REVIEW ON MANAGEMENT POLICY AND ENERGY USE IN THE FISHERIES SECTOR

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This is research in progress.

Introduction

- Fisheries management, determining access conditions to a resource, application of effort, harvesting and thereby the longer-term sustainability fish stocks, has the potential to exert a significant influence on catching efficiency and sector profitability including fuel use and operating costs.
- However, such management systems may also act to reduce fleet size and activity levels, limit rights to resources, and reduce community access to income and food benefits.
- In this presentation we will look at how fisheries management policy could affect capacity, effort, fuel use, market returns and profitability, through controlling effort, improving market returns and through longer term potential stock recovery.
- *The Sunken Billions* (World Bank, 2009), estimates that, if world ocean capture fishery resources were managed optimally, they would yield "resource rents" in the order of US$50 billion per annum. The study continues that these same fishery resource are currently yielding no "resource rents" whatsoever. As a consequence, *The Sunken Billions* calls for a programme of positive investment in fishery resources and reduction in fishing fleets.
- Historically, fishery resources have been exploited on a "common pool" basis. The "common pool" nature of the resources has created a set of economic incentives for fishermen that are highly perverse from society's point of view, leading to resource overexploitation and economic waste. Fishery management has been dominated by attempts to counter the baleful impact of the "common pool" nature of the resources.
- We first look at catch rights based management (CRBM) and analyse under which conditions this management system can achieve socially beneficial outcomes.

Catch Rights Based Management (CRBM)

- The FAO (1998), in its discussion of fisheries management, makes a distinction between:
  - Incentive blocking approaches.
  - Incentive adjusting approaches.
- As discussed by Bjorndal and Munro (2012), resource managers initially relied upon incentive blocking measures, where fishers are hopefully blocked from responding to perverse incentives.
- As these approaches overall met with limited success, greater emphasis is being placed on incentive adjusting measures, in which the management measures are designed to adjust the incentives facing fishermen, so that these are more compatible with the goals of society.
- In other words, the purpose is to change fishermen's incentives so that a socially optimal outcome is achieved rather than that of the "common pool" fishery.
- The most common approach consists of fishing rights often in the form of harvesting rights, popularly referred to as "catch shares." including:
  - individual harvest quotas (IQs)
  - territorial use rights fisheries – "TURFs"
  - fishermen cooperatives.
  - sectoral TAC programmes.

Individual harvest quotas

- By mid-2010, the number of states adopting individual harvest quotas (IQs) had increased to 22, accounting for almost 25% of global capture, as measured by the FAO (Arnason, 2012).
- IQs, which were originally designed to curb the "race for the fish," are now seen as doing much more. If properly designed, and administered, they will serve to give the fishermen an incentive to invest in the resource.
- Important aspects of IQs:
  - as property rights to the fishery resource.
  - short term or long term in nature.
  - expressed in fixed quantities over time, or as percentages of the TACs.
  - non-transferable or transferable – ITQs.
  - implications for equity.
  - multispecies fisheries.
  - as cooperative games, and problems of surveillance and enforcement.
- Bjorndal and Munro (2012) provide a thorough discussion of these aspects. One distinction is, however, made, that between Individual Transferable Quotas (ITQs) and Individual (non-transferable) Vessel Quotas (IVQs). In the first instance, vessels are able to adjust their quota holdings – seasonally, by leasing extra quotas, or permanently, by purchase/sale of quota rights. Firms will optimise their activities given these constraints. In the case of IVQs, a vessel has a fixed quota to be harvested for the year.

Territorial use rights fisheries (TURFs)

- Christy was also the first to introduce the concept of TURFs (Christy, 1982). Christy recognised the infeasibility of ITQ schemes in most, if not all, artisanal developing coastal state fisheries.
- TURFs involve the granting of harvesting privileges to one, or a set of, fishing coastal communities. An example is provided by the Japanese Fishery Cooperative Associations (FCAs), which can trace their origins back to the 16th century fishermen guilds.
- A TURF is, almost by definition, a cooperative fisherman game.

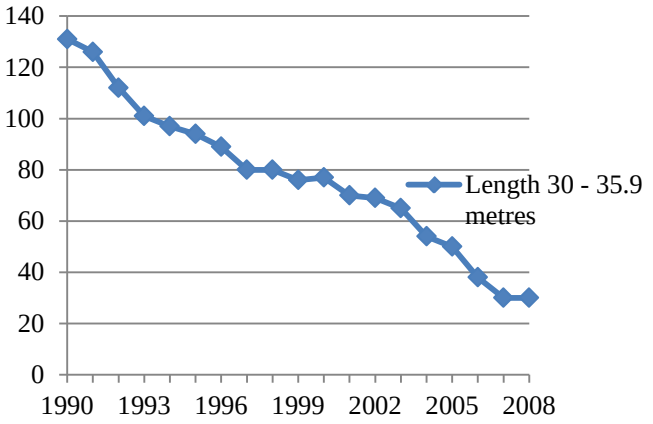
Fishermen cooperatives

- Fishermen cooperatives can be thought of as similar to TURFs, except that there is no particular geographical location.

