the compliance with the management measures. The election of an independent institution for the monitoring (the OIC in Eckenförde) was also an additionally intended incentive to cooperate with the monitoring process.
Unintended incentives created during the process resulted in further collaboration with the government in the process of policy design, development of the social capital already available in the affected fishing communities as well as neighbouring ones and the exploration of management measures in other regions.

3.6 Conclusions
It is still soon to say whether the problem has been solved. The conservation of the sea ducks is on its way to be solved through the preservation of their feeding grounds. The results on the harbour porpoise population of the Baltic Sea need further investigation. Nevertheless the indirect social and economic problems that could have been caused by the measures have been avoided by the adaptation of the initially proposed measures through consensus.
References


4. Description of the current management system and its incentives for the Italian fishery

4.1 Introduction
This chapter gives an overview of the management measures implemented for the case study on co-management of clam fishery in the Adriatic sea. The purpose is to investigate management incentives and the fishermen’s behavioral responses as well as the governance structure behind the successful management of this fishery.

The data was gathered through a critical review of all the existing information (scientific papers, technical reports, EU and national legislations, as well as official data collected under the DCF) combined with the input from stakeholders (through semi-structured interviews). A working meeting with stakeholders took place in Chioggia on February 26th, 2013. A number of ten semi-structured interviews have been conducted with a fairly open framework which allows for focused, conversational, two-way communication. A list of questions (reported in Annex A) has been proposed, but the majority of questions have been created during the interview, allowing both the interviewer and the person being interviewed the flexibility to probe for details or discuss issues.

4.2 The fishery
Bivalve mollusc fishing with hydraulic dredges is an activity that has been introduced relatively recently, in the early 1970s, and is mainly concentrated on the Adriatic side of the peninsula. The main target resource is the *Chamelea gallina* (striped Venus clam), which is of native origin and harvested with hydraulic dredges. Other species of bivalve molluscs, (razor clams - *Ensis minor*, smooth clams - *Callista chione* and European aurora venus clams - *Venerupis aurea*) are also fished using this system (Del Piero et al., 1984; Giovanardi et al., 1992; Marano et al., 1998), in different areas and on a smaller scale than the *C. gallina*.

The analysis performed in this case study is focused on the consortia located in the Adriatic Sea (FAO Geographical Sub-Area 17 and 18), which includes the coastlines of the administrative regions of Friuli-Venezia-Giulia, Veneto, Emilia-Romagna, Marche, Abruzzi, Molise and Apulia. This type of fisheries, characterised by the sedentary and the short-life of the exploited stocks, involves only Italian vessels in the Adriatic Sea.

The current number of boats operating with hydraulic dredges in Adriatic Sea is 668 (Mipaaf, Italian Ministry of Agricultural, Food and Forestry Policies). Hydraulic dredges are standardised boats from a technical and size perspective (average size 12 GT, average engine power 105 kW). The number of fishermen in 2012 was estimated at 1,326, which is the equivalent of an average crew of two per boat (see table 4.1).

In economic terms, the contribution of the hydraulic dredge segment to the gross saleable production of the entire Italian fisheries sector is 12%. In 2012, overall production is approximately 21,400 tonnes and represents 19% of the entire fishing fleet production.
The main target species is the native striped venus clam (*Chamelea gallina*), which is harvested with hydraulic dredges. Clams are short-lived, sedentary species and stock status can vary from year to year depending on environmental conditions as well as exploitation patterns. Clams make up 90% of the landings in this segment, 84% in revenues. Other species harvested are hard clams (8% in landings and 12% in revenue) which are landed by 80 vessels in Chioggia, Venice and Monfalcone.

4.3 The management system

The current management system is the result of a long regulatory process that has involved the central administration and the local operators. The legislation adopted for the management of bivalve molluscs fisheries is highly structured. This includes a combination of measures to control both output and input and technical measures. The main strength of this legislation lies in the implementation of a whole series of management measures at the same time, which include:

- Output control measures limiting the catches of the fleet belonging to each single consortium by maximum daily catch quantities per vessel;

- Input control measures addressing production factors through restrictions on the number of boats licensed to fish, the establishment of port exit timetables and limitations on the time (hours) available for fishing;

- Technical measures regulating the relationship between input and output, like the minimum size of the landed product, the temporary or seasonal suspension of exploitation activity, the closure of fishing areas, limitations on equipment and vessel technical characteristics.

The management of bivalve mollusc is delegated to consortia that regulate the effort (fishing days) and the daily quotas according to the status of the resource and the market situation. The consortia have to work within nationally set limits, but they are free to introduce more restrictive measures if they decide to. There are no pre-set parameters similar to traditional reference points, but the management objectives are very clear. Management is rapid and effective in maintaining the following variables within safe limits:

- Size of population,

- Long term income, and

- Catch stability.
4.3.1 Historical development of the hydraulic dredge management system

The clam management experience in Italy can be broken down into three phases (Spagnolo, 2007). The first period, from the early ’70s to the beginning of the ’90s, was characterised by a massive increase in fishing effort owing to growth in the number of vessels. Landings, profits and stock exploitation also increased. Consequently, within a few years, the resource became overexploited. New measures were established at the central level once the management authority identified the problem. Command-and-control input and output restrictions were introduced, and a licensing scheme was started. These measures imposed restriction on fishing time (hours), vessel size, daily landings, minimum size, fishing areas, landing sites. Furthermore, licence transferability was formally forbidden.

The second period started in 1992, when a process for a progressive shift of management of the resources from the government to the industry started. Contradictory decisions meant that the shift of power from the Ministry to consortia progressed slowly. Nevertheless, by 1998 a complete industry based co-management system was achieved (Ministerial decree 515/1998).

In 1992, a National Management Committee for the management of clam fisheries was established. The National Management Committee, chaired by the Director General of Italian DG fishery, is composed of ten members (two of those belonging to the National Administration, three among researchers and five belonging to the productive sectors).

The Committee’s task was to submit proposals intended to improve fisheries management. Over the period in consideration, both the licence rent and the pressure to issue new licences were high. A debate related to the need for reducing the licence rent by issuing new licences was resolved in the period 1993-1994 by granting fewer new licences and by introducing new restrictions on the activity. Undoubtedly, this resulted in a higher pressure on the stock, without any real benefit for the fishery itself, given that the demand for both fresh and processed products was particularly strong.

At the end of this period, the quality of the product suffered, and clam size failed to meet the minimum requirements (25mm). These conditions resulted in a decrease in the unit prices of target species from 1.65 €/kg to 1.09 €/kg (the lowest price registered over the period under analysis) and the related reduction in revenues.

As described above, transition to a co-management approach started in 1992 and in 1996 the central authority launched the first Clam Program which main elements were:

- Introduction of a voluntarily buy-back scheme, with a minimum number of vessels to be withdrawn in each fishing area;

- Institution of the consortia for the management of bivalve molluscs in each area where at least 75% of all vessel owners operating within the fishing area had to be registered. Vessels that fished traditionally in a given fishing ground and were registered in a given maritime district were invited to form a consortium. The powers and activities of the consortia were defined by law. In particular, they were entitled to decide about control and surveillance procedures, rotation of fishing areas, restocking areas, temporary closures and any other restrictions on the limitations still decided by the central authority; and

- Introduction of subsidies for clam restocking and other related activities.
The shift of power from the Ministry to consortia was substantial, even though the basic management measures were still centrally determined (restriction on fishing time (hours), vessel size, daily landings, minimum size, fishing areas, landing sites). The buy-back program required a scientific assessment of the clam stock in each fishing area. Based on the results of this analysis, the number of vessels to be withdrawn to better match fishing capacity to fishing opportunities was defined. The first Clam Program included the permanent withdrawal of 36 dredges which were chosen by granting priority to those areas where the pressure on the resource was higher.

The third period in the clam management experience started in 1998 with the second Clam Program. Within the second program, 109 dredges were withdrawn through a buy-back program similar to that used in the first round, but not all areas were affected by the measure. This buy-back program was also implemented on the basis of the stock assessment results (i.e. prioritizing those areas where the pressure on the resource was higher). In some areas (e.g. the administrative regions of Marche and Emilia Romagna), where the management had already produced good results, there was no need for any further reduction of the fleet. As in the first Clam Program, apart from a few cases, fishermen voluntarily adhered to the buy-back in the second program.

Other important management measures were adopted as part of the second Clam Program. The most important concerned the rules regarding the complete transfer of management responsibility from the Ministry to consortia. The National Management Committee established in 1992 was dismissed and Local Management Co-ordination Committees were established. The powers granted to these committees were provided for by a central regulation, which entitled them to determine maximum landings, area rotation, allowed gears, fishing periods, landing sites, restocking areas, and the like. Basically, they were granted all the powers previously held by the Ministry, which were added to those already in their control. Furthermore, no other clam licences could be issued prior to 1st January 2009, when the performance of the new management arrangement was expected to be reviewed. The second Clam Program therefore brought about the replacement of the co-management arrangement with a complete co-management approach.

Between 1996 and 2005, 15 consortia were established and recognised by the Ministry. The first consortia were established in Ancona (Marche) and Chioggia (Veneto) in 1996. In 1997 another seven consortia were recognised by the Ministry: Venezia in Veneto, San Benedetto del Tronto and Pesaro in the region of Marche, Monfalcone in Friuli-Venezia-Giulia, Termoli in the region of Molise, Rimini in Emilia-Romagna and Pescara in Abruzzi. The subsequent year, an additional consortium was recognised in Emilia-Romagna, Ravenna, achieving the number of 10 consortia in 1998. In 2000, three new consortia were recognised for the management of smooth clam fisheries: Chioggia and Venezia in the region of Veneto, and Monfalcone in Friuli-Venezia-Giulia. In 2004 a new consortium for the area between Ancona and San Benedetto del Tronto (Marche region) was accepted. The last consortium was established in 2005 at Ortona in Abruzzi. Nowadays, all geographical areas interested in this type of fishing activity are managed by consortia.

In 2012, a national management plan for hydraulic dredges was approved by central authority in accordance with Article 19 of Regulation (EC) No 1967/2006; the national plan provides general background information, a description of the historical circumstances that led to the establishment of the consortia and the consolidated
management system that is already being implemented by individual clam management consortia (COGEVO).

4.3.2 Current role and Instruments of the Consortia (The Rights-Based Management (RBM) system)

Rights-Based Management (RBM) is a formalized system of allocating individual fishing rights to fishermen, fishing vessels, enterprises, cooperatives or fishing communities (EC, 2007). The Rights-Based Management (RBM) system adopted for the clam fishery in Adriatic sea was a combination of co-management and TURFs, where the management of the clam fisheries in each maritime district was delegated to a consortium consisting of at least 75% of the vessel owners operating in that area. Once a consortium is empowered with the management of the area, even vessels not registered in the consortium are obliged to comply with the consortium rules.

With the exception of “transferability,” the TURFs and co-management system established for the clam fisheries in the Adriatic waters satisfy all RBM system attributes (MRAG, 2009):

- **Exclusivity**: rights are allocated by law to consortia which are based in territories with a long fishing tradition.
- **Period of validity**: territorial rights are allocated indefinitely to each consortium.
- **Security**: this is a self management approach thus it will be difficult for government to withdraw the rights.
- **Transferability**: consortium’s rights on a given territory cannot be transferred to other consortia.

The regulation adopted for the management of bivalve mollusc fishing includes measures such as:

- A definitive reduction in capacity (withdrawal of licences)
- Establishment of the characteristics of boats and equipment
- A minimum size for the landed product
- A fishing limitation in the waters of the registration compartment
- The establishment of port exit timetables
- The establishment of maximum daily fishing quantities
- A time limit for generalised fishing activities or activities involving certain species
- A limitation of daily fishing hours
- A limitation of equipment and technical characteristics

The framework and general regulations are decided at the central level by the Department of Fisheries and Aquaculture, while the consortia can regulate specific activities in the following areas, through the adoption of internal measures that are more restrictive than the limits imposed by national legislation:
- Equipment characteristics
- Fishing times
- Daily catch quantities
- Minimum sizes
- Seeding
- Area rotation
- Market policy to maintain high product prices
- Control of landing points
- Monitoring at sea
- Fines
- Collaboration with the local health authorities

The consortia are provided with scientific consultation from a research institute that contributes to the establishment of resource displacement practices from one area to another and to decisions concerning rotation of activities.

4.4 Governance

4.4.1 Relationships between fishermen, producer organisations, and government

The guiding principle of the legislation that brought about the RBM system was to allow the introduction of a management approach capable of increasing landings value for the benefit of operators, ensuring a balance between fishing effort and stock size, and maximising product quality. The introduction of co-management was gradual.

From the start of fishing activity in the early 1970s until the beginning of the 1990s, the central management authority imposed restriction on fishing time (hours), vessel size, daily landings, minimum size, fishing areas, landing sites; in addition, licence transferability was formally forbidden. These stringent restrictions imposed by the central authorities, proved to be ineffective and overexploitation and stock decline continued, with negative effects on the economic performance becoming evident the second half of 1990s. The central management strategy was blamed for the failure and fishermen asked for financial support and new rules to reduce fishing capacity. The central authority agreed to make a progressive shift of the management responsibility to the industry through the Consortia.

Meanwhile, the role of Producers Organisations grew; in some cases, POs in order to match supplies with market demands begin to regulate the fishing activity. Nowadays a clear distinction between the role of the Consortia and of the POs has been defined; Consortia are responsible of the management measures (mainly, limitation of fishing days and the establishment of maximum daily fishing quantities), while POs help them match supplies with market demands and support them in creating added value. In each area, the local Producer Organisation sells the product caught by hydraulic dredges to domestic market or abroad. For example, in the area of lagoon of Venice, the two Consortia for the management of clams in Venice and Chioggia collaborate with the PO “Bivalvia Veneto” that is responsible for the sale of the clam caught.
4.4.2 The Introduction of the co-management system – higher compliance rates

The co-management system is seen as the appropriate institutional arrangement to restore the relationship between fishermen and government. From the early ’70s to the beginning of the ’90s, the situation in the industry with a policy that was considered highly illegitimate by the fishermen, subsequent low compliance rates, had put a severe pressure on the relationships between fishermen and government.

Afterwards, fishermen were increasingly required to act as entrepreneurs and managers and to cooperate in co-management groups. More responsibility regarding effort management and enforcement (through social control), has led to more legitimacy and higher compliance rates. The fishermen feel protected by the consortium and have more faith in the decisions that have been taken (conclusion based on stakeholders meeting held in Chioggia on February 26th, 2013).

Overcapacity and decommissioning schemes

Until the early 1990s, the sector experienced a consistent increase in fishing effort. The number of hydraulic dredges operating in the Adriatic increased from 384 in 1974 to approximately 900 in 1994. Due to an excessive and uncontrolled fishing effort, production levels dropped from 100 thousand tonnes in 1984 to 38 thousand tonnes in 1993, even accounting for annual fluctuations and differences between geographical areas (fig. 4.1).

Fig. 4.1 – Trend in number of hydraulic dredges (Mipaaf).

During subsequent years, with the introduction of the two Clam Programs, the fleet underwent a slow but steady reduction. The first Clam Program, launched by the central authority in 1996, introduced a voluntarily buy-back scheme with a minimum number of vessels to be withdrawn in each fishing area. Given the critical condition of the fisheries in that period, there was an immediate response by vessel owners, which allowed the central authority to design and implement a second and more ambitious Clam Program. The number of vessels decreased, reaching about 700 units in 2002 and remaining more or less stable thereafter. In percentage terms, the withdrawal programs produced a reduction of around 20% of the fleet. After the withdrawal programs, stability in fleet size
can be attributed to a ministerial decree 515/1998, which determined that no new licence could be issued prior to 1\textsuperscript{st} January 2009.

### 4.4.3 Incentives from the RBM system

The RBM system progressively implemented for clam fisheries in the second half of the '90s was aimed at overcoming the problems associated with the overcapitalisation and overexploitation. The intent was to re-establish a healthy stock, capable of yielding a high quality product, thereby increasing landings value and regulating catches to stabilise revenues and profits in the face of fluctuating environmental conditions. The success of co-management directly hinges on an incentive structure (economic, social, and political) that induced various individuals to participate in the process. It is often easier to implement co-management arrangements in which the resource user recognises an incentive for participation on its own and undertakes action rather than when an incentive is presented to a resource user by an external agent (Pomeroy et al, 2001).

In the case of Adriatic clam management system, the consortium acquires the right to manage that area and also enforce its management decisions to vessels with owners that are not members of the consortium. Individuals felt that the benefits obtained from participation in the co-management arrangements, including compliance with rules, have been greater than the losses in case of non-adhesion.

The incentives associated with the RBM for the Adriatic clam co-management measure can be classified in (de Vos et al 2013):

1. Coercive incentives
2. Social incentives
3. Financial incentives
4. Economic incentives

Coercive incentives exist when a person can expect that the failure to act in a particular way will result in punishment (e.g. a fine, imprisonment, confiscating or destroying possessions) by others in the community (business dictionary).

Social incentives involve the potential psychological costs (e.g. exclusion) to an individual of not behaving in line with a social norm. Social norms can provide an incentive for individuals to follow a certain course of action, which might be different from that based on financial incentives (Bruggen and Moers, 2007).

Financial incentives exist when an actor can expect some form of material reward — especially money — in exchange for acting in a particular way (for example decommissioning schemes).

Economic incentives exist when fishermen can expect that the economic performance of the vessels changes significantly with the introduction of the RBM system.

This section of the report evaluates the coercive, financial, economic and social incentives associated with the RBM system implemented for the clam fishery in Adriatic sea.

**Coercive incentives**

The Adriatic clam fishery is subject to the monitoring, control and surveillance system implemented for the Italian fishery sector. The National Management Plan for hydraulic dredges (Ministerial Decree 27/12/2010) has defined a minimum biomass level “security
threshold” that would serve as a reference above which there is a good guarantee of biological sustainability of the stock. In the event, the annual average catch index per day and boat falls below the threshold value (183 kg/day/vessel) for 3 consecutive years, corrective management intervention is required. In such an event the following limitations shall be adopted:

   a) Reduction in the fishing period through a moratorium on fishing for, at least, an extra month

   b) Reduction of one day in the fishing week

In the event the above indicators do not rise above the threshold value in the two following years, fishing shall be stopped for an entire year. In the case of fishermen involved in clam fishery, the coercive incentive is not very significant in consideration of the higher compliance rates of the rules. The framework and general regulations are decided at the central level by the Department of Fisheries and Aquaculture of the Ministry of Agricultural, Food and Forestry Policies, while the consortia can regulate specific activities through the adoption of internal measures that are more restrictive than the limits imposed by national legislation. The fishermen in the Consortia self-regulated, for example, the daily catch quantities, the minimum sizes of the clam and the fishing time with threshold much restricted than the national regulation.

Financial incentives

The government used financial incentives to stimulate the installation of the co-management system in a first phase of the process that lead to current RBM system. Both the first and the second Clam Plans basically introduced a series of subsidies to the clam division in addition to those already intended for the fishing sector as a whole. These included, in particular:

- Income support subsidies: contributions towards definitive shutdown and temporary suspension, and compensations for environmental and ecological damage;
- Subsidies for general services: the assignment of a contribution towards the establishment of each management consortium and an additional contribution towards the expenses of the scientific research institutes for their elaboration of the individual consortium plans and technical assistance.

The first Clam Plan in 1996 assigned significant financial resources to increasing stock productivity. In particular, development actions were encouraged (seeding and restocking of bivalve molluscs), with the consortia being responsible for their implementation. Most of the financial interventions were intended to support the consortia and activities to help the resource recover. Of the 27 million Euros allocated with the first Plan, only 5 million were used to finance the definitive shutdown of 36 hydraulic dredges, which represented approximately 4.5% of the fleet.

Under the second Clam Plan in 1998, 109 hydraulic dredge permits were withdrawn. With the second Clam Plan there was a reversal in the trend for allocation of financial resources. Only five million Euros were allocated to restocking and connected activities,
whereas 20 million Euros were granted for financing definitive shutdowns. A sum of 10 million Euros was also allocated to financing temporary suspension (table 4.2).

During the first and second Clam Programs, fishermen spontaneously adhered to the buy-back plan, and complied with its requirements. The considerable buy-back allowance provided an incentive for fishermen to leave the fishery.

<table>
<thead>
<tr>
<th></th>
<th>I Clam Program</th>
<th>II Clam Program</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permanent withdrawal</td>
<td>5</td>
<td>21</td>
<td>26</td>
</tr>
<tr>
<td>Restocking and other related activities</td>
<td>22</td>
<td>5</td>
<td>27</td>
</tr>
<tr>
<td>Temporary withdrawal (Years ’97 e ’98)</td>
<td>-</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>27</td>
<td>36</td>
<td>63</td>
</tr>
</tbody>
</table>

Table 4.2: Financial resources for the implementation of Clam Programs (Mipaaf, Direzione Generale Pesca e Acquacoltura).

**Economic incentives**

The introduction of the RBM system has resulted in a substantial improvement in the economic performance of the Adriatic clam fishery. The change in management system moved the fishery from a situation of negative net profits in 1996, to a condition of sustained higher profitability within a few years. The total value of landings shows a relatively stable level from 1994 to 1999, and a significant increase in the period managed under RBM up to 2003. After 2003, revenues in the fishery decreased before becoming stable.

