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International comparison of fisheries management with respect to nature conservation

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International comparison of fisheries management with respect to nature conservation

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Abstract
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In this report we explore some examples of fisheries that are regulated in such a way that they cause no significant harm to the ecosystem. In fact, our leading question is whether such fisheries exist Policy options how fisheries can be managed to decrease the negative impact on the ecosystem and the role and state of eco-labelling of fisheries such as the Marine Stewardship Council are described. We address the general question whether there are cases where fisheries self-regulation contributed to maritime ecosystem conservation. For the North Sea we describe the possible implications of EU directives such as the Birds Directive and the Habitats Directive and international treaties for fisheries.

Key words: sustainable fisheries, fisheries management, co-management, nature conservation, eco labelling, Marine Stewardship Council, EU Habitats Directive, EU Wild Birds Directive

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In dit rapport worden enkele voorbeelden besproken van visserijen die zodanig zijn gereguleerd dat geen significante schade wordt aangericht aan het ecosysteem. De leidende vraag is in feite of dergelijke visserijen wel bestaan. Het rapport bespreekt beleidsopties voor een zodanig beheer van visserijen dat de negatieve gevolgen voor het ecosysteem worden beperkt, en beschrijft de rol en de huidige status van systemen voor eco-keurmerken voor visserij, zoals die van de Marine Stewardship Council. Tevens wordt de algemene vraag besproken of er voorbeelden zijn aan te wijzen waarin zelfregulatie door visserijbedrijven heeft bijgedragen aan de bescherming van mariene ecosystemen. Voor de Noordzee worden de mogelijke implicaties van EU-richtlijnen zoals de Vogel- en Habitat-richtlijn en van internationale visserijverdragen besproken.

Trefwoorden: duurzame visserij, visserijbeheer, co-management, natuurbehoud, eco-keurmerken, Marine Stewardship Council, EU Habitatrichtlijn, EU Vogelrichtlijn

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Content

Summary

Throughout the world, fisheries are not only harming themselves through over-fishing (leading to collapsing stocks, rent dissipation and, eventually, declining income for the fishermen), but also harming the ecosystems where the fisheries take place. This happens through direct negative impact on the fished stock and direct negative impacts on non-targeted species via bycatches, up to large-scale long-term changes of the ecosystem. Cases where the fishery harvests the fished stock in a sustainable manner are few. Cases where the fishery not only harvests the fished stock in a sustainable manner, but also does not damage the ecosystem are even fewer. In Chapter 1 we define the problem and give a short description of the approach that we adopted in this study.

The aim of the current project was to identify examples of viable and sustainable fisheries that are regulated in such a way that they cause no significant harm to the ecosystem. The objective was to learn lessons on fishery management in the context of nature conservation that might be applicable to the Netherlands. Our first step was to describe the legal context for nature conservation as it applies to Dutch fisheries. This includes the EU Birds Directive, the EU Habitats Directive, the EU Water Framework Directive and the OSPAR convention. Chapter 2 provides a glimpse of the challenges that must be overcome by Dutch fisheries together with the Dutch government in the coming decades with respect to nature conservation in the marine environment. We then set out to assemble international case studies of fisheries conducted in such a way that the fishery could be considered sustainable for both the fish and the fishermen, and that nature was sufficiently protected. Those cases that seemed to meet our criteria and for which we subsequently succeeded in acquiring sufficient information on the sustainability of the fishery, the impact on the ecosystem and the management system are described in Chapter 3. To these should be added the fisheries certified with the ecolabel of the Marine Stewardship Council (MSC), which are described in Chapter 4.

Our next step was to organize a workshop (see Annex 1) around these case studies with the aim of deciding which of these case studies should be studied in more detail. To this end, a draft version of this report was circulated before the workshop to all participants. The many comments during the workshop on this draft led us to extensively rewrite and completely reorganize the report. Thus, instead of studying one or more of the cases in more detail, we focused our efforts on rewriting the report.

Initiatives to improve the sustainability of a particular fishery can derive from the private sector or from the public sector. We devote two chapters to initiatives from the private sector. In Chapter 4 we focus on one example of self-organisation of the private sector: the Marine Stewardship Council (MSC). In Chapter 5 we address the general issue to what extent fishermen self-organisation can contribute to maritime nature conservation.

The Marine Stewardship Council (MSC) is an independent, global, non-profit organisation that seeks to enhance responsible management of seafood resources and to ensure sustainability of global fish stocks and the health of marine ecosystems. It has developed an environmental standard for sustainable and well-managed fisheries. It uses a product label (the MSC certificate) to reward environmentally responsible fishery management and practises. Principle 1 states that the stock should not be overfished. Principle 2 states that the fishery should not damage the ecosystem. Principle 3 demands an effective management system such that the

first two principles are actually adhered to. On paper, the MSC certified fisheries are viable and sustainable fisheries that are regulated in such a way that they cause no significant harm to the ecosystem, i.e. exactly the type of well-managed fisheries that this project set out to identify. When we studied the fisheries awarded the MSC certificate in some more detail, it appeared that the MSC certificate had been awarded to several fisheries where there was still considerable uncertainty with regard to the impact on the ecosystem. In some cases, a negative impact seemed quite likely. From this it can be concluded that obtaining the MSC certificate does not provide an absolute guarantee against damage to the ecosystem. However, in these cases MSC requires corrective actions to remedy the potentially negative impacts on the ecosystem. Given the many scientific uncertainties with regard to ecosystem functioning and fishery impact, the MSC certificate may be a good way of starting a process towards reducing the scientific uncertainties and reducing the ecosystem impact. Inside nature reserves (marine protected areas, special areas of conservation and special protection areas), the added value with respect to nature conservation of the MSC certificate may be small. However, outside nature reserves, the MSC certificate has great benefits for both nature and the fishery.

There are many cases in the literature where fishermen self-organisation contributes to stock preservation. The leading question in Chapter 5 is whether there are also cases where fisheries self-organisation contributed to maritime ecosystem conservation? In order to answer this question, the first step was to review the literature on fishermen self-organisation or co-management. It is concluded that co-management is not so much an alternative management instrument, but rather it indicates an alternative approach to management decision making, whether it includes state-initiated rules, market-based instruments, voluntary agreed constraints, or any combination of these. This alternative approach embodies the notion that the quality of decision making should not only be judged in terms of performance criteria (effects on stocks or fishing communities), but also in terms of process criteria (to what extent are basic principles of good governance observed?). The next step was to introduce the ecosystem approach to fisheries management, which entails an explicit recognition of the complexity and dynamics of marine ecosystems and of the interconnections among its component parts. There seems to be an intimate – although as yet not fully understood – connection between over-all ecosystem health and fisheries productivity. Apart from that, ecosystem conservation as part of wildlife management has become a legitimate management goal in its own right, not just in the terrestrial but increasingly also in the aquatic environment. There are several ways in which public as well as private parties, including fishermen themselves, can contribute to maritime nature conservation. The institution of marine protected areas is one such way, the certification of ecosystem-friendly fisheries practices is another one. It is concluded that private sector self-organisation can indeed contribute to maritime nature conservation, and it should be pursued more systematically in order to bring about a transition towards more sustainable fisheries.

In chapter 5 it is concluded that co-management can only thrive if it is properly embedded in the overall governance system in place to manage a fishery. Time did not permit to study this interaction between market-based and government-initiated measures in any detail. One problem is that parts of the international legislation are still in the process of implementation.

Although this report contains many pages, we feel that we have only just begun to scratch the surface of this important topic. We explored different aspects of the problem, but are unable to come up with a grand and all-encompassing synthesis. Instead, we end the report with a short epilogue (Chapter 6).

Samenvatting

Over de gehele wereld zien we momenteel een patroon waarbij visserijen niet alleen zichzelf benadelen door overbevissing (met als gevolg instortende populaties, teruglopende productiviteit en uiteindelijk dalende inkomens voor de vissers), maar ook de ecosystemen schaden waarin wordt gevist. Deze schadelijke invloed vindt plaats via rechtstreekse negatieve impact op de beviste populatie, via rechtstreekse negatieve impact op niet beviste soorten (bijvangst) en via grootschalige veranderingen op langere termijn in het ecosysteem. Er zijn maar weinig voorbeelden bekend waarin vispopulaties op een duurzame manier worden geoogst, en nog minder voorbeelden waarin niet alleen de beviste populatie duurzaam wordt geoogst maar ook geen schade wordt aangericht aan het ecosysteem. In hoofdstuk 1 van dit rapport wordt het probleem in kaart gebracht en wordt een korte beschrijving gegeven van de voor dit onderzoek gekozen benadering.

Doel van het onderhavige project was het vinden van voorbeelden van levensvatbare en duurzame visserijpraktijken, waarbij een zodanig beheer wordt gevoerd dat geen significante schade wordt aangericht aan het ecosysteem. Het was onze bedoeling aan dergelijke voorbeelden ideeën te ontlenen voor visserijbeheer in het kader van natuurbehoud die zouden kunnen worden toegepast in de Nederlandse situatie. De eerste stap in het onderzoek was het beschrijven van het wettelijke kader voor natuurbehoud, voor zover van toepassing op de Nederlandse visserij. Tot dit kader behoren de Vogel- en Habitatrichtlijnen van de EU, de Kaderrichtlijn Water van de EU en de OSPAR-conventie. In Hoofdstuk 2 wordt iets getoond van de uitdagingen waarvoor de Nederlandse visserij en de Nederlandse overheid zich in de komende decennia gesteld zullen zien wat betreft het natuurbehoud in de mariene omgeving. Vervolgens zijn een aantal internationale voorbeelden bijeengezocht van visserijen die zodanig worden beheerd dat sprake was van duurzame visserijpraktijken voor zowel vis als vissers, terwijl het ecosysteem afdoende wordt beschermd. Die voorbeelden die aan onze criteria leken te voldoen en waarover we vervolgens voldoende gegevens konden verzamelen aangaande de duurzaamheid van de visserij, de gevolgen voor het ecosysteem en de wijze van beheer, staan beschreven in Hoofdstuk 3. Hieraan kunnen worden toegevoegd de visserijen die het eco-keurmerk van de Marine Stewardship Council hebben gekregen; dit wordt beschreven in Hoofdstuk 4.

De volgende stap in het onderzoek was het op basis van de gevonden casestudies organiseren van een workshop (zie Bijlage 1), met als doel te beslissen welke van de casestudies interessant genoeg waren om nader te worden bestudeerd. Daartoe werd een conceptversie van dit rapport vooraf toegezonden aan alle workshopdeelnemers. Naar aanleiding van de vele commentaren op dit concept gedurende de workshop hebben we het concept grondig herschreven en geherstructureerd. In plaats van het nader bestuderen van één of meer cases hebben we daarom onze energie besteed aan het herschrijven van het rapport.

Initiatieven om de duurzaamheid van een bepaalde visserij te verbeteren, kunnen komen vanuit de particuliere sector of van de overheid. In het rapport worden twee hoofdstukken gewijd aan initiatieven vanuit de particuliere sector. In Hoofdstuk 4 ligt de nadruk op één specifiek voorbeeld van zelfregulering door de particuliere sector, namelijk de Marine Stewardship Council (MSC). In Hoofdstuk 5 wordt de algemene vraag besproken in hoeverre zelfregulering door de vissers een bijdrage kan leveren aan natuurbehoud in de mariene omgeving.

De MSC is een onafhankelijke, wereldwijde non-profit organisatie die streeft naar een verantwoorde wijze van beheren van (zee)visserijproducten, naar een duurzame status voor de visvoorraden op de wereld en naar gezonde mariene ecosystemen. De MSC heeft een internationale milieunorm opgesteld voor duurzame en zorgvuldig beheerde visserij. De raad kent een eco-keurmerk toe (het MSC-certificaat) aan milieuvriendelijk visserijbeheer en visserijpraktijken. Dit is gebaseerd op een aantal principes. Principe 1 zegt dat de populatie niet mag worden overbevist. Principe 2 stelt dat de visserij het ecosysteem niet mag aantasten. Principe 3 vraagt om een effectief beheerssysteem dat ervoor moet zorgen dat ook werkelijk aan de eerste twee principes wordt voldaan. Op papier zijn de door de MSC gecertificeerde visserijen levensvatbare en duurzame visserijen die zodanig zijn gereguleerd dat ze geen schade toebrengen aan het ecosysteem, dus precies de soort zorgvuldige beheerde visserij dat we met ons onderzoek trachtten op te sporen. Toen wij echter de MSC-gecertificeerde visserijen nader gingen bestuderen, leek het erop dat het certificaat in verschillende gevallen was toegekend aan visserijen waarbij nog aanzienlijke onzekerheid bestond over de mogelijke impact op het ecosysteem, en in sommige gevallen leek een negatieve impact zelfs tamelijk waarschijnlijk. Hieruit kan de conclusie worden getrokken dat MSC-certificering geen absolute garantie vormt dat er geen schade aan het ecosysteem wordt aangericht. In dergelijke gevallen eist de MSC echter wel maatregelen om de eventuele negatieve gevolgen voor het ecosysteem te corrigeren. Aangezien uit wetenschappelijk onderzoek nog lang niet volledig bekend is hoe ecosystemen functioneren en wat de impact van visserij is, is het MSC-certificaat wellicht toch een goed uitgangspunt voor een proces waarbij de wetenschappelijke onzekerheden kunnen worden verkleind en de schade aan ecosystemen kan worden beperkt. Binnen natuurreservaten (Marine Protected Areas, Special Areas of Conservation en Special Protection Areas) zal de toegevoegde waarde van het MSC-certificaat voor het natuurbehoud waarschijnlijk gering zijn. Maar buiten dergelijke gebieden biedt het certificaat grote voordelen voor zowel natuur als visserij.

In de literatuur zijn vele voorbeelden beschreven waarin zelfregulering door vissers heeft bijgedragen aan het behoud van visvoorraden. De belangrijkste vraag die in Hoofdstuk 5 aan de orde komt is of er ook voorbeelden zijn waarin een dergelijke zelfregulering bijdraagt aan het behoud van het mariene ecosysteem. Om deze vraag te beantwoorden, hebben we allereerst de literatuur op het gebied van zelfregulering of co-management door vissers bestudeerd. Hieruit bleek dat co-management niet zozeer een alternatief beheersinstrument is, maar meer een alternatieve benadering aangeeft voor besluitvorming voor het beheer, of het nu gaat om door de overheid opgelegde regels, marktinstrumenten, vrijwillig aangegane beperkingen of combinaties hiervan. Deze alternatieve benadering is gebaseerd op het idee dat de kwaliteit van de besluitvorming niet alleen moet worden beoordeeld met behulp van prestatiecriteria (zoals het effect op visvoorraden of vissersgemeenschappen) maar ook met procescriteria (bv. in hoeverre worden de basisprincipes van ‘good governance’ in acht genomen?). De volgende stap was het toepassen van de ecosysteembenadering op het visserijbeheer, wat een expliciete erkenning inhoudt van de complexiteit en dynamiek van mariene ecosystemen en van de vele onderlinge verbanden tussen de samenstellende componenten. Er lijkt een nauw – zij het nog onvoldoende begrepen – verband te bestaan tussen de algehele gezondheidstoestand van ecosystemen en de productiviteit van de visserij. Daarnaast is ecosysteembehoud als onderdeel van natuurbehoud zelf een legitiem beheersdoel geworden, niet alleen in de terrestrische maar in toenemende mate ook in de mariene omgeving. Zowel overheden als particuliere betrokkenen, met inbegrip van de vissers zelf, kunnen op verschillende manieren een bijdrage leveren aan het natuurbehoud in zee. Een van die manieren is het instellen van beschermde gebieden (Marine Protected Areas), een andere is certificering van ecosysteemvriendelijke visserijpraktijken. Geconcludeerd wordt dat zelfregulering door de particuliere sector wel degelijk kan bijdragen aan marien natuurbehoud,

en dat een dergelijke zelfregulering meer systematisch zou moeten worden nagestreefd om een overgang te bewerkstelligen naar meer duurzame visserij.

De conclusie in Hoofdstuk 5 luidt dat co-management alleen succes kan hebben als het op de juiste wijze wordt ingebed in het bestaande governance-systeem dat verantwoordelijk is voor het visserijbeheer. De tijd heeft ons ontbroken om deze interactie tussen op de markt gebaseerde en door de overheid geïnitieerde maatregelen in detail te bestuderen. Een van de problemen hierbij is dat de internationale wetgeving op dit gebied nog niet volledig ten uitvoer is gelegd.

Hoewel dit een dik rapport is geworden, hebben wij desondanks het idee dat we nog maar een eerste aanzet hebben gegeven tot de bestudering van dit belangrijke onderwerp. We hebben diverse aspecten van het probleem bestudeerd, maar kunnen hieruit nog geen grote alomvattende synthese destilleren. In plaats daarvan eindigen we ons rapport met een korte Epiloog (Hoofdstuk 6).

1 Introduction

1.1 Defining the problem

Fisheries is causing extensive problems

Fisheries have caused problems world-wide, that are far from trivial and that gravely affect the fished populations, a large suite of associated wildlife, the very habitats in which fishery takes place, and ultimately also the people involved, i.e. the fishermen themselves, the associated industries and in their wake the fisheries scientists, policy makers, and the general public. Clear examples are the outstanding environmental issues of European fisheries described by Daan & van der Mheen (2005). Fisheries advice, originally aimed at determining take-levels that would result in maximum sustainable yields, today often focuses on preserving dwindling stocks and struggling fisheries, or attempting to keep or return the stocks to a minimum biologically viable size. Depleted stocks have only in few cases returned to former population sizes, and most prized fish (or anything else that has been intensively fished, such as whales or shellfish) have been greatly reduced in numbers, in some cases possibly to a point of no return. With increasing numbers of fish stocks becoming depleted, and fisheries turning to previously neglected stocks (because of low market values or high costs for obtaining them) the world's fisheries have moved into a process that has become known as "fishing down the food chain" (Pauly *et al.* 1998). Usually, the fish that act as toppredators grow to a large size and hence are the most valuable. As a result, the toppredators are fished first, but as soon as these are overfished, the next species to become the target of the fishery are the former food species of the toppredators. This process may be repeated, hence the phrase "fishing down the food chain".

Future perspectives

An optimistic view may be that there is still plenty of fish in the sea (be it different fish than in former times), but this line of thinking has been dismissed as "the shifting baseline syndrome" (Pauly & Maclean 2003). Our memory appears to be alarmingly short when it comes to considering the state of the oceans and we have very little recollection of what a sea once looked like in an unfished state. Yet, "long-term" reviews of the state of the oceans reveal that the global ocean has lost more than 90% of large predatory fishes, and that new fisheries usually follow a "boom and bust" pattern that quickly leads to overexploitation with an 80% decline typically occurring within 15 years of industrialized exploitation (Dietz *et al.* 2003, Myers & Worm 2003, Pauly & Maclean 2003, Berkes *et al.* 2006). Although this pattern, of initial increasing stock exploitation by increasing effort, followed by the ultimate crash has been observed in many fisheries (Pauly *et al.* 2002; Pauly & Maclean 2003), the fishing industry habitually blames external factors for the downhill slide, rather than the fishing industry itself. Often, natural predators (that have "exploded in numbers"), such as whales, seals or birds are blamed for the decline in the stock, or climatic influence ("global warming")[1] or extreme weather events such as "abnormal" storms or "extreme" winters. In fact, it seems likely that, compared to unexploited populations, heavily exploited populations are more vulnerable to environmental fluctuations (Pauly *et al.* 2002; Worm *et al.* 2006). By blaming others, it is of course conveniently overlooked that climate and weather variations are of all

[1] We do not want to imply that climate change does not influence fish stocks. On the contrary, climate change will almost certainly profoundly affect the fish stocks. However, our point is that climate change should not be invoked as the sole cause of declining stocks, when these stocks are clearly overexploited.

ages (and overfishing is not) and that the consumption by piscivorous top-predators is usually smaller than that of the fish community itself or the catches of the fishery (Trites *et al.* 1997; Barrett *et al.* 2001; Kaschner & Pauly 2004; Reilly *et al.* 2004). Moreover, we have forgotten what it was that once drew the fishermen, whalers and sealers to areas such as the Grand Banks: its "unlimited" wealth of marine top predators such as large cod, whales, seals and seabirds that, in the pristine situation, must have existed there in numbers now no longer imaginable despite their consumption rates and despite climatic anomalies that undoubtedly also occurred before man arrived at the scene (Jackson *et al.* 2001; Jackson 2001).

Another factor that usually comes with over-exploitation of certain target fish stocks is that numbers of other wildlife may decrease, through unintended bycatches, depletion of prey-organisms for predators at higher trophic levels, and habitat degradation. In a world that has only limited space and biotic resources, but growing human populations and demands for protein, modern fishing practice is a road to disaster and many today consider our fisheries a sunset industry, unless we can drastically change our way of thinking and fisheries management (Daan & van der Mheen 2004, Royal Commission on Environment and pollution 2004, Board of the Millennium Ecosystem Assessment of the United Nations 2005).

Management / how to deal with it

The underlying problem of over-fishing is that of the *tragedy of the commons* (Hardin 1968), which was recently rephrased as the *tragedy of the* ***unmanaged*** *commons* (Hardin 1998). In situations where the resource (a fish stock) is exploited by many, each individual fisherman, company or country will strive to optimise his short-term take at the expense of others, and ultimately, of the fish stock. There are ways of dealing with this inherent problem of free competition, either through a very strict top-down management of the fisheries, by making one fisherman (or company or country) the sole owner of the stock, or by making all resource users better herdsmen of the commons by giving them a greater responsibility for their actions and allowing rules to evolve over time. Fisheries that are governed by top-down rules based on models that are not credible among users often have low compliance and are frustrated by a strong resistance from the fishermen. A solution might thus be to make the fishermen fully aware of the problem and the need for good "stewardship" and this can only be achieved by having a good scientific understanding of the problem and an equally good communication with the fishermen who should then govern "their" stock by rules that serve their long term interests best (Dietz *et al.* 2003). An important key to the solution is that all fishermen that use the stock should be involved in managing, and that no outsiders should be allowed to fish in the common pond (Ostrom 1990; Dietz *et al.* 2003). Such "adaptive governance" probably works best in relatively simple situations, i.e. in fisheries that are small in scale or in number of fishermen involved, without the complication of stocks crossing international borders and fishermen from more than one community (or country) pursuing them. In more complex situations, i.e. internationally managed common fish stocks or Exclusive Economic Zones (EEZ) that can only cover part of the stock's range, the commons problem will probably be a much harder problem to solve. However, in situations where an EEZ can cover the whole (fishery on a) stock, such as in geographically isolated areas, its declaration and subsequent implementation can be helpful (see e.g. Verbeek & Christiansen 2003).

Mixed fisheries, or one fishery inadvertently impacting the stocks fished by others, pose specific and hard-to-solve problems. Unidirectional or multi-purpose fisheries, such as groundfish fisheries, impact many different species at the same time. Protecting one or a few of these that are at risk can only be achieved, at the "expense" of the whole fishery. Worse even, in terms of attaining the necessary compliance from the fishermen, is when one stock needs protection from a bycatch problem stemming from a fishery targeting another stock.

For instance, dangerously low stocks of gadoids in the North Sea would probably benefit from a reduction of the bycatch in the flatfish fishery. However, fishermen targeting flatfish might not be interested in saving undersized gadoids if this negatively affects their own flatfish returns. The incentive to reduce fishing effort or change fishing practices to minimize damage to the ecosystem may be even less. Yet, this is precisely what is needed when the area where the fishery takes place is declared a nature reserve, or more generally, when a sustainable way of fishing is to be achieved.

Project aim

This then brings us to the aim of the current project (instigated by the Netherlands Environmental Assessment Agency), which is:

> *to identify examples of viable and sustainable fisheries that are regulated in such a way that they cause no significant harm to the ecosystem.*

The Netherlands Environmental Assessment Agency (MNP in Dutch) functions as the interface between science, policy and politics, producing independent assessments on the quality of the environment for people, plants and animals to advise national and international policy-makers[2]. So far, the MNP has dealt mostly with the terrestrial environment, doing no justice to the fact that a substantial part of the Dutch territory is part of the aquatic marine environment and the fact that this marine environment is increasingly affected by all kinds of human activities. Fisheries are among the activities that have a big impact on the marine ecosystem. For these reasons, the MNP felt the need to support an investigation comparing different types of fisheries management in the context of nature conservation.

1.2 The approach

Research design

Given the limitations with regard to time and finances and the sheer magnitude of the problem, this study could only be of an exploratory nature.

Our first step was to study the international legislation that seeks to protect the marine environment and investigate how it might affect current Dutch fisheries.

Our second step was to try to assemble international case studies of fisheries conducted in such a way that the fishery could be considered sustainable for both the fish and the fishermen, and that nature is sufficiently protected. For this, we relied on the expertise in the group and our scientific contacts. When we questioned our international colleagues for examples of sustainable fisheries that did not harm nature, some replied that they were not aware of fisheries meeting these criteria. Others replied that the only cases they were aware of were the fisheries that were certified by the Marine Stewardship Council. However, we also succeeded in accumulating a series of non-certified fisheries, potentially meeting our criteria.

Our third step involved the organisation of a workshop. Initially, we aimed to organize a workshop around the various case studies and then decide which of these case studies would be worth studying in more detail. In preparing the workshop it became clear that such an

[2] On the website of the MNP http://www.mnp.nl/en/index.html one finds the following mission statement: "The Netherlands Environmental Assessment Agency (MNP) supports national and international policy makers by analysing the environmental impact of policies and of trends in society."

approach would have been too restrictive. The case studies helped us to define the important questions, but during the workshop new cases were discussed. Also, much discussion focused on the problems of current fisheries in the Netherlands with regard to nature conservation and how these could be solved. The workshop was organised together with "*Stichting de Noordzee*", because it turned out that this conservation organization had very similar interests. A draft version of this report was circulated before the workshop to all participants and the many comments during the workshop on this draft led us to extensively rewrite and completely reorganize the report. Thus, instead of studying one or more of the cases in more detail, we focused our efforts on rewriting the report.

During our investigations, it became clear early on that the Marine Stewardship Council (MSC) was highly relevant to our research question. The MSC is an independent, global, non-profit organisation that seeks to enhance responsible management of seafood resources and to ensure sustainability of global fish stocks and the health of marine ecosystems. It has developed an environmental standard for sustainable and well-managed fisheries. It uses a product label (the MSC certificate) to reward environmentally responsible fishery management and practices. We provide some summary data on the fisheries that have succeeded in obtaining the MSC certificate. We also describe the MSC principles and the criteria derived from these principles that need to be met by the fishery to obtain the MSC certificate. Principle 1 states that the stock should not be overfished. Principle 2 states that the fishery should not damage the ecosystem. Principle 3 demands an effective management system such that the first two principles are actually adhered to. On paper, the MSC certified fisheries are viable and sustainable fisheries that are regulated in such a way that they cause no significant harm to the ecosystem, i.e. exactly the type of well-managed fisheries that this project set out to identify. However, the proof of the pudding is in the eating. We therefore set out to assess to what extent the MSC-certificate is a real guarantee against damage to the ecosystem from the fishery.

The MSC-certificate is an example of self-organisation of the private sector and should therefore be distinguished from state-ordained rules which are the domain of the public sector. Instead of focusing on one particular example of private initiative, like the MSC certificate, we subsequently decided to address the question to what extent fishermen self-organisation can contribute to maritime nature conservation in general. Are there cases where fisheries self-organisation contributes to maritime ecosystem conservation? Any private initiative must always operate within the legal bounds set by the government and international treaties. Because most of the national jurisdiction is not effective outside the territorial waters, international organisations and the European Union are better equipped to develop jurisdiction or a common policy. It is concluded that co-management can only thrive if it is properly embedded in the overall governance system in place to manage a fishery. Time did not permit to study this interaction between market-based and government-initiated measures in any detail. One problem is that parts of the international legislation are still in the process of implementation.

1.3 Contents of the report

In Chapter 2 we describe the current state of international nature legislation in relation to current Dutch fisheries. This chapter lists the challenges that must be overcome by Dutch fisheries together with the Dutch government in the coming decades with respect to nature conservation in the marine environment.

In Chapter 3 we describe fisheries that seemed to be conducted in such a way that the fishery could be considered sustainable for both the fish and the fishermen, and that nature was sufficiently protected. We selected those cases for which we succeeded in acquiring sufficient information on the sustainability of the fishery, the impact on the ecosystem and the management system.

In Chapter 4 we focus on the Marine Stewardship Council. Our leading question is to what extent the MSC-certificate is a real guarantee against damage to the ecosystem from the fishery. At the end of the chapter we focus on the relationship between the MSC certificate and Dutch fisheries.

In Chapter 5 we address the question to what extent fishermen self-organisation can contribute to maritime nature conservation in general. The chapter does not provide exhaustive empirical evidence to answer this question, but rather its purpose is to review the fisheries management literature. The chapter consists of three parts: a conceptual part in which the literature on co-management is reviewed, an empirical part in which the relation between co-management and nature conservation is explored, and an analytical part in which the points raised in the conceptual part are used to discuss the cases introduced in the empirical part.

In Chapter 6 we reflect on the lessons to be learnt from our exploratory investigations.

In Annex 1 we provide a program of the workshop that we jointly organised with the "*Stichting de Noordzee*", the list of participants and a summary of the conclusions.

1.4 Glossary, Acronyms and species names

The nature of our subject made it unavoidable that the report came to contain many abbreviations, technical concepts and names of animal species. These may not be familiar to the general reader. We have therefore included a glossary, a list of acronyms and a list of species at the end of this report. The list of species gives the English name, the Latin name and the Dutch name for all species, not only fish, but also crustaceans, bivalves, birds etc., which are mentioned in the text. The species list is ordered alphabetically for the English names.

1.5 Acknowledgements

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2 The implication of European Directives and the OSPAR convention for fisheries in the Netherlands

Because most of the national jurisdiction (including legislation on nature conservation) is not effective outside the territorial waters, international organisations and the European Union are better equipped to develop jurisdiction or a common policy. Within the OSPAR framework criteria have been developed on the basis of which sites can be designated as Marine Protected Areas. So far, designations have not been made. The EU-legislation is still further developed and new proposals for marine habitats are in the pipeline. Both the OSPAR convention and the EU-Directives strongly focus on habitats (within specific areas) and/or species. In this respect they are quite different from the market-based approach of management and protection. One problem is that parts of the international legislation are still in the process of implementation. In this chapter we describe the current state of international nature legislation in relation to current Dutch fisheries.

2.1 Legislation of the North Sea

The North Sea territorial waters at more than 1 km from the coast are not part of the jurisdiction from communities or provinces. The national government is the only authority responsible for legislation, policy making and management for that area. For these territorial waters the EU Birds and Habitats directives are applicable. National authorities have struggled for years with the question whether the EU Birds and Habitats Directives are also applicable to non-territorial waters, outside the 12 miles zone. Following questions in the European Parliament (E-3529/96, OJ C138, 5.5.97) the EU stated in 1997 that the EU Directives also apply for non-territorial waters[3]. A seminar on this subject, held in Morecambe Bay (UK) in 1997 (Coffey 1998), only partly answered the question how these directives can be implemented in non-territorial waters. Because the Interpretation Manual of European Union Habitats (European Commission 2003) also deals with typical marine habitats it can be concluded that it has always been the intention from the EU Commission that marine habitats should become part of the Natura2000 network. This implies that also in non-territorial waters Special Areas of Conservation can be designated. This philosophy has been confirmed by the English Supreme Court, due to which the UK has designated sites outside its territorial waters (McLeod et al. 2002). Following the publication of clear statements by the European Commission[4] (European Commission 2002) other countries have done the same.

[3] "As far as Member States have competence, it applies to the exclusive economic zones. However, the marine species and habitats concerned generally have their main range inside territorial waters".

[4] Action 2: The Commission will pursue its efforts to fully implement the EU Habitat and Birds Directives in the marine environment including Exclusive Economic Zones. The Commission will develop by 2005, together with the regional conventions, a programme aimed at enhancing the protection of species and habitats in European waters. Consequently, the Commission will develop proposals to adapt the annexes to the Habitats Directive containing marine habitats and species to be protected under the Natura 2000 Network to scientific and technical progress.

2.2 Developments in the Netherlands

The Nota Ruimte (Ministries VROM, LNV, V&W and EZ 2004), a policy document outlining spatial planning strategies for the Netherlands, describes the future protection strategy for the Dutch part of the North Sea. The whole coastal zone along the Wadden Sea islands, the mainland coast and along the Delta area up to a depth of 20 m, the Frisian Front, the Oyster Grounds, Klaver Bank and Dogger Bank have been highlighted as areas with special ecological values, deserving protection through the designation of a coherent network of protected areas in the North Sea. A recent Alterra/RIKZ report (Lindeboom et al. 2005) confirmed this. The highest densities of birds, marine mammals, fish and macrobenthic species are present in these areas. This report also made suggestions for the designation of areas as either Special Protection Areas under the Birds Directive, as Special Areas of Conservation under the Habitats Directive or as Marine Protected Areas under the OSPAR convention. The proposals made in these two documents have recently been implemented in the Integraal Beheersplan Noordzee (IBN) 2015 (IDON 2005) which presents the governmental policy for the coming 10 years. The proposals from the Nota Ruimte and the Alterra/RIKZ report have largely been accepted in IBN2015 but the areas will not be designated before 2008 (IDON 2005). Possible restrictions on future human activities in these areas have not yet been worked out.

2.3 Habitats Directive

According to the Habitats Directive the following habitats occurring in the Dutch part of the North Sea can be designated as Special Areas of Conservation (SAC):

- 1110, Sandbanks which are slightly covered by sea water all the time
- 1140, Mudflats and sand flats not covered by seawater at low tide. This habitat type includes sands and muds of the coasts of the oceans, their connected seas and associated lagoons, not covered by sea water at low tide
- 1170, Reefs. This habitat type includes submarine, or exposed at low tide, rocky substrates and biogenic concretions, which arise from the sea floor in the sub littoral zone but may extend into the littoral zone
- 1180 Submarine structures made by leaking gases. This habitat type includes submarine complex structures, consisting of rocks, pavements and pillars up to 4 m high. These formations are due to the aggregation of sandstone by carbonate cement resulting from microbial oxidation of gas emissions, mainly methane.