Case studies of rights based management

Denmark: ITQs for the demersal fleet

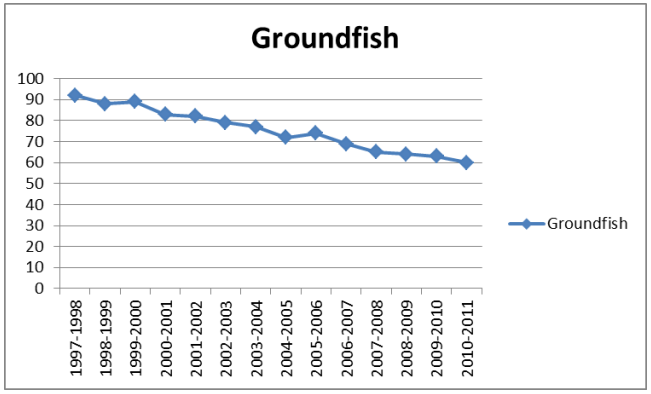
- Main demersal species are cod, European plaice and other flat fish. ITQs – in the form of Vessel Quota Shares (VQSs) - were introduced for the demersal fleet on January 1st, 2007. It concerned largely vessels 12 – 35.9 metres.
- To ensure an effective ITQ management it is important with ownership and transferability. A way to do this is by using 'fish pools'. Within the pool the vessels can lease and swap quotas within the quota-year.
- The pool system is also reducing discards as there is a rule that no fish must be discarded as long as one fisher in the pool has a quota.
- The number of boats of length 30-35.9 metres has shown a steady decline since 1990 but we are interested in the development after the introduction of the ITQs (see figure 1). The number of boats has been reduced from 38 in 2006 to 30 in 2008. This is a reduction of 26.6 %.
- Reduction in GT and engine power has been more or less the same as the reduction in boats. The 30% overcapacity vanished during the two first years after the implementation of the VQSs.
- Although numbers of fishers may have declined, average number of operating vessel-days has increased. It is now also common for vessels to fish with 1½ or even two crews. Thus, total employment – e.g. aggregate person days/year – will have decreased substantially less than what is indicated by the reduction in the number of vessels.



ITQs in The British Columbia Groundfish Trawl Fishery

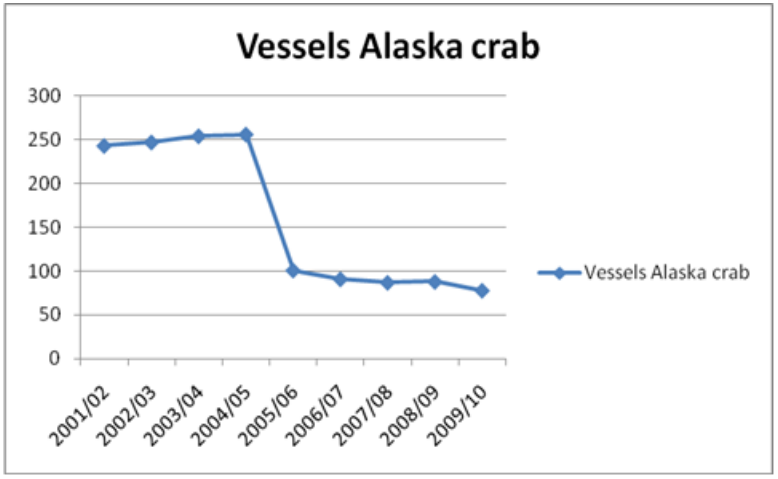
- The groundfish trawl fishery (GTF) is the largest in terms of both the value and the total catch. It lands about 100,000 tonnes of fish per year. Important species in terms of catch are rockfish, hake, Pacific cod, thornyheads, sole and lingcod. In terms of volume, hake is most important, but its average price is a lot less then many other species. This is an extremely complex multi species fishery, with a large number of species, and over 50 different stocks.
- In 1997, an ITQ scheme was established. Under the scheme, 55 stock TACs were established. The Canadian Department of Fisheries and Oceans proceeded to allocate quotas to all 55 stocks to all vessels licenced to operate in the fishery, and then hoped for the best.
- A sophisticated quota market quickly emerged. The licence holders, working through the market, solved the allocation problem.
- The licence holders became, if effect, quota portfolio managers. Many of the vessels specialised to some degree by species and/or area, and/or gear. Such specialisation required the licence holders to rebalance their quota portfolios. The required portfolio balancing was, and is, effected through the quota market. As of 2009, up to 3,000 ITQ transfers occurred annually in the fishery.

