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Farming the Edge of the Sea
The Sustainable Development of the Dutch Mussel Fishery

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Abstract

Throughout the world, there are myriad examples of abuse, overexploitation, or even depletion of living marine resources. Instances of successful fisheries management and sustainable development are rare. One such example is the Dutch mussel fishing and farming industry. During well defined periods in spring and autumn, the mussel fishers are allowed to catch young mussels, which they plant on plots rented from the state. This system has been in operation since the 1860s and has evolved into a successful and sustainable mode of marine resource utilization. The present paper explores the history of the musseling industry, the way in which it is managed by state representatives and users, some of the problems it faces, and the possibilities of transfer of this resource management system to other countries.

With compliments,
Robert van Gi...

Introduction

There are numerous examples of "tragedies of the commons" (Hardin 1968) which menace fish stocks and fishing industries in many parts of the world. Marine biologists and economists widely accept that resource abuse is inevitable under a system of common property tenure. They point out that fishers who enjoy unrestricted access to fishing grounds seek to maximize their profits in the short run. Fishing, they argue, is a zero-sum game in which one man's gain is another's loss (cf., e.g., Anderson 1976; Gordon 1954; Pontecorvo 1967). The pessimistic message of the theorem is that "[r]uin is the destination toward which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons" (Hardin 1968:1244).

In recent years, the assumptions underlying this proposition have been criticised (cf., e.g. McCay and Acheson 1987; Berkes 1989; van Ginkel 1989a). The gist of the critique concerns the implicit understanding that commons are inherently open access, inevitably lead to maximization of short-term self-interests and, hence, to abuse. These assumptions often do not hold true. Anthropologists and ecologists, for instance, have presented case studies which show that there are many past and present instances of viable common property regimes characterized by communal and careful management and sustainable use (cf., e.g., Ruddle and Akimichi 1984; Ruddle and Johannes 1985; McCay and Acheson 1987). Nonetheless, it is generally understood that tragedies are likely to occur when access to fishing grounds is entirely open to all and exploitation is not regulated by some form of resource management, be it by the users, by external authorities, or by a combination of both. In response to current crises in the exploitation of the commons, there is a growing awareness that we need to develop modes of sustainable resource use. In attempting to do so, we do not have to start from scratch: there are many common property resource management practices that contribute to the continuing sustained use of living resources. A careful analysis of the knowledge and social arrangements upon which they are based can yield valuable information which may pave the way for the development of sustainable resource use on a larger scale.

This paper describes a succesful common property management regime: the Dutch mussel fishing and farming industry. It focuses on how it

evolved from a capture fishery into a culture fishery, or how "plunderers" became "planters." It explores the history of the musseling industry, the way it was and is managed by state officials and participants, and the successes and drawbacks it has encountered. Furthermore, the possibilities of transfer of this resource management system to other countries is discussed. Most of the data relate to the town of Yerseke in the province of Zeeland, the country's foremost centre of shellfish cultivation and trade.

The Setting

Zeeland is a province in the south-west of the Netherlands. Several inlets and estuaries indent its coastline and divide its territory into islands and peninsulas. Nowadays, the major local fishing grounds can be found in the Eastern Scheldt. The mouth of the sea-arm is protected by a storm-surge barrier, which can be closed during severe gales, but which under normal weather conditions maintains the tidal regime. The saline inlet penetrates 48 km inland from the North Sea. Its tidal range averages 3.20 m. The large intertidal zones and intersecting deeper channels provide rich econiches, where many species of fish and shellfish abound. The firm seabed of the shallow flats, the constant water salinity, the moderate velocity, and an abundant food supply of phytoplankton form excellent conditions for the spawning and growth of the common blue mussel (<u>Mytilus edulis</u>). Similar ecological conditions can be found in the western part of the Wadden Sea, situated in between the Frisian Islands and the mainland, some 200 kilometers to the north of the Eastern Scheldt. Since the 1950s, this area has also become an important fishing and farming location for Zeeland mussel planters.