In designated areas these habitats have to be managed so that the Conservation Status remains stable or is improved. For marine areas this implies, among others, that physical processes (sedimentation, erosion, currents) can act in an undisturbed and natural way, leading to mosaics of naturally occurring habitat types each featuring a corresponding fauna and flora. The presence of a naturally occurring fauna and flora is an essential criterion in the assessment of the Conservation Status of a particular habitat type. At the same time the population developments of typical species for that particular habitat are included in such an assessment, as well as the distribution of species within the site, and whether the site fulfils the ecological needs of typical species. Assessments on the Conservation Status of Special Conservation Areas have to be carried out at 6 years intervals. Management changes can be enforced by verdicts and statements from the European Court. The implementation of the Directive in marine habitats is still in the process of being developed. It will certainly take several years before each country has designated sites and set out criteria by which the Conservation Status can be determined and evaluated.

2.4 Birds Directive

Based on the presence of species mentioned in Annex 1 of the Birds Directive, areas can be designated as Special Protection Areas (SPA). These species include: *Gavia stellata, Gavia arctica, Gavia immer, Podiceps auritus, Hydrobates pelagicus, Oceanodroma leucorhoa, Sterna sandvicensis, Sterna hirundo, Sterna paradisaea, Sterna albifrons* and *Chlidonias niger*. Additionally areas can be designated when over 1% of the biogeographical population of a waterbird species is present or when regularly over 20,000 waterbirds occur in a certain area. Assessments of the Conservation Status are carried out for the species for which the area has been designated. In such an assessment population developments are included, as well as the distribution of species within the site, whether the site fulfils the ecological needs of the species and, in some areas, their breeding success. Also in areas designated as Special Protection Areas assessments on the Conservation Status have to be made every 6 years. Management changes can be enforced by verdicts and statements from the European Court.

2.5 OSPAR

Annexes A and B of the OSPAR convention describe the criteria through which an area can be designated as a Marine Protected Area (MPA). Annex A describes the ecological criteria; Annex B describes how to deal with priorities when choices have to be made between areas. These are different from priorities in the Birds and Habitats Directives. For instance: an MPA in the OSPAR framework can have a higher priority when there is a stronger basis for it under stakeholders. MPA's under the OSPAR convention can be selected using criteria like:

1. The occurrence of threatened or declining species and habitats
2. The occurrence of globally or regionally important species or habitats
3. The ecological importance of habitats (whether an area is especially important as a feeding area, breeding area, moulting area, wintering area, nursery area, spawning area or whether the area is characterized by a high production or the presence of high proportions of biogeographical populations)
4. A high biodiversity
5. Whether the area is characterized by a high sensitivity, representativity or whether the area is characterized by pristine nature

Areas to be designated have to fulfil a number of these criteria, but not all. The designation of Marine Protected Areas under the OSPAR convention is carried out by the member states. Member states have research and monitoring obligations on the status of habitats and/or species but there is no jurisdiction to enforce these obligations. Member states do not have possibilities to enforce changes in the management or protection of MPA's in other countries. OSPAR's intensions are to harmonize the international conventions on the protection of marine habitats. When the Habitats and Bird Directives become more fully implemented in marine waters it is likely that OSPAR criteria will become integrated in the toolbox of the other Directives.

MPA's can also be designated for other reasons than those formulated by OSPAR. Several examples and a comprehensive summary of the implications of the designation as an MPA have been presented in Chapters 5.7 and 5.8 of this report.

2.6 Water Framework Directive

The Water Framework Directive may have large consequences for the water quality in inland water systems and coastal waters but the Directive has no obligations towards waters more than 1 km from the coast. The water quality in nearby coastal waters, however, has to fulfil criteria regarding hydromorphological components, tidal regime, phytoplankton biomass, abundance of benthic fauna, salinity and oxygen and nutrient contents. The water quality in areas off the coast can only indirectly improve by benefiting from improvements in the coastal zone. There are no criteria on fishes. The Water Framework Directive is currently in the process of being implemented. When effective a process of water quality improvement will come into force according to guidelines set out by the EC.

2.7 Effects of fisheries in the North Sea and adjacent coastal waters

In a recent study on the effects of human activities in the Dutch part of the North Sea the effects of fishery activities at the Klaver Bank and Dogger Bank were classified as "considerable negative effects". The effects of fisheries at the Oyster Grounds, the Frisian Front and in the whole North Sea coastal zone were classified as "strong" (Lindeboom *et al.* 2005). In order to consider the effects of fishing in the proposed SPA's (Birds Directive), SAC's (Habitats Directive) and MPA's (OSPAR) an attempt has been made to describe the fishing methods applied in the North Sea and their effects. This has been done because there is a large difference in the effects of fishing methods. Some methods cause considerable collateral damage to the habitat or to non-target species. Other methods may be highly selective. Beam trawl fishery in the North Sea affects both the demersal fish stocks and the seafloor (and the macrobenthic community living there) whereas pelagic fishery (with some precautions) does not affect the sea floor but only the fish stocks in the water column (and potentially the higher trophic levels that are dependant on these fish stocks). When considering the measures that have to be taken to safeguard the habitats mentioned in the Habitats Directive and the fish stocks, birds and mammals depending on these, the existing differences between fishing techniques and their side-effects also have to be taken into account. Table 1 presents an inventory of which fishery techniques play a role in those areas of the North Sea and adjacent coastal waters where conservation measures are to be expected. Table 2 presents an overview of the ecosystem effects of different fisheries techniques.

Table 1 Overview of current knowledge on commercial fishery techniques in the proposed Dutch SAC's, SPA's and MPA's. When effects in specific sites are expected this has been marked with √. For each proposed site a tentative prediction on its future protection regime has been made, based upon the ecological values of the sites that have been described in Lindeboom et al. (2005). Abbreviations stand for: BD=Birds Directive; HD=Habitats Directive, OSPAR=OSPAR Convention. Bold characters indicate areas that have already been designated under one of the Directives.

	(Possible) designation	**Beam trawl**	**Twinrigging**	**Snurrevaad-fishery**	**Shellfish dredge**	**Gill net**	**Long-line**	**Pair trawling**	**Angling**	**(Eel) fykes**	**Bulk fishery (Sandeel)**
Wadden Sea (intertidal)	BD, HD				√					√	
Wadden Sea (subtidal)	BD, HD	√			√				√	√	
Ooster- + Westerschelde (intertidal)	BD, HD				√					√	
Ooster- + Westerschelde (subtidal)	BD, HD	√			√				√	√	
Voordelta	BD, HD	√	√	√	√			√	√		
part of coastal zone	BD, HD OSPAR?	√	√	√	√	√		√	√		
Klaver Bank	HD OSPAR?	√	√	√		√	√	√			
Dogger bank	HD OSPAR?	√	√	√		√	√	√			√
Frisian Front	BD OSPAR?	√	√	√		√	√	√			
Oyster Grounds	OSPAR	√	√	√		√	√	√			

Table 2 Overview of the effects of commercial fishery techniques on the fauna (macrobenthos, fishes, birds, seals, cetaceans) of the North Sea. When effects are certain or likely this has been marked with ✓. Probable or possible effects are marked by +?.

	Beam trawl	**Twinrigging**	**Snurrevaad-fishery**	**Shellfish dredge**	**Gill net**	**Long-line**	**Pair trawling**	**Angling**	**(Eel) fykes**	**Bulk fishery (Sandeel)**
Demersal fish	√	√	√	√	√		√	+?	√	√
Pelagic fish		√	√		√	√	√	√	√	√
Macrobenthos	√	+?	+?	√			+?			√
Birds	+?			√	√	√	√		√	√
Seals	+?				√	+?	√	+?	√	√
Cetaceans	+?				√	+?	√	+?		√

Beam trawl fishery is carried out all over the North Sea, although the intensity of this type of fishing is smaller in the northernmost part of the North Sea (Lindeboom et al. 2005). This technique is primarily used for demersal fish species and Brown shrimps *Crangon crangon*. The gear used for this type of fishery slightly digs into the sediment, leaving tracks and disturbing the upper sediment layer (10-60 mm, Gubbay & Knapman 1999). The extent to which the seafloor is affected depends on the sediment type (Lindeboom & de Groot 1998). Main effect of beam trawl fishery is the extraction of demersal fishes from the ecosystem. Additionally, there is a considerable bycatch of non-target species, including damage to echinoderms, worms, crustaceans, bivalves and non-target fish species. These effects differ between substrates and currents and depend also on the penetration of the fishing gear in the sediment. Even the thick-shelled *Arctica islandica* may be severely affected (Gubbay & Knapman 1999). There is evidence that beam trawling affects the structure and composition of the benthic communities in the North Sea, favouring short-lived, opportunistic and rapidly resettling species and damaging epifauna and shallow infauna. In areas with little current movement the physical effects may be visible for weeks or months (Gubbay & Knapman 1999). Slow growing, fragile reef species (like *Sabellaria*) are vulnerable as well, their resettlement may take years. In areas which are fished on a regular basis beam trawl fishery may prevent the re-settlement of Reefs (Habitat type 1170) altogether. Scavenging species, like Whelks *Buccinum undatum,* Sea urchin *Strongylocentrotus pallidus* and several worm and fish species, may benefit from these activities.

Twinrigging has been developed in the 1950's in Mexico. The technique has been imported in a slightly modified way in Europe by Danish fishermen around 1983, firstly mainly for catching small crustaceans (*Nephros norvegicus* and *Pandalus borealis*). Since then the technique, by which 2 trawl nets are being pulled by 1 fishing vessel at low speed has been further developed. Currently twinrigging is also used for catching pelagic roundfish and demersal fish, since 1999 also by Dutch fishermen. The technique, which is considered to be highly efficient, is especially suitable for low powered ships. New developments include the use of 3 nets (multirig). Because of the low speed at which twinrigging is practised the technique is expected to have small or no direct effects on birds, marine mammals or other bycatch species (den Heijer & Keus 2001).

Snurrevaad-fishery. This originally Danish method is currently only applied at a small scale by Dutch fishermen. The technique dates from the mid-1800's and has been applied in the Netherlands since the 1920's. is relatively old. The technique consists of fencing off an area of seafloor and the water column above it by a net, which is then pulled in towards the ship. The technique can only be applied during daylight and can therefore only in summer. It has gradually become less popular over time but since the 1980's attempts have been made to revitalize the snurrevaad-fishery again, mainly because it yields good quality large fish and because fuel costs are relatively very low. Although no proper research has been carried out on unwanted bycatch of this type of fishery the side-effects are considered to be low. This is mainly due to the low speed at which the net is pulled in (den Heijer & Keus 2001).

Shellfish and mussel seed dredging (on Mussels *Mytilus edulis* and Cockles *Cerastoderma edule)* in shallow coastal areas like the Wadden Sea and the Delta area has been subject of extensive debate and research over the 1990s and in the past few years. Because of negative effects on shellfish stocks, sediment structure and consequently on the numbers of shellfish consuming birds (Eider *Somateria mollissima*, Oystercatcher *Haematopus ostralegus* and Knot *Calidris canutus*) mechanical harvesting of Cockles has recently been completely banned from the Wadden Sea and regulated in the Oosterschelde and Westerschelde. In the Wadden Sea 2000 ha of stable intertidal mussel beds are now being safeguarded from mussel dredging. Whether mussel seed fishery can continue on "wild" subtidal and the remaining intertidal

mussel beds is currently under investigation. The Birds and Habitats Directives played an important role in these decisions. Shellfish fishery on other species (*Spisula, Ensis*) concentrates on the coastal zone, although there are intentions to start up fishery activities in the Frisian Front and Oyster Grounds on species like *Arctica islandica*. Fishing for shellfish often requires the use of powerful suction dredging techniques. Since *Spisula* is a species living on top of the sediment surface, fishing for *Spisula* only affects the upper sediment layer. *Ensis* lives up to 50 cm deep in the sediment. This type of fishing requires more powerful machinery and will affect the seafloor severely, probably destroying all macrobenthic life in the fished areas and locally affecting the sediment composition. *Ensis* fishery may leave trenches of 0.5-3.5 m wide and 0.25-0.6 m deep in the sediment (Hall et al. 1990). Recovery of the sediment may take weeks or months, even in mobile sediments (Gubbay & Knapman 1999). Recovery of the infauna may take months and for some species even years.

Gill nets are fine structured nets that float vertically in the water column. They are used to catch demersal as well as pelagic fish species which become entangled in the nets. Although gill netting is a relatively selective technique in theory, it can accidentally lead to bycatch of birds and sea mammals (Jefferson & Currey 1994). In the UK accidental entanglement of Harbour porpoises is considered to be the most frequent cause of death of stranded porpoises. Considering their slow reproductive rate this could be a serious threat to the sustainability of discrete populations (Gubbay & Knapman 1999). When close to the seafloor surface many species of scavenging invertebrates may attack captured fishes. Such invertebrate species may turn into unwanted bycatch when the nets are lifted. An accidental risk is the loss of this type of nets. When lost such nets can behave like “ghost nets” in which many different species of invertebrates, fish, birds and sea mammals may get entangled and die. Under calm weather conditions such “ghost nets” may be active for up to 6 months (Dawson 1991; Kaiser & Spencer 1996). Gill netting may lead to bycatch of species listed in Annex 2 of the Habitat Directive (Allis shad *Alosa alosa*, Twaite shad *Alosa fallax*, Lampern *Lampetra fluviatilis*, Sea lamprey *Petromyzon marinus* and Sturgeon *Acipenser sturio*). In the Netherlands, gill netting is mainly used for sport fishing near wrecks. At the same time gill netiing is used at a large scale by Danish fishermen (den Heijer & Keus 2001.

Long-lining is carried out at a small scale over the most of the North Sea. Theoretically long-lining is a selective way of fishing but side effects are that seabirds may get attracted to the catch and become victim of the hooks when scavenging on captured fishes (Gubbay & Knapman 1999). Long-lines may get lost resulting in the entanglement of non-target species, including birds and sea mammals.

Pair trawling is carried out at a rather small scale over most of the North Sea. Main target species are shoal fishes like Herring but pair fishing may also be applied for catching demersal species. In the latter case the side-effects may be comparable to those of beam trawl fishery. When used for shoal fishing this type of fishery may incidentally result in the bycatch of sea mammals.

Angling from small ships (both professional and as sport angling) concentrates very much on the coastal zone. Angling is a selective way of fishing with few side effects. However, fishing gear may get lost easily when angling is carried out in the neighbourhood of ship wracks, preferred locations for angling because many species concentrate in the vicinity of wracks. Lost fishing gear may result in the entanglement of non-target species, including birds and sea mammals.

Fyke nets are operated by professional fishermen and recreational fishermen, mainly in intertidal waters. Apart from fishes sometimes seals and diving waterbirds are captured (and

locally sea otters). Drowning of seals (and otters) in fykes can be prevented through the use of square guards in the fyke entrance, which can be passed by fishes but not by seals (Vincent Wildlife Trust 1988; Reijnders et al. 2005). Fykes may lead to bycatch of species listed in Annex 2 of the Habitat Directive, especially of Sea lamprey *Petromyzon marinus* (pers. comm. from fishermen from Wieringen, the Netherlands).

Bulk fishery using fine mesh nets is probably only carried out at the Dogger Bank. It is mainly used for catching large quantities of sandeel which are removed from the nets by using powerful pumps. Probably this type of fishery is selective in the species which are captured. Because very high quantities of fish are captured this type of fishery may have side effects on the food availability of many species of birds and sea mammals depending on sand eel, which constitutes a staple food source for many marine species.

2.8 Discussion

2.8.1 Impact of protective measures on Dutch fisheries

In areas which already have been designated under the Birds and/or the Habitats Directives like the Dutch part of the Wadden Sea, the Oosterschelde and the Westerschelde mechanical cockle fishery has been banned altogether (Wadden Sea) or has been regulated (Oosterschelde, Westerschelde). The effects of mussel seed dredging are currently being evaluated by means of an appropriate assessment within the framework of the European Directives and national jurisdiction in which these Directives have been implemented. Shrimp fishery in coastal waters will have to be evaluated in the same way.

As mentioned earlier in the Dutch EEZ five marine areas have been highlighted which qualify on the basis of either the presence of habitat type 1110 (Habitats Directive), the presence of bird concentrations (Birds Directive) or the occurrence of a diverse fauna (OSPAR). The Dutch government now is in the process of considering whether the proposed areas should be suggested to the European Commission, to become future SAC's of SPA's. The EU, after consulting the European Topic Centre in Paris will report back to the Dutch government whether they agree with the proposed sites and whether the EU considers the proposed areas as large enough and appropriate. Hence, the final designation will only be made after an agreement between the national government and the EU.

According to the Nota Ruimte (2004) existing use (such as fishery) can continue in these areas. New developments (plans, projects) that can have a significant effect on habitat characteristics or the natural values in these areas are not accepted if no appropriate assessment has been made. Due to a ruling of the European Court of Justice on Cockle fishery in the Dutch part of the Wadden Sea (case C-127/02 from September 2004 this policy may have to be changed. In many cases also existing use will have to be taken into account. Hence, appropriate assessments on existing use (such as fishery activities) in proposed SPA's and SAC's in the North Sea may be necessary in the future. As long as these areas have not been designated under the Birds or Habitat Directive or the OSPAR Convention no protective measures are in force yet.

Whether restrictions will have to be applied to fishery in designated areas will depend on the values to be protected. These are different under the Birds and Habitats Directives:

- The protection regime deriving from the Birds Directive focuses on species living within specific areas (SPA's). In areas which will be designated under the Birds Directive the Conservation Status of the birds for which the site has been designated should be

favourable. Obviously fishery removes potential food from the ecosystem which cannot be used by birds using that particular site. However, as long as the food stocks in the SPA fulfil the requirements of the birds living in that site its Conservation Status for a particular bird species can still be favourable. The restrictions upon fishery in such areas will have to be studied in advance in order to determine what restrictions are necessary. Developments, both in terms of fish stocks as well as in terms of bird use (numbers, distribution) will have to be monitored properly in order to adapt the management regime, when necessary. This implies that for each site a profound analysis on the natural values will have to be carried out prior to its designation, combined with an analysis how fishery could negatively affect the Conservation Status of those bird species for which it has been designated under the Birds Directive.

- The protection regime deriving from the Habitats Directive focuses on habitats and on species living within specific areas (SAC's). In such areas specific habitats should be protected. Activities affecting the seafloor (like beam trawl fishery and shellfish dredging) may have to be restricted or maybe even banned because they may severely conflict with the Conservation Status of the habitat. This implies that pelagic fishery may still be possible in SAC's as long as the Conservation Status for marine mammals remains favourable. Also in this case a profound analysis on the natural values of a site has to be carried out prior to its designation, combined with an analysis how fishery could negatively affect the habitats for which that site has been designated under the Habitat Directive. Such an analysis should include the Conservation Status of seals and Cetaceans for which it is designated under the Habitats Directive.

2.8.2 Government-based versus market-based protection

In chapter 4 it is concluded that from the point of view of nature protection, the added value of the market-based MSC-certificate was not very high for fisheries inside nature reserves protected under the EU Birds and/or Habitats Directive, but that outside such SPA's and/or SAC's, the contribution of the MSC-certificate to nature conservation seemed substantial. This chapter demonstrates that there is also an added value to the MSC-certificate in areas declared SPA and/or SAC. The MSC certification focuses on wise use of species and limited (acceptable) influence on habitat features. MSC certification is not restricted to a specific area. It focuses on a sound exploitation of seafood stocks and the protection of the ecosystem whereas the Birds Directive on the protection of birds in SPAs and the conservation of the ecosystem these birds live in. The Habitats Directive focuses primarily on the conservation of specific habitat types, the protection of a limited number of species using these habitats and an even more limited number of species that require protection in general. OSPAR focuses mainly on the protection of declining species and deteriorating habitats and biodiversity. MSC certification can contribute to a protection regime from the Birds Directive in areas designated for sensitive bird species because in such areas a wise exploitation of seafood stocks can still be possible. The same applies for areas where the conservation of seafloor habitats is the primary goal. MSC certification can also be applied for the protection of species in Marine Protected Areas designated under the OSPAR convention. MSC can be combined with restrictions emerging from the European Directives and OSPAR and play an additional role in a wise exploitation in such areas. Whether the MSC certificate actually improves nature protection in areas that are already legally protected one way or another, remains to be seen.

2.9 Conclusions

The Birds and Habitats Directives offer a suitable framework for an objective assessment of the effects of human activities on the Conservation Status of species and ecosystems. This is especially so because national jurisdiction on most topics (like nature conservation) in the Netherlands stops at the 12-mile border line. Hence, the directives can play a valuable and partly complementary role in the management of species and habitats, next to measures and policies described in the following chapters.

3 Promising cases

In this chapter a number of fisheries are described that are regulated in such a way that fishing does not significantly harm the ecosystem. At least, that was our impression of these cases when we started our study and assembled the information pertaining to these cases. The cases were selected on the basis of experience of the members of the project team, or were suggested to us by international contacts. Thus, the cases do not represent an exhaustive review of all instances of sustainable fisheries that do not damage the ecosystem. Additional cases which have acquired certification of the Marine Stewardship Council (MSC) are described in Chapter 4[5]. For each of the cases, we tried to collect information on: (a) the fishery and the impact of the fishery on the status of the ecosystem and fished stock, (b) the economic value of the fishery for the fisherman, so as to be able to compare different fisheries and give insight in the scale and importance of the fishery, (c) the (institutional) regulation of the fishery and the role of fishermen in regulation. We did not always succeed in acquiring all the information within the time available. In some instances we did not proceed beyond a very superficial description of the fishery and we decided to exclude such cases from our report.

3.1 Fishery and aquaculture in Ria Formosa, Portugal

Introduction

The Ria Formosa is situated in the Algarve in the south of Portugal to the east of Faro, and a small part west of Faro, with a total area of 17.000 ha (Figure 1). The Ria Formosa is a shallow lagoon. Towards the sea, it is limited by a non-continuous belt of sandy dunes formed by two peninsulas and five barrier islands that separate the lagoon from the Atlantic Ocean. Six inlets allow good exchange of the water with the sea. 50-75% of the water mass is exchanged each tidal cycle. The entire water body is sheltered with an average depth of 3 m. The Ria includes habitats such as salt marshes, mud flats, sand banks and dunes interspersed by a branched system of channels, some of which are navigable. More than 50% of the area consists of intertidal flats. The intertidal flats are largely covered by Seagrass and Spartina. 90% of the Ria Formosa area is listed as a Natural Park (1987), Ramsar Site, Special Protection Area (EU Wild Birds directive) and Special Area of Conservation (EU Habitats Directive) (Michler, 2003).

[5] During completion of this report the Halibut fishery described in this chapter actually acquired the MSC certificate.

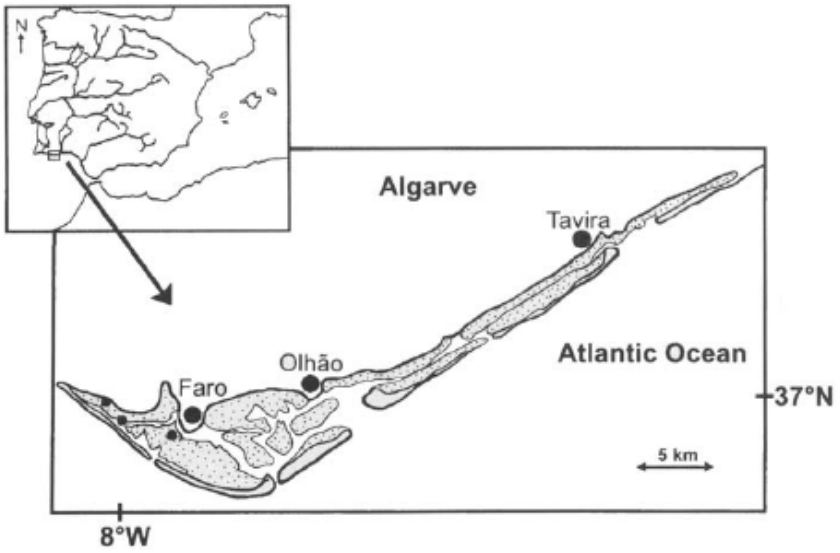

Figure 1 Map of Ria Formosa (source: Asmus, 2000).

Type of fishery or culture

A variety of species is exploited in different manners: bivalve culture, finfish culture, fishing by gear and gathering/colleting of invertebrates. The Ria Formosa has a long history of bivalve harvesting, especially of clams (*Ruditapes decussates*). 80% of Portugal's mollusc fishery is harvested in the Ria Formosa (Coelho *et al* 2002, Michler, 2003). Around 20% of the total area of Ria Formosa is occupied by on-growing banks of R*. decussates*, that are cultured throughout the entire lagoon and are the most important commercial species in the area (Coelho *et al* 2002). Other species of significance include the clam *Ruditapes romboides*, *Spisula solida*, cockle, razor shells (*Ensis*) and oysters (*Crassostrea angulata and Ostrea edulis*) (Coelho *et al* 2002, Michler, 2003). Bivalves are cultured in lots but also manually collected on the intertidal flats.

There are 1319 licenses for bivalve culture lots with an area of around 450 ha (Michler, 2003). Many lots are not larger than 50 x 50 m. The lots are well maintained and weeds are removed. The lots are used by single persons organised in cooperatives using manual methods for seeding and harvesting. Seed is collected from natural banks and "planted" in the lots (stock husbandry). The annual harvest of this bivalve is about 3000 tons per year. Average bivalve production is 0.5 kg/m^{-2} (Michler, 2003).

Much of the finfish farming is carried out in converted saltpans or *salinas* where fish production depends on the benthic organisms present. Total area for finfish culture is around 100 ha and there are 9 license holders (Michler, 2003). Main species are seabass and seabream. The main water reservoir of the *salinas* and the extensive aquaculture ponds behave like small lagoons where there are one or more openings to a tidal channel. The yield of fish (in culture ponds which have water exchange with the estuary) is in excess of 22-25 g/m^2 (Gamito, 1997). Gamito (1997) warns for problems with anoxia if attempts are made to increase production by fertilisation or food addition which may provoke rapid deterioration and endanger all production.

Parallel tot the cultivation of bivalve molluscs and other fishing activities, there is a large activity related to the commercial gathering of bivalves on natural banks and the collection of

different invertebrates on the flats and in the intertidal zone, undertaken by hand or adequate individual tools (Michler, 2003). There are around 3000 licenses for commercial collection of bivalves, these include licenses for harvesting seed to grow in the culture lots. In public areas it is also allowed to collect invertebrates for own use.

Artisan fishing is also an important activity in the Ria with many people involved (Michler, 2003). Fishing gear has remained artisanal and is mainly limited to small gear. Nonetheless an increase in effort and in the efficiency of the gear has led to an increase in catches of juvenile fish which use the area as nursery site.

Status of the ecosystem

There is not much evidence of serious impact of marine aquaculture on the environment, although some farmed stocks of clams have suffered from overcrowding (ICES, 2003). In the public area it is busy with people collecting shellfish. There is much disturbance of foraging birds.

Status of the fished stock

The annual harvest of bivalves is stable around 3000 tons per year over the last 10 years (ICES, 2003; Michler, 2003). There is, however, concern that the intensification of fishing activities has led to a high pressure on natural banks and juveniles of shellfish. Particularly the group of razor shells is exposed to high pressure and the stock is expected to decline within a few years.

Economic status of the fishermen

A large number of people in the Ria Formosa area are involved in fishing. It is estimated that 20% of the active population is directly or indirectly dependent on the fishery sector (Michler, 2003). The importance of the fishery, particularly of the bivalve culturing and gathering activities, is attributed to the high productivity of the lagoon and the high commercial value of bivalves. Prices on the local market are for *Ruditapes decusstaus* €13-14 /kg, €2-3 for cockle and up to €20 /kg for razor shells (*Ensis*). The sector of bivalve culturing is not a professionalized sector and quite a lot of people are performing this business for their own subsidence and for increasing the family's income without officially declaring their profits (Michler, 2003).

According to the official data the value of cultured clams in Portugal is € 20–30 million. Value of the finfish production in Portugal is € 10-15 million. Most of this production comes from the Ria Formosa (ICES, 2003).

Participation of fishing community in policy-making

Unknown

Institutional context of fishery

Bivalve culture, fish culture and fisheries are regulated by licenses. Fishing gear that can be used is regulated by legislation. However, a lot of illegal fishing with beam trawls, beach seines and other unpermitted gear still takes place. In public areas it is allowed to collect for own consumption to a maximium of 2 kg/species (Michler, 2003). However, a lot of people without having licenses sell products to the local market.

3.2 Fishery and aquaculture in the Galician Ria's, Spain

Introduction

Galician Ria's are located on the Spanish north-west coast. They are under influence of the Atlantic Ocean. The Galician coastline is more than 1200 km long. There are numerous coastal embayments or ria's and shallow oceanic areas with intertidal flats.

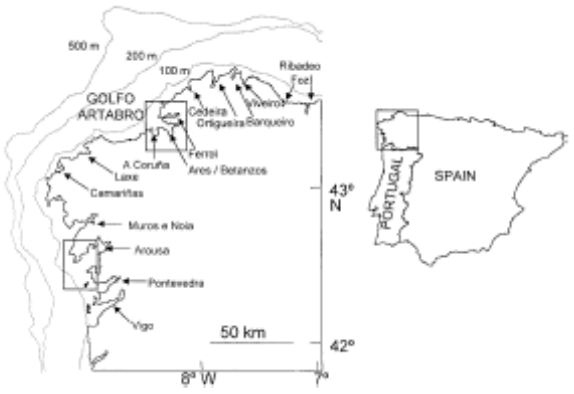

Figure 2 Map of the Galician Ria's (Freire 2002).

Type of fishery or culture

In the Galician Ria's a great variety of fishing/aquaculture activities are carried out: bivalve culture, finfish culture, gathering/collecting of invertebrates on the intertidal flats on foot and fishing by boat using a variety of gear.

Mussel culture (*Mytilus galloprovincialis*) on rafts anchored in the Ria's is the region's most important aquaculture activity. Mussel culture takes place in designated areas. Traditionally, mussel farming is a family business although there are a few big companies. Most firms have 1-3 rafts for mussel culture. A raft consists of 6 large floats (4x2 m) and heavy beams making a raft of 25x16 m. From each raft there are around 400 – 500 ropes (10 m) hanging vertically. Seed is collected from the ropes and from the rocky shore. It is thinned several times and attached to the rope in netting which breaks down after several weeks when the mussels are attached. The estimated number of rafts is 3537. Total estimated production of mussels is 250.000 tons with a value of € 132 million (website Xunta de Galicia: http://www.xunta.es/).

Shellfish culture (stock husbandry) in small lots marked with stones and sticks is carried out in the intertidal zone by family businesses. Seed or juveniles of bivalves are collected from natural banks. Important species are cockles, oyster and clams. On foot shellfish fishing on the intertidal flats is also carried out by groups of mainly women. They collect a large number of species of bivalves, gastropods, scallops, razor shells and clams. It is estimated that 5600 people collect shellfish. The Xunta de Galicia tries to promote the professionalisation of the on foot shell fishing to a form of semi intensive culture of shell fish (website Xunta de Galicia: http://www.xunta.es/).

Turbot is the main species in the finfish culture. Turbot is cultured in 17 farms. In 2002 production of turbot was 3.237 tons with a value of € 26.6 million (website Xunta de Galicia: http://www.xunta.es/).

Artisanal fishing by boat is carried out form vessels usually less than 9 m long. The artisanal fishery is multispecific and multi-gear exploiting more than 50 species, mainly sedentary benthic invertebrates. Among the most important species area crustaceans (crabs and prawns), bivalves (clams, razor clams, scallops and cockles), cephalopods (cuttlefish, squid and octopus). Finfish catches are low. According to the official data there are 8811 vesels with 28.000 fishers. In practice the number of vessels is much higher (Freire *et al.*, 2001).

Status of the ecosystem

Production from mussel rafts seems sustainable. Possibly there are problems with bottom sediment underneath rafts (low oxygen in deposited pseudofaeces). The small scale production of shellfish has a large impact on natural development of the intertidal flats, including large disturbance of feeding birds.

Status of the fished stock

Half of the necessary seed for the mussel raft culture is collected from ropes which have no impact on the fished stock. The other half comes from rocks along the ocean coast and has an impact on the natural development of the rocky shore. The small scale collection and culture probably has a large impact on the intertidal flats

Economic status of the fishermen

The mussel raft and finfish culture is profitable and well regulated Small-scale business collectors and growers provide necessary additional income for households.

Participation of fishing community in policy-making

Fishermen are organised in local fishery associations. Local fishermen participate on village level. Participation seems to be very well organised.

Institutional context of fishery

The Galician administration annually regulates inter-tidal fishing activities by means of exploitation plans, which specify dates, places, species, number of authorised workers and maximum catches. The Fishing Inspection and Surveillance agents of the Xunta have an extensive network along the entire coastline and make sure that the fishing sector respects minimum sizes of species, off seasons or areas where fishing is prohibited (website Xunta de Galicia: http://www.xunta.es/).

3.3 Otter Trawl Fishery in the Great Barrier Reef, Australia

Introduction

The Great Barrier Reef (GBR) is situated in the South Pacific Ocean east of Queensland in Australia (Figure 3). The GBR is a World Heritage Area of 347,800 km^2. Approximately 99.3% of the Heritage Area is also protected as a Marine National Park.