The most important economic trends that positively affected the Adriatic clam fisheries were:

1. The **stabilisation of the economic performance**. Prior to the RBM system, the economic performance of the hydraulic dredges operating in Adriatic Sea fluctuated along with the fluctuations in stock status. The economic performance indicators have shown a decreasing trend since 1997; from 1998, following the introduction of the RBM system, an increasing trend in revenue has been registered. After 1999, consortia operated to maintain higher prices by reducing the levels of activity and market supply and this led to an increase in revenues and a generalised containment of costs, particularly operational costs. The most recent period started in 2005 and shows a stable trend where variations in landings are counterbalanced by changes in prices (fig.4.2).
2. **Increase in market price**: restrictions on catch quotas by consortia have promoted the catch of bigger sizes of clams and the improved quality of landings has been reflected in an increase in market prices. In the last three years, a decrease in demand has been recorded. This negative trend is related to the increased competition of the farmed clams (carpet shell) associated with a reduction of foreign demand, in particular from Spain (the producer organisation in Veneto, OP Bivalvia Veneto, exports about 60-70% to Spain). In the past years, a part of the production was sold to local fishing processing companies; nowadays, the fishing processing companies transform raw material from extra-eu countries, which are more competitive. Notwithstanding the decrease of the demand, the RBM system has allowed the sector to keep prices at a stable level while avoiding drastic reductions (fig 4.3).
3. **Better control of the supply**: a market strategy at Consortia level has been introduced to better manage the fluctuations in productivity; the consortia control the supply, and hence the selling price (clam prices respond rapidly to changes in supply). The strong correlation between landings and prices observed from 2000 can be considered the final result of a management strategy aimed at stabilising revenues and profits. For example, the CoGeVO of Chioggia regulate the volume of landing day by day in consideration of the demand; the production price is stable since 2009 (about 4.50 €/kg). However, a market strategy at national level was never introduced and each consortium makes management decisions independently. A sort of coordination committee in which coordinate the market strategy doesn’t exist at the moment.

4. **Increased market value of hydraulic dredges**: higher profits increased the value of licences for hydraulic dredges. The ship owners who did not withdraw from the fishery during the first and second Clam Programs benefited from the suspension on new licences as well as from the reduction in the number of vessels in the fishery. In 2002, the licence value was estimated as € 500,000 (Spagnolo, 2007). In 2012, the value of a licence with its vessel attached is around € 1,000,000. In consideration of the fact that the transfer of an hydraulic dredge by a consortium to another is not allowed, there is a large fluctuation in the average value of each vessel. The variation is related to the different economic performance by fishing area; in 2011, in the Marche region, the average annual income per vessel has been 129,000 €, much higher of the income in Veneto (54,000 €). The dimension of the fishing area is not the same for each Consortia and the number of hydraulic dredges for each Consortia is not related to the extension of the fishing area; for example in Ancona (Marche Region), the number of hydraulic dredges is 55, while the fishing area has an extension of 7,615 ha; in Venice, there are 45 hydraulic dredges that operate in a fishing area of 1,045 ha. The different level of concentration (number of vessels per hectare) influences the economic and physical productivity.

**Social or moral incentives**

The RBM system is seen by fishermen as an instrument able to protect resources and mitigate the effects induced by environmental crises. Fishermen are motivated to join the consortium also because this choice is widely regarded as the right thing to do by the community. In the recent year, in particular in some fisheries, such as the hydraulic dredges or the pelagic fisheries, the attitude of fishermen has changed in favour of a more responsible behaviour. The fishermen are aware of the environmental impact of their activities and are willing to reduce fishing effort, to increase the size of the products and to individuate protected areas on a voluntary basis.

The environmental risks represent the main externality that has affected the performance of the hydraulic dredges; the resource is subject to significant annual fluctuations and can suffer declines in production caused by the recurring problems of anoxia, predator and parasite damage and, especially, cyclical blooms of toxic microalgae. Even though the negative long-term dynamics in clam fisheries cannot be tackled by the introduction of an RBM system, especially when these dynamics depend on environmental factors that are outside the control of the consortia, the negative short-term effects can be mitigated by consortia through management (Spagnolo, 2007).
From an ecological point of view, the introduction of TURFs has allowed consortia to eradicate the “race to fish,” thereby reducing overexploitation and allowing stocks to recover from short-term environmental impacts. On the other hand, Consortia decide, in case of a steady reduction of production in an area to close that area for a certain period to allow for the restoration of the environment. The community and local authorities perceive that the fishermen and their Consortium act with due respect for the environment; the fishermen, for their part, feel more socially accepted and represented by the Consortia.

Another important purpose of the system is related to the function of balancing income among fishermen who participate in the consortium. Each vessel is guaranteed the same level of income, through the setting of fishing days and daily catch quantities equal for all. In this way, critical situations resulting from reductions in profits are distributed among all the fishermen as well as higher earnings from increased product demand.

4.5 Conclusion

The RBM system progressively implemented for clam fisheries in the second half of the ‘90s was aimed at overcoming the problems associated with the overcapitalisation, and overexploitation. The intent was to re-establish a healthy stock, capable of yielding a high quality product, thereby increasing landings value, and regulating catches to stabilise revenues and profits in the face of fluctuating environmental conditions.

The successful management of the segment is based on a progressive decentralisation of the decision level, ending up with a co-management regime where Territorial Use Rights (TURF: Territorial Use Rights for Fisheries) were introduced.

Some aspects of the Adriatic clam fisheries have contributed to the success of the system such as:

- The sedentary character of the target resource, which is distributed in specific areas easily identified in every harbour;
- Homogeneity of the fishery segment is another important aspect, allowing the introduction of rules largely accepted by all fishermen;
- More responsible behaviour of the fishermen and of their perception of the ecological impacts of their activity.

The existence of a co-management approach plays an important role; a command and control approach would have never been appropriate. The combination of the measures adopted, their timely introduction, together with economic and social incentives proved to have an important role in allowing a segment of the fleet to leave the central administration support and to accept its own responsibility. The degree of responsiveness of vessel owners, who were requested to play an active role in the whole process, has been high.

The RBM system has allowed profits to remain on acceptable levels and to mitigate the negative effects induced by the increase of operational costs, the reduction of domestic demand and the fluctuations in stock biomass. A better quality of catch and efficient market strategies has given rise to increases in clam prices.
Weaknesses exist and depend on the uncertainties linked with periodical environmental damages; the RBM system has allowed stock condition to recover through the eradication of the race to fish and the possibility to make coordinated exploitation decisions at local level.
References


5. Description of the incentives that have stimulated the transition to a more sustainable Dutch flatfish fishery (2000-2014)

5.1 Introduction
This chapter deals with the Dutch cutter fisheries which has gone through many changes in the last fifteen years. We will elaborate further on the coercive, financial and social incentives that have played an important role in these changes. We end this chapter with a conclusion on the role of incentives in changing the behaviour of fishermen.

5.2 The Dutch cutter fisheries
The Dutch cutter fisheries counts 275 active cutters, which are mainly active in the North Sea, and the Wadden Sea. The vessels are owned by families of which the members often fish themselves as skipper-owner or crew member. The main target species are plaice, sole, and shrimps.

The financial yield of the Dutch fisheries has gone down by 30% in the period of 2000-2012 (figure 5.1). The most important reasons for this decrease are: 1) The reduction in number of vessels, 2) Decreasing fish prices (see figure 5.5), and 3) Increasing costs (fuel, wages) (Taal et al, 2014).

![Figure 5.1: Financial yield of the Dutch fisheries industry from 2000-2012 (Compendium voor de leefomgeving, 2013)](image)

During the last four years the net results of the Dutch cutter fisheries have improved (see figure 5.2). One of the main reasons for the increase is the use of different fishing techniques that consume less fuel.

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4 The financial yield can be defined as the gross income (fish caught times prices), plus other activities that generate an income.
Figure 5.2: Net results of the Dutch cutter fisheries (Taal et al, 2014)

Ever since the beginning of the Millennium, the fishing fleet is undertaking many efforts to get more sustainable. Many vessels have switched to more sustainable fishing techniques, such as twinrig, flyshoot, sumwing and pulse (see figure 5.3), and many fishermen are (getting) certified with a sustainability label. A number of incentives have played a role in these changes, such as:

- High prices for fuel (with a peak in 2008)
- Decreasing fish prices, increasing competition with cheap farmed fish coming from Asia, as well as wild MSC certified flatfish coming from Alaska.
- The establishment of Natura 2000 at sea, which limits the accessibility of certain areas for the beam trawl.
- Possibilities of receiving subsidies for investments in sustainable fishing techniques, as well as subsidies for assistance in certification procedures.
- Pressure from NGOs (in the form of Fish Guides and labels), and criticism on the use of the beam trawl.
- The supermarkets which have changed their purchasing policies implying among other that fish requires to be MSC certified.

These incentives have stimulated the changes in the Dutch fishing industry in favour of more sustainability. The effort (in hp-days) diminished from 83% in 2007 (2003=100%) to less than 15% in 2012 (Taal et al, 2014) (see figure 5.3).
In the next sections we will elaborate further on the incentives that played a role in these changes.

5.3 High fuel prices
After a period of rather low fuel prices in the nineties, fuel prices almost doubled round the year 2000, arriving at a peak in 2008 (see figure 5.4). In 2005, 33% of the yield went straight to the oil supplier (http://www.visserijinnovatieplatform.nl/downloads/gesignaleerd/economische_bulletin_energieverbruik_visserij.pdf).
Figure 5.4: The development of the oil price since 2000 (adapted http://www.mongabay.com/images/commodities/charts/crude_oil.html 22 May 2011)(de Vos, 2011).

5.4 Fish prices

The prices for fish have diminished for plaice and sole. The prices for shrimp have gone up (see figure 5.5). With the increasing costs (fuel, certification, wages) it is more and more difficult to earn money.

Figure 5.5: Prices of sole, plaice and shrimps (Taal et al, 2014)

5.5 The establishment of marine Natura 2000 areas

Currently the Netherlands designated six marine Natura 2000-areas which will be protected under the Bird and or Habitat Directive (see table xx). These areas will be part of the European Natura 2000 network. In the direction group VIBEG (Fisheries in Protected Areas, within territorial waters) agreements have been made regarding fisheries measures within the Natura 2000-areas of the Coastal Zone and the Vlakte van de Raan. These measures are shown in table 5.1. An important incentive for change lies in the fact that more sustainable fishing techniques such as pulse fisheries are allowed in 75% of the area, while the traditional beam is allowed in zone 4 until January 2016.

<table>
<thead>
<tr>
<th>North Sea Coastal Zone</th>
<th>Zone I</th>
<th>Zone II</th>
<th>Zone III</th>
<th>Zone IV</th>
<th>Zone V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regime</td>
<td>Completely closed for fisheries</td>
<td>Open for non-trawling techniques (e.g. gillnet)</td>
<td>Innovation areas. Best available fishing techniques are allowed, such as shrimp fisheries and pulse fisheries</td>
<td>Remaining fishing area. From 2016 onwards the beam trawl will be denied access.</td>
<td>Research area</td>
</tr>
<tr>
<td>% of the Total area</td>
<td>10%</td>
<td>15%</td>
<td>28%</td>
<td>47%</td>
<td>To be decided</td>
</tr>
</tbody>
</table>

Table 5.1: Zoning and measurements for the North Sea Coastal Zone (VIBEG-agreement, 2011)

In 2009 the FIMPAS-project (Fisheries Measures in Protected Areas) was established in which a package of fisheries measures has been developed for the Natura 2000 areas...
outside the territorial waters: Doggerbank, Claeverbank and Frisian Front in cooperation with environmental NGOs, and representatives of the fishing industry in the UK, Denmark, Germany, Belgium and the Netherlands. The aim is to regulate fisheries in such a way that the conservation goals of the three areas are being met without completely excluding fisheries. The proposals for the Doggerbank and Claeverbank concern a zoning in which specific forms of trawling will be forbidden. For the Frisian Front it concern limitations to the gillnet fisheries in the period in which birds are vulnerable.

The fishing sector has for a long time tried to prevent the establishment of Natura 2000 areas by means of a political lobby. Interesting is that in 2008 the Minister had said that fisheries is seen as an ‘old’ activity for which the new conservation rules will not count (personal communication with an environmental NGO, 2014). However this changed and fisheries is now seen as a new activity for which every year a new license needs to be applied for. The fisheries industry is however given time to restructure, and switch to other techniques. In VIBEG it is also stated that sustainability means both ecological and economic sustainability, and both condition need to be present (VIBEG, 2011).

<table>
<thead>
<tr>
<th>Area</th>
<th>To be protected under Natura 2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Sea Coastal Zone</td>
<td>Birds and Habitat Directive In December 2008 announced with the EC. On February 26th 2009 officially designated. On December 27th an amendment on the designation. On October 4th and 18th another amendment. In February 2014 the concept management plan was published.</td>
</tr>
<tr>
<td>Voordelta</td>
<td>Birds and Habitat Directive On February 19th officially designated as Natura 2000-area. February 17th 2010 amendment on the designation. On July 16th 2008 the management plan was approved for six years.</td>
</tr>
<tr>
<td>Vlakte van de Raan</td>
<td>Habitat Directive On December 22nd 2008 announced at the EC. In December 2010 officially designated. In the spring of 2014 the management plan was ready. The fisheries agreements as laid down in the VIBEG agreement will be integrated in the management plan.</td>
</tr>
<tr>
<td>Doggerbank</td>
<td>Habitat Directive On December 22nd announced at the EC. In April 2014 not yet officially designated.</td>
</tr>
<tr>
<td>Claeverbank</td>
<td>Habitat Directive On December 22nd announced at the EC. In April 2014 not yet officially designated.</td>
</tr>
<tr>
<td>Frisian Front</td>
<td>Birds Directive In the summer of 2010 announced under the Birds Directive, and officially designated as Natura 2000-area.</td>
</tr>
</tbody>
</table>

Table 5.1: Areas in the North Sea that will be protected under European regulation (Natura 2000) (van Bets, 2010; De Vos et al, 2014).

5.6 Financial incentives (subsidies) contributing to the decline of the beam trawl, and the increase in certification

Since 2008, the Ministry of Economic Affairs (previously Ministry of Agriculture, Nature and Food Quality) has provided a number of financial incentives in the form of subsidies for the fishing industry to switch to more sustainable fishing techniques, as well as subsidies to become certified. Also several rounds of decommissioning subsidies have led to the decline of the traditional beam trawl.
5.6.1 Decommissioning
In 2008 23 traditional beam trawlers have been decommissioned. This was the result of the arrangement which former Minister Verburg of the Ministry of Agriculture, Natura and Food Quality had opened. 30 Million euro was available for the decommissioning of the flatfish fleet, of which 29 million was intended for the decommissioning itself and 1 million for social-economic measures [http://www.rijksoverheid.nl/documenten-en-publicaties/persberichten/2008/01/04/verburg-neemt-met-saneringsregeling-visserij-23-kotters-uit-de-vaart.html](http://www.rijksoverheid.nl/documenten-en-publicaties/persberichten/2008/01/04/verburg-neemt-met-saneringsregeling-visserij-23-kotters-uit-de-vaart.html).

5.6.2 New fishing techniques
The pulse fisheries has a long history in the Netherlands. From the seventies onwards the Ministry subsidised research on the pulse technique. Big steps have been made since 2005. Research was done by biologists, a Steering Committee was set up consisting of the Ministry, fishermen, biologists, and economists, and a test vessel was financed (Quirijn et al, 2013).

In 2008 the Minister of Agriculture, Nature, and Food Quality provided a subsidy of 880.000 euro for the purchase and installation of a pulse trawl on board of five fishing vessels through a subsidy regulation called ‘Investments in fishing vessels’.

Technically, the EU regulation prohibits electrical fishing. The fishermen who apply the pulse technique are granted an exemption that allows them to fish. In 2010 and 2011 in total 42 experimental pulse exemption were granted by the EU to the Dutch fishermen. On March 13th the European Parliament and the Fishery Council amended article 31 of the Regulation Technical Measures, as a result of which fishing with pulses is allowed. Because of this amendment, the pulse fisheries is no longer a forbidden technique. However, the European Union imposed some limitation on the fishery, among others the limitation that only up to 5% of the total beam trawl fleet is allowed to fish with pulses (Quirijn et al, 2013).

Apart from the subsidies for pulse fishing, the Ministry opened several subsidy rounds for innovation and collective action in the fisheries value chain. Part of these subsidies was used for investments in sustainable fishing techniques, such as pulse fisheries, flyshoot, twinrig and sumwing, which replace the traditional beam trawl:

- In March 2008 5,5 million euro was spent on innovations in the value chain, of which 3 million in March, and then another 2 million in the summer. The maximum subsidy for each application was 500,000 euro. Part of that originated from the European Fisheries Fund (EFF). The Fisheries Innovation Platform (VIP) assessed and classified the applications, based on the following criteria: applicability, sustainability, effect on the environment, and selectivity of the fishing techniques [http://www.rijksoverheid.nl/nieuws/2008/04/04/veel-belangstelling-voor-subsidie-innovatie-in-de-visketen.html](http://www.rijksoverheid.nl/nieuws/2008/04/04/veel-belangstelling-voor-subsidie-innovatie-in-de-visketen.html). 22 projects were honoured.
- In 2009 2,5 million euro was spent on innovations in the fish chain (Ministerie van LNV, dienst regelingen, 2009)

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5 With pulse fishing, the heavy tickler chains of the classical beam trawler are replaced by much lighter wires through which very light electric impulses are sent. The advantages are that fuel consumption is 20 to 40% lower, there is less disturbance of the bottom, less by-catch and an improved catch. Bottom fish only triggered by the light pulses to leave the bottom.
- In 2010 the Ministry opened two subsidy arrangements, one for innovation in the value chain and one for collective actions in the value chain. The total amount was 2 million euro.
- In 2011, 25 projects were subsidised with a total amount of 6 million euro (of which 30% originated from the EFF) ([http://www.rijksoverheid.nl/nieuws/2011/08/26/zes-miljoenen-euro-voor-innovatie-en-samenwerking-in-de-visketen.html](http://www.rijksoverheid.nl/nieuws/2011/08/26/zes-miljoenen-euro-voor-innovatie-en-samenwerking-in-de-visketen.html)).
- In 2012 6 million euro was spent on innovation, sustainability, and cooperation within the fish value chain. 8 of the 21 projects were aimed at new fishing techniques ([http://www.rijksoverheid.nl/nieuws/2012/05/16/6-miljoen-voor-innovatie-en-samenwerkingsprojecten-in-de-visketen.html](http://www.rijksoverheid.nl/nieuws/2012/05/16/6-miljoen-voor-innovatie-en-samenwerkingsprojecten-in-de-visketen.html)).

For the fishermen this decommissioning as well as the subsidies for new fishing techniques made a big difference:

“We have made a lot of progress by decommissioning vessels. The selectivity has improved, and we are still working to improve this further. The upcoming discard ban provides another important incentive for change.” (personal communication fishermen representative, 2014).

### 5.6.3 Certification

Next to the change in fishing techniques, also certification is seen by the Ministry as an important step in the transition towards a sustainable fisheries. Mainly the MSC label is perceived as a trustworthy label.

- During the period of 2008-2011, the leading group sustainable North Sea fisheries, existing of: the two main fisheries organisations (Vissersbond, and Federation (currently Visned)), an environmental NGO, the Fish product Board, MSC, and fishermen, received 50,000 euro subsidy from the European Fisheries Fund (EFF), 116,000 euro subsidy from the Ministry, and 58,000 euro private subsidies in order to coordinate the certification process in the flatfish fishery, and in addition to inform fishermen about the necessary adaptions required to be eligible for a MSC certificate ([http://www.europa-nu.nl/id/vj3nmn6mspug/mede_mogelijk_gemaaktDoor_de_eu_8](http://www.europa-nu.nl/id/vj3nmn6mspug/mede_mogelijk_gemaaktDoor_de_eu_8)).
- In 2009 the Ministry made 1 million euro available (of which 50% originated from the EFF) for certification processes in the sea and coastal fisheries and shellfish farming.
- In 2010 again 1 million euro was (€ 0.8 miljoen), and for certification processes in the inshore fisheries and aquaculture (€ 0.2 million). Companies received a maximum for 100,000 euro.
- In 2011 the project ‘Transition to a Sustainable Dutch Fish Value Chain’ granted a non-recurring subsidy for a confidential MSC pre-assessment. The project was carried out by the North Sea Foundation, WWF (both environmental NGOs), with money that originated from the State lottery [http://www.msc.org/visserijen/nieuws/newsitem/subsidie-voor-voorstudie-msc-certificering](http://www.msc.org/visserijen/nieuws/newsitem/subsidie-voor-voorstudie-msc-certificering).
- In the project ‘Fisheries Knowledge Groups’(2008-2014), which was paid by the Ministry, and EFF, also some money was spent on certification processes, although this was not the focus of the project.
The certification with MSC was also encouraged by the environmental NGOs, as well as the supermarkets. At the moment there are 11 units that are MSC certified (i.e. vessels that apply certain techniques, fish in certain areas at certain target species) in the Netherlands (see table 5.2). Until 2013 there were 12 units, however the gillnet fishermen (sole) did not go for re-certification, as the extra costs did not counterbalance the benefits.

<table>
<thead>
<tr>
<th>Year of certification</th>
<th>Unit of certification</th>
<th>Target species</th>
<th>Market</th>
<th>Number of certified vessels</th>
<th>Total number of Dutch vessels in this fleet segment</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>Pelagic Freezer-Trawler Association (PFA)</td>
<td>North Sea herring</td>
<td>Young herring goes to Germany, Belgium, and the remaining herring is exported outside Europe</td>
<td>18 (Dutch + flag vessels)</td>
<td>14 Dutch vessels</td>
</tr>
<tr>
<td>2009</td>
<td>Twinrig fisheries Ekofish group</td>
<td>North sea plaice</td>
<td>Netherlands/ Northern-Europa</td>
<td>5 (4 flag vessels and 1 NL vessel)</td>
<td>15 Dutch vessels</td>
</tr>
<tr>
<td>2009</td>
<td>Pelagic Freezer-Trawler Association (PFA)</td>
<td>Mackerel</td>
<td>27 (14 NL and 13 flag vessels)</td>
<td>14 Dutch vessels</td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>Pelagic Freezer-Trawler Association (PFA)</td>
<td>Atlanto Herring</td>
<td>Europa and outside Europe</td>
<td>26 Dutch and flag vessels</td>
<td>14 Dutch vessels</td>
</tr>
<tr>
<td>Tot 2013</td>
<td>Staandwantijsseij</td>
<td>North Sea sole</td>
<td>Southern Europe</td>
<td>60 Dutch vessels</td>
<td>Unknown</td>
</tr>
<tr>
<td>2010</td>
<td>Twinrig fisheries Osprey Group</td>
<td>North Sea plaice</td>
<td>EU</td>
<td>6 flag vessels</td>
<td>15 Dutch vessels</td>
</tr>
<tr>
<td>2011</td>
<td>PO Mussels</td>
<td>Mussels in the Wadden Sea and coastal regions</td>
<td></td>
<td>63</td>
<td>63</td>
</tr>
<tr>
<td>2011</td>
<td>VBHL angler fishery</td>
<td>Seabass in the Southern part of the North Sea</td>
<td></td>
<td>19</td>
<td>Unknown</td>
</tr>
<tr>
<td>2011</td>
<td>Zeeuwse hangcultuurmosseelen</td>
<td></td>
<td>Dutch and Belgium market through retail and restaurants</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>2012</td>
<td>Cockle fisheries in the Wadden Sea and Oosterschelde (handpicked).</td>
<td>Cockles</td>
<td>Spain and France</td>
<td>31 licences</td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td>Ensis fisheries</td>
<td>North Sea (Dutch EEZ)</td>
<td>Spain and Italy</td>
<td>2 Dutch and 2 flag vessels</td>
<td>8 licences, but only 4 active vessels</td>
</tr>
<tr>
<td>2012</td>
<td>Coöperative Fisheries Organisation (CVO) Twinrig, outrig and flyshoot</td>
<td>North Sea plaice and North Sea sole</td>
<td>worldwide</td>
<td>75 Dutch and 20 flag vessels</td>
<td>Unknown</td>
</tr>
</tbody>
</table>

Table 5.2: Number of Dutch fleet segments that are MSC certified (based upon [www.msc.org](http://www.msc.org)) (De Vos et al, 2014).

In 2014 65% of the total volume landed by the Dutch fleet is MSC certified (personal communication with MSC, 2014).

5.7 Pressure from NGOs and retail

In 2004, the environmental NGO, the North Sea Foundation, introduced the *Goede Vis Wijzer* (Good Fish Guide), a wallet card which categorises the main fish species consumed according to a traffic light system: red for ‘preferably not’, orange for ‘second choice’ and green for ‘excellent choice’. The colour differentiations makes it easy for...
consumers to see which species are close to extinction and which species causes little
damage to the environment. MSC certified fish was categorised as green. Other
certification schemes were not included. North Sea flatfish was categorised as red. The
aim of the wallet card was to stimulate the demand for sustainable fish, and in that way
push the fishermen to become sustainable (De Vos and Bush, 2011).

In 2006 a new Fish Guide was published, 2.7 million copies were spread. In 2007 the
third Fish Guide was published together with WWF (2.8 million copies). WWF aimed to
stimulate the availability of MSC certified fish in the supermarkets. The impact of the Fish
Guide was considerable. Many heated debates were held in the media. NGOs, scientists,
fishermen, politicians; all expressed their opinion about the Fish Guide. Even the Minister
of Agriculture, Fisheries and Nature stated that she would do her best to reach an
agreement between government, NGOs, and industry regarding the Fish Guide. This led
to the sign of a covenant in 2008, in which NGOs, part of the POs, and government
agreed to work together on sustainable fisheries (De Vos and Bush, 2011).

In 2004 Greenpeace demonstrated against beam trawling on the North Sea. Five activists
were lying in the water in front of a trawler to prevent the vessel from entering the
Doggerbank. Greenpeace declared the Doggerbank as a marine reserve, and during
several weeks they marked the area with buoys (http://www.nrc.nl/handelsblad/van/2004/augustus/18/actie-greenpeace-op-
doggersbank-tegen-boomkor-7698054).

In 2007 Greenpeace developed their own ‘fish card’ (vis-a-card), and published an online
list of Dutch supermarkets ranked on their fish purchasing policy and a red list of
unsustainable species (www.maakschoonschap.nl). The Greenpeace red list was (and
remains) longer than on the Viswijzer. As part of this campaign Greenpeace places a 16m
long fish bone on the roof of supermarket C1000. According to Greenpeace the
purchasing policy of C1000 exists for more than 50% of unsustainable/red listed fish

In 2010 Greenpeace went to court to request the closure of the Voordelta area for the
beam trawl. In 2012 their request was approved http://www.greenpeace.nl/Nieuwsoverzicht-2012/Boomkorren-mogen-niet-langer-de-
bodem-van-de-Voordelta-omwoelen/.

In 2009, 2011/2012, 2013/2014 new Fish Guides were published, however at present it
hardly gets any attention anymore, because of all the changes that have taken place in
the Dutch fisheries industry.

Retail

In 2007 two large supermarket chains (among others Albert Heijn) in the Netherlands
announced that they were considering to remove the main target species of Dutch
fishermen (North Sea plaice and sole) from the shelves because of its unsustainable
character (Anonymous 2007a). This triggered a lot of reactions from the industry,
including from the Fish Product Board which published leaflets that describe the efforts of
fishermen to become more sustainable (http://www.visserijnieuws.nl/nieuws/archief/6478-goede-sier-over-rug-kottervissers.html).
In December 2007, the CBL (the representative of the Dutch retail and food service) announced to sell only MSC certified fish by 2011. However, they were not able to reach this goal, as not all fish was available in terms of volume. In 2013 they reset their goal to 2015. For the retail sustainability is very important, partly caused by the pressure exerted by environmental NGOs, and partly caused by the need for traceability after a number of food security risks (personal communication MSC employee, 2014).

From 2009-2011 North Sea plaice and sole were available again in the supermarket Albert Heijn with the label ‘local fish’. This ‘project’ was financed by the Fisheries Innovation Platform. Fishermen who were in the MSC certification process were allowed to sell their fish to the AH. This created an incentive to obtain a MSC certificate (http://www.visserijnieuws.nl/nieuws/7083-landelijke-pool-voor-vis-van-dichtbijopnieuw-noordzeevis-in-het-schap-van-albert-heijn.html). Since 2014 Albert Heijn is selling MSC certified plaice of the Osprey group with the name ‘Fish Tales’.

Fishermen know that MSC provides access to the retail market:

“If you want to sell nowadays fish to Germany, Austria, Sweden, Denmark or the Netherlands, than MSC is required” (personal communication with fishermen representative, 2014).

“it is inevitable that we need to become certified, because the retail asks for it. Without a certificate one is not able to compete. The biggest competitor for plaice is the MSC certified flatfish coming from Alaska, instead of pangasius en tilapia.” (personal communication fishermen representative, 2014).

The Ekofish group sells its plaice to this market. A large part of the plaice still goes to Italy where different standards apply, however MSC is going to open an office in Italy to start promoting MSC locally (personal communication with MSC employee, 2014).

5.8 Conclusion
The call towards a more sustainanable fisheries industry in the Netherlands has been coming from different stakeholder groups, like government, NGOs, and retail. At the core of this call was the ban on beam trawling. A number of incentives have stimulated the shift towards more sustainable fishing, like: high fuel prices, decreasing fish prices, the establishment of Natura 2000 areas at sea, subsidies for investments in new techniques and certification schemes, pressure from NGOs (campaigns), and the value chain (mainly supermarkets who demand MSC certification). As a result, the beam trawl has made place for more sustainable fishing techniques, such as: twin trawling, pulse trawlings, sumwing, flyshoot etc. Both social, financial and coercive incentives have played a role in the behavioral change of fishermen:

Social incentives: Societal values have changed. Sustainability is at present considered as “the right thing to do”. NGOs and retailers have played an important role in this shift, however fishermen also increasingly see the value of sustainability. Discarding for example is seen by many fishermen as unethical. With the new discard ban this is confirmed as unethical behaviour. The co-management system in combination with an ITQ system has also stimulated sustainable behaviour. In addition quota uptake became transparent. The race to fish stopped as it was no longer necessary to fish as much as possible as soon as possible, because quota uptake was visible for everyone.
Financial incentives: Behaving in a more sustainable way leads most of the time to a financial reward. E.g. enlarging market access, receiving a subsidy for investing in a sustainable technique, and diminishing costs (e.g. fuel costs).

Coercive incentives: The beam trawl will be from 2016 onwards no longer allowed in certain areas of the North Sea because of the Natura 2000 regulations. This has stimulated a shift towards other techniques.

A fishermen representative describes the shift as follows: “There is societal demand for sustainability. There is pressure. Without that pressure, fishermen would not have become certified. Fishermen only support sustainability when they see an advantage. Those advantages can be economical or technical. Without those advantages it would be difficult to change.” (personal communication fishermen representative, 2014).
References


6. Providing incentives for fishermen through allocation: the Basque case

6.1 Introduction
This chapter is about fisheries management measures and compliance behaviour in the Basque country. The aim of this chapter is to understand fishermen behaviour within the context of different experiences with co-management and management measures. Semi-structured face-to-face interviews with fishermen representatives were used to analyse fisheries governance issues. Secondly, focus groups with fishermen were used to examine issues related to fisheries management measures and more importantly, issues related to the fisher’s behaviour, in particular, compliance behaviour.

6.1.1 Methodology
Qualitative methods have been applied in this work. First, two semi-structured face-to-face interviews with Basque fishermen representatives of the inshore and offshore organisations were used to analyse fisheries governance issues, such as centralised or decentralised processes, relationships between local, national and European Government with stakeholders, and the role of the Producer Organisations (POs), among others. Second, three focus groups have been organised, on the one hand, with both scientists from Bizkaia and Gipuzkoa at the same time and, on the other, with fishermen from artisanal and inshore subsectors from Gipuzkoa on a separate way. The main aim was to examine issues related to fisheries management measures and, more importantly, issues related to the fisher’s behaviour, in particular, compliance behaviour. The main interest of these interviews and focus groups was to gather knowledge about the aforementioned issues from regional stakeholders in order to provide regional and European authorities with empirical evidence about the perceived legitimacy of current and future management measures. Qualitative information collected on fishermen incentives could help regional and European authorities in defining new management measures aimed at providing the right incentives for reaching the expected results in terms of bio-socioeconomic sustainability.

The interviews and focus groups help describing and understanding fishermen behaviour within the context of different experiences with co-management and management measures. Fishermen usually take part in the decision process through their official representatives, thus, focus groups represent an effective way of accessing directly to their knowledge.

6.1.2 Background
The Basque Country is one of the regions of Spain with the longest fishing tradition. Currently, it is the second largest following Galicia in terms of landings and vessels. Although the fishing activity represents around 1% of the Basque Country’s GDP (Iborra, 2012) it has a high importance in the coastal communities in terms of employment and culture. The fishing activity is based on the exploitation of pelagic species such as anchovy (*Engraulis encrasicolus*), mackerel (*Scomber scombrus*), albacore (*Thunnus alalunga*), blue fin tuna (*Thunnus thynnus*) and horse mackerel (*Trachurus trachurus*), and demersal species such as hake (*Merluccius merluccius*), anglerfish (*Lophidae sp.*),
megrim (*Lepidorhombus whiffiagonis*). The Basque fleet comprises two well differentiated segments: the inshore and the offshore fleets. The former focuses on the pelagic species, using a variety of fishing technologies, including purse seining, pole and line, hand line, and trolling.

Among the target species, anchovy, mackerel and horse mackerel are harvested by employing purse seine nets, while tunas are caught by using pole and line. Currently, the Basque purse seiner fleet comprises 42 fishing vessels, operating from the harbours of Orio, Getaria and Hondarribia (Database on fisheries of AZTI-Tecnalia)

The offshore fleet in turn comprises otter bottom trawlers, locally known as "bakas", and pair bottom trawlers (Iriondo et al., 2008). The fleet is a multispecific fleet that traditionally distributes its activity across the year except in July and August, when they tie vessels to the dock due to crew’s holidays and biological considerations. Currently, the Basque fleet comprises 11 otter trawlers. In average, an otter trawler employs 13 fishermen, thus the fleet shall directly employ around 143 people. The offshore fleet focuses on Northern hake, megrim and angler fish. In recent years, mackerel and horse mackerel have been incorporated into the target species group.

Fisheries institutions play a key role in the day-to-day fishing activity in the Basque Country. The pelagic fleet is organised under the umbrella of the *cofradías*, which are ancient institutions that represent the interest of the fishermen, both boat-owners and crew members, and centralise the trading of the fish captured by their associates. POs in turn gather the industrial trawling boat owners. Their primary role is the trading of fish but has evolved to manage fishing activities and to administrate the fishing rights of their associates. *Cofradías* are now gathering under the umbrella of the PO model to access to the powers that the EU’s legal framework provides for POs.

### 6.2 The allocation system

#### 6.2.1 Eligibility and allocation criteria

In Spain, access to fishing possibilities to many of the main fisheries is limited. The TAC shares assigned to Spain (aka quotas) can be restricted to specific vessels. The basis for the allocation process is the official register of vessels licensed to carry out the fishing activity in the national fishing grounds. Thus, vessels included in this register are eligible for allocation of fishing possibilities. Access of new actors to fishing possibilities is only possible by purchasing of a given vessel included in the register. The magnitude of the allocation is made by the Spanish government, basically on the basis of historical catch records in the fishery, vessels characteristics and socioeconomic criterion\(^6\). The latter, which consists basically of employment levels, is increasingly being combined with catch records to decide on allocation.

However, allocation is to a large extent based on catch records. This socioeconomic criterion was first applied in the bluefin tuna fishery in 2008\(^7\) and is being increasingly taken into account. In fact, this plays a meaningful role in the allocation of fishing

\(^6\) Ley 3/2001, de 26 de marzo, de Pesca Marítima del Estado

\(^7\) Orden ARM/1244/2008, de 29 de abril, por la que se regula la pesquería de atún rojo en Atlántico Oriental y Mediterráneo.
possibilities in the new Management Plan for the Northeast Cantabrian fishing ground\(^8\), which was enacted in July 2013 after intense debate between the government of Spain and the governments of the communities of the Basque Country, Cantabria, Asturias, and Galicia; and their respective fishing sectors.

It is worth pointing out that only two of the species of the Management Plan are dealt with by this report. These are mackerel and horse mackerel in VIII c. The remaining species of the Management Plan are beyond the scope of this report.

Quota allocation to fishing technologies (for the vessels included in the official register) is being increasingly used. In particular, a Spanish national regulation has been implemented in 2010 with the aim of distributing the Spanish catch quota of the Northeast Atlantic Mackerel\(^9\), which has been further revised and modified in the framework of the Management Plan for the Cantabrian and Northwest fishing ground.

### 6.2.2 Allocation modalities

**Equal access to quota for licensed vessels**

This was the predominant criteria for allocation of fish resources in Spain before the inception of the individualised approach, species such as bluefin tuna, mackerel, and horse mackerel were managed according to this approach. It consists of equal access to all licensed vessels to the Spanish quota for a given species, regardless their historical catches. Thus, licensed vessels are granted access to a common pool. Currently, it is still in force for key economic resources such as anchovy. In the particular case of the Basque purse seiner fleet the equal access to anchovy has provided the basis for arrangements within the cofradías on daily and weekly limits to anchovy. These limits have been mainly established to raise prices. In addition, they also prevent market saturation. It is worth mentioning that the purse seiner fleet has exclusive access to anchovy; no other technology is allowed to harvest the resource.

**Vessel allocation**

Vessel rights allocation has been in place since early 1980s in the demersal fleet operating in Grand Sole and Bay of Biscay (Prellezo, 2010). Individual rights were granted to vessels in ICES areas VI, VII and VIII a, b, d, e in preparation for the adhesion of Spain to the European Community. The criteria for allocation were based on fishing capacity expressed on kWs and fishing ground. A set of coefficients was determined for fishing vessels; they were the basis of the days at seas allocation. The allocation criteria based on coefficients, and species by ICES areas, have been maintained since then without substantial changes (Iriondo et al, 2013), although the fleet has experienced a reduction in vessel numbers as a result of the possibility of transferring rights (Aranda et al, 2012). Successive improvements on rights transferability have propitiated the implementation of a kind of an ITQ system. This differs from the classic ITQ systems applied in other areas of the world e.g. Iceland and New Zealand because transfers are restricted to the vessels of the official register.

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\(^8\) Orden AAA/1307/2013, de 1 de julio, por la que se establece un Plan de gestión para los buques de los censos del Caladero Nacional del Cantábrico y Noroeste.

\(^9\) Orden ARM/271/2010, de 10 de febrero, por la que se establecen los criterios para el reparto y la gestión de la cuota de caballa, y se regula su captura y desembarque.
The current system is based on the aforementioned coefficients. They are used to calculate the individual vessel quota for each demersal species. Special provisions are in force for vessels targeting hake in areas VIII a, b, d, e (Bay of Biscay). A 2% of the hake quota is reserved by the government to possible reallocation. As mentioned before, 60 tons of hake are ring-fenced for vessels up to 50 GRT using pole & line. In turn, 21% of the hake quota is reserved for vessels up to 100 GRTs operating in VIII a, b, d, e. These measures are conceived to protect the interests of smaller fishing vessels. This measure can be seen as an antecedent to the more compressive technology allocation system discussed later. The remaining quota of hake is allocated to vessels larger than 100 GRT.

**Technology allocation**

This is the most recent modality of allocation in Spanish fisheries. The use of technology allocations was first introduced for the bluefin tuna fishery in 2008. This criterion was adopted to fulfill the requirements of the International Commission for the Conservation of Atlantic Tunas (ICCAT) in relation to the blue fin tuna recovery plan. The ICCAT’s quota for bluefin tuna for the Northeast Atlantic and Mediterranean is first allocated to the EU and then to Spain and other Member States. The government retains 3.71% of the quota for compensation of quota surpasses, aka “maneuver fund”. This fund is also contributed by swaps of fishing possibilities between countries. The government also reserves a 2.5% for unintended catches for diverse fishing gears. Quota concentration by companies or groups of companies is limited to 30%. The bulk of the quota is allocated to the following fishing technologies: purse seiners fishing with pole and line in the Northeast Cantabrian; fleets using pole and line and hand lines in the Gibraltar strait; fleets using long lines and hand lines; purse seiners of the Mediterranean and tuna traps.

In 2008, the initial allocation distributed shares of the national quotas to the fishing technologies. Each share was established on the basis of historical catches (60%) and socioeconomic dependency on the fishing activity, taking into account employment and the months of the year devoted to the fishing activity (40%). It is worth pointing out that these shares were estimated on the basis of the individual vessels and traps in each technology. Each of these vessels or tuna traps was awarded a percentage in the national quota and thus an individual quota. The system has evolved towards a rights-based management system. It is worth highlighting that the IQs have been managed collectively by the POs despite the fact that individual management is also possible.

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10 Orden APA/3773/2006, de 7 de diciembre, por la que se establecen para el año 2007, las condiciones de distribución y gestión de las cuotas asignadas a España de especies demersales, en aguas comunitarias no españolas, de las subzonas Vb, VI, VII y VIIIa,b,d,e del Consejo Internacional para la Exploración del Mar. BOE nº 296 del 12 de diciembre de 2006.
11 Orden ARM/3812/2008, de 23 de diciembre, por la que se establecen las condiciones de distribución y gestión de las cuotas asignadas a España de especies demersales, en aguas comunitarias no españolas, de las subzonas Vb, VI, VII y VIIIa,b,d,e del Consejo Internacional para la Exploración del Mar.
12 Technology allocation can be defined as ‘allocation which guarantee that all fishing technologies enjoy an equilibrated share of national quotas’
13 Orden ARM/1244/2008, de 29 de abril, por la que se regula la pesquería de atún rojo en Atlántico Oriental y Mediterráneo.
14 Orden AAA/642/2013, de 18 de abril, por la que se regula la pesquería de atún rojo en el Atlántico Oriental y Mediterráneo.
15 Orden ARM/1244/2008, de 29 de abril, por la que se regula la pesquería de atún rojo en Atlántico Oriental y Mediterráneo.
Quota transfers are allowed on a temporal basis i.e. two years in a row within a five-year period.

The technology allocation criterion has also been introduced in the management of pelagic species such as mackerel and horse mackerel. Technology allocation was introduced for mackerel in 2010, for which 80% of the catch allocation was based on historical catches and 20% on socioeconomic criteria. The initial technology shares have been revised and modified in the Management Plan for the Cantabrian and Norwest fishing ground. The mackerel quota in ICES VIII c is allocated in the following proportions: 28.74% to trawling; 34.29% to purse seining; and 36.97% to other technologies. This latter category includes a variety of small scale gears. In the case of horse mackerel, the technology allocation was introduced in 2012 and revised and modified by the aforementioned Management Plan. Current quota allocations are 42% to trawling; 53% to purse seining; and 5% to other technologies. As seen in the case of the bluefin tuna fishery, the criterion for the quota allocation was based on historical catches and socioeconomic dependency on fishing. Although allocation is partially based on catch records it does not allocate individual shares to fishing vessels. Thus, there are not individual rights neither any sort of individual quota exchanges among the fleet. However, individual catch limits are imposed as a complementary mechanism with the aim of improving management, while avoiding market saturation. These individual limits are not tradable among the purse seiners.