Over 70% of the national mussel harvest, which exceeds a hundred million kilograms per year, is exported to such countries as France, Belgium, and Germany. The Dutch mussel industry contributes to more than 30% of European production, which makes the Netherlands the largest mussel producing country in Europe. All important shellfishing communities are situated in Zeeland. They are Bruinisse, Tholen,

Zierikzee and Yerseke.[1]

Yerseke is an affluent community, located on the south bank of the Eastern Scheldt. The town's favourable position near urban markets and a good communication network with the hinterland have contributed to its rise as a nucleus of maritime enterprise. The town has a population of approximately 5900. Its economy is dominated by mussel and oyster culture and trade. There are 80 mussel firms and companies in the Netherlands, 36 are based in Yerseke. The processing and marketing of the bivalves is almost entirely concentrated in this town. There are six mussel canneries and twenty odd shellfish processing and packing plants. A dozen of these companies are vertically integrated, i.e. combine farming, processing and shipping. Other maritime pursuits, like shrimping, lobstering and cockle fishing, also provide an important source of local employment. Yerseke harbours the country's second largest fishing fleet. It consists of a 112 diesel-powered boats, ranging from 17 to 40 m in length. Each mussel vessel is equiped with two or four dredges and manned by from two to four crewmen. A large percentage of Yerseke's occupational population depends directly or indirectly on the fishing industry for its livelihood. In 1980, for example, it provided employment for nearly 700 men and women.

Mussel Fishing and Farming Methods

Today, musseling is practised on rectangular parcels rented from the state, which vary in depth from 2 to 12 m during high tide. Each firm rents a number of plots, delineated by seamarks, in the Eastern Scheldt and the Wadden Sea from the Crown Land Office (Domeinen). Access rights are exclusive. The average size of plots in the Wadden Sea is 500 x 200 m, and in the Eastern Scheldt 300 x 150 m. An area of 6000 hectares is available for cultivation in the Wadden Sea, in addition to 4000 hectares in Zeeland waters.

Mussel farming in the Netherlands is a semi-culture. The reproduction of mussels is left entirely to nature. The seed fishery, carried out during a well-defined period of some weeks in spring and

[1] Several other Zeeland villages and towns also had a small musseling fleet. They could not retain their position (cf. van Ginkel 1989c). Outside Zeeland, there are only two locales in the Netherlands where a small number of mussel farmers are active today: Harlingen and Wieringen.

autumn, forms the basis of cultivation. The Ministry of Agriculture and Fisheries sets the opening and closing dates of this short season. During this period, the musselmen are allowed to dredge seed and young mussels on grounds assigned by the Ministry. Usually, the natural beds are productive enough to permit seed fishing from year to year. It is of paramount importance that the fishers catch a sufficient amount of seed to stock their plots. As one man stated: "It is a nerve-racking time. Everything has to be in perfect order: the vessel, the motor, the gear, and the crew, 'cause if I would miss part of the seed fishery, the entire season would be lost. Sometimes I worry so much about it that I cannot sleep at night." The musselmen tremendously enjoy the competitiveness of what they consider to be a "truly free" fishery. If they have located a good spot, they will not share this information with colleagues in order to monopolize it as long as possible. Usually, however, other crews soon find out and make sure that they get their share. It is no exception that dredges and lines get entangled because several boats crowd a small, but rich niche, especially so when seed mussels are scarce.

The musselmen plant the young bivalves on leased beds, usually the shallowest plots they rent. There is a shortage of deep grounds. When winter sets in, they are dredged and deposited on deeper beds to stimulate growth and to prevent that the mussels are washed away or covered by sand due to storms. The mussels are full-grown within two years. They are dredged again and brought to the mussel-auction in Yerseke. The mussel dealers and canneries who buy a ship's load plant the molluscs on special plots with a firm peaty bottom for at least ten days so that they can dispose of sand and silt. This self-purification process is a crucial step before the bivalves are marketed. The only suitable underwater grounds for this procedure are located just off the shore near Yerseke. The dealers also lease these beds from the state.