The Marine National Park is managed by the Great Barrier Reef Marine Park Authority. The GBR Authority with its aim to protect the natural qualities providing reasonable use of the GBR Marine Park, has control over fisheries by virtue of the use of zones which restrict certain fishing activities in specific areas. In July 2004, the zoning system of the GBR Marine Park was revised (GBRMPA, 2003) because in the old zoning system less than 5% of the area was protected as a marine sanctuary and this was inadequate for effective protection of the range

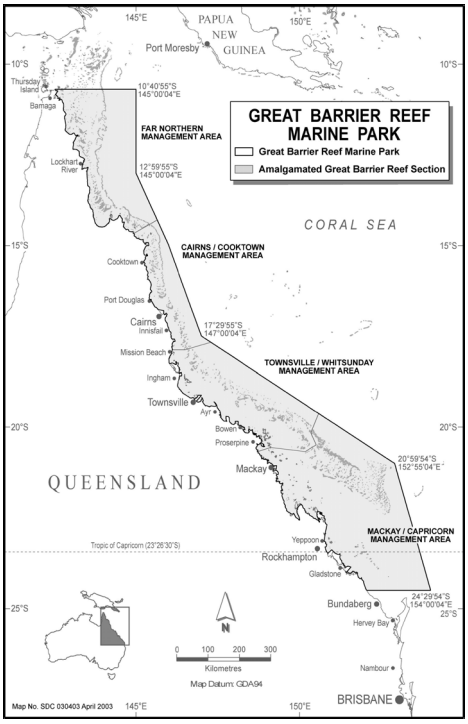

Figure 3. Location of the Great Barrier Reef Marine Park (GBRMPA, 2003).

of biodiversity in the GBR. In the new zoning system areas are closed for all fishing. In some zones only certain fisheries with low impact on the ecosystem are allowed.

The GBR Authority also becomes involved in fisheries management when there is concern that levels and type of fishing have an unacceptable negative impact on the ecosystem. The Queensland Fisheries Service has responsibility for the day-to-day management of all fish stocks in waters adjacent to Queensland coast including the GBR.

Type of fishery or culture

Fishing in the GBR includes major commercial fisheries of prawn trawling, reef line fishing, inshore netting and crabbing. There is also smaller dive based fishing for lobster aquarium fishes, coral, sea cucumber, trochus and shells. Recreational fishing is an important activity with 56,000 privately registered boats. Until recently commercial fishing effort has been very high. Over the last decade regulations have been made to decrease the fishing effort.

All fisheries are managed in more or less the same structure which is determined by the national and regional laws (see institutional context of the fishery). In this case study we focus on the otter trawl fishery which with the reef hook and line fishery is one of the major fishing activities. There is also river and inshore beam trawl fishery and Moreton Bay trawl fishery which has an overlap in species caught. The catches of these fisheries are much smaller than the otter trawl fishery and are not further described here. The otter trawl fishery and the management of this fishery is described in the Fisheries (East Coast Trawl) Management Plan 1999. Assessment of the Queensland East Coast Otter Trawl fishery (DEH, 2004) and the Great Barrier Reef Marine Park Authority website (GBR, 2004) were used as main source of information.

The otter trawl fishery takes place in all tidal waters (excluding estuaries) of Eastern Queensland, east to the outer edge of the Exclusive Economical Zone, south to the New South Wales border and north to Cape York. About 70% of effort in the otter trawl fishery is within the GBR. It occurs predominantly within the GBR lagoon, the area between the Queensland coastline and the western margin of the mid-shelf reef complex. Otter trawling on the Queensland east coats began in 1950 and new areas were progressively opened to trawling. The fleet grew to a peak of 1413 vessels in 1981.

The fishery is composed of several sectors, based on target species and geographical location. The five main fisheries include eastern king prawn, tiger/endeavour prawn, scallop, red spot/western king prawn and bay/banana prawn. Other principal species include Moreton bay bugs and squid. The total catch fluctuated in the last 20 years between 7834 tonnes in 2001 and 11572 tonnes in 1998.

Trawling is permanently excluded from 66.2% of the GBR Marine Park and approximately 42% of the total fishing area. Gear restrictions vary between different sectors and area of the fishery. There are several seasonal closures specific to areas and fishers. Target species are controlled by limited entry fishery, effort allocation, boat and gear restrictions (size and number of nets, mesh size and size of the ground chain), spatial and seasonal closures. Spatial closures are intended to protect habitats (such as sea grass beds or reserve areas free from extractive use. Seasonal closures are designed to minimize capture of juvenile prawns recruiting to the fishery. Byproduct species are controlled through possession limits and restrictions on size, sex and reproductive condition. Take is restricted to principal and permitted species as defined in the Fisheries (East Coast Trawl) Management Plan. Bycatch reduction devices and turtle excluder devices are now compulsory in all nets in the fishery.

Management responses reduced the number of licenses and a more recent reconstructing in 2001 has further reduced vessel numbers to 485 in May 2004. There is an effort cap in the fishery with effort units allocated to individual vessels. Surrender provisions apply if boats are replaced or licenses and/or effort units are transferred. Compliance and enforcement tools implemented in the otter trawl fisheries include a vessel monitoring system and random at sea and port inspections and a 24 hour hotline to enable general public to report suspected illegal fishing activities. In 2003, in the trawl fisheries (including the inshore beam trawl and Morecombe bay trawl fisheries there were 51 convictions recorded, 31 of these being Serious Fishing Offences as defined under the Trawl plan, such as closed water offences, satellite monitoring system incursions, bycatch reduction device offences, etc. Fines are high and offences may lead tot suspension of the fishing license.

Status of the ecosystem

As in any trawl fishery, bycatch to target ratios are high with a large variety of species caught incidentally. Some bycatch species in the fishery are listed as protected species under the Commonwealth Environment Protection and Biodiversity Conservation Act. Protected species interactions in the fisheries include capture of syngnathods (seahorses and pipefish), sea snakes and marine turtles and the provisioning and possible habituation of dolphins and seabirds.

Through the zoning of activities of the Great Barrier Reef a large area is not impacted by trawl fisheries. Within the areas open for trawl fisheries, the management arrangements described in the fisheries management plan are so that the impact of the fisheries on the ecosystem are on a level that is accepted by the Australian government.

Status of the fished stock

The status of the fished stocks varies between sectors from fully exploited (maximum sustainable yield) to under exploited. Stock assessments are available for several target species. A preliminary risk assessment has been conducted on byproduct species.

Economic status of the fishermen

The catch fishing effort and value of the catch is summarized in Table 3 (DPI, 2005).

Table 3 Otter trawl catch and effort in Queensland.

Year	Number of boats	Number of nights fished	Catch (in tonnes)	Approximate gross value of production (AUD $million)
2001	590	68 526	8086	102
2002	532	67 611	8505	104
2003	515	65 786	8680	108
2004	497	63 712	8972	112

Participation of fishing community in policy-making

The Queensland Fisheries Service has established a system of Management Advisory Committees for all fisheries. These committees are expertise based and include representation from major stake holders such as fishers, marine park managers, scientists, marketers and conservation groups.

User groups and communities are consulted and involved in the development of GBR Marine Park zoning and management plans. Communication and education program further enhances understanding and acceptance of the fishing regulation in the Marine Park management strategy.

Institutional context of fishery

In 1992, the Australian and local government committed to an ecologically sustainable approach to the use of natural resources including fisheries. Queensland commitment to managing fisheries in a sustainable way is embedded in the Fisheries Act 1994. The Australian government introduced the Environment Protection and Biodiversity Conservation Act 1999 and the Environment Protection and Biodiversity Conservation Amendment Act 2001. Following these acts fisheries must have management plans and demonstrate through an ecological assessment submission that fisheries are managed in a sustainable manner. The Department of the Environment and Heritage is responsible for auditing the submissions. All submissions must be based on a Guideline for the Ecologically Sustainable Management of fisheries. The guidelines cover a number of objectives relating to impact on target species; bycatch and byproduct species; endangered, threatened and protected species, ecologically threatened ecosystems and the marine ecosystem generally.

The Great Barrier Reef Marine Park Act 1975 provides for the establishment, control, care and development of the GBR Marine Park. This act has significant influence on the management and accessing of fish stocks, principally via the GBR Marine Park zoning plans, which regulate activities including fishing. The Queensland Fisheries Service and the GBR Marine Park Authority consult regularly to ensure that fisheries and Marine Park management planning arrangements are complementary and compatible.

3.4 Halibut fisheries in the North Pacific Ocean and Bering Sea

Introduction

The pacific halibut (*Hippoglossus stenolepis*) longline fishery takes place on the continental shelf of the United States and Canada (water depth 130 m) ranging from California to the Bering Sea (Figure 4). Halibut can grow to be as much as 500 us pounds and are popular food fish and wanted by sport fishermen because of size and strength. Males are mature at 8 years, females are mature at 12 years. Maximum age is 40-50 years.

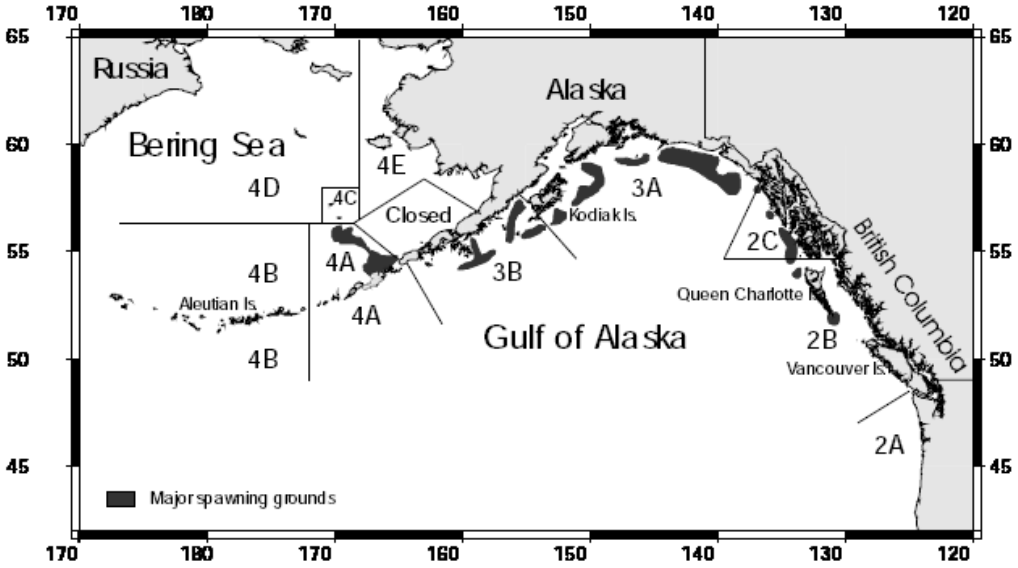

Figure 4. Regulatory areas of the Pacific Halibut fisheries (IPHC, 1998).

Type of fishery or culture

Halibut has been fished commercially with longlines for more than 100 years. From 1930 until 1970 the commercial catch of halibut varied roughly around 25,000 metric tons[6]. An increase in foreign fisheries for halibut and an increase in bycatch of halibut in the ground fisheries along with a natural decline in halibut recruitment contributed to a decline in the population with a historical low catch of 9,500 metric tons in 1974. During the 1970s and 1980s the halibut fishery was regulated with low catch limits so that the stock could recover. The catch peaked again in 1988 at over 33,566 metric tons. After a decline in the first half of the 1990s, what is believed to be a natural cycle of abundance, the catch is now at a level again of over 30,000 metric tons (Figure 5). 80% of the catches take place in the waters off British Colombia and the central Gulf of Alaska (regions 2b, 2c, 3a and 3b, Figure 4). Average individual weight of the catch is 14-18 kg (the range is 5-91 kg) (IPHC, 1998).

Halibut is also a wanted fish for sport fishermen. The catches of recreational fisheries are considerable when compared to the commercial catch (Figure 5). Bycatch of halibut in the ground fisheries is also considerable. The majority of the halibut bycatch occurs in the Bering Sea, killing smaller and younger halibut (IPHC, 1994).

[6] All weights are net weight (head off, guts out and ice and slime removed). Net weight is 0,75 of round weight.

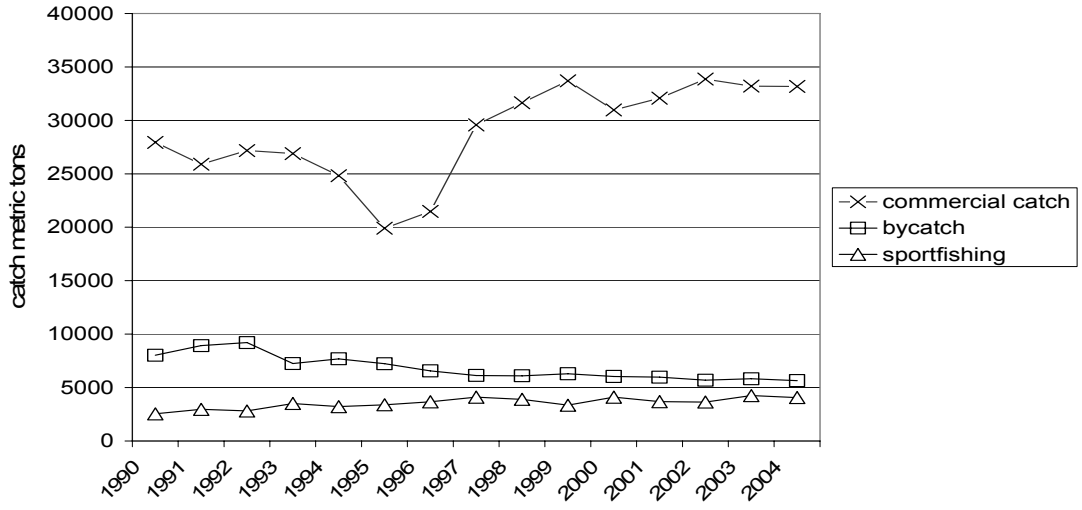

Figure 5. Catch statistics of the Pacific Halibut in IPHC regulatory areas (IPHC, 2004).

The regulation of the halibut fisheries also has a long history and started in the 1920s.
By 1910 over-fishing of Halibut was evident and the American and Canadian fishery industry asked for regulations by the United States and Canada. The International Pacific Halibut Commission was formed to make these regulations. Since 1920 regulations for commercial and sport fishery have evolved, including:

- Minimum size of landed fish of 32 inch (81 cm) these individuals are mature and 8 years old
- Closed area for fishing.
- Closed season in winter
- Regulation of gear used
- Fishing grounds are divided in 10 regulatory areas (Figure 4). In these areas the fishery is regulated in different ways, by setting catch limits and limiting the number of vessels or fishermen with an individual quota system. In Canada there are 435 quotas to vessels. In the US in Alaska, there are individual quotas to 5000 fishermen not to vessels as in Canada. Within the open season the fishermen can choose which days they want to fish on halibut within the restriction of their quota. In the west coast (regions 2A an 2B) the number of vessels is not regulated. The fishery remains open access or 'derby' fishery of 7 determined days of 10 hrs
- Fishing period limits, this is the maximum amount of halibut that may be retained and landed by a vessel during one fishing period.
- Regulation of sport fishery by individually daily takes and in one region by total catch rate

From stock assessments the exploitable biomass (over 81 cm) is calculated. The constant exploitation yield is calculated as a fixed proportion (20-25%) of the estimated exploitable biomass. The constant exploitation yield is reduced with estimates of bycatch of halibut in ground fisheries, wastages from halibut fisheries, personal use and sport fish catch. What is left is the catch limit of the commercial fisheries.

Because bycatch of halibut in the groundfish fishery reduces the commercial catch of halibut an effort is made to reduce bycatch. Only domestic vessels are allowed in the ground fisheries. Since 1990, the US have certified observers on board of groundfish vessels to

gather information on catch and bycatch. In the Bering Sea and Alaska for each groundfish fishery or group of fisheries a limited amount a discarded dead halibut is set. Once the mortality rate is reached the groundfish fishery is stopped.
In Canada in 1995 an individual bycatch quota system along with a mandatory observer program for trawl fishers in all major ground fish fishing areas was introduced. Fishers made dramatic changes and improved techniques to reduce the bycatch.

The pacific halibut fishery is currently undergoing full assessment for the Marine Stewardship Council certification.

Status of the ecosystem

The effect of the halibut fisheries on the state of the ecosystem is relatively small. There is concern on seabird mortality caused by longline fishing. Techniques are developed to be able to quantify bird kills and to make adjustments to the gear tot prevent bird kills (Ames *et al.*, 2005). Other fisheries for instance on pollock, yellow fin sole and pacific cod are more intensive and are more likely to have an impact on the ecosystem (IPHC, 1994).

Status of the fished stock

The halibut population is very well regulated. Only a small proportion of the total stock is fished. Halibut enter the fisheries when they are mature so that they can reproduce before being caught. Most of the fish caught are 9-17 years old (IPHC, 1998).

Economic status of the fishermen

Pacific halibut is one of the most valuable fish species in the North Pacific. In 1996 the average price per pound in US was $ 2,27 and in Canada $ 2,67. Total value of the commercial catch in 1996 was 111 million US dollar (Canada $ 25 million, US $ 86 million). In Canada the average catch per year per vessel is 10,000 kg and the income per vessel is estimated as $ 59,000. In the US in the Alaska region the catch is 2700 kg per fisherman and the income is $ 14,000. Crew size ranges from 1-8 people. The larger vessels usually carry 5 crew members and a skipper (IPHC, 1998).

Participation of fishing community in policy-making

The fishery industry is involved in fishery management. In the 1950s voluntary regulations have been initiated by the industry to manage the halibut stock such as 8 and 10 days lay-up programs between fishing trips. Nowadays the stock assessment is made with participation of the fishermen. The stock assessment is presented annually and fishers, industry and other interest groups can comment and make recommendations of their own.

Institutional context of fishery

The pacific halibut fishery is regulated by The International Pacific Halibut Commission. The commission meets each year to set catch limits and regulations based on a model that estimates the exploitable population. Individual governments and regional councils enforce the regulations and allocate fish among users. Only domestic vessels are involved in the fishing.

3.5 Lugworm fishery in the Wadden Sea, the Netherlands

Introduction

The Wadden Sea is wetland of international importance that is nowadays primarily managed as a nature reserve under the EU Birds and Habitats Directives. However, fisheries for fish, shellfish, shrimps and worms have existed there since many centuries.

Type of fishery or culture

In the Dutch Wadden Sea a small fishery exists for lugworms (*Arenicola marina*). Four fishing companies have a license to fish mechanically for these worms in certain lots. Lugworms are the most commonly used bait used in angling off the Dutch coasts. It is estimated (van Wijk *et al.*, 2003) that 87% of all marine anglers use lugworms in the Netherlands. Lugworms live in the Wadden Sea sediments on intertidal flats. They used to be harvested by hand. Today, some 80% of all lugworms are harvested at high tide by machines operated from barges. This mechanical harvesting in the Wadden Sea has been operational for over 25 years. The fishery uses a form of suction dredging in which the sediment is dug up, sieved and put back into the sea, while the lugworms are removed manually from a conveyor belt. Worms are kept and sold alive to specialized bait shops, sports fishing vessels, etc.

Status of the ecosystem

In the fished lots there is a considerable impact on the environment because the fishing gear draws deep scars in the seabed. However, in comparison with the total area of sand- and mudflats, the surface area of the lugworm lots is relatively small.

Status of the fished stock

The four licensed companies worked under two different management regimes that can be compared for their effectiveness in terms of stock development, stewardship and sustainability. Three of the four companies share common fishing grounds while the fourth has a license to fish exclusively in another lot. The three companies that shared common grounds, over fished the local stock of worms and were allowed to fish in new fishing grounds directly adjacent to the lot of the fourth company. The fourth company, working on its own lot without competition from other companies, showed good stewardship and has not suffered a reduction in its local worm stock. The areas where fishing is allowed have changed little over the years, only recently one area has been fished out and the fishermen involved have successfully asked for other lots. Apparently therefore, the stock can locally be overfished, but this only happened in a situation where three companies shared several lots between them. In the alternative situation, where only one company fished a lot, overfishing has never been reported within this lot. Given this fact, it seems possible to fish in a sustainable manner for lugworms, in a private lot, i.e. in a situation that is not a “tragedy of the commons” setup. Where several companies fish in competition, this has not worked in one case. Given the total size of the Wadden Sea in comparison to the sizes of the combined fished areas, there is no danger that the whole stock might be significantly affected.

Economic status of the fishermen

A total of 9 people are fully employed in the four companies that are involved in the lugworm fishery. The total annual turnover is estimated at about 1 million, with an added value of about € 800.000 Euro over the years 1999-2001 (van Wijk *et al.*, 2003). Another 14 people are employed part time in the distribution process of the lugworms (7 full time jobs).

Lugworms are sold to be used in the Dutch Wadden Sea itself, and in the Dutch Delta area, and abroad in the German and Danish Wadden Sea, the UK and France. The companies (and anglers) are active throughout the year with a peak of activity in summer.

Participation of fishing community in policy-making

The lots for fishing have been given out by the government. Fishermen need to spare certain structures within these lots, should these be encountered (e.g. mussel beds, seagrass stands). The lots are policed by the government. There have been irregular contacts between fishermen and government, particularly when changes in the licensing were due. The recent installment of extra lots for 3 of the 4 companies next to the existing lot of the fourth company has stirred up discussions. The fourth license holder feels threatened by the encroachment of the other three. He fears that lugworms may now also be fished out in the general area where he has been fishing in a sustainable manner for many years. The location of the new lots has been discussed at length between the government and the three companies that requested this move.

Institutional context of fishery

There is no total allowable catch (TAC) set by the government. The governmental policy for this fishery is one of restriction. The fishery is only allowed within the appointed fishing lots. Licenses of the current fishermen cannot be sold or otherwise transferred. Their companies will cease to exist when the current fishermen stop working.

3.6 Sea turtle protection, Brazil

Introduction

Along the 1100 km mainland coastline and oceanic islands of Brazil 5 protected species of sea turtles occur (*Caretta caretta, Eretmochelys imbricata, Chelonia mydas, Lepidochelys olivacea and Dermochelys coriacea*). Up to the end of the seventies sea turtles were disappearing rapidly due to capture at sea by fishing activities, killing of females and collection of eggs. Both nationally and internationally there was pressure to respond to the situation. In 1980 the Brazilian government established the National Sea Turtle Conservation Program (Projeto TAMAR), which is affiliated with the Brazilian Institute for Environment (IBAMA). Today a network of 20 research and conservation stations has been established, in 8 states. Conservation activities focus on major nesting and feeding grounds (Figure 6) (Marcovaldi & Marcovaldi, 1999). Fishermen and the fishing community are actively involved in protection of the sea turtles.

Figure 6. Distribution of sea turtle conservation stations in Brazil.

Status of the ecosystem

Breeding Areas

Intensive study areas and conservation areas have been implanted in each of TAMAR continental stations in the main nesting areas. Each intensive study area is coincident with a major concentration of nesting. A research team patrols the intensive study area each night during the nesting season. All nests left in the original sites are marked. In areas where predators are a serious threat, nests are protected with a plastic or wire mesh buried just below the surface of the sand, above the eggs.

The conservation areas are monitored and protected by local fishermen. When a fisherman encounters a nest, he carefully transfers it to a box that is delivered to a TAMAR's station collection point. The eggs are then moved to hatcheries, located centrally in natural nesting habitat. Hatcheries are a necessary interim step; at present, nests that cannot otherwise be protected from predators, heavy beach traffic, or erosion are moved to hatcheries for safe incubation. The main goal of TAMAR in the near future is to keep as many nests as possible in the original site. Nowadays, nearly 70% of all nests are left in their original places.

Feeding Grounds

The stations dedicated to protecting turtles on their feeding grounds (Figure 6) were set up in areas, where it was believed that large numbers of turtles were accidentally caught and subsequently drowned in various forms of artisanal fishing nets and wooden weirs (Marcovaldi,

1993). Building on the positive experience at the other stations, research and monitoring of turtles in the water have been designed to incorporate participation of the coastal residents. Fishermen and coastal residents are taught about the natural history of sea turtles, and their role in the ecosystem. The objective involves developing strategies to reduce the numbers of turtles drowned through incidental capture. Results so far, include the introduction of alternative fishing methods, as oyster and mussel culture. Several families that once relied on fishing nets for their livelihood now work with shellfish culture.

Another positive measure has been recruitment of the fishermen to actively resuscitate "stunned" turtles. Frequently, after being caught in a net, a sea turtle becomes comatose and appears dead (Shoop *et al.*, 1990). In the past, stunned turtles accidentally caught by the fishermen were quickly thrown back in the water, causing their death. These actions were based on the fishermen's fear of punishment, since turtles in Brazil are protected by law and their intentional capture is banned. In response to this situation, TAMAR began distributing brochures and posters explaining how the fishermen can save turtles that are accidentally caught. The fishermen are encouraged to check their nets often for sea turtles, and are instructed how to revive an unconscious animal. After rehabilitation, the turtles are released in the ocean by the fishermen, usually with tags.

Since June 2001, TAMAR develops the National Program for the Reduction of Sea Turtles Incidental Capture in the Fishing Activity. The purpose is to reduce the incidence of turtles captured and deceased by the different fishing activities, through the development of mitigation measurements adequate to each one.

Economic status of the fishermen

Due to the country's economic situation, the small coastal communities adjacent to TAMAR areas of activity historically have problems of social exclusion, lack of opportunity, and income distribution. Such problems transform themselves in tensors, disrupting TAMAR *modus operandi.* Therefore another challenge appeared: to develop ecologically sustainable strategies that would distribute income by creating direct job opportunities and generating other economic alternatives, conditions which are essential to neutralize non sustainable human pressures on sea turtles (Patiri, 2002).

After years of activity, having acquired insight regarding the peculiarities and logistics specific to its areas of activity, TAMAR identified 'market openings' for communities with a high profile for tourism, and for those with lesser potential. Consequently, strategies creating economic alternatives are created with two focal points in mind: institutional self support and development of community policies generating economic alternatives.

Institutional Self Support

TAMAR seeks to use ecotourism principles when developing activities in areas with high potential for tourism. In this context, places for public visitation called Visitors centres have been constructed in areas adjacent to operational stations. Visitor centres usually include a small museum, retail store(s), and aquaria containing local species in various life cycle stages, signs explaining species biology and status, and program activities. The museum may serve multiple purposes, sponsoring activities, such as video clubs, art centres, and school group presentations (Marcovaldi & Marcovaldi, 1999). Visitor centres in areas of program activity provide opportunities for direct contact between residents, visitors, and sea turtles. Such centres are important tools for education and fund-raising campaigns. The first TAMAR Project experience in conciliating tourism with conservation took place at Praia do Forte, situated on the northern coast of the state of Bahia.

Generation of Economic Alternatives for Communities: Stimulation of Community Entrepreneurship

Most of TAMAR financial resources are generated by visitor centres, mainly through thematic garment sales. These products, T-shirts, caps, local handicrafts, and other souvenir items, inspired by sea turtle conservation campaigns, impart the Project's principal objective. Resources are also raised through admission ticket sales, space rentals for restaurants and other services. To strengthen local production, TAMAR began to develop production verticalization. In this way, communities closer to the operational stations, located in areas with lesser potential for tourism, became product suppliers for the other visitor centres. In the course of time two T-shirt factories were established, one in Regência, Espírito Santo, and the other in Pirambu, Sergipe. Both factories produce articles of clothing, especially T-shirts, to meet the demands of gift shops associated with visitor centres that receive a high number of tourists. All the products made at the factories also help to promote the conservation message of sea turtles through pictures emphasizing the institutional message. A total of 127 thousand pieces have been produced in 2003, of them about 94 thousand in Regencia and 33 thousand in Pirambu.

Participation of fishing community in policy-making

Along with its mission of sea turtle protection, TAMAR incorporated human and social issues into its conservation efforts. Indeed, the first strategy adopted, in order to effectively promote sea turtle protection was to involve the fishing community. For this purpose, fishermen were hired to carry out sea turtle conservation and management activities, which not only provided an alternative source of income for them, but also made future community-based resource administration possible. The fishermen were in the past the main turtle hunters and egg collectors (Marcovaldi & Marcovaldi, 1999). This community involvement strategy has solidified, as TAMAR stations managers began to reside within the communities adjacent to areas of sea turtle occurrence, and consequently identifying more quickly the expectations and prospects of these native communities. As a result, an opportunity was created to initiate an on-going learning process about local customs and traditions, and also the biology of this species. Years of cohabitation between TAMAR teams and community members, resulted in the development of ties of trust. This factor has been fundamental in motivating these inhabitants to participate in sea turtle conservation efforts. This allowed for integrated environmental conservation and social inclusion effort to be made, especially of the kind related to education and betterment of local population's quality of life (Patiri, 2002). Of the people involved in the sea turtle protection 90% are members of the communities where the stations are established.

Institutional context of fishery

As a Federal program, TAMAR was initially affiliated with, and assisted by, several national non-governmental organizations (NGOs). However, as the program matured in scope and personnel, and financial needs expanded at a quickening pace, these alliances became unmanageable. In response, PRO-TAMAR Foundation, a private, non profit organization, was legally created in 1988 to support, raise funds, and co-manage the TAMAR jointly with the IBAMA. The Foundation is comprised of a board of Trustees, a president, an executive director, a self-supporting director and seven regional directors responsible for the 20 stations. A system of partnerships between the public and non-profit sectors creates an institutionally hybrid environment, making the efforts for protection, handling and research of sea turtles more effective (Figure 7).

In the case of - IBAMA, the Brazilian agency for environmental policy execution, its role is to guarantee the protection and recuperation of species in danger of extinction, such as in the

case of five sea turtles species on the Brazilian coast. On the other hand, PRO-TAMAR Foundation, which functions as a stabilizing element, complements the role of the State, and throughout all these years, has provided continuous effort of sea turtle conservation. The Foundation has provided about 70% of the funding for TAMAR. The sources of such funds originate with Brazilian private and public organizations, international agencies, with income generated trough its own self-support activities (manufacture and sale of TAMAR products - T-shirts, embroidery, crafts, tourism, and visitors centres).

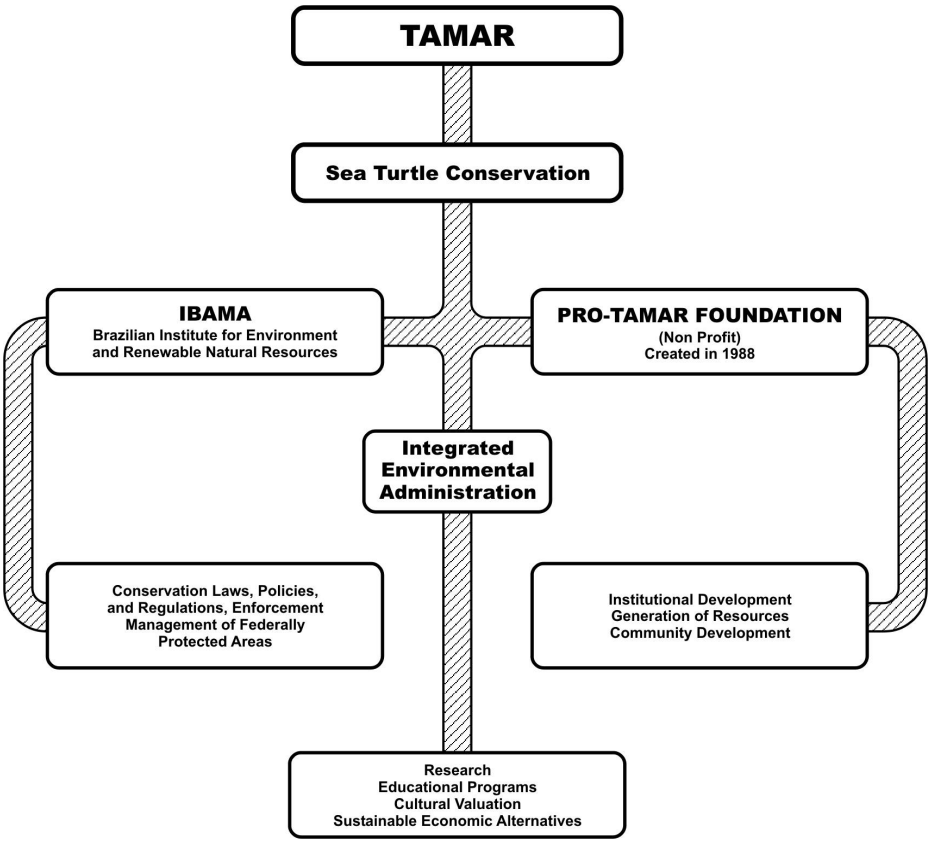

Figure 7. TAMAR's hybrid management and partner institutions.

3.7 Conclusions

The case studies that we described above are not an exhaustive review of all possible cases of sustainable fisheries that are both economically viable and do not cause significant harm to the ecosystem. Additional cases are described in Chapter 4 dealing with fisheries certified by the Marine Stewardship Council and in chapter 5 dealing with fisheries self management in general. Also, most of the cases listed in this chapter seem sustainable fisheries from the point of view of exploitation of the stock. However, closer inspection suggests that in some cases the impact on the ecosystem is quite considerable. Initially, the Ria's in Galicia seemed quite promising, but closer inspection revealed that the impact on the natural environment of the large number of fishermen is probably quite considerable. The same seems to apply to Ria Formosa. Thus, these artisanal fisheries may be sustainable from the point of view of the shellfish stock that is harvested and from an economic point of view, but there is a considerable negative impact on the ecosystem.

Nonetheless some cases remained that seemed to meet all three criteria, including proper protection of the ecosystem. In some cases, this is achieved through a marine protected area (MPA[7]). In other cases, this is achieved because there is a market for nature conservation. In the extreme case, fishermen stop fishing and start earning money from nature conservation.

[7] See the list of acronyms at the end of the report for a detailed description.

4 The possible role of eco-labelling in reducing the conflict between nature conservation and fishery

4.1 Introduction

The idea behind a fishery eco-label is that consumers can reward fisheries that are undertaken in a 'sustainable' manner. Potentially, eco-labelling could reduce, or even completely eliminate, the conflict between nature conservation and fishery. The latter requires that (a) the majority of the consumers can be persuaded to buy only eco-labelled fish and (b) the eco-label provides sufficient guarantees for the ecosystem. This chapter investigates whether these conditions are met or will be met in the future.

With regard to the first condition it may be remarked that at present most fish and fish products on sale for consumers are unlabelled. Kaiser & Edwards-Jones (2006) explain this among other things on a general lack of consumer concern for marine fish and sustainable fisheries. It is easy to get public support for protecting seals and dolphins, but fish are generally "unloved" in their opinion. However, it may be questioned if consumers should be and/or are the prime direct target of the eco-label. The primary target could be the supermarket chains and the trading companies, instead of the consumers, even though it is consumer concern that should persuade companies to buy labelled fish. It is certainly the case that supermarket chains and trading companies show a growing interest in eco-labelled products. The Marine Stewardship Council for instance was co-founded by the multinational Unilever. Our condition that the majority of consumers buy eco-labelled fish is also met if supermarket chains and trading companies preferentially or even exclusively buy properly labelled fish. This is not a utopia. In a communication of the commission of the European Communities that seeks to launch a debate on a Community approach towards eco-labelling schemes for fisheries products (EU 2005), we find the following statements:

> *The most frequently cited, and possibly most controversial, case of eco-labelling in the fisheries sector is the "dolphin-safe/dolphin-friendly" labelled tuna. This label is meant to certify that the tuna was caught in a way that protects dolphins, either based on the Agreement on the International Dolphin Conservation Programme (AIDCP), a multilateral Regional Fisheries Organisation, or in line with a programme promoted by the Earth Island Institute, a US based non-governmental organisation. Although "dolphin-safe/dolphin-friendly" labelling started out as a technical regulation, it has ever since changed the market to such an extent that tuna which is not labelled as "dolphin-safe" is no longer acceptable in some countries. However, the AIDCP and the US norms are not complementary. As a matter of fact, the "dolphin-safe" label bars tuna caught in accordance with AIDCP standards from access to the US markets. This has given rise to an ongoing dispute between Mexico and the US. Attempts by the US administration to amend the US law to meet AIDCP requirements have been challenged in the US courts by some NGOs that consider the AIDCP measures not to be stringent enough.*

On the one hand, the tuna example shows that eco-labelling may lead to labelled fish completely displacing unlabelled fish from the market. On the other hand, it shows the importance of our second condition that the eco-label provides sufficient guarantees for the ecosystem.

In this chapter we have made no attempts to present a comprehensive review of all extant fishery eco-labels. Instead, we have restricted ourselves to the Marine Stewardship Council (MSC) for several reasons. First, it is the best known fishery eco-label that seems to "dominate

the market" of fishery eco-labels. Second, the information on the MSC label and the certified fisheries was easily accessible on the MSC internet site (www.msc.org). Third, time was limited. Our leading question in this chapter is whether the MSC label provides sufficient guarantees for protection of the ecosystem. We will examine information on MSC certified fisheries and at the end of the chapter explicitly discuss Dutch fisheries and MSC certification.

4.2 Criteria for certification

The Marine Stewardship Council was founded in 1997 by Unilever, the world's largest buyer of seafood, and WWF, the international conservation organisation. However, it became an independent non-profit organisation in 1999. The first fisheries were certified in 2000 and in December 2006 a total of 21 fisheries were certified (*Figure 8*). Another 18 fisheries are currently undergoing assessment.

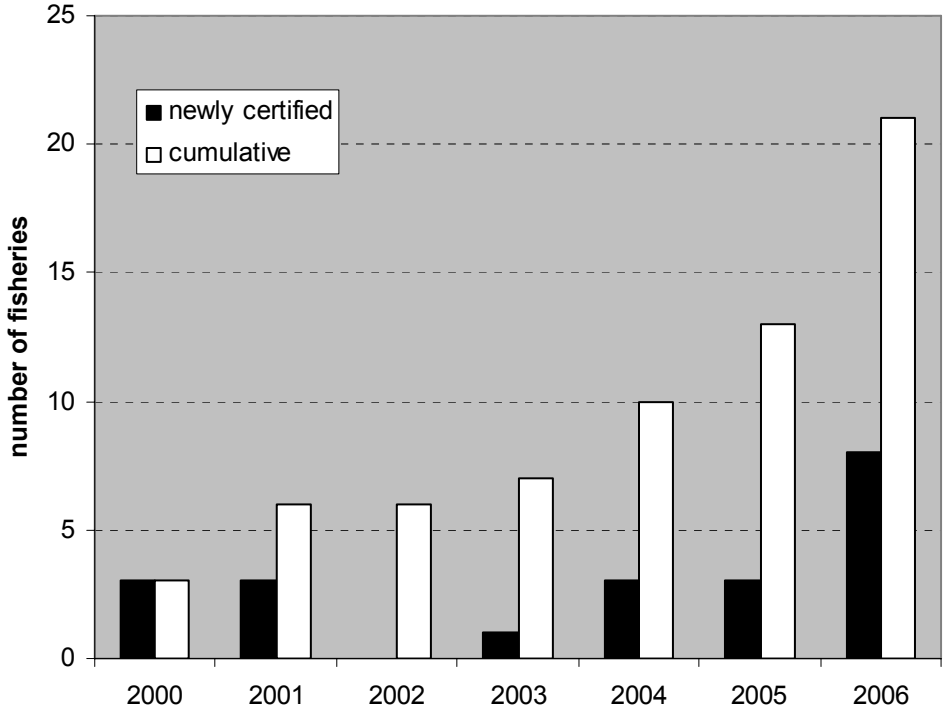

Figure 8. The number of newly certified fisheries and the cumulative number of fisheries certified under MSC.

Recently, the FAO has drafted guidelines for the eco-labelling of fish and fishery products from marine capture fisheries (FAO 2005a), following extensive discussions by experts (FAO 2003c; FAO 2005b). For the purpose of this project, it is important to note that the implementation of the precautionary approach to protect the "stock under consideration" and to preserve the aquatic environment is considered a minimum substantive requirement in these guidelines. In fact, this is article 7.5 of the code of conduct for responsible fisheries that was drafted by the FAO in 1995 (FAO 1995). How many of these guidelines are actually met by the Marine Stewardship Council is not easy to tell, but the core requirements certainly seem to be met. According to the MSC internet site (www.msc.org):

The MSC programme shares key characteristics with the new FAO guidelines including:
· objective, third-party fishery assessment utilising scientific evidence;
· transparent processes with built-in stakeholder consultation;
· a three-pronged standard based on the sustainability of target species, ecosystems and management practices.
At present, we have no reasons to doubt these statements. According to Kees Lankester (pers. comm.) there are only two minor items for which the MSC standard does not meet the FAO guidelines at present[8]:

- The separation between accreditation and "standard-setting".
- The way in which a dispute panel is assembled and executed.

The current MSC principles and criteria for sustainable fishing can be found on the MSC internet site (www.msc.org) and we have copied them below with a grey background:

PRINCIPLE 1

A fishery must be conducted in a manner that does not lead to over-fishing or depletion of the exploited populations and, for those populations that are depleted, the fishery must be conducted in a manner that demonstrably leads to their recovery[9]**:**

Intent:

The intent of this principle is to ensure that the productive capacities of resources are maintained at high levels and are not sacrificed in favour of short term interests. Thus, exploited populations would be maintained at high levels of abundance designed to retain their productivity, provide margins of safety for error and uncertainty, and restore and retain their capacities for yields over the long term.

Criteria:

1. The fishery shall be conducted at catch levels that continually maintain the high productivity of the target population(s) and associated ecological community relative to its potential productivity.
2. Where the exploited populations are depleted, the fishery will be executed such that recovery and rebuilding is allowed to occur to a specified level consistent with the precautionary approach and the ability of the populations to produce long-term potential yields within a specified time frame.
3. Fishing is conducted in a manner that does not alter the age or genetic structure or sex composition to a degree that impairs reproductive capacity.

[8] During the completion of this report the MSC standard was adapted and now meets all FAO criteria.

[9] The sequence in which the Principles and Criteria appear does not represent a ranking of their significance, but is rather intended to provide a logical guide to certifiers when assessing a fishery. The criteria by which the MSC Principles will be implemented will be reviewed and revised as appropriate in light of relevant new information, technologies and additional consultations

PRINCIPLE 2:

Fishing operations should allow for the maintenance of the structure, productivity, function and diversity of the ecosystem (including habitat and associated dependent and ecologically related species) on which the fishery depends.

Intent:

The intent of this principle is to encourage the management of fisheries from an ecosystem perspective under a system designed to assess and restrain the impacts of the fishery on the ecosystem.

Criteria:

1. The fishery is conducted in a way that maintains natural functional relationships among species and should not lead to trophic cascades or ecosystem state changes.
2. The fishery is conducted in a manner that does not threaten biological diversity at the genetic, species or population levels and avoids or minimises mortality of, or injuries to endangered, threatened or protected species.
3. Where exploited populations are depleted, the fishery will be executed such that recovery and rebuilding is allowed to occur to a specified level within specified time frames, consistent with the precautionary approach and considering the ability of the population to produce long-term potential yields.

PRINCIPLE 3:

The fishery is subject to an effective management system that respects local, national and international laws and standards and incorporates institutional and operational frameworks that require use of the resource to be responsible and sustainable.

Intent:

The intent of this principle is to ensure that there is an institutional and operational framework for implementing Principles 1 and 2, appropriate to the size and scale of the fishery.

A. Management System Criteria:

1. The fishery shall not be conducted under a controversial unilateral exemption to an international agreement.

The management system shall:

2. demonstrate clear long-term objectives consistent with MSC Principles and Criteria and contain a consultative process that is transparent and involves all interested and affected parties so as to consider all relevant information, including local knowledge. The impact of fishery management decisions on all those who depend on the fishery for their livelihoods, including, but not confined to subsistence, artisanal, and fishing-dependent communities shall be addressed as part of this process;
3. be appropriate to the cultural context, scale and intensity of the fishery – reflecting specific objectives, incorporating operational criteria, containing procedures for implement-tation and a process for monitoring and evaluating performance and acting on findings;

4. observe the legal and customary rights and long term interests of people dependent on fishing for food and livelihood, in a manner consistent with ecological sustainability;
5. incorporates an appropriate mechanism for the resolution of disputes arising within the system[10];
6. provide economic and social incentives that contribute to sustainable fishing and shall not operate with subsidies that contribute to unsustainable fishing;
7. act in a timely and adaptive fashion on the basis of the best available information using a precautionary approach particularly when dealing with scientific uncertainty;
8. incorporate a research plan – appropriate to the scale and intensity of the fishery – that addresses the information needs of management and provides for the dissemination of research results to all interested parties in a timely fashion;
9. require that assessments of the biological status of the resource and impacts of the fishery have been and are periodically conducted;
10. specify measures and strategies that demonstrably control the degree of exploitation of the resource, including, but not limited to:

a. setting catch levels that will maintain the target population and ecological community's high productivity relative to its potential productivity, and account for the non-target species (or size, age, sex) captured and landed in association with, or as a consequence of, fishing for target species;
b. identifying appropriate fishing methods that minimise adverse impacts on habitat, especially in critical or sensitive zones such as spawning and nursery areas;
c. providing for the recovery and rebuilding of depleted fish populations to specified levels within specified time frames;
d. mechanisms in place to limit or close fisheries when designated catch limits are reached;
e. establishing no-take zones where appropriate;

11. contain appropriate procedures for effective compliance, monitoring, control, surveillance and enforcement which ensure that established limits to exploitation are not exceeded and specifies corrective actions to be taken in the event that they are.

B. Operational Criteria

Fishing operation shall:

12. make use of fishing gear and practices designed to avoid the capture of non-target species (and non-target size, age, and/or sex of the target species); minimise mortality of this catch where it cannot be avoided, and reduce discards of what cannot be released alive;
13. implement appropriate fishing methods designed to minimise adverse impacts on habitat, especially in critical or sensitive zones such as spawning and nursery areas;
14. not use destructive fishing practices such as fishing with poisons or explosives;
15. minimise operational waste such as lost fishing gear, oil spills, on-board spoilage of catch, etc.;
16. be conducted in compliance with the fishery management system and all legal and administrative requirements; and
17. assist and co-operate with management authorities in the collection of catch, discard, and other information of importance to effective management of the resources and the fishery.

[10] Outstanding disputes of substantial magnitude involving a significant number of interests will normally disqualify a fishery from certification.

On paper, the guarantees for the ecosystem provided by the MSC eco-label through principle 2 are very good. For instance, criterion 3 of principle 2, which states that depleted fish populations should be fished in such a way that "*recovery and rebuilding is allowed to occur to a specified level within specified time frames, consistent with the precautionary approach*" offers hope that overfished stocks will recover under the MSC scheme. However, a similar condition for ecosystems that are damaged from fishery is lacking. Furthermore, the proof of the pudding is in the eating.

4.3 Impact on the ecosystem of fisheries with the MSC certificate

In August 2005, five (very) large and seven small fisheries were certified with the MSC label. These certified fisheries are described in Table 4. The information that we collected includes the species fished, the fishing gear used, the annual landings, whether or not the fishery is shared with other nations, the management body, the management mechanism and the market.

What do we know of the protection that is offered to the ecosystem in each of these cases? To investigate this question we studied the reports on the certification that can be downloaded from the MSC website trying to extract the following information:
1. What is known on the impact of the fishery on the ecosystem?
2. In which way is the impact on the ecosystem monitored?
3. Were objections raised against the certification or during the certification process?

The results are displayed in Table 5. Although significant depletion of the fished stock is a clear ecosystem effect, the information in Table 5 specifically relates to principle 2 (which deals with the ecosystem effects of the fishery) and not to principle 1 (which deals with effects of the fishery on the fished stock). The information that we collected includes the start of the assessment, the year the fishery was certified, the species fished, whether or not the stock is also fished by other fishermen, a list of the ecological problems and impacts on the ecosystem, the ecosystem indicators that are monitored and whether or not formal objections were raised against certification of the fishery. All data in the table were extracted from the MSC internet site www.msc.org. It proved convenient to distinguish between small-scale fisheries harvesting on average 10.000 tonnes per year or less, and large-scale fisheries harvesting on average 100.000 tonnes per year or more.

Small-scale fisheries

For several of the small-scale fisheries there seems to be very little actual information on the ecological impact of the fishery. However, experts are quoted in these cases who believe the ecological impact to be minimal. From the descriptions of the fishery one is inclined to agree.

So far, no objections have been raised against the certification of 6 of the 7 small scale fisheries. Objections were raised against the certification of the South Georgia Patagonian Toothfish Longline Fishery. This led to the convening of an Objections Panel and the certification report and the accompanying Scoring Table were modified to meet the requirements of the Objection Panel. Subsequently, the fishery was certified under no less than 10 conditions, each of which should be met within a specified time frame. These conditions include (1) a study of the impact of the fishery on rajid populations and the development of mitigation measures, (2) an estimate of hooks discarded in fish heads (and swallowed by birds) and, if necessary, implementation of a monitoring program, (3) research into the ecosystem relations of toothfish, and (4) a determination if there are significant interactions with the benthic habitat. It was also recommended to develop an ecosystem model for the fishery. The first annual surveillance report describes in detail the progress that has been made in meeting the conditions. The report concludes that progress is sufficient.

*Table 4. Key features of fisheries awarded Marine Stewardship Certification as of August 2005. Data extracted from the MSC website **www.msc.org**. where further details on each fishery are available. Annual landings are given as approximate values (in the case of Alaska salmon this has been estimated from landings of 200 million fish per annum) as these are likely to vary from year to year according to the level of Total Allowable Catches (TACs). Table reproduced from (Kaiser & Edwards-Jones 2005) and extended with information on Gulf of Alaska Pollock fishery, which certified after (Kaiser & Edwards-Jones 2005) constructed their table.*

Fishery	Gear	Annual landings (t)	Fishery shared with other nations?	Management body	Management mechanism	Market
Large-scale fisheries						
Bering Sea/Aleutian Islands pollock fishery	Midwater trawls	c. 1 100 000	No	North Pacific Fishery Management Council (US)	TAC and quota allocation to meet management plans, permit limited entry, fishing seasons, observer monitoring, area and fishing gear restrictions	Asia, USA, Europe (frozen product) and Japan (surimi)
The Alaska salmon fishery	Drift and set gillnets Purse seine Trolling	c. 320 380	No	Alaska Department of Fish and Game	Occurs within delineated districts, multiple technical regulations (bag limits, minimum landing sizes) and management of other participants (sport fishing) and components of the ecosystem (e.g. habitat)	Whole frozen or processed canned, Japan, EU, USA
South African Hake Trawl Fishery	Bottom trawling	c. 195 000	No	Department of Environmental Affairs and Tourism: Branch Marine and Coastal Management	Technical measures (mesh size), TACs allocated to companies, limits on number of vessels and closed areas	South Africa, frozen product to Spain, France, Portugal, Italy, Australia and US, fresh chilled product to Germany, Spain and France.
New Zealand Hoki	Midwater and bottom trawling	c. 100 000	No	New Zealand Ministry of Fisheries and Hoki Fishery Management Company (fishers)	TAC set below maximum sustainable yield, satellite monitoring of large vessels (> 42 m), industry run observer programme, severe penalties for breach of regulations	Primarily export to US, Japan, European Union and Australia
Gulf of Alaska Pollock fishery	Trawling	c. 90 000	No	North Pacific Fishery Management Council (US)	TAC and quota allocation to meet management plans, permit limited entry, fishing seasons, observer monitoring, area and fishing gear restrictions	USA, Europe (frozen product) and Japan (surimi)
Small scale fisheries						
Western Australian Rock Lobster	Static bottom set trap fishing	c. 10 500	No	Government of Western Australia, Department of Fisheries, processors and fishers	Technical measures (seasonal area closures, minimum landing sizes, prohibition on catching breeding females), TACs and licensing	Exported to Taiwan, Japan, Hong Kong, China, US and Europe
South Georgia Patagonian Toothfish Longline fishery	Bottom set longlines	c. 4 400	Yes, but managed by single organisation	Commission for the Conservation of Antarctic Marine Living Resources. Implementation by the Government of South Georgia and South Sandwich Islands (UK territory)	Seasonal restriction (open from May to August). TAC set by CCAMLR, management funded through license fees, providing for enforcement and monitoring	US, European Union and Japan
Burry Inlet cockles	Hand raking	c. 3 500	No	South Wales Sea Fisheries Committee	Defined area, minimum landing size, participation controlled by license	as processed product, UK, Spain, Holland, France and Portugal
South West Mackerel (*Scomber scombrus*) handline fishery	Handlining	c. 1 750	No	Department of Environment, Food and Rural Affairs and the Cornish Sea Fisheries Committee	Minimum landing size, TAC, fishery closure upon reaching TAC.	UK wholesale, Europe (France and Italy)
Red Rock Lobster Mexico	Static bottom set trap fishing	c. 1 300	No	Sub-delegation of fisheries (fishers), National Fisheries Institute and governmental research bodies	Defined area, limited entry, user rights given to fishing co-operatives, TACs, minimum landing sizes and protection for gravid female	Primarily export to Asia, US and France
Loch Torridon *Nephrops norvegicus*	Static bottom set trap fishing	c. 150	No	European Union and Scottish Executive for Environment and Rural Affairs	Defined area closed to other forms of fishing	Primarily exported to Spain as live product
Thames Blackwater Herring	Drift gill net	c. 121	No	Department of Environment, Food and Rural Affairs and the Essex Sea Fisheries Committee	TAC, technical measures (mesh size), trawling prohibition over herring spawning grounds. N.B. concurrent trawl fishery not certified.	UK processors

*Table 5. Information on what is known on the ecological impact of the fisheries certified with the MSC label as of August 2005. Also indicated is the way this ecological impact is monitored or will be monitored and whether objections were raised by conservation groups against the certification. Data extracted from the MSC internet site **www.msc.org**.*

Fishery	Start assessment	Certification	Species	Latin name	stock also fished by other fishermen?	Ecological problems and impacts on the ecosystem	Ecosystem indicators that are monitored	Objections
Large-scale fisheries								
Bering Sea/Aleutian Islands pollock fishery	2001	2005	Alaskan Pollock	*Theragra chalcogramma*	Same stock also fished by Russian fishing fleet	Effect on protected predators of Pollock (seabirds and Steller's sea lion, harbour seal, northern fur seal) through bycatch, competition for food (high proportion Pollock taken from critical habitat of Steller sea lion) and fishing waste (lost nets causing entanglement mortality for fur seals) and discards (seabirds)	Conditions for continued certification include studies of the effects of fishing on Steller sea lion and its critical habitat, studies of the effects of fishing on prey for Steller sea lion and fur seals, better bycatch reporting, effects of lost fishing gear on seals, experiments with fished and unfished areas including collecting data on seals and seabirds	objections by Alaska Oceans Program, Greenpeace International, National Environmental Trust, Oceana
Gulf of Alaska pollock fishery	2001	2005	Alaskan Pollock	*Theragra chalcogramma*	Exclusive access	Effect on protected predators of Pollock (seabirds and Steller's sea lion, harbour seal, northern fur seal) through bycatch, competition for food (high proportion Pollock taken from critical habitat of Stealler sea lion) and fishing waste (lost nets causing entanglement mortality for fur seals) and discards (seabirds)	Conditions for continued certification include studies of the effects of fishing on Steller sea lion and its critical habitat, studies of the effects of fishing on prey for Steller sea lion and fur seals, better bycatch reporting, effects of lost fishing gear on seals, experiments with fished and unfished areas including collecting data on seals and seabirds	Objections by Alaska Oceans Program, Greenpeace International, National Environmental Trust, Trustees for Alaska
The Alaska salmon fishery	1999	2000	Sockeye	*Oncorhynchus nerka*	Native and subsistence fisheries	bycatch of other fish, shellfish, birds and marine mammals	Within 3 years of the certification in 2000 implement a sampling program to identify major bycatch of non-salmon fish species, birds and marine mammals. Within 5 years provide evidence and summary on this topic.	no formal objections
			Chum	*Oncorhynchus keta*				
			Chinook	*Oncorhynchus tshawytscha*				
			Coho	*Oncorhynchus kisutch*				
			Pink	*Oncorhynchus gorbuscha*				
South African Hake Trawl Fishery	2002	2004	South African Hake	*Merluccius paradoxus*	Longline and handline hake fishery take ca. 10% of the stock; small numbers of hake as bycatch in fishery on horse mackerel; assumption that South African stock and Namibian stock are separate may be wrong	bycatch (sometimes Kob - an over-fished species) and discarding; trawls attract seabirds, but high bird mortality as reported in hake fisheries elsewhere have not been reported for this fishery, but the issue has not yet been seriously studied; mortality of Cape Fur Seal reported to be insignificant for the population; increasing populations of Cape Fur Seal may lead to increasing competition between fishers and seals;	Fishery is certified under several conditions including: (1) implementation of a bycatch plan, (2) development of a plan to study ecosystem relations and inclusion in monitoring, (3) study impact on benthic fauna and derive mitigation measures from results, (4) implement monitoring plan to study impact on seabird populations. It is also recommended to initiate an Ecological Risk Assessment.	no formal objections
				Merluccius capensis				

						impact on benthic fauna is likely, but this has not been seriously studied		
New Zealand Hoki	2000	2001	New Zealand Hoki	*Macruronus novaezelandiae*	The hoki stock is restricted to New Zealand's Exclusive Economic Zone. Recreational fishing and Maori customary fishing believed to be negligible. Some bycatch of hoki in large offshore trawl fisheries.	Bycatch of other fish species, New Zealand fur seals and seabirds. Impact of bottom trawling on the seafloor. Ecological effects on midwater ecosystems	Monitoring of bycatch of icon species by independent observer programme operated by the Ministry of Fisheries. Monitoring programmes are limited to stock issues and to issues related to formally protected species. There are no habitat or ecosystem monitoring systems in place.	formal objections by Royal Forest and Bird Protection Society of New Zealand
Small scale fisheries								
Western Australian Rock Lobster	1998	2000	Western Australian Rock Lobster	*Panulirus cygnus*	smaller numbers taken by recreational fishermen	bycatch of icon species (sea lions)	bycatch of icon species	no formal objections
South Georgia Patagonian Toothfish Longline fishery	2001	2004	South Georgia Patagonian Toothfish	*Dissostichus eleginoides*	exclusive access	some effect of lines on biogenic structures (entanglement in coldwater coral); bycatch of rays and seabirds; hooks in discarded heads; IUU fishery (very high in 1997, but drastic decline in recent years)	bycatch is monitored by observers. Fishery is certified under several conditions, including (1) a study of the impact of the fishery on rajid populations and the development of mitigation measures, (2) an estimate of hooks discarded in fish heads (and swallowed by birds) and, if necessary, implementation of a monitoring program, (3) research into the ecosystem relations of toothfish, (4) Determine if there are significant interactions with the benthic habitat. It is also recommended to develop an ecosystem model for the fishery.	objections
Burry Inlet cockles	2000	2001	Cockle	*Cerastoderma edule*	exclusive access	removal of mussel "crumble" (young mussels which bind cockles together), which serves as food for waterbirds	shorebirds (oystercatcher) are monitored by BTO, but no "target" numbers are specified	no formal objections
South West Mackerel	2001	2001	Mackerel	*Scomber scombrus*	large commercial fleets fishing same stock elsewhere	Negligible	expert judgement	no formal objections
Red Rock Lobster Mexico	2001	2004	Red Rock Lobster	*Panulirus interruptus*	exclusive access in Mexico granted to cooperatives (that now have MSC label) since 1930s; virtually no illegal fishing; smaller catches of same stock in USA	bycatch of fish, crustaceans and other epifauna; ghost fishing by lost traps not considered a problem	no specific studies, but general studies of parts of the ecosystem (especially in biosphere reserve) and experts believe ecological impact to be minimal	no objections
Loch Torridon Nephrops Creel Fishery	2002	2003	Norway Lobster	*Nephrops norvegicus*	creel fishery in area closed to trawlers is minor part of total catch of stock in ICES Sub Area Via, Management Area C	small amount of bycatch of fish, crustaceans and other epifaunal	evidence of absence of ecosystem effects apparently based on single inspection visit on 30th May 2002	no formal objections
Thames Blackwater Herring	1999	2000	Herring	*Clupea harengus*	large commercial fleets fishing same stock elsewhere	occasional bycatch *of Alosa fallax* and *Alosa alosa*	area is under EU habitats directive - fishery is believed not to damage the ecosystem	no formal objections

The example of the Patagonian Toothfish illustrates that at the moment of the certification, there may be many uncertainties and lack of adequate information on ecosystem effects, but that with the MSC certificate a process is initiated towards a better understanding of ecosystem effects and a better protection of the ecosystem against negative impacts of the fishery. As yet, there are no examples that failure to meet the conditions has led to a fishery losing the MSC certificate, but continuation of certification is not automatically guaranteed. Surveillance reports can be quite critical as the Western Australian Rock Lobster fishery demonstrates. In the 2005 MSC Final Surveillance Report by Scientific Certification Systems, Inc. (SCS) one can read the following:

> *"Despite repeated and considerable discussion between SCS, the client, and the fishery managers a number of the procedures still do not appear to be working smoothly:*
> *Properly functioning advisory systems for providing independent expert scientific advice to the fishery managers about the ecological impacts of the fishery or the impacts of the fishery on sea lions;*
> *A rigorous and effective system for engaging stakeholders and securing input about key ecological issues in the fishery;*
> *The lack of an effective process for identifying and implementing research in relation to ecosystem impacts of the fisher".*
> *Expert advice about ecosystem risks identified as needing further research and possible mitigation are still handled in a cumbersome and time consuming manner that does not allow for the smooth and timely handling of potentially important ecosystem risks."*

Large fisheries

The certified large fisheries include some of the largest fisheries in the world. In contrast to the small fisheries, the large fisheries are more likely to be contested than uncontested: objections were raised against 3 of the 5 large fisheries that were certified. Thus, the rule that "outstanding disputes of substantial magnitude involving a significant number of interests will normally disqualify a fishery from certification" is not always adhered to by the MSC.

The large fisheries that are contested are the New Zealand Hoki fishery, the Gulf of Alaska Pollock fishery and the Bering Sea/Aleutian islands Pollock fishery.

According to the Royal Forest and Bird Protection Society of New Zealand (a partner of BirdLife International) the hoki fishery is New Zealand's largest fishery and it also has the greatest impact of any fishery (http://www.forestandbird.org.nz). The two methods used to catch hoki are mid-water and bottom trawling and it is fished all year in depths of 400-800 meter, i.e. both spawning and non-spawning stocks are targeted. The Bird Protection Society lists as the main problems of the fishery "*the bycatch of hundreds of NZ fur seals, albatrosses and petrels each year, the management of two stocks as one quota management area, the declining state of the Western stock fishery, the lack of a management plan, and the need for the annual quota to be reduced to 100,000 tonnes in 2004*".

The damage to the ecosystem is specified in more detail:

- **"Bycatch:** Hundreds of NZ fur seals, albatrosses and petrels are drowned in the hoki fishery each year. The affected albatrosses and petrels include several globally threatened species such as black-browed and Buller's albatross and white-chinned petrel. Non-target fish species bycatch is also a problem with hake, ling and silver warehou being caught in West Coast hoki fisheries. Other bycatch species are deepwater sharks including shovelnose dogfish, seal shark and Baxter's dogfish. Threatened basking sharks are also caught.
- **Habitat damage:** Bottom trawling bulldozes the sea floor, destroying soft corals, sponges and long-lived bryozoans. The expanding use of double linked nets with a large

heavy roller in between has increased the impact of this fishery on fragile deepwater habitats.
- **Ecological effects:** The dumping of bycatch and other fish waste during processing at sea has an ecological effect together with the impact of bottom trawling. "

The public summary of the certification report issued 14th March 2001 by SGS admits that in many places knowledge is inadequate and monitoring of impacts insufficient. Several corrective actions (CAR) are raised to correct weaknesses with regard to MSC principle 2 on ecosystem impact:
- **Minor CAR No. 004**: Information is not sufficient on the distribution of habitats, major assemblage types and the natural functions and trophic relationships among species in the midwater and benthic ecosystems where the fishery operates.
- **Minor CAR No. 005**: A full ecological risk assessment has not been conducted
- **Minor CAR No. 006:** Action needs to be taken to correct the following weaknesses: (1) the impact of the hoki fishery on non-target quota species is not well defined, (2) research programs are mainly limited to aspects of setting the TAC for hoki, (3) the information availability is not adequate to comply with the requirements for full implementation of the Fisheries Act.
- **Minor CAR No. 007**: The risks to seabirds have been assessed but the assessment of the risks to seals is insufficient.

The report concludes that since there are no major CARs, the assessment team recommends certification of the New Zealand Hoki fishery. For the minor CARs the HFMC (Hoki Fishery Management Company Ltd) is required to present an action plan and commence the agreed actions before 14 September 2001. These final conclusions seem rather favourable for the fishery, given that the same report also concludes that:
1) No ecological objectives or targets for habitats or ecosystems are in place in the fishery management system. The responsibility for setting and implementing such ecosystem-based objectives is not clear.
2) No targets have been developed and implemented for levels of unacceptable impact on non-target species
3) Monitoring programmes are limited to stock issues and to issues related to formally protected species. There are no habitat or ecosystem monitoring systems in place.
4) Both industry and government measures are available to alter fishing practices where unacceptable impacts are identified. However, the responsibility for management of non-commercial species that are not also formally protected under legislation – the bulk of the marine biodiversity – and marine habitats is not clear.

The Bird Protection Society launched a formal complaint against the certification and a panel, consisting of Sir Martin Laing, Dr. Dick Deriso, Dr. Jake Rice and Sir Michael Connell, was formed to investigate the complaint. With regard to MSC principle 2, the panel concluded that "at the time of the original assessment, the information used to assess these impacts was poor to non-existent. There had been little directed action taken to measure the extent or magnitude of these impacts, and little use had been made of information collected for other purposes but possibly informative about the impacts of the hoki fishery on other ecosystem components. Where impacts on ecosystem components were known or suspected, little had been done to ameliorate them. The Complaint gave much attention to real shortcomings in the fishery at the time of application for certification. However, in several instances the Complaint proposed to evaluate the fishery against relative standards that were unrealistic or unworkable. Having said that, since the original assessment the industry has recognized these issues and focused quite strongly on remedying the deficiencies in their Corrective Action Plan. The CAP includes measures that will substantially increase knowledge of the actual

impacts of the fishery on the wider environment. It also includes measures that increase the openness and inclusiveness of how environmental risks are evaluated, how needs for mitigation are determined, and mitigation measures are chosen and implemented. These are significant improvements, although sustainability of the fishery at the ecosystem scale remains the greatest concern for certification." In addition, the panel makes the following recommendations:

1. Seal excluding devices be tested in New Zealand waters as a complement to the trials off Western Tasmania.
2. The trawl grounds should be mapped, especially those areas where trawls impact on the sea bed.
3. Using the information from 2, a preliminary ecological risk assessment of the impact of the fishery on benthic habitats should be undertaken as a priority, even if the full ecological risk assessment proposed in the CAP requires several years to complete.
4. Interim but measurable management objectives for key ecosystem components should be set using existing knowledge, consistent with the principles of the Precautionary Approach, and with the full understanding that these objectives would be revised as the Ecological Risk Assessment is completed.

The discussion between the Bird Protection Society and the Hoki Fishery continues to this day. The most recent surveillance report by SGS posted on 12 October 2005 on the MSC website again concludes considerable progress, but at the same time notes that minor CAR No. 17 dealing with the lack of an overall strategy for managing the environmental impacts of the hoki fishery, which should have been completed by 31 March 2005, remains open. For this CAR the report ends with the warning: "This CAR remains open because although significant progress on the Middle Depth Fisheries Plan has been made, the plan has not been completed with sufficient detail and information. Completion of the Plan is required by 26 November 2005. It shall be reviewed during a surveillance on-site assessment visit at the end of November 2005. If the Plan is not finally completed and made available for audit at that time, SGS will be likely to raise the CAR to the status of Major, requiring immediate completion or revocation of the MSC certificate within 30 days." Reassessment commenced in early 2005, because a full reassessment is required every 5 years and the certificate was awarded in March 2001

Emotions also run high in the discussion on the Pollock fishery, which is believed by several conservation organizations to have a negative impact on several toppredators, especially the threatened Steller's Sea Lion, via direct competition for food. For this reason these conservation organisations objected against the MSC being awarded to both the Pollock fishery in the Gulf of Alaska and the Pollock fishery in the Bering Sea and Aleutian Islands. Objection panels reviewed the objections raised, but concluded in both cases that the MSC certificate was rightfully awarded. A huge research effort (140 million US dollar) is initiated to investigate the ecosystem effects of the Pollock fishery, but some claim that this research is not targeted at the most pertinent questions (Dalton 2005). One bone of contention is the lack of direct experiments comparing fished and unfished areas. In fact, the initiation of such experiments is one of the conditions that need to be met for the continuation of MSC certification in both Pollock fisheries. For the Gulf of Alaska Pollock fishery, the certifying body concluded that assessments "to identify and estimate impacts of the fishery on protected, endangered, threatened or icon species" were insufficient. This led to the following condition (#10): "the fishery must design and carry out experiment(s) to test the possible impact of the Pollock fishery on Stellar sea lions by comparing outcomes of regulated levels of fishing in experimental and control areas on Steller sea lion behaviour, breeding and population trends.

The hypothesis to test would then be that Steller sea lion numbers or productivity in reduced fishing areas would show a positive deviation relative to values in fished areas, and the null hypothesis that performance of Steller sea lion would be no different between areas. Such an experiment should be underway no later than 2006". The action plan of the At-sea Processors Association (dated April 27, 2005) to meet the conditions for continued certification contains the following on this particular condition: "The Final Reports on the Bering Sea / Aleutian Islands and Gulf of Alaska Pollock fishery recognize the legal and practical impediments identified by fishery management authorities and scientists to conducting the controlled area experiments proposed by the National Research Council (NRC) in 2002. In addition, NMFS' scientists have provided fishery management authorities with a detailed analysis of the substantial cost of such experiments, the decades-long commitment required for such a program and the likely prospect that the findings would be inconclusive". The impression that the fishery sector is trying to find a way out of this condition is increased by the text that follows, which more or less implies that they will do everything except planning a direct experiment. They will organize meetings and summarize current research and prepare a review which "will contain a thorough analysis of how the current research meets the condition, which is to conduct a direct experiment". It will be interesting to follow how this issue develops in the years to come.

4.4 Dutch fisheries and the MSC certificate

4.4.1 North Sea Herring

In May 2006, the fishery for North Sea Herring (*Clupea harengus*) was the first "Dutch" fishery awarded with the MSC certificate. The fishery targets the North Sea and Eastern English Channel autumn-spawning stock within the exclusive economic zone (EEZ) of the EU and Norway. The stock is managed according to the EU-Norway Agreement (December 1997). In addition, the fishery also implements, on a voluntary basis, the additional management measures as set out in the Policy Plan of the Pelagic Freezer-Trawler Association (PFA), whose members are based in The Netherlands, The United Kingdom, Germany and France. Thus, the fishery is only partly Dutch. The stock of Herring was badly overfished in the 1970s, but has since recovered. The Herring fishery is a pelagic fishery targeting the large shoals of this species. It is known that pelagic fisheries can recover faster than other fisheries, when overfishing stops (Hutchings 2000)[11]. The likely reason is that pelagic fisheries do not disturb the benthic fish habitat and tend to be highly specific, targeting only one species. Thus, the only major impact of the fishery is on the fishing mortality of the target species and once this fishing mortality is sufficiently reduced, stocks can recover. To continue certification, several conditions have to be met. These include:

- Making available all VMS, logbook, or other information relating to the fishery, that would reasonably be requested for management or research purposes;
- Maximise the access to PFA vessels participating in this fishery for observers and/or to maximise the availability of catch sample information;
- Recording of additional and incidental sources of herring mortality;
- Recording of interactions with rare, protected or threatened species (cetaceans, seabirds, seals, elasmobranches, turtles etc.),

[11] The main message of the paper by Hutchings is actually that many fisheries take surprisingly long to recover after fishing stops and some fisheries haven't recovered decades after the overfishing was stopped.

4.4.2 Shellfish fisheries

In 2001 MSC pre-assessment reports were published for the Dutch mussel fishery (Agro Eco Consultancy, 2001c), the Dutch mechanized cockle fishery (Agro Eco Consultancy, 2001b) and the Dutch hand-gathering of cockles (Agro Eco Consultancy, 2001a). In 2001, the pre-assessments were paid for by the respective producer organisations. In actual fact, a first pre-assessment was already undertaken in 1999, paid for by the international conservation organisation WWF. At the time, these shellfish fisheries were at the centre of a heated debate between conservationists and fishermen whether such fisheries should be allowed in nature areas like the Wadden Sea. In 2000, the Dutch government initiated a major research effort, EVA II, to study the impact of the mechanized shellfish fisheries on the ecosystems of the Wadden Sea and Oosterschelde (Ens *et al.,* 2004). In 2004, a new policy was introduced (LNV 2004) which included a complete ban of mechanized cockle fishing in the Wadden Sea. The pre-assessments were not followed up by actual assessments to obtain the MSC certificate. In a letter accompanying their reports, Agro Eco hypothesized that this was primarily due to the bad public image of the mechanized shellfish fishery, making MSC reluctant to certify such a fishery. However, whether or not a fishery is contested is not part of the formal criteria used by MSC to judge whether a fishery can be certified (pers. comm. Aldin Hilbrands).

For the mechanized mussel fishery, Agro Eco concluded that it might be possible to conform to principles 1 (no overfishing of the stock) and principle 2 (no damage to the ecosystem) with the exception of fishery on stable littoral mussel beds and unregulated fishery on sublittoral mussels. They expected that the MSC certificate could only be granted if the sector provided convincing and watertight measures that would prevent any damage to stable littoral mussel beds. They also expected that part of the sublittoral mussel seed would be needed to be reserved for the birds. Related to this, most problems were expected with regard to meeting the demands of principle 3 (adequate management system): adequate measures to protect littoral mussel beds were lacking, there should be more transparency with regard to data on the fishery, structured consultation of conservation organisations was lacking, there was no active support for initiatives to improve the sustainability of the sector, there was insufficient certainty with regard to economic sustainability (due to insecurites about the new policy that was supposed to come into effect in 2003). Under the new policy (LNV, 2004) mussel fishery is allowed to continue in the Wadden Sea under the condition that it will transform into a more "sustainable" fishery. If this transformation is successful, one suspects that it would be relatively easy for the mussel sector to obtain the MSC certificate.

For the mechanized cockle fishery, Agro Eco concluded that it would be possible for the sector to comply with principle 1 (no overfishing of the stock). For principle 2 (no damage to the ecosystem) Agro Eco expected problems with fulfilling criterion 1 (no ecosystem changes). They expected that this criterion would only be met with additional constraints on the fishery with regard to disturbance of the sediment and with regard to food needs of the birds. They expected that especially principle 3 (adequate management system) might prove to be a problem, due to insufficient transparency in the accounting and the verification of the sector. In their pre-assessment Agro Eco stressed the difficulty in reaching unambiguous conclusions on the impact of the fishery and the fact that at the time no article in a peer-reviewed scientific journal had appeared that demonstrated negative and irreparable effects of the cockle fishery. From this uncertainty Agro Eco concluded that the fishery might possibly meet the MSC criteria. However, the precautionary approach is at the heart of the MSC criteria, so this uncertainty is an argument against instead of in favour of meeting the MSC criteria. It is the uncertainty on the ecological impact, and not the public debate, that would have been the major obstacle against MSC certification. Since that time several articles have appeared in peer-reviewed scientific journal showing a negative impact of the mechanized

cockle fishery (Piersma *et al*. 2001; Atkinson *et al*. 2003; Verhulst *et al*. 2004; van Gils *et al*. 2006). Under the new policy, mechanized fishing for cockles is no longer allowed in the Dutch Wadden Sea, but it is allowed to continue in the Oosterschelde and the Westerschelde.

For the hand gathering of cockles, Agro Eco concluded that at the current scale (20 fishermen that actively fish by hand gathering) it should be easy to meet the criteria of principles 1 (no overfishing of the stock) and 2 (no ecosystem damage). However, they expected problems with meeting the criteria of principle 3 (adequate management system). Some of the problems were due to the government as a result of the uncertainties with regard to the new shellfishing policy. Other problems could be mended by the sector: starting structural contacts with all stakeholders, better registration of catches; better labelling of cockles gathered by hand in the production line. The cockles should not be mixed with cockles gathered via methods not labelled as sustainable. Under the new policy, hand gathering is allowed to continue in the Wadden Sea. Hand gathering of cockles in the Burry Inlet in Wales was one of the first fisheries to obtain the MSC label, but the Dutch sector does not appear to take initiatives to obtain the certificate.

4.4.3 Shrimp fishery

In terms of the number of permits, shrimp fishery is the largest fishery in the Wadden Sea. There are 90 permits for shrimp fishery in the Wadden Sea and 160 permits for fishery outside the Wadden Sea (Johan Nooitgedagt, pers. comm.). In December 2005, SGS was awarded the contract for a pre-assessment of the shrimp fishery in the Netherlands (http://crangon.nl)[12]. In September 2006, this pre-assessment was completed. According to a press release published on the website http://crangon.nl the pre-assessment concluded that it should be possible to obtain the MSC-certificate when current practices were sufficiently changed. The most urgently needed change was a strong reduction in the amount of bycatch of young Sole (*Solea solea*) and Plaice (*Pleuronectes platessa*). Also the management of the sector should be improved, including a better self regulation. A more active role of the Dutch government is needed to harmonise the permit system and law enforcement in the different countries. The press release also mentions that conservation organisations are worried not only about the discards, but also about the disturbance of the sea bottom. The press release ends with the statement that the fishery should comply with all legislation, including the Dutch nature conservation legislation, to obtain the MSC certificate. It seems that actual certification for MSC had not yet commenced in December 2006, as this logical next step was neither mentioned on the website http://crangon.nl , nor did the MSC website www.msc.org mention the Dutch shrimp fishery as being in the process of certification.

4.5 Discussion and conclusions

A major advantage of MSC certification is transparency. The criteria for certification, assessment reports and the formal handling of objections can be freely downloaded from the internet. Another advantage is the active involvement of all stakeholders. Neither transparency nor active involvement of stakeholders is necessary to obtain a nature conservation permit to fish in a SAC or SPA (marine areas protected by the European directives). What is needed

[12] The initiative for MSC certification was taken by the conservation organisations "Stichting de Noordzee" and the "Waddenverening" in cooperation with "Scomber", a consultancy for sustainable fisheries. The project is financed by the "Stichting Doen" and endorsed by the international conservation organisation WWF, the ministry of LNV and the society for improvement of shrimp trading (VEBEGA – Vereniging ter Bevordering van de Garnalenhandel).

nowadays is an impact assessment that shows that there is little risk that the activity causes significant damage to the nature goals for which the area was designated a nature reserve. Reasonable doubt on the absence of significant impacts is sufficient ground to withhold the permit (see also Chapter 2). Can the MSC certificate remove such doubts?

On the basis of our review, we conclude that the MSC does not offer an absolute guarantee against damage to the ecosystem by the fishery, because the MSC certificate was awarded to several fisheries where there was great uncertainty with regard to the impact on the ecosystem, yet damage from the fishery seemed likely. From this it can be concluded that obtaining the MSC certificate does not guarantee that fisheries in areas protected under the EU Birds and/or Habitats Directive will be allowed to continue, but that fisheries permitted in areas protected by the European Directives will find it easy to obtain an MSC certificate. However, at the workshop it was remarked that the MSC certificate requires that all national and international legislation is strictly adhered to. Thus, for the fisheries in the Wadden Sea (like the mussel fishery and the shrimp fishery), a nature conservation permit is a necessary condition for the MSC certificate. From the point of view of nature conservation, the added value of MSC certification for fisheries in nature reserves may not be high, except if the MSC includes nature values that are not covered by the conservation goals of either or both EU-directives (see Chapter 2). This could be the case for fish species not listed in the Habitats Directive, or fish species that migrate over large areas.

The situation is quite different for fisheries in areas without the status of marine protected area or adequate government policies to prevent ecosystem damage from fishery. The MSC conditions specify that fish populations that are depleted should be fished in such a way that recovery occurs to a specified level within a specified time frame, consistent with the precautionary approach and considering the ability of the population to produce long-term potential yields. And although the MSC conditions do not offer an absolute guarantee against damage to the ecosystem, they can require corrective actions to remedy negative impacts on the ecosystem. Certification should be revoked if the corrective actions are not acted upon in time. So far, this has not happened. Given the many scientific uncertainties with regard to ecosystem functioning and fishery impact, the MSC certificate may be a good way of starting a process towards reducing the scientific uncertainties and reducing the ecosystem impact. Outside nature reserves, the MSC certificate benefits both nature and the fishery. At the workshop it was remarked that if the EU had succeeded in devising and executing a proper communal fishing policy, there would be no added value to the MSC certificate. The very existence of a certificate for sustainability should be regarded as a testimony to the failure of the communal fishing policy of the EU to adequately protect the fish stocks and the marine ecosystem.

Whereas this chapter was exclusively devoted to the MSC, which only certifies entire fisheries, the workshop also addressed the issue of certification of individual fishermen, e.g. the "*Waddengoud*" certificate for sustainable regional products (http://www.waddengoud.nl/). It is self-evident that certification of individual fishermen offers less protection against overfishing and damage to the ecosystem than schemes that certify an entire fishery, like MSC. However, certification of individual fishermen may be a good way to commence the process of certification of an entire fishery.

5 Fisheries self-management and nature conservation

5.1 Introduction

This chapter addresses the question to what extent fishermen self-organisation can contribute to maritime nature conservation. There are many cases in the literature where fishermen self-organisation contributes to stock preservation. Are there also cases where fisheries self-organisation contributes to maritime ecosystem conservation? This chapter does not provide exhaustive empirical evidence to answer this question, but rather its purpose is to review the fisheries management literature in order to provide a conceptual basis for future analysis of empirical cases. The chapter consists of three parts: a conceptual part in which the literature on co-management will be reviewed, an empirical part in which the relation between co-management and nature conservation will be explored, and an analytical part in which the points raised in the conceptual part will be used to discuss the cases introduced in the empirical part.

In order to answer the question, we first review the literature on fishermen self-organisation or co-management[13]. Co-management involves the sharing of management responsibilities between government and fishermen organisations (Jentoft 1989). As fishermen become actively involved in co-management decision making, this will improve the quality of decision making, as well as its legitimacy, hence its adequacy and effectiveness (Jentoft and Mikalsen 1994). Co-management is often presented as an innovative alternative management instrument which is more effective than classical state-initiated instruments such as administrative rules (e.g. gear restrictions) and/or property rights (e.g. individual transferable quota; Dubbink & van Vliet 1996). We conclude, however, that co-management is not so much an alternative management instrument, but rather it indicates an alternative approach to management decision-making, whether it includes state-initiated rules, market-based instruments, voluntary agreed constraints, or any combination of these. This alternative approach embodies the notion that the quality of decision-making should not only be judged in terms of performance criteria (effects on stocks or fishing communities), but also in terms of process criteria (to what extent are basic principles of good governance observed?).
Next, we introduce the ecosystem approach to fisheries management. The ecosystem approach entails an explicit recognition of the complexity and dynamics of marine ecosystems and of the interconnections among its component parts (FAO 2003a). On this account fish stocks cannot be singled out as isolated management units, as has been done in fisheries management more traditionally, but rather fish stocks are integrated parts of larger ecosystems, which have an impact on fisheries as well as are impacted by fisheries. There seems to be an intimate –as of yet not very well understood however- connection between over-all ecosystem health and fisheries productivity. Apart from that, ecosystem conservation as part of wildlife management has become a legitimate management goal in its own right, not just in the terrestrial but increasingly also in the aquatic environment. There are several ways in which public as well as private parties, including fishermen themselves, can contribute to maritime nature conservation. The institution of marine protected areas is one such way, which will be elaborated in this chapter, the certification of ecosystem-friendly fisheries practices is another one, to be discussed in another chapter of this report. Several cases of co-management which include nature conservation will be discussed, while we make use of the

[13] Fishermen self-organisation may in theory exist without any formal interference of the state; hence, there is not always a co-management component to it. In practice, however, fishermen self-organisation almost always exists in some form of interaction with state management of fisheries. Hence, we speak of co-management.

points raised in the conceptual part of this chapter. This chapter concludes that private sector self-organisation can indeed contribute to maritime nature conservation, and it should be pursued more systematically in order to bring about a transition towards more sustainable fisheries.

5.2 Fisheries management practice

Classical government intervention in fisheries has been facing many problems over the past decades. When over-fishing occurred, governments have tried to regulate fishing behaviour in one way or the other. Fishermen who are economically dependent on fishing have been trying to circumvent the rules. This has lead to increasingly complex regulation, which in many cases has also been increasingly difficult to enforce. Rules may also be counterproductive, in that they turn out to have unforeseen negative side effects, and do not result in the objectives intended.

Flat-fisheries management in the Netherlands
April 1976: introduction of individual catch restrictions;
enforcement problems.
1975-1976: voluntary decommissioning (but no HP restriction instituted).

January 1983: Common Fisheries Policy into force;
October 1984 European Commission infraction procedure against NL; enforcement efforts increase;
1985-present: quota market.
January 1984: voluntary catch effort limitation (PO groups).
February 1985: introduction of HP licences.
April 1987: introduction of days at sea.
1988-1991: voluntary decommissioning.
September 1990: Minister resigned.

January 1993: introduction of quota management groups; public flexibility in exchange for private responsibility; introduction of closed areas; tightening of gear restrictions (beam size, mesh size).

An example of the classical government approach to fisheries management is provided by the Dutch flat fisheries (see textbox). This is a telling example because the Dutch government is not an under-resourced, underdeveloped state government, but a fully equipped modern state administration. To be sure, one part of the problem has been that for a rather long period of time EC member states were lacking a formal basis in law to intervene. The Common Fisheries Policy (CFP) came into force only in 1983; more than 15 years after the EC member states established a common fisheries zone covering large parts of the Northeast Atlantic. But even when it came into force officially, the CFP (and its translation into national regulation) still was not immediately effective. It took another 10 years in the Netherlands before a practically working system of quota management was instituted, which –notably- incorporates some form of fishermen's self-organisation. This is the Biesheuvel quota group management system, in which fishermen voluntarily take up some extra management responsibility in exchange for more flexibility in public rules (Van der Schans 2001). Almost 15 years after this co-management system was introduced, there may be seen another change in fisheries management in the Netherlands, to the extent that ecosystem and nature conservation management goals not only apply to the coastal zone, but are beginning to extend their influence to fisheries management at large.

This brief overview of fisheries management in the Netherlands shows that it may take several years before changes in public policy making translate into changes in fisheries management institutions. The Dutch experience also shows that some experience has been gained with directly involving fishermen groups in management decision making. New management goals such as nature conservation appear on the agenda, but it remains to be seen whether and how fishermen self-organisation can be more actively involved in reaching those goals.

5.3 Fisheries management theory

The idea that fishermen can themselves contribute to managing a fish stock responsibly has gained prominence in recent years, not just from a practical policy point of view (as a response to overly complex government regulation), but also as a reflection of resource management theory which informs practical policy making. In this section we discuss developments in fisheries management theory. Classical fisheries management theory starts from the assumption that the problem of over-fishing is just another example of the famous *tragedy of the commons,* as popularised by Hardin (1968; see also Chapter 1). On this account, the open access character of the fishery induces fishermen to compete with each other to catch more fish. Eventually, the fish stock will collapse as there is no way in which a responsible fisherman can protect the positive effects of his restraint from other fishermen who behave more opportunistically. Given this situation, the only way in which fish stocks can be preserved is through state-initiated regulation, be it either in the form of state-administrated constraints or the introduction of some form of private property. Economic theory also suggests that the introduction of private property is superior to administrative rules, because it changes the incentive structure such that the owner of the resource bears all the costs of over-fishing and/or reaps all the benefits of exercising restraint.

Over the past decades, the classical model of fisheries management has been criticised for being overly optimistic about the possibilities of governments to develop, implement and enforce rules and property rights that prevent fisheries from being over-exploited. Also, the classical fisheries management perspective tends to underestimate the capacity of fishermen to self-organise in order to prevent overexploitation of the resource on which they depend. There have been many cases documented in literature which show that community-based management systems exist in which fishermen cooperate together in order to exercise restraint among themselves and exclude outsiders (Berkes 1989, Ostrom 1990). As a result, co-management has been proposed as a promising way forward for fisheries management. Co-management takes a middle course between state-initiated approaches on the one side and community-based approaches on the other side (Jentoft 1989). It involves the delegation of some management responsibility currently residing with the government to fishermen organisations themselves. The idea is that direct involvement of fishermen increases the legitimacy of the rules, and that by increasing the legitimacy of the rules fishermen are more likely to abide to them voluntarily (Jentoft and Mikalsen 1994). Co-management therefore entails a critique of traditional fisheries management theory, which assumes an unrealistically prominent role for the state. However, the co-management perspective itself has been criticized too, from an empirical point of view, as more experience had been gained with co-management in practice, but also from a more theoretically point of view, in terms of modern democratic governance theory. We will now turn to this critique of co-management.

5.4 Co-management reconsidered

5.4.1 Instrumental versus empowering co-management

Social scientists studying co-management initiatives in practice distinguish between two types of co-management: instrumental and empowering (Viswanathan *et al.*, 2003). In the former case, co-management is basically seen by governments as just another instrument to reach their objectives more efficiently by involving fishing communities in the implementation process. In the latter case, co-management is seen as a more radical institutional innovation, where governments and fishermen organisations really share the power on more equal terms. This may entail fishermen involvement not just in issues of implementation but also in setting management objectives as such. Empowerment of fishing communities would mean to give the people within the fishing communities a real chance to influence their own future. If we look at co-management in practice, it is true that fishermen organisations quite often are only involved in the implementation process. In the Dutch co-management system for example, fishermen are involved in managing some practical aspects of the quota system (intra and inter group trade of quota, group administration of days at sea, private obligation to auction all fish under quota). Fishermen involvement does not extend to the constitution of the quota management system as such (individual quotas and a national days at seas regulation existed already before the co-management system was introduced). Neither does the Dutch co-management system extend to the setting of fisheries management objectives as such. Total Allowable Catches for example are set in the context of the prevailing decision making procedures of the European Union Common Fisheries Policy. This explains why quota management groups in the Netherlands have indeed complained that they are made co-responsible for enforcing rules, in which they had no say in making (Van der Schans, 2001).[14]

From a public administration theory perspective however, we should not belittle of private sector involvement in the implementation and enforcement of rules that are basically public in nature (Van der Schans *et al.*, 2003). Given the inherent complexity of much public policy making, and also given the limited capability of state administrators to oversee the practical consequences of many complex rules, a lot can be gained if the target group of the rules is involved in the implementation process. This is a basic principle in much environmental regulation in the Netherlands and other developed countries (Van Vliet, 1992). It is particularly in the implementation and enforcement process, that public rule making often develops its own logic, such that the state administration not only prescribes the goals to be reached but also, and often in great detail, the means deemed appropriate to reach the goals. In this way, public regulation may however become more burdensome for the target group affected, than would be strictly necessary to reach public goals.[15] For example, in order to increase the efficiency of monitoring and enforcement of individual quota uptake, the Dutch government in the 1980s introduced detailed rules to land fish (e.g. landing hours and procedures). Fish not landed according to the prescribed rules was assumed to be fished illegally (above quota), whereas in practice it was almost impossible for fishermen, even if they did not want to, not to break a rule. Under the co-management system introduced in 1993, fishermen voluntarily committed themselves to auction all fish under quota, which improved the transparency of the landing process to such an extent that strict landing hours and procedures could be relaxed or abolished. The same happened with public restrictions on trade in fish quota among fishermen. In order to keep track of changes in catch entitlements in relation to the amounts

[14]Fishermen have some influence over CFP policy goal setting however through their regular sectoral interest representation in the national and EU decision making machinery.

[15]Apart from that, when the means to reach a public goal are prescribed in law in detail, this tends to remove the incentive for innovative companies to come up with more effective means to reach the goal. Means-oriented regulation tends to frustrate innovation (for examples in pig farming; see Van der Schans *et al.* 2000).

of fish landed by individual fishermen, the government previously had to put severe restrictions on trade in quota among fishermen. Most fishermen would benefit from unrestricted trade in quota however; as this allows them to respond to unforeseen circumstances (such as break down of an engine, or adapt the balance of catch entitlements for different target species in a mixed fishery). Under the 1993 co-management system, fishermen are allowed to trade quota throughout the year, in exchange for providing the government with more transparency in quota transactions (control and enforcement agency AID was granted access to relevant group administrations). A study conducted in 1996 to evaluate the co-management system estimated that group members gain over 70.000 DFL (32.000 Euro), mainly because they are able to use their individual quota more effectively given the flexibility provided by the co-management system (LEI, 1996). Thus, being involved in rule implementation may increase the legitimacy of regulation already, even if the target group is not (directly) involved in the goal setting stage of the regulation.

Therefore, it can be concluded that fishermen involvement in rule implementation cannot be discarded too easily, as being just instrumental rather than empowering co-management. Fishermen may benefit substantially if public policies are implemented more flexibly and more responsive to individual circumstances and local business practices, without compromising the publicly decided objectives to be reached. Apart from that, it should be noted that fishermen are but one group with a stake in the marine environment, there are other societal interests as well. So if fishermen are granted a more prominent place in public decision-making, this should be extended to these other stakeholders as well. This point will be elaborated next.

5.4.2 Corporatism versus multi-stakeholder approach

The co-management approach has been criticised also for being biased too much towards fishermen organisations as the only group to be involved more directly in the management of the fishery. In practice there are often differences of interest both within fishermen groups and also between the fisheries sector and society at large. Increasingly, it is recognised therefore that fishermen organisations may not be perfectly representative, and that other societal groups are affected by management decisions as well. Hence, the interests of a variety of stakeholders should be somehow included in the decision making process (Jentoft and McCay 1995). Fishermen may differ according to the technology they employ, the species they fish, the licenses they have, the area they come from, etc. There may also be difference between boat owners and crew members, part-time and full-time fishermen, etc. Given this variety of interests, it can not be taken for granted that delegating management responsibility to fishermen organisations just like that increases the expediency and legitimacy of rules among all fishermen belonging to the target groups. In addition, it should be recognised more explicitly that other societal groups also have a stake in the management of the fisheries.[16] Environmental groups for example have long drawn attention to the negative side effects of fisheries management (by catch, high-grading, ecosystem disturbances more generally). In addition, it is generally acknowledged now that other uses of the marine environment -apart from economic activities, such as fisheries, transportation, and fossil energy extraction- are also important, most notably nature conservation (see later in this chapter).[17]

[16] These other groups obviously include fish traders and processors, whose economic performance is directly affected by the success of the fisheries management system locally. Evidence suggests that fishermen self-manage their fishery not so much to preserve the stocks at sea, but rather to increase the price they are paid for fish in the market. A case in point is the fishermen co-operative in the New York Bight region, which discovered that it was able to influence the price of whiting in its favour by limiting the supply of fish (McCay 1980; Van der Schans 2001, p. 279 and following).

[17] There are also arguments in favour of a special position for fishermen in the regulatory process. In the end of the day it is the fisherman who must abide to the rules, so it is better to engage him in rule

Traditionally, fishery management systems do not take into account the wider societal concerns sufficiently. This is particularly so in European countries with a corporatist tradition, such as the Netherlands, Norway and Denmark (Van Hoof *et al* 2005).[18] In the corporatist tradition, industries can be organised in sectoral sub-divisions (occupational groups or professions), consisting of employers and employees under the direction of the state, which assume management responsibility for certain aspects of economic activity, such as labour conditions, quality standards, trading rules, etc. In a corporatist form of economic organisation there is no conflict in principle between sector and societal interests, as both are assumed to be organically intertwined. In practice however, corporatist decision making has often been criticised for being dominated too much by the particularistic interests of a small group of organised industry, at the exclusion of other non-organised industry groups and societal interests not represented by the corporatist elite.

For The Netherlands, the corporatist decision making arrangement was able to resist the imposition of severe restrictions in agriculture throughout the 1970s and 80s. The agricultural policy community at that time has been referred to as an "iron triangle", consisting of organised industry, sectoral Ministry government officials and sectoral spokes persons in Parliament (Frouws, 1994). Towards the end of the 1980s, the erosion of the "iron triangle" irreversibly began, as the limits to growth in agricultural production became visible (overproduction, environmental degradation), the sector became internally divided, and pressure group activism gained prominence in the public decision making process. Even though the over-all corporatist landscape changed drastically in The Netherlands over the last couple of decades, corporatist institutions have not been dismantled in each and every sector equally, nor has the corporatist way of thinking disappeared completely. In fisheries, the corporatist Commodity Board for Fish and Fish Products traditionally played an important role in regulating the fisheries, for example in 1959 it instituted an obligation to auction all fish landed in the Netherlands. This semi-public obligation to auction was however believed to be in conflict with (expected) EC market regulation. The Board therefore abandoned its obligation to auction in 1975 (Van der Schans 2001). In the same year however, the North East Atlantic Fisheries Commission (NEAFC) established Total Allowable Catches (TACs) for several bottom species in the North Sea, including sole and plaice, cod, haddock, saithe and whiting. The Dutch government initially delegated the management of the national quota to the Fish Commodity Board. The Board was not able to sufficiently control fishing effort during the year, however, and the Ministry closed the sole fishery before the end of 1975 because the national quota was exhausted. In the beginning of 1976 the Fish Commodity Board therefore returned its quota management task to the Dutch government. In the turbulent years that followed (1776-1990), the Fish Commodity Board seemed to have lost its grip on sectoral policy making (Van Hoof *et al* 2005).

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making than to force him into rule compliance, which will be difficult to enforce (Jentoft, 1989). Apart from that, fishermen have a direct interest in the regulatory outcome, since their livelihood depends on it, whereas NGOs for example do not have such a direct interest, hence their participation in decision making may be organised differently (Jentoft and McCay 1995).

[18] In a survey studying the division of management responsibilities between fishing industry and governments in several European countries, it was found that in Northern-European countries (NO, DK, NL, FR) in particular there is a discussion how to include environmental interests more systematically in (co-)management decision making. In southern European countries (SP) the more important issue seems to be how to involve local fishermen organisations more prominently in national and regional fisheries management decision making (Van Hoof *et al* 2005).

The introduction of the co-management system in 1993 has been analysed as a re-formulation of the corporatist way of organising (Hoefnagel 2002). The co-management system re-introduced an obligation to auction all fish under quota (albeit under private rather than corporatist law), and also it re-introduced involvement of the Product Board of Fish in administrating the quota system (the Board provided secretarial support to quota management groups and also the groups' fishing plans were subject to approval of the Board). Interestingly however, it was the Ministry's Directorate of Fisheries, who took the political initiative to develop the co-management arrangement, and the Product Board of Fish (the corporatist organisation in fisheries) at first only offered lukewarm support. Also, the obligation to auction is private law and not semi-public (corporatist) law. This suggests that the co-management system in the Netherlands is perhaps not so much a sign of revitalisation of corporatism, but really co-management is competing with corporatist organisation (Van Hoof *et al* 2005). Quite interestingly, however, the Ministry's Directorate of Fisheries did not completely by-pass or ignore the existing corporatist structure, but offered it a coordinating role in the design of the co-management system as well as in its implementation. Thus, the technical and organisational support initially provided by the Product Board of Fish indeed seems to have been an important factor accounting for the success of co-management in the Dutch flatfish industry (Van der Schans 2001).[19] A drawback of this evolutionary rather than revolutionary approach however may be that other societal concerns, such as environmental groups, are not represented in the flatfish co-management arrangement, as they also do not have a place in the existing corporatist structure in fisheries in The Netherlands.

The previous discussion indicates the relevance of raising the question how a multi-stakeholder approach to fisheries management can be organised in practice. From a public administration perspective, this could either be done by re-orientating the existing institutional arrangements by integrating other societal concerns more systematically. For example, in the Netherlands it has been proposed to open up the existing corporatist structure for NGOs (SER 2000, pp. 38-40). Or it could be done by superseding the existing decision making machinery through the introduction of new and innovative, but less exclusive, and more flexible, some may argue therefore also more adequate, co-governance arrangements (Kooiman *et al* 1999).

5.4.3 System character of governance problem

A final point of critique of the co-management approach is related to the fact that *formally* delegating management responsibility to fishermen organisations does not yet mean that fishermen organisations *actually* control the most important factors influencing their fishing behaviour. A case in point is the situation that the relevant ecosystem boundaries extend beyond the territorial jurisdiction of the co-managing fishermen organisation. This is in fact a classical tragedy of the commons problem. Any voluntary effort to restrict catches will be undermined if the fish stock is over-exploited elsewhere by fishermen who share access to the same resource base, but are no party to the co-management arrangement. The fact that there must be congruence between the decision making capacity of the resource users and the boundaries of the resource base to be managed is generally recognised as a pre-condition for

[19]Experiments with farmer self-organisation (as part of a co-management arrangement) also took place in other agricultural sectors in the Netherlands, for example the development of farmer environmental cooperatives, which play a role in the implementation of nature conservation and manure application policies. These experiments have not been so successful however, as the Biesheuvel group system, and this may be (partly) due to the fact that they were introduced quite independently of the corporatist institutions still existing in these sectors (Van der Schans 2003). The co-management approach in fisheries presupposes the existence of strong fishermen organisations. If such organisations do not exist, they must first be developed before fishermen can take over (some) management responsibilities (Jentoft and Sandersen 1996).

the success of resource user self-management (Ostrom 1990). It is all the more remarkable therefore that the Dutch co-management system is a success, even though no such arrangements exist in other European countries bordering the North Sea with fishermen fishing side by side with the Dutch. This can be explained however if we take into account that the Dutch co-management system is more about implementation rather than goal setting (as we discussed before), and also that the Dutch co-management system was designed such that it provides concrete benefits for Dutch fishermen who join the system, *vis a vis* other fishermen who do not join the system (as discussed above). Obviously, it is not always possible to design a co-management arrangement in such a way that fishermen participating in the system capture concrete benefits, even if other fishermen fishing the same fishing grounds do not participate. Hence, there are limits to the development of co-management at the local level, when a tragedy of the commons remains unresolved at the system level. A case in point may be the extensions of the Dutch co-management system that have been proposed more recently. A committee was formed in 2002 to review the existing co-management system and also to study ways to extend the (enforcement) responsibilities of the groups, notably in the field of technical measures (where and when to use which mesh sizes), and also engine capacity control (does the actual HP power of the engines conform to the licensed HP power?). This extension of responsibilities was resisted by the fishermen organisations however, who argued that the differences in control and enforcement between EU countries were too large in order for the Dutch to incorporate these measures in the co-management approach (this would undermine a level playing field; Van Hoof *et al.*, 2005).

There may be other systemic mechanisms preventing fishermen who have been formally delegated management responsibility to actually take (some) control over their destiny with regard to a fishery. Due to the globalisation of markets, fishing as an economic activity is increasingly being dominated by international market forces. Thus, in a very real sense the penetration of distant markets has contributed to the declining ability of local communities to manage their local resources (McCay and Jentoft 1996). In a context of non-local fish trade, it is for example not so easy anymore for fishermen organisations to increase the price in the local fish market by limiting the supply of fish. The possibility to manipulate prices however has often been an important motivation for groups of fishermen to self-organise (e.g. McCay 1980). For example, the introduction of voluntary catch effort limitations in Dutch flatfisheries in January 1984 (see text box above) was motivated by expected price increases in the local fish market (Van der Schans 2001). The introduction of bureaucratic rules may be another factor limiting the ability of fishermen organisations to self-manage their exploitation of a fishery. Where the state takes over control, this may in effect mean a disruption of social and ecological responsibility that used to be a concern of co-managing resource users themselves (McCay and Jentoft 1996). An example of this with respect to the Dutch co-management system is the introduction of a days-at-sea regulation at the European level in 2004, replacing the national days at sea regulation that existed in The Netherlands since 1987. The problem with European days at sea regulation is that it doesn't allow for the flexibility, which had been awarded to fishermen participating in the co-management system under the national days at regulation (10% extra days at sea for group members and the sharing of surplus days-at-sea among group members). Group boards argued therefore that this type of regulation is dis-proportionate and inconsistent, as it prescribes in detail the means (EU defined days at sea) to reach goals (EU decided catch restrictions). Thus, at EU level a policy instrument is introduced to replace an alternative developed at the national level (NL defined days at sea), which has proven to be effective while allowing for flexibility and a sharing of management responsibilities between government and industry (Van Hoof *et al* 2005). Group boards were asked to oversee compliance to a rule, but they didn't have a say in the constitution of the rule (a case of instrumental rather than empowering co-management, as discussed above).

5.4.4 Co-management is not an alternative to 'state' or 'market

The discussion in the previous paragraph brings home the point that co-management can only thrive if it is properly embedded in the overall governance system in place to manage a fishery. This point may seem obvious enough, but note that in the public administration literature co-management is often presented as an *alternative* to more classical governance instruments, such as bureaucratic rules or private property rights which are presumed to be ineffective per se to manage the fishery (Dubbink and Van Vliet 1996, Kooiman *et al* 1999). In practice however co-management is often complementary to other governance instruments (it does not replace the classical mix of governance instruments, but rather makes it more complete).[20] In the Dutch case, co-management did not replace the existing governance structure, but rather made more intelligent use of its components (it provided a more sophisticated implementation of the quota and national days at seas regulations, instruments which in themselves remained in place without change). In fact, the public system of rules and regulations was complemented (rather than replaced) by a private system of rights and obligations (group contracts and bylaws). This private system was in principle voluntarily agreed among group members themselves, but in practice the Ministry provided detailed guidelines as to how the system of private rules should be framed in order for group members to qualify for more flexibility in public rules. Thus, co-management should not be seen as a stopgap to undo the failures of state-initiated regulation or market-based approaches, rather for co-management to be successful it seems to require a well-functioning public administration that has a clear view on which responsibilities can be shared with industry and also which steps need to be taken to create the conditions that are conducive for the industry to take up its co-management tasks properly.

5.5 Co-management as an example of 'good governance'

More fundamentally, the co-management debate has brought to the foreground the notion that regulation will be more effective, if it is perceived as more legitimate by those addressed by the rules. But this holds for any form of regulation, including state-administrated bureaucratic rules, and market based instruments such as tradable rights. The legitimacy of regulation is a challenge for democratic government anyhow. Modern democracy should strive for legitimate government anyway, not just with respect to voluntarily agreed co-management arrangements but also -and perhaps even more so- in relation to state-centred and/or market based governing arrangements -as these ultimately depend on the state using its monopoly of force (Van der Schans 2001). Advocates of co-management also seem to take for granted that giving fishermen organisations a greater say in fisheries management as a matter of course improves the quality and legitimacy of decision making. In practice however co-management decision making may be dominated by local elites of fishermen, who do not necessarily take into account the interests of the whole fishing community to be represented. Other interests (outside the fishing community) also play an increasingly prominent role (the multi-stakeholder approach, as discussed above).

In order to improve fisheries management, we must therefore look for a perspective which does not limit itself to the possibility of introducing co-management but rather addresses the

[20]In countries where governments are under-resourced and markets are underdeveloped, co-management may function in practice as an alternative to state-initiated or market-based regulation. But in the context of a lawful society, where governments have the capacity and resources to implement bureaucratic rules and oversee markets, co-management arrangements can be sustainable in the long run only if they are embedded properly in the wider institutional context. In such cases, co-management is not an alternative *instrument* to classical fisheries management instruments, but rather it provides an alternative *perspective* on fisheries management.

issue of good governance in general. Related to this is the point that direct participation -a defining characteristic of co-management- is but one way to increase the legitimacy of regulation. There are other ways to increase the legitimacy of public decision making as well, for example by improving the process of indirect participation (political representation), by encouraging transparency (which allows constituencies to monitor what their representatives decide and to take notice of the reasons used to legitimate decisions) and accountability (which allows constituencies to hold their representatives responsible for what they have decided).[21]

An increasing number of government agencies, including international ones, have explicated the normative conditions to satisfy the way in which they exercise power. For the European Union these principles are (COM(2001) 428):

- *openness* (relevant information should be accessible and understandable)
- *participation* (a wider group of relevant stakeholders should participate in the policy chain; from conception to implementation)
- *accountability* (it should be clear who at which level is responsible for what)
- *effectiveness* (policies must include explicit objectives, and they must be based on an evaluation of future impact and past experience, they must also be properly enforced)
- *coherence* (policies in one field and by one agency should be coherent with those in other fields and of other agencies), *proportionality* (the instruments selected should be proportionate to the goals to be achieved)
- *subsidiarity* (is the European level indeed the most appropriate level?).

These principles apply to governance in general, but they are also relevant to the functioning of fisheries management in particular. In its Roadmap to reform the Common Fisheries Policy, the EU Commission has explicitly taken the position that these European governance principles should be embodied into the new Policy (COM(2002) 181). This change of perspective can be seen in the global fisheries management debate more generally (Kooiman *et al* 2005), such that the focus shifts from a purely technical-instrumental approach ('which policy instruments are effective?') to a more social-political approach ('which policy proposals are perceived as legitimate?'). This also involves a shift in focus from performance-oriented criteria (impact on fish stocks, socio-economic goals, etc.) to performance- *and* process-oriented criteria (quality of decision making process; Van der Schans *et al* 2003).

[21]Alternative ways to produce legitimacy may in fact be more appropriate in the context of a modern society where governance issues are so complex and diverse that it is hardly possible for all stakeholders involved in practice to *participate directly* in each and every step of the decision making process. To make a multi-stakeholder approach practical, one can think of a co-management arrangement in which fishermen are involved directly, while representatives of NGOs are involved only indirectly in decision making. Still this co-management decision making should be legitimate for NGO constituencies as well. Hence, decision making should be *transparent* and it should be possible to hold the decision makers *accountable*.

EU Governance, a White Paper, COM (2001) 428:
Five principles underpin good governance: *openness, participation, accountability, effectiveness and coherence*. Each principle is important for establishing more democratic governance. They underpin democracy and the rule of law in the Member States, but they apply to all levels of government – global, European, national, regional and local.

- **Openness**. The Institutions should work in a more open manner. Together with the Member States, they should actively communicate about what the EU does and the decisions it takes. They should use language that is accessible and understandable for the general public. This is of particular importance in order to improve the confidence in complex institutions.
- **Participation**. The quality, relevance and effectiveness of EU policies depend on ensuring wide participation throughout the policy chain – from conception to implementation. Improved participation is likely to create more confidence in the end result and in the Institutions which deliver policies. Participation crucially depends on central governments following an inclusive approach when developing and implementing EU policies.
- **Accountability.** Roles in the legislative and executive processes need to be clearer. Each of the EU Institutions must explain and take responsibility for what it does in Europe. But there is also a need for greater clarity and responsibility from Member States and all those involved in developing and implementing EU policy at whatever level.
- **Effectiveness**. Policies must be effective and timely, delivering what is needed on the basis of clear objectives, an evaluation of future impact and, where available, of past experience. Effectiveness also depends on implementing EU policies in a proportionate manner and on taking decisions at the most appropriate level.
- **Coherence**. Policies and action must be coherent and easily understood. The need for coherence in the Union is increasing: the range of tasks has grown; enlargement will increase diversity; challenges such as climate and demographic change cross the boundaries of the sectoral policies on which the Union has been built; regional and local authorities are increasingly involved in EU policies. Coherence requires political leadership and a strong responsibility on the part of the Institutions to ensure a consistent approach within a complex system.

Each principle is important by itself. But they cannot be achieved through separate actions. Policies can no longer be effective unless they are prepared, implemented and enforced in a more inclusive way.

The application of these five principles reinforces those of

- **proportionality and subsidiarity**. From the conception of policy to its implementation, the choice of the level at which action is taken (from EU to local) and the selection of the instruments used must be in proportion to the objectives pursued. This means that before launching an initiative, it is essential to check systematically (a) if public action is really necessary, (b) if the European level is the most appropriate one, and (c) if the measures chosen are proportionate to those objectives.

In conclusion of this review of the literature on fisheries self-organization, it should be noted that it is possible to reformulate both the argument for co-management as well as the critique on co-management, as discussed above, in terms of principles of governance, such as introduced above. At first, one could argue that the debate on whether co-management is instrumental or empowering is captured by the governance principles of participation and subsidiarity (to what can fisheries decision making power be delegated to the local level of government and/or to fishermen organizations?) and proportionality (are the means publicly prescribed proportionate to the goals to be reached, or is there room for private deviations of means without compromising public goals?). Secondly, the question whether fishermen organizations should play a special role in management or whether co-management should be based on a multi-stakeholder approach is captured by the governance principles of openness (relevant information should anyhow be accessible), participation (a wider group of relevant stakeholders should be able to participate in principle) and accountability (for those who do not participate directly, it should be clear who is responsible for what). Lastly, the fact that fisheries co-management should be embedded in a larger institutional framework is covered by the governance principles effectiveness (co-management decision making capacity should be congruent to the boundaries of the resource to be managed) and coherence (the larger

institutional setting should facilitate rather than frustrate the delegation of decision making capacity to fishermen organizations). In the final section of this chapter we will use the points raised here to discuss several empirical cases of co-management which include nature conservation. But first these cases will be introduced in the next section.

5.6 Fisheries self-management and nature conservation

We now have some more insight in the way in which fishermen self-organisation or co-management can contribute to the more classical goals of fisheries management (conservation of target species, socio-economic goals). This section aims to address the question to what extent fishermen self-organisation can contribute to maritime nature conservation. Maritime nature conservation also includes the protection of non-target species, and the reduction of negative side effects of fishing on the maritime ecosystem more generally. These are goals that fishermen may find difficult to pursue voluntarily, as it is not immediately obvious how they directly benefit from them.

The more encompassing perspective on fisheries management, which goes beyond stock conservation, is often referred to as the *ecosystem approach to fisheries* (FAO 2003a). From an ecosystem perspective, fish stocks are not just isolated natural production units but also functionally integrated (parts of) living ecosystems (Van der Schans 2001). Ecosystems tend to exhibit a high degree of interpenetration. Ecosystem elements are related in many ways to each other, and to the whole: 'everything is connected to everything else'. Ecosystems therefore possess properties that cannot be predicted on the basis of knowledge of component parts; ecosystem properties 'emerge'. Incorporating ecosystem considerations in fisheries management entails, among other things, taking into account the impacts of fisheries on the marine ecosystem and also the impacts of the marine ecosystem on fisheries (Reykjavik Declaration on Responsible Fisheries in the Maritime Ecosystem 2001). This interconnectivity should be taken into account even if there is incomplete scientific knowledge about the structure, functioning, components and properties of the ecosystem as well as about the ecological impact of fishing; the precautionary approach. The objective of including ecosystem considerations in fisheries management is to contribute to long-term food security and to human development *and* to assure the effective conservation and sustainable use of the ecosystem and its resources (Reykjavik Declaration 2001; see also FAO 2003b). There have been several calls over the past decades to incorporate the ecosystem approach into fisheries management: UN Conference on Human Environment, Stockholm 1972, UN Convention of the Law of the Sea 1982, UN Conference on Environment and Development 1992, including the Agenda 21 which advocates an ecosystem approach to ocean management, Convention on Biological Diversity 1992, World Summit on Sustainable Development, Johannesburg 2002 (see also FAO 2003a). We are now entering an era however that ecosystem considerations are not just called for in international conferences but they actually become enshrined in national laws, for example in Canada, Australia and the United States of America (Sainsbury and Sumaila 2003). More recently there is also a move to include ecosystem considerations more prominently in international agreements covering the high seas, such as the Agreement for the Conservation and Management of Straddling Stocks and Highly Migratory Fish Stocks, which was established in 1995 and is currently under review (UN 2006).

The increased attention for ecosystem considerations in fisheries management stems from at least two sources. Firstly, fisheries management based on a single species approach has failed to conserve fish stocks, even those that are valuable from a commercial point of view, l*et a*lone reduce the negative impact of fishing on non-commercial species and habitats. The standard bio-economic model of a fishery assumes a direct relation between stock size and

recruitment success, a relation that has been very difficult to quantify in practice however and also that fails to take into account the complex and dynamic interactions with other species and the natural environment at large. A more ecologically informed alternative model suggests that the biomass of the ecosystem as a whole is relatively stable, but the biomass of individual species varies unpredictably (Wilson *et al*. 1994). Even if minor variations in quantitative inputs may lead to considerable differences in outcomes, the qualitative behaviour of the ecosystem is relatively stable throughout the years. From a management perspective, this analysis implies a shift away from quantitative harvesting limits for individual species, which used to be the policy instrument most favoured in the conventional analysis of the overfishing problem (as discussed earlier). Rules should not so much focus on maintaining minimum stock sizes of individual species, as recruitment success anyway fluctuates erratically given the complex ecosystem dynamics at sea. But rather rules should focus on maintaining the basic biological processes, which constitute the long-term reproductive capacity of the ecosystem (spawning, migration, etc.). The ecosystem approach to fisheries management therefore argues for instruments such as territorial use rights, gear restrictions, and/or other rules which prescribe how, when and where to catch the fish (rather than how many fish should be taken). It also suggests adaptive harvesting strategies that allow for switching between species. When catch per unit effort for one species declines, it makes ecological sense to switch to another species.[22] In conclusion, the idea is that if fisheries management is extended to include ecosystem considerations, it is better able to ensure the continued productivity of the seas; hence, to secure a livelihood for fishermen whilst maintaining the natural integrity of the maritime ecosystem (FAO, 2003a).

Secondly, ecosystem considerations get more attention in fisheries management due to the fact that in many countries the societal appreciation for the different functions of the seas has changed, notably the nature function gains importance over economic functions such as fisheries. From an ecosystem point of view -some call this ecocentric (Eckersley 1992)- ecosystems are to be protected for their own sake, not just for their capacity to provide goods and services to humankind. In any case, there are now many examples around the globe where ecosystem conservation, as a form of wild life management, has become a legitimate management goal in its own right, not just on land but increasingly also at sea. In the Netherlands, for example, in 1993 the government produced the Sea and Coastal Fishery policy document which recognised that the relation between fisheries and nature needed to be reconsidered, such that nature considerations should be more prominent in fisheries policy making (LNV 1993). This was particularly so for designated areas in the coastal zone, such as the Wadden Sea, where fishing was still possible but only within the constraints of sustainable development and conservation. Under the new policy certain areas were permanently closed for mussel seed and cockle fisheries, and in years of poor production a certain amount of shellfish had to be reserved as food for birds at the expense of what was available for fisheries. The protection of the Wadden Sea ecosystem is accorded under national spatial planning law (there is a special national planning decision which formulates the Dutch government policy with respect to the Wadden Sea; PKB Waddenzee), and nature conservation law (some parts of the Wadden Sea are accorded the status of National Nature Reserve). We return to The Wadden sea example later.

It is important to note that there has been an interesting development over the past decade in the Dutch maritime policy arena, in that it is now recognised that nature conservation is not limited to designated areas of the coastal zone, such as The Wadden Sea, but should extent

[22]One drawback of assigning quantitative catch restrictions per species to individual fishermen is that switching between species is more difficult. The Dutch group system, precisely re-introduces some of this adaptive flexibility by allowing fishermen to trade in excess sole or plaice quota among group members.

to the territorial sea (up to 12 mile) and the Exclusive Economic Zone (Dutch part of Continental Shelf) as well. The largest amount of nature in The Netherlands is to be found at sea, and environmental pressure groups increasingly demand that areas of special interest at sea are to be protected; for example the Foundation North Sea asks for the protection of five areas in the North Sea (SDN, 2003): Doggersbank, Centrale Oestergronden, Klaverbank, Friese Front en Kustzone).[23] But also at the European level it is recognised that land-based conservation policies should be extended out to the seas. For example, in 2002 the EU Commission decided to expand its ambitious European ecological network Natura 2000 to include an offshore marine environment network. This means that the EU Birds and Habitat Directives (79/409/EEC and 92/43/EEC respectively) also apply to the seas (COM(2002) 539). In addition, the European Ministers of the Environment (in the OSPAR Commission) recommended in 2003 that there should be a network of marine protected areas by the year 2010 (OSPAR 2003). Even though these international initiatives do not preclude fisheries in principle, it should be noted that their principle aim is to protect the marine environment rather than ensure the long term productivity of the fishery. For example, in areas designated under the Birds and Habitat Directives fishing activities (as well as other economic activities) may continue in principle only if it can be proven that they do not negatively impact the specific nature qualities that are afforded protection under the Directives. Initially it was assumed that this would hold for the development of *new* (fishing) activities in the protected areas, but there have been court rulings already that *existing* (fishing) activities should also comply with the new rules; see also Chapter 2. In 2004 Dutch nature conservation groups successfully questioned the licences issued by the Ministry of Fisheries to fishermen who use a mechanical suction gear to catch cockles in the Wadden Sea. In a prejudicial ruling, the European Court confirmed that the European Birds and Habitats Directives were indeed applicable to this type of activities (C-127/02). The Dutch Administrative Court (Raad van State) in turn ruled that the licences issued indeed needed to be withdrawn since the required appropriate assessment of environmental impacts had not been made (Raad van State 200407395/1 and 200409107/2). The contours of the new regime at the North Sea are not so clearly established yet as compared to the Wadden Sea. It is obvious however the relation between economy and nature is profoundly changing at sea also, even though it may still take years before it is exactly clear how the European directives will be implemented in national legislation, and which activity is allowed where and under what conditions (this was the opinion of fisheries and conservation policy experts at the SDN/W-UR workshop 01-12-05).

There are at least two somewhat different sources in theory which inspire the increased attention for ecosystem consideration in fisheries management; namely ecologically informed fisheries management, and wildlife management extended to the seas. In practice however there are many opportunities for 'fusion' rather than 'collision' to paraphrase the FAO document on the ecosystems approach (FAO, 2003a). For example, the institution of marine protected areas (MPAs) may protect habitats and ecosystem functioning, which should benefit wildlife, as well as structurally improve the production capacity and resilience of commercially exploited fish stocks, which should benefit fishermen (Roberts *et al* 2001).[24] In practice, it however depends very much on the particular fish stock and habitat characteristics under consideration whether or not proposed MPAs serve both the goals of nature conservation and

[23]The very fact that the Netherlands Environmental Assessment Agency commissioned this research project proves that there is growing interest in nature protection at sea.

[24]MPAs are controversial, however; see for example the discussion following the Roberts *et al* 2001 article (Science 15 Febr. 2002, pp. 1233-1235). The reported positive effect on fisheries can hardly ever be attributed to MPAs only, combinations of instruments, including conventional instruments such as catch limits, are therefore often preferable to stand alone MPAs. Nevertheless, MPAs are singled out as example here, because they are seen as the ecosystem management instrument par example, whereas conventional fishery management instruments such as catch limits are seen as representing the 'single species' approach of the past (Roberts 1999).

increased commercial yield equally and simultaneously (see below). Ecosystem-based fisheries management and wildlife protection both draw attention to the possible negative side-effects of other uses of the marine environment, ecosystem productivity is affected not just by fishing but also by pollution, for example. On this account, the institution of an MPA may prompt for example the adoption of land-based pollution reduction plans that also benefit fisheries, a case in point are the herbicide and pesticide reduction targets agreed with the sugarcane industry to protect the Great Barrier Reef MPA, which also benefited fisheries (WWF, 2005). More generally, both the ecosystem approach to fishery management and wildlife management extended to the sea draw attention to multi-stakeholder involvement in management decision making. Both recognise that the inherent complexity and dynamics of maritime ecosystems are difficult to comprehend from a single actor perspective. In fact, the multi-stakeholder perspective should not be limited to involving fisheries and nature conservation interests, but more pro-actively efforts should be made to involve other sectors of industry and society as well; for example the leisure industry. In this way, nature conservation may actually create new sources of income for fishermen, who on the one hand are limited in their possibilities to catch fish, but on the other hand may become involved in new ecosystem-based economic activities such as recreational diving, tourism, and supplying eco-certified fish to premium market outlets. Some examples of a more or less successful transition from a fisheries-based to an ecosystem-based local economy will be provided later.

5.7 Marine protected areas

The institution of marine protected areas is seen as a key tool to include ecosystem protection as a management objective in its own right (Greenpeace 2004). Marine protected areas (MPAs) are 'discrete geographic areas that have been designated to conserve and enhance marine resources by an integrated plan that includes restrictions on some activities'. A very commonly used definition of MPA internationally is provided by IUCN, 'any area of inter-tidal or sub-tidal terrain, together with its overlying water and associated flora, fauna, historical, or cultural features, which has been reserved by law of other effective means to protect part or all of the enclosed environment' (Kelleher and Kenchington 1992, cited in: Agardy *et al* 2003). The term MPA covers the full range of area designations, from completely protected areas (no-take zone's or marine reserves proper), to areas where all extractive uses are excluded but other activities are permitted (e.g. recreation), and areas where a variety of activities (included fishing) is permitted, but within the restriction of sustainable use (Greenpeace 2004). MPAs are expected to be able to protect habitat and marine life within their boundaries, enhance spawning potential, and contribute to fisheries through larval transport and spill over of juveniles and adults. They are also controversial, however, especially when they include closed areas or no-take zones, as it is not always clear where boundaries need to be drawn at sea, and also which human activities exactly need to be restricted to what extent in order to prevent irreversible ecosystem damage.

MPAs have been advocated as an alternative to more conventional fisheries management tools, which were unable to prevent overexploitation and ecosystem degradation, but MPAs are not without problems themselves. The science underlying the (proposed) establishment and (proposed) management of an MPA is not always unproblematic (Agardy *et al* 2003). There is much debate among marine ecologists and fisheries biologists concerning the relative size of an MPA; the percentage of total ecosystem that needs to be set aside in order to reach certain biodiversity and fisheries management objectives. There may also be debate over the exact location of the MPA. Setting an MPA boundary may be relatively straightforward when clearly delineated fixed structures, such as coral reefs, are in need of protection, but it is a much more complex and ambiguous task, when the objective is to protect marine ecosystem characteristics which quite naturally change gradually in space and over time. The

latter may be the case for ecosystem characteristics in need of protection under the EU Birds and Habitats Directives.[25] Another issue heavily discussed by the marine conservation community is the proposed character of the MPA; which designation is most desirable given the (conservation) goals that must be reached. Should the MPA be strictly a no-take reserve, or a protected area, where destructive fishing practices are outlawed but sustainable fisheries are permitted? A combination of MPA designations may be the solution such that smaller no-take MPAs are integrated within larger multiple-use MPAs (Agardy *et al* 2003). Another issue which may be controversial is the (proposed) duration of an MPA in relation to the evaluation of its performance; which biomass targets must be reached within what timeframe before the MPA is revoked? Apart from these science related problems, there are also policy related problems with many MPAs. It is one thing to formally establish an MPA, but it is quite another thing to actually enforce compliance to MPA boundaries and restrictions, and to support and educate users to cope with the change of regime (Roberts and Hawkins 2000). This is particularly problematic when MPAs are quite large, when government agencies are under-resourced, and also when the users groups affected don't really accept the new regime. It tends to be difficult to restrict or ban human activities at sea when there is only limited evidence that they irreversibly damage the marine environment (outlawing the use of dynamite to fish coral reefs is more self-evident than outlawing practices such as mussel seed collection). It may be consistent with the ecosystem approach to embrace a precautionary approach anyway (FAO 2003a), but in practice this is not always easy, in particular when social and economic stakes are high (for example the user groups affected have few alternative means of employment). The establishment of an MPA may be challenged in court, which not only undermines its effectiveness but may also lead to a polarisation between user groups and NGOs that are involved, or between private parties and the government: "us" against "them" (Roberts *et al*. 2000). Against this background, it should come as no surprise that MPAs are not always successful; the degree of failure being estimated at approaching 90% in some countries (Christie *et al* 2003).

5.8 MPAs and co-management

Given the controversies and problems around the establishment and management of MPAs, it is interesting to see how affected parties are actually involved in decision making, more in particular to what extent co-management or community-based management can play a role. There is a growing literature now discussing the link between MPAs and co-management (Pomeroy 2003) or community based management (Roberts and Hawkins 2000:, p.80). In fact, the idea that community-based and co-management institutions may have clear, if not always intended, nature conservation benefits, has been around for quite some time already (Johannes 1978, Pinkerton 1989). Local self- or co-management arrangements often include marine reserves in the form of temporary or permanent spatial closures of areas of fishing for particular or all species (Wilson *et al* 1994, Pomeroy 2003). Interestingly, the Dutch government also linked the concepts of co-management and nature conservation more explicitly in its Sea and Coastal Fisheries Policy adopted in 1993 (LNV 1993). The new policy was focussed around two central themes: the (re-)distribution of management responsibilities between Government and fishing industry, and the (re-)consideration of the balance between economic activities and nature conservation.[26]

[25]This point was brought forward by marine biologist Niels Daan at the SDN/W-UR workshop 01-12-05 in relation to the protection of North Sea ecosystem characteristics generally referred to as the Frisian Front. The Frisian Front is no 'ecosystem' in any practical sense; it is a phenomenon which varies in space and time. It is anyhow strongly affected by natural developments taking place within the North Sea at large.

[26]For North Sea fisheries this led to the introduction of the quota management group system, discussed above (Van der Schans 2001). For North Sea fisheries, a fundamental re-consideration of the balance

Arguments in favour of a co-management approach to nature conservation are in essence rather similar to arguments in favour of a co-management approach to fisheries management as discussed above. Resource users and managers, scientists and other stakeholders can provide essential scientific and local knowledge on the biophysical and human dimensions of marine resource use to aid the design of marine reserves to achieve their goals and avoid unintended negative outcomes (Pomeroy 2003). It is expected that co-management's diverse participants will bring their particular knowledge and concerns to the process, and assist in the identification and definition of problems. The boundaries and objectives of MPAs may differ if local resource users are more actively involved, as this often leads to smaller MPAs and also to MPAs having social and economic objectives apart from merely biological ones, but it is expected that resource user involvement will also increase the legitimacy, hence effectiveness, of MPAs (Christie *et al* 2003). If local fishermen are involved, the MPA may be established and managed in such way that it is more likely to provide improved yields to the local fishery (Casia 2000, pp. 11-12). Community involvement may also lead to a more equitable distribution of economic benefits from establishing an MPA (local income from user fees, visitor facilities, etc.). It may lead to increased employment opportunities, both inside and outside the MPA (local people employed as guides, and in transportation, hotels, restaurants etc.). Resource users may also play an important role in implementation and monitoring, in that public and private parties are each uniquely equipped to handle specific aspects of enforcement, and all parties cooperating together are better able to provide an integrated approach (Pomeroy 2003). Community involvement can facilitate enforcement of regulation, as local people will understand and accept the purpose of the rules more readily, and also they may apply informal sanctions next to the formal ones in order to stimulate compliance (Casia 2000). Finally, engagement in monitoring provides participants with direct and credible evidence of the successes or failures of MPAs (Pomeroy 2003). Apart from that, involving local people on a voluntarily basis may also reduce the financial burden for government agencies, which may be under-resourced for example to develop interpretative and educational programs (Casia 2000).

Examples of local community involvement in the establishment and management of MPAs come from around the world, well-published cases are located in the Caribbean (St. Lucia, but also for example Saba Marine Park at the Netherlands Antilles; Roberts and Hawkins 2000), the Philippines (Apo Island and Sumilon Island, but also many marine reserves around other Philippine islands, for example Balicasag and Pamilacan; Christie *et al* 2002), and in the Pacific (Vanuatu, Samoa, and other island states in the Western Pacific; Johannes 2002).

between nature and fishing at the national level is hardly possible, as these fisheries are managed within the context of the EU Common Fisheries Policy (Van der Schans 2004). For the Wadden Sea this led to the introduction of a co-management approach which includes nature conservation goals more explicitly (Stein 1999), to be discussed below.

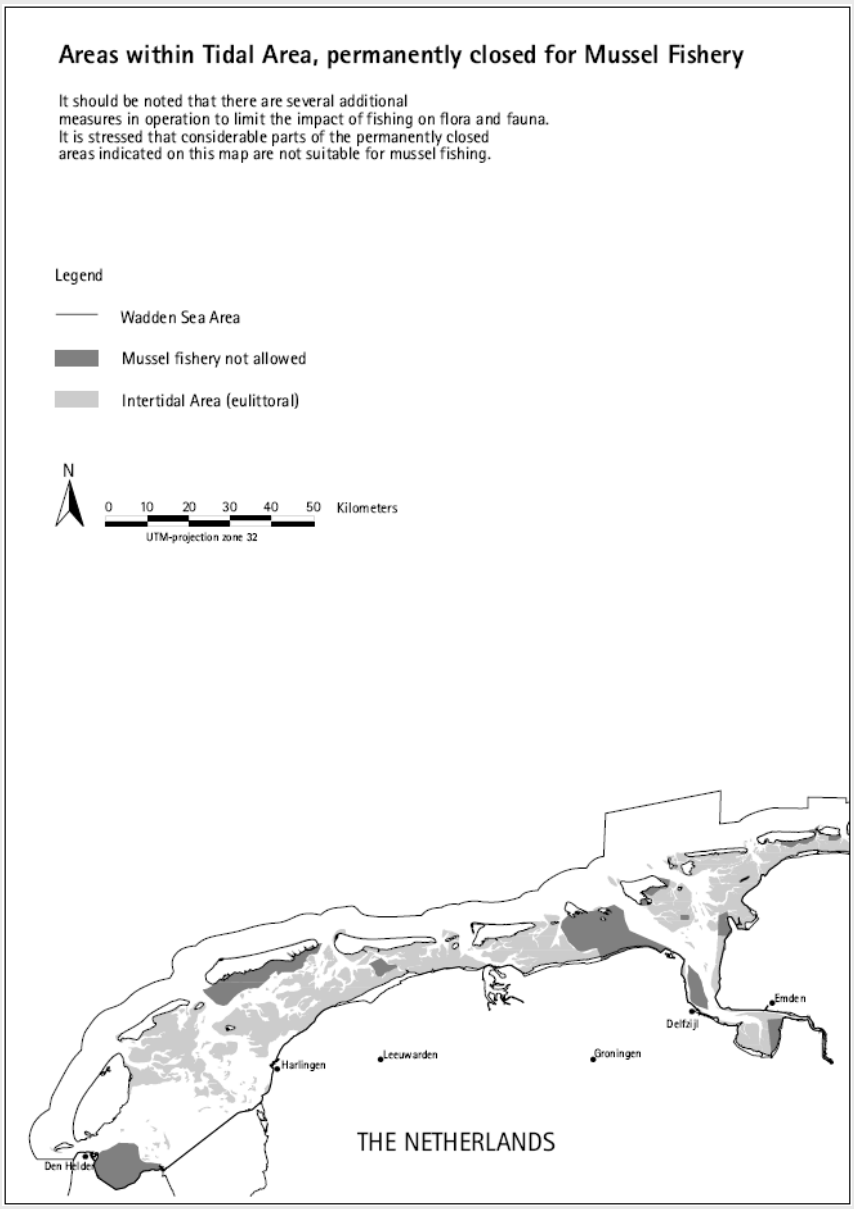
The Soufrière Marine Management Area provides a well-documented example of a participatory approach to nature conservation (Roberts and Hawkins 2000, pp. 98-101; Pomeroy 2003, p. 218). The town of Soufrière, at the Caribbean island of St. Lucia, attracts thousands of tourists every year because of its magnificent coastal scenery, sandy beaches and beautiful coral reefs. By the mid-1980s however, local fish catches declined and also conflicts between local fishermen and tourism operators increased. The St. Lucian government therefore tried to establish a country-wide system of fish priority areas and marine reserves. This top-down approach was viewed as arbitrary however, and strongly resisted by local fishermen.

A couple of years later, the St. Lucia government reconceived the process, using a more cooperative strategy this time however, coordinating with the Soufrière Regional Development Foundation (SRDF), a local NGO, and the Caribbean Natural Resources Institute (CANARI), a regional knowledge institute. This time the process involved all local stakeholders, including fishers, diving operators, hoteliers and representatives of the yachting community. A comprehensive management plan was crafted for 11 km of coastline, which lead to the establishment of the Soufrière Marine Management Area (SMMA) in July 1995. The plan involves a series of four no take zones interspersed between fishing areas and yacht mooring areas. The SMMA is a non-governmental organisation responsible for enforcing the management plan. This organisation employs a small staff of people, some of whom are responsible for patrolling the coastline by boat. Part of the running costs of the SMMA come from user fees paid by divers and yachters. Some fishermen felt that they had not been properly represented in the negotiations leading to the establishment of the SMMA, and resisted the plan initially. A compromise was worked out, which allowed a few older fishermen (with no other employment opportunities) to fish in part of one of the no-take zones, and also they were temporarily compensated not to fish in the rest of the no-take zones.