- Figure 2 shows that the total number of vessels for groundfish trawl has steadily decreased since the introduction of ITQs. From 92 vessels in 1997 there were 60 in 2011, a reduction of 34.8%.
- The value of the groundfish harvest has increased due to better quality of the fish, which is often marketed fresh rather than frozen. The fishing season had also been extended.



The Bering Sea / Aleutian Islands crab fisheries

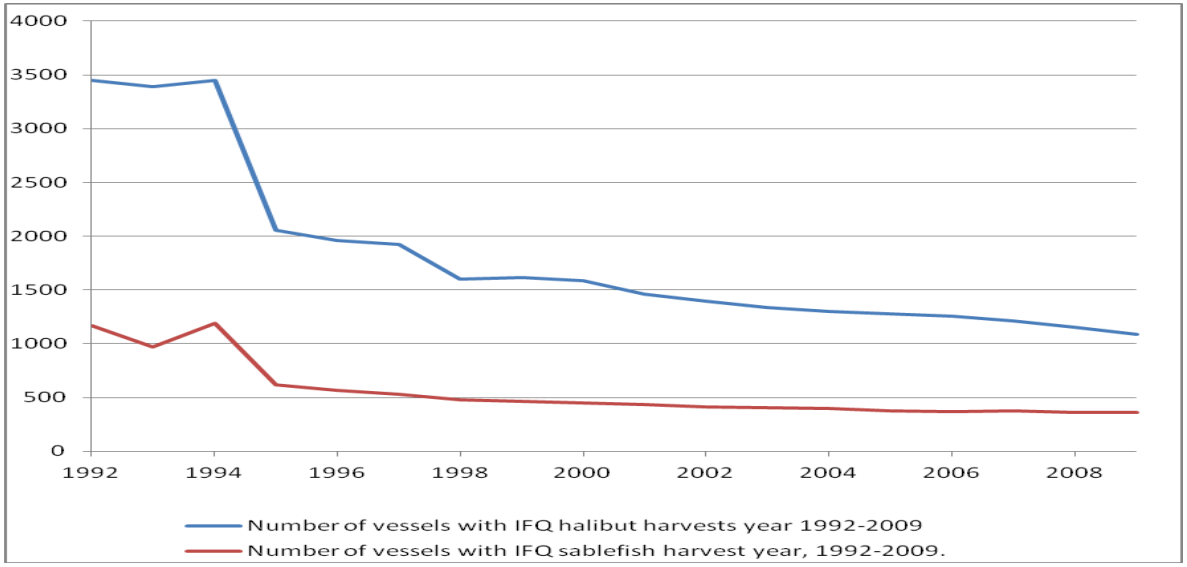
- The Bering Sea / Aleutian Islands (BSAI) crab fisheries target a total of eight species with Bering Sea snow crab and Bristol Bay red king crab most important. The BSAI rationalisation programme allocates harvest rights to BSAI crab resources among harvesters, processors and coastal communities. The programme wanted to address conservation and management issues, reduce bycatch and discard mortality and increase the safety of the fishermen. All these issues were associated with the race for crab that existed in the crab fishery due to overcapacity.
- The rationalisation programme set out to get rid of the current problem of the race for crab and at the same time satisfy the stakeholders dependent on the fisheries. Before the implementation of this programme the eight major BSAI crab fisheries were managed under the License Limitation Programme. There were stock declines leading to seasons as short as a few days or weeks because the fishermen were racing to catch the annual quota. Figure 3 shows that after the implementation in 2004, the number of vessels dropped from 256 in 2004/2005 to 101 in 2005/2006. That is a reduction of 60.5%. In 2009/2010 the number of vessels was 78; this gives a total reduction of 69.5% from 2004 to 2010.
- Abbot, Garber-Yonts and Wilen (2010) examine the effects of catch shares on employment and remuneration of crew. The reduction in the number of vessels has caused a roughly commensurate decrease in the number of individuals with some degree of employment in the fishery. Nonetheless, the overall employment – measured in crew hours (man days) spent fishing – has stayed roughly constant.



- With this comes a smoother, less seasonably pattern of employment. Remuneration has increased (often substantially) on both a seasonal and daily basis for the majority of fishermen relative to the period before rationalisation.

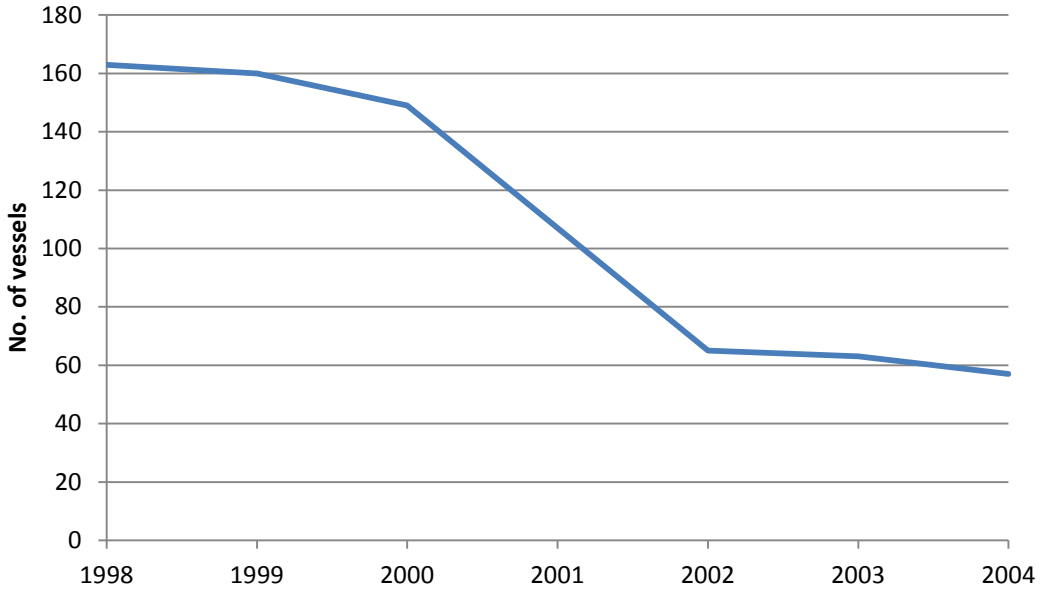
ITQs in Alaskan halibut and sablefish fisheries

- The halibut and sablefish (black cod) fisheries in Alaska are among the more valuable fisheries in the North Pacific, with stocks managed jointly with Canada. In the late 1970s, the North Pacific Management Council started to consider a different management plan than open access. The season was getting shorter, and the fishery was characterised as a very strong 'derby'. The individual fishing quota (IFQ) management plan was approved November 9th, 1993 for the Pacific halibut and sablefish (black cod) fisheries of Alaska.
- Figure 4 shows the development in numbers of vessels for 1992-2009. For halibut the number of vessels fell drastically from 3,450 in 1994 to 2,057 in 1995. Similarly, for sablefish, the number of vessels was reduced from 1191 (1993) to 616 (1995). This is a decrease of 40.4% in just one year for halibut and of 48.2% for sablefish. Thereafter, one can observe a gradual decline in the number of vessels in both fleets.



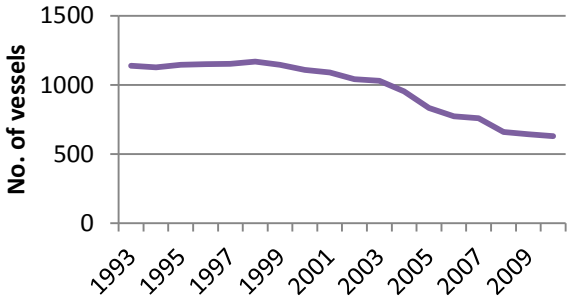
ITQs in Chile

- The southern pelagic fishery in Chile is an industrial fishery that historically has been focused on pelagic species to be reduced to fish meal and oil. Until the 1990s, the fishery was basically an open access fishery.
- The individual quota system was introduced in February 2001. Licensed boats had a right to harvest a percentage of the annual TAC.
- The development in vessel numbers is shown in figure 5. As one can see, the number of vessels in the southern fishery was rapidly reduced from 149 in 2000 to 65 in 2002. During the next two years another eight vessels was removed, reducing the fleet to 57 vessels in 2004. This is a reduction of 61.7 % from 2000 – 2004.



Individual Vessel Quotas: the case of Norway

- The cod fisheries are the most important as measured by value in Norway, and while cod is the most important species a number of other whitefish species such as saithe, haddock, redfish, etc are also caught. While most studies have focused on the trawlers, it is the coastal fleet that take the largest share of the catch and it has been showed to obtain a higher unit value for its catch.
- Individual vessel quotas were introduced from January 2004 for the vessels larger than 15 metres, and expanded to include vessