PISH FOR ALL
ON SOLUTIONS TO CPR-PROBLEMS IN NORTH-ATLANTIC ENVIRONMENTS

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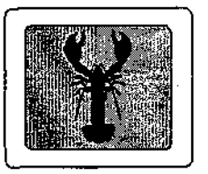


FISH FOR ALL
- ON SOLUTIONS TO CPR-PROBLEMS IN NORTH-ATLANTIC ENVIRONMENTS.

At the time of downfall of the Roman empire, fish had become so scarce that "a fish costs more than an oxen" and only the very rich could afford it. This was not the effect of health campaigns, but the results of erosion of the finely tuned institutional mechanisms that provided a steady flow of fresh fish to the imperial metropolises. Both the sustained yield from convenient fishing grounds and the supply to the consumer of this most perishable of goods required well functioning logistics, appropriate technology and trustworthy institutions.
Even with coldchains and satellite navigation, fisheries are still dependant on institutional arrangements for its very existence. As such it can to some extent serve as an "indicator-organism" of how well the institutions of a particular community, of a nation-state or of a region are functioning.

At the verge of a unified European market which by 1992 could hold 500 million consumers, the situation is very critical for the most important fisheries of the North Atlantic region, that is the cod /capelin/herring fisheries of the Norwegian Sea and the Arctic Sea. At the same time fast-growing, and highly entrepreneurial fish-farming is hitting a variety of "environmental roofs". It will be a test of the political maturity of the "new" old world whether it is able to craft institutions that are able to manage the total marine resources for maximum sustainable yield and provide high quality fish products for the consumers of a larger european commonwealth.

The tragedy of North-Norwegian fisheries.

For about 9000 years the rich fish stocks of the Norwegian Sea and the Arctic Sea (Barents Sea) has been not only a common property for the Northerners, but close to a "public good" to the whole of Europe. At times of over-population or hunger this was "frontier land", for large parts of Southern Norway, Denmark, Finland, Holland and Northern Germany, many parts of which were characterized by age old privileges for the few. By going north it was possible, by investing only manual labour and skill, to make a living, even make a fortune, from these rich stocks of fish and sea mammals. Like emigration to the New World, migration to these northern coasts contributed to a large extent to solve the structural problems of the more central parts of Europe. The open access properties of these fisheries have been so deep-rooted that even by 1989, when the cod was all gone, there were still battles over proposals to restrict leisure-fishers to rod and hand-line and to limit entry to the old open access Lofoten-cod-fisheries. Historically it were these open access properties - or more correctly: open accommodation - that populated large parts of the North-Norwegian coast. Specifying the common ; access was open to anyone who was daring enough to move and settle in these harsh environments, although finding arable land and good harbour sites could pose some difficulties and unpleasant encounters with privilege-holders. With the fisheries technology available through most of the last thousand years , being close to the best fishing grounds was an advantage both for staying alive and for harvesting the "cash crop". Open access for youngsters in the fishing communities also secured the recruitment of new fishermen and maintained the viability of the fishing communities. (Jentoft & Wadel 1984). This is so fundamental that without the customary abundance of fish along these northern coasts, much of the *reason d'etre* for settlement in these areas are no longer present.

Judged in the light of this thousands-year tradition it must be correct to classify this open-access common property as a set of social institutions . But these institutions are much older than the ones created by the Dutch East Indies company' s "freedom of the seas" doctrine (McCay 1987). In the century-old Lofoten fisheries there had developed strict rules about the wheres and whens and hows of fishing, making accommodation of new entrants efficient and orderly. But they have always been institutions for dealing with abundance and congestion of men and gear in a short period, not institutions for dealing with scarcity. These institutions have been

challenged by every new technological invention: Steamboats, motor-boats, purse-seiners,longliners and trawlers etc. have all created havoc on the congested fishing grounds. Both political and physical battles have been fought and the local institutions have accommodated and regulated also the use of these new technologies. For the last 90 years these fisheries has operated under a sort of co-management regime, where fishers have been electing inspectors from their own ranks (Jentoft & Kristoffersen 1987). Today's erosion of these institutions is however caused by unchecked developments in other areas - on the high seas. Here idle national and international capital has been invested in trawling for cod in the arctic sea - in line with the doctrine of the "freedom of the seas". Ironically, the first massive onslaught on the rich arctic marine recourses can be dated back to the dutch in the 17 th. century.

A purpose of this paper is to discuss some of the dilemmas in managing fisheries and marine resources in an "old world" north-atlantic environment (Northern Norway) and present them in a CPR (common pool resource)- perspective. This is done both in order to contribute to the variation in forms of CPR-problems available to international scholars and in order to throw some theoretical light on the somewhat muddled debate in the Norwegian political and organizational environment.

The history of north-Norwegian fisheries is by many observers (Brox 1989) compared with Hardins "Tragedy of the Commons", where individually perfect rational actions adds up to the collective catastrophe (Hardin 1968). Like Hardin , most of these fail to distinguish between common property as a social institution (the commons) and an open-access situation where there are no relevant social institutions (McCay and Acheson 1987)(Ciriacy-Wantrup and Bishop 1975).

Up to the end of the 50-ies, fishing technology was not developed to such an extent that fishers posed any greater threat to the fish stocks than did sea mammals or changes in temperatures, salinity and sea currents. However, long before that, experience from whaling, seal hunting and walrus hunting had shown what big fortunes could be made in very short periods from the concentrated biomass of the arctic,. The same applies to herring where development of purse seine technology made big catches and big fortunes possible from the end of the 19th century. But these were labour intensive technologies which distributed wealth to many

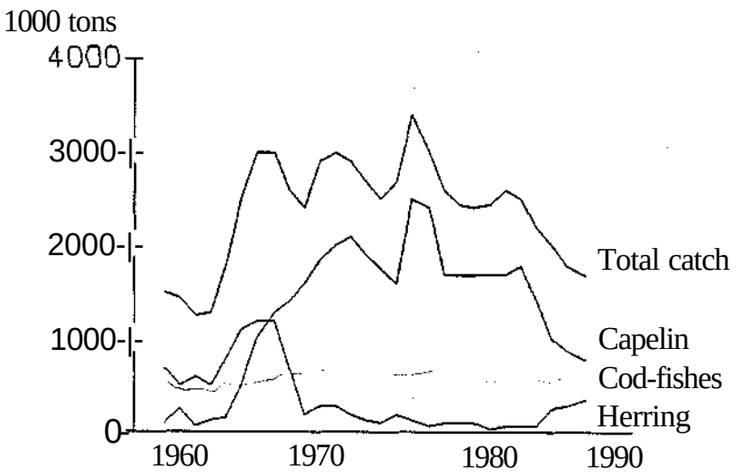
households. North-Norwegian fishers had in earlier times just been scratching the surface of the fish stock, leaving the rest to sea birds and sea mammals. Up to the 50-ies more people, more capital and more technology was attracted to the fortunes created and the fishers started to dig into the sustainable yield of the various fish stocks. At most there were over 100.000 fishers participating in the traditional Lofoten cod-fisheries, all pocketing a very good income almost every year in the hectic 3 month season. There were fluctuations both in the abundance of fish and its migration routes and consequently in the catches of the different species. However, there seems to have been a "critical mass" of all important species, thus giving the fishers a fair chance of good catches of at least some species. The preparedness for uncertainty and the ability to switch between different kinds of fisheries were therefore also important properties of north-Norwegian fisher-culture.

