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Why and How Blue Mussel Growers Succeeded in Developing a Long Term Co management Process to Use Marine Open Access Resources?

Fisheries

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Abstract

The large marine ecosystem in the Bay of Mont St Michel has been utilized by mussel (Mytilus edulis) growers for more than 40 years (10,000 metric tons.yr-1). Mussels are grown in bags attached to wooden stakes which aresupported in the sediment. Despite the prevailing semi-privatized system to allocate the public tidal flats to growers, most of them initially behaved as free-riders, increasing the number of stakes to take advantage of the fugitive marine productivity. Water circulation and plankton productivity were sufficiently altered to weaken mussels feeding together with parasiticover-infestations, resulting in a drastic decline in production and rapid dissipation of the resource rent. To challenge this tragedy of open access,leaders of the grower association together with State managers and scientists developed a comanagement process. By regulating the use of space and providing appropriate technical support and financial incentives, they succeeded in counterbalancing this dramatic backlash. The dilemma was solved by : (i) expanding the available space allowed for settling new stakes further to the East bay and (ii) removing forty percent of thestakes within each lot. Mussel growth increased so that the total production doubled between 1970 and 1990.

Introduction

The Bay of Mont Saint-Michel is a large bay located at the bottom of the Normandy-Brittany Gulf of the English Channel. Beside the world renowned Mont Saint-Michel which attracts over 2 million tourists every year, it is one of the major shellfish farming areas in France with an annual production of about 10,000 tons of Blue mussel (Mytilus edulis), 10,000 tons of Cup oyster (Crassostrea gigas) and European flat oyster (Ostrea edulis) for a total value of 40 millions US$ ex-farm price. Mollusk farming represents a major contribution to the world aquaculture production with about 4 millions metric tons. Because the largest part of the weight is in the shells, this overestimates its real importance to the aquaculture industry which is best seen in terms of value.

Blue mussel aquaculture only started in this bay during the mid 1950s while oyster production started long ago with the exploitation of wild beds and farming since 1940s. The utilization of natural plankton productivity by more and more mussels led to a typical tragedy. The potential economic rent was rapidly dissipated as a result of an unregulated competition among the farmers sharing the limited productivity of the area. Faced with the dilemma in the commons, compete under free access rule or cooperate, theusers were able to realize that a

collective action was the only way for them to address both issues of sustainable use of the resource and high economic rent levels. This paper is focused on the elements that may explain the success of a co-management process to solve the dilemma in the commons.

The productivity of marine waters as a Common Resource in Shellfish Culture

Bio-technically, mollusk farming can be considered as an extensive production because no external energetic input is supplied such as feed or oxygen. Economically it can be a highly productive industry : 4 to 5 tons of oysters per hectare, 50 to 60 kilograms of mussels per stake (Gerla,1993). The maximum yield of a given area is determined by the natural productivity of the coastal waters. Phytoplankton living in the watercolumn are carried by currents and filtered by the shellfish to be converted into flesh. This phytoplanktonic resource displays all the characteristics of both a non self-regulated renewable resource and a common resource. In many cases there is no evidence of a relation between filtering animal stock and the productivity in a given area. The annual potential may express more or less variability according to climatic and physical parameters. It is limited and substractible as any unit consumed is not available for others but it is also hardly divisible before being consumed by the shellfish. Comparing with Hardin herder's case (Hardin, 1968), the feeder is fixed while the food is moving. The access is limited through the allocation of tradeable individual rights on tidal space. Among the tidalflat users, the productivity is shared as it crossed the boundaries of space rights. Within the group of right owners, the dilemma is either to compete (free access within the group) or to cooperate.

Within coastal ecosystemic units, the production is the final outcome from complex processes including terrestrial flows, coastal currents, sedimentation and phytoplankton development in the water column. It may be highly variable from one place to another in the same coastal zone or from year to year. The total resource in an area defines its carrying capacity.The growing technic is also an important parameter that influence the capacity to use part of all of the water column potential. Technical innovation may strongly modify the production potential of a given area. At any spot, the resource availability depends on the subtraction that may occur upstream. This dependency may be more or less high according to the above parameters. An individual share of the resource cannot be guaranteed ex-ante, not only because of this natural variability but, also because of the interdependency of these variables which contribute to production. In addition, because of indivisibility, individual property rights on the resource can hardly be designed. This is well illustrated in France by the fact that individual tradeable rights on space have not prevented depletion effects.