Marine Commons and Maritime Commoners

Shellfishing in Zeeland is at least 7000 years old. Yerseke's history as a maritime community is, however, relatively recent. As late as the 1860s, its economic resource base was still mainly agricultural. The village was even landlocked until the 1530s, when floods washed away large areas of South-Beveland's territory, turning Yerseke and the

hamlet of Yersekedam into coastal communities. The sea-change was, however, not solely destructive. It also provided new opportunities for the exploitation of marine resources. In 1784, official documents refer to the local shellfish fishery for the first time. The firm peaty seabed which had developed off Yerseke's coast provided an excellent base for the settlement and growth of oyster spat and mussel seed, which clustered into vast shellfish banks.

Fishermen from nearby villages started to exploit these banks. Even in the still predominantly agrarian village of Yerseke, some enterprising inhabitants began to switch between farming and fishing. Others, male and female farm-hands especially, gathered oysters, mussels, periwinkles and whelks when the receding tide left large areas of tidal flats exposed. They walked out onto the exposed banks and harvested shellfish to earn extra income during the winter months, when farm work was slack.

Depending on the tide and depth of the water, the fishermen used dredge-nets or rakes. Like the gatherers, they sometimes collected shellfish by hand when sailing was impossible due to exposure of the beds. In the 1820s, Yerseke harboured ten flat-bottomed boats. These craft had two or three crewmen, usually agnatic kinsmen. In addition, the village counted some forty shellfish gatherers. The majority of eighteenth century villagers were, however, still land-oriented.

Though all Zeelanders held equal access rights to the common property marine domain, _de facto_ entry to its resources was often limited because local fishermen claimed customary rights over the shellfish beds near their residence. Sometimes they even used violence against outsiders who fished on 'their' grounds (van Ginkel 1988, 1989b). This 'culture of the commoners' (McCay 1987) notwithstanding, occasionally more than 200 vessels crowded the most productive niches. A report concerning this period states that:

> In those times disorder prevailed. Each fisherman acted according to what his greed or rapacity dictated. It happened more than once that armed fishermen from one place set out to rob the beds over which those of another place claimed exclusive rights. Thus, the fishing grounds were often the scene of bloody meetings, which regularly necessitated the intervention of armed forces and eventually compelled [the authorities] to introduce regulations to counter the disturbances (Verslag 18..:..).

Hence, the menace of overexploitation, especially of oyster stocks,

loomed large. It had been triggered by the steadily rising demand for shellfish which in turn was linked to population growth in western Europe, the boost to consumption provided by the improving standard of living, and the improvement of the means of transport.

In 1825, the government assigned the management of the local waters to the Board of Fisheries for the Zeeland Streams (_Bestuur der Visscherijen op de Zeeuwsche Stroomen_). It consisted of impartial notable citizens, who had no stake in the fishing industry. When it became clear that the natural shellfish beds faced gradual depletion if no measures would be taken, the Board regulated fishing-gear and methods, seasons, minimum sizes of marketable shellfish, demanded a modest licensing fee and patrolled the waters to enforce the rules. This state intervention was supposed to stop overfishing, but poaching and fishing illegally became a widespread phenomenon. Sometimes, this caused conflicts among fishermen. Crews fishing off season, for example, were confronted by colleagues who tried to prevent that 'their' shellfish beds were plundered by non-locals before the season started. Thus, the new regulations could not prevent that depletion of natural shellfish beds continued.

By the 1860s, hundreds of artisanal shellfish fishermen and gatherers exploited the Zeeland estuaries, providing a meagre subsistence to many households. Though the monetary rewards were small, the fishing industry expanded due to demographic growth in the province, which could not be absorbed by employment in agriculture. Yerseke's population, for example, increased from 560 in 1817 to 854 in 1860. Many took to fishing and the local fleet expanded to 24 boats in 1867. Yet the village was one of the poorest fishing communities in the country. Scores of villagers found themselves in dire straits and had to be assisted by poor-relief boards. The widespread poverty was closely linked to the undependability of the market, a shrinking supply of shellfish due to resource depletion, and vehement competition. However, Yerseke would soon become the scene of radical transformations spurred by the privatization of parts of the marine domain.

Enclosure of the Commons

In the 1860s, the Board of Fisheries privatized several mussel banks in the Eastern Scheldt and other Zeeland waters. The Board demarcated

plots and allocated these for the duration of ten years to musselmen by the drawing of lots. It also provided for police patrols to prevent theft and poaching. Henceforth, mussel fishermen gained exclusive access rights in return for a modest rent of a few florins. The plots were reallotted ten-yearly. Capture fisheries gradually turned into culture fisheries, though there were still grounds where a free mussel fishery was permitted. The transition from fishery to semi-culture led to an increase in output, but did not cause dramatic changes in the social structure of the occupational community of musselmen and labour remained the most important factor of production. A transition from free oyster fisheries to oyster farming did, however, have a tremendous impact upon the social relations of production.

In 1870, the state privatized several oyster banks in the Eastern Scheldt and other Zeeland estuaries. Extensive underwater grounds were divided into five and ten hectare plots, which could be leased at public auctions. The highest bidders gained exclusive access rights. This measure attracted many wealthy urban capitalist entrepreneurs and this in turn brought about a rapid capitalization and industrialization of the oyster industry (van Ginkel 1988, 1989b, 1990). Shellfishing rapidly gave way to mariculture. By 1886, all banks suitable for mussel and oyster farming were privatized.

Within decades Yerseke became the Dutch centre of oystering. Most of the newcomers to the industry established their firms and companies in Yerseke because in 1866 the town was connected to an international railway network, contrary to most of the other important Zeeland shellfishing communities, such as Bruinisse, Zierikzee, Tholen and Philippine. The town received a huge fillip from the spread of railways and the boost to consumption provided by the steadily improving standard of living at home and abroad. In the wake of this development the village turned into a relatively affluent town which attracted many migrants. By 1895, its population had quintupled to 4338. From merely fifteen sailing craft in 1860 the local fleet expanded to a 160 boats, including ten steam-powered vessels, by 1900. The harbour, built in 1871, had to be expanded several times.

The new mode of production in the oyster industry initially resulted in a loss of independence of the existing oystermen. Most of them could not afford to pay the lease fees, which skyrocketed soon after the introduction of the auctions. They either became wage-labourers for one of the newly established companies or oyster barons, or turned to

musseling (van Ginkel 1988). The gatherers, whose domain was drastically reduced, did not have the latter possibility. The majority had to get a job in the oyster industry. After an initial period of remarkable successes, the oyster trade suffered serious setbacks. The employees constituted a disposable labour force and many were sacked.

Compared to oyster culture, musseling was far less labour and capital intensive. The required means of production still consisted of a boat and relatively inexpensive gear. The fees for the rent of mussel plots remained modest. In contradistinction to the oyster trade, the mussel industry did not undergo a phase of rapid capitalization because the monetary rewards were smaller and plots were not up for public bidding but allocated by lot. Besides, a free mussel fishery was permitted in the Zuyder Sea and Wadden Sea.

Initially, however, the allocation of plots by the drawing of lots led to abuse. Anyone could take part in the draw. Thus, many non-fishermen tried to lease a plot with the sole objective to sublease it to a musselman for a profit. In the early 1900s, this abuse ended when the Board of Fisheries raised the lease fees and decided that only mussel planters could participate. Later, the lease contract was automatically renewed unless the culturists wished to end it.

Following the growth of the oyster industry, the number of musselmen also increased. Given the lower capital investments required, many fishermen turned to musseling. Whereas the oyster industry became strongly stratified, the occupational community of musselmen remained fairly egalitarian. All mussel fishermen operated independently in family firms, possessed similar means of production, and had equal opportunities to rent plots by participation in the drawing of lots. Even though the profits were considerably smaller than those that could be obtained in oystering, those who possessed little money but valued their independence became musselmen. Since the vessels were still relatively small and cheap, it was feasible for every crew member, given reasonable luck, arduous labour, and a degree of thrift, to aspire to own his own boat. Turn of the century Yerseke counted approximately 90 musselmen, and several fishermen who also fished oysters, lobsters, crabs, periwinkles and whelks. Not only were they small commodity producers, many were fish mongers, too. They sailed to Belgian cities like Antwerp, Brussels, Ghent and Mechlin and sold their catch to merchants, market vendors and peddlers. Each year, they exported 20,000 to 30,000 tons of mussels this way.

In the early decades of the twentieth century, vehement competition for a share of the market resulted in continual overproduction. A similar process had also occurred in the oyster trade. Given the imbalance between supply and demand, prices dropped. As a result, most musselmen tried to increase production to maintain or improve their standard of living. This solution to the 'peasant dilemma' (Wolf 1966:15) only exacerbated their situation, of course. Things became even worse when due to the motorization of the fleet the supply of mussel seed shipped home from the Wadden Sea increased. Many musselmen quickly adopted the new technology of mechanical power.

During the First World War, export became increasingly difficult. Though the Dutch were neutral, the acts of war and restrictions imposed by the occupying German authorities in Belgium hampered a free trade. A boom in the home industry of cooking, shelling, salting and bottling mussels, slightly alleviated the problems. By this time there were also two mussel canneries which processed considerable amounts of bivalves. After the war ended, a rise of the rent fees, unfavourable exchange rates, and declined purchasing power in Belgium and France created additional problems to the musselmen. A contemporary report mentions that "the mussel fishery is in a bad state. Some fishermen blame the exchange rates, which is partly true, but the main cause is that the mechanical power cannot sustain the fishery. Motors are installed in ever more boats because without them the fishermen are unable to compete" (Verslag 1921:106). The motorization and the introduction of mechanical dredges caused an increase of supply and a concomitant fall in prices. Early innovators were at an advantage over those who continued to use sailing boats. This was especially true for the seed fishery and the trade to Belgium. There was growing antagonism between those with and those without motorized craft. The latter requested to ban the use of mechanical power in the seed fishery, to no avail, however. Some even feared that a few wealthy persons would monopolize the mussel trade and that they would oust the small planters from the fishery. Most petty fishermen, however, responded in time and also motorized their sailing craft. Thus, in 1932, a biologist could still observe that "mussel farming is exclusively a small-scale enterprise" (Havinga 1932:58).

Several times the culturists tried to reverse the industry's impairment. They established co-operatives and unions which introduced quotas, quality standards and minimum prices. However, these measures

failed time and again because there were always farmers and shippers who did not join, or refused to live up to the voluntary regulations. In 1917 and 1927, for instance, unions of Zeeland mussel planters (both named Bond van Zeeuwsche Mosselkweekers) were established at the initiative of Yerseke and Bruinisse musselmen. Both were liquidated within a few years. The problem was that several planters who did not join sold their mussels under the minimum prices set by the unions. Some members evaded the regulations, while at the same time benefitting from them. They favoured their own private interests above those of the mussel industry as a whole. Through the 1920s, overproduction, low exchange rates and low prices continued to weaken the industry. Though there were also some good years, a growing number of small culturists had to ship the bivalves to Belgium themselves to earn extra money.

State Management of the Mussel Industry

In the 1930s, the state finally gave up its laisser-faire policy and intervened in the ailing industry to control the disrupting consequences of the general economic crisis. In 1934, it issued the Mussel Crisis Measure, (Crisis Mossel-besluit). This management regime finally introduced the measures which organizations of musselmen had also proposed, but were unable to enforce. All mussel fishermen and dealers had to join the Dutch Fishery Marketing Board (Visscherijcentrale). The Board set minimum prices for mussels for export. The home market remained free, however. Soon Belgian dealers started to work with Dutch middlemen to evade the price regulations. To counter this situation, in 1935 the Central Sales Bureau of Mussels (Centraal Verkoopkantoor van Mosselen) was established, partly at the instance of the planters, who suffered most from the evasion of the price regulations. Henceforth, all transactions between planters and shippers had to be made via the Bureau. Subsequently, it set quality standards and introduced fixed prices, both for mussels the Bureau bought from the producers and for the bivalves it in turn sold to the dealers. Moreover, it regulated the admittance of newcomers in order to curb the expansion of the number of culturists and introduced a licensing system for shippers, thus reducing the number of musselmen who were allowed to ship their own merchandise.

The management regime was still not quite successful; soon a new

boom in output followed. In 1938, the Bureau responded by allocating production quotas, so-called standard capacity numbers (*standaardcapaciteitscijfers*), to all individual musselmen, based on their estimated production in earlier years. Alternately, each planter was allowed to supply a certain quota to the Bureau. This rigid regulation of the industry, aimed at balancing supply and demand, proved adequate and the position of the culturists improved. It had a stabilizing influence, though it also brought about a fixation of the industry's structure and limited the expansion of individual firms. The standard capacity numbers were fixed and non-negotiable. The only way to expand a firm was by buying another firm. The number of musselmen who kept sailing to Belgium started to diminish, not only due to restrictions imposed by the Bureau, but also because the transportation of bivalves was gradually taken over by trucking companies.

When the mussel industry had hardly recovered from the crisis of the 1930s, the Second World War broke out. Many boats were confiscated, damaged or destroyed, fuel was scarce, export made impossible and several Yerseke fishermen were forced to work as convicts on the German island of Wyk auf Föhr. Production came to a near standstill and the Germans demanded the best part of the landings.

After the war ended, the Dutch government reduced the rent of plots to stimulate the industry's recovery. Nonetheless, this was a difficult time, due to the damages inflicted upon the fleet. Following two good years, things appeared to get even worse. In 1950, a parasitic copepod, *Myticola intestinalis*, killed a large proportion of Zeeland mussels. Some musselmen lost over 80% of their stock. The shippers were consequently unable to supply customers. The culturists and dealers were powerless against this ecological disaster and feared that it presaged the end of musseling in Zeeland.

Expansion and Co-Management

Paradoxically, however, this catastrophe preluded a phase of capitalization and expansion. Some enterprising planters gained permission to cultivate plots in the Wadden Sea, until then a location mainly used for seed fishing (cf. van Ginkel n.d.). Soon all Zeeland

musselmen relocated parts of their production areas to the Wadden Sea.[2] Moreover, the mussel parasite vanished from the Zeeland inlets within a few years. Thus, there was an enormous expansion of the total available area of plots, which gradually increased from 4,000 to 10,000 hectares.[3] Since the demand for mussels had also risen, the Bureau considerably extended the individual quotas.

In 1967, some planters and dealers persuaded the Ministry of Agriculture and Fisheries to withdraw most of the protective measures which had been introduced in the 1930s. The quota system was abandoned and henceforth mussels were sold at a free auction in Yerseke. This did not imply that the industry returned to a *laisser-faire* situation. The state has retained formal jurisdiction over shellfish grounds, still polices the waters, monitors the sanitary condition of shellfish farming areas and finances a department of the Netherlands Institute for Fisheries Investigation in Yerseke, which carries out biological research and provides the shellfish farmers with information. However, the involvement of the industry's participants has increased. The Industrial Board of Fisheries (*Produktschap voor Vis en Visprodukten*), an organization of the fishing industry as a whole, together with representatives of all branches of the mussel industry -- planters, dealers and canneries, united in the Mussel Advisory Committee (*Mosseladviescommissie*) -- now determine quality standards and maintain minimum prices. In order to make this work, a fund (*Mosselfonds*) was created. The planters deposit a small percentage of each sale with this

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[2]This expansion was at the expense of shrimp fishermen in the north the country, who saw their shrimping territory drastically reduced. The fishermen of the island of Texel tried to gain permission to rent plots in order to start mussel cultivation, too. Their efforts did not bear fruit.

[3]In 1953, a flood disaster struck Zeeland. Five years later, the government decided to dam off all inlets but one in the province. In 19 the Grevelingen inlet -- till then an important mussel farming location - was closed off by a dam, rendering mussel cultivation impossible. The Eastern Scheldt was scheduled to be shut off from the North Sea some yea later. In anticipation of the damming off of the Zeeland delta, the relocation of mussel farming to the Wadden Sea was hastened. However, growing opposition by fisher folk and environmentalists led to a reconsideration of this government decision. In 1976, Parliament appr the construction of a storm-surge barrier which would maintain the tidal regime. This meant that mussel and oyster farming in the Eastern Scheldt would remain possible. Thus, the total available area for mussel cultivation increased, though the acreage of mussel beds in Zeeland decreased.

fund. If their mussels do not meet with the quality standards, or cannot be sold for at least the bottom price, they are compensated by the fund. The mussels are bought by the fund, planted on plots and sold at a later date. Thus, this system is quite flexible. The Industrial Board and Advisory Committee also negotiate with the Ministry of Agriculture and Fisheries regarding the replacement of plots which have become unproductive, for example due to silting. In general, this co-management regime has been successful so far. Production has boomed, but supply could not keep up with demand and, concomitantly, prices have increased sharply.

However, there were also disadvantages. The relocation of many production areas to the Wadden Sea implied that larger boats were needed. This changed the balance of forces of production from labour being more important to capital becoming more important. A period of rapid modernization, increases in scale and mechanization ensued. These changes worked to the advantage of the large culturists and to the detriment of the petty planters, who were unable to keep pace with the developments because they lacked the funds to modernize. Many could no longer compete and especially those without successors had to sell their business to large-scale planters and dealers. The number of firms decreased from 143 in 1960 to 80 in 1985. Thus, the expansion of the mussel industry as a whole brought about the demise of small enterprises. Nonetheless, the industry's social organization remained based on family firms. Today, the state follows a very restrictive policy with regard to the admittance of newcomers. Only those inheriting a family business or experienced employees who want to set up their own enterprise can get a license, provided that the total number of firms does not grow.

Problems and Possibilities of Privatization

This case-history describes, among other things, several management regimes which have been in operation in the Dutch mussel industry. For ages, the mussel fishing grounds have been commons which local shellfish fishermen regarded as "theirs." However, they could claim but not enforce exclusive rights and often extralocal fisher folk incursed on "their" territory, ultimately resulting in a tragedy of the commons. The introduction of exclusive property rights by the drawing of lots in

the 1860s implied a change toward ecologically sustainable development. Capture fisheries turned into culture fisheries which resulted in increased production. This management system seemed equitable since all participants had equal opportunities to rent plots. Nonetheless, abuse occurred and was only countered in the 1900s, when the Board of Fisheries decided that only musselmen could participate in the draw. Moreover, one of the shady sides of this successful development was overproduction and, consequently, a fall in prices. Thus, privatization _per se_ is not necessarily the answer to all resource management problems in fisheries. The musselmen themselves established unions in order to turn the situation for the better through the introduction of quality standards, minimum prices and production quotas. Such agreements were undercut by fishermen who evaded the rules or did not join the unions established to this end. In the 1930s, the state intervened and did exactly what fishermen had tried to do earlier. Unlike the fishers, however, the state was capable of enforcing production and market regulations. This rigid management regime bore fruit and was maintained into the late 1960s. Following the expansion of the mussel farming area in the Wadden Sea and the capitalization of the industry, the planters and dealers asked for a relaxation of the strict regulation. The Ministry of Agriculture and Fisheries withdrew its measures, though it maintained formal jurisdiction with regard to marine property and allocation of new grounds. All parties in the mussel industry participate in management through the Mussel Advisory Committee and the Industrial Board of Fisheries. So far, this co-management system has worked well.

