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**Technical capacity versus capacity in use
- challenges in defining efficient fisheries regulations**

Abstract:

In Norway, perceived improvements that followed the introduction of quotas and access limitations to secure future fisheries, pose some interesting questions about efficiency. Comparison of small scale fisheries practices before and after the introduction of efficiency regulations, shows that these regulations can change the social system of fishing in unforeseen ways. The economic and biological improvements following the regulations are debatable. Explanations for the lack of efficiency draw upon the politics of knowledge, or how scientific explanations narrowly define and legitimize what efficiency is and how to achieve it. In the case of small boat fisheries, defining fisheries problems by technical measures alone, overlooks two important factors: 1) Variation within that technological category of fisheries and 2) Social incentives and constraints of technology in use. Failure to take these factors into account leads to changes that are actually counterproductive to fishing efficiency in the small boat fisheries. The present longitudinal study draws upon qualitative and quantitative data in the small scale fleet in Troms and Finnmark, the two northernmost counties in Norway. Data were collected intermittently from 1984-1996.

Introduction

The Russian economist Chayanov showed that with increased prices for the products, the peasant household would lower its effort and produce less (Grønhaug 1976). These behavioral studies demonstrated that the peasants' *productional capacity* was focused on their households' needs. Chayanov's work had little impact on the construction of modern resource management regimes. Rather, these regimes are formed around the logic inherent in the famous 'tragedy of the commons model' (Hardin 1968).

According to this model, people's harvesting is only limited by the system's natural resources. This implies that *technical capacity* is an index of productional capacity. Thus, *fishing capacity* can be measured by counting fishers, vessels or gears in use. Furthermore, if the calculation reveals that the number of fishers cannot be sustained by the natural resources available, *over-capacity* is defined as the problem, and reducing the number of fishers the solution.

The perspectives of Chayanov, and those inherent in modern resource management regimes, represent two very different understandings of productional capacity.

Scholars criticizing the model of Hardin refer to empirical studies showing how fishers' use of natural resources are socially constrained¹. Thus, fishers' technical means are wrong indexes of productional capacity. Data from my fieldwork on small scale cod-fishing in Northern Norway, underline the importance of distinguishing between the technical measure of capacity and the more qualitatively oriented concept which I will refer to as *capacity in use*. Discussing these two notions with reference to small scale fishing capacity, I will show how capacity in use changes when the fishery is regulated as if technical capacity equaled capacity in use.

The analysis is based on studies of small scale cod-fishing in Troms and Finnmark, the two northernmost counties in Norway. These counties hold around 40 % of the nations small scale fishing vessels (Maurstad 1997). By 'small scale' I refer to vessels below 13 meters. Data were collected intermittently from 1984-1996, and I draw on quantitative catch data as well as qualitative data on how the fishery is performed. The

¹ References to empirical studies are found in McCay and Acheson (1987), Pinkerton (1989), Ostrom (1990), Berkes (1989), Dyer and McGoodwin (1994), Feeny et al. (1990), Wilson et.al. (1994).

latter was obtained through participant observation, my own experience from one year in fishing, and through additional interviews with fishers.

I organize the discussion in three sections: First I describe the background for the cod-fishery regulations introduced in 1990, and how they were designed. Then I turn to how regulations influenced the social organization of small scale fishing. Thirdly, I discuss the lessons to learn from the Norwegian example of basing management policies on a priori assumptions of fishing capacity.

Norwegian cod fishery regulations

For centuries, cod (*Gadus morhua*) has been the main species caught in North-Norwegian waters. Vast amounts of North-Atlantic cod comes from the Barents Sea to the coast of Norway twice a year. The spawning cod gives rise to a winter fishery, and the feeding cod gives rise to a spring fishery. In addition, Coastal cod is present all year around. All fisheries take place in coastal waters, and they provide small scale fishers with good income opportunities. The ecological conditions are reflected in the structure of the fishing industry. In 1996 a total of 6800 boats participated in the cod fishery. Of these, as many as 5600 vessels were below the size of 13 meters.