The SMMA has resulted in a higher biomass of commercially important fish, a higher biodiversity throughout the entire management area, and a reduction in conflicts between fishermen and tourists (Roberts and Hawkins 2000, p. 101). In fact more fishermen become engaged in tourism as they turn their boats into water taxis or pick up a part time job in construction. This does not mean that all problems are gone, however; the SMMA faces many challenges, for example coral reef degradation due to high sedimentation resulting from run-off from the land and via rivers (Pierre Nathoniel 2003).

The establishment of marine reserves at Sumilon Island and Apo Island, both small coralline islands in the central Philippines, has been well-documented (Russ and Alcala 1999, Roberts and Hawkins 2000, Pomeroy 2003), and provides an interesting example of the impact of community involvement on nature conservation. In both cases the conceptualisation of the marine reserve began with marine conservation and education programs at community level, initiated by the Marine Laboratory of Silliman University, located on the nearby island of Negros. In 1974 scientists from Silliman University, persuaded the municipal council of Oslob to declare one of the world's first marine reserves on Sumilon. By local government decree, a quarter of the island's coral reef was set aside for marine research and totally protected from fishing. The University appointed an experienced local fisherman as caretaker to ensure that no fishing occurred in the reserve, to disseminate information about the reserve among other fishermen, and to monitor fish catches from areas close to the reserve. Although some fishermen reported increased yields following the implementation of the reserve, fishing violations started to increase, when in 1980 a new major was elected in Oslob who favoured 'giving Sumilon Island back to the fishermen' (Russ and Alcala 1999). Confronted with this change in the local political climate, Sulliman University asked the national Bureau of Fisheries and Aquatic Resources to assume legal responsibility for the reserve, which it did. Local resentment against this top-down management approach grew however, and after 1985 the reserve became heavily fished. The municipal government, quite opportunistically as it seems, changed its policies several times in the following years. From 1988 it upheld a no fishing rule around the *whole* island to support the development of a tourist resort on Sumilon Island; when the resort was opened in 1992, all restrictions were lifted again, and over-fishing of the reserve resumed. These changes in local rules occurred despite the fact that Sumilon reserve officially retained a national protective status throughout the whole period, which shows that local support for nature conservation is more important than formal protection by national law (Roberts and Hawkins 2000). The Sumilon case stands in sharp contrast to the Apo marine reserve, which was also initiated by Silliman University, following a similar marine conservation and education programme begun in 1976. In 1982 Silliman University and Dauin municipality, under which jurisdiction Apo Island falls, reached an agreement to establish a marine reserve. Informally, protection by the local community started in 1982. Officially the reserve was established in 1986. The local community was involved in the establishment and management of the reserve from its conception. In 1985, the local community endorsed a comprehensive marine reserve plan, which included the no take sanctuary established in 1982, as well as a marine reserve covering the entire reef (up to 500 meters offshore), in which only non-destructive fishing techniques were allowed. A Marine Management Committee, consisting of local residents, was formed and given responsibility to maintain the sanctuary and reserve, with the Philippine Constabulary providing enforcement support and Sulliman University providing scientific and management advice. Evidence suggests that the reserve has strong local support and a good degree of community compliance with regulations (Russ and Alcala 1999). Apo Island marine reserve is a show case example of community based conservation management. Many fishermen report increased catches since the reserve and sanctuary are set up, and also most fishermen acknowledge the creation of island revenue from tourism. Two small tourist resorts have been set up (1991 and 1996) and the Apo sanctuary area is now a well-known dive site (Time Asia Magazine, May 27 2002, http://www.starwaves.tv/corp/2005/viewroom_rs04.jsp).

The Dutch Wadden Sea has been an important fishing ground for centuries, today shrimp, cockles and mussels being the most important target species. It is also Europe's largest wetland ecosystem; the area being an important habitat for coastal waterfowl and shorebirds. Furthermore, the Wadden Sea is an important nursery area for fish species from the North Sea and surrounding coastal waters (Stein 1999). Consequently, a large number of national and international nature conservation designations apply to the area, or parts of it. Apart from fisheries, the economic value of the Wadden Sea area includes merchant shipping, military defence, recreation, and also quite importantly the extraction of gas. Traditionally, fisheries management for the Wadden Sea was aimed at fish stock conservation.



In 1993 the Dutch Government adopted a new Sea and Coastal Fisheries Policy, signalling a re-consideration of the balance between fishing and nature conservation and introducing the concept of co-management as a guiding principle for policy implementation. For the Wadden Sea, this meant that management is aimed at nature conservation and the protection of natural processes. Fishing activity is allowed but only if it doesn't negatively affect nature values (LNV 1993, p. 52). More concretely, a total area of 26% of the Wadden Sea was closed for cockle fishing and mussel seed fishing to protect the development of mussel and cockle beds and eelgrass. Furthermore, in years with food shortage for birds a minimum of 60 % of the calculated mean food demand was to be reserved for the birds, and

fishermen were to be allocated quota for the remaining shellfish. If less than 60% of the mean food requirement for birds was available, the fishery would be closed. Within this framework the shellfish industry, in collaboration with nature conservation groups, was responsible for the design and implementation of a Shellfisheries Management Plan (1993-1998). Within the structure of this collaborative co-management framework, the Producer Organisations for the mussel and the cockle sectors were responsible for the design, and implementation of yearly fishing plans, which prescribe more precisely how, where and when shellfish can be fished (Stein 1999, Odus 2001). An important aspect of co-management was the installation of a black box on cockle dredgers and mussel vessels, which allowed an objective monitoring of compliance with (voluntary agreed and mandatory) zoning regulations. In an evaluation of the Sea and Coastal Fisheries Policy conducted in 2002, it was concluded that the shellfishery sector complied exactly with the restrictions agreed under the co-management arrangement (van Geffen *et al* 2002, p. 20). For the cockle sector this in effect meant a considerable economic loss: estimated at 32.9 million Euros over the period 1993-1997 (Stein 1999, p. 134). The whole idea of allowing mechanical cockle dredging in Europe's largest wetland ecosystem remained controversial however with certain conservation groups. They argued that, even though they were consulted about the content of the fishing plans, these didn't go far enough in terms of nature conservation (Stein 1999, p. 137). In subsequent years, the goal of nature conservation became more and more prominent in Dutch Wadden Sea policy making. This was in accordance with international obligations and agreements (Odus 2001, PKB Wadden Zee 2001). The policy framework gradually shifted from a situation were fishing was allowed until proven that it harmed the ecosystem, to a situation were fishing was not allowed unless it could prove that the ecosystem was not harmed. Conservation groups continuously challenged the licences issued by the Ministry of Fisheries, and court cases led to a further polarisation between the mechanical cockle fishing industry and NGOs. In 2000 the Dutch Government commissioned a research project to evaluate the effects of the Dutch shellfishery policy on the Wadden Sea ecosystem (EVA II), the results of which were published in December 2003 (Ens *et al*. 2004). The research concluded, among other things, that cockle fishery by suction dredging has significant impacts on the Wadden Sea ecosystem: e.g. there is more cockle biomass in closed areas than in open areas, cockle fishing disrupts the development of sea grass, and cockle fishing disrupts the sediment (see also Meijer *et al* 2004). On the basis of this research, the Dutch Administrative Court (Raad van State) ruled that mechanical cockle fishing licences issued in 2004 indeed needed to be withdrawn, since they didn't fulfil the requirements of the EU Birds and Habitats directives. This in effect meant the definite closure of mechanical cockle fishing at the Wadden Sea as of January 2005.

Although these examples are all listed as evidence that community involvement increases the success of an MPA, one should be careful to draw the conclusion that community based MPAs are always successful. First of all, there are important differences between the examples listed, as to the way in which the community has been involved more precisely in establishing and managing the MPA. Secondly, evidence suggests that the community based approach exemplified by the well-published success stories cannot be translated indiscriminately to other contexts. Inspired by the initial success at Apo Islands, the community based MPA model has been replicated throughout the Philippines, but with a disappointing high rate of failure (Christie *et al* 2003). There is also much debate whether the experiences gained with (small-scale, community-based) MPAs in the tropics can be translated for use in temperate conditions (Polunin 1999). Although this is not the place to provide a comprehensive analysis of the literature on community based MPAs, in the last section of this chapter some comments will be made. The structure of the analysis follows the issues singled out in the first part of this chapter, when the concept of co-management was critically reviewed in light of principles of good governance.

5.9 Fishermen participation in MPAs

There are several ways in which fishermen organisations can be involved in establishing and managing MPAs. The evidence suggests that fishermen themselves hardly ever take the initiative to include nature conservation in self-management efforts. The exceptions to this are

probably the traditional fisheries management practices described by Johannes, who reports that artisanal fishermen often adopt measures, such as self-imposed closed seasons, closed areas, and gear restrictions that deliberately or inadvertently function as conservation measures (Johannes 1978). In most other cases, the initiative is taken by parties outside the local fishing community, for example a government (St Lucia, Dutch Government vis a vis Wadden Sea), a research institute (Sulliman University), a development agency (Soufrière Regional Development Foundation), or a nature conservation society (Saba Conservation Foundation in the case of Saba Marine Park, Netherlands Antilles, not discussed any further in this text, see www.sabapark.org). In the Wadden Sea case, shellfishermen adopted voluntary restrictions already two years before co-management became an official policy in 1993, but one could argue that they did so in re-action to mounting societal and administrative pressure (Steins 1999, p. 129).[27] As experience is being gained with MPAs, fishermen may more enthusiastically endorse them, especially when they see that fish production actually increases (Apo Island Marine Reserve), or when they discover some other concrete benefits from nature conservation (income from tourism, diving, education, etc.; Soufrière Marine Management Area, Saba Marine Park; Roberts and Hawkins 2000).

If we look at the nature of fishermen involvement, this may also differ considerably, sometimes fishermen organisations are involved throughout the policy making process (Apo Island Marine Reserve), sometimes they are only involved in implementation rather than goal setting (Wadden Sea, shellfish POs are mainly involved in fishing plans, the appropriate balance between nature and fishing is decided by national government). It has been suggested to analyse this type of difference in involvement in terms of empowering versus instrumental co-management (Viswanathan *et al* 2003). The evidence presented here suggests however that it is not so easy to establish whether fishermen involvement is empowering or instrumental. In any case, the legitimacy and therefore also effectiveness of co-management tends to depend on other factors as well. The shellfish POs in the Wadden Sea seem to have learned to accept that the goals of Wadden Sea policy making are decided elsewhere. Within the overall policy framework of the Dutch Government, the shellfish POs, as co-management institutions involved in implementation only, have indeed been able to define a meaningful role for themselves. In 2001 they published their own vision on sustainable development of the Dutch shellfishery (Odus 2001). In this way they created a real chance to influence their own future, which is a defining characteristic of empowering co-management (Viswanathan *et al* 2003). Problems in legitimacy arose, but not so much because of the instrumental nature of the co-management arrangement but rather, because of a lack of consistency and transparency of the co-management model. In 1997-1998, a preliminary evaluation of the Wadden Sea co-management arrangement was carried out. As the recovery of wild mussel beds fell short of expectations, additional measures needed to be implemented, such as the closure of additional areas of sea for cockle and mussel fishing. The shellfish POs didn't resist this closure in principle, but suggested alternative areas for the ones proposed by biologists, on the basis of their practical knowledge of the territory. Nature conservation groups also had their opinion. Under the time pressure of a debate in the Dutch parliament, the Ministry passed over the principles of co-management by not allocating time for a discussion of the proposed additional measures involving all relevant stakeholders, as they had done before when co-management was first introduced (Stein 1999, p. 145). The Ministry's own evaluation carried out in 2002 concludes co-management in the Wadden Sea worked well in the early years, but in later years the Ministry reduced its own involvement too much, especially when it became

[27]Given high mortalities of birds, in 1991 the Ministry for Agriculture, Nature Conservation and Fisheries closed almost 50% of the Wadden Sea for cockle fishing. The cockle sector took legal action and the fishery was re-opened again. Fisheries legislation at that time did not grant the Government power to take nature conservation measures. It is within this situation of potentially losing access to the fishing grounds that the shellfish sector decided to self-imposed restrictions (Steins 1999, p. 150).

clear that the relation between fishermen and nature conservation groups polarised (van Geffen 2002, p.20).

In the case of the Soufrière Marine Management Area, local fishermen were indeed involved in the initial stages of the policy making process; they participated in drawing maps and establishing zoning designations. But several problems arose in the implementation stage; for example some older fishermen felt their specific concerns were not adequately addressed (Sandersen and Koester 2000). In addition, enforcement of the zoning agreement was inconsistent and insufficient (Pierre Nathoniel 2003). Even though the establishment of the SMMA is generally regarded as a good example of a bottom up, collaborative approach, the evidence suggests that the Department of Fisheries was to retain overarching control. The Department was to consult with and delegate selected management responsibilities to a Technical Advisory Committee, consisting of community representatives (Pomeroy 2003). In order to solve the problems that arose in implementing the SMMA, the Department worked out a solution however with the fishermen involved directly, and did so without consulting the Technical Advisory Committee. The lack of transparency about and ad hoc character of, this type of solutions undermined the legitimacy of the SMMA as (co-)management institution. The problems in implementing the SMMA have been numerous and continuous (for a comprehensive discussion; Pierre Nathoniel 2003). A new Management Agreement was signed in January 2001, which among other things, strengthened the legal basis of the SMMA and also more clearly defined the role of all parties to the Agreement. For example, SMMA rangers were given proper policing functions in order to adequately enforce the management plan (Pierre Nathoniel 2003). This shows that fishermen involvement is both relevant in goal setting as well as implementation, and also that problems arise when a collaborative approach is not consistently applied throughout the policy implementation process, or at least it is not clear to all stakeholders who is responsible for what decision at what stage of policy implementation (the governance principles of transparency and accountability, which should be taken into account, especially when direct participation as governance principle is not possible or desirable throughout the decision making process).

5.10 Multistakeholder approach in MPAs

The next question we turn to is to what extent a multi-stakeholder approach has been adopted, alternatively are the examples of co-management in relation to nature conservation still very much a fisheries centred approach? It is interesting to note that in most of the examples reviewed the inclusion of nature conservation in fisheries management has been approached from a spatial planning perspective (in response to resource user conflicts) and/or from a development perspective (in response to marginalisation of fishery dependent communities).[28] This is in line with the observation that fishermen, or their sectoral representative organisations (or respective sectoral government departments) hardly ever played an initiating role (as discussed above). Public and private actors in both the spatial planning as well as socio-economic development policy arena are more used to take a multi-stakeholder approach, than actors in the more traditional sectorally divided policy arenas such as agriculture and fisheries; where until recently a corporatist tradition prevailed, at least in many European countries (discussed earlier). In contrast, in the examples presented here many stakeholders were actively involved in drafting the zoning agreements, either on a more

[28]The introduction of MPAs as management instrument not only implies a different perspective on fish stocks as integrated parts of the marine ecosystem, but it often also implies that fishermen have to find their way in a policy arena that is quite differently institutionally embedded than it used to be. This aspect hasn't been researched very much yet.

consultative or more decisive basis (Wadden Sea, Apo Island and Soufrière respectively).[29] Note that even if a multi-stakeholder approach is consensus oriented; it cannot be guaranteed that consensus is always reached (Van der Schans 2001). In the case of the Wadden Sea, the impression arose that whatever measures the Producer Organisation for mechanical cockle fishers would take and despite the fact that nature conservation groups were consulted in the drawing of fishing plans, in the end of the day it was just unacceptable for (some) nature conservation groups, that this type of fishery would be allowed in the Wadden Sea. In theory it may be possible to work out acceptable solutions if parties are willing to communicate openly and negotiate on the basis of rational argumentation, but in practice stakeholder involvement always happens in a context were there is a time pressure to act, and also parties may be drawn in a negotiation based on strategic action rather than open-minded deliberation (Habermas 1981). In such case, multi-stakeholder negotiation may lead to polarisation rather than mutual understanding and innovative problem solving. This is what happened with multi-stakeholders involvement in co-management at the Wadden Sea. The mechanical cockle fishery was banned in 2005. The consultation and negotiation structure that evolved around the Wadden Sea shellfish co-management was not strong enough yet to accommodate the mounting pressures between nature conservation groups and mechanical shell fishermen. It could be argued that The Ministry of Agriculture, Nature Conservation and Fisheries withdrew its active involvement too early. This conclusion seems all the more warranted since it became clear at the SDN/W-UR workshop that with hindsight and according to some marine ecologists, it might have been possible to work out a solution in which mechanical cockle fishery would have been allowed but with different techniques and within a limited area (see also interview Lindeboom, Resource, nr. 10, 9-11-2006).

5.11 Institutional framework supporting MPAs

Finally, we discuss the way in which the grass-roots co-management arrangements presented here are embedded in the larger system of bureaucratic rules or market incentives. In the case of the Wadden Sea it is clear that the implementation of EU Directives concerning nature conservation and environmental protection gradually became more important. This, in combination with the outcomes of scientific research evaluating the impact of shellfisheries on the Wadden Sea ecosystem, led to a turning point in Dutch Wadden Sea policy making in 2004. In this year the Dutch Administrative Court decided that the licences for the mechanical shellfisheries should be revoked, which in practice meant a definite ending of this type of fishing in the Wadden Sea. The social-economic impact of this policy outcome was ameliorated by the introduction of a compensation scheme for the cockle fishermen who were forced to stop. This shows how important wider institutional and societal developments are for the functioning of co-management in practice.

Another example is provided by the Soufrière Marine Management Area. Despite many achievements, in the years that followed the successful establishment of the SMMA, there were also many controversies. The St. Lucia Marine Police's vigilance to oversee compliance soon dropped when it became clear that the SMMA and Department of Fisheries didn't follow up by confiscating the fishing gear (Pierre Nathoniel 2003). The impression raised that management and regulatory bodies gave preferential treatment to certain user groups in terms of enforcement of the rules. Voluntary compliance to the zoning arrangements eroded

[29]It is not always clear from the evidence however to what extent direct participation of stakeholders actually changed the draft proposals that where initially put forward by scientists or civil servants. In the case of the Soufrière Management Agreement the maps drawn as a result of the participatory process where similar to the ones the Department of Fisheries had drafted earlier. They were viewed as "everybody's maps" however and therefore deemed more legitimate (Pomeroy 2003, p. 218).

and old conflicts between fishermen, divers and tour operators re-merged. Fishers complained that the 'rich', predominantly white tourists that visit the SMMA, and the tourist service operators, were the only parties benefiting from the SMMA arrangement. The problems of the SMMA were amplified by several unfavourable economic developments, such as the closure of a local factory and a major hotel, which implied that many people returned to fishing as a readily available source of income. The controversies around the SMMA have been attributed to the fact that the St. Lucia Fisheries Act and relevant Government decisions did not provide an adequate legislative basis for management and regulation of the SMMA. More fundamentally, there is no connection between the SMMA and a national development plan for St. Lucia, in fact there is no comprehensive national development policy at all in St. Lucia (Pierre Nathoniel 2003). As a consequence the effectiveness of the SMMA is too dependent on ad hoc developments in local politics and other areas of land-based and maritime activity, which are beyond its sphere of influence. The New Management Agreement signed in 2001 is supposed to provide a more adequate institutional backing for the SMMA.

Precisely such a move to integrate smaller locally embedded MPAs in an overall national planning strategy has taken place in the Philippines. Sulimon and Apo Island were among the first marine reserves in the country, and they were initially established under municipal law. Authority for declaring such reserves is the Local Government Code of 1991 (Raymundo 2002).[30] Since 1999 more extensive coastal areas or those perceived as being of particular importance, may be classified under the National Integrated Protected Areas System (NIPAS). Apo Island was declared a 'Protected Landscape and Seascape' of the NIPAS in 1994. The declaration of Apo into the NIPAS scheme was recommended by the Silliman University research group involved in Apo reserve management already, and it was expected to be a positive move that would result in better management (Raymundo 2002).[31] Although there is no up to date evaluation available of the effectiveness of management under NIPAS, it is clear that the community based approach is being replaced by a more formalised approach, which on the one hand reduces the direct participation of the local community, and on the other hand increases the involvement of regional and provincial government agencies, and the representation from various NGOs. Although this transition has not been without problems (e.g. there are more delays in channelling tourist fees back into the local community), there are also positive effects. Placing Apo into the NIPAS framework increases the level of support the community can draw upon for establishment and enforcement of management regulations, which is of particular importance, as impacts from increasing tourism pressure are starting to affect reef health (Raymundo 2002, p. 4).

[30]Following the initial success of marine reserves such as Apo Island, the establishment of small-scale locally based MPAs proliferated throughout the Philippines. In 1991 the authority to manage natural resources was officially devolved to local governments. In the years to follow it became clear however that the Apo Island model of community based reserve management could not always be replicated with similar success (White *et al* 2005). Local governments were sometimes under-resourced to provide proper management and enforcement, fishing pressure increased outside the no take areas, spill over effects were sometimes smaller than expected, diving as alternative source of income also created negative impact on the coral reef, pollution from land-based sources also affected the quality of nature protection in marine reserves. Hence, the need grew to integrate small-scale MPA projects in the framework of an overall coastal zone management approach (White *et al* 2005).

[31]The exact reasons to place the Apo Island Reserve under NIPAS remain unclear however, as there is no evidence in the literature that the system of community based management and enforcement established in the 1980-ies showed major flaws in the 1990-ies.

5.12 Fishermen involvement in the development of North Sea spatial planning

5.12.1 Introduction

Before we discuss the possible role for co-management in North Sea nature conservation, there is one point already mentioned earlier, that should be re-iterated here. There is much debate among marine biologists and ecologists whether the experiences gained with small-scale, community-based MPAs in the tropics can be translated directly for use to establish and manage MPAs in temperate zones (Roberts 1999). There is evidence that on tropical reefs, small MPAs will lead to increase of the individual size and / or abundance of many species within the areas so protected. But this effect has not been observed for all species, and also increased size / abundance within MPAs does not always equate to increases in yield for fisheries outside MPAs. Spill-over effects tend to operate over very limited distances (Polunin 1999). In temperate waters, small MPAs can be expected to work well for sessile species (such as lobster, rockfish and shellfish), and /or they may be of use when overlapping with nursery areas.[32] But, as fisheries biologists argue, it can not be taken for granted that establishing (relatively) small MPAs will have a positive impact on the major commercial species in temperate zones in Europe (such plaice, sole, herring and mackerel) cannot be taken for granted (Polunin 1999). The reason is that these fish stocks are highly migratory, whereas coral reef fish species tend to be sedentary as adults while dispersing widely as larvae. The implication would be that in temperate zones MPAs should be either very large, or in some way move along with the fish stocks when they migrate.[33] A similar point was made by a fisheries biologist at the SDN/W-UR workshop, who argued that the very concept of ecosystem implies that relations *within* the system are more relevant than *boundary crossing* relations, i.e. between the system and its environment (Niels Daan, pers. comm. 2006).

For many species in the North Sea the water system as a whole is their habitat, and water currents do not limit themselves to arbitrary delineated areas within which there exists some form of protection. 'On this account, the National Ecological Network of the North Sea is the North Sea itself and protecting this network can only be done by regulating the fisheries impact for the whole system and not for some of its parts' (Niels Daan, pers. comm. 2006)[34]. This perspective does not imply that area protection as such should be rejected for temperate zones, but rather area delineations need to be very carefully chosen (Roberts 1999). Apart from that, the arguments used to establish areas cannot be easily borrowed from experiences gained elsewhere. In contrast to reef fisheries, the impact of area closure on recruitment success may be less important in the North Sea than natural or human initiated processes that occur anyway.[35] There are still very few situations where it has been possible to research the

[32]The success cases presented in this chapter all fall within this category: they are either reef fisheries in the tropics (Philippines, Caribbean) or shellfisheries in a temperate zone (Wadden Sea).

[33]In the boundary waters of San Juan Islands, for example, a mobile species specific MPA has been developed to manage whale watching (Osborne *et al*, 2001). This community based MPA only applies when orcas are present, and it exists around the whales as they move through the region.

[34] It should be noted though that the aim of the MPA's in the North Sea was to specifically protect selected natural values, especially bird populations. These bird populations depend on specific areas for part of the year.

[35]A case in point is the establishment of the so-called Plaice box. The Plaice box is an area of sea close to the Dutch, German and Danish border. Only small beam trawlers (<300 HP) are allowed to fish here. The Plaice box has been established to protect young plaice coming from the Wadden Sea. In 2004 the effects of this MPA have been evaluated. Although effects of the closed areas in terms of the size structure of the fish assemblage can be shown, the expected positive effects on the fisheries are more difficult to demonstrate. The importance of the closed area as nursery has decreased over the last

ecological effects of an MPA over a longer period of time and under controlled conditions. The Apo Island case is an exception; the effect of this MPA has been studied extensively in comparison with results on reference sites without MPA (Russ and Alcala 1999). In any case, much more experience must be gained with MPAs in different sizes, character and duration before ecological and socio-economic effects that are predicted in theory will be actually realised in practice (Agardy *et al* 2003).

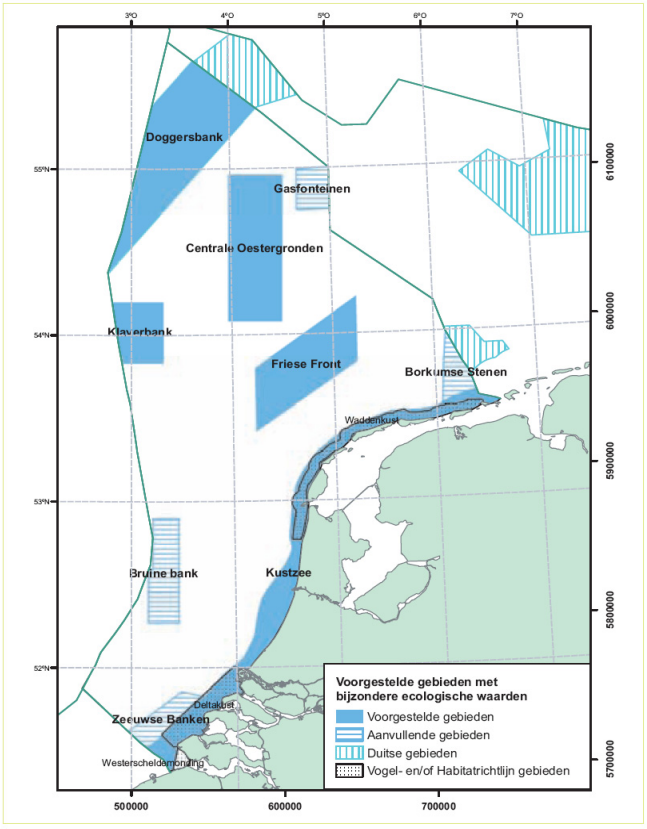


Figure 9. Areas in the North Sea with specific ecological values

Figuur 5.6: Gebieden met bijzondere ecologische waarden op het NCP.

5.12.2 Fishermen participation in North Sea planning

To conclude this chapter on the possible role of fishermen co-management in nature conservation a couple of remarks will be made with respect to the process of establishing nature conservation areas in the North Sea. Given the possible benefits of active stakeholder involvement in policy making, one may wonder how fishermen are actually involved in this process. At the SDN/W-UR workshop it became clear that even though the process of establishing the areas at sea is well under way, fishermen as important target group do not seem to be very well informed.[36] There is a very informative web-site which provides a lot of

decade, due to a changing geographical dispersion of young plaice. In any case, the data is limited to draw more definite conclusions (COM2005 422).

[36]The Ministry of Traffic and Waterways coordinates the designation of protected areas at sea. The contribution of the Ministry of Agriculture, Nature Conservation and Fisheries/Ministry of Agriculture, Nature and Food Quality is coordinated by the Nature Department, with the Fisheries Department in a

information for the general public (www.noordzeeloket.nl), but stakeholders still tend to be rather confused as to the exact location of the areas as well as the type of management regime that will apply (De Vos *et al* 2006a, p. 20). The official policy of the Dutch government is that the fishing industry is not to be involved in the designation of areas; they will be involved in the implementation (De Vos *et al* 2006a, p. 18). As such, this would be consistent with the co-management approach to fisheries management as adopted by the Dutch Government in 1993. In 2005, the Dutch Government published the Integrated Management Plan for the North Sea 2015, in which the spatial planning policy for the North Sea was presented (IBN 2015). In this plan, co-management is not explicitly mentioned, however, as a strategy to implement more nature conservation oriented policies vis a vis the fishing industry. On the basis of the international review presented in this chapter, this would be an option worth considering.

This is not the place to provide a full discussion how this might work out in practice. One could imagine that certain areas are closed for certain fishing gear types, but also that if the appropriate technical measures are taken closure is waived. The establishment, control and enforcement of these appropriate technical measures could be included in the co-management approach that already exists; the Biesheuvel quota group management system. Biesheuvel groups gradually have taken on a more adaptive -if you like ecosystem oriented- approach to quota management already, in that they voluntarily stop fishing for plaice in the spawning season, and also they voluntarily implement real time area closures when too many undersized plaice are caught (De Vos *et al* 2006b). One could also imagine that control and enforcement of group rules is more systematically taken up by group boards, and that compliance to group rules that come above what is legally required are monitored by private auditing companies (Van der Schans 2001). A fishermen representative at the SDN/W-UR workshop also made another suggestion, which is worth considering. He advocated analysing the implications of closing certain areas at sea for the fishing plans of individual fishermen.

This approach again would be consistent with the co-management model that is already operational for Dutch North Sea fisheries and the Wadden Sea. For, the most important management instrument of group boards to prevent over-fishing of quota at the North Sea, and to include nature conservation at the Wadden Sea is the fishing plan of individual group members, which must be approved by the group board. A logical next step would be that Biesheuvel group boards become more active in overseeing the adaptation in fishing patterns that will be required when marine protected areas become operational at the North Sea.[37] From a transition management perspective, analysing the implications of closed areas for the fishing plans of individual fishermen (or fishermen organised in groups) would be a good alternative to a societal cost/benefit analysis at sector level which is currently used to assess the implications of nature conservation for the fishing industry. More research is needed to see whether and to what extent the Biesheuvel co-management system could actually be used to practically adapt fishing patterns of individual fishermen and groups of fishermen in order to

secondary role. The fishing sector may have to re-orientate its relation with the Ministry in order to be more actively involved in the rapidly emerging field of nature conservation at sea.

[37]If areas are closed at sea, this is a collective problem for all fishermen engaged in the fishery, because fishermen who lose their fishing plot can easily re-direct their activity to areas that are still open. This may create a problem of crowding and over-fishing, if no additional measures are taken. A co-managing group of fishermen may be well placed in theory to more proactively co-ordinate an orderly adaptation of fishing patterns collectively. In practice however, it may require a careful institutional development strategy to move the Biesheuvel group system into this direction, as closed areas at the North Sea are still quite controversial among fishermen (De Vos *et al* 2006b). On land however, experience has been gained already to support groups of farmers in adapting their farm strategy to meet environmental and nature considerations (Van der Schans 2006). It may be worthwhile to explore whether this interactive strategic management approach can be applied in the fishing sector as well.

accommodate the establishment of marine protected areas and other nature conservation instruments at the North Sea. More research is also needed to see how the development of the North Sea spatial planning policy is actually embedded within the Ministry of Agriculture, Nature and Food Quality, and how this affects the extent of participation of various stakeholder groups including the fishing industry.

5.12.3 Multistakeholder approach in North Sea planning

With respect to the adoption of a multi-stakeholder approach, the Ministry of Transport, Public Works, and Water Management is the lead Ministry in developing the Integrated Management Plan for the North Sea 2015. This Ministry does not have a corporatist tradition such as the Ministry of Agriculture, Nature Management and Fisheries used to have, or at least it doesn't have a close clientele relation with the fishing industry. This may explain to some extent why fishermen feel somewhat lost in the North Sea spatial planning policy making process. In any case, North Sea fisheries are mainly regulated within the framework of CFP, whereas certain other uses of the North Sea fall under national jurisdiction (De Vos *et al* 2006a, p. 18). These other uses have been more actively involved in the North Sea spatial policy development process right from the start. The development of the Integrated Management Plan for the North Sea 2015 is supervised by a steering group consisting of the various Directorates and Ministries involved in North Sea spatial planning. The Ministries and Directorates within Ministries are each responsible for involving their own traditional circle of stakeholders in the planning process. The nature of involvement of various stakeholders may therefore differ across Ministries (De Vos *et al* 2006a, p. 18). More research is needed to see how the actual involvement of various stakeholders can be evaluated in terms of governance principles such as transparency, accountability, participation and coherence (across Ministries).

5.12.4 Institutional framework supporting North Sea planning

Finally, if we look at the way in which the development of marine protected areas is embedded in the larger institutional setting, it is clear that there are several EU policy documents and Directives, as well as international agreements which indicate that this is the way ahead. The general opinion at the SDN/W-UR workshop was that it is clear that the policy framework is changing towards a more important role for nature conservation at sea. There was some concern however that it would take several years (and perhaps also several court cases) before it is exactly clear how the rules should be implemented in practice, and which activity is allowed where and under what conditions. Concern was also raised that there will be differences in implementation between different EU member states. More research would be needed to monitor the implementation of the various Directives and to see how they work out in practice for the fishermen and other stakeholders involved.