6.3 Incentives

6.3.1 Intended incentives

In this section we identify the intended incentives that justify the government’s choice for the diverse allocation systems currently in place. It is worth highlighting that the intended incentives have to some extent diverged from the aim of the managers, leading to operational incentives (see 6.3.2). The intended incentives are:

- **To provide a basis for fair access to fishing possibilities.** The technology allocation was devised by the government to guarantee that all fishing technologies enjoy an equilibrated share of national quotas. These allocations are expressed as percentages of the quota for a given species. This measure is mostly used for pelagic species such as mackerel, horse mackerel and bluefin tuna. For example, 34% of the quota for mackerel is allocated to purse seiners.

- **To provide a basis for enforcement.** The technology allocation allows the government to impose a more strict control on landings in order to prevent the surpassing of the national quota. This intended incentive is becoming increasingly used in the pelagic fisheries although it has not always produced the expected...
results in terms of compliance. The most relevant example is seen in the mackerel fishery, where Spain has been requested to exert a more strict control \(^{20}\) (see 5.4).

- **To provide a basis for improvement of profitability through prices.** Within the framework of the technology allocation for mackerel and horse mackerel, and employing the complementary measures of this allocation system, the government imposed limits on daily landings. These measures attempted to improve management and conservation and to avoid daily market saturation. The latter was expected to improve prices \(^{21}\).

- **To adapt allocation management to the fisheries governance system.** POs are being provided with an increasing role in management of fisheries resources throughout the diverse modalities of fish allocation. POs have demonstrated to be key institutions to manage individual or collective fishing rights. POs key role is devoted to the fishing activity management and the administration of all associate fishing rights and can even extend to proposing conservation and management measure. In Spain the POs model has been used in the offshore sector since the adhesion of Spain to the EC. Recently, the model has been adopted by the inshore sector. In fact, the traditional Basque cofradías gather now under the umbrella of POs. As an example, POs have played a key role in the management of bluefin tuna technology allocation, through collective transfers of rights among technologies.

- **To provide a basis for adjustment of capacity to fishing possibilities.** Transferability of fishing rights is playing an increasing role in fisheries management in Spain to adjust capacity and effort to fishing possibilities. Flexible mechanisms on rights management are being devised within the allocation modalities. Transferability is becoming a key driver for annual allocation. In the offshore fleet, for example, the number of vessels has been progressively reduced thanks to the reallocations of individual quotas. Within the technology allocation transferability of rights has also been provided to manage the blue fin tuna fisheries even though rights are only temporally transferable.

6.3.2 Operational incentives provided by the allocation system

The technology allocation is deemed unfair

According to the interviewees and participants in the focus groups there is discomfort in relation to technology shares, which do not seem to reflect well the historical catches of the sectors and the socioeconomic dependency on the resources. It seems that the methodology employed to estimate the shares was too complex and required a large amount of data. Given that the sector does not consider this allocation as fair it motivates non-compliance behavior in the mackerel fishery, which has to be counteracted by strong penalisation. On the other hand, in the bluefin tuna fishery the sector seems to comply more with regulations even though they also believe that the technological allocation does not reflect reality. The difference between these two incentives may be found in the complementary mechanisms. In the case of mackerel the technology allocation has been complemented by a daily limit from 2010 to 2013, which cannot be transferred to others to avoid overshooting individual limits. It neither can be

\(^{20}\) Orden ARM/271/2010, de 10 de febrero, por la que se establecen los criterios para el reparto y la gestión de la cuota de caballa, y se regula su captura y desembarque.

\(^{21}\) Orden ARM/271/2010, see above.
transferred to others to obtain profits when fish market conditions are bad. In the case of bluefin tuna the complementary mechanism is the IQ, which allows flexibility for limited quota transfers, which provide profits to the sector when facing low market prices and high fuel costs. In this context, the technology allocation for mackerel has not provided the right incentives resulting in non-compliance of the largest fishing vessels with this measure. This non-compliant behavior is also followed by the smaller capacity fishing vessels.

*Non-compliance has been counteracted with strict enforcement*

As mentioned earlier, the mechanism to allocate fractions of the national quotas among the technologies is questioned. Thus, there is a tendency to overshoot quota allocation because of a lack of quota and competition among the technologies. The government has imposed limits in the mackerel fishery to avoid daily market saturation, thus improving first-sales mackerel prices. The fact that the fishing season is short also motivates inshore fishermen to aim at catching large amounts of fish. In their perception the abundance is perceived to be high (which increased the gap between the scientific and the empirical knowledge and, consequently, non-compliant behavior arises). Low prices are other drivers for fishermen to aim at larger catches. Non-compliant behavior is counterbalanced by new reinforced and strong control at ports. The sector recognises that controls are necessary to stop surpassing of individual vessel limits. The control of mackerel fishing activities is also accompanied by strong penalisation in the form of fines (i.e. coercive incentives) imposed by the EU due to the overexploitation of this resource in 2009 and 2010 years. Fishermen consider that the transfer of fish between vessels at sea may facilitate the fulfilment of the daily limits.

*Flexibility in rights management has facilitated decisions on capacity utilisation. Key driver for the allocation system to provide right incentives*

ITQs have been used for years in the hake, megrim and anglerfish fisheries. Rights transferability together with decommissioning schemes has triggered a substantial fleet reduction. An ITQ system has been used for years in the offshore sector. It seems to provide good incentives, by allowing reduction of the fleet although fleet reduction has also been triggered by decommissioning schemes. The system is, however, not considered by the sector as a “real” ITQ system due to the important restrictions on rights transferability at the EU level. The sector is supportive of a pan-European market of fishing rights. The sector considers that such a rights market may encourage fleet reduction and address the problem of discards produced by quota overshooting. The difficulty with creating a pan-European market is caused by the Relative Stability Principle, which imposes a restriction to permanent transfers among vessels of different Member States.

Transferability of fishing rights, as currently in place for bluefin tuna, was considered by the government as a good tool for adapting capacity and effort to fishing possibilities in the context of the ICCAT’s Recovery Plan for the species. However, the temporality imposed to transfers of the rights (i.e. only possible on an annual basis) is impeding a permanent reduction of the effort devoted to this species. The flexibility in the trading of these rights has been used to obtain income in a scenario where high fuel prices and low fish prices are threatening the inshore fleet’s future. In 2013, the entire share of the Basque fleet quota for this species was temporally transferred to tuna farmers in thebe
Mediterranean. In spite of this, the inshore sector does not consider these management mechanisms as suitable for all species.

**POs play a key role in management of their associates’ rights. Key driver for the allocation system to provide right incentives**

POs are key professional institutions that represent boat owners. They manage the rights of their associates, which facilitate group decisions on fishing strategies and market measures. They also represent their associates within the Spanish and EU governance framework. They are institutions that provide moral/social incentives because they are platforms of participation and collaboration for fishermen, where they agree on decisions that are to be respected by all. Hence, fishermen are expected to respect those collective decisions, otherwise the offender might be excluded from the group. According to the fishermen, the role of POs in co-management seems to be positive. This model has been used for the Basque offshore sector for many years and is presently being adopted by the inshore sector. POs play a key role in Basque fisheries. In the offshore sector, they establish fishing plans and manage the rights of their associates and made collective decisions such as pooling of fishing rights. They facilitate rights exchange within the PO and with other POs, hence reducing information and legal costs (i.e. transaction costs). They also provide to managers updated information on quota uptakes. The PO model has been recently embraced by the inshore sector. They have played a key role in recent decisions of the inshore fleet. In fact, the bluefin tuna rights of the Basque fleet have been transferred for the second consecutive year. This decision was made within the PO OPEGUI, an institution conformed by the cofradías of the province of Gipuzcoa.

*Group decisions on group rights are usually respected*

The inshore sector enjoys high exclusivity in the exploitation of the anchovy quota. The inshore fleet does not share this resource with other sectors such as the offshore or the artisanal sector. Hence, it has a great autonomy in decision making on marketing and conservation. A cap on anchovy landings, for example, is a group decision made within the cofradías, which is widely accepted because of the perceived legitimacy of the group decisions (self-management system). The rationale of the cap on landings can be considered an improvement of the anchovy price and a measure to protect of the resource. According to the fishermen, the strategy to limit landings yields good results in terms of better price. Hence, the fleet does not have the incentive to race for the resource. In relation to the market, the anchovy of the Bay of Biscay enjoys a well established reputation among consumers, which seems to protect the price from competition with imported anchovies.

**6.3.3 Summary: Basque fleets within an allocation system**

Table 6.1 summarises the Basque main fisheries and fleets for which an allocation system has been proposed and applied, as already described in this document. Key elements in this table are the type of allocation, the type of co-management, the intended and the operational objectives associated to each allocation system.
6.4 Conclusion and discussion

The allocation measure could provide different results in terms of providing right incentives. In the case of the mackerel fishery, the technology allocation is not enough to guarantee that all fishing technologies enjoy an equilibrated share of national quotas, and also to solve the low profitability problem surrounding this fishery. Thus, it should be accompanied by other complementary mechanisms, such as the introduction of daily limits from 2009 (on a voluntary basis), and 2010 to 2014 (imposed by the government). However, the fishing sector agrees with the allocation system itself but not with the TAC established and the adopted criteria for quota distribution among technologies, which motivates non-compliance behavior. The impact of this is also negative for artisanal vessels, whose fishing strategy can be defined as following the larger vessels. The non-compliant behavior is counteracted by new reinforced and strong control at ports. The sector recognizes that controls are necessary to stop surpassing of individual vessel limits. Thus, right incentives are pursued only within a coercive framework.

For the same allocation system, by technology, the outcome is different for the bluefin tuna fishery. The main reason is the establishment of an IQ system directly linked to the quota allocation to individual vessels. In this case, the allocation system provides better incentives than in the mackerel fishery. Some drivers contribute to this positive result; among the drivers are the key role of POs and the transferability of the fishing rights. Both of them allow the sector to re-allocate the rights among technologies annually, which motivate a higher compliance with regulation and thus right incentives are provided.

The best outcomes are found in the vessel allocation system applied to the demersal fleet since early 1980s. Successive changes on rights transferability have propitiated the implementation of an ITQ system in this fishery managed within the umbrella of the POs. This system has propitiated a reduction of the fleet size. It is worth pointing out, however, that the transferability of the rights has been limited to the vessels of the fleet register.

Thus, key institutions (POs) and transferability of fishing rights are playing an increasing role in Basque fisheries to ensure that the allocation systems provide the right incentives.

With the aim of overcoming the lack of success of the management system for the mackerel fishery, the Spanish Ministry of Agriculture, Food and Environment has just published the Ministerial Order AAA/417/2014 for the mackerel and horse mackerel fisheries. The new order introduces an individual quota system for the purse seiner sector and encourages firms to comply with this new individual regulation. In addition, the new Ministerial Order fosters collective management of the individual rights within the professional associations or regional federations.

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22 AAA/417/2014, de 17 de marzo de 2014, por la que se modifica la Orden AAA/1307/2013, de 1 de julio, por la que se establece un Plan de gestión para los buques de los censos del Caladero Nacional del Cantábrico y Noroeste.
<table>
<thead>
<tr>
<th>Fleet segment</th>
<th>Fishery</th>
<th>Type of initial allocation after TAC establishment</th>
<th>Accompanied measure</th>
<th>Type of co-management</th>
<th>Intended incentives</th>
<th>Operational incentives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basque trawlers in ICES VI, VII, VIII</td>
<td>Mix fishery. Target species: hake, megrim and algerfish.</td>
<td>Vessel allocation that can be managed by the POs</td>
<td>ITQs</td>
<td>Top-down management introduced by Spanish government</td>
<td>To reduce the “race for fishing” and promote the adjustment of fishing capacity and effort to fishing possibilities along the year.</td>
<td>It is not a “real” ITQ system due to the restrictions on rights transferability, and thus, it would be possible to increase the profitability. To reduce the “race for fishing” and promote the adjustment of fishing capacity and effort to fishing possibilities along the year. By reducing the restriction on rights transferability, this system is expected to increase profitability.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ITQs + POs</td>
<td>Self management of the ITQs within the umbrella of POs</td>
<td>To provide institutional capacity for the management of fishing rights.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>They facilitate rights exchange within the PO and with other POs, hence reducing information and legal costs (i.e. transaction costs)</td>
</tr>
<tr>
<td>Purse seiners in the Bay of Biscay</td>
<td>Anchovy</td>
<td>Equal access to quota for individual vessels</td>
<td>Daily limits</td>
<td>Group decision made within the cofradías. Self-management.</td>
<td>To restrict landing limits to trigger increase of prices.</td>
<td>Widely accepted by the sector which perceives the legitimacy of the group decisions. This results in higher compliance. The strategy to limit landings has increased the price. Hence, the fleet does not have the incentive to race for the resource.</td>
</tr>
<tr>
<td>Fleet segment</td>
<td>Fishery</td>
<td>Type of initial allocation after TAC establishment</td>
<td>Accompanied measure</td>
<td>Type of co-management</td>
<td>Intended objectives</td>
<td>Operational incentives</td>
</tr>
<tr>
<td>Purse seiners in the Bay of Biscay</td>
<td>Bluefin tuna</td>
<td>Technology allocation</td>
<td>IQs</td>
<td>Top-down management. ICCAT’s quota allocated first to EU and secondly, to Spain and other MS</td>
<td>• To adjust the effort to the fishing possibilities, by controlling the entry/exit of vessels in the fishery. • To provide a basis for a fair access to fishing possibilities.</td>
<td>Temporality imposed to transfers of the rights is impeding a permanent reduction of the effort devoted to this species. And thus this does not lead to totally adjust the effort to fishing possibilities.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>IQs + POs + transferability of rights</td>
<td>Common pool for the IQs organized within the cofradía (self-management)</td>
<td>Socioeconomic benefits are expected to gain from the adoption of collective measures. Otherwise more difficult to reach by individual vessels.</td>
<td>Global quota transference to tuna farms has been used to obtain extra income in a scenario where high fuel prices and low fish prices are threatening the inshore fleet’s future</td>
</tr>
<tr>
<td>Fleet segment</td>
<td>Fishery</td>
<td>Type of initial allocation after TAC establishment</td>
<td>Accompanied measure</td>
<td>Type of co-management</td>
<td>Intended objectives</td>
<td>Operational incentives</td>
</tr>
<tr>
<td>---------------</td>
<td>---------</td>
<td>---------------------------------------------------</td>
<td>---------------------</td>
<td>-----------------------</td>
<td>--------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>Purse seiners in the Bay of Biscay</td>
<td>Mackerel</td>
<td>Technology allocation (not to individual vessels)</td>
<td>Quota allocation to technologies</td>
<td>Top-down management introduced by Spanish government</td>
<td>To provide basis for fair access: so high fishing capacity vessels do not reduce the fishing opportunities of smaller capacity vessels of special importance for mackerel fishery where a lot of competition between very different technologies is given. To provide a basis for enforcement with an expected increase of the compliance with the regulation.</td>
<td>The mechanism to allocate fractions of the national quotas among the technologies is highly questioned by this sub-sector. And thus leads to a non-completely compliance of the regulation.</td>
</tr>
<tr>
<td>Daily limits</td>
<td>Top-down management</td>
<td>Daily limits are introduced within a Top-down management by Spanish government</td>
<td>to avoid market saturation and obtain better prices</td>
<td>The sector recognises that controls are necessary to stop surpassing of individual vessel limits. Without it this measure does not provide right incentives. As a result, the level of prices continues to be unusually low and with non-positive trend in the last decade.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control and enforcement systems</td>
<td>Control established within a Top-down system. Accompanied by strong fines imposed by the EU.</td>
<td>To provide compliance with the regulation.</td>
<td>Coercive incentives provide expected results in terms of compliance with the regulation.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 6.1. Basque fleets within an allocation system. Type of management and general intended and operational objectives.
References


7. Recent management measures and incentives for purse seine fisheries in the Black Sea (Turkey)

7.1 Introduction
This chapter summarises the measures implemented in the last decade to improve the management of the small pelagic fish stocks captured by the purse seine vessels in the Black Sea.

Recent management measures mostly were implemented after the harmonisation period of Turkish Fisheries Legislation to EU fisheries acquis and according to the advices of consultants under twinning programs. This report aims to give brief information on purse seine fisheries not only in Turkish EEZ but also in the Georgian waters. All of the critics and information are based on official data, focus group meeting, articles and scientific surveys.

7.2 Purse seine fishery in the Black Sea
Three indicative periods can be distinguished in Turkish fisheries:

1. Pre 1970: Old legislations were active, regulations were made for mussel and oysters on the Black Sea coast beyond Bosphorus, market regulations

2. 1970-1989: Directorate of Fisheries established under Ministry of Agriculture new Fisheries law inacted in 1971 to cover all fisheries issues under one authority, fisheries cooperatives were supported, and fishermen were subsidised. Size and engine power of vessels increased; wooden vessels were replaced with steel ones, cotton fishing gears turned to synthetic fibers and their lengths increased, quantity of landings raised more than 5 times of 1970 level. Also fish meal and plants were subsidised, and their total processing capacity reached over total fish landings of Turkey. As summary this was over investment period under the invasion of *Mnemiopsis leidyi* predating on eggs and larvae of anchovy and other small pelagics. Finally, anchovy and predating stocks collapsed in the 1988-89 fishing season.

3. Post 1990: Recovery period of fishery in the Black Sea, necessary management measures were taken (consisting of spatial and temporal, size and weight limitations)

Total catch in Turkish fisheries can be divided into three main groups; 1) pelagic, 2) demersal fish species, 3) shellfish, molluscs and others. Total production is 644852 tons according to the 2012 fishery statistics of which 61.4% is obtained from the marine, 5.6% from inland capture fish and 33% comes from aquaculture (see table 7.1).
Table 7.1. Fish production (tons) in Turkey from 2002 to 2012 (TUIK, 2013)

<table>
<thead>
<tr>
<th>Year</th>
<th>Capture Fisheries</th>
<th>Aquaculture</th>
<th>Total Production</th>
<th>Consumption per capita (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Marine %</td>
<td>Inland %</td>
<td>Quantity</td>
<td>Marine % Quantity</td>
</tr>
<tr>
<td>2002</td>
<td>522744</td>
<td>43938</td>
<td>7.0</td>
<td>61165</td>
</tr>
<tr>
<td>2003</td>
<td>463074</td>
<td>44698</td>
<td>7.6</td>
<td>79943</td>
</tr>
<tr>
<td>2004</td>
<td>504987</td>
<td>45585</td>
<td>7.1</td>
<td>94010</td>
</tr>
<tr>
<td>2005</td>
<td>380381</td>
<td>46115</td>
<td>8.5</td>
<td>118277</td>
</tr>
<tr>
<td>2006</td>
<td>488966</td>
<td>44082</td>
<td>6.7</td>
<td>128943</td>
</tr>
<tr>
<td>2007</td>
<td>589129</td>
<td>43321</td>
<td>5.6</td>
<td>139873</td>
</tr>
<tr>
<td>2008</td>
<td>453113</td>
<td>40111</td>
<td>6.3</td>
<td>152186</td>
</tr>
<tr>
<td>2009</td>
<td>425046</td>
<td>39187</td>
<td>6.3</td>
<td>158729</td>
</tr>
<tr>
<td>2010</td>
<td>445680</td>
<td>40259</td>
<td>6.2</td>
<td>167141</td>
</tr>
<tr>
<td>2011</td>
<td>477658</td>
<td>37097</td>
<td>5.3</td>
<td>188790</td>
</tr>
<tr>
<td>2012</td>
<td>396323</td>
<td>36120</td>
<td>5.6</td>
<td>212410</td>
</tr>
</tbody>
</table>

Marine production showed a steady increase until 1988 when the total catch amounted to 676 thousand tons. However, catches have started to decline thereafter, and dropped to 300 thousand tons as a result of a collapse in the pelagic fisheries in late 1980s (mainly anchovy stocks collapsed) due to overfishing, invasive species *Mnemiopsis leidyi* and pollution (Erdogan et al., 2008). From 1992 to 1995, the amount of marine production has gradually increased again and reached the level of before the crisis in 1988. After 1995, however, the production began to decrease again, and in 1997 production realised as 531 thousand tons. It is assumed that marine production stagnated at the level of around 550-600 tons (Celikkale et al., 1998, Duzgunes, 2008). At present, total marine production is 396323 tons (315637 tons fish and 80686 tons other marine species) in 2012 and the Black Sea is the main source in the total production (table 7.2, figure 7.1).

Figure 7.1. Marine fish production (tons) in the Black Sea and Turkey in 2012 (TUIK, 2013)

Table 7.2. Marine fish production according to the regions (tons) (TUIK, 2013)
The Eastern Black Sea is the major fishing area for the marine fish production. 50% of the total catch is obtained from purse seine fisheries in the Eastern Black Sea (anchovy, mullets, bonito, horse mackerel, etc.) and followed by the Western Black Sea (11% with the same species in the eastern BS), Sea of Marmara (7%; anchovy, mullet, bonito, whiting), Aegean Sea (7%; sea bream, sea bass, sardine, sword fish, bonito, tuna, dogfish) and Mediterranean Sea (5%; bluefin tuna, sardine) (table 7.2).

European anchovy, horse mackerel, blue fish, bonito, whiting, sardines, chub mackerel, red mullet and mullet species make up more than 90% of the total marine production (figures 7.2, 7.3). The major fish species in the national catch are anchovy (228491 t), mullets (2514 t), horse mackerel (25010 t), hake (921 t), whiting (9455 t), sardines (34709 t), bonito (10019 t), sprat (87141 t) and chub mackerel (3127 t). Anchovy stocks are the migratory pelagics, which serve as food for the higher trophic layers in the food web and plays an important role for the nutrition of the people. 89% of anchovy is harvested in the Black Sea. Pelagic fish species have the biggest share of the total production as 60-80% followed by demersal species as whiting, turbot, red mullet and striped mullet (figure 7.3) (Duzgunes, 2008).

Figure 7.2. Catch of the major commercial fish species in Turkey (tons) (TUIK, 2013)
The majority of the other marine species is captured from the Western Black Sea. Baby clam and Rapa whelk are the top species in this part of the Black Sea (Celikkale et al., 1999, Duzgunes, 2003b). The share of the other marine species in the Black Sea has reached to 89% of the total production of 80686 tons as whole national harvest in this segment.

There are several basic types of fishing in Turkey. The largest group is formed by small scale or artisanal boats, which are operated by 2-3 fishermen with 8-10 m overall length (OAL) open boat with a 10-25 HP inboard diesel engine. The smallest but the most efficient group are trawlers and purse seiners which are the employers of 10-35 fishermen. Some of the small vessels are equipped with depth recorder/fish finders and use variety of gill nets, trammel nets, long lines and dredges. Due to subsidies given after the implementation of Fisheries Law (No: 1380) some developments have been observed in the fishing fleet in terms of the capacities and engine powers. But still there are no fishing fleets into the open seas and oceans in Turkey. However, this positive development has brought problems of over-fishing, therefore additional licensing of over 12 m fishing boats was stopped in 1991. From 1997 onwards, no longer licenses were granted for new fishing vessels (Saglam & Duzgunes 2010; BSGM, 2013; Oğuz, et al., 2012).

Table 7.3. Landings of other marine species (tons) in the Black Sea and Turkey (TUİK, 2013)

<table>
<thead>
<tr>
<th>Years</th>
<th>Eastern</th>
<th>Western</th>
<th>Total</th>
<th>% of Turkey</th>
<th>Turkey</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>6796</td>
<td>12929</td>
<td>19725</td>
<td>67</td>
<td>29298</td>
</tr>
<tr>
<td>2003</td>
<td>7536</td>
<td>21725</td>
<td>29261</td>
<td>62</td>
<td>46948</td>
</tr>
<tr>
<td>2004</td>
<td>14490</td>
<td>19320</td>
<td>33810</td>
<td>70</td>
<td>48145</td>
</tr>
<tr>
<td>2005</td>
<td>9568</td>
<td>16738</td>
<td>26306</td>
<td>57</td>
<td>46133</td>
</tr>
<tr>
<td>2006</td>
<td>9445</td>
<td>50391</td>
<td>59836</td>
<td>76</td>
<td>79021</td>
</tr>
<tr>
<td>2007</td>
<td>9868</td>
<td>50456</td>
<td>60324</td>
<td>85</td>
<td>70928</td>
</tr>
<tr>
<td>2008</td>
<td>9126</td>
<td>39038</td>
<td>48164</td>
<td>84</td>
<td>57453</td>
</tr>
<tr>
<td>2009</td>
<td>6159</td>
<td>29567</td>
<td>35726</td>
<td>80</td>
<td>44410</td>
</tr>
<tr>
<td>2010</td>
<td>6256</td>
<td>28880</td>
<td>35136</td>
<td>76</td>
<td>46024</td>
</tr>
<tr>
<td>2011</td>
<td>4932</td>
<td>33377</td>
<td>38309</td>
<td>84</td>
<td>45412</td>
</tr>
<tr>
<td>2012</td>
<td>6671</td>
<td>65422</td>
<td>72093</td>
<td>89</td>
<td>80686</td>
</tr>
</tbody>
</table>

Figure 7.3. Catch share of major commercial species in the Black Sea and Turkey in 2012 (TUİK 2013)
Figure 7.4. Production of other marine species (tons) in different fishing locations by years (TUIK, 2013)

<table>
<thead>
<tr>
<th>Species</th>
<th>Turkey</th>
<th>Eastern Black Sea</th>
<th>Western Black Sea</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tons</td>
<td>%</td>
<td>Tons</td>
</tr>
<tr>
<td>Baby clam</td>
<td>61225.40</td>
<td></td>
<td>61225.40</td>
</tr>
<tr>
<td>Rapa whelk</td>
<td>9596.00</td>
<td>69.36</td>
<td>2237.10</td>
</tr>
<tr>
<td>Crab</td>
<td>21.60</td>
<td></td>
<td>12.30</td>
</tr>
<tr>
<td>Mediterranean mussel</td>
<td>2093.40</td>
<td>0.74</td>
<td>1916.20</td>
</tr>
<tr>
<td>Others</td>
<td>7749.1</td>
<td>0.001</td>
<td>30.60</td>
</tr>
<tr>
<td>Total</td>
<td>80685.50</td>
<td>8.27</td>
<td>65421.60</td>
</tr>
</tbody>
</table>

Table 7.4. Production of important other marine species in the Black Sea in 2012 (TUIK, 2013)

Due to heavy subsidies since 1976, the size and power of the fishing fleet has quadrupled. The number of fishing vessels increased from 8749 in 1990 to 14324 in 2012 and despite of the decline in marine production during the beginning of the last decade and a slight increase towards the end, fishing effort has increased by 50% (figure 7.5). Eastern Black Sea contains more vessels than the other major fishing areas. More than 50% of vessels bigger than 20 m overall length has been operating in the Black Sea (table 7.5).

Figure 7.5. Number of fishing vessels by years (TUIK, 2013)
Due to the regulations to stop new entries to the fishing fleet, total number of vessels has decreased by 19% from 2002 to 2012 (see table 7.5). The majority of the vessels are artisanal and below 10 m OAL. It is obvious that 88% of national fishing fleet is composed of small vessels under 10 m OAL (table 7.6). In case of the whole, Eastern and Western Black Sea these figures are 86%, 86% and 82%, respectively. The Black Sea is very important also for the distribution of the vessels as 42% of trawlers, 72% of multi-purpose vessels and 42% of purse seiners, 52% of carriers, 34% of small sized vessels and 36% of total vessels fish in that area. The decision to stop the construction of new vessels and decommissioning of vessels from the fishing fleet has proven to be ineffective in reducing the fishing effort in the Black Sea and across the country. Table 7.6 shows the reduction and increase percentages between the figures 2002 and 2012.

In the entire fishing fleet the reduction is % 208 but mainly concerns small sized vessels. The number of trawlers has increased by 21%, while purse seiners and multi-purpose vessels are reduced by 2% and 47%, respectively. The most surprising figure comes from carrier vessels which have increased by 302%. It is not easy to explain the reason of this increase if there is a reduction in purse seiners. It is the same case in sub regions. The number of purse seiners and carrier vessels has increased from 62 to 99 and 15 to 109 vessels, respectively, while multipurpose vessels decreased from 80 to 12 in 10 years in the Eastern Black Sea. The reason of these variations should be analysed sensitively either the trend among fishermen to have fishing licenses to their carriers, or to use more fuel quota currently supported by tax relief scheme.

Distribution of vessels by the Black Sea provinces is given in Table 7.6. Trabzon, Rize, Zonguldak and Samsun are the leading cities in terms of registered vessels.

Gross tonnage (GT) of the vessels is also high in the Black Sea. In case of smaller GT under 50-99, vessel in the Western Black Sea is more but there are more bigger vessels over this volume in the Eastern Black Sea (Table 7.7).

Table 7.5. Fishing fleet by vessel types and selected years (*:% of each category to total national figures at the same category, **:% of categories in total vessels of regions in 2012, % reduction or increase by 2002 data)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Eastern</td>
<td>Trawler</td>
<td>130</td>
<td>64</td>
<td>40</td>
<td>127</td>
<td>130</td>
<td>19</td>
<td>5</td>
<td>-</td>
<td>68</td>
</tr>
<tr>
<td>Black Sea</td>
<td>Multi Purpose</td>
<td>80</td>
<td>90</td>
<td>134</td>
<td>42</td>
<td>26</td>
<td>12</td>
<td>2</td>
<td>627</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Purse seiner</td>
<td>62</td>
<td>125</td>
<td>129</td>
<td>112</td>
<td>99</td>
<td>23</td>
<td>3</td>
<td></td>
<td>59</td>
</tr>
<tr>
<td></td>
<td>Carrier</td>
<td>15</td>
<td>78</td>
<td>125</td>
<td>109</td>
<td>90</td>
<td>51</td>
<td>4</td>
<td></td>
<td>427</td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td>4014</td>
<td>4298</td>
<td>3614</td>
<td>2421</td>
<td>2566</td>
<td>20</td>
<td>86</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>4301</td>
<td>4655</td>
<td>4042</td>
<td>2811</td>
<td>2930</td>
<td>21</td>
<td>100</td>
<td></td>
<td>32</td>
</tr>
<tr>
<td>Western</td>
<td>Trawler</td>
<td>170</td>
<td>148</td>
<td>107</td>
<td>154</td>
<td>159</td>
<td>23</td>
<td>7</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Black Sea</td>
<td>Multi Purpose</td>
<td>203</td>
<td>175</td>
<td>147</td>
<td>132</td>
<td>130</td>
<td>60</td>
<td>6</td>
<td></td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>Purse seiner</td>
<td>74</td>
<td>107</td>
<td>63</td>
<td>83</td>
<td>82</td>
<td>19</td>
<td>4</td>
<td></td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Carrier</td>
<td>6</td>
<td>123</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td></td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td>2260</td>
<td>2100</td>
<td>2130</td>
<td>1795</td>
<td>1807</td>
<td>14</td>
<td>82</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>2713</td>
<td>2653</td>
<td>2545</td>
<td>2182</td>
<td>2183</td>
<td>15</td>
<td>100</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Whole</td>
<td>Trawler</td>
<td>300</td>
<td>212</td>
<td>147</td>
<td>281</td>
<td>289</td>
<td>42</td>
<td>6</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Black Sea</td>
<td>Multi Purpose</td>
<td>283</td>
<td>265</td>
<td>374</td>
<td>189</td>
<td>158</td>
<td>72</td>
<td>3</td>
<td>44</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Purse seiner</td>
<td>136</td>
<td>232</td>
<td>192</td>
<td>195</td>
<td>181</td>
<td>42</td>
<td>4</td>
<td></td>
<td>33</td>
</tr>
<tr>
<td></td>
<td>Carrier</td>
<td>21</td>
<td>201</td>
<td>130</td>
<td>112</td>
<td>112</td>
<td>52</td>
<td>2</td>
<td></td>
<td>433</td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td>6274</td>
<td>6398</td>
<td>5744</td>
<td>4216</td>
<td>4373</td>
<td>34</td>
<td>86</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>7014</td>
<td>7308</td>
<td>6587</td>
<td>4993</td>
<td>5113</td>
<td>36</td>
<td>100</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>TURKEY</td>
<td>Trawler</td>
<td>566</td>
<td>688</td>
<td>543</td>
<td>700</td>
<td>686</td>
<td>100</td>
<td>5</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Multi Purpose</td>
<td>416</td>
<td>443</td>
<td>469</td>
<td>241</td>
<td>219</td>
<td>100</td>
<td>2</td>
<td>47</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Purse seiner</td>
<td>448</td>
<td>510</td>
<td>526</td>
<td>485</td>
<td>440</td>
<td>100</td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Carrier</td>
<td>53</td>
<td>295</td>
<td>213</td>
<td>201</td>
<td>213</td>
<td>100</td>
<td>2</td>
<td></td>
<td>302</td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td>16213</td>
<td>16460</td>
<td>15410</td>
<td>12673</td>
<td>12766</td>
<td>100</td>
<td>88</td>
<td>213</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td>17696</td>
<td>18396</td>
<td>17161</td>
<td>14300</td>
<td>14324</td>
<td>100</td>
<td>100</td>
<td>208</td>
<td></td>
</tr>
</tbody>
</table>
Table 7.6. Number of vessels by provinces in the Black Sea (TUIK, 2013)

<table>
<thead>
<tr>
<th>Province</th>
<th>Western Black Sea</th>
<th>Eastern Black Sea</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>% of the BS total</td>
</tr>
<tr>
<td>Zonguldak</td>
<td>590</td>
<td>10.58</td>
</tr>
<tr>
<td>Bartin</td>
<td>252</td>
<td>4.52</td>
</tr>
<tr>
<td>Kastamonu</td>
<td>251</td>
<td>4.50</td>
</tr>
<tr>
<td>Sinop</td>
<td>510</td>
<td>9.14</td>
</tr>
<tr>
<td>Sinus</td>
<td>461</td>
<td>8.27</td>
</tr>
<tr>
<td>Subtotal</td>
<td>2064</td>
<td>37.00</td>
</tr>
<tr>
<td>BS TOTAL</td>
<td></td>
<td>5578</td>
</tr>
</tbody>
</table>

Table 7.7. Grosstonnage distribution of fishing vessels by sub-regions in 2012 (TUIK, 2013)

<table>
<thead>
<tr>
<th>Region</th>
<th>&lt;5</th>
<th>5-9</th>
<th>10-29</th>
<th>30-49</th>
<th>50-99</th>
<th>100-199</th>
<th>200-499</th>
<th>500+</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eastern BS</td>
<td>2282</td>
<td>263</td>
<td>109</td>
<td>54</td>
<td>94</td>
<td>81</td>
<td>40</td>
<td>7</td>
<td>2930</td>
</tr>
<tr>
<td>Western BS</td>
<td>1363</td>
<td>347</td>
<td>225</td>
<td>92</td>
<td>83</td>
<td>38</td>
<td>32</td>
<td>3</td>
<td>2183</td>
</tr>
<tr>
<td>Black Sea Total</td>
<td>3645</td>
<td>610</td>
<td>334</td>
<td>146</td>
<td>177</td>
<td>119</td>
<td>72</td>
<td>10</td>
<td>5113</td>
</tr>
<tr>
<td>Black Sea %</td>
<td>36</td>
<td>30</td>
<td>33</td>
<td>39</td>
<td>47</td>
<td>48</td>
<td>64</td>
<td>72</td>
<td>100</td>
</tr>
<tr>
<td>Turkey Total</td>
<td>10154</td>
<td>2014</td>
<td>1004</td>
<td>372</td>
<td>381</td>
<td>248</td>
<td>113</td>
<td>14</td>
<td>14324</td>
</tr>
</tbody>
</table>

Overall length segmentation of the fishing vessels is also given in Table 7.8. The majority of the vessels in the marine fishing fleet are less than 20 m OAL (94%) and only 826 vessels out of 14324 is over 20 m (829 units). Vessels over 20 m OAL are 423 in the Black Sea which covers 2.96 % of the total fleet and total vessels of the Black Sea 35.70 % as total vessels. These figures indicate that there is not only the impact of big vessels to the Black Sea ecosystem but also small vessels in high numbers may have considerable effects in the near shore zone along the Black Sea coast.

Despite of a reduction in the number of vessels, the increase in fishing effort stil requires attention by the redesigning applications of the vessels, as they can increase the overall length in an uncontrolled manner. Larger vessels mean more powerful engines, bigger nets and renewal of fish finders with high-ranged more advanced versions.

Table 7.8. Length segmentation of fishing vessels in the Black Sea in 2012 (TUIK, 2013)

<table>
<thead>
<tr>
<th>OAL M</th>
<th>Eastern Black Sea</th>
<th>Western Black Sea</th>
<th>Black Sea Total</th>
<th>Turkey</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
</tr>
<tr>
<td>5-7.9</td>
<td>1788</td>
<td>12.48</td>
<td>970</td>
<td>6.77</td>
</tr>
<tr>
<td>8-9.9</td>
<td>671</td>
<td>4.68</td>
<td>662</td>
<td>4.62</td>
</tr>
<tr>
<td>10-11.9</td>
<td>106</td>
<td>0.74</td>
<td>111</td>
<td>0.78</td>
</tr>
<tr>
<td>12-14.9</td>
<td>65</td>
<td>0.45</td>
<td>157</td>
<td>1.10</td>
</tr>
<tr>
<td>15-19.9</td>
<td>51</td>
<td>0.36</td>
<td>109</td>
<td>0.76</td>
</tr>
<tr>
<td>20-29.9</td>
<td>165</td>
<td>1.15</td>
<td>111</td>
<td>0.78</td>
</tr>
<tr>
<td>30-49.9</td>
<td>77</td>
<td>0.54</td>
<td>63</td>
<td>0.44</td>
</tr>
<tr>
<td>&gt;50</td>
<td>7</td>
<td>0.05</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>2930</td>
<td>20.46</td>
<td>2183</td>
<td>15.24</td>
</tr>
</tbody>
</table>

According to the TUIK 2012 Fishery Statistics, MFAL has issued 20100 fishing vessel (16998 for seas and 3102 for inland waters) and 151541 fishermen (147263 for seas and 4278 for inland waters) licenses (table 7.9) of which 28 % of fishermen and 30 % of the vessel licenses were given by the Provincial MFAL Directorates in the Black Sea. If the number of vessels in the fleet and the licenses issued are compared there are some discrepancies between the two figures. If there are 14324 vessels, there should be the same number of licenses instead of 20100 (40 % more). On the other hand the number of fishing licenses allocated to the fishermen and vessels in inland waters seems very few both in total and provincial level indicating there are deficiencies to register all of capture fisheries in FIS.
The fisheries subsector is one of the important fields of the economy to reduce unemployment especially in the coastal areas. According to the 2012 Fishery Statistics there are 36776 persons working in the vessels and 45% of the workers are recorded in the Black Sea (table 7.10). Most of the fishermen working individually, family members and friends without any payment are 47% in Turkey and 41% in the Black Sea. Crew, usually, prefer to work on share basis and with payment; 26% and 30% in the Black Sea and 27% and 23% on country level, respectively.

<table>
<thead>
<tr>
<th>Province</th>
<th>Fishermen</th>
<th>Vessel</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Marine</td>
</tr>
<tr>
<td>Gümüşhane</td>
<td>29</td>
<td>128</td>
</tr>
<tr>
<td>Kırklareli</td>
<td>1185</td>
<td>1185</td>
</tr>
<tr>
<td>Sakarya</td>
<td>629</td>
<td>626</td>
</tr>
<tr>
<td>Düze</td>
<td>202</td>
<td>202</td>
</tr>
<tr>
<td>Zonguldak</td>
<td>5367</td>
<td>5366</td>
</tr>
<tr>
<td>Bartın</td>
<td>2508</td>
<td>2506</td>
</tr>
<tr>
<td>Kastamonu</td>
<td>944</td>
<td>942</td>
</tr>
<tr>
<td>Sinop</td>
<td>3101</td>
<td>3047</td>
</tr>
<tr>
<td>Samsun</td>
<td>5041</td>
<td>4750</td>
</tr>
<tr>
<td>Tokat</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Çorum</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>Trabzon</td>
<td>5123</td>
<td>5120</td>
</tr>
<tr>
<td>Ordu</td>
<td>4322</td>
<td>4308</td>
</tr>
<tr>
<td>Giresun</td>
<td>2585</td>
<td>2583</td>
</tr>
<tr>
<td>Rize</td>
<td>3876</td>
<td>3870</td>
</tr>
<tr>
<td>Bartın</td>
<td>1190</td>
<td>1190</td>
</tr>
<tr>
<td>TOTAL</td>
<td>36131</td>
<td>35823</td>
</tr>
</tbody>
</table>

Table 7.9. Fishing licenses for fishermen and vessels in the Black Sea in 2012 (TUIK, 2013)

The numbers of fishing ports are presented in Table 7.11.

<table>
<thead>
<tr>
<th>Type of structure</th>
<th>Black Sea</th>
<th>Marmara</th>
<th>Aegean</th>
<th>Mediterranean</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fishing ports</td>
<td>29</td>
<td>33</td>
<td>36</td>
<td>11</td>
<td>99</td>
</tr>
<tr>
<td>Small fishing port</td>
<td>15</td>
<td>8</td>
<td>2</td>
<td>2</td>
<td>27</td>
</tr>
<tr>
<td>Shore facility</td>
<td>33</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>33</td>
</tr>
<tr>
<td>TOTAL</td>
<td>77</td>
<td>41</td>
<td>8</td>
<td>13</td>
<td>159</td>
</tr>
</tbody>
</table>

Table 7.11. The number of fishing ports in Turkey (TUIK, 2013).
them located in the Eastern Black Sea. Due to lack of connection roads there are limited fishing port facilities in the west even though sea conditions are very rough in this region which creates a high risk to all ships.

<table>
<thead>
<tr>
<th>Province</th>
<th>Western Black Sea</th>
<th>Eastern Black Sea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zonguldak</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Bartın</td>
<td>3</td>
<td>22</td>
</tr>
<tr>
<td>Kastamonu</td>
<td>8</td>
<td>24</td>
</tr>
<tr>
<td>Sinop</td>
<td>5</td>
<td>30</td>
</tr>
<tr>
<td>Samsun</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
<td>86</td>
</tr>
</tbody>
</table>

Table 7.12. Landing ports and shore facilities in the Black Sea (BSGM, 2013)

7.3 The management system in purse seine fisheries

There is no effective management system in purse seine fisheries in Turkey. Purse seine vessels and multipurpose vessels were registered at the national maritime registry system and FIS, also they have fishing permissions to catch small and high migratory pelagic species. There is no quota system in Turkey except for bluefin tuna in the Mediterranean Sea. Results of new acoustic survey on anchovy and horse mackerel are expected for estimating stock abundances and TAC to implement quota system (after 2015).

There is open access system for fishing vessels permitting all the vessels in all locations on the migration route of migrating fish. This is one of the main impacts on the stocks to be subjected with overfishing capacities. Some of the management measures for purse seine fisheries are a closed season (from 1st of May to 31st August) and area, minimum allowable catch size restrictions (9 cm for anchovy, 13 cm for horse mackerel, 20 cm for blue fish, 25 cm for bonito, 11 cm for pilchard, 20 cm for scomber; 15 % of smaller are permitted in the landings of anchovy, pilchard, horse mackerel and bluefish, and 5% for the other species on weight basis) depth range (over 24 m depth) and time (permitted from 16:00 to 06:00) restrictions. There is no size limit for sprat. Due to unselectivity of purse nets, bycatch rate is too high not only for the smallest mesh sizes used (10-16 mm for anchovy, horse mackerel, sardines and bluefish; 32 mm for scomber and bonito) but also for the depth of the purse seine nets which reaches up to 110-180m which is more than 4-7 times more than the minimum depth allocated for purse seine operations in the Black Sea coasts.

In addition existing monitoring, control and surveillance services are not so effective. Market controls are very limited. All these reasons encourage fishermen to catch undersized fish or to participate in illegal fisheries of which the catch is processed in fish meal and oil plants at the lowest prices.

7.3.1 Management measures and incentives in purse seine fisheries

- OPTIMISATION OF FISHING FLEET: The decision on limitation of the fishing fleet had been taken in 1991 just after the anchovy crisis. New entries were not permitted except 20 % length extensions of vessels due to obtaine better hygiene and social spaces for both fish and the crew. Due to social and political pressures temporary permissions were given in 1994, 1997 and 2001, then new vessel entries fully stopped. Only length extensions were permitted within the same level. Although the results of scientific studies, economical outputs and experiences of the fishermen showed the optimal overall
length and engine power of purse seine vessels should be 25-30 m and 2x 500 HP, many of them preferred to construct bigger vessels considering to go blue fin tuna fishing in the Mediterranean; the biggest one have 64 m OAL. Subsidises for importing engines, steel, fish finders, communication gears and radars are the other encouraging reasons for over investment in the fishing fleet.

- PROGRESSES IN TECHNOLOGICAL EQUIPMENT: Introduction of high ranged of sonars (up to 10 km) instead of low ranged ones (several km) increased fishing effort. There is high competition among fishermen to own newest and high ranged navigation equipment, sonars, echosounders as the factors not only increasing factor for fishing effort but also creators of social and economical problems. In bigger purse seine vessels there are different sonars for anchovy, bonito and blue fish (Üstündağ, 2013).

- SUBSIDISED FUEL SUPPORT: Fuel subsidy has started in 2004 due to keep fish prices on a stable level in the market, unfortunately this support promoted vessel owners to buy second and third engines in the fleet along with the length extensions. As conclusion, this support also has impact on fish stocks as to increase fishing effort.

- RESTRICTION DAY TIME OPERATIONS: Day time operations of purse seine fleet completely banned since 2008-09 fishing season to permit anchovy schools migrating. But it is the reality that anchovy catch is very high due to migration of zooplankton from bottom to surface during dark time and following anchovies are more available to the nets. This measure has very limited positive effect on the exploited stocks. On the other hand midwater trailer are permitted to operate in day time to catch same species in the Black Sea.

- ENVIRONMENTAL FACTORS: Historically anchovy fishing season was at least 4 months from October to the late March. At present it is only 2 months due to global warming (sea water temperature should be 12-15 o C to form schools), establishment of dams on major rivers which prevents nutrient flow, and the last construction of power plants on rivers discharged to the Black Sea has changed the composition of river waters and habitats. As a result, food web of the Black Sea has almost changed comparing with the state before 1970’s.

- QUOTA APPLICATION IN ANCHOVY CATCH: It is the first co management decision raised by the purse seine fishermen to stabilise the market prices and sustainable use of the anchovy stocks by allocating certain quantity of daily quotas to the licensed vessels. This proposal was accepted by the Ministry and announced in annual regulations (250 boxes for the vessels below 15 m; 300 boxes for 15 to 20 m; 500 boxes for 20 to 25 m; 600 boxes for 25 to 30 m; 700 boxes for 30 to 35 m; 750 boxes for 35-40 m; 800 boxes for 40-45 m; 850 for 45-50; and 900 boxes for the vessels over 50 m per day; 900 boxes for pair mid-water trawlers cathing sprat with the annual limitation between 12500 to 45000 boxes according their length for two years period). In fact, this quota aimed to stable supply of fish to the market not regulating the catch.

- BOX APPLICATION FOR ANCHOVY LANDINGS: This application has been started in order to cover the need of requirements for EU on fish hygiene, tracebility and effective registry of landings. Box dimensions redesigned for anchovy since 2009-2010 fishing season as 52x37x7 cm (internal dimensions) and 11 cm high from the base for wooden boxes, 52x37x7 cm for plastic boxes and 54x34x11 cm for styrofoam boxes.
- ANCHOVY FISHING IN FOREIGN WATERS: In the last 10 years Turkish purse seine vessels are operating in different regions of Georgia with the special agreements established between vessel owners and local governments. It became more important due to crises in Turkish Black Sea fisheries. When anchovy season lasts too short, fishing in Georgian waters is the second chance to conduct fishing. Due to increases in anchovy landings Turkish enterprisers establish fish meal and oil plants in Georgia.

There is a Law of Georgia on Licenses and Permission (2005) which includes arrangement of commercial fishing. Licenses for sea fish quota for a ten year period have been auctioned in 2006 (Valid until 2016). Six companies have acquired licenses. The quota had been increased from originally 60000 tons anchovy to 70000 tons (2010/11), and is further increased to 80000 tons anchovy for the coming season (2011/12). Further, 10 % of the quota has been provided to the Georgian (small-scale) fishery companies.

There is a chance that licences will be prolonged beyond 2016. The administration of marine fishery has been moved to the Ministry of Energy and Natural Resources. They are also responsible for the licenses. Responsibilities within the government structure regarding fisheries are divided between:

- Ministry of Energy and Natural Resources (including Agency for Natural Resource Management): Marine Fishery (Quota, licenses, fishing rules, inspection);
- Ministry of Environment: Biodiversity, Data collection, Monitoring;
- Ministry of Agriculture: Aquaculture (theoretically/as they do not have aquaculture experts);
- Ministry of Economy: Landing sites for fishery within harbours.

In addition to the license fee paid in 2006, the license holders also have to pay two types of taxes: natural resource tax (25 GEL/ton of quota) and one other tax (14 GEL/ton quota, will be increased to 25 GEL/ton). The companies complained that the tax has to be paid on the full quota, not on the actual tax. Further, by increasing the quota and the tax rate, the tax burden of the companies is heavily increased (e.g. for a 10000 ton quota and future tax rate of 50 GEL/ton, a total of 500000 GEL have to be paid annually). On the other hand, the quota application have no bases to any stock assessments and TAC’s, depends only historical catch or assessments carried out by the Ukranian Scientists.

Turkey is the main trading partner of Georgia. Fish is quite a substantial portion of the Georgian export structure to the Turkish market. Exports of fish and fish products are of a value of approximately USD 1.5-4 million annually, mainly anchovy.

Regulations applied to the Turkish fishermen by the Georgian Authorities in last year:

(1) MPAs: Purse seine vessels have no right to operate in MPAs implemted in Georgia.
(2) Coastal protection (>300 m): 300 m band from the coastal line is not permitted for purse seining.
(3) Minimum size (7 cm): Minimum landing size (in total length) is under 2 cm than it is applied in all the countries. Majority of catch is deserved for fish processing industry.
(4) TAC (60 000 tons)
(5) Detain 2/3rd of the landing in Georgia (for the fish processing plants established in the country).

<table>
<thead>
<tr>
<th>UNIT</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Tons</td>
<td>5,928</td>
<td>11,743</td>
<td>19,010</td>
<td></td>
</tr>
<tr>
<td>1000 USD</td>
<td>1,412</td>
<td>2,930</td>
<td>2,382</td>
<td>4,114</td>
</tr>
<tr>
<td>Anchovies Tons</td>
<td>3,883</td>
<td>9,351</td>
<td>18,360</td>
<td>n/a</td>
</tr>
<tr>
<td>1000 USD</td>
<td>568</td>
<td>1,118</td>
<td>1,992</td>
<td>n/a</td>
</tr>
<tr>
<td>Flours, meals and pellets Tons</td>
<td>808</td>
<td>1,571</td>
<td>337</td>
<td>n/a</td>
</tr>
<tr>
<td>1000 USD</td>
<td>662</td>
<td>1,181</td>
<td>331</td>
<td>n/a</td>
</tr>
<tr>
<td>Others Tons</td>
<td>1,237</td>
<td>821</td>
<td>313</td>
<td>n/a</td>
</tr>
<tr>
<td>1000 USD</td>
<td>182</td>
<td>631</td>
<td>59</td>
<td>n/a</td>
</tr>
</tbody>
</table>

Table 7.13: Fish and Fish Product(s) Exports from Georgia to Turkey in 2007-2009

A part of the Turkish fishing fleet operates in the Georgian waters based bilateral agreements with the annual quota 60000 tons, total boats legally involved is 19 (plus 2 Georgian vessels), daily quota per vessel is 3000 tons in the purse seine fisheries.

Means to control Turkish fishermen operating in the Georgian waters:

(1) VMS (AIS) should be open during their stay in Georgian EEZ,
(2) Vessels should have Interpreter/Observer,
(3) Skipper should prepare three stage reporting/control at the ports about catch/landings.

According to the news coming fishermen there were some 30 fishing vessel were also operated in the north of Georgia where there is no control on the fishery (Gucu et al., 2013).

- DECOMMISSIONING VESSEL PROGRAM: Due to reduce overcapacity, Ministry has started new initiative to take out some vessels over 10 m from fishing fleet in 2013. At first stage 531 vessels (144 of them over 12 m, and 17 steel vessels) applied and 398 vessels were either scraped or given to the universities to be used as research activities (18 of the total) or Provincial Directorates to be used in control and surveillance services (12 vessels). It is expected that 529 vessels will be use this new funds for decommissioning. Expected benefits are:

  - Sustainable use of the stocks,
  - Balance catch and fishing effort,
  - Conservation of the stocks by reducing fishing pressure on the stocks,
  - Increase real incomes of fishermen,
  - Establish economical sustainability,
  - Compensate fishermen’s economical losses who leave fishing and give them an opportunity to establish new field of work,
  - Support traditional coastal fisheries.

By the end of 2014, it is expected that 30% of the fleet over 12 m OAL and 3.2 % of the total fleet will be reduced in terms of numbers (Akyurek, 2013).

7.3.2 By-catch rates in purse seine fisheries

Due to unselectivity of purse seine nets and their operations in more shallower waters than their depths by catch rates are to high comparing other fishing methods in the
region. There are several surveys conducted to determine bycatch rates of purse seine nets in the Black Sea. The main common marine living organisms in the bycatch are marine mammals as fully protected animals (*Delphinus delphis*, *Phocena phocena* and *Tursiops truncatus* – though there is no legal measures if they caught unintentionally fishermen hesitate to keep records due to afraid of possible penalties), untargeted demersal species as turbot, dogfish, whiting, red mullet, mullets, garfish, gurnard, rays, sea horses, shrimp, sea grasses, rapa whelk, baby clam and mostly undersized anchovies, horse mackerel, sardines, pilchard and blue fish as targeted species.

Sahin et al. (2008) reported bycatch rates as 8.91% in Rize province in 2005-2006 fishing season. But they neglected to add fish smaller than 9 cm total length which processed as fish meal and oil.

Bycatch rates of anchovy purse seiners are found to be higher (30 % in numbers and 9.85 by weight) in 2009-2010 fishing season. Sprat is the dominant species in bycatch (7%) and followed by horse mackerel (1.1 %) (Genç et al., 2010). Sardines were found first time as bycatch in this season which is the indication of ecological changes in the Black Sea ecosystem. Share of demersal species in the bycatch was 1% (table 7.14) composed mainly by red mullet and whiting. This rate shows the impact of purse seining carried out in shallow waters. On the other hand this data contain only the graded quantity not the processed anchovy.

<table>
<thead>
<tr>
<th>Species</th>
<th>September</th>
<th>October</th>
<th>November</th>
<th>December</th>
<th>January</th>
<th>February</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red mullet</td>
<td></td>
<td>0.82</td>
<td>0.30</td>
<td>0.13</td>
<td>-</td>
<td>0.35</td>
<td>0.32</td>
</tr>
<tr>
<td>Horse mackerel</td>
<td></td>
<td>-</td>
<td>2.12</td>
<td>1.21</td>
<td>2.14</td>
<td>0.53</td>
<td>1.10</td>
</tr>
<tr>
<td>Sprat</td>
<td>1.17</td>
<td>12.14</td>
<td>10.95</td>
<td>5.20</td>
<td>2.98</td>
<td>3.62</td>
<td>7.01</td>
</tr>
<tr>
<td>Shad</td>
<td>-</td>
<td>0.11</td>
<td>0.05</td>
<td>0.31</td>
<td>0.53</td>
<td>0.52</td>
<td>0.27</td>
</tr>
<tr>
<td>Whiting</td>
<td></td>
<td>-</td>
<td>-</td>
<td>0.16</td>
<td>-</td>
<td>-</td>
<td>0.04</td>
</tr>
<tr>
<td>Sardines</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2.10</td>
<td>0.47</td>
</tr>
<tr>
<td>Rays</td>
<td></td>
<td>-</td>
<td>-</td>
<td>0.01</td>
<td>-</td>
<td>0.41</td>
<td>0.09</td>
</tr>
<tr>
<td>Others</td>
<td></td>
<td>0.10</td>
<td>0.07</td>
<td>2.02</td>
<td>-</td>
<td>0.01</td>
<td>0.54</td>
</tr>
<tr>
<td>By-catch</td>
<td>1.17</td>
<td>13.16</td>
<td>13.50</td>
<td>9.03</td>
<td>5.65</td>
<td>7.53</td>
<td>9.85</td>
</tr>
<tr>
<td>Total</td>
<td>93.83</td>
<td>86.84</td>
<td>86.50</td>
<td>90.97</td>
<td>94.35</td>
<td>92.47</td>
<td>90.15</td>
</tr>
</tbody>
</table>

Table 7.14. By-catch rates (% on weight basis) of purse seine nets in various months in the Black sea in 2009-2010 fishing season

Increase in the operational depth of purse seining has positive effects on the reduction of by-catch. Demersal species can be found in shallower waters while sprat is abundant in the deeper localities. Ceylan (2011) reported that by-catch rate in purse seine operations 2.15% (of the total catch of 117 tons) for the Black Sea. He also did not add the bulk of anchovy sold to the fish processing industry.

In one of the recent research survey conducted with different types of fishing gears in the Black Sea, by-catch rates were found very high as 37 % in weight and 11 % in number basis in anchovy purse seine fisheries (table 7.15) (Kasapoğlu, 2013). Twenty three percent of anchovy in the purse seine net are composed by the undersized individuals (< 9 cm TL), all of the red mullets were smaller than 13 cm legal size, 98 % of horse mackerel and 93 % of whiting and 100% of *Mullus barbatus* are under their minimum allowable catch size (table 7.16). When fishermen grading anchovy at sea after operations, sometimes smaller ones discarded directly to the sea and bigger ones were boxed and transferred to the market with better price. On the other hand there is no chance to survive for the ones discarded to the sea (Üstündağ, 2013). By-catch rate of anchovy is very high mainly in Trabzon region in weight basis.
### Table 7.15. By-catch and targeted catch rates for anchovy purse seine nets in different provinces

<table>
<thead>
<tr>
<th>Location</th>
<th>By-catch Targeted catch</th>
<th>Total catch</th>
<th>By-catch (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Weight (kg) #</td>
<td>Weight (kg) #</td>
<td>Weight (kg) #</td>
</tr>
<tr>
<td>Hopa</td>
<td>0</td>
<td>0</td>
<td>20000</td>
</tr>
<tr>
<td>Rize</td>
<td>1439</td>
<td>357810</td>
<td>20531</td>
</tr>
<tr>
<td>Trabzon</td>
<td>33826</td>
<td>322779</td>
<td>10590</td>
</tr>
<tr>
<td>Giresun</td>
<td>665</td>
<td>157815</td>
<td>10735</td>
</tr>
<tr>
<td>Ordu</td>
<td>31</td>
<td>7453</td>
<td>194</td>
</tr>
<tr>
<td>Samsun</td>
<td>16</td>
<td>3549</td>
<td>194</td>
</tr>
<tr>
<td>TOTAL</td>
<td>35978</td>
<td>859406</td>
<td>62243</td>
</tr>
</tbody>
</table>

Table 7.16. By-catch quantities and rates in horse mackerel purse seine net by provinces (Kasapoğlu 2013).

<table>
<thead>
<tr>
<th>Species</th>
<th>Targeted Fish</th>
<th>N</th>
<th>Length (cm)</th>
<th>Weight (g)</th>
<th>Mean L (cm)</th>
<th>Mean W (g)</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>E. encrasicolus</td>
<td>1493</td>
<td>5.9</td>
<td>14.6</td>
<td>1.06</td>
<td>18.05</td>
<td>10.5</td>
<td>8.12</td>
<td>340</td>
</tr>
<tr>
<td>Mullus barbatus</td>
<td>152</td>
<td>5.3</td>
<td>12.6</td>
<td>1.20</td>
<td>22.32</td>
<td>6.9</td>
<td>3.73</td>
<td>152</td>
</tr>
<tr>
<td>S. sprattus</td>
<td>138</td>
<td>6.4</td>
<td>10.7</td>
<td>3.12</td>
<td>8.14</td>
<td>8.6</td>
<td>3.66</td>
<td></td>
</tr>
<tr>
<td>Seahorse</td>
<td>1</td>
<td>26.7</td>
<td>2.19</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sole</td>
<td>45</td>
<td>3.4</td>
<td>6.8</td>
<td>1.10</td>
<td>3.00</td>
<td>2.1</td>
<td>5.50</td>
<td></td>
</tr>
<tr>
<td>Horse mackerel</td>
<td>164</td>
<td>6.2</td>
<td>15.2</td>
<td>1.71</td>
<td>29.10</td>
<td>8.7</td>
<td>5.46</td>
<td>160</td>
</tr>
<tr>
<td>Picarel</td>
<td>2</td>
<td>11.2</td>
<td>11.4</td>
<td>14.24</td>
<td>16.81</td>
<td>11.3</td>
<td>15.53</td>
<td></td>
</tr>
<tr>
<td>Gobies</td>
<td>1</td>
<td>6.2</td>
<td>2.24</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whiting</td>
<td>14</td>
<td>7.2</td>
<td>14.3</td>
<td>2.05</td>
<td>23.00</td>
<td>10.2</td>
<td>8.55</td>
<td>13</td>
</tr>
<tr>
<td>Mullus surmuletus</td>
<td>1</td>
<td>10.3</td>
<td>7.76</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trachinus clavata</td>
<td>1</td>
<td>20.1</td>
<td>46.31</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Raja clavata</td>
<td>4</td>
<td>70.0</td>
<td>90.0</td>
<td>27.31</td>
<td>4364</td>
<td>80.3</td>
<td>3491.50</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>2016</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

With average values, 8 % and 52 % of the total catch in purse seines used for horse mackerel is either undersized or untargeted species in the region in weight and number basis, respectively, in the Eastern Black Sea. Similar values are 62 % and 93 %, 3 % and 33 %, 7 % and 51 % in Hopa, Trabzon and Ordu provinces with the same order. Sub samples taken from the total catch has showed that 63 % of the total catch is horse mackerel of which 38 % is formed by undersized fish. Among untargeted fish species, 28 % of red mullets and 8 % of whiting are smaller than legal size while all of the blue fish are smaller than minimum allowable catch size. All these figures show the impact of purse seiners operated in shallow waters on the demersal fish stocks.
The major part of the bonito (84.6%) is obtained in the Black Sea. Purse seines are intensively used for bonito from September to November. Bonito fishing by big boats is conducted around the eastern parts of the Central Black Sea. With big boats of 48 m and 1600 HP, bonito shoals are followed easily, operating 24 hrs/day. During September, October, and November when the bonito catches are at the peak, the CPUE of these boats were found to be 818.3, 601.7, and 156.5 kg boat/op. (Zengin et al., 2006). Surveys conducted only in Sinop province for bonito purse seine operations. In the total samples (300 kg, 1711 individuals) 34 kg (11%) and 1079 individuals (63%) were by-catch (Table 7.18) (Kasapoğlu 2013).

<table>
<thead>
<tr>
<th>Species</th>
<th>Weight</th>
<th>#</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anchovy</td>
<td>37</td>
<td>11</td>
</tr>
<tr>
<td>Horse mackerel</td>
<td>8</td>
<td>52</td>
</tr>
<tr>
<td>Bonito</td>
<td>11</td>
<td>63</td>
</tr>
</tbody>
</table>

Table 7.18. Summary of by-catch rates (%) in purse seine nets

7.4 Conclusions

7.4.1 Governance

It is very difficult to say whether there is an effective management system regarding purse seine fishery in the Black Sea or not. All the riparian countries seem to struggle with fisheries management. Though Bulgaria and Romania are EU members, they were not able to establish fishery management plans (even for sprat and turbot fisheries), and fully meet the requirements of the CFP. In Georgia there is no single fisheries administration and all the responsibilities regarding fisheries are distributed among different ministries which create new problems as: an increase in bureaucracy, failures to follow up regional problems, limited experienced staff working in the related institutions, etc. Fisheries in the Black Sea has no importance for the Russian Federation due to lacking of efficient fishing fleet, old vessels now out of order and old state infrastructures, which are under reconstruction. Russian fish production mostly comes from the Azov Sea. Ukraine is also in the same situation even though they have very efficient research institutes for the Black Sea fisheries (in Odessa, Sebastopol and Kerch as former Ukraine lands). They had financial problems to support institutes and run research vessels and plus political problem at present. In case of Turkey, there is no effective fisheries management system in the Black Sea purse seine fisheries. Although the progresses after 2000’s in order to harmonise fisheries management policies with the EU, and the implementation of new measures in the CFP, there is very small effectiveness on the management of fisheries across countries and in the Black Sea. New or amended Fisheries Law is waiting in the Ministry of Food, Agriculture and Livestock while Ukraine and Russia have a new Fisheries Acts.

Common problems on the governance of the Black Sea fisheries can be summarised as follows:

- Insufficient port offices, staff availability and technical infrastructures,
- Lacking of efficient data collection system,
- Limited experienced staff employment,
- Lack of funds to support fisheries from EU in the pre-accession period
- Ineffective administration
- Ineffective monitoring, control and surveillance services at sea, wholesale and retail fish markets,
- Lack of regional fisheries agreement, which is essential for the management of shared stocks like anchovy, horse mackerel, sprat, blue fish and Atlantic bonito.
• Limited funds for research on fish stock abundances,
• Lack of efficient stakeholder participation in decision making process,
• Over centralisation, lack of regional management policies (important for Turkey due to the surrounding seas as Mediterranean, Aegean Sea, Sea of Marmara and the Black Sea), having different ecosystems, different fisheries (single-mixed, purse seining-trawling-artisanal) and different political and social problems (Cyprus-Turkey, Greece-Turkey; EU membership and continental shelf problem, conflicts between artisanal fishermen and mobile purse seiners in the Mediterranean and Aegean Sea),

Future expectations for better governance:

The Black Sea Economic Cooperation (BSEC) and the Commission on the Protection of the Black Sea against Pollution (BSC): Albania, Armenia, Azerbaijan, Bulgaria, Georgia, Greece, Moldova, Romania, Russia, Turkey and Ukraine are the members of the BSEC which is responsible to cover the needs of Convention on the Protection of the Black Sea Against Pollution (Bucharest Convention), its Protocols and the Strategic Action Plan for the Environmental Protection and Rehabilitation of the Black Sea. All of the riparian countries are members of the BSC.

BSC possesses cooperation links and options for consultative conversation with other intergovernmental organisations involved in marine pollution affairs at the global and regional level, including the United Nations Environment Program (UNEP), International Maritime Organisation (IMO), Global Environmental Facility (GEF), International Commission for the Protection of the Danube River (ICPDR), Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (ACCOBAMS), European Environment Agency (EEA), different institutions of the European Union (EU) and some other organisations. Till that time Commission has no effective specific success in terms of Black Sea fisheries management due not a lack of sufficient financial support and political willingness of the member countries.

After the membership of Bulgaria and Romania, the Black Sea became EU interest area. Fishery management decisions are taken by the Commission according to the advices of STECF (JRC) over annual meetings held by the participation of the experts from all Riparian countries. According to the data provided by the invited experts, STECF experts evaluate the data, discuss the quality, decide the best assessment method, run the analyses and produce short, mid and long term advices to the countries and estimate quota for the member countries. At present quota system implemented only for turbot and sprat for Bulgaria and Romania. STECF reported that main deficiencies for the Black Sea fisheries are the lack of standard methodology on sampling, ageing, timing, fishery operational data, scientific surveys for holistic methods and lack of experts for the assessments. On the other hand advices of STECF usually have never been taken into consideration by the non-member countries.

General Fisheries Commission for the Mediterranean of FAO has started the new initiative in 2007, to implement sub-regional cooperation to support of fishery research and management in the Black Sea by GFCM Black Sea Working Group, aiming:

• To foster cooperation between fishery scientists and stakeholders from the Black Sea coastal area within the framework of an Ecosystem Approach to Fisheries,
• To promote technology transfer between countries and support capacity building.
• To develop multidisciplinary databases and regional information systems,
• To conduct joint data collection schemes including surveys to complete information deficiencies and calibrate national systems, as appropriate,
• To cooperate with other initiatives by Black Sea scientific bodies, national entities and international projects, in order to achieve coordinated results,
• To promote the attendance of Black Sea national scientists at international fisheries scientific fora, and encourage their effective participation in GFCM Scientific Advisory Committee activities,
• To promote publication of the results.

At present, GFCM seems as the best umbrella for the regional management of Black Sea Fisheries and all of the riparian countries have political will to be involved in with GFCM Black Sea Working Group.

7.4.2 Optimisation of fishing fleet and decommissioning program
At present Turkish fishing fleet is fixed. New entries are not permitted except length extension (20%) for modernisation purposes. According to the decommissioning program certain amount of vessels were taken out from the fleet, but it is very difficult to say if the reduction was effective. Most of the vessels removed from the fleet are wooden and inactive ones. Even this application is very useful as to prevent fishermen who want to build up new one by withdrawing all this old vessels from the fleet. In order to improve results, Ministry should increase the rates of payments more promotional levels to reduce industrial vessels which are more efficient to exploit the stocks.

7.4.3 Progresses in technological equipment
Fish finders (sonar and echosounders), navigation equipment (radars and modern communication units) are followed closely by the industrial fishermen even in competing each other. They can reach the fish schools easily then ever, inform each other where the schools are, and reach faster with high powered engines. All these equipment are subsidised if they are the members of cooperatives. It has been a very serious problem for the stocks subjected to high fishing mortalities. New measures are urgently needed to prevent over investment in this field which encourage over fishing in the very narrow continental shelf in the Turkish EEZ.

7.4.4 Fuel subsidies
This application was done to support fishermen, price regulation in the fish market and let vessels to look for fish schools in deeper and distant waters. Since 2004, it can be said that fishermen did not change their intention to operate in shallower coasts, even under 24 m depth limitation. It has never helped to reduce fishing effort, contrary was very useful to increase fishing mortality of the Black Sea stocks.

7.4.5 Restriction of day time operations
This application proposed by the purse seine fishermen society in order to reduce fishing pressure on migrating fish stocks as one of the co-management proposal and to have new compensations as to show their intention to devote themself for the benefit of fish stocks. Naturally, anchovy fishing is more successful at night fishing due their feeding behavior as to follow upward migration of zooplankton. In order to reduce fishing pressure on the anchovy stoks realistic efforts needed to restore anchovy stocks (as to apply weekly shifts for day and night fishing).
7.4.6 Environmental factors
The Black Sea is a very fragile ecosystem. It has water exchange only via Bosphorus. Any pollution from either industrial or domestic resource could be very serious threat on the fish stocks. All need to mid and long term concerted actions. Under these circumstances fisheries management has more importance than in the past. Cooperation under the same organisation is very vital for the Black Sea fisheries. Existing conventions on pollution, conservation of biodiversity, environmental and safety aspects, control of pollution from land based sources; control of pollution from land based sources of shipping, development of common methodologies for integrated coastal zone management should be signed/ratified/applied where/when necessary.

7.4.7 Quota application in anchovy catch
Actually it was not a real quota application aiming the price regulation in the markets by providing certain quantity of supply. However, it was one of the co-management applications coming from purse seiners. In the first year it worked very well, earnings of fishermen raised but fish meal and oil plants could not find fish to process against considerable prices. Historically, fish processing plants are owned by wholesalers, or have shares as whale salers, or owners have agreements with purse vessel owners to provide raw material for the plants. When they did not have profit, they started to encourage fishermen to catch more fish even formed schools by small sized individuals. This type of manipulations was the reason to stop this application. In the meeting organised by the top association of fisheries cooperatives held in April, all the groups; artisanal fishermen, trawlers, purse seiners, long liners and NGO’s decided to start a quota system in all fisheries which will be based upon historical catch of each species. Additionally, they expressed the necessity of reporting catch and landings, more actively by the Ministry on monitoring, control and surveillance services, combating IUU fisheries and more stakeholder participation to make decisions on quota implementation and application process. To conclude, quota application applied in the past and new application had/may have indirect benefits for the sustainable use of fish stocks.

7.4.8 Box application for anchovy landings
This measure was implemented in order to supply fish to the market in safe conditions, handling, transport and marketing in standard units and provide better estimate of quantity of landings. Results of this application are very useful for the fishermen, market and the consumer.

7.4.9 Anchovy fishing in foreign waters
It was a very good idea as to use a part of fishing effort in other countries to reduce national fishing effort. But it was observed that Turkish purse seine vessels were usually targeting anchovy schools along Turkish coasts. On the other hand, the majority of the landings go to fish meal and oil plants in Georgia. Fishing regulations are not the same in this country with Turkey and the other Black Sea countries; the major failure is the minimum size of the anchovy allowed to catch as 7 cm in total length. Bilateral or multinational agreements, of course, are very useful for cooperation in fisheries. But common measures need to be applied in all of the countries. Governments should cooperate on the use of existing fishing fleet in the Black Sea.

7.4.10 Combatting IUU to reduce by-catch rates
It is very essential to use more selective fishing gears, or increase the selectivity of existing expensive nets. Funds should be created to promote to use of environmentally
friendly gears by offering them free of charge to the fishermen. Effective monitoring, control and surveillance services are very vital to stop intentionally over exploiting of the stocks.
References


8. Devolved management in the UK: The case of the south west POs

8.1 Introduction
The UK Western Waters case-study fishery is the South West English demersal fishery, specifically those over 10 metre vessels in membership of the two principal Producers’ Organisations for the region: the South Western Fish Producers’ Organisation (SWFPO) and the Cornish Fish Producers’ Organisation (CFPO). Most of the UK-registered vessels fishing in Western waters (ICES sub-areas VII and VIII) belong to these two POs. Between them, they represent the majority of fishing vessels based in South West England (principally the counties of Devon and Cornwall), although they both also have member vessels from other parts of the UK. The UK Western waters offshore demersal fleet includes beam trawlers, demersal trawlers, liners and netters. Main target stocks include sole, plaice, hake, megrim and monkfish.

The principal landing ports for SW English vessels are Brixham in Devon (particularly for the SWFPO vessels) and Newlyn in Cornwall (for CFPO vessels). Other important landing ports include Plymouth in Devon and Looe in Cornwall, although landings are also made into French and Belgian ports. Brixham is a major port for beam trawlers landing sole and plaice as well as scallops. There is an important seasonal fishery for cuttlefish. Newlyn also receives significant landings from liners, netters and demersal trawlers catching hake and megrim. These high-value fisheries predominantly supply European export markets such as France and Spain.

There are just under 200 vessels in the CFPO, of which around 80 are inshore vessels (10m or under in overall length). The SWFPO has about 70 over 10m vessels and only 8 inshore vessels. Approximately half of the offshore vessels in the SWFPO are beam trawlers and/or scallop dredgers.

8.2 Quota management

8.2.1 Summary
The UK quota management system is determined by the UK Fisheries Administrations, including DEFRA for England and Marine Scotland for the Scottish Government. The system is currently very similar across the UK although under a recent Concordat the approaches may now start to diverge, particularly between England and Scotland.

UK vessels of over 10 metres in overall length have individual Fixed Quota Allocations (FQAs) which determine their quota allocations each year as a percentage of UK quotas. FQAs are used to determine “sectoral” allocations to Producers’ Organisations (together with some other groups such as Interfish and certain pelagic vessels) but do not directly confer individual quota allocations to individual vessels. Quota allocations to individual vessels/firms are determined within the groups themselves. Some POs use monthly landings limits while others use individual vessels or company quota allocations.

For those few over 10m vessels which do not belong to a PO or other sectoral group, a small quota pool (based on these vessels FQAs) is managed directly by the Fisheries Administrations. A separate quota pool (in essence, the residual) is reserved for the 10m
and under ("inshore") fleet and is managed by Fisheries Administrations, generally by means of a combination of monthly limits and fishery closures.

Quota trading does take place, even though quotas are not officially tradeable. Trading of quota between vessels in different groups is effected via quota "swaps". As a rule, quota trades do not affect vessels’ FQAs, thus there is effectively only an in-year lease market, although multi-annual agreements can be made. In general, quota trading is only possible for over 10m vessels, although there is currently a scheme to enable 10m and under vessels to lease quota for certain stocks in order to supplement availability from the quota pool.

Note that FQAs are attached to the licence, not the vessel per se. Hence changes in vessel ownership or scrapping do not directly affect FQA “ownership”: licences can be transferred onto a new or replacement vessel.

8.2.2 Monitoring and enforcement
Fisheries Administrations (or their Agencies) are responsible for ensuring that vessels maintain accurate logbooks and submit true landings declarations and sales notes. Only over 10m vessels are required to keep logbooks, although 10m and under vessels are encouraged to do so and many do in order to establish verifiable track records.

In England, the Registration of Buyers and Sellers (RBS) Scheme has been in operation since 2005. Under the Scheme, all buyers and sellers of first sale fish must be registered and all auction sites of first sale fish designated. Registered buyers who buy fish direct from a vessel or an agent have to submit buyer’s sales notes to the local fisheries office within 48 hours (24 hours if electronic) of the sale taking place. Registered sellers (those selling first sale fish by competitive bidding at a designated auction site) are required to complete a seller’s sales note and submit them to the local fisheries office within 48 hours (24 hours if electronic) of the sale taking place. In addition, buyers and sellers are also required to keep records of each purchase and sale. These records shall be made available for inspection at all reasonable times. Records must be kept for a minimum of two years.

POs also monitor their members’ uptake of quota allocations through routine checking of submitted copies of the vessels’ logsheets, landings declarations and sales notes. These are checked against allowances (e.g., monthly limits or IQs). If detected, infringements, which represent violations of the rules of the PO are then dealt with in various ways ranging from a private warning to quota deductions, fines and ultimately the threat of expulsion from the PO for persistent offenders. As a general rule it appears that all the POs apply a penalty whether or not the PO as a whole is disadvantaged as a result, to the extent that quota available to other members is reduced in the current year or the PO suffers a quota deduction in the subsequent year.

8.2.3 Historical background
Since the inception of the TAC/quota system under the EU’s Common Fisheries Policy, UK Fisheries Administrations have progressively devolved a considerable amount of quota management responsibility to the fish Producers’ Organisations, of which there are now 20 established in the UK.

Until 1997 the allocations of quota to the POs were based each year on the recorded landings of individual member vessels over the previous three years (so-called landings
“track records”). In 1998 quota allocations were based on the same track records as the 1997 allocations, in preparation for a fixing of quota allocations. In 1999 the same allocations were converted into 100kg quota “units”, giving each vessel its Fixed Quota Allocation (FQA). Vessels’ FQAs now remain the same each year, but the value of a quota unit depends upon the size of national quotas in relation to those set in 1999. One of the main reasons underlying the move to FQAs was to remove incentives to secure quota allocations by artificially inflating track records.

The POs have always been allowed to determine their own internal quota allocation methods. Some operate a common quota pool and set monthly landings limits which apply to all members. Others allocate individual quotas (IQs) to member vessels on the basis of each vessel’s FQA. Some POs pool quotas for certain stocks and allocate IQs for others, or for some parts of the membership. Linked to an increase in quota trading (see below), in recent years more POs have implemented IQ systems while many which have traditionally operated quota pools now allow members to top up their pool allowances by buying in extra quota.

For the over 10m vessels which do not belong to a PO, a quota pool is reserved based on the sum of these vessels’ FQAs. This is relatively small since many of these vessels target primarily shellfish stocks which are not subject to quotas. Their landings of quota stocks are regulated by means of monthly limits. Vessels of 10m or under in length, which make up some 77% of the fleet by number, do not have FQAs. The quota pool reserved for them is a very small part of the total UK quota, but for certain stocks, mainly in the English Channel, they account for a significant proportion of total landings. Their landings are mostly regulated using monthly limits with prohibitions for exhausted allocations.

Since they were first introduced in their present form, UK restricted fishing licences have, to a greater or lesser extent, been privately tradeable. In 1995 landings track records became associated with licences rather than vessels and this gave the licences a greatly increased value because of the quota rights they now carried. Under the licence aggregation scheme, first introduced in 1990, vessels could now increase their quota allowances by combining licences from more than one vessel. In 1997 a number of track records were also permanently traded during the last decommissioning round, when owners of decommissioned vessels were permitted to sell rather than surrender their quota rights.

The main driving force behind an increase in quota trading, however, came from relaxed rules on the swapping of quota between POs, in particular the facility from 1996 for POs to make quota “gifts” (i.e., with no reciprocal transfer of quota, which had previously been required). This made it much easier for a vessel in one PO to lease or sell quota to a vessel in another PO. Deals were complex, involving the vessel owners and the PO officers, but under the track record-based allocation system a quota sale could be completed in three years. Within the POs operating IQs, of course, quota trading had always been possible.

The move to FQAs meant that trading of quota could not affect each vessel’s basic quota allocation. This facilitated quota leasing but permanent sales of quota became effectively impossible, a quota “sale” becoming instead a long-term lease agreement. Nevertheless, quota trading has escalated in recent years, evidenced by an increase in the annual number of quota swaps between POs.
8.3 Analysis

8.3.1 How the current system works
In the UK there are mixed views on quota trading and this is to some extent reflected in the differences between POs in the way in which quota is allocated internally. In Scotland, for example, many of the PO administrations continue to take a strong position against quota trading and operate quota pools for all stocks. In England and Wales, more POs operate IQ systems for at least some stocks and some vessels. In the South West, the CFPO has adopted what is commonly known as a “pool-plus” system, whereby quota is pooled but individual vessels are able to supplement their monthly landings limits from the pool with quota leased privately from other vessels. Where vessels have acquired additional FQA units, these effectively give rise to IQs. The SWFPO operates IQs for most of its membership, although a group of smaller inshore vessels do work within a quota pool. Many UK POs operating quota pools hold some FQAs centrally (on so-called “dummy” licences) which are used for the benefit of the membership as a whole. Both the CFPO and, to a lesser extent, the SWFPO, have invested in FQAs in order to secure additional quota for the membership as a whole. The CFPO also holds FQAs acquired by the Dutchy Fish Quota Company which aims to secure quota for the benefit of fishermen in Cornwall.

Both POs assist their members with quota trading where required, for example by arranging exchanges (“swaps”) with other UK POs via the MMO, but are not otherwise actively involved in quota trading: there are a number of private companies which act as brokers in this market. Although day-to-day management decisions are taken by the PO offices, decisions on quota management approaches are taken by elected representative boards or at general meetings. UK fishermen can join any PO in any part of the country, however, so that although most POs do have a strong regional identity, members are often attracted by the quota management systems or specialisations offered by the PO. Thus, for example, the SWFPO membership includes beam trawlers and scallop dredgers from outside the Southwest, even Scotland.

Although there is an active FQA/quota market in the UK, and fishing firms routinely use the money value of FQAs as security for bank loans, the legal position is that FQAs are not private property in law. This was tested recently in a UK High Court judgement which found that Government had the right to allocate FQAs as it saw fit, without financial compensation, and that fishing firms had no “legitimate expectation” that the rights conferred by FQAs amounted to possession. This is despite the fact that FQAs had been adjusted to reflect private quota trades three times (in 2001, 2005 and 2011).\(^{23}\)

8.3.2 Differences between FQAs and ITQs
ITQs are usually held by individual firms who can trade them freely with other firms, i.e., they can be bought and sold outright. Under the FQA system, quota units are held against vessel licences or against Producer Organisation (PO) dummy licences. There has been a gradual evolution in practice from the time that FQAs were implemented, when it was stated that they were not to hold a monetary value, and to the situation today, where UK devolved governments acknowledge that there is a trade in FQA units. The trade in units is not easy, however, since trades must be backed up with separate legal

\(^{23}\) “High Court Spells Out Quota Rights”, *Fishing News*, 26 July 2013, p.2.
agreements and only every few years have fisheries departments reconciled which licences are actually the beneficial holders of FQA units. In general, FQAs cannot be freely traded as independent assets, although licence transfer and aggregation rules can be used to trade FQAs.

The actual right granted to the holders of FQAs is not well defined and there is uncertainty about the legal precedence and legitimate expectation that has arisen in relation to their trade. Technically, FQA units only give a right to land a proportion of the UK total catch quota (TAC) that the government chooses to allocate among FQA holders – this is how the government currently intends to allocate some more quota to the under 10m fleet, and the over 10m sector is complaining that the government is somehow “stealing” or “repossessing” their quota entitlement.

In contrast to the FQAs, the property rights status of ITQs is likely to be more clearly defined and the rights can be considered secure enough to lend against and to hold as assets on balance sheets of businesses. Because there is less uncertainty surrounding the entitlement with well-designed ITQs, investors in the industry can have more confidence in being able to benefit from fishing opportunities for a known period of time and, very importantly, enjoy the future benefits of investments in stock recovery. This improves the ability to plan ahead for business reinvestment.

In the operation of FQAs, individual vessels that are members of POs have no direct relationship with the fisheries administrations as regards their adherence to quota limits. The government expects POs to adhere to their collective limits and does not impose a single way of achieving this onto POs. Some POs allow their member vessels to operate against their own quota units, leasing or buying any extra they need to access. Other POs however operate a pool allocation system among vessels in a way that alters the business incentives of the vessel owners. To join such a PO a vessel would have to bring in a certain amount of quota (i.e., FQA) units held on its licence, but would then be allocated monthly landings allowances for various species which might not be in line with the species it contributed to the quota pool. How POs deal with over-quota landing varies too and the fisheries administrations have no involvement in this at individual vessel level, as long as the PO as a whole has not landed more than its collective allocation.