With its large fisher population, increased mechanization, fisher specialization (on one specie) and more sophisticated technology, Norwegian fisheries did in the period 1960 - 90 reach its maximum sustainable yield for the commercially most important fish-stocks, went beyond that level and subsequently experienced full collapse in one stock after the other, cf. Fig.1.
The rich Atlanto-Scandinavian Herring Fisheries collapsed around 1966-68, the reason being that fishing on schooling pelagic species can virtually be profitable until the last ton of fish is caught in one catch (Brox op.cit.). Following this collapse, government regulations were introduced. For herring these were clear cut, a complete moratorium being imposed with the purpose of building up the stock. Towards the end of the 80-ies careful fishing is again allowed, but the pressure against the growing stock is formidable, both from local politicians and from organized interests in the fishing communities.

Efficient government regulations ahead of anticipated collapse have been much more difficult to achieve. Negotiations over research findings and yield projections, over quotas and regional effects have been the order of the day. Even the question of what is the critical minimum level of a particular stock is a matter of negotiations between researchers and fishermens' associations because one ministry has the responsibility for both the fish-stocks and the earnings of the fishers..
Adding to the complexities are also the multigovernment setting, where Norway, USSR, Iceland and to some extent EEC-countries have to agree on the management

of "joint fish stocks". In this kind of multiple level game situation where no player pursues a strategy for the fish, the collapse of other stocks were predictable.
The very rich fisheries of capelin in the arctic sea collapsed around 1983, again being profitable virtually up to the last catch. The traditional cod-fisheries of Lofoten and northwards to Spitsbergen collapsed around 1985-86, the reason being partly the lack of food (capelin) for the arctic cod, partly forced competition between inshore fishers hunting mature spawning fish and modern trawlers hunting for younger and younger cod on the high seas. The collapse in the cod-fisheries does not show up in the national figures in Fig. 1 because there were increased catches in other species classified together with cod. But for Northern Norway the inshore fisheries for cod were the lifeline and the collapse is particularly serious here. The long evolved "native" institutions of the Lofoten fisheries had no provision to deal with scarcity created by more or less open access activity off-shore. The central government has dragged its feet on the question of having native fishermens" rights clearly defined in law and must take the blame for not developing adequate institutions able to deal with a more complex situation in a larger area before these stocks dipped below its critical minimum level. Now it had to enforce limited entry to these thousand year old open access fisheries, a measure characteristically "too little too late."

Fig.1. Catches from Norwegian fisheries 1960-1990



Source: Norwegian Fisheries Directorate: Fisheries statistics.

By 1990, the Norwegian fishers has diminished to 22.000 and the participation in the traditional Lofoten fisheries has dwindled to around 2000. Economic experts have backing from the conservatives arguing that Norwegian fishermen need not be more than 5000 to harvest the maximum sustainable yield with the available technology and without the heavy subsidy of today.(Hannesson 1990). Once a very powerful segment of the Norwegian electorate, the fishers "have" a separate "Fisheries Committee" in the Parliament. With only 5000 active fishers there would probably be no need for such a committee nor for the separate Ministry of Fisheries.

In this sad situation there is a heated debate on "what ought to be done" with North Norwegian fisheries, a debate that is made all the more complex with the coming of the unified European market and the looming question of full membership in the European Economic Community for Norway, Sweden and Finland. Grossly simplifying the issue, the main positions in this debate are as follows:

> The (neo-classical) economist position is already stated: Reduce excess capacity in Norwegian fisheries and use all available technology so that fisheries again can give a positive contribution to national economy (from minus 1 billion NOK to plus 2 billions NOK). Privatized fishing rights (transferable quotas) will ensure that fish stocks are built to optimal levels through the working of self-interest and the market mechanism.

> The environmentalist position: Build up the fish stocks to previous levels through strict government regulations. Allow a maximum sustainable yield that has to be shared between sea-birds, sea-mammals and humans. Allow only fully grown fish to be fished and allocate quantities administratively on the basis of increased multispecies research.

> The Ocean Fisher position: Allow fishers to be efficient, capital intensive and technology intensive. Limit entry to those presently engaged in "serious" fishing (mostly corporations) and issue environmentally sound and predictable central government quotas to each economic enterprise.

The Inshore Fisher position: Allow as open access to fisheries as possible, allowing also seasonal fishers common property rights. Regulate strictly the use of technology, the time of fishing, the place of fishing, the quantity for each boat or fisherman and the price/processing of various species to achieve an even distribution of income to fishers.

Several interesting developments have taken place in the wake of the crisis in North-Norwegian fisheries. North-Norwegian inshore fishers have formed a competing "Coastal Fishers Association" that challenges the West-Coast-Ocean-Fisher dominated National Fishers Association from the "inside". There is a growing coalition between coastal native fishers , environmentalists and the provincial governments of the northern provinces who want the central government to transfer the authority to manage fish resources in these northern seas to them.

There is also a strong coalition between conservatives, economic "experts" and Ocean fishers, mainly from the west Coast, but also some from the North. These are joined by free-market advocates who argue that central government must retain sole control over marine resources because fishing rights will be an important bargaining chip in negotiations over entry to a unified European market. Fishing rights are also important in the unsettled dispute with the Soviets over the "grey zone" in the Barents Sea.

The challenge of how to deal with the new situation of scarcity is immense and the multitude of considerations outside the pure bionomic ones does not make it easier. Harbouring all the regional,social, professional, economic,distributive, environmental and strategic international considerations is certainly not going to be possible. In addition, there is always the possibility that the conventional disagreements among marine biologists over the real cause of stock fluctuations can stimulate the traditional government inertia in facing complex matters.
However, there are two separate task ahead and they do often tend to be confused. One is to restore the major fish stocks to their sustainable levels, a task which requires tough measures for limited periods. Another task is to craft new and more viable institutions that has inbuilt mechanisms actively counteracting the tragedies of overfishing. It is to the latter task the rest of the paper addresses itself, identifying

elements of such institutions and such mechanisms in the present "natural" institutions which can be used in purposively constructed ones (Coleman 1990).

Land rent, Sea rent and rent-seekers rent

In any debate about extractive economic activities, the question of rent plays a crucial role. Following the influence of the "Public Choice-thinking" on western legislatures it is important to examine the influence on the current debate on North-Norwegian fisheries from this "school".

In the old Rikardian sense hunting and fishing in virgin areas gives initially a very high rent, intricate irrigation farming on Java a low rent (Geertz 1963). In truly competitive economies with no privileges and no restrictions on economic actors, all rent is believed to be dissipated after a while, for the benefit of the consumers (Tullock 1988 and 1989) . In the real world however,rent seem to be persistent as well as the accompanying rent-protection and rent-seeking. Especially when it comes to utilizing natural resources which are held in common by a group, a nation or by all mankind, several questions about fairness enter the discussion, most of them relevant for our discussion.

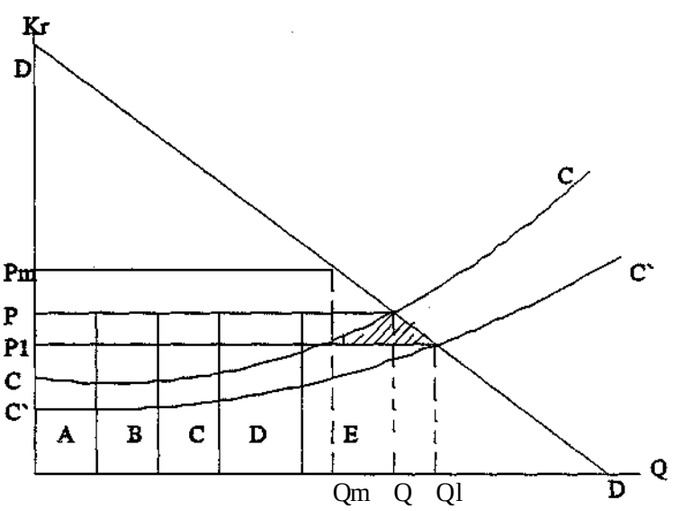
In the truly open access resource utilization system without privileges, rent dissipation is likely to be endemic, i.a. running at an accelerating pace as the extractors close up on the exhaustion of the resource (Ostrom 1990). From a neo-classical point of view this is a positive property of an economy, rent dissipation transfer resources to the consumers. From a CPR-point of view however, it is a sad state when the resource is actually eroded before the extractors see any need for institutional change. If the price mechanism cannot save the resource as its yield gets scarce, one has to introduce privilege (limited access), cartel or monopoly of some sort to safeguard the remaining resource, or if possible, to allow it to replenish.

In the public debate however, these arguments of fairness from different schools of thought tend to get muddled: There are questions of "good" rents or "bad" rents, questions whether innovative activity resulting in entrepreneurial rent being really "good", questions whether protective, non-market fighting (lobbying) being "bad", questions whether protection of traditional, low-technology resource extraction is

really "good" and questions whether traditionalists being driven out of business by entrepreneurs is equally "good".

A brief course in rent pocketing will aid the further discussion. Starting with the traditional theory of (Rikardian) **land rent,** this can be depicted as in Fig.2. Following Tullock, the rent pocketed by the land-owners from their plots A,B, C,D,E (in western agriculture) is the area above the cost-curve C-C and below the price equilibrium P (intersection of cost-curve and demand curve D-D). If technology and land is available so that more can be produced at a lower cost CT - CT, the net social gain, assuming that necessary investments are made up to the present discounted value of the rent, is the small shaded triangle to the right.

Fig. 2. Rents from land resources



Source: Tullock 1988

While this technological innovation is a sizeable transfer form owners of land-resources to consumers, it hardly makes the increased effort worthwhile for the farmers. But still farmers behave like this (dissipate rent) and innovative farmers on good land tend to drive out owners of pre-existing capital (traditional farmers on marginal land) without these being compensated. If we from the net social gain of going ahead with the technological innovation or expansion of farming enterprises (the shaded triangle), subtract the social cost of resettling disposed farmers in a

congested urban area, there might in some cases even be a net social benefit of not implementing the innovation/expansion. The entrepreneurial rent is positive for the entrepreneur for a while and he is the hero of a competitive economy (Vesper 1990). However, after a while the others catch up on him, the investment is made obsolete by further developments in a "perpetual gale" (Schumpeter 1934), and rents to both entrepreneurs and epigones are dissipated.

On the other hand, if farmers organize themselves and through lobbying (which of course also has a cost) achieve a monopoly, they can lower their production, farm only the most favourable plots and refrain from costly investments in unnecessary inventions. Still they can achieve a higher price and pocket the whole "super-rent" between P and Pm. The cost to society is this rent (which is a transfer from consumers) plus the loss of rents on land taken out of production.
This is rent-seekers rent, it is considered "bad rent" and will persist as long as the monopoly or cartel exists (Tullock 1988).

The notion of rent is based on age old notions of mans relation to nature. Nature is raw/wild and has to be tilled and tamed (Hobbes 1651). Rikardo also assumes that rent comes from "the original and indestructible powers of the soil". It still feels right for most people that this rent goes to the owner i.e. the one that discovered or claimed the resource and not necessarily to the one who cultivates it (the farmer or the lumberman or the aquaculturalist). It is more doubtful whether rent is morally justifiable to the one who depletes a resource. Traditional land rent is not considered payment to those who are denied access to land (could be pocketed by the government on behalf of the landless and redistributed).

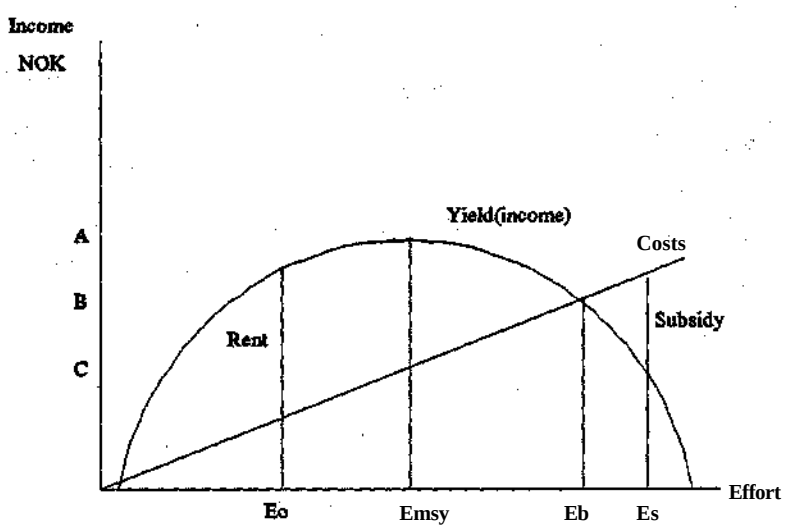
Furthermore such rent is not considered as payment for or contribution to maintaining the life-supporting systems of a particular region or even of Planet Earth. (Lovelock 1987). If agricultural resources were limited and access was open, a situation which certainly exist in many developing countries, overutilization of agricultural resources would both dissipate the rent and erode the resource base (the indestructible powers of the soil). The situation would then be more like the one depicted in Fig.3. (See also Chayanov A.V., Boserup E. and the estensive literature on peasants' traps in these traditions). In the CPR-literature, most work related to farming has been mostly concerned with grazing and water, not with the productive capacity of soils as a common resource. (Ostrom op cit.)

"Sea-rent" or rent from hunting wild stocks of fish and animals is very different from the traditional land rent. The appropriator does only harvest or subtract from the common source, never plant or cultivate. From the Norwegian setting we know only of a few exemptions to this rule: managed moose hunting that directly increases the yield of the moose population and cultivation of salmon and sea-trout fry for the stocking of certain rivers and fjords. Typically these are harvesting systems with very limited access. It is thus questionable whether this is real rent or just windfall gains, but for purpose of comparison we shall label it "sea-rent".

The first fishers who came to the north-Norwegian coasts some thousand years ago, pocketed enormous sea-rents, it was truly "the original affluent society" (Sahlins 1974), Even by 1950 a "rent" over and above return to capital and labour could amount to about 8 times the average daily wage to industrial workers in the season or about 3.5 times the average daily wage in average over the year (Brox 1988). When marketing of fish became easier and more fishers and catching capacity are engaged in fishing, the rent is dissipated and disappears. However, the dynamics of the rent dissipation is quite different from that of the land rent in western agriculture.

A simplified picture of the principles of sea rent can be obtained from the conventional Schaefer-Gordon model of the relationships among fishing effort, costs and revenue. A good explanation of how this is derived from fish-stock population dynamics and effort/cost/revenue is offered by Ralph Townsend and James A. Wilson (Townsend and Wilson 1987). Although this bionomic model is basically designed for a single and unified species fishery and may not be very useful for practical management of multispecies fisheries (Schlager 1990), it can still serve the purpose of explaining the basics of sea-rent, rent dissipation and rent-seeking in fisheries.

Fig. 3 . Rent from marine resources



Source: Scott Gordon (1954), Munro (1982) , Brockman (1981) and Brox (1988)

In this model the yield (= income) from fishing on a particular stock will increase with increasing effort, in the initial stage very rapidly, later slowly until it reaches its maximum sustainable yield (Emsy) and start to drop with further increase in effort - with a possible collapse somewhere beyond Es. There is an assumption that there is a constant market for fish, but gradually higher prices for a gradually depleted specie of fish is not reflected in the model. The sea-rent is now the difference between the total yield (=income) and the costs at a particular level of effort.

In the early history of this fishery, the fisher can pocket a sea-rent that is many times the cost of fishing, the primitive fisher will probably stop fishing where the rent is say 5 times the cost of fishing rather than proceed to the maximum economic yield (Eo) where the more modern fisher would be maximizing her net income. From this point increased effort will decrease the rent pocketed for the fisher, first unnoticeably, then somewhere beyond the maximum sustainable yield the rent decreases rapidly and is dissipated to the increased number of fishers, or to the more capital-addicted fishers, at point Eb. In actual life the price of scarce fish-species might rise if consumers are reluctant to substitute, this might keep some rent for fishers beyond Eb, might stimulate further effort and make the depletion of the stock even more dramatic (Townsend and Wilson op.cit.). Also in the real world

fishing does not stop where revenue equals costs, effort can still be increased even if the consumers do not want to pay the negative rent. This has been the situation in Northern-Norway, where the government pay a subsidy to fishers that enables them to go on overfishing. Fishers negotiate with the central government over the size and profile of the subsidy, the common argument has been that the good cod-spawns of the early 80-ies would create top cod fisheries towards 1990 and it was pertinent not to deplete the stock of able fishers. The top cod fisheries did not materialize because the cod starved to death due to the collapse in capelin-stocks, and by 1991 the subsidy will probably be negligible.

This kind of subsidy to sustained or increased effort is probably the closest we get to harmful rent-seeking in relation to depletable resources. The common rent-seeking practices of business and western agriculture, cartels and monopolies are in fisheries translated into limited entry systems, cooperative management systems etc. In fact these are privileges, but in public opinion privileges considered necessary to safeguard a valuable natural resource. Consequently, in moral terms, citizens who are active or lobby in order to take upon themselves the role of janitors of a biological, depletable resource are engaged in good rent-seeking activities. However, also in limited access systems it is necessary to distinguish between "hard" and "easy" access and between systems that yield an "efficient" and "wasteful" use of a particular resource. The use of effort to maintain a privilege that denies access to new (young) contestants and in addition uses the resource inefficiently should clearly be labelled rent-seeking, the use of the term should be made dependent on how the enclosure is done.

When seas are farmed, sea-rent will be of the same category as land-rent (cfr. Fig.2), as long as the farming practices do not interfere with the "original and indestructible powers of the sea". As we shall see later, there are few constraints to this kind of production, except for markets. Most attempts to limit access to aquaculture though advocating licensing, monopolies or cartels should therefore be labelled rent-seeking.

Ending the Tragedy without Closing the Common

Most of the debate in Norway about new management systems for wild fish centres around issues of openness and equality. This has some bearing on mainstream ideological flavours in Norwegian politics, but more important are national interests:

- to keep a sizeable fisher-population as an argument for a large share of the potentially huge international fish stocks
- to keep Northern Norway populated, for strategic reasons
- to prevent large scale rural unemployment and migration to urban areas
- to preserve some genuine fishing culture in most coastal areas in order to promote high quality tourism on the larger European market.
- to avoid injustice and political unrest by taking fishing rights away from those who contribute the least to the destruction of the resources.

These considerations , in addition to the challenge of stock-management and profitability of fisheries, make the crafting of a viable open management regime a complicated task. Although there might be neat theoretical solutions, the politics of the real world is likely to stall every initiative to do something fundamentally about the "natural" or evolved management systems. However, the collapse of important fisheries changes the political setting and facilitates political solutions that were formerly unthinkable. This is the situation in Norway today, accompanied by the risk of panic-stricken politicians jumping on some "expert" solution that closes the common for good.

A brief discussion of the major management systems is provided below. These are not organized in the conventional way i.e. according to whether the management system is related to fishing effort or to landed catch and whether the instruments used are pricing or size limits. (See Anderson 1986, for a thorough treatment of the pros and cons of the different management systems). In real life, where a multitude of objectives shall be attained, a regime will have to be a combination of these pure forms. We shall therefore only distinguish between government attempts to manage the commons and privatisation of the common, this will also highlight the CPR-

relevant aspects of the discussion. The challenge is to identify mechanisms that can maintain the properties of the open access or easy access regime at the same time as it is securing the productivity of the fish stock.

Failure of Government Regulations

Governments are usually the owner of commons in fisheries, either alone or joint with other governments. As owners they can in principle manage these stocks for the maximum sustainable yield i.e. maximum revenue to the government. Why then do most governments fail to manage their commons, even after the 200-mile extended economic zone (EEZ) and the extended fisheries jurisdiction *(EFT)* ?
The instruments available to governments are in short the following:

> Government can levy a tax on the effort used in fisheries, thus raising the costs of capital and labour used in fishing. This would make fishing unprofitable at a lower level of effort and presumably save the stock.
>
> Government can levy a tax on the catch, either as a tax per ton or a resource fee per extracted individual fish. The fee could be set administratively according to the expected scarcity of the fish or through the market by an auctioning of set fishing rights. This would also raise the price of the "crop" harvested and make fishing unprofitable at a lower level of effort.
>
> Government can decide directly the level of effort to be used in a particular fishery, e.g. by the number and size of boats , gear and fishermen-days that can be engaged in a specified period. Provided the calculations (relations between effort and yield of this particular stock) are correct and the sanctions sufficiently stiff, this kind of direct regulation should stop fishing effort at a comfortable level of effort in relation to stock size.
>
> Government can determine quotas for each particular stock of fish and distribute this as fishing rights among registered fishers, as absolute tonnage or as percentages of an overall quota.

In the North Norwegian setting, the two first mechanisms has not been tested, as these leave it to the fishermen themselves to decide the level of fishing effort after the government has decided the price on the means of production or on the common resource. These are seen as part of privatisation measures and are treated below.
Direct regulation of the physical quantities involved in fisheries (boats, men and tons of fish) has been practiced since the end of the 60-ies, the first one being a zero-quota (moratorium) on herring. These management instruments are fairly cheap

to administer and easy to legitimate when imposed, still they have not been successful.

Imposing a ceiling on the physical effort in fisheries is the same as closing the common and has negative effects that are now evident (Brox op.cit.). The government (unwillingly) makes the open common recourse the property of those engaged in those particular fisheries at the time of enclosure. This means that seasonal (combination) fishers are kept out and that youth cannot be recruited to fishing any more: This has meant an impoverishment of fishing culture along the coast and depletion of many fishing villages. Neither has this instrument solved the basic problem of the commons, i.e. overfishing. No matter how many (costly) additional regulations are added to the basic effort limitation system, the innovative capacity of the fishers are always ahead of that of the government. By extending their boats, putting in stronger engines, more efficient gear etc. each fisher will tend to defeat the effort limiting rule and thereby increase the total fishing effort (Townsend and Wilson 1987).

The licence limitation program which has been operating in Northern Norway during the last 20 years has also developed into an "imitated property rights system" where government looses the ability to vary effort according to changes in stock size because the licence ("consession") assumes a market value and questions of compensation, "buy-back" of licences etc. arises.

On the other hand the "disharmonious incentives" facing the fishermen from this property rights system act to destroy even the privatized common. It also creates rigidities for the fisher, investing heavily in the licensed fishery limits his ability to switch easily to other and suddenly richer fisheries. Or he simply goes on fishing on a depleted stock for fear of losing the right to participate. For Northern Norway, this unplanned, unconscious and illegitimate privatisation of the common has both destroyed the advantages to these northern areas of an immensely rich open access coastal common without being able to prevent the collapse of one important fish-stock after the other.

Government quotas on catch size are also tried in the North-Norwegian setting, mainly in connection with the careful build-up of controlled herring-fisheries. Both fleet quotas, enterprise (boat) quotas and even man-quotas have been tried, with

varying results. A fleet quota tend to produce a race to catch as much of the quota as possible before the others and consequently lead to over-investment. An enterprise (boat) quota might produce more cost effective fishing, although there has been a tendency for owners to substitute boat-crew with capital investments, thus limiting the access to the common even further. There is also a tendency to "high grade" and under-report the catch (throwing dead small and inferior fish overboard), thus defeating the conservation purpose of a quota system. Experiments with man-quotas are quite recent, and there are few experiences build a judgement on. They tend to result in a more labour intensive kind of fishery - as a boat can take a larger quota the more crew it takes on - and thus produce a more easy access to a closed common. Coastal fishermen tend to favour this kind of quota system, while off-shore fishing enterprises see this as untimely interference with their business strategies.

Privatisation and Externalities

In contrast to the imitated private-property right system produced by limiting effort controls, a true private-property system is believed to be maintained by the owners because they have self-interest in conserving the resource, either as an object for sale in a market for property rights or as an inheritance object. Like in western agriculture the self-interest of the owner of a property right corresponds with the society's collective interest in maintaining the resource. Once privatized, government does not have to enforce detailed rules about fishing-periods and gears, the system now provides a set of harmonious incentives that reinforce its operation (Townsend and Wilson op.cit).

Running the risk of offending important scholars,the theoretical debate on fisheries management systems in Norway can be reduced to two alternative models of privatisation: the Hannesson model and the Brox model. They do both base their theory on a Schaefer/Gordon model of population dynamics in major fish-stocks and predict that their system will over time bring the harvest closest to the maximum sustainable yield. They do to a varying degree represent a true private-property system.

The Hannesson model is basically a transferable individual quota (ITQ), as a percentage of a total catch quota for each species, set by government in accordance

with advice from scientists. In order to depict a true private-property system and achieve economic efficiency, the quotas (enterprise-quotas) must be long-term. This creates an incentive to utilize the quota in the best way, without wasteful over-investing. By transferability one ensures that quotas are (accumulated) in the hands of those who can get the catch in the most cost-effective way.

In his ideal model (following Scott 1982), the quotas (in numbers of fish) were to be auctioned every year, so that the government can pocket the sea-rent on behalf of the greater community. However,he considers this a "politically impossible" solution and settle for the long-term transferable quota. Because the government is currently subsidizing Norwegian fisheries, he does not see any point in selling quotas to fishers. Quotas should therefore be given to those who are active fishers today. The more efficient fishers will then buy quotas from the less efficient fishers, who can pocket some of the rent from the ancient common when they are closed off. Over time the system will produce a correct number of fishers relative to markets and resource base. The capitalized value of all the quotas will now be the total sea-rent, this is pocketed by the active fishers and their children(Hannesson 1984). Behaving like owners of forests, quota-owners will have incentives to increase the value of their quotas and will most probably keep their catch levels close to maximum sustainable yeild in the bionomic model. Thus the common is completely privatized, coompletely enclosed and the system will work as a true private-property system, with minimum administrative costs to government.

The Brox model is basically a nontransferable yearly man-quota (YFQ) that is the total catch quota for each species, set by government in accordance with advice from scientists, divided equally among all the registered fishers, regardless of what capital investments they have made. Quotas for all commercial species are distributed among all fishers. Assuming that sanctions against overfishing works as well as in other quota systems, this should secure a total catch at or below maximum sustainable yield in the bionomic model. The annual redistribution is supposed to safeguard against cumulative effects of regime-defeating practices and the system also utilizes the potential for self-control and co-management that is inherent in the egalitarian fishing culture. Based on the already existing fishers register plus 10% new recruits annually (and a similar exit of old fishers), this system should maintain an approximate openness of the common, or at least an easy access. If the interest to join should grow to such proportions that the man-quotas

become to small, the model specifies a queue organized according to some overall principle, for instance a "worst first" principle. The system can also be seen as a true private-property system, but in stead of quotas being offered for sale, fishers will offer themselves to other fishers with bigger boats or specialized gear in order to get their share of the quota with as little costs as possible. This would be an incentive to innovative activity in the organization of local fisheries, regenerating structures that are more robust to fluctuations in fisheries than the conventional commercial enterprise. These structures would also be well suited to cater for recruitment and training of new fishers to the widely different fishing communities along the Norwegian coast. The model does not assume any rent pocketed by the government, the registered fishermen and the recruits are "trusted" with the common property every year and can pocket the sea-rent in so far as they keep the costs below returns to capital and labour.(Brox op.cit.)

Comparing the two models in any just way is very difficult, as they are based on quite different schools of thought. The Hannesson model is a conventional neo-classic economist model of business enterprises which after the massive failure of "licence limitation systems" sees no other solution than full enclosure of the common and full private ownership rights. The Brox model is based on the other side of the duality in most fisheries, the household-economic actor (cfr. Chayanov op.cit.) and the value to him of an open access common pool resource.

Both models have weaknesses. The ITQ-model will over time produce the same stock externalities as the licence limitation systems: Capital stuffing, quota bursting and "high grading" of the catch (see also Pinkerton 1989 and Schlager 1990). System defeating strategies will further have cumulative effects as there is no yearly redistribution/auctioning like in the ideal model (Scott). The YFQ-model will also produce "high grading" and quota bursting, but Brox might be right in that a larger number of equality-oriented fishers commands a more efficient control and sanction instrument than fewer and more "inequality-oriented". One problem with the Brox model will be "Ghost fishers", quota holders that do not participate in active fishing, but let friends catch their quota. There is likely to be fights over this as the fishers' registry for next years quota allocation is subjected to public hearings in the fishing villages, and this is probably the best safeguard against a wide spread black market for ghost fishers. Like in the licence limitation systems, the amount of stock

externalities in these models will also depend on the sanctioning mechanisms, not even the ideal ITQ-system would be fully self-regulating in the neo-classical sense.

The YFQ-privatized rights are not financial securities in the same way as the ITQ-rights and probably less suitable for long term planning, the former are also dependent on fishing activities this year to yield rights next year. Under the YFQ-model larger investments will also require binding contracts with other quota-holding fishers for a reasonable time horizon. All this will probably have the effect that investments will be more careful and risks spread on more options under this model. On the other hand, when substantial sea-rents start to accrue to property owners in the ITQ-model, it becomes politically difficult to justify a continued enclosure, especially if potentially active fishers still remembers that this was once an open access common. Organized activity to protect continued enclosure will easily be labelled harmful rent-seeking.

A basic fear connected to the ITQ-model is that this permanent transfer of ownership from the public to the private sphere will pave the way for development of sea-owners who are not necessarily active fishers, but corporations (national and foreign) whose management of private property rights in fish-stocks are reflected on the stock exchanges. These will pocket the potentially enormous sea rent and hire fishers in a "tenant" position. This would not only end the tragedy of the common, but also end the Norwegian common itself.

Likewise there is a fear that the easy access YFQ-model will forever make the Norwegian fisher backward and noncompetitive in the wider European setting, by effectively constraining the development and operation of modern, high quality fishing units like freeze-trawlers etc., and preserve an overstocked and subsidy-driven fishery.

A simple computation of what outcome the adoption of either of the two alternative management systems would produce shows that this is a question of real political choice:
The ITQ-model would after some years produce a fishery that consist of approximately 5500 fishers (as against 22.000 today) and around 7000 in fish-processing industry (as against 14.000 today). This would be a specialized,modern

and technology intensive fishery that contribute annually about 2 bill. NOK to the government revenue. (Hannesson 1990).

The YFQ-model would after some years produce an easy access fishery that still had approximately 25.000 fishers in a multitude of fishing villages and with a decentralised processing industry. There would be a multitude of organizational forms and a multitude of technology intensity and capital intensity. With a conservative total yield estimate of 1 mill, tons this should give each fisher a gross income of NOK 200.000 (35.000 dollars), which is low if there are heavy capital expenditures, but adequate if low cost strategies are adopted while the fish stocks are built up to previous levels (Brox 1988).

The cardinal point in these two proposed models, but probably most prominent in the ITQ-model, is the belief that enclosure and privatisation of the common is an absolute necessity for fishers to invest in the quality of the common, i.e. end the tragedy of the common. Both these models are based on the bionomic modelling done by Schaefer in 1957 and craft their institutional instruments in order to reach a level of effort at or somewhere below Emsy (maximum sustainable yield). This is surprising in view of the fact that the world's leading fisheries managers started to move away from Msy-based regulatory regimes as early as 1976 (Environment Canada 1976).

It is impossible to judge from the scanty empirical evidence which of the two models will give the best investments in the quality of the commons, if at all choosing the one or the other will make a difference. It therefore remains a big puzzle how two influential academics, with the same objectives regarding resources, can reach so different models with so widely different outcomes, from merely different beliefs in human nature.

Cultivating the seas

During the last 20 years fish-farming, or aquaculture, has grown to such proportions in Northern Norway that it has altered the strategic rules of a large number of small coastal communities. The amount of fish produced in fish farms, the high value of the "crop" and the number of people engaged in fish-farming has made this an activity of equal importance to fishing on wild species. In the very long term

perspective, reliance on aquaculture represents a basic shift in production relations, comparable to the neolithic revolution in agriculture some 6-7000 years ago.(Sandberg & Didriksen 1986). Some observers disagrees with this notion of fundamental importance and believe that the success of aquaculture in these northern waters stems merely from the tragedy of the commons: the absence of private property rights and the collapse in major commercial fish stocks (Brox 1989).

Property rights might be critical, but it is important to understand that exactly like in early agriculture, the possible modes of production in marine environments is more fundamental than the property rights systems that develop inside these constraints: For the last 9000 years the fishing communities of Northern Norway have had to rely on hunting technology, thus being completely dependent on wild stocks of fish, birds and marine mammals. The whims of nature catered for the living conditions of these stocks and their movements, this in turn determined the fate of coastal communities: abundance or starvation, poverty or prosperity. The addition of agriculture to the fishing communities from around 400 A.D., market outlets from around 800 A.D. and processing-industry from around 1850 did not really change the basic dependence on wild stocks - it was still hunting societies.

Like animal hunting technology developed from spears to modern firearms, fisheries has developed from bone angling to modern trawling using electronics and computers. Still it is just refinement of the basic technology. Unlike in moose-hunting, no managed hunting technique (i.e. shoot only young males) is yet developed for fish-stocks, therefore even the most entrepreneurial purse-seine fisherman (Barth 1972) cannot alter the fundamental biological process of the fish stock, he can only use skill and technology to harvest more or better than the other hunters. Ability to farm the seas is therefore a dramatic shift for coastal dwellers in Northern Norway, not only in terms of economic opportunities, but also in terms of cultural impact, outlook on life, individual discount rates etc. It is the completely new relationship between the factors of production rather than the private ownership of these that gives the aquaculturalists an ability to plan production, processing and marketing in a completely different way than the fisher.

The property right system that has evolved within Norwegian aquaculture is not only a result of opportunity for privatisation, but as much a result of government regulations : Size-limited licences for fish-ponds (net-bags) have since 1977 been

given to individuals or to companies (ltd.). While the licensing was introduced to protect the infant smallholder aquaculturalist development in threatened coastal villages from the competition of big capital, the effect of the licence design was to stop spontaneous organizational developments based on local entrepreneurial and environmental advantages (Sandberg 1983). This regulatory regime has both hampered the technological development of aquaculture and produced an ownership structure that is toofragile in face of market fluctuations and aggregated environmental effects like local pollution from fish farms and spreading of virus due to far too densely stocked ponds.

With the development of such externalities, the Norwegian government is now relaxing the licensing system. The question is then what property rights systems will evolve that can act as efficient incentive systems and minimize transaction costs (Dahlman 1980). This will no doubt be an exciting field where Norwegian scientists, both of the neoclassical and the community inclination, will offer their services.

More important for our discussion here is the relationship between a growing privatized aquaculture activity in most coastal communities and the continuing fishing activity on the commons.
The psychological effects of the "modern" on the traditional might not be the most significant, as there have been failures also in aquaculture, especially in the farming of salmon. Fish have run away, poor husbandry has led slow growth and déceases, overstocking has stuffed markets and forced aquaculturalists to freeze the surplus, banks have withdrawn credit, bankruptcies have thrown people out of their houses etc. (Sandberg 1990). These are hazards that rarely happened in the non-privatized traditional fisheries.

The entrepreneurial activities of the early aquaculturalists are probably the most significant linkage between the new form of purposive marine production and the old form of harvesting whatever windfall gains that nature provided. In North-Norwegian aquaculture the first entrepreneurs appeared in coastal communities around 1971, typically being strong minded individuals with a deep community commitment. He or she was the first one to put this technological innovation (a 3000 year old South-East Asian innovation) into full commercial use in these environments. By doing that he or she used a better combination of production

factors and expanded markets in order to reap an extra profit (entrepreneurial rent) which was over and above the usual profit made in these communities (Schumpeter 1934). These factors of production were initially typically low-priced due to their close association with the traditional open-access fluctuating fisheries:

capelin (up to 1983)
fish-cuttings, fish-flour, fish-oil, shrimp-shells and other kinds of fodder
"district-capital"
marginal area labour
sheltered locations

The only high priced factors of production were fish fry, pond installation equipment, medicines and "aqua-consultants". As firms have organized production of these for an expanding market, competition in factor markets made even these items cheap. In addition, efficient vaccines are increasingly replacing costly medication. This radically new and better combination of production factors with an enhanced predictability of production, enabled producers to expand and stimulate demand and to benefit from long term agreements with retail chains in Europe, USA and Japan.

Initially, this gain to the local aquaculturalist did not represent a loss to the other economic actors in the community, empirically we have observed no local losers in the game except for the entrepreneurial failures.(Sandberg 1983). This is also an important underlying theoretical argument: In the entrepreneurial phase the increased gain is not transferred from the traditional fisheries, but is a net gain to the whole fishing community over and above the value created in ordinary fisheries. As we have seen earlier, traditional fisheries managed through its own internal dynamics (overcapitalization and overfishing) to dissipate all "sea-rents" during the 20-year period from 1970- 1990. The growth of aquaculture during the same period did in fact help many fish-receiving-stations and fishing villages to survive (ibid.).

Substantial entrepreneurial rent does not last forever. Imitators, or epigones are attracted to the promising ventures like bees to a jar of honey. According to Schumpeter, they come in big swarms and erode the very profit they were attracted by, by bidding up the price of the formerly low priced production factors and flood the market with their products, thus lowering the price to the consumers. Despite a strict government licensing system, whose issue of new licences typically coincided

with election periods, the number of aquaculturalists have grown steadily. More important, licence-holders have exercised considerably political influence to facilitate the obvious alternative: to enable themselves to triple their own production capacity (expanded size-limits) in face of seemingly unlimited markets for health-giving salmon among consumers. This rent seeking activity may have produced a lower growth in the number and spread of aquaculturalists, but it was also counteracting the aim of protecting the entrepreneurial rent. It might even have hampered the technological and organizational innovation in most coastal communities.

By 1990, the first fundamental change for centuries in north-Norwegian coastal communities is "digested" and the entrepreneurial rent is dissipated, mainly to the benefit of consumers in Europe, Japan and USA. However, traditional fishing, and other economic activities in these communities are now faced with different factor markets, new financial and management models, new processing and marketing strategies, new hygiene and product handling standards etc. Of special advantage is the increases price of throw-aways from fish-processing industry (used as fodder) and the lowered price of fish fry due to vivid competition in fry production (Borch, Scholberg and Aaker 1989). On the other hand there is a considerable increase in the price of labour, in the price of capital, the price of insurance, the price of management capacity and the government subsidy to coastal communities is being phased out. Despite these emerging indirect linkages between hunting for fish and cultivating the seas, they are still separate systems, far from the integrated irrigation/fish-pond systems of China (Zweig 1985).

For years ahead the challenge to the coastal dwellers of Northern Norway is to regain control of the wild fish stocks and to take into full use the comparative advantage these north-Atlantic environments have for marine cultivation. New and more efficient methods have to be found that can bring new entrepreneurial rent to these societies. Many of these methods exist today. If they are allowed to be adopted by coastal entrepreneurs without interference from government, a multitude of modes of sea-cultivation is likely to occur, many of which will circumvent the environmental problems of todays technology:

Closed land-tanks with 100% control of pumped-in water and waste-water. These will give laboratory like conditions and will certainly produce healthy and high quality fish. However, this technology is expensive and does not take any advantage of the northern environment(see also Aaker,Edvardsen,Wold and Meland 1990). Controlled land tanks can as well be set up closer to the markets in continental Europe, thus rendering any entrepreneurial rent a very short life.

Cooperative enclosures.
Many places along the north-Norwegian coast are suitable for larger enclosures or enclosure systems that integrates rivers etc. By fry-cultivation, feeding and domestication, high quality fish can thus be produced in healthy environments at a low cost. Also the purposeful growing of fodder is conceivable in such systems. Government regulations and the presence of individual aquaculturalists using "traditional" pond-technology in the most suitable environments (fjord-basins etc.) is today the greatest obstacle to such developments. Though, local resentment to pollution from private aquaculturalists can form the necessary basis for this kind of cooperative effort.

Marine transhumance
Some anadrome fish, like the arctic char and the sea trout, enter into very short migrations between fresh water and a nearby body of salt water. Systems of spawning enhancement/hatcheries and traps are possible that make these stocks "herdable" and that can give good return to labour and investments. Local control over both the freshwater run and the fjord basin is necessary .

Sea-ranching
Especially salmon, but also other species have a homing instinct that can be utilized commercially by the coastal communities. After a ban was introduced on drift-net fishing for migrating salmon off the coast of Northern-Norway, sea ranching development is now feasible. Even from small freshwater runs, large amounts of salmon fry can be sent out to "graze" on the immensely rich pastures in the arctic sea, where 50 million extra salmons would not make any difference (Raa 1984). Traps would catch the fish without use of much effort, a 3% return would break even, a 10% return, which is common for Iceland, would give a considerable sea-rent from cultivating the sea and owning the stock.

Most of these forms of cultivating the seas require different kinds of property rights systems than the present private pond technology. Many villagers, holding shore rights, salmon-net rights (in fjord), river shore rights etc. has to come together and cooperate in order for such new systems to work. It is also necessary for government to legitimate ownership of such semi-wild, cultivated fish stocks and to grant protection to these against preying humans of the urban leisure class. The reasons why such technological innovations are not put into full use are the lack of

organizational innovations - it is difficult to conceive of forms of property rights between the open access common fisheries and the private fish pond. However, rent dissipation usually activates innovativeness, especially when many economic actors in the same community feel the same kind of pressure (see also Spjelkavik 1990). It is therefore likely that the coming years will see a multitude of organizational forms evolving around different ways of cultivating, herding and owning fish in the various environments along this coast.

Because the idea of owning fish - and caring about fish, evolves from the private fish ponds and from the problems within aquaculture, there is most probably going to be strict sanctions against coastal dwellers who try to claim ownership over fish without direct efforts to cultivate the stock, enhance the spawning grounds and a general tending attitude (see also Wilson 1982). This is also because new forms of aquacultural production to a greater extent than hitherto will be seen as privatisation of the common, i.e. a territorial enclosure of popular inshore fishing areas. Consequently the demands on increased production and profitability stemming from enclosure will be aggressive, owners who get together on a poorly designed sea-ranching project just to monopolize traditional fishing will no doubt be labelled rent-seekers.

Another effect of the drive to find new and more profitable ways to do aquaculture in these northern waters is that it will be increasingly difficult to claim ownership to fish-stocks which are subject only to harvesting, where the owner does no cultivation or enhancement. For instance the introduction of TIQ' s will be politically more difficult the further the development of these more open forms of aquaculture has developed. The hypotheses which can be derived from this is that the open or the easy access to the commons in this north Atlantic environment is strengthened by development of forms of cultivating the sea that links ownership to the obligation to cultivate.

For the single coastal community the challenge is really to expand the more predictable production from enclosed, cultivated sea areas and from privately or cooperatively owned fish-stocks at the same time as the common (wild fish stocks) is kept easily accessible for all members of the community (see also Dahlman 1980 and Netting 1981). This will also secure the flexibility necessary for the coastal natives to fully utilize the resources of the northern seas.

A compound management regime ?

We have earlier raised doubts whether wild fish stocks behaves in a way that makes the introduction of TIQ' s and YFQ' s feasible property rights systems for the seas off the coast of northern Norway. In recent years a growing number of scientists have become increasingly uncomfortable with the Schaefer/Gordon bionomic model as a basis for long term control of fisheries. Both Hennemuth and Cushing suggest that in a multispecies setting there are no strong relationship between current catch/ stock-size and the future stock-size/catch (Hennemuth 1979 , Cushing 1981). The determinants are system-wide - for the whole ocean ecosystem - based on a relatively stable photosynthesis, the biomass production is also relatively stable, but it may accumulate in different species from time to time.

According to these critics, the important factor is the **"critical minimum** size" of the fish-stock, above this the variations are large and unrelated to stock size, below this threshold recruitment falls dramatically (stock collapse). These new fish population theories see the survival rate of eggs spawned in a particular year the single most important factor determining the stock size in a later year. However, as we saw in the case of the starving cod-youngsters, also after a spawning success a complex ecosystem can surprise the scientists. This scientific approach to immensely complex ecosystems like the Norwegian Sea/Arctic Sea is also in line recent design changes in Norwegian marine research. There are by now good data on spawning successes and other ecosystem variables although the comprehensive modeling has been slow to move away from a 100 year tradition of single species research.

If the bionomic population dynamic model is grossly inadequate, so must also be the management systems and proposed property rights systems based on this. Several fisheries scientists and economists argue that as long as fish population is kept above the "critical minimum size", all measures to tune the catch to the Msy-level: quotas (TIQ' s,YFC' s), licence limitation etc. are likely to be irrelevant to the future size of the stock.(Wilson 1982, Townsend & Wilson 1987, Pinkerton 1989, Schlager 1990). In a CPR-perspective this also means that the subtractability criteria cannot be applied absolutely because a fish not harvested by one fisher is not necessarily available for other fishers, the resource is also common to birds and whales. In this

perspective the Hannesson model of closing the common and issue a private property right that can be capitalized is then not only an unnecessary enclosure, but also cheating on the capitalist, as the predicted relationship between his self-interest and the maintenance of the resource is false.

The alternative management systems advocated by these authors are largely concerned with the need to keep the fish-stock above this "critical minimum size" by administrative provisions with low transaction costs, e.g. moratoria or resource fees. The actual management of fisheries must reinforce the spontaneous (i.e. self-interest-induced) switching effort away from stocks with declining populations towards stocks with increasing populations (Wilson 1982). Already an important element in indigenous systems, this will have to be the most important part of any management regime.

Among other means are the deregulation effort, like removal of species-specific licensing program, necessary to avoid forcing fishers to go on in a fishery for fear of loosing the right to participate. . The price increase of scarce species has also to be addressed with appropriate measures, as this with only modestly rational fishers tend to delay switching to more abundant species (Townsend and Wilson op.cit.).

From empirical studies of naturally evolved management systems around the world, there abundant lessons to be learned for fishers, scientists and managers who set out on the task of crafting viable institutions for solving CPR-dilemmas and managing a more uncertain common resource without the comfort of a stable species-specific Msy and well defined institutional arrangements (Schlager 1990):

- we must substitute the model of a strictly rational utility maximizing fisher with a boundedly rational and opportunists fisher who acts as fallible learners in uncertain and interdependent situations.

- we must recognize all fishers as able to engage in institutional design and change, especially at the local level, as long as the benefits generated by the new set of arrangements exceed those of the status quo arrangements.

- we must accept the real costs to fishers of creating or changing institutions that comprise more than their immediate community.

- we must recognize that in order for monitoring and enforcement systems to function effectively, fishers must have a stake in the governing institutional arrangements and must be involved in their monitoring and enforcement.

- we must appreciate the rich inventiveness among the world' s fishing communities regarding institutional design, realizing that the most effective rules are those concerned with residence requirements, spot allocation, fishing periods, technological limits, fish size etc. and that fisher do not themselves design rules like quotas, licences, limited entry etc.

Equipped with these insights and with the lessons from the initial attempts to cultivate the seas, we shall finally attempt to outline a compound management regime for marine resources in these northern waters that has the potential to provide fish for all, for all who want to come and fish and for all in the European internal market who likes to eat fish.

The starting point is that the marine resources of the north are the inherited easy access common property of the coastal population of the north and that national governments and the European community should give legitimacy to local and regional management regimes. In keeping with tradition of an easy access common, this should be a non-discriminatory access, so that any citizen of a European country who move and settle on these coasts should have a right to fish. A residence requirement for utilization of a natural resource would not be in violation of the principles of the European common market (Kleppe 1990).

The central government" s resource and environmental agency has the responsibility to monitor the stock size of all ecologically significant species and has the authority to impose a resource fee (per fish) when the stock is low and a moratorium when the stock gets close to the "critical minimum size". The resource fee should be quite steep in order to offset the likely price-increase on scarce fish and induce switching to other species. Rents should not be pocketed by government or regional authorities when fishing is abundant, these should bee seen as windfall gains that accrue to active fishers.

The research on cultivation of new species of fish should be stimulated so that there is a cultivation technology available for all major commercial species. When the wild stock is low, the higher price to the consumer will stimulate private

aquaculturalists or cooperative groups to increase cultivation, an incentive that will act in consert with the resource fee to ease the pressure on the wild stock.

The management regimes for wild stocks should be further evolved from the indigenous fisheries management regimes (e.g. the Lofoten management system), with the participation of both fishers and scientists and should be given legal authority by provincial and national governments.

With a multitude of locally adapted management systems based on these simple principles, and a continued growth in aquaculture there will still be men and women willing to live and work in these harsh environments and these northern coasts should be able to provide fish for all in an enlarged European market.

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