In some ways the establishment of protected areas at sea can be seen as an extension of the National Ecological Network on land (Ecologische Hoofd Structuur; EHS). From a transition management perspective it may be interesting to look more closely at similarities and differences between involving stakeholders on land versus at sea.[38] A lot of experience has

[38]This section discusses similarities and differences from a (co-)management and transition management perspective only. At the SDN/W-UR workshop, it was argued that from a biological/ecological perspective, there are more differences between nature protection on land versus at sea than usually assumed (as discussed above). Marine ecosystems are more dynamic than terrestrial (hence boundaries may continuously change), they are more interrelated with their environment (hence it is more difficult to separate the impact of one human intervention out from all other human interventions or natural changes). This raises the question whether the EU Wild Birds and Habitats Directives imply a nature protection approach that is essentially land-based (Niels Daan, pers. comm. 2006). From a management perspective, also, there are differences between terrestrial and marine nature protection, in that farmers who are restricted in their development can not so easily re-locate, whereas fishermen are more flexible

been gained already for example with farmers and horticulturalist located inside or close to the Ecological Network, who needed to adapt their business management in order to comply with the regulations that apply locally. New networks and coalitions have emerged at the local level between farmers and other rural interest groups, such as environmental groups, professional nature conservation agencies, associations of rural dwellers en organisations of other rural entrepreneurs (leisure and tourism, shops etc.). Farmers' self-organisation, in the form of environmental cooperatives, has often played an important role in creating these networks (Van der Ploeg *et al* 2002). In some cases these cooperatives have in fact been able to assume, one could say- "co-management" functions in the field of Dutch agro-environmental policy implementation (Van der Schans 2003).[39] The point is that agro-environmental cooperatives have taken on the task of integrating nature management and landscape maintenance in operational farm management already several years ago, and for Biesheuvel quota management groups in fisheries this may be a road worth pursuing as well.

However, adapting one's business management to meet nature conservation interests is not just a matter of complying with more restrictive regulation only, on land we have seen the development of innovative types of rural entrepreneurs, who proactively look for business opportunities to make a living out of the new situation; e.g. farm tourism, local produce, nature education (Broekhuizen *et al.*, 1997). The evidence presented in this chapter suggests that when fishermen are actively involved in nature conservation policy making it is also more likely that they proactively adapt their economic activities in order to make the best out of a new situation. At the Wadden Sea we see some coastal fishing initiatives moving in this direction. An example is the Working group Integrated Fisheries (Werkgroep Geintegreerde Visserij). This is a group of artisanal fishermen who start from the assumption that there should be a balance between landscape, cultural history, nature conservation and business. In order to reach this balance the fishermen implement the principles of –ecologically inspired- adaptive fisheries management (as discussed earlier). For example, they pool their fishing entitlements in order to be able to catch fish when it is there, but have the flexibility to change to other fish species when the target species is not there. This is a clear alternative to the specialised fisheries, which have developed in the mainstream fishing fleet, which are heavily dependent on one or two species and have no alternatives when stocks are low. In the integrated fishery, fish landings follow the seasonal pattern (shrimp in one month, smelt in another month, and shellfish in yet another month). In addition, the fish is being processed and sold locally by members of the group, in order to capture a higher share of the value added.

Another example is fishing vessel TS 31 who has obtained the Waddengoud certificate (a certificate of regional origin). The criteria for this certificate have been formulated in collaboration with the Dutch Bird Protection Association. Fishing is carried out with a non-intrusive catching technique (staand want, a type of gill net fishing technique). The aim is to establish a more direct link between fishing as a regional activity and the end consumer who values sustainable quality food production. To this end, the fish is being sold by the fisherman

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to look for alternative fishing areas. This makes establishing a protected area on land much more a problem of some individual farmers, whereas establishing a protected area at sea is much more the problem of all fishermen engaged in a fishery collectively. In relation to this, fishing happens on a common property resource, whereas farming happens on a private property resource. The right of a farmer to be compensated when development restrictions come to apply to his property, is generally stronger enshrined in law, as the right of a fisherman to be compensated when somewhere at sea some fishing possibilities are being limited.

[39]Vel and Vanla, environmental cooperatives of dairy farmers in the Frisian Woodlands (Friese Wouden), are both good examples of farmer groups that have obtained extra flexibility in public regulations in exchange for taking on extra obligations voluntarily. This type of exchange is also the basis of co-management in Dutch flatfisheries (Van der Schans 2003). In the case of Vel and Vanla flexibility in public regulation did not so much relate to EHS zoning, but to other aspects of Dutch agro-environmental regulation (van der Ploeg *et al* 2002). The principle is however the same.

(or his wife) directly on the Amsterdam open air organic fish market (www.goedevissers.nl). The TS 31 is also used for training young people who are in a socially or psychologically disadvantaged position; very much in the same way as some land-based farmers have taken on social-health care provision activities at their farms. In addition, people can join the fisherman to roam the Wadden Sea; a form of recreation and education which we also see on land. The Government welcomes this type of diversification –a transition from fisheries based to ecosystem based economic development. Farmers and fishermen as well as policy makers involved could learn from each other how to deal with limitations in public rules and create more room for the transition towards ecosystem based multifunctional land- as well as sea-use.

5.13 Conclusion

This chapter provides international evidence that fishermen involvement in nature conservation is possible and can indeed play a positive role. Fishermen involvement in nature conservation should therefore be pursued more systematically in order to bring about a transition towards sustainable fisheries. The chapter highlights several issues that need to be taken into account when fisheries co-management and nature conservation are to be integrated. Fishermen organisations should be involved more directly in the development and / or implementation of nature conservation policies. This does not mean that they should always participate *directly* in all stages of the policy making process, as the empowerment perspective on co-management suggest, it requires however that decision making should be transparent, proportionate, and accountable. In similar way, the interests of other stakeholders should be adequately addressed in decision making, either through direct participation or through increasing the transparency and accountability of the decision making process. Furthermore, local initiatives should be embedded in a wider institutional framework, which ensures that factors beyond the control of local management institutions are effectively taken into account, and also ecosystem based fisheries management is consistent with other policy objectives and vice versa.

More research would be needed to look at similarities and differences of nature conservation on land and at sea, and the consequences this may have for policy instruments which have been developed, and are to be used, in the terrestrial and marine environment respectively. More research would be needed to monitor how EU directives are being translated into national regulation, and in what way stakeholders (including fishermen) are being involved. More research would be needed as to how the Dutch co-management system can be geared to integrate more pro-actively an ecosystem-based management approach. More research would be needed also to provide positive role models for Dutch fishermen how commercial fishing activity and nature conservation can be practically combined.

6 Epilogue

The aim of the project was to provide an international comparison of fisheries management with respect to nature conservation. The EU Birds and Habitats Directive protect species and habitats both on land and at sea. Both directives are currently implemented and implementation has proceeded to a much greater degree on land than at sea. We hope that some of the insights in this report may be of some use in the process of implementation.

We sought to identify examples of viable and sustainable fisheries that were regulated in such a way that they caused no significant harm to the ecosystem. The objective was to learn lessons on fishery management in the context of nature conservation that might be applicable to the Netherlands. Although this report contains many pages, we feel that we have only just begun to scratch the surface of this important topic. We explored different aspects of the problem, but are unable to end this report with a grand and all-encompassing synthesis. However, we do feel a few closing comments are in place.

The classic tools to govern fisheries are restrictive, imposing catch quota, and capacity and technical limits. These have largely failed in preserving fish stocks at optimal, or even viable, economical and ecological levels, and have been effectively frustrated by the "commons" aspect of the fisheries problem. Managing fisheries so that they do not harm nature with these classic tools is an even greater challenge, if not impossible. However, the classicial tools can work if they are applied consistently, as seemed to be the case in the Halibut fishery.

More generally, there is a role for fisheries self-management but not as a stopgap for government-initiated regulation but rather as complementary to public regulation. Market based approaches can play a role, but they cannot be solely depended upon to reach conservation goals. A mixed approach may be optimal, where both public regulations as well as market incentives are combined in a practically intelligent way, and each adds its own distinctive qualities to the overall framework. Thus, self- or co-management may play a role especially when the overall framework of governance has evolved from a regime that is compliance oriented to a regime that tries to stimulate companies to proactively integrate societal concerns in the corporate strategy and organisation.

Throughout this study we had many discussions on what properties and managerial measures may be typical for sustainable fisheries. Below, we provide a list of what came up during these discussions. This list is to a large extent hypothetical. We nonetheless decided to reproduce it here, because it may be of use in future studies:

1. The target species is highly appreciated and highly priced.
2. Product quality is reflected in the price.
3. The economic benefits for individual fishermen or fishing companies are high.
4. The fisheries are manageable and there are no major conflicts concerning catch or bycatch with other forms of fisheries, or these have been dealt with.
5. The fisheries are accompanied by scientific research jointly financed by government and industry.
6. There exists a (national) ownership feeling of the fish stocks by the fishermen.
7. The fishing industry is mainly self regulating and internal control is high.
8. Fishing gear is optimized, taking into account effects on target species, habitats and bycatches.

9. There is a quota system whereby the quota are based on scientific research and agreed by managing authorities and fisheries representatives.
10. When relevant, there are not only quotas for target species but also for vulnerable bycatch species, like sea mammals, turtles, birds, other (large) fish or (long living) benthos.
11. Independent observers often accompany individual fishing vessels.
12. Quotas may differ from Total Allowable Catch (TAC) for the whole fleet to Individual Daily Takes (IDT) for individual fishermen, or combinations of these.
13. When quotas either for target or bycatch are reached, the fishery is stopped immediately.
14. The spawning stocks are protected or only very limited fished.
15. Management is aimed at keeping the reproducing stock as high as possible.
16. To avoid killing of small juveniles or reproducing adults, sometimes fisheries are only allowed on intermediate fish sizes (lobster).
17. Closures or no takes both in space and time are an integral part of sustainable fisheries.
18. By scientifically establishing the stocks before setting quota, and by observing strict management rules, overfishing in times of diminishing stocks is avoided.
19. Measures to improve the stocks are often part of the total fisheries management plan.
20. When rules or quotas are not observed, fines are extremely high and in repetitive cases may lead to exclusion from the fisheries.
21. Basic criteria of good governance are being observed (governance is immune for corporatist interests)

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Acronyms

CANARI: Caribbean Natural Resources Institute

CAP: Corrective Action Plan used in Marine Stewardship Council certification

CAR: Corrective Actions used in Marine Stewardship Council certification

CCAMLR: Commission on the Conservation of Antarctic Marine Living Resources

CFP: Common Fisheries Policy of the European Union

DFL: Dutch Guilder (extinct monetary unit of the Netherlands)

EC: European Communities (one of the three pillars of the European Union)

EEZ: Exclusive Economic Zone; area of the sea where one country has the exclusive economic rights

EHS: National Ecological Network (*Ecologische Hoofd Structuur*)

EC: European Community

EU: European Union

FAO: Food and Agriculture Organization of the United Nations

GBR: Great Barrier Reef

HFMC: Hoki Fishery Management Company Ltd

HP: Horse Power (engine power)

IBAMA: Brazilian Institute for the Environment

IBN2015: Dutch management plan for the North Sea (*Integraal Beheersplan Noordzee*)

ICES: International Council for the Exploration of the Sea. ICES is the organisation that coordinates and promotes marine research in the North Atlantic.

IDT: Individual Daily Takes

ITQ: Individually Transferable Quota

IUCN: The International Union for the Conservation of Nature and Natural Resources. Since 1990 known by the name of World Conservation Union.

IUU fishery: Illegal Unregulated and Unreported fishing

LEI: Landbouw-Economisch Instituut – Research institute for agricultural economics

LNV: Ministry of Agriculture, Nature and Food Quality of the Netherlands

MNP: Netherlands Environmental Assessment Agency (Milieu- en NatuurPlanbureau)

MPA: Marine Protected Area - any area with a protective regime for the natural environment. Often specifically linked to the OSPAR convention, but SAC's and SPA's can also be considered MPA's. Different MPA's may have different protective regimes.

MSC: Marine Stewardship Council; an independent non-profit organisation that promotes responsible fishing practices

MVO: organisation that promotes corporate social responsibility (CSR) to businesses, public authorities and NGOs (*een zelfstandige organisatie die Maatschappelijk Verantwoord Ondernemen stimuleert en ondersteunt*)

NEFAC: North East Atlantic Fisheries Commission

NGO: Non Governmental Organisation

NIPAS: National Integrated Protected Areas System

NMFS: National Marine Fisheries Service

NRC: National Research Council

OSPAR: Oslo Paris convention 1992. Convention for the protection of the marine environment of the north-east atlantic Contracting parties of the convention are 16 European countries.

PFA: Pelagic Freezer-Trawler Association

PO: Producers Organizations (of cockles or mussels for instance)

RIKZ: National Institute for Coastal and Marine Management (*Rijks Instituut voor Kust en Zee*)

SAC: Special Areas of Conservation under the European Union Habitats Directive

SDN: *Stichting de Noordzee*

SCS: Scientific Certification Systems

SGS: International company for inspection, verification, testing and certification

SMMA: Soufrière Marine Management Area

SPA: Special Protection Areas under the European Union Wild Birds Directive

SRDF: Soufrière Regional Development Foundation

TAC: Total Allowable Catch

TAMAR: Brazilian organisation for the protection of sea turtles

UN: United Nations

VEBEGA: Vereniging ter Bevordering van de Garnalenhandel – organisation to boost shrimp trading

VMS: Vessel Monitoring System

WWF: World Wide Fund for Nature

WUR: Wageningen University and Research Centre

Glossary

Beam trawl fishery: Fishery technique where a net attached to a heavy metal beam is towed over the sea floor by a vessel to catch bottom living fish species and shrimp. The gear used for this type of fishery slightly digs into the sediment, leaving tracks and disturbing the upper sediment layer.

Birds directive: European Union directive for the protection of areas that are important for wild birds

Bivalve: molluscs such as mussels, oyster etc

Bulk fishery: industrial fishery using fine mesh nets. In the North Sea it is mainly used for catching large quantities of sandeel which are removed from the nets by using powerful pumps.

Bycatches: catch of non target species in fishery

Demersal: living on the sea floor

Epifauna: animals living on a certain substrate, for example bentic epifauna: animals living on the sea floor

Fyke: a long bag shaped fishing net held open by large loops at the opening and small at the end of the fyke, usually placed on the sea floor, fish can swim in the net but can't get out.

Gadoid: species of the taxonomic group (family) that includes cod (Gadus morhua)

Gill net: Long rectangular nets. Gillnets are placed in the water with corks and weights to allow them to hang in a vertical position. Fish swimming into the mesh are caught in the web by their gills or get entangled.

Groundfish fisheries: fisheries on species that live on the sea floor such as shrimp and flatfish

Habitats directive: European Union directive for the protection of ecologically important areas

HP restriction: restriction in of engine power (horse power) in fishing vessels

Infauna: animals living in the sediment

Intertidal: shallows that emerge at low tide

Invertebrates: animals without bones e.g. crabs, mussels worms etc.

Long-line fishing: A long-line consists of a main line to which many branch lines (called snoods) are attached. Each snood has a baited hook at its end. Depending on the type of long-line, buoys and weights are attached to the long-line to ensure the long-line is at its

required depth. Some of the long-lines set are over 100km long and they contain more than 20,000 hooks.

Macrobenthic community: small but with the bare eye visible animals living on the sea floor

Maximum sustainable yield: for fishery management calculated long term fishery catch that can be taken without harming the fish stock

Mesh size: size of the openings in a fishing net

Natura2000 network: European Union network of nature protection areas, comprises of areas under the Habitats and Birds directives

Otter trawl fishery:. As beam trawl fishery but the trawl net is kept open vertically by the headrope to which lots of floatsand sometimes kites are attached, and horizontally by otter boards, hence English otter trawl. The otter boards or doors are set at a particular angle, so that drag is minimised and spread of the net is maximised.

Oyster spat: young oysters

Pair trawling: a net is towed between two vessel; mostly used to catch pelagic species (midwater paired trawling)

Pelagic: living in the water column

Piscivorous: fish eating

Primary production: organic production of plants and algae

Pseudofaeces: non edible or redundant food particles embedded in mucus that are not digested but expelled e.g. by bivalves such as musssels

Rajid populations: rays

Salinas: saltpans in former salt marshes that have been converted to fish ponds

Subtidal areas: areas that are also al low tide submerged

Shellfish dredge: powerful suction dredging techniques to catch shellfish such as mussles, cockles, oyster

Triploid: genetically changed to having a triple set of chromosomes in stead of double (diploid)

Trophic level: position of an organism in the food web. Plants are the first level in the food web, predators dolphins, seabirds are the highest level.

Species names

English name	Scientific name	Dutch name
Abalone	*Haliotis spec*	Zeeoor (soort schelpdier)
Alaska salmon	*Oncorhynchus spec.*	Zalm - verschillende soorten
Alaskan Pollock	*Theragra chalcogramma*	Koolvis
Albatross	a.o. Diomedea spec.	Albatros
Allis Shad	*Alosa alosa*	Elft
Arctic Tern	*Sterna paradisaea*	Noordse stern
Basking Shark	*Cetorhinus maximus*	Reuzenhaai
Baxter's Dogfish	*Etmopterus baxteri*	Soort diepwaterhaai uit NZ
Banana prawn	*Penaeus merguiensis*	Bananengarnaal
Bivalves	Class Bivalvia	Tweekleppigen
Black-browed Albatross	*Thalassarche melanophris*	Wenkbrauwalbatros
Black Tern	*Chlidonias niger*	Zwarte stern
Black-throated Diver	*Gavia arctica*	Parelduiker
Brown Shrimp	*Crangon crangon*	Garnaal
Bryozoans	Phylum Bryozoa	Mosdiertjes
Buller's Albatross	*Thalassarche bulleri*	Bullers Albatros
Cephalopods	Class Cephalopoda	Inktivissen
Cetaceans	Order Cetacea	Walvissen en Dolfijnen
Chinook salmon	*Oncorhynchus tshawytscha*	Chinookzalm
Chum salmon	*Oncorhynchus keta*	Chum Zalm
Blond Clam	*Ruditapes rhomboides*	Soort Tapijtschelp
Cockle	*Cerastoderma edule*	Kokkel
Cod	*Gadus morhua*	Kabeljauw
Coho salmon	*Oncorhynchus kisutch*	Zalm
Common Tern	*Sterna hirundo*	Visdief
Cordgrass	Spartina spec.	Slijkgras
Creel	*Nephrops norvegicus*	Noorse Kreeft
Crustaceans	Subfylum Crustacea	Kreeftachtigen
Cuttlefish	Order Sepiidae	Zeekatten (Inktvissen)
Eastern king prawn	*Melicertus plebejus*	Soort garnaal
Echinoderms	Phylum Echinodermata	Stekelhuidigen (o.a. Zeesterren)
Edible Oyster	*Ostrea edulis*	Platte Oester
Eider	*Somateria mollissima*	Eidereend
Endeavour prawn	Metapenaus spec.	Soort Garnaal
European Storm-petrel	*Hydrobates pelagicus*	Stormvogeltje
Gadoid	Family Gadidae	Kabeljauwachtigen
Gastropod	Class Gastropoda	Slakken
Great Northern Diver	*Gavia immer*	IJsduiker
Green Sea Turtle	*Chelonia mydas*	Soepschildpad
Grooved Carpet Shell	*Ruditapes decussatus*	Getraliede Tapijtschelp
Haddock	*Melanogrammus aeglefinus*	Schelvis
Hake	*Merluccius sp*	Heek
Harbour porpoise	*Phocoena phocoena*	Bruinvis
Hawksbill Turtle	*Eretmochelys imbricata*	Karetschildpad
Herring	*Clupea harengus*	Haring
Honeycomb Worm	*Sabellaria alveolata*	Honingraatworm
Icelandic cyprine	*Arctica islandica*	Noordkromp (tweekleppige)
Knot	*Calidris canutus*	Kanoetstrandloper
Lampern	*Lampetra fluviatilis*	Rivierprik
Leach's Storm-peterl	*Oceanodroma leucorhoa*	Vaal stormvogeltje
Leatherback Sea Turtle	*Demochelys coriacea*	Lederschildpad
Ling	*Geypterus blacodes*	Vissoort uit Nieuw-Zeeland
Little Tern	*Sterna albifrons*	Dwergstern
Lugworm	*Arenicola marina*	Wadpier
Loggerhead Sea Turtle	*Caretta caretta*	Onechte Karetschildpad

Mackerel	*Scomber scombrus*	Makreel
Mediterranean Mussel	*Mytilus galloprovincialis*	Diepwatermossel
Moreton bay bugs	*Thenus orientalis*	Berenkreeft
Mussel	*Mytilus edulis*	Mossel
New Zealand Hoki	*Macruronus novaezelandiae*	Blauwe grenadier (heekachtige)
North Sea Herring	*Clupea harengus*	Haring
Norway Lobster	*Nephrops norvegicus*	Noorse Kreeft
Oyster	*Ostrea edulis*	Platte Oester
Octopus	Order Octopoda	Octopus
Olive Ridley	*Lepidochelys olivacea*	Warana
Oystercatcher	*Haematopus ostralegus*	Scholekster
Pacific cod	*Gadus macrocephalus*	Pacifische Kabeljauw
Pacific halibut	*Hippoglossus stenolepis*	Heilbot
Patagonian Toothfish	*Dissostichus eleginoides*	Tandvis
Petrel	Order Procellariiformes	Stormvogels
Pink salmon	*Oncorhynchus gorbuscha*	Roze Zalm
Plaice	*Pleuronectes platessa*	Schol
Pollock (Alaskan)	*Theragra chalcogramma*	Koolvis
Portuguese Oyster	*Crassostrea angulata*	Portugese Oester
Razor clam	*Ensis spec.*	Zwaardschede (tweekleppige)
Rajid	Family Rajidae	Roggen
Red Rock Lobster (Mexico)	*Panulirus Interruptus*	Langoest
Red spot king prawn	*Melicertus longistylus*	Soort Garnaal
Red-throated Diver	*Gavia stellata*	Roodkeelduiker
Rockfish	*Morone saxatilis*	Gestreepte Zeebaars
Saithe	*Pollachius virens*	Koolvis
Sandwich Tern	*Sterna sandvicensis*	Grote stern
Scallop	Family Pectinidae	o.a. Sint-Jakobsschelp
Sea lamprey	*Petromyzon marinus*	Zeeprik
Sea urchin	*Strongylocentrotus pallidus*	Zee-egel
Seabass	*Dicentrarchus labrax*	Zeebaars
Seabream	Family Sparidae	Zeebrasemachtigen
Sea cucumber	Class Holothuroidea	Zeekomkommer
Seagrass	Zostera spec.	Zeegras
Seahorses and pipefish	Family Syngnathidae	Zeepaardjes en Zeenaalden
Seal	Superfamily Pinnipedia	Zeehond
Seal shark	*Dalatias licha*	Soort diep water haai
Shovelnose dogfish	*Deania calcea*	Soort diep water haai
Shrimp	*Crangon crangon*	Garnaal
Silver warehou	*Seriolella punctata*	Soort uit familie v.d. Zwartvissen
Slavonian Grebe	*Podiceps auritus*	Kuifduiker
Sockeye salmon	*Oncorhynchus nerka*	Rode Zalm
Sole	*Solea solea*	Schol
South African Hake	*Merluccius paradoxus*	Heek
South Patagonian Toothfish	*Dissostichus eleginoides*	Patagonische IJsheek
Squid	Order Teuthida	Pijlinktvis
Sturgeon	*Acipenser sturio*	Steur
Surf Clam	*Spisula solida*	Stevige Strandschelp
Syngnathids	Family Syngnathidae	Zeepaardjes en Zeenaalden
Tiger prawn	*Penaeus monodon*	Tijgergarnaal
Trochus	*Trochus spec.*	Knoopjesschelp
Trough Shells	*Spisula spec.*	Strandschelp (tweekleppige)
Twaite shad	*Alosa fallax*	Fint
Yellow fin sole	*Limanda aspera*	Japanse Schar
Western King Prawn	*Melicertus latisulcatus*	Soort Garnaal
Western Australian Rock Lobster	*Panulirus cygnus*	Langoest
Whelk	*Buccinum undatum*	Wulk (schelpdier)
White-chinned Petrel	*Procellaria aequinoctialis*	Witkinstormvogel
Whiting	*Merlangius merlangus*	Wijting

Annex 1 Workshop on fishery management in nature areas

Invitation and program

Fishery management in nature areas – What is the most effective way to protect the ecosystem?

Lessons from the real world

Workshop. Thursday the 1st of December 2005, at the LEI in The Hague

Almost the entire Wadden Sea and Oosterschelde, and important parts of the Westerschelde are designated as special protection areas and special areas of conservation under the European Bird and Habitat Directives. Soon, the European Water Framework Directive will take effect. This leads to many questions. How will these Directives be implemented? What does this mean for the many fisheries that currently exist in these areas? Does fishery always conflict with nature conservation, or do fisheries exist that do not significantly harm nature? In which way should the fishery be managed? How can we organize the fishery that sustainables fisheries are allowed to continue, while not damaging the ecosystem? Or should we decide for a geographic separation between fishery and nature conservation?

Similar discussions will soon commence for the North Sea. Nature areas on the open sea may be realized before long now that the "*Integraal Beheerplan Noordzee 2015*" has designated 4 protected areas on the North Sea. This leads to the question which fisheries are possible and acceptable in the protected areas. Which types of management can guarantee that the impact of the fisheries on the ecosystems of the protected areas will be minimal? At the very least, the fishery in the protected areas should not deplete the fished stocks, should have a minimal impact on the bottom and the benthic fauna and should not affect the productivity and the structure of the ecosystem.

Do fisheries exist elsewhere in the world that are managed in such a way that nature is sufficiently protected and can these fisheries serve as an example for Dutch policy makers? Do such cases always involve fisheries governed by the state, or is there also a role for self regulation by the fishermen (co-management)? What is the role of other parties (in the chain of production, non-governmental organizations) in the protection of the natural values? Is it the case that fisheries that qualify for the MSC certificate (Marine Stewardship Council) automatically meet the criteria of the Bird and Habitats Directive that the fishery should not cause significant harm to the natural values for which the area was designated under these directives. How does the management of the MSC fisheries function in practice? What are the advanteges and the disadvantages of the different types of management? And on what points can the public and the private sector learn from each other and mutually strengthen each other?

On thursay the 1st of December 2005, Alterra, LEI, "*Stichting De Noordzee"* and "*Waddenvereniging*" organize a workshop on this topic. The workshop gives further impetus to a discussion in the Netherlands which types of management can contribute to sustainable fisheries in protected areas.

The morning program consists of five plenary presentations. In the afternoon, working groups will discuss specific themes and examples. With this invitation we ask you to reserve Thursday the 1st of December in your agenda.

The workshop is aimed at:
- scientists (fishery biologists and ecologists)
- persons with an active role in the management of a particular fishery

Morning Program

Bruno Ens (Alterra) & Esther Luiten (SDN) – Introduction and goal of the workshop

Jan Willem van der Schans – Which forms of fishery management are the most effective with regard to nature conservation: stimuli from the government or stimuli from the market?

Ger Jan Piet (RIVO) – Ecosystem approaches in the Communal Fisheries Policy of the EU

Cor Smit – What are the implications of the Euprean Nature Directives and OSPAR for fishery management?

Kees Lankester – How are ecosystem effects monitored of fisheries certified under the MSC and what are the opporunties to certify SSDD (small-scale data-deficient) fisheries?

Bruno Ens – What is known of the ecosystem impact of the fisheries certified under the MSC criteria?

Afternoon Program

Discussion in groups on selected fisheries and questions. The draft report on the international comparison of fishery management produced for the *Milieu- en Natuurplanbureau* will serve as the basis for our discussion.

- Does the MSC certificate offer sufficient protection against damage of the ecosystem by the fishery, i.e. do MSC certified fisheries automatically meet the demands of the Birds and Habitats Directives? Is it perhaps even true that the Marine Stewardship Council offers more protection against damage to the ecosystem from fishery than the European directives? The discussion could focus on selected examples:
  a. Mussel fishery in the Wadden Sea
  b. Shrimp fishery in the Wadden Sea and North Sea
  c. Beam trawl fishery on flatfish in the North Sea
- Are there fisheries that are not certified by the MSC, yet are regulated in such a way that they offer sufficient protection of the natural values in an area? The discussion could focus on the examples in the draft report for the MNP:
  a. Ria Formosa in Portugal
  b. Ria's in Galicië in Spain
  c. Otter trawl fishery on the Great Barrier Reef in Australia
  d. Halibut fishery in the norther Pacific and the Bering Strait
  e. Fishery on lugworms in the Wadden Sea
  f. Former fishery on sea turtles in Brazil
- What are the possiblities to oganize small-scale and data-deficient fisheries in such a way that they do not cause significant harm to nature? The discussion could focus on:
  a. Fishery on Bass and Mullet in the Wadden Sea
  b. Small scale integrated fishery in the Wadden Sea
  c. Hand cockle fishery in the Wadden Sea

Discussion groups report back and final discussion on the conclusions

Pariticipants

Name	Organisation
Berends, Derk Jan	Vissersbond
Berg van den, Wout	Mosselvissers
Breukelen van, Siebold	Alterra
Brocken, Fenneke	Productschap Vis
Bult, Tammo	RIVO
Daan, Niels	RIVO
Ens, Bruno	Alterra
Geertsema, Jan	Hardervissers
Hilbrands, Aldin	SGS
Keus, Bert	Beheerplan Ensisvisserij
Lammers, Hans	RWS Noordzee
Lankester, Kees	Stichting Scomber
Lanters, Ronald	LNV
Lindeboom, Han	Alterra
Luiten, Esther	Stichting Noordzee
Meer van der, Magnus	Agro Eco
Meeuwsen, Edwin	LNV
Nagelhout, Dick	NMP
Neumann, Frank	IMI
Nooitgedagt, Johan	Vissersbond
Petersen, Frank	De Waddenvereniging
Piet, Ger Jan	RIVO
Quak, Martin	Mosselvissers
Sahin, Fatma	IMI
Sas, Hein	IMSA
Schans van der, Jan Willem	LEI
Smit, Cor	Alterra
Stralen van, Marnix	Marinx
Vos de, Birgit	LEI
Vroegop, Frans	LNV
Walker, Paddy	RIKZ

Main conclusions of the workshop

Topic 1: Does the MSC offer sufficient protection against damage of the ecosystem by the fishery? (Bruno Ens & Frank Petersen)

The participants did not agree on a clear yes or a clear no to the question.

The discussion focused on the added value and the possibilities of the MSC for the Dutch fisheries.
In the past, the mussel fishery has initiated a process of certification, but this process was not finished. The time may not have been ripe, but present conditions seem more favourable for the MSC certificate.

At present, the mussel fishery must make each year an impact assessment for the European Directives. For the MSC certificate a full impact assessment is only required every five years.
Some remarks on MSC:

- MSC is a way to solve the discussion on what constitutes a sustainable fishery
- With the MSC fishermen can show what they actually do to improve the sustainability of their fishery
- The market asks for certification
- The existence of the MSC certificate attests to the failure of the Common Fishery Policy of the European Union

The Dutch government does not take an active policy with regard to ecological labels and certificates. Government provides the framework and business must take the initiative. In some special cases the government contributes to certication (mullet fishery in the Wadden Sea). Other governments may be more inclined to contribute to certication. The international examples of fisheries with the MSC certificate include only one case where certification was obtained without government support.

The EU is also developing a policy on certification. At present it is not clear what this policy will look like. It seems logical to take the FAO document as a starting point, instead of coming up with completely new policies.

The MSC does address welfare issues via stakeholders and fishery management.

Topic 2: Do there exist fisheries not certified by the MSC that are managed in such a way that nature is sufficiently protected and what can we learn from these fisheries? (Han Lindeboom and Hein Sas)

The cases studies suggest that in other countries fishery is more often managed from an ecosystem perspective. The important question concerns the underlying motivation and the decision making process leading to this type of management. To learn more on these issues, the following questions need to be addressed:

- Are we sufficiently informed about the case studies? Answering this question requires a more thorough investigation into the case studies
- What are the goals and the results of the case studies and do these include results that should be copied by the Netherlands?

A major problem of many fisheries is the lack of selectivity, leading to a lot of bycatch. As a result the impact on nature is often high and it is difficult to reconcile such unselective fisheries with nature protection.

A problem for the fishermen is that fish stocks can be quite variable. How should fishermen cope with this natural variability?"

- Spreading of risk by fishing on different target species. Specialization on only one species increases the risk of overfishing.
- Small scale fisheries can be temporarily closed when stocks are low. This is not possible in large fisheries where a lot of capital has been injected, due to the financial risks.

Especially with regard to the management of small-scale fisheries we may learn from other countries. However, the current licensing system may make it difficult to implement some of the foreign solutions in the Netherlands. Changing to a different way of fishing may be difficult

due to the quota system, permits, financial consequences and the mentality of all parties involved.

Sustainability requires leadership and a governing body. Those involved should profit from organizing a sustainable fishery.

Topic 3: Should smallscale fisheries always be given a chance to fish in nature areas? (Esther Luijten and Siebold van Breukelen)

The scale of a fishery is not the issue. What matters is the impact of the fishery on the ecosystem. Data are needed to gauge this impact and to a large extent, these data can be collected by the fishermen themselves (catches, bycatches, expenses etc.). Anticipating more restrictive regulations, the mullet fishery in the Wadden Sea has embarked on a process of certification (Waddengoud). Four of the five fishermen participate in this certification process. The collection of data, like the size of captured fish and the size of the stock, is discussed.

Fishermen should explain to society how they exploit the fish stocks and what impact they have on the ecosystem. The annual income of a fisherman is a good indicator of the sustainability of a fishery. Topdown regulation results in the fishermen being less inclined to provide information. Initiatives from the sector, like the application to obtain the MSC certificate, are more positive, resulting in a greater willingness of the fishermen to provide data.

Smallscale fishermen are more flexible and can more easily adapt their fishing methods, because they suffer less from high capital burdens. However, adaptation or change to another type of fishery is difficult, because fisheries are regulated species by species. Monitoring of smallscale fisheries may also be difficult.

One way or the other (smallscale) fishery should be limited to guarantee that the number of permits does not increast too much. The fishery sector should come up with a proposal. If the government regulates a fishery well, certification would not be necessary.

Final discussion

If not all fishermen participate in the MSC certification this may lead to problems with the antitrust authority. MSC certification depends on the voluntary participation by the fishermen. If some fishermen do not want to cooperate, it is difficult to obtain certification.

The Dutch government endorses certificates, like the MSC. Transparency and an explanation by the fishermen of their activities to society and stakeholders is very valuable.

Implementation of the Habitats and Birds Directive at sea and the formulation of the conservation goals is taking shape in relative isolation. Yet, implementation (in 2007) will be strict and swift.

WOt-onderzoek

Verschenen documenten in de reeks Rapporten van de Wettelijke Onderzoekstaken Natuur & Milieu – vanaf september 2005

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