The enforcement of an ITQ system, by contrast, generally requires that the quota/landings status of all vessels/firms be monitored in real time by fisheries authorities, subject to the reconciliation rules adopted under the system.

Under an ITQ system, the annual quota can be leased to other firms (within the year) and quota shares can be sold or bought to adjust long term quota rights. Under the FQA system, quota leasing is possible only between vessels in the same POs which assign individual quota allocations (including top-ups). When vessels are in different POs, leasing involves quota swaps between the POs and is administratively cumbersome. Recently, under 10m vessels have had the temporary right to lease-in access to quota and this right was granted in acknowledgement of the fact that the monthly pool allowances of the under 10m fleet were completely inadequate for highly capable, commercially operated vessels in the under 10m sector.

Rules can be imposed on either system to limit “ownership” in various ways, although firms and their lawyers/accountants will be no doubt be adept at finding ways around these (e.g. hidden beneficial ownership). Under the current FQA system there are no
rules to prevent concentration of holdings among a few participants and no rules to prevent beneficial holding of units by those not otherwise involved in vessel ownership or operation.

8.3.3 Discarding incentives
Quota-related discarding incentives are reduced under the current system to the extent that firms are able to change their landing limits for different species (see, for example, Hatcher 2014). Otherwise, as is generally the case in EU fisheries, vessels are required to discard species for which they do not have quota. UK Fisheries Departments are still consulting on how to implement the new EU landing obligations. One possibility at the PO level is the use of quota pools for “by-catch” species, although POs are apparently placing great emphasis on the possibility of quota “uplifts” in order to reduce discarding incentives. It is arguable, however, that this is misguided, as discarding incentives will actually be unaffected (there will simply be an upward shift in all vessels quota allocations - or not). More important will be the expected penalties (pecuniary or otherwise) for discarding and as yet it is unclear what these will be.

8.4 Conclusions
The UK devolved quota management system exhibits a range of allocative approaches from collective quota “pools” (usually managed using monthly landings limits) to individual quotas. The SWFPO principally employs IQs, while the CFPO uses quota pools, although as a result of active quota trading the latter permits members to “top up” their monthly allowances by leasing extra quota from outside the PO. The more collective approach of the Cornish PO reflects a more local community oriented organisation but also probably a more polyvalent fishery than the vessels in the SWFPO which is dominated by beam trawlers. We therefore observe a complex mix of incentive structures depending on the ability of individual vessels to vary their quota limits through trading. This is complicated by the ability for POs as institutions to buy quota and hold it collectively on “dummy” licences. A further complication is that the freedom for POs to swap quota with other POs means that democratic (non-market) as well as market quota allocation takes place. An ongoing problem for the system is posed by the inshore (10m and under) vessels which are not fully part of the system and are perceived to have an inadequate quota pool available to this group as a whole.

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25 This refers to the anticipated quota increases that may arise as a result of the move from landings quotas to catch quotas as the discard bans are implemented.

9.1 Introduction

This chapter gives a brief description of the Irish Celtic Sea Herring fishery which was described in greater detail in the report on SocioEc Deliverable 3.2. It analyses current management measures utilised in the fishery and incentives which have been created as a result of these measures. The chapter focuses in particular on a recent innovation in the fishery: the sustainability certification issued by the Marine Stewardship Council (MSC).

The Celtic Sea Herring fishery occurs off the South coast of Ireland in ICES areas VIIj, VIIg and the southern part of VIIa. There are two distinct Irish fleets targeting Celtic Sea Herring. The main fishery, which is allocated 89% of the Irish quota, comprises vessels mainly over 15m in length and has a mix of polyvalent vessels which switch between pelagic and demersal species throughout the year and solely pelagic vessels which use refrigerated sea water tanks to store their catch. There is also a small-scale fleet, known as the sentinel fishery, which is allocated 11% of the quota and which can fish inside an area, which is closed to fishing by larger vessels in order to protect spawning Herring. There were approximately 20 vessels in this fleet in 2013. The majority of these vessels are approximately 10m in length. The main fishery occurs between September and November while the sentinel fishery occurs between November and February. Both fleets (main and sentinel) are multispecies fleets. Many of the smaller sentinel fishery vessels target shellfish with pot fisheries outside of the Herring season. The polyvalent vessels in the main fishery usually focus on trawling for mixed demersal species in the Celtic Sea when not fishing for Herring while the pelagic vessels also target Mackerel, other Herring stocks, Blue Whiting, Horse Mackerel, Sprat, Albacore Tuna and Boarfish when not targeting Celtic Sea Herring. All of these vessels fish using the pair pelagic trawling method.

86% of the TAC is allocated to Ireland and the only other significant player involved in the fishery are Dutch vessels and Dutch owned vessels from France and Germany (Marine Institute, 2013). It is essentially a single species fishery without any significant bycatch issues (Ryan & Berrow, 2013).

The history of the fishery over the past 50 years has been one of an alternating boom and bust cycle (Fitzpatrick, 2014). Stock collapses occurred in the mid-1970’s and again between approximately 1998 to 2007 (Marine Institute, 2013). An EU ratified Recovery Plan developed in 2007 and a subsequent Long Term Management Plan drafted in 2011 have managed to rebuild the stock from the last collapse. Over the past decade there has been a major change in emphasis from the previous annual maximising of catch and economic return to longer-term recovery and precautionary management. The two previous stock collapses have sharpened the focus on prudent management of this fishery. However an additional feature of both collapses, along with the direct effects on the vessels, was market share losses which proved difficult to regain when stocks recovered (Fitzpatrick, 2013). This has driven additional attention to market incentives
which are perceived by the management players to potentially improve the market position of the fishery.

The main management forum for the Irish share of the TAC is the Celtic Sea Herring Management Advisory Committee (CSHMAC) which was established in 2001. All of the Irish Fish Producer Organisations and the main pelagic processors are represented in the CSHMAC. Marine Institute Scientists, although not formal members of the committee, are present at the majority of Committee meetings to advise on scientific issues. The Sea Fisheries Protection Authority and an environmental NGO, the Irish Whale and Dolphin Group (IWDG), are also represented at the CSHMAC meetings. The only significant stakeholders not represented at the CSHMAC are representatives of the Department of Agriculture, Fisheries and Forestry.

Material for this chapter was compiled through a combination of interviews conducted as part of Socioec project research and also attendance as an observer at meetings conducted by the CSHMAC.

9.2 Management Measures utilised in the fishery

9.2.1 Limited Access Regime

Up until 2012 the main Celtic Sea Herring fishery was essentially open access but a new policy, published by the fisheries minister in 2012, (Dept. Agriculture, Food and Fisheries, 2012), has sought to limit access to vessels which landed Herring between 2006 and 2010. This has resulted in approximately 38 vessels qualifying for access to the fishery from 2012. Incidentally this is higher than the average participation over the previous 4 years.

<table>
<thead>
<tr>
<th>Size category</th>
<th>Number Qualifying for Access</th>
</tr>
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<tbody>
<tr>
<td>&gt;24m</td>
<td>11</td>
</tr>
<tr>
<td>20-24m</td>
<td>17</td>
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<tr>
<td>15-20m</td>
<td>9</td>
</tr>
<tr>
<td>&lt;15</td>
<td>1</td>
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*Table 9.1: Number of vessels qualifying for access to the fishery*

The sentinel fishery is still an open access fishery for vessels under 15m and numbers in this fishery have increased from 4 in 2009 up to approximately 20 in 2013 despite the limited amount of quota available.

9.2.2 Spatial Management Measures

One of the problems with the stock when the CSHMAC was established in 2001 was the prevalence of small, immature fish. An original objective of the Committee was to “ensure that all landings of herring should contain at least 50% of individual fish above 23 cm” and where landings contained a higher proportion vessels were required to fish in another area. A more significant spatial measure taken in the 2007 Recovery Plan was the closure of a large area off Dunmore East known as the Dunmore Box where herring
spawning took place and where fishing effort had previously been concentrated. This was aimed at reducing catches of small first time spawning herring. The draft LTMP also set a very low fishing mortality level (well below the fishing mortality estimated to achieve maximum sustainable yield, FMSY) and retained the closure of the Dunmore spawning area.

9.2.3 Quota Measures
Another significant management measure utilised by the CSHMAC is a weekly quota regime. This has been utilised in order to ensure that processors receive a steady supply of raw material over a longer period rather than a glut of supplies over a shorter season. The measure has been successful in this objective but its use has been criticised by representatives of larger vessels on the basis that it is uneconomical for them to operate on small weekly quotas and also an unnecessary restriction on their fishing practices. Since 2013 a trial of allocations to vessels which can be caught over a longer period has been introduced in order to address this perceived disadvantage to larger vessels.

9.3 Incentives

9.3.1 Coercive incentives
A significant development in the fishery within the past decade has been the strengthening of control and enforcement in both legislative and operational terms. These changes have been driven mainly by the introduction of the pelagic weighing regulations and the establishment of an independent fisheries control agency. These factors have increased confidence in the precision of the scientific assessment and the Marine Institute in their most recently published advice state that “under the current management regime the quality of the catch data has improved” (Marine Institute, 2013).

Control and enforcement measures in the Celtic Sea Herring fishery include:

- Restrictions on the number of days on which fishing is permitted per week and times at which landings are permitted.
- Prohibition on weekend fishing.
- Restrictions on the amount that can be landed per week by any vessel or pair of vessels.
- All landings must be weighed in the presence of a Sea Fishery Protection Officer.
- Fishing activities may not commence without notification to Sea Fishery Protection Officer.
- Landings can only be made at approved ports.
- Landings may not take place until approval has been obtained from a Sea Fishery Protection Officer.
9.3.2 Social/moral incentives

The area of rights based management represents one of the major problems facing the Irish Celtic Sea Herring fishery (Fitzpatrick, 2014a). Prior to 2012 there was an open access situation in the fishery for vessels under 25 meters in length which had an automatic entitlement to fish for herring. The recent success in rebuilding the stock has resulted in a classic free rider issue with increased numbers of larger vessels booking in to the fishery. Many of these larger vessels had not participated in the fishery for much of the previous decade despite holding valid Celtic Sea Herring licenses. Attempts by the CSHMAC to address this issue in 2010 by specifying a preclusion on whitefish and shellfish fishing for the period of the herring fishery for any vessel booking in did not have the desired effect partly due to difficulties in obtaining timely information from the relevant Department officials.

The expansion in the number of vessels participating in line with an increasing stock has also led to more frequent and significant conflicts at recent CSHMAC meetings. This observation adds weight to the argument that co-management functions more effectively when exercised by more coherent social groups and that an expansion in participation may result in greater conflict and reduced decision-making efficiency. Recent meetings with fisheries control agency staff have highlighted these negative incentives and associated behaviours.

How fishermen will respond to this access change and whether it will result in rationalization or consolidation of fishing rights is still uncertain. As the new policy has only been implemented since 2012. Information from representatives of POs indicates that there is a growing appetite for tradeable licences within the fishery. A choice experiment survey conducted in this fishery in 2013 (Fitzpatrick et al, 2014b) indicates however that the majority of fishermen involved in the fishery are opposed to such tradeability. The access restriction itself created some conflict between fishermen as some felt that they were unfairly excluded from a fishery due to not participating when stocks were low. Another area where there has been an attempt to strengthen rights based management has been in the establishment of the sentinel fishery which has a twofold aim, firstly to safeguard the interests of small scale fishing vessels by setting aside a fixed allocation of the quota and secondly to enhance the scientific knowledge base by allowing smaller vessels to fish inside an otherwise closed area and ensuring that scientists receive samples of catch from that area.

9.3.3 Economic incentives

The main area covered under economic incentives in this chapter will be the use of MSC certification.

Evolution of Marine Stewardship Council Certification

In 2010 discussions began at the CSHMAC on the benefits and costs of applying for Marine Stewardship Council certification for the fishery. Initially attitudes towards the MSC were quite negative with the perception that application for it represented dancing to an environmentalist tune (personal notes from observations at CSHMAC meetings). But this tone was moderated over time with greater consideration being given to the fact that failure to have certification from the global leader in such schemes may result in the further loss of markets for Celtic Sea Herring.
To give a brief account of the MSC certification process it involves assessment by independent consultancies of an applicant fishery against three principles which are:

- **Principle 1**: Sustainable fish stocks – fishing effort must be at levels which are sustainable over the long term.
- **Principle 2**: Minimising environmental impact - Fishing operations should be managed to maintain the structure, productivity, function and diversity of the ecosystem on which the fishery depends.
- **Principle 3**: Effective management - The fishery must meet all local, national and international laws and must have a management system in place to respond to changing circumstances and maintain sustainability.

MSC certification also involves detailed descriptions of chain of custody and traceability requirements to ensure that fish sold under the MSC logo are correctly labelled and there is an open and public process for any interested parties to give their views during the assessment period. The Celtic Sea Herring fishery was certified under the MSC in March 2012 after a number of recommendations were made by the assessment team and addressed by the CSHMAC.

The Marine Stewardship Council (MSC) in 2011, as part of their assessment process for Celtic Sea Herring, made a number of recommendations related to updating objectives (Food Certification International Ltd., 2012). These recommendations included:

- That the CSHMAC should evaluate its objectives against scientific advice. Specifically, the objective to sustain catches around 20 000 t may be too optimistic and raise unrealistic expectations causing later problems for management.
- That the objectives in relation to Principle 2 (maintenance of the ecosystem) should be made more explicit both in short and long term contexts.
- That the CSHMAC operate with greater transparency and improve communications with stakeholders not directly involved in the management committee.
- That an overall management plan, encompassing the aspects covered by the LTMP, but also covering governance and environmental aspects, should be developed.

The CSHMAC, in response to the MSC assessment report, developed a client action plan which contained the following commitments:

"The Celtic Sea Herring Management Advisory Committee will:

- Develop short and long term objectives for the Celtic Sea Herring in line with the EAFM. This approach will be consistent with MSC’s Principles and will help develop an improved fishery management system.
- Develop an Environmental Management Plan for the Celtic Sea Herring Fishery which, tuned by policy, will demonstrate clear and achievable fishery specific environmental management objectives and which will shape management advice
through consideration of wider ecosystem elements. Proposals will be sought to help drive this process.

- Support an informed and transparent decision making process. This process will clearly and transparently demonstrate how environmental targets and objectives guide decision making and overall management advice provided for this fishery. The process will be open to wider stakeholder consultation.

(Food Certification International Ltd., 2012)

The Celtic Sea Herring fishery was certified under the MSC in March 2012.

### 9.4 Changes to incentive structures due to current management measures

The CSHMAC has now, in conjunction with the Irish Whale and Dolphin Group, developed an Environmental Management Plan for the Celtic Sea Herring fishery. The plan includes elements covering cetacean bycatch, the use of observers, protection of gravel spawning beds and other environmental impacts from the fishery. This does to an extent ensure that wider environmental factors, which had not been prioritised previously by management participants (Fitzpatrick, 2013) will be considered in management from now on. Failure to follow through on these environmental commitments will create the risk of losing MSC certification and associated economic losses.

In relation to economic losses interviews with management participants carried out over the past 4 years have revealed a significant altering in attitude towards MSC certification. Initial scepticism was replaced by an acceptance that market access required MSC certification but a disbelief that prices would be improved. However during 2013 strong indications that vessels participating in the MSC scheme were receiving significantly higher prices than those not covered by MSC have led to an increased number of applications to join the scheme. The value of MSC certification is also evidenced by a legal challenge taken by two vessels to their disqualification from the scheme for not fulfilling documentation requirements of the scheme.

Additionally a number of vessels participating in the sentinel fishery are now seeking to establish a sentinel chapter within the MSC certification scheme as they feel that their economic returns from the limited pool of quota available to them would be maximised by MSC scheme membership.

In relation to quota management and access to the fishery despite the recent TAC increases and access limitation scheme the average allocation to vessels in 2013 was less than that available in previous years. This has created a difficult economic situation for vessels, only partly offset by price gains created by MSC membership. The SEA Fisheries Control Agency (SFCA) in 2012 reported at CSHMAC meetings on what they saw as an increased incentive to misreport landings and an associated rise in fisheries infringements. Following a number of meetings between CSHMAC and SFCA representatives the situation appears to have been satisfactorily resolved. This incentive issue is likely to be strongly influenced by the future evolution in the relationship between access entitlements and quota allocation regimes.

Finally the implementation in 2015 of a pelagic landing obligation will have uncertain implications for management and incentives in the fishery. In anticipation of the landing obligation the 2014 fishery will trial a 20% overshoot above the figure allocated to an
individual vessel which will be deducted from subsequent allocations in order to avoid discards.

9.5 Conclusions

The use of environmental certification, under the MSC banner, has addressed a number of governance related challenges in the Celtic Sea Herring fishery. Prior to MSC certification management focus was entirely stock centred with no emphasis on wider ecosystem elements and their mutual interactions with the Herring stock. This is obviously a challenge in relation to the implementation of an ecosystem approach, which nominally at least forms the underpinning infrastructure of the CFP. MSC certification has required an attention to issues of wider ecosystem relevance.

Additionally the emphasis on clarification of management objectives and on improved transparency have resulted in a greater attention to how the CSHMAC operates. Previously the ministerial endorsement of the committee and the success of the stock recovery were taken as evidence of the committee’s success and there was no perception within the CSHMAC that changes may be required. So the challenges laid down by the MSC recommendations have contributed to a process of governance evolution. There are also strong indications, both direct and indirect, of positive economic benefits to fishermen involved in the MSC scheme.

On the other hand there are some indications that a combination of greater interest in the fishery due to the successful stock recovery and a widening of the stakeholder base recommended by the MSC may be creating some internal conflict. Additionally there may be a risk that MSC certification merely stimulates superficial box-ticking by the management participants. However it is too early to tell whether these potential shortcomings will create real problems or will be resolved. On balance at this relatively early stage it appears that the benefits of MSC certification outweigh any potential problems.
References


10. Conclusions and recommendations

This report deals with incentives created with fisheries management measures which have been implemented in several countries across Europe. Governments, through management measures, influence the behaviour of fishermen. This has wanted and unwanted effects. By analysing the management measures and the incentives in the different case studies we have gained more insight into how the behaviour of fishermen is changed.

Management measures have also changed throughout the years. In the eighties governments stimulated (through financial incentives) fishermen to buy bigger vessels that were able to catch fish more efficiently. The policy was also centralised, and the influence of fishermen limited. When stocks became overfished, governments responded firstly with strong control and enforcement policies (coercive incentives). This often resulted in distrust between the government, and fishermen, and among fishermen themselves, leading to low compliance rates.

After that (1990s-2000) large decommissioning programmes were set up, and fishermen got more involved in fisheries governance. This often led to an improvement in relationships, compliance, and profits. The case studies show that a combination of financial, coercive, but also social incentives leads to a more sustainable fisheries governance. Fishermen are not only driven by financial motives, but are largely influenced by the behaviour of other fishermen. For example some fishermen still want to catch more fish than their neighbour, although this can mean that more costs are being made. Other aspects that influence their behaviour are norms, values, and identity. How important identity is, shows the example of two fishing families who wanted to share one boat for efficiency reasons, but in the end did not do it, because this would mean that one of the sons would not have his own boat. Social incentives have been overlooked by policy makers for many years, but prove to be very important.

Research in other sectors has shown that interventions aimed at behavioural change should include the desire of people to conform to the behaviour of other people. Other important insights that should be taken into consideration in fisheries governance are the facts that: People are often not completely aware of the consequences of their behaviour, and the amount of information they can process is limited (Bouma and Dietz, 2013). Individuals also maximise welfare as they conceive it, whether they be selfish, altruistic, loyal, spiteful, or masochistic (Becker, 1993).

What complicates policy making is the fact that there is often a gap between the preferences of a person, and the actual behaviour. Habits, short term focus, and conflicting preferences can be the cause for that (Bouma and Dietz, 2013). It is therefore important to understand why fishermen sometimes do not follow the rules, or are not ‘willing’ or able to change their behaviour. When the reasons for this are found, specific policy interventions can be performed.

Those policy interventions can be done according to ‘Nudge theory’. A nudge is “any aspect of the choice architecture that alters people's behavior in a predictable way without forbidding any options or significantly changing their economic incentives. To count as a mere nudge, the intervention must be easy and cheap to avoid. Nudges are
not mandates. Putting fruit at eye level counts as a nudge. Banning junk food does not..." (Thaler and Sunstein, 2008 p.6)

A wide range of effective nudges is now at work in the world. They help people make decisions that conform better to their long-term goals. For example, people all over the world have trouble saving money. People tend to save more when they have access to bank accounts that make it easy to put money in, but difficult to take it out. Other examples show that changing the default in organ donation systems or voluntary retirement account programs from "opt in" to "opt out" dramatically changes participation rates (Ferrero, 2014). Finally, showing people how their water or energy use compares to others in their community can reduce water and energy use. In addition, allowing people to set voluntary energy reduction goals make them more likely to save energy. Offering an attic clearance service in Britain at full cost made people five times more likely to adopt attic insulation than did subsidies for attic insulation (Ferrero, 2014).

In fisheries policy these insights can be applied. When for example average numbers of discards are shown to fishermen, and they see what the social norm is, the ones that are above the norm will most likely adapt their behaviour, and start diminishing the amount of discards. In D 3.4 we will be looking more into the use of nudge theory in fisheries governance.

References


