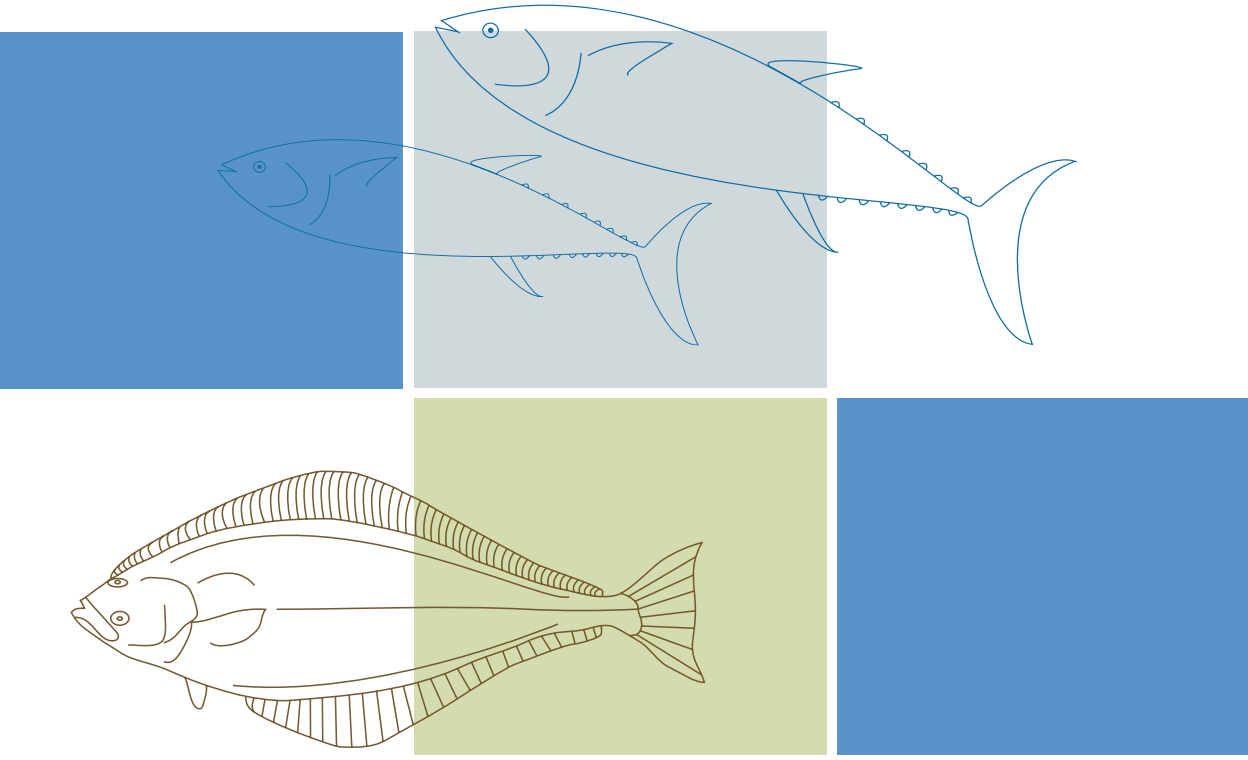
Roving Bandits in Modern Fisheries



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Preface

This is the fifth edition of the Swedish FAO Committee's publication series. The purpose is to spark an interest in issues related to global cooperation, particularly the work being conducted at FAO (Food and Agriculture Organization), the United Nations organization for agriculture, forestry, fisheries and food production. The last discussion paper discussed conflicting interests related to the trade advantages of developing countries and whether some countries benefit at the expense of others. As the FAO Committee has decided to continue the paper series along a similar topic, this edition will focus on problems related to the growing global market for fisheries products and the threat which the illegal, unreported and unregulated (IUU) fishery presents to viable fish stocks around the world.

The declining stocks of the last decades and the growing demand for fish have led governments around the world to introduce tougher regulations. This has caused fishing fleets to seek new fishing grounds, the coasts of Africa being one such place. The weak institutions, and thus weak fisheries governance, of many of these coastal states often lead to a situation where illegal fishing undermines the conditions for local fisheries and food security, thereby threatening the livelihoods of poor coastal populations.

The discussion paper highlights the alarmingly fast loss of marine biological resources and illustrates the need for political action.

The term 'Roving Bandits' is explained. These Roving Bandits illustrate the difficulties facing fisheries governance bodies. Questions are raised regarding how the phenomenon of Roving Bandits operates and who can be regarded as a Roving Bandit. Which factors contribute to the phenomenon and what are the possible effects? Which initiatives have been instigated to combat the problems?

In this discussion paper Beatrice Crona, Stockholm Resilience Center, and Henrik Österblom, Stockholm Resilience Center and the Baltic Nest Institute, discuss the growing illegal, unreported and unregulated fishery and the implications of this for attaining sustainable fisheries. The development of the paper was commissioned by the Swedish FAO Committee. Beatrice Crona and Henrik Österblom are responsible for its content. The purpose of this paper is to spark a debate which can lead to further discussions on the subject. It is my hope that it will give the reader a deepened understanding of the complex conditions surrounding the world's fisheries and stimulate a fruitful debate.

Happy reading!

Rolf Eriksson
Chair of the Swedish FAO Committee

1. Background

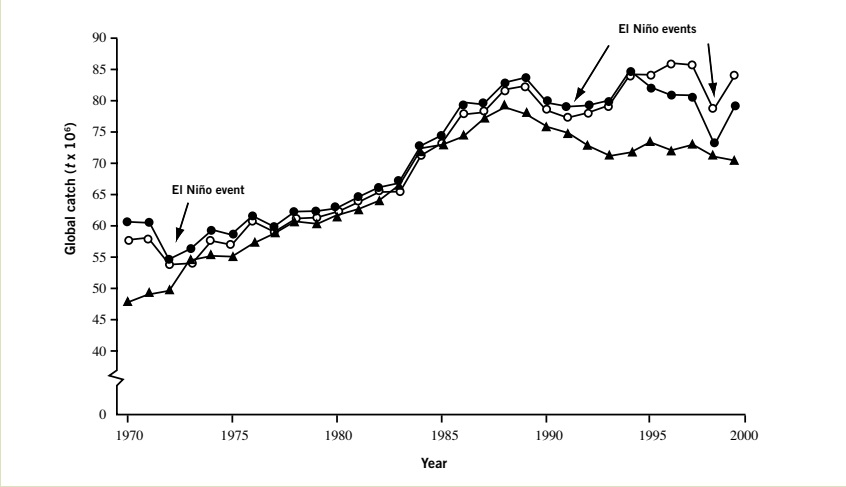
1.1. Not enough fish in the sea

During the last decade our understanding of the problems surrounding fisheries worldwide has increased. A large number of scientific studies have shown a very clear and significant decline in important fish stocks around the world, often as a result of excessive fishing pressure. The previously stable increase of catches since the 1950's (as a result of improved technology among other things) has abated. Catches have remained virtually unchanged during the last twenty years (Figure 1). Nonetheless, the demand for fish has not diminished. Fish consumption has increased significantly since the 1970's, largely as a result of the strong increase in China (Table 1). Between the years 1970 and 2007 the average consumption of fish per capita rose from 11.5 kg to nearly 17.0 kg.