Fishery biologists have regularly measured the size of the cod stock since mid 1970s. Each year, a Total Allowable Catch is set on the basis of their advice. Cod being managed on a bilateral basis, the TAC is shared between Norway and Russia. The Norwegian part is then distributed among national interest groups. Until 1990, only trawlers had fixed vessel-quotas. Individual maximum vessel-quotas, as well as public licenses to fish, regulated catch and access in the coastal fleet. These regulations did not affect small scale fishers, who did not need licenses. The maximum vessel quota was also too high to represent a limitation on catch. It ranged between 250 and 400 tons, and this was more than even the most industrious fishers caught. In essence, the small scale fishery was an open fishery.

The fishing authorities' policy on closing the fishery when the TAC was caught, was poorly developed in the 1980s. Consequently, over-fishing the TAC was common

(Sagdahl 1992, Holm and Rånes 1996). It took a 'fishery crisis' to change this management situation: In the beginning of 1988 the TAC was set at 590 000 tons. Later that year, scientists found that the growth in the stock was lower than expected, and the quota was reduced to 450 000 tons. In the years to come the quota were to be reduced further. While the prognosis in the mid 1980s had been an increase towards 800-900 000 tons, the TAC for 1989 was set at 300 000 tons. Good availability of cod along the coast this year, led the quota to be caught during the first months of the spring. This year the fishery was closed, and as early as the 18th of April.

The early closing of the cod fishery had severe impacts for all fishers (Jentoft 1993). The traditional winter fishery provides the mainstay for many, especially small scale fishers. Many of these start their fishery as late as February, March or April, and some had just begun to fish when the fishery was closed.

The Norwegian cod crisis left its participants with disparate problems. For the fishers, their mainstay was at risk. For the authorities, the cod stock was at risk, and with a fishing capacity out of proportion with the reduced TAC, allocation problems had to be dealt with. The immediate solution was to enforce new restrictions, both to save the cod stock, and to distribute fishing possibilities so to avoid the critical events of April 1989.

A distributive key for allocating the total allowable quota between fishers had to be found. The notion of 'cod-dependency' became central. Cod-dependent, and especially small scale fishers, should be given preferential treatment. Restrictions should be harder on fishers with opportunities to switch to other resources than cod. Furthermore, the distribution was based on merit. Fishers who had fished small quantities were considered as not sufficiently dependent on cod-fishing for their livelihood. A demand of minimum catch the years of 1987-1989 was set to differentiate between fishing opportunities in the new regulation system.

Having decided upon these central ideas for rights distribution, the next step in the construction of the new regulation system was arithmetical. On the basis of former catches, average catches for vessels in various length-groups was calculated. Both the

minimum demand and the quota cuts related to these numerical tables. Preferential treatment was given to the smaller vessels by allocating small scale fishers (who fulfilled the demands of minimum catches) a smaller reduction relative to the average of their vessel-group. The quota distribution then became as follows²:

Fishers who had fulfilled the demands for minimum previous catches for their length-group got *individual fixed vessel-quotas*. The quota size was made dependent on boat size. Fishers who had fished less than the minimum demand could also participate in the fishery. Provided they accomplished the requirement of not earning more than Nkr 170 000,- (24 000 US Dollars) from other occupational activities, they were allowed *maximum vessel-quotas*. The difference between the two types of quotas was that the former vessel-quota, in addition to being guaranteed, was higher. Fishers in the latter category were allocated small quotas and had to fish them on a competitive basis.

Thus, the new regulations installed two different types of fishing opportunities. The category of fishers who were allocated individual guaranteed vessel-quotas was labelled 'Group I' or 'full rights', while the category of fishers who were assigned maximum vessel-quotas was labelled 'Group II' or 'reduced rights'. The amount of fishers in both categories were approximately the same in 1990, but fishing opportunities differed. While Group I counted 3548 boats and was assigned 73 000 tons of cod, Group II counted 4030 boats, and were allocated only 12 000 tons of the Norwegian TAC. Boats operated by small scale fishermen made up the majority of vessels in both groups - 2761 boats in Group I and 3894 in Group II³.