Can similar management systems work elsewhere? I think they can. When carefully planned and introduced, mariculture could perhaps provide a solution for marine resource management problems. This does not necessarily mean that the marine domain has to be privatized; state or communally managed shellfish resources, or a combination, are also an option. Nonetheless, it seems a sound strategy to introduce some form of exclusive access to sedentary fish stocks in order to develop ecologically sustainable fisheries or mariculture. There are, of course, many difficulties to overcome before this can be done successfully.

An obvious prerequisite is that ecologically suitable areas, a market and a communication network must exist or have to be created. Therefore, a careful analysis of local situations should be made before

attempting to introduce forms of mariculture, such as mussel farming. It should at least include a study of the consequences for the ecosystem; the sanitary condition of local waters; the chance that diseases are introduced or spread (such as MSX in oyster culture); and culturally mediated food preferences and taboos in view of marketing possibilities.

With regard to management, several factors must be considered. It will be difficult to introduce exclusive access rights to fishing grounds, because this will render multiple-use impossible. There are conflicting interests between on the one hand mariculturists and on the other, for example, commercial and recreational fishermen, environmentalists, holiday-makers, energy (e.g., oil and nuclear) and other industries, and sewage works. The case of the Dutch mussel industry is telling in this respect: where mussels are farmed, all other forms of marine resource exploitation are prohibited. Since the 1950s, with the expansion of mussel cultivation to the Wadden Sea, the musselmen have taken up much space formerly mainly exploited by shrimpers. This has led to conflicts because the latter felt that the mussel farmers encroached on "their" territory. There may also be different perceptions of property which can lead to poaching. Thus, McCay writes that in the U.S.A., the history of eastern seaboard oystering shows "the persistence of the sentiment or culture of the commons even in the context of a strong rationale for a privatized fishery" (1987:208). Her case history bears a family resemblance to what happened shortly after the enclosure of the Zeeland commons. It is not easy to turn fishermen into "farmers." Even when fishermen are in favour of a privatized fishery, poaching and theft can occur. For instance, Zeeland mussel farmers still claim that mussels are fished illegally from their plots and that there is fraudulent displacement of seamarks. Policing the waters is necessary but will never be entirely effective. One of the major management concerns should be an equitable allocation of marine resources. Often, privatization leads to marginalization of the commoners (cf. van Ginkel 1990; McCay 1987; Taylor 1983). It further protects the interests of participants once they have gained access and may create tremendous barriers for potential newcomers to the industry. They seem to be inherent inequities of an exclusive entry rights system. Perhaps they can be mitigated somewhat if the main goal of management is to give as much people as possible access rights. However, tragic choices can hardly be

avoided in finding solutions for resource management dilemmas.

Conclusion

The present paper shows that the introduction of exclusive entry rights can provide fishermen with incentives not only to maintain, but even to increase their harvest at an ecologically sustainable level. This conclusion is perhaps deceptive. It may create the impression that I subscribe to at least parts of the tragedy of the commons theory, in that exclusive access rights convey only benefits. I do not think that they do. I have already stated some of the negative aspects, but there is more. In previous articles, I pointed out that the allocation of exclusive use rights is no panacea for resource management problems. I used the history of the Dutch oyster industry to illustrate this point (cf. van Ginkel 1988, 1989b). Nonetheless, stationary marine resources, such as mussels and oysters, seem to offer excellent opportunities for the development of sustainable resource use under certain types of management regimes. Such sedentary shellfish stocks can be assigned to specific owners or user groups (Townsend and Wilson 1987:318). As in the case of mobile fish stocks, the main problem is to devise equitable forms of access allocation to the resource. The introduction of exclusive property rights is certainly not the only possible management solution. Such resources can also be managed communally or in combination with external authorities. Sustainability, however, appears to be much less of a problem, since the shellfish are planted on plots which provide better ecological conditions for growth and reproduction than under entirely natural circumstances. In the instance of the shellfisheries, "man the plunderer" can be turned into "man the planter," as has already been the case in many countries. In this sense, shellfish farming is a viable option for the enhancement of ecologically sustainable use of renewable marine resources.

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