In France, the marine coastal waters, including the intertidal area, are State owned and open to public access. Resources within the water do not have a legal status and should thus be considered as res nullius. The individual or collective appropriation of coastal resource or space (aquaculture, drilling, mooring) may occur under a long term leasing system of "concessions" (25 - 30 years). Recent legal changes have recognizedtraditional practices of transferability of lease through monetary compensation (March 22, 1983 Order modified in 1987). This gives almost all the attributes of an individual property right to the leasing system. But the administrative use right only considers the physical location area (space), not the resources that move across the tracts. Thus, the leasing system does not prevent the users from competing for the resource. Every one may be tempted to always take more from the common pie and behave as a free-rider. When the limits of the carrying capacity (defined by the full expression of the natural growth potential for each animal) are reached, every user is affected by any additional stocking: overstocking is similar to overcapitalization in fisheries or to Hardin's herder's dilemma or open access issue. As described by many authors (Berkes et al. 1989; Bromley,1989; McCay & Acheson, 1987; Ostrom, 1992), this issue is more related to

the understanding of the potential or difficulty to generate benefits into the commons by a collective action than "poverty and despair" as a supposed inherent attribute of the commons.

A local participatory management approach to solve the common resource dilemma

More and more examples are described in the literature showing that such common resource dilemmas may be solved by an appropriate co-management if all stakeholders take a part in the decision making process. We define co-management as follows: a co-management regime may be defined as a natural resource management system in which relationships among the stakeholders (ranging from resource users to governments) involve substantial sharing of decision-making power and management actions."Co-management regimes work by altering the relationships among the actors (resource users and governments). They institute together a shared decision making process as a game in which the actors can learn to optimize their mutual good and plan in cooperation for a long term" (Axelrod, 1984). For Pinkerton (1989), alteration of modern management regimes with more centralized power is "a route to decentralize decisions to effectively address the problems, to manage the consent of resource users and reduce conflicts through a process of participatory democracy".These new relationships can be generated within existing institutional and legal arrangements or contribute to change them. Co-management processes may be differentiated according to various characteristics.

The case of Mont Saint-Michel mussel production is a very local and highly participatory process of co-management with a strong individual leadership effect. We would like to illustrate this by looking at the case of Blue mussel aquaculture management in the Bay of Mont Saint-Michel for the last 40 years.

Prevailing conditions in the Mont St Michel Bay and evolution

The Mont St Michel Bay is located between Brittany and Normandy (Western part of France). The coastal zone huge tidal ranges (as high as 12 meters)which provide tremendous tideflats where many fisheries and aquaculture activities (oysters and mussels) have been developed for centuries. In addition, the watershed and wetlands provide resources for agriculture, tourism, hunting, waterfowl watching. This area is listed under the UNESCO Ramsar Convention.

After depleting wild stocks of flat oysters by fishing, local people developed an oyster aquaculture during the late 19th century by using spatfall trapping devices. The spatfall are grown in bags on racks settled on tide flats in front of Cancale city. Blue mussel aquaculture is similar.Mussels are grown in bags fixed to stakes planted into the mud flats of thebay, off old fish-traps lines. Unlike the oyster aquaculture in this bay, there is no wild spatfall available. They must be imported from southern regions (Charente, Atlantic coast) as young larvae which are fixed to ropes. This induces a short-term growing season for only one cohort forall. Obviously, the final results will depend on annual spatfall availability, productivity of the bay and its related distribution within the bay. In the Mont St Michel Bay, the evolution of Blue mussel aquaculture may be split up into three phases (see figure on last page):

Phase 1 : Colonization of an open space (1954 - 1962)

The Bay was considered as a virgin and vast area for potential mussel growing by "pioneers" who were looking for new productive sites. They all came from a long traditional mussel aquaculture region on the French Atlantic coast (Charente). This group was very homogeneous and skilled at mussel aquaculture. This activity rapidly expanded on the available area just before the small town Le Vivier / Mer by extensive claiming of the maritime public domain under the leasing system. They intensified the production by planting as many

stakes as possible on the allocated beds.They displayed the typical "free-rider" mentality : to get the biggest share from an apparently unlimited common resource. Hence, the overall production increased until a threshold was attained.