Table 1. Trends in the consumption of fish between 1970 and 2007 (WHO 2008)

Per capita consumption (kg)	1970	1980	1990	2007
The World	11,5	12,8	14,8	16,9
The World excluding China	13,5	14,3	13,5	14
China	5			26

Figure 1. Trends in the global marine fishery



Data on total catches (open circles) comes from FAO and show a continuous increase during the 1990's. If adjustment is made for over-reporting by China, the graph shows a somewhat different pattern (filled circles). The Peruvian anchoveta constitutes a significant portion of the total catch, while the fish resource is simultaneously affected by El Niño. If catches of anchoveta are excluded from the analysis (i.e. total catches minus the anchoveta) a clearly decreasing trend is discerned during the entire period of the 1990's (filled triangles). The figure is from Pauly et al (2005;7), and reprinted with the kind permission of The Royal Society Publishing.

Fish consumption has also increased in other parts of Asia, Europe and North- and Central America. The consumption is stable but considerably lower in South America and in Africa (see Table 2). The situation can be seen as particularly worrisome in Africa, in part because fish consumption is lowest in this areas, but also because a significant increase in population is expected in this region and is likely to cause large problems related to health and food security.

Table 2. Current regional differences in fish consumption (FAO 2008)

Region	Per capita consumption (kg)
Asia (excl. China)	14,3
China	26
Europe	19,9
North and Central America	18,6
South America	8,7
Africa	8

In response to the growing demand for fish large investments have been made in fishing fleets in virtually all industrialized nations, and many fish stocks have been subject to increased fishing pressure. This has lead many important stocks of food fish in the Northern hemisphere to become classified as fully exploited (i.e. there is no room for further increase in fish extraction), or over exploited. Alaska pollock (*Theragra chalcogramma*) is fully exploited (or in some cases stocks have already collapsed, as in the Eastern Bering Sea), as is blue whiting (*Micromesistius poutassou*) in the North Atlantic. Most stocks of Atlantic cod (*Gadus morhua*) are over exploited and in some cases have even collapsed (FAO 2007).

In recent decades the increasing global demand has been met by a substantial increase in the development of aquaculture (primarily in China). Thus today we are approaching a level where almost half of all the fish consumed by humans is derived from aquaculture. The demand is expected to continue to increase in the next decades as an effect of increasing world population and rising levels of welfare. Aquaculture is, however, not decoupled from wild fish stocks and hence marine systems. In predatory fish farms (e.g. salmon) large amounts of fish meal (produced from wild caught marine fish) is used as fodder. Without significant development and improvement of vegetarian alternative fodder an increase in the production of predatory fish will therefore result in an increased pressure on wild fish stocks of e.g. sprat (*Sprattus sprattus*), sand eels (*Ammodytidae*) and capelin (*Mallotus villosus*), species which constitute an essential food source for wild predatory fish but also for marine birds and mammals (Österblom et al 2008).

1.2 Too many boats at sea

More boats at sea no longer mean larger catches being landed. The biological capacity of our seas to produce fish seems to have been reached, and in several instances it has been exceeded. One of the fundamental problems facing today's fisheries governance is the excessive amount of vessels or, as it is often referred to, over capacity of the fishing fleet. Profit maximizing companies naturally invest part of their profit in the business. This applies to the industrial fishery as well, and it has led to a development towards more efficient vessels and gear. Quite often state subsidies are also provided as a mean to improve fishing capacity and safety on board the vessels. The result is an increased capacity of the fishing fleet to catch fish while there are ecological constraints on how much fish ecosystems can produce.

A large part of the regulated fishery is managed through a quota system, where a certain fixed amount of fish can be caught each year. When the quota has been filled fishing is stopped. This means that the vessels with the greatest capacity have the biggest potential of catching a relatively larger portion of the total quota. The world's total fishing capacity is currently significantly larger than what is needed to catch the existing marine resources, even if it is

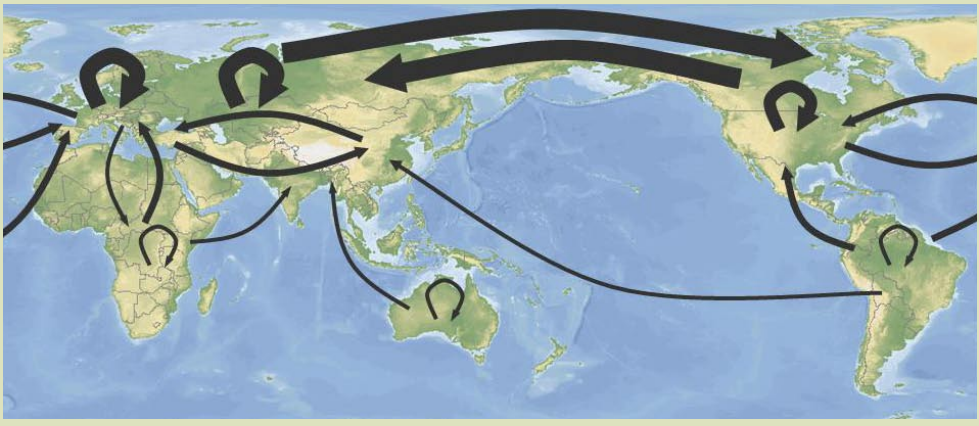
very difficult to make precise estimates of the scale of the over-capacity.

Realization of this over-capacity has led to the initiation of a number of measures from governments around the world. In some cases financing is being provided for the decommissioning of vessels, and to a growing extent economic incentives are being used to reduce over-capacity. One such incentive is to limit and specify how much of the annual quota is allocated to a specific vessel. These quotas can often be sold between vessel owners which can lead to an improved adaptation of the fishery to the size of the existing resource. What happens to decommissioned vessels is not entirely clear however. In some instances boats can be traded between nations or move to fisheries which are less regulated, in other parts of the world.

1.3 Fish of the world

The international trade with fish and fisheries products is continuously increasing. The liberalization of the market for fisheries products is by some considered to be a contributing factor. The reason for this is that liberalization means, among other things, a decrease or elimination of trade tariffs for products traded between nations, and in theory this promotes a more efficient production and utilization of resources. The theory partly agrees with reality at least within the manufacturing sector but since there is very limited room for increased production of fish, it is not as successful in predicting

Figure 2. Major trade flows of fish and fisheries products.



For intercontinental flows, only those worth over 500 million USD per year are shown. The figure is based on data from FAO (2007) and it is adapted from a version published in Stop Illegal Fishing (2008), produced by Suzannah Walmsley, Marine Resources Assessment Group Ltd (England).

sustainable production of fisheries. However, it is very likely that the trade in fish and fisheries products would have increased regardless of the liberalization initiatives, and current trends point to a continued increase. During the last thirty years the value of export fisheries has increased from close to 10 to 86 billion USD. During the last few years the increase has stabilized around 9% per year. Developing countries are important actors on the export market and contribute with approximately 50% of the total export value. For many of these countries the export of fisheries products has increased so much that it today constitutes a larger portion than the combined total of other agricultural products. Fish is therefore a very important source of income for many developing nations while at the same time it also constitutes an essential source of protein for their populations.

Japan, the EU and USA account for around 70% of the import (Pauly et al 2005). At the same time international trade flows are becoming increasingly complex and in recent years parts of the production has shifted to Asia, the former East European nations and North Africa, primarily as a result of large differences in production costs. Today China is the worlds leading producer and exporter of fish products, and in 2006 it accounted for 10% of the global fish exports in terms of monetary value (Lem 2007). A large portion of this is re-exports, i.e. fish which has been imported, refined and then exported again. China is currently the main exporter of white fish (Atlantic cod and Alaska pollock) to the EU (Glitnir 2007), of which a large portion is caught in Arctic waters (WWF 2008).

Globalization, in the form of increasing interdependencies between markets within the fisheries sector around the world, is occurring primarily through trade in fish and fisheries products, as well as through foreign direct investment in catch and processing. The evolution of increasingly global distribution channels and multinational corporations has further stimulated this development. China is only on example of how complicated the trade flows of fish can be. An attempt to illustrate this complex phenomenon is shown in Figure 2. This complexity impedes the monitoring and control of the production chain from raw material to the consumer.

2. The illegal fishery

2.1 Is everyone following the rules?

It has long been known that there are significant difficulties in governing and managing fisheries in a sustainable manner. In many countries the over capacity discussed above creates a difficult problem as it results in a high political pressure to maintain a fishery which is larger than the stocks can sustain. The professional fisherman who has invested large sums in more efficient vessels is naturally dependent on the quota being high enough for the business to be profitable. Industrial fisheries are often important in regions where other alternatives sources of livelihoods are scarce which means that demands from lobbyist groups often influence politics in the direction of quotas which surpass those advised by science. It is not uncommon that direct and short-term economic and social needs receive priority during political deliberation, at the expense of a more long-term, biological sustainable (and thereby also socially and economically sustainable) fishery. In the EU this problem has been apparent for quite some time (Sissenwine & Symes 2007). Another issue which has received increasing attention in recent years is the fact that illegal fishing undermines the conditions for sustainable fisheries. Since fisheries governance is often conducted at the international level it is not uncommon that social norms differ between, as well as within, nations. The opportunities for cheating can often also be quite good. Fishing is commonly conducted far off shore where there is significant difficulties monitoring catches. The risk of being caught 'red-handed' with catches that surpass the allocated quota is very slim. Within the EU there is a well developed organization for fisheries governance and management, including functions for the control of vessels at sea and in port. In spite of this the European Court of Auditors recently (2007) concluded that set quotas are consistently being surpassed and that insufficient measures are being taken to deal with and punish the perpetrators. The phenomenon is not unique for the EU.

There are considerable difficulties associated with estimating the illegal catches, but in spite of this a number of recent reports have attempted to do just this. Naturally they can not present exact figures but they give us an idea of the magnitude of the problem at hand, regional differences and trends over time. Some estimates suggest that illegal fishing operations correspond to a value of the catches landed ranging between 4 to 9 billion USD, of which one billion stems from African waters south of the Sahara. This furthermore corresponds to a quarter of the total income from export of fisheries products from these countries (HSTF 2006, EJF 2005). A flight inventory off the Guinean coast reported 60% of the 2,313 vessels observed in the area to be there illegally. Similar surveys outside the coast of Sierra Leone

and Ghana estimated that 25% of the vessels present in the territorial waters of both countries were there illegally (EJF 2005).

An analysis of illegal fishing in sixty countries estimated that between 10–45% of all fish landed has been caught illegally between 1980 and 2003[1]. There are considerable differences between regions. The illegal fishing operations were highest in the central and eastern parts of the Atlantic, that is outside of the West African coast. This region has also seen a significant

Illegal fishing could be defined in different ways. In English the term Illegal, Unreported and Unregulated (IUU) fishery is often used. This publication has decided to follow FAO:s definition which can be summarized as follows:

Illegal fishing refers to activities:

- conducted by national or foreign vessels in waters under the jurisdiction of a State, without the permission of that State, or in contravention of its laws and regulations.
- conducted by vessels flying the flag of States that are parties to a relevant regional fisheries management organization (RFMO) but operate in contravention of i) the conservation and management measures adopted by that organization and by which the States are bound; ii) relevant provisions of the applicable international law; or iii) in violation of national laws or international obligations, including those undertaken by cooperating States to a relevant regional fisheries management organization.

Unreported fishing refers to fishing activities:

- which have not been reported, or have been misreported, to the relevant national authority, in contravention of national laws and regulations.
- which are undertaken in the area of competence of a relevant regional fisheries management organization and which have not been reported or have been misreported, in contravention of the reporting procedures of that organization.

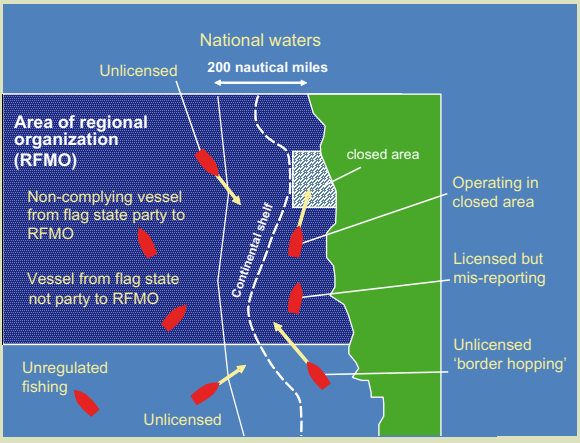
Unregulated fishing refers to fishing activities:

- conducted in the area of application of a relevant regional fisheries management organization (RFMO) but are i) conducted by vessels without nationality; ii) by those flying the flag of a State not party to that organization; or iii) by a fishing entity, in a manner that is not consistent with or contravenes the conservation and management measures of that organization.
- conducted in areas, or for fish stocks, where no applicable conservation or management measures are in place and where such fishing activities are conducted in a manner inconsistent with State responsibilities for the conservation of living marine resources under international law.

Source: FAO 2001, Articles 3.1 – 3.3.

[1] Data used for this analysis includes information from surveillance programs, existing literature and interviews with experts. The focus of the study were those species that made up the most important catches in each respective region (in total 46% of the global catches).

Figure 3. Illustration of the various types of IUU fishing.



Within an exclusive economic zone (EEZ) there may be unlicensed fishing (poaching), under- or non-reporting, or unauthorized fishing by area, seasonal, gear, quota or species. Outside the EEZ there may be non-compliance with an RFMO, or there may be unregulated fishing outside the area of an RFMO. Note that included in IUU are also un-regulated fishing conducted outside of the management area of an RFMO (see box on previous page). Adapted from MRAG (2005).

increase in illegal fishing in recent years. The study estimates the value of the illegal catches to somewhere between 10 to 23 billion USD, corresponding to a volume between 11 and 26 million metric tons (MRAG and UBC 2008). Thus illegal fishing is highly significant in many regions of the world.

However, illegal fishing is only part of the problem. In several regions fishing is also poorly regulated. Catches in the unregulated fishery, most often conducted far off shore outside of the Exclusive Economic Zone (EEZ) (200 nautical miles outside the coast), are included in the estimates above. The box on previous page describes the different types of fishing which is commonly classified as illegal, and Figure 3 illustrates how this works in relation to national and international waters.

2.2. Roving Bandits – what are they?

The term 'Roving Bandits' was first described by the economist Mancur Olson (2000). He contrasted the term with what he called 'Stationary Bandits'. In his book Olson discussed the economic implications of different types of governance regimes, with particular focus on anarchy, tyranny and democracy. Among other things, he articulated the theory that under anarchistic conditions (that is a situation without any clear governance structure), Roving Bandits have no incentives to conserve or manage a resource. On the contrary they are more likely to try to amass as much wealth and resources as possible and then move on to another place. So the plundering continues. This differs from the stationary bandits who, on account of their stationary nature, have much stronger incentives to manage their resources sustainable for the long term.

Mancur Olson discussed these types of bandits in relation to governance

regimes but interesting parallels can be made in relation to modern day fisheries resources and governance. The absence of clear governance structures in many regions, with well functioning control and sanctioning mechanisms, can be likened to the anarchy which Olson describes[2]. The role of the Roving Bandits is played by mobile actors who can exploit fisheries resources quickly and efficiently. When the resource collapses, or when it is no longer profitable, they can move and find new areas and stocks to exploit. This 'sequential exploitation', as it is often called, is one of the key characteristics of the Roving Bandits of the modern fishery (See section 3).

2.3. Who can be seen as a Roving Bandit?

The global scope of illegal fishing underscores the fact that it is conducted by a multitude of different actors. So then, which types of actors can be seen as Roving Bandits in a fisheries context? For the sake of simplicity we choose to divide them into two groups: 1) technically well equipped distant water vessels, and 2) trade operators. Both categories have the capacity to behave as Roving Bandits as a result of weak or non-existent governing institutions and trade restrictions.

The ability of individual fishing vessels or fleets to conduct a highly profitable illegal fishery is highly dependent on technical infrastructure, in combination with flaws in existing governance. Several indicators suggest the situation is most severe outside the coast of West Africa. This is partly as a result of the very limited capacity of these states to monitor their territorial waters. A number of environmental organizations have led the way in mapping the existence of illegal fishing vessels in the region. Investigations from, for example, the Environmental Justice Foundation (EJF 2005, 2007) indicate that the majority of vessels have their origin (and/or ownership) in Europe or Asia. Particular attention has been directed at Spanish, Japanese, Korean, and Taiwanese vessels.

EU is considered to be an important driver behind the current development of illegal fishing activities in the region, partly because EU fishing vessels are operating in the area. There are also indications that some illegal activities are coordinated by Spanish companies located on the Canary Islands. Las Palmas is one example of an important port used for transfer and further shipment of catches from Africa to Europe, as well as a central location for maintenance of IUU vessels. In many cases onward transport of illegally caught fish to Europe occurs without any information about how or where it was caught. Consequently, it is very difficult to discern which fish has been legally or illegally caught along the West African coast, and subsequently consumed by Europeans.

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[2] Berkes et al (2006) discuss how the problem surrounding the so called Roving Bandits can be applied to a fisheries context.

The situation looks a little different if we look at the trade operators, but similarly to the distant water fleets they are characterized by high mobility. At the global level there are a number of multinational companies which buy up and distribute large amounts of fish, both for grocery store chains and for different processing purposes. However, much of the trade occurs through smaller actors who operate at several different levels in the commodity chain. The trade in sea cucumbers in parts of Eastern Africa is an illustrative example. Small-scale fishermen are linked to local buyers with access to larger collection and storage facilities. These buyers, in turn, are linked to buyers at a higher level in the hierarchy. These can be based within the country but also purchase on behalf of external traders to satisfy the international market. Sea cucumbers (belonging to the genus Holothuria), is a group of animals which by tradition have not been consumed to any greater extent in East Africa. In Asia, however, they are used for different types of traditional medicines. The Asian demand for sea cucumbers have caused local and regional stocks in parts of South East Asia to decrease and the market is increasingly satisfied by imports from other parts of the world. The South African stocks of abalone (*Haliotis midae*) are similarly affected by trade, as over 95% of exports are destined for Asia. Actors trading in abalone and sea cucumber trade thus behave as Roving Bandits. They move between continents in search of new areas with viable stocks. Sea urchins, live reef fish, and large pelagic fish like tuna are similar examples where mobile actors behave like Roving Bandits.

2.4. Roving Bandits throughout history

Historically there have been many examples of behavior which simulates Roving Bandits[3]. European fur traders who came to North America during the 1700s are one example. In 1768 the last sea cow was killed by European hunters in Alaska but the hunt for new fur resources continued. During the 1800s the sea otter was hunted to extinction. The same course of events played out in California where sea otter populations were decimated already at the start of the 19th century. Similar stories can be told about the sea turtles in Australia and North America, as well as for cod stocks off the North American East coast. Almost all the cases described can be said to have one common denominator; stocks which had previously been protected due to their inaccessibility, or as a result of technical constraints, could suddenly be exploited with the help of improved technology in combination with access to a large market. Times and technology have changed but these two factors remain important contributions to the problem of the Roving Bandits of modern day fisheries. Globalization is another circumstance which contributes to, and in some cases reinforces, the effects of these factors.

[3] Jackson et al (2001) describe in depth how historical overfishing has affected the earth's marine ecosystems throughout time.

2.5. Which factors contribute to the phenomenon of the Roving Bandits of the modern day fishery?

We have established that Roving Bandits are represented by highly mobile actors who can move to new stocks once the resource base they are currently exploiting has declined. One can, for the sake of simplicity, divide the preconditions that make roving banditry possible into two types; 1) institutional and 2) technological. The institutional preconditions are the political, economic and social climate which is created by fisheries politics, economic incentives and social norms. The technical preconditions are an important prerequisite which allows the Roving Bandits of the modern fishery to operate efficiently.

2.5.1. Technological preconditions

Modern, high-tech fishing vessels have a great capacity to fish far out at sea during prolonged periods of time. They can move over large areas relatively quickly and they have high-tech equipment onboard (including freezing facilities) which facilitates off-loading, fueling and changing of crew members at sea. The use of trans-shipment vessels which can collect fish from a number of different vessels and transport the catch from the fishing area to port, decreases the operational costs significantly. Illegal fishing can be very well organized and consist of extensive coordination among illegal fleets, joint ownership of vessels in shell-companies which conceals those responsible, as well as well developed illegal distribution chains. In this form of organized crime those involved put great deliberate effort into obscuring the production chain. Naturally, this presents a great challenge for governing institutions. Some forms of illegal fishing is even directly related to well known organized crime operations. There are clear indications that the illegal fishery in the Barents Sea is partly coordinated by the Russian mafia and in a similar way the Chinese Triads are involved in the trade with the South African abalone (see above). Transport of illegally caught fish has at times even been associated with smuggling of weapons, narcotics and humans.

Modern communication technology and equipment create good preconditions for localizing fish aggregations as well as avoiding controlling governments. A vessel fishing for cod in the North Sea or the Baltic Sea during one part of the year can fish outside the African coast a few months later. Regulation of fisheries in one part of the world can therefore lead to a shift in illegal fishing effort to another region where regulations are less strict or where control less extensive. One sign that this is in fact occurring can be drawn from the import restrictions put in place for Patagonian toothfish (*Dissostichus eleginoides*) which was instituted in the Indian Ocean (FAO areas 51 and 57). This led to a marked reduction in the illegal fishing in this region – at the same time illegal fishing increased in the Atlantic. It is possible that the illegal fishing in the two areas described is conducted by the same ves-

sels. Improved technology, and thereby also better communication, has thus contributed to shrinking the world.

2.5.2. Institutional preconditions

Subsidies

Subsidies for the modernization of existing, or construction of new, fishing vessels have been an important driver behind the development of the over capacity we are currently witnessing, and which is 'spilling over' to regions suffering from illegal fishing. Thanks to subsidies fishing can be conducted on stocks which would otherwise not be profitable. Subsidies thereby constitute a form of overarching economic incentive for the development of illegal fishing.

Economic incentives

The difficulty associated with monitoring fishing at sea is another important driver behind the growth of illegal fishing. If the value of the catches is simultaneously high, and the penalties (in the unlikely event of being caught) are low, the incentives for partaking in illegal fishing increases. A review of the probability of being caught in a number of different fisheries in relation to existing penalties shows with great clarity that there are strong incentives to fish illegally. According to the analysis the size of the penalties would have to increase 24 times for the expected cost to be comparable to with the expected profit (Sumaila et al 2006). Fish with significant economic value (e.g. tuna or Patagonian toothfish, se box) further increase the incentives to fish illegally. Cooperation between illegal actors can further increase the profit margin for the illegal operator. By having a joint organization for maintenance (fuel) and trans-shipment of catches at sea (see trans-shipment vessels described above), the risks of being caught are reduced. In addition, organized fleets who engage in illegal fishing can often afford to loose a vessel if one was to get caught by a control operation (Gallic and Cox 2006, OECD 2005).

Governance regimes and institutions

In a report by the English organization MRAG (Marine Resources Assessment Group (MRAG): 2005) it was shown that a strong relationship exists between the governance of a nation and its vulnerability to illegal fishing. Good governance was associated with good systems for combating illegal fishing activities, through surveillance and control, political will and cooperation across national borders. Thus, the lack of strong institutions at local, national and international levels is an important contributing factor to the phenomena of Roving Bandits.

Regional fisheries Management Organizations (RFMOs) are intergovernmental fisheries organizations and agreements which have the mandate to

establish measures to protect and manage fish stocks in international waters. RFMOs play a critical role in the fisheries governance as they constitute the bulk of the international structure in place to achieve cooperation between fishing nations. Cooperation between states is essential for effective management and governance of international stocks. RFMOs have (in principle) the mandate to manage all commercially important stocks within their respective areas. However, effective governance is often only achieved for a minority of species such as fore example tuna like species, salmon and halibut. Many of the remaining species being fished within RFMO areas are, for all practical purposes, not encompassed by any management plans and regulations, particularly many of the deep-sea species described below. Several of the RFMOs have therefore in many respects failed in their task to prevent over fishing and negative effects on the ecosystems. One line of critique is targeted at the fact that RFMOs primarily focus on management of the fish stocks without much consideration for the ecosystems to which they belong, such as the sea floors which are being exposed to trawling. For example, in the North Atlantic the North Atlantic (NAFO) and North East Atlantic (NEAFC) fisheries organizations have failed in the regulation of bottom trawls for over 40 years, with dire consequences for the ecosystems associated with the sea bed. However, since 2004 important measures have been taken to improve the situation. In the Mediterranean Sea restrictions have also been introduced on bottom trawling but only in waters deeper than 1000 meters.

Flags of convenience and tax havens

Poor control of vessel flag states is another contributing factor to the problem of illegal fishing. A large number of vessels sail under so called 'flag of convenience'. This means that they are registered in a country with less stringent control, often as a result of not having ratified agreements central for fisheries governance or not being party to relevant RFMOs. Vessels which sail under their flag therefore do not have to pay for fishing licenses, vessel monitoring systems, or abide by the regulations stipulated by the RFMOs. Most commonly, nations who allow flags of convenience have so called open registries, which means that they make money by letting foreign vessels pay to sail under their flag. Flag of convenience is relatively easy to acquire via the internet for only a few hundred dollars. To 're-flag' is thus both simple and cheap and allows Roving Bandits to change flag several times in a season, which makes surveillance and control difficult. The existence of 'tax havens' further contributes to the problem as vessel owners can protect their identity by using banks in these countries and thereby avoid having to pay fines. The costs for the illegal fishery can also be kept at a minimum since many vessels are being operated with e.g. Indonesian, Chinese or Philippino crews, which involves greatly reduced salary costs. Lack of surveillance also makes the risk of being

caught and the cost of penalties for not maintaining appropriate working and safety conditions on board relatively low.

Ports of convenience

Despite the occurrence of trans-shipment vessels all fishing vessels must eventually enter a port. Regulating which vessels are allowed to dock is seen as an effective way of controlling illegal fishing. In spite of this many countries fail in their capacity to uphold effective port controls.

Finally, underestimation of the social costs incurred by illegal fishing should also be seen as a contributing factor. This can, however, not be seen as an institutional factor. It relates more to the ethical values among the actors operating within fisheries world wide. The morale in the fishing industry can be one such important aspect. For example, in the Baltic Sea Swedish fishers have for a long time been accusing fishers from Poland and the Baltic countries of conducting extensive illegal fishing. At the same time Polish fishers accuse Swedish vessels of similar illegal activities. A report from the EU commission shows that there was some substance to the accusations against the Polish cod fishery, while Swedish were also found to have significant amounts of illegal cod onboard at inspections. According to the analysis made by the commission Polish were almost 50% higher, and Swedish catches more than 20%, when inspected (EU Commission 2007). The commission's estimates of Swedish catches were, however, seen by Swedish controlling authorities to be unduly high. Regardless of the absolute figures in this particular case this example emphasizes the fact that suspicions of cheating among nations with regard to fisheries quotas can undermine the will to adhere to rules and regulations set by joint agreements.

3. How does the phenomenon of Roving Bandits work?

The availability of significantly improved technology has contributed to the success of Roving Bandits. Faster ships, freezing possibilities onboard, better communication (e.g. satellite radio), and technical aids to find stocks (GPS and high-tech fish finders/echo sounders) have all made it easier and faster to exploit the resource. Improved communication and generally increased trade as a result of e.g. Internet auctions and other web based interactions facilitate quick contacts between the exploiter, buyer and market. Together this allows previously isolated areas and fisheries resources to be reached and exploited. Restrictions, both in terms of depth and geography, have thereby disappeared in today's globalized fishery.

3.1. Masking of dwindling resources through sequential exploitation

Why is it that we in Northern Europe, despite having decimated several of our own food fish stocks in the Northern hemisphere, have not really seen any noticeable lack of fish in out markets and grocery stores? The answer is that dwindling fisheries resources at our own latitudes have been gradually compensated through geographical expansion and shifting of fishing fleets to other parts of the world, or by directing fishing efforts at deeper waters thereby exploiting species which were not previously targeted for food consumption. This is called sequential exploitation and it can occur both geographically and by depth (see also box about sea urchins).

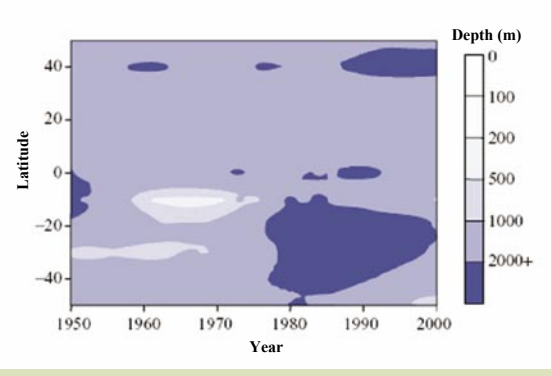
3.1.1. Sequential exploitation through geographical expansion

The expansion of fishing effort geographically has occurred both from the North to the South, but also from a local to a global scale. The European 'third party fisheries agreements' increased dramatically during the period 1960-1990, but have since decreased, partly as a result of critique being leveled at them (Sumaila et al 2006). The critique is primarily directed at the fact that the rts of toiSC BT/T1_2 1 Tf10 0 0 10 76.arsli3que is primarily directed ata3

fishing[5] did not become a well established practice until the period between 1960–70, and coincided with the decline in fish catches from shallow waters (Figure 6). The opportunities for an increased deep-sea fishery appeared as a result of the development of technology in the form of larger and more efficient vessels. This development was sped up in part by state subsidies, issued as an attempt to mitigate the effects of dwindling fisheries resources in shallower waters. Today approximately 40% of the world's trawl areas lie in areas outside the continental shelves (McAllister et al 1999) and according to FAO data on the status of the world's fisheries the global catch of oceanic species was estimated to amount to almost 8.5 million tons in 2000. This then corresponded to almost 10% of the total fish catches in the world (FAO 2002). Although no exact estimates exist, a large portion of the so called deep-sea fisheries are thought to lie in international waters and consequently, in many cases, there are no regulations in place for how much fish can be caught (Cox 2005). Alternatively, the deep-sea stocks targeted fall under the mandate of Regional Fisheries Management Organizations (RFMOs).

The exploitation of deep-sea fish stocks can be very lucrative as a result of initially big catches. The orange roughy (*Hoplostethus atlanticus*) serves as an illustrative example. The fishery for this species started in the 1970's but took off in the 80's when spawning aggregations were located around the deep-sea mounds off the coast of New Zeeland. Within approximately a decade the stocks had plummeted to a level below 20% of their original size and were very close to complete collapse. The species met the same fate in the North

Figure 6. Mean depth of global fish catches (in latitude) from 1950 to 2000, based on data from Watson et al (2004)



Note the trend towards increasingly deep waters being targeted, particularly in the Southern hemisphere. The figure is from Pauly et al (2005;9), and reprinted with the kind permission of The Royal Society Publishing.

[5] Deep-sea fishing as a term is primarily defined as fishing which occurs at a depth greater than 400–500 meters. Hence it is not a biologically defined term. For more information see e.g. ICES 2003 Report of the Working Group on Biology and Assessment of Deep-Sea Fisheries Resources, Advisory Committee on Fishery Management.

Atlantic (Roberts 2002), and similar examples can be seen for species such as the blue ling (*Molva dipterygia*) in the North Atlantic. Most deep-sea species grow and reproduce at very low speed. Many do not reach maturity until a considerable age. These factors make them particularly vulnerable to high fishing pressure. It is therefore questionable whether the stocks of many deep-sea species can be seen as renewable resources. Given the high costs associated with deep-sea fishing (specialized equipment, large vessels and long transports) it is hard to see how this industry can be economically viable without actors adopting the strategy of sequential exploitation of stocks, i.e. a roving bandit behavior.

The Arctic in focus

The sea ice in the Arctic is melting. Debates continue as to exactly how fast and how far into the future we can expect completely ice free summers, but the trend is now clear; within a not so distant future Arctic waters will lie open for exploitation, at least during the summer months. What will then happen to the rich natural resources which previously lay protected from exploitation under the pack ice? Arctic waters are known for their high productivity of phyto- and zoo plankton which benefit both fish and marine mammals. The Barents Sea contains one of the world's last large cod stocks, but also important stocks of Alaska pollock (*Theragra chalcogramma*). An intensive fishery already exists within those areas which belong to the EEZ of the countries surrounding the Arctic. In total Arctic waters currently contribute to 20-30% of the global catch of whitefish.

Illegal fishing has been, and to some degree still is, a problem in the Arctic, but it has reportedly decreased since 2005. However, the positive trend could be broken as the stocks of whitefish in other areas collapse and new areas of Arctic waters open up for expansion of the fishery. Ownership over the waters that in all likelihood will become ice free is highly contested. Eight countries – USA, Russia, Norway, Canada, Denmark, Sweden, Finland and Iceland – all make claims on Arctic areas, while China is also beginning to show an interest. According to the United Nations Convention on the Law of the Sea (UNCLOS), states can claim the right to the waters (and the biological and geological resources) up to 200 nautical miles off their coast. However, as of yet the US has not ratified the law and its implementation has been delayed by various disputes between involved nations over the location of boundaries.

As a result it is not difficult to imagine a scenario where the development of joint institutions and agreements for the governance of the Arctic resources can not keep level pace with melting of the pack ice. This could create a golden opportunity for Roving Bandits and is a big and important challenge for the governments in the surrounding states.

4. What are the effects?

The illegal fishery has ecological, economic and social consequences. As the ecological balance is disrupted through excessive exploitation of certain species, the preconditions for biological sustainability diminish. Since a large portion of the fish caught is not reported it becomes gradually more difficult for scientists to make sensible estimates of the size of stocks. The scientific advice thereby looses its relevance and credibility, which further impedes a sustainable use of the fisheries resource. The economic and social effects are significant, in part because nations loose tax income, but also employment opportunities in the long term.

4.1. Ecological, economic and social consequences

The expansion of the fishery for sea urchins to, for example, the North East coast of the USA was facilitated by the fact that stocks of sea urchins had virtually exploded in size as an effect of the decimation of their main predator, the cod. The mechanization of the cod fishery after the 1920's started a dramatic decline of the cod stocks, from the coast of Maine all the way to Georges Bank. Smaller sized species of less commercial value replaced the cod in the ecosystem but these species were not interested in sea urchins as a source of food. The lack of predators caused the stocks of primarily urchins, crabs and lobster to grow. The effect was an enormous grazing pressure as sea urchins are marine grazers, and as the stocks grew the exerted grazing pressure on the kelp forests became so intensive that much of the kelp forest previously extensive along the Maine coast disappeared[6]. The Baltic Sea is another interesting example. A decrease of the valuable cod contributed to a dramatic increase in the stocks of its main food item, the sprat. Today, the sprat constitutes the main catch in the region.

The sequential exploitation and decimation of species which play a key role in the flow of energy and biomass through the marine foodweb presents the most serious threat and ecological risk[7]. The elimination of the cod has had dramatic and persistent effects on the ecosystems in both the Baltic Sea and in North America. But the fishing for more pelagic species such as tuna, which is more difficult to monitor and regulate, also affects the foodweb in the open ocean. For example, a strong correlation has been noted between

6 Kelp is a type of large brown algae, a so called macroalgae, which can grow large and create 'underwater forests'.

7 Key species are species which have a disproportionately large effect on the surrounding ecosystem in relation to the abundance of the population. The species in question thus play a key role in the functioning of the ecosystem.

the decrease in fish and a simultaneous increase in jelly plankton, i.e. different types of jellyfish[8].

In addition, the focus of the fishery on large, long-lived and predatory fish species on many of the world's coral reefs has led to cascading effects. As these larger predatory species have disappeared from the foodweb exploitation has gradually been shifted to the larger, grazing fish species instead. These large grazers are also those which have the most profound grazing effect in the ecosystem (due to their size and intensity of feeding) and thereby fill an important role to insure that the coral reefs are not overgrown by algae. An increased fishing pressure on this group of fish species have in many cases led to a situation where algae have been able to establish on coral reefs, especially after a storm or some other big disturbance when the coral structure has been damaged and is most vulnerable. Corals grow slower than algae and are therefore commonly out competed by these plants that grow quickly and overshadow the corals which need sunlight to survive.

The effects of the deep-sea fishery described earlier are likely to be similarly negative, but since the deep seas are still largely unexplored scientists know less about the complex relationships in these foodwebs and how they are linked to other, more shallow water stocks. One thing worth mentioning in relation to this is the significant effect of bottom trawling on both shallow as well as deeper sea beds. The trawl doors, the large metal plates which keep the trawl open as it is dragged over the sea bed, leave large ploughed furrows which cause damage to bottom dwelling organisms. These deep-sea bottom dwelling animals are, much like the deep-sea fish, slow growing and are therefore very vulnerable to bottom trawling. Furthermore, they are often an important source of food for fish and therefore have long-term effects on the fish stocks as well.

Bycatch is another big and important effect of fishing with consequences for many species not necessarily targeted by the fishery. For deep-sea fishing this is particularly pronounced as most of the species caught as bycatch are not marketable because their flesh is watery and therefore can not be used either for human consumption or fish meal production.

The economic consequences are notable, partly because overfished stocks cannot generate the same returns as sustainable managed fisheries, but also because illegal actors affect the profitability and economic incentives of law abiding actors. The social effects can be very negative, particularly in Africa

[8] Outside the South Western coast of Africa a significant increase in the abundance of jellyfish has been observed while a simultaneous decrease in fish biomass has been noted. In 2006 jellyfish represented a larger portion of the marine biomass (12.2 million tones) than fish (3.6 million tons). Similar 'jellyfish blooms' have been observed in other parts of the world have as well. Whether these are caused by fishing is unclear at the present moment, as climate variations also seem to be a contributing factor to the abundance and distribution of jellyfish. It is, however, likely that fishing plays a role since declining fish stocks mean less competition for food for the jellyfish (Lynam et al 2006).

and other developing nations. In many African nations the population depends on the ocean for protein and as a source of income. The working conditions and salaries on illegal fishing vessels are also often far below what would be considered acceptable by serious and legitimate actors. It is not uncommon that illegal fishing vessels trawl in close vicinity to the coast in areas reserved for small-scale, coastal fisheries. There are a number of reports documenting incidents where fishing gear or human lives have been lost as a result of these circumstances (e.g. JALA 2008).

4.2. New markets for old resources – or vice versa?

Ecosystems which have been altered as a result of strong fishing pressure often appear to have stimulated new fisheries (Jackson et al 2001). The market can be satisfied through sequential exploitation of 'new' fisheries resources, which in turn has led to a masking of the fact that many fisheries around the world are declining. The increasing demand for fisheries products on the global market has made altered ecosystems, where previously unexploited species have increased dramatically in abundance, primary targets for Roving Bandits in search of new stocks to exploit, and have thus helped in masking the sequential collapse of local resources. As a result of overfishing, which affects the species composition of ecosystems, new industries are thus created around 'new' species which in many cases have not been used in the host country but which are valuable and sought after on established markets in other parts of the world. Old markets can therefore be said to be linked up to 'new' resources. Or is it in fact the reverse – where 'old' existing resources, i.e. species which have always existed but traditionally have not been used, are finding new markets on opposite sides of the globe? Regardless of how one chooses to look at it is clear that one of the biggest reasons that these newly developed fisheries become perfect targets for Roving Bandits is the lack of local institutions to regulate exploitation. Because these 'new' species have not been previously fished to any great extent in the particular host nation, at least not for international export, there are often no, or insufficient, institutions in place to regulate extraction.

Unforeseen effects in the future?

The link between strong fishing pressure (in many cases created by illegal fishing activities) and changes in the configuration of ecosystems – with new fisheries as a consequence – is very important to note. It illustrates the negative spiral which is created in the interplay between overfishing and insufficient institutions, as well as how this affects the resilience of the entire coupled social and ecological system. Resilience, in this case, is referred to as the ability of the ecosystem, as well as the social system dependent upon it, to respond to disturbance without collapsing. When we fish down the foodweb (see footnote 4) we gradually remove species which play an important role

in regulating, among other things, grazing species at lower trophic levels. If these grazing species are also subsequently removed it is unclear what will happen. We do, however, see that the 'new' fisheries which arise serve to mask what is happening. We are thus turning a blind eye to the fact that for long periods of time we have been altering the species composition and function of ecosystems and thereby likely also undermined the resilience of many of our seas. The simple fact is that no one knows exactly what the consequences will be.

A recent report from UNEP (Nelleman et al 2008) states that there is a risk that combined effects of climate change, overfishing, and pollution will cause a collapse of commercial fish stocks within only a few decades. Climate change has already been shown to reinforce the negative effects of overfishing by increasing sea surface temperatures which kill corals, threaten the spawning areas of tuna, and cause a shift in ocean currents and through this affects the distribution of plankton which are the foundation of marine food chains. The report deems the most threatened areas to be those which also correspond to approximately half of the world's fish catches today.

An important point to make in this context is that much if the discussion relating to the problems of illegal fishing focuses on improvement of the governance of stocks which are already known (even though some may not be currently exploited). But what happens when new stocks emerge as a result of overfishing on other species? How then can institutions and rules be devised quickly enough so that these 'new' fisheries are not also decimated by Roving Bandits? This is a big and important challenge for fisheries governance, at both the local and global level.

5. Which measures have been taken to handle the problem of Roving Bandits?

To confront the illegal, unregulated and unreported (IUU) fishery international cooperation and common rules are needed. There are several ongoing international initiatives which aim to tackle IUU fishing. In most cases FAO plays a central role (see also Box below). As an extension of the FAO code of conduct for responsible fishing, an action plan against the illegal fishery was accepted in 2001 (International Plan of Action to Prevent, Deter and Eliminate IUU Fishing). FAO also conducts a program[9], which is partly supported with Swedish funding, to help developing nations improve their port control. At the last COFI (Committee on Fisheries 2007)[10] FAO was appointed the task of developing a proposal for binding rules and guidelines for port state control, to be presented at the next meting (COFI 2009). Furthermore, within FAO work is currently undertaken to create a global ship registry for fishing vessels in order to improve

Important international instruments for fisheries governance

The United Nations Convention on the Law of the Sea (UNCLOS). The convention was adopted in 1982 and entered into force in 2004. It is binding and has been ratified by 152 nations. It constitutes an important legal foundation for fisheries governance. The convention demands that port states, based on scientific data, manage and protect the fish stocks within their EEZ for long-term sustainability (a capacity which the majority of developing nations have difficulties meeting). To the extent which a surplus exists, which is not utilized by the nations own fishery, the nation must allow other states the right to fish in their EEZ.

The FAO Compliance Agreement (Compliance Agreement to Promote Compliance with Management Measures by Fishing Vessels on the High Seas). This is a binding agreement from 1993 which entered into force in 2003 and has been ratified by 29 states. The agreement obliges flag states to make sure that fishing vessels sailing under their flag comply with international governance regulations while fishing in international waters.

9 FAO Model Scheme on Port State Measures to Combat Illegal, Unreported and Unregulated Fishing

10 The Committee on Fisheries (COFI) convene every second year and is the meeting forum of the world's fisheries governance bodies.

control and monitoring and thereby facilitate the struggle to reduce illegal fishing activities. In 2008 EU adopted stricter criteria for fish landed in, or imported to, the EU market[11]. These criteria stipulate that importers or fishers must be able to provide documentation that traces the origins of the fish which enters the EU, and which proves that the fish has been caught legally in compliance with current governance regulations.

[11] COUNCIL REGULATION (EC) No 1005/2008 of 29 September 2008 establishing a Community system to prevent, deter and eliminate illegal, unreported and unregulated fishing.

Conclusions

The fisheries politics in Europe, like in many other regions, have significant difficulties in meeting the goals set for economic, social and ecological sustainability. These problems are exhibited through declining fish stocks and deteriorating profitability in the fisheries industry. The demand for fisheries products continues to be high and is expected to increase even more in the years to come. Commodity chains for fisheries products are becoming increasingly more complex and today fish is truly a global commodity. This also applies to some of the actors involved in catching it. Modern fishing vessels have the capacity to move over long distances and to stay at sea for weeks on end. A development towards a more global market and global actors creates conditions for a highly adaptable fisheries industry, especially if it chooses not to abide by existing rules and regulations. Around the world those involved in fisheries governance have become more attentive to the extensive illegal fishery which is conducted in many regions, particularly where the possibilities to monitor and survey are limited and where the institutional capacity is insufficiently developed.

This discussion paper has described Roving Bandits, a term we use to illuminate the phenomenon of global actors who currently operate around the world, at sea and on the global market for fish and fish products. These Roving Bandits illustrate the difficulty which faces agencies involved in fisheries governance, even in parts of the world which have traditionally had well developed institutions. Naturally the problem is likely to be even more severe in other parts of the world. The paper highlights the alarmingly rapid loss of biological marine resources and illustrates the need for political action.

Abbreviations and glossary

FAO	The Food and Agriculture Organization of the United Nations
OECD	Organization of Economic Cooperation and Development. A collaborative organization between industrialized countries with head quarters in Paris.
WWF	World Wildlife Fund
UNCLOS	United Nations Convention on the Law of the Sea
UNEP	United Nations Environment Programme
CITES	The Convention on International Trade in Endangered Species of Wild Fauna and Flora

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This fifth edition of the Swedish FAO Committee's publication series highlights the difficulties that fisheries policy in Europe and in many other regions have in meeting the goals set for economic, social and ecological sustainability. The demand for fisheries products remains high and is expected to increase even more in the years ahead. This is reflected in declining fish stocks and deteriorating profitability in the fisheries industry, which has resulted in fishing fleets seeking new fishing grounds, including along the coasts of Africa. Fisheries management in these countries is often weak, which leads to predatory fishing, and this can undermine the conditions for local fisheries and food supply. In turn, the survival of poor coastal communities is threatened.

This publication describes the phenomenon of global actors who currently operate on the oceans of the world and in the world market for fish, and who pose a threat to global marine resources.

Questions are raised regarding how the phenomenon of the Roving Bandits in modern fisheries operate, who can be regarded as a Roving Bandit, which factors contribute to the phenomenon and what initiatives have been taken to deal with the problems.

The effects of the growing global market for fisheries products and the threat posed by illegal fishing demonstrate the need for forceful political action.

The Food and Agriculture Organisation (FAO) is the UN's specialised agency for agriculture, forestry and fisheries. The FAO was founded in 1945 with the purpose of, among other things, contributing to food security and freedom from hunger, as well as an improved global economy.

The Swedish FAO Committee was established in 1950, the same year in which Sweden became a member of the FAO. The task of the Committee is to assist the Swedish government in efforts to food security for all people, taking into consideration global trends and the maintenance of biological diversity in the areas of agriculture, fisheries and forestry. The Committee comprises 14 members in addition to the Chairman, Rolf Eriksson, State Secretary at the Swedish Ministry of Agriculture. The Swedish government's overarching work on matters involving the FAO as an organisation is handled through the FAO group within the Ministry of Agriculture.

Swedish FAO Committee

Swedish FAO Committee
c/o Ministry of Agriculture
SE-103 33 Stockholm, Sweden

www.regeringen.se/fao