Within the new regime, access to the cod-fishery is fairly open. Provided meeting the aforementioned income criteria, one can register as a fisher, register a boat and use the fishing rights following Group II-status. The access to good catch opportunities however, is restricted. In 1990, a fixed vessel-quota for a boat of 10 meters was 17,7 tons in Group I. In Group II it was 2,5 tons. Later quotas have increased. In 1994 the sizes were 25,7 and 17,5 respectively. Thus, the difference between the catch

² I outline only the aspects necessary for my discussion on fishing capacity. For a closer look at the institutional process by which the regulation system was established, as well as a more detailed outline of its design, see Holm and Rånes (1996).

opportunities of fishers in the two different categories have decreased. For some fishers, especially part-timers, the size of a Group II-quota is sufficient to meet their household's demand for income from the fishery. One problem though, is the insecurity following Group II-status. Since individual quotas are caught on a competitive basis, and since the increase in total allowances for this group is minor, the chance is that one may catch only a small proportion of the maximum allowed vessel-quota. Thus, Group II does not attract recruits to the fishery. To pay for investments, recruits need access to the more secure Group I-position, and this access is restricted. Since quotas are attached to vessels, and since only a limited number of vessels have Group I-quotas, one must buy a boat with quota to gain access to the fishing opportunities in Group I.

In terms of efficiency, management of cod and fishers seems to have improved as a result of the regulations. Comparing mid 1980s with mid 1990s, the overall structural change indicate increased economic efficiency. The number of fishers is reduced. While 8233 smaller boats was in business in 1984, only 5577 are present in 1996. This amounts to a 32 % reduction. The decrease among the larger coastal cod-fishing vessels is 23 %. Fewer fishers should mean better income opportunities for those remaining. The new regime should also imply that it is easier to achieve a satisfactory harvest control. A closer scrutiny of how the social system of small scale fishing have changed, however, provides a basis to challenge such conclusions.

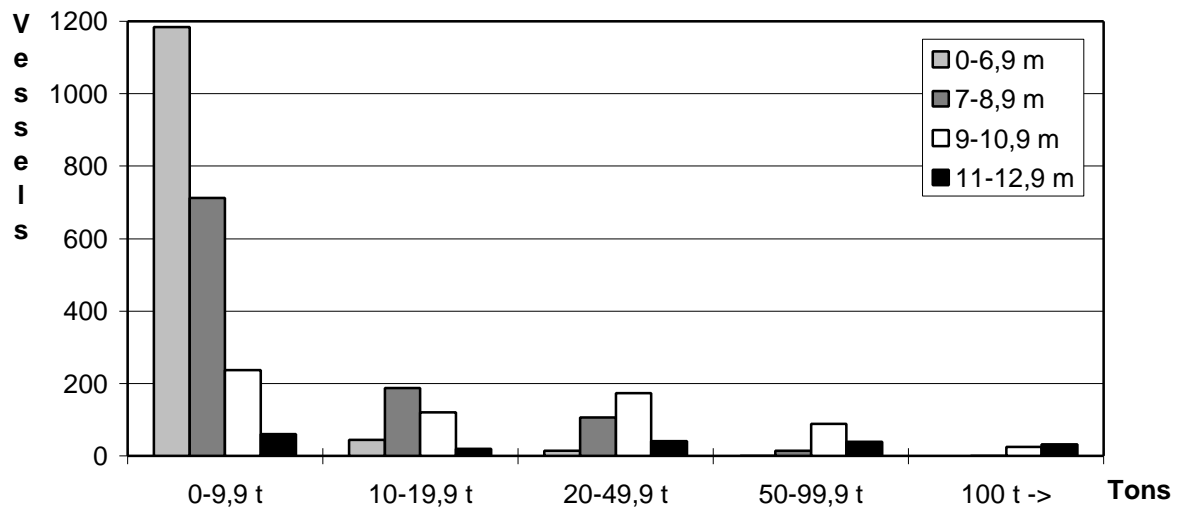
Small scale fishery

The small scale fishers operate near shore, and in the North almost all participated in the cod-fisheries in the 1980s. The intensity of their participation varied, and so did their catches. Figure 1 shows how vessels in Troms and Finnmark, the two northernmost counties in Norway, were distributed into various length- and catch-groups in the year of 1984 - a year where no formal rules limited fishers activities⁴.

³ Data from the Directory of Fisheries.

⁴ Based on the Directory of Fisheries accounts of all vessels participating in the cod-fisheries north of 62. latitude.

Figure 1: Fishing patterns in the small scale fleet of Troms and Finnmark. Cod north of 62. latitude. 1984.



At the right end of the scale, we find the higher catch-groups and the larger small scale boats. I call these adaptations ‘the millionaires’. Cod being paid by around 7 kroner per kilo in 1984, a catch above 100 tons approximates a million Norwegian kroner (140 000 US Dollars). At the left end of the scale, in the ‘ten-toner’ group, the smaller boats dominate. The number of vessels is large. There are, however, an impressive amount of larger boats in the ‘ten-toner’ group. In fact, there are more large vessels here than among the ‘millionaires’.

Qualitative data from my fieldwork suggest there are social explanations for the variation in fishing intensity. Fishers’ varied *social* and *economic* needs influenced their fishing patterns. In one village for instance, some fishers were busy fishing haddock. One man stated he had to partake in this fishery to make ends meet. Another, who did not participate, gave his reasons for this: The seasonal cod fishery was just over, and he wanted to spend time on shore with his friends and family, and engage in other activities than fishing. The haddock fisher also enjoyed family life. He stated opportunities for family life as the main reason for choosing small scale fishing as a livelihood. The daily deliveries of catches brought him home every day, as opposed to

the weekly, monthly, or even rarer visits of fishers in the large scale fleet. Such cases illustrate that fishers' varied strategies can be explained by their different economic situations. The haddock fisher had high debts on boat and house, as opposed to the other who had inherited the boat from his father, and lived in his parents' home. Having earned enough in the cod season to secure his low debts, he could enjoy family life in the haddock season.

In other villages I found the same pattern. Fishers with low debts - young ones with inherited capital equipment, and older fishers who had finished paying down their investments - tended to have a lower fishing intensity than their counterparts with higher debts. Effort seemed to be debt-dependent. The low-debt careers were often people with long experience in fishing. Thus, a career-dependent fishing pattern characterized small scale fishing. As newcomers, fishers worked hard to secure their debts, but as debts declined, they reduced their effort.

As I pointed to, figure 1 demonstrates that within the group of fishers who own large vessels, more fishers managed on a 'ten-toners' income, than on that of a 'millionaire' in 1984. This is rather surprising, since having a large boat means high investments. The point is however, that it does not necessarily imply high daily or yearly expenses. To understand this, one must study the investment patterns of the 1980s. People used their income to buy better equipment, thereby improving *catch capability*, i.e. their technical capacity. As their activity were dependent on needs, investments were not always used for increasing the actual *capacity in use*. As fishers entered older age, their boats were often fully equipped, meaning their technical capacity was high. They could, however, use it to enjoy the benefits of a long career in fishing - a better and comfortable working-place - instead of catching more and more fish.

Another explanation for the variable catch pattern can be seen as *ecologic*. In some areas fish is scarce parts of the year, and here people tend to fish on a part time basis. Instead of leaving the home port for other fisheries, they use alternative income opportunities. Fishing and farming have for long been a common adaptation along the coast. When, from the mid 1900s the number of fishing-farming households have decreased (Brox 1966, Saugestad Larsen 1980), new multifaceted adaptations have

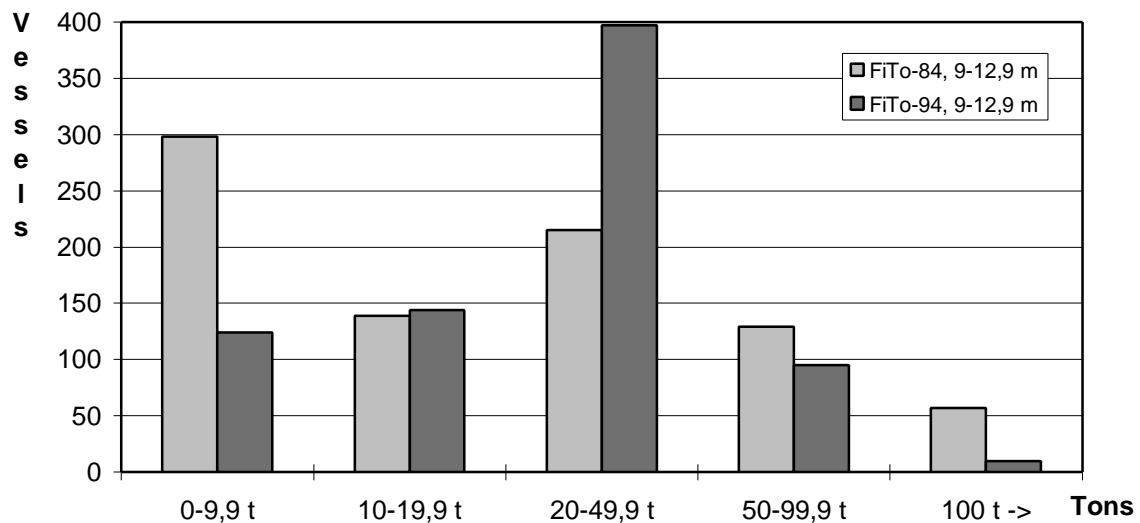
emerged, such as fishing and carpentry, fishing and taxi-driving, fishing and work in the public sector (Nilsen 1990, Lillevold 1998).

To conclude then, the technical measure of boat size was not directly related to *capacity in use* in the fishing patterns of the 1980s. The quantitative information in figure 1 show that boat owners with large vessels, used them for catching small quantities, and vice versa. My qualitative studies give reason for why fishers used their technological equipment differently. The fact that many small scale fishers fished according to needs, is central to explaining fishing patterns - more central than the technical expression of what they were capable of fishing.

The new regulations initiated changes in small scale fishing patterns, however. Discussing quantitative changes first, figure 2 shows the fishing patterns of vessels between 9 and 12,9 meters. These boats catch 70 % of the small scale fleet's total catches. I have chosen the years 1984 and 1994 for two reasons. 1984 represent a year of open fishery, that is before regulations were introduced, and 1994 is a year when regulations have worked for a while. The total catches, as well as the number of vessels the two years, are approximately the same⁵.

Figure 2: Fishing patterns among vessels 9 - 12,9 meters, Troms and Finnmark. Cod north of 62. latitude. 1984, 1994.

⁵ There is, however, a total change of 20 % fewer vessels in 1994. This change is not represented in the figure, since vessels below 9 meters make up 97 % of this reduction.



The figure shows a considerable reduction in the ‘ten-tonner’ group, and a minor reduction among the ‘millionaires’. Within the new regime, only cod-dependent fishers were allowed to stay in business. Those who fished small quantities were excluded. The rules also maintained catch restrictions, thus reducing the possibility to fish large quantities. The reduction among ‘millionaires’ and ‘ten-tonners’ was therefore to be expected according to the new regulations. There are, however, other changes that are rather surprising. Figure 2 shows that the number of fishers in the intermediate category has doubled. This increase is larger than the decrease in larger catch categories. Thus, many fishers have *increased* their effort in the 1990s.

There is no technological innovations in the period that can account for the change in harvest patterns. It is best explained as a result of the new regulations. The purpose of introducing quotas and licenses in the fisheries is to *restrict* catch and access. Setting exclusion criteria on the basis of minimum size of previous catches, however, the message is clear: If you are to gain rights within the new system, you must catch a certain amount of fish. In addition, it was required that fishers used their rights, that is caught a certain proportion of the vessel-quota assigned in Group I, to attain future rights to this quota. Thus, the message of proving oneself as one who could catch large amounts of fish, was fortified. Fishers feared for their present and future rights, and took on new strategies.

Now, had fishers been using their capacity fully in 1984, there would not be much room for increased effort. The increase is thus an indication of the fact that small scale fishing patterns followed a logic more compatible with Chayanov's model for productional capacity, than the perspectives inherent in conventional management procedures. But the design of new management procedures triggered a change in this productional logic: Boat owners who fished small quantities in the 1980s, got - since averages for vessel-sizes became the distributive criteria - a *larger* quota than their individual previous catch. Their peers in the same boat-sizes had fished high quantities, resulting in the average being high. These fishers now increased their effort to *reach the average level* defined by the regulations. Other fishers, who formerly had fished just about enough to secure themselves continued fishing rights, also increased their effort to secure their future rights.

The way fishers expanded their businesses was to increase the use of labor and capital in the fishery. Regarding the work load, fishers now spend more time on board their vessels. From participating in the seasonal fisheries for cod - some only in the winter fishery, others only in the spring fishery - most fishers now do *both* seasons, as well as fish cod *out of season*, in the autumn. Catching fish during the autumn imply leaving the home port for some fishers. Many places, local resources cannot sustain the increased demand for fish. Spending time moving to other places and locate fish takes time. In addition, fishing in places where one's knowledge is poorly developed, also increase the work load.

Fishing in other seasons and other places also increase capital costs. Using the vessels an extra day at home is costly; using them away from home is even costlier. Regarding capital use, expenses increase due to more causes. Fishers now tend to buy *bigger* boats. They allow fishers to be more mobile, and to use gear that are more catch-efficient. Since the size of the quota is attached to boat-length, this represents a third incentive to buy bigger boats. Thus, investment patterns are in the process of changing. Formerly, low debts allowed for flexibility and security in case cod was scarce for a period of time. Low debts still have the same function, but it has become more difficult to keep them low. The incentives to buy bigger boats is one cost-increasing trait. Another is that the boat one buys, should be fully equipped from the first entry of

fishing. With the new incentives to catch large quantities one cannot risk not being able while cod is available.

Another factor increasing costs and risks is that the price of entry also includes buying a quota. As discussed, the best rights are within Group I where quotas are attached to boats, and a finite number of quotas exist. Thus, to attain rights in Group I, one must buy a boat with a quota⁶.

The new fishing patterns raise the individual catches for many fishers, and as such one can question whether or not the cost increasing traits I point to are paid for by the increased catches. The fact that fishers expand into poorer catch conditions indicates that the marginal returns are lower than previously. The marginal returns might still be positive, thus paying for some of the increased costs. The interesting point is, however, that this eventual increase in income was not sought by fishers before the regulations. The new strategies are a result of adaptations to new *bureacratic* rules of fishing, and not responses to *material or social* needs of doing so. Neither are they responses to changes in the *natural* system. In 1990, the cod stock was defined as low, but few years after it could again sustain the catches of 1980s. And it also does. The difference between 1984 and 1994 is that *fewer* fishers fish the *same* quantities as was caught in the open access situation of the 1980s. Thus, the cod 'saved' by excluding some 'ten-toners' and 'millionaires', is now caught by fishers in other vessel categories.

Although the quantitative changes in the cod stock are minor, the regulations led to some qualitative changes of biological importance. Fishers' increased effort to fish the quota represent an *increased* pressure on the cod. This increased pressure is to be controlled by the newly installed formal control. But there are loopholes in the formal control system, and clear incentives for using them.

Changed harvest patterns may have ramifications for stock composition. From fishing heavily in the winter, fishing pressure is now shifting towards other times of the year.

⁶ Quotas are legally not transferable, but the prices of boats have increased, and reflect an informal market for quotas.

The impacts on stock composition might be positive or negative - the interesting point is that we do not yet know how changed fishing patterns are affecting the cod stock.

Neither do we know how they are affecting *other* species than cod. The restrictions in the cod fishery led to a shift towards fishing other resources. So far, I have discussed increased effort stemming from fishers who formerly did not use their capacity fully. But as figure one shows, there were 'millionaires' in the fishery of the 1980s. Some did use their capacity, and these fishers were restricted by the new regime. With low cod-quotas, many of those who experienced cuts compared to former fishing activity, turned to other resources in order to obtain sufficient incomes. The adaptations I described earlier, where one fisher enjoys family life, while another, equipped with the same technological capacity, is busy fishing haddock, is not so common any more. The cod-fishing possibilities being restricted, combined with the new incentives to catch large quantities, imply that the cod season no longer provide opportunities to enjoy family life in the haddock season.

Pressures on other resources than cod also increased for another reason. From fishing these resources for their present income, fishers soon wanted them for their future *rights potential*. As Copes (1986) has pointed out, closed fisheries attract people. This was the case in the Norwegian cod fishery after the introduction of the new rights system. Fishers feared that regulations would be introduced, and hurried to be among the future beneficiaries.

Discussion

The regulation of the Norwegian small scale fishing fleet exemplifies a situation where formerly social control mechanisms implied that capacity in use was *lower* than technical capacity. Regulating as if technical capacity was the problem, a set of new incentives for harvesting was created, and this changed the former social characteristics of the fishery. Fishers are now occupied with catching a certain number of fish - the size of a quota. Furthermore, they take on many different strategies to *increase* their quota. The overall change is that instead of catching small, medium and large quantities of fish - determined by their varied social needs - fishers have become

more homogeneous in the sense that their catches can be predicted from the size of their boats. Fishers capacity in use have increased, and their technical capacity is *becoming a real measure* of their activities. Paradoxically, regulations now seem to be necessary to prevent them from using their capacity fully.

Effort increase was an unintended outcome of the regulations. The idea was to distribute scarce resources, and criteria were chosen to meet two demands. They had to be workable for bureaucratic ruling and acceptable among fishers. Choosing previous effort related to vessel-size seemed to meet both demands. The bureaucrats had records of catches and vessels, and could perform the necessary calculations. The fishers would be restricted according to their historical catches, their economic investments, as well as their cod-dependency, and this was reckoned as just. Had technical capacity been a realistic index of productional capacity, this model would have worked well. But not considering the high technological variety within the small scale fleet, and creating a new rights system centred around the sizes of vessels, fishers were stimulated to take on new strategies. Thus, regulating the fishery on the grounds of model prescriptions of human behavior, may lead the models to work as self-fulfilling prophecies (Maurstad 1998).

In stead of social and economic needs deciding effort, membership in a bureaucratic category is now central for fishing patterns. By this, the concept of *scarce resources* has changed meaning. The availability of cod differs from year to year. Fishers are used to dealing with scarce natural resources. They have also dealt with scarce informal rights - negotiating fishing opportunities according to an informal rights system (Maurstad 1997). The new regulations confronted them with a new scarcity - formal rights.

The question is whether removing the new regulation system, reverting to the open access and quota-free fishery of the 1980s, will reverse the situation. In the public debate, various reasons for a more open fishery is advocated. The buying and selling of quotas, i.e. boats, is seen as a threat to recruitment. Not only is entry expensive - boats are sold out of the small scale sector, thereby reducing the amount of available commodities. Liberating access regulations are seen as a way of dealing with this

problem. Others want to liberate the system of vessel-quotas. Such quotas are seen to hinder the small scale fleet in using their competitive advantage of fishing in seasons when fish is abundant. These reasons for changing the management system are all linked to the fact that fishing rights now have become the scarce resource. Fishers' concern are to negotiate better places within the new formal right categories. In the open fishery of the 1980s they did not have to take on such tasks. Thus, a crucial distinction between the 1980s and the 1990s, is that fishers now compete, not only at the fishing field, but also on the political arena, to attain better rights. The prospects for those with 'reduced' rights however, are not good. As Holm et al (1998) has shown, those assigned the 'full rights' of Group I occupy important political positions, while fishers in Group II are marginal in that respect. This means that a fishers' call for an open fishery, including the large amount of Group II type fishers, is unlikely. It is exactly this political support that makes the regulations viable, argue Holm et al.

The paradox is that ecologically, scarce formal rights was not necessary. A distributive arrangement was required in 1990, but very shortly after, the cod stock improved. In 1994 the catches of the small scale fleet again amounted to be the same as in good years in the 1980s. Removing today's regulations could imply that former social constraints again would regulate fishing effort. An open fishery might lead fishers to lower their effort. It might mean that fishers again dared to fish according to needs, and not alone formal demands. But the question is also: Given the new rights focus, would fishers see such an arrangement as a test period, and fish to be sure? Furthermore, would many people enter the fishery to gain rights before the test period was over? The fact that formal rights have become the scarce resource has taught fishers that local ecological conditions, and social relations between fishers, are no longer the central factors that decide access and rights distribution. Formal rights do.

Figuring a way out of today's problems with the new regulations is difficult. In the co-management approach much is to be gained if fishers themselves sat at the resource management table. In their discussion on problems following another aspect of the numerical approach in management - counting the fish - Wilson et al. (1994) recommend that focus should be moved to gaining qualitative knowledge of the *performance* of the fishers - to *how, where and when* people fish. By this the counting

of fish becomes less crucial data to management. Wilson et al's idea on fishers' performance is also relevant for solving some of the problems I point to. Such an approach forces us to see the fishers' activities as more than arithmetical tables and numbers. It opens for understanding the interplay between fishers, their effort and the fish.

In so doing, a decentralized approach is necessary, say Wilson et al. Fishers need to have a say in resource management, since a great amount of local knowledge is needed to make such a management approach work. Wilson et al. refer to fishers' knowledge on the biological environment. Fishers also have knowledge on the social aspects of the fishery that I have discussed. They do know about the difference between capacity in use and technical capacity. They know the life history of the 'ten-toner', as well as the 'millionaire'. They know that needs among these fishers differ. The 'millionaire' might have bought his boat recently, perhaps even been unlucky last season, and need high quantities to make ends meet. Their sense of fairness, as well as their thoughts on practical solutions, are quite different from the views of bureaucrats. They are able to create criteria and rules for fishing in which such circumstances are integrated (Jentoft 1989).

However - power and inequity are part of local life - also fishers' (Davis and Bailey 1996). Their involvement and supportiveness of formal institutional mechanisms differ (Davis 1991). As demonstrated by Holm et al. (1998), fishers varied political power are important for the viability of the new Norwegian regime. Centralized bureaucratic ruling has the advantage of taking some conflicts out of the hands of local fishers. A de-centralized approach could quite possibly produce another set of new and unexpected consequences.

Nevertheless, a shift in focus from viewing the fishery through strictly technical measures seems necessary. As I have argued, it is such models of human behavior that initiate the changes in the social nature of fishing. A shift in focus could enable us to find ways to deal with the weaknesses of today's management. A management approach based on arithmetical calculations of facts that are not understood properly, is unsatisfactory. Decentralized approaches have the benefit of bringing focus closer to

what fishery is, why people fish, and how they do it. Although I reveal some pessimistic thoughts, both management models and practices would improve from gaining a more appropriate knowledge on what fishery is.

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