Phase 2: Transfer to other areas (1963 - 1984)

Although there was a general increasing trend in mussel production, periodic parasitic infestations occurred and jeopardized some annual production. As the individual yield per stake decreased somehow, the mussel growers realized that there were correlations among the stocking densities of mussels, poor growing conditions and parasitic infestations. They realizedthat the natural plankton productivity, which was first considered to be as endless, had limits. For some years, the Fisheries Institute (ISTPM-IFREMER) cautioned them about this problem. This led the commercial mussel growers (all joined under a "syndicate") to challenge the status-quo. They proposed to fix the problems within their group under a joint panel with administrative managers of maritime activities and the scientific institute. They all agreed about the possible causes of this decaying situation and about the possible remedies that might create new benefits from a collective action. They commonly decided on two actions to facilitate the water circulation through the "forest of stakes" and improve access to the planktonic food for mussels :- to reduce the number of stakes by suppressing the double lines (1970);- to partially compensate the actual loss by allocating new beds toward the Eastern part of the bay : Hermelle Bank). This new area was in fact much more favorable than the others.The outcome of these changes was very fast and mussel production increased again until the late 1970s when the production dropped again. An urgent new collective action was needed.

Phase 3 : Thinning

The new incident of declining production was probably due to another overloading situation. Thus, a thinning operation was initiated and stake numbers decreased (from 180 to 110 per 100 m) in 1985. The benefit was shortly demonstrated by an increase in yield per stake. Furthermore, the benefits were stabilized with a high resistance to adverse conditions as the shortage of spatfall and of freshwater outflows combined with stormy weather that occurred in 1990-91. Even, the 1995-96 and 1997 harvests reached higher records.

Why did this case become successful ?

By looking at this case through White's flow chart analysis for a collective action (1994), some relevant determinants may be highlighted to explain why the mussel aquaculturists in the Mont St Michel bay developed a successful co-management to collectively save their activity, which was threatened by a "free-rider" temptation.

The sequence of events and actions that are observed in this case follow the steps of White's chart. The drastic decline in production were the events that forced the user group to react as a group and challenge the status-quo. As a group, they proposed a collective action by joining their efforts with that of the scientific institute and administrative managers. Several incentives were negotiated and established to make all individuals able to solve their common issue by individual decisions. However, some specific factors facilitated these individual choices including the following :

- A high homogeneity of the user group may be considered as the first key factor.

All mussel growers came from the same geographical region (Charente) about 300 kms from the Bay and they continue to remain linked to this region by family roots and by their dependence on the annual spatfall origin of themussel obtained from this region. The aquaculture industry they developed in this "virgin area" was also based on the same principle. So, when adverse conditions occurred, they had common history to facilitate the designing and crafting of new rules and organizations to manage their activities and resources on which they were dependent.

- There was limited controversy about the causes of the declining production. Thus, a rapid scientific consensus was easily reached. `
- The bulk of users of the common resource agreed on the objectives, means and importance of the cooperation involved. They also accepted the sanctions against the possible "free-riders."
- They acknowledged the new rules proposed by the user group and negotiated with the administration. The constitutionality of these rules guaranteed the control and implementation of the sanctions.
- They also acknowledged the legitimacy of the leader and of the professional organization to which they felt deeply connected. In this case, the leader of the group was elected as the mayor of the small town (Le Vivier / Mer) the wealth of which depends exclusively on mussel aquaculture.
- The participatory and decision-making process was very clear. Everybody was aware of all stages (information, transparency, involvements and leadership).

Other outcomes from this collective action in Mont St Michel Bay:

- As often observed when a co-management action is properly implemented,the relationships among the individuals were altered enough to induce other results. Thus, the evaluation of effects of the changes needed an appropriate yearly estimation of mussel production for any growers. Every producer was aware of the current situation for the user group. Hence, when adverse climatic conditions occur and decreases production above 27 % of previous four years result, every user may apply for a financial compensation as a hazard calamity. Since this collective action was implemented, all remediation requests were properly approved by the ad-hoc State Agricultural Fund. This collective action led to much better estimations of production by all mussel growers in Mont St Michel Bay.
- Another important outcome recently emerged from this process. Gradually, at the Mont St Michel scale, the production cycle and the technological methods converged to consistently produce. Subsequently, the user group joined their efforts with that of the Fisheries Institute and Administrative managers to develop a Label Policy and a related National Origin Controlled trade mark. This long process is being approved by National Authorities in late 1996 and will give the mussel grower of this Bay the right to sell their product at a higher price on the market.

Conclusion

The current history of Blue mussel aquaculture in Mont St Michel Bay shows that successful local comanagement cases do not only occur in less developed countries. Some may also be found in Western Europe in spite of a strong centralized management. This case seems illustrate the process described by White (1994) where all the stages were passed and should encourage such approaches in other situations as alternatives to address open access dilemmas. However, the robustness of new institutions to maintain sustainable production and adapt to new conditions will depend on various factors:

- the strong homogeneity of the user group (origin, history, interests);
- the existence of a structured user group with a "leader" who is selected through a democratic process;
- the time between initiative of changes and benefits of a collective decision will be perceived by any individuals (insurance issue: Runge, 1981). In this particular case, the very short-term response was a great incentive for people to join the process;
- the expected benefits for all versus the costs they should have to bear;
-the opportunity to stabilize benefits on a mid-term scale, resisting variability due to adverse conditions inherent to natural productivity; and

- the ease of implementation process. In this example of mussel aquaculture the control cost was rather cheap and was easily achieved by aerial census and random sampling of number of stakes. This is much easier than estimating oyster-bags on racks and oyster stock in bags.

Therefore, this coastal shellfish aquaculture case demonstrates that co-management provides an opportunity to prevent over exploitation of a transboundary resource (plankton carried by water masses). As suggested by Hanna (1994), private property cannot be a good remedy for utilizing such common resources. This case may also act as a catalyst in promoting research joining natural scientists and social scientists in order to develop guidelines for governments and resource users for co-managementalternatives.

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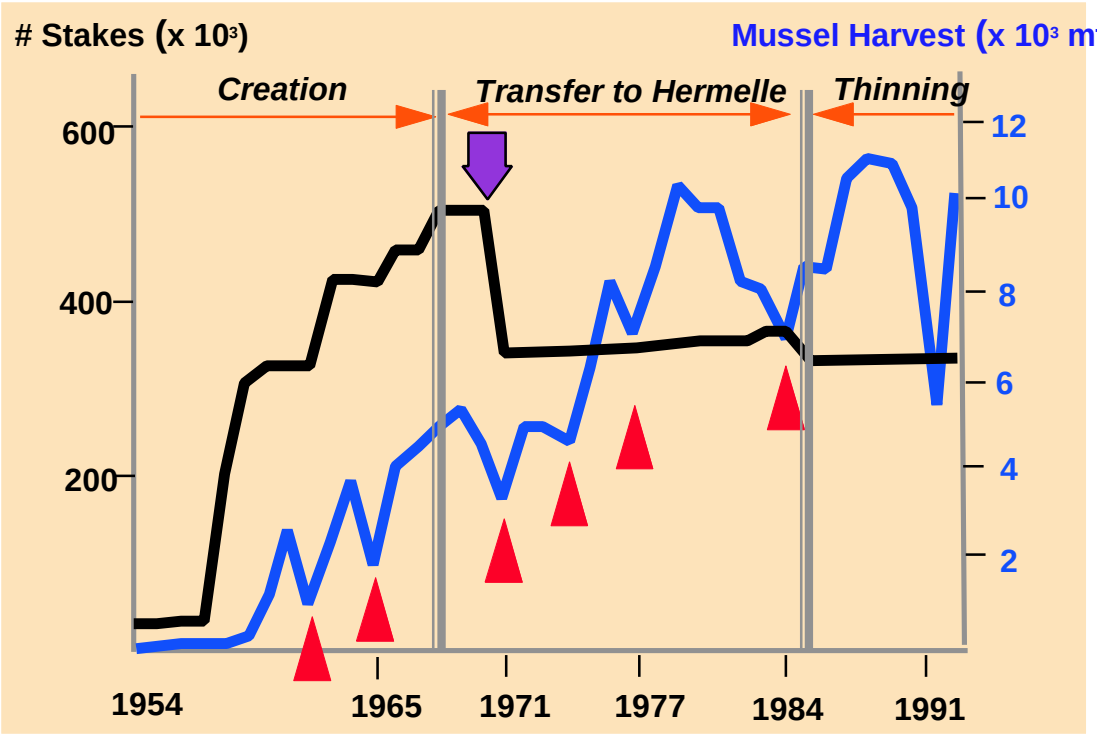
Figure

Blue Mussel Production and Stake numbers in Bay of Mont St Michel



Over infestation of *Mytilicola* Parasite

Double stake-lines --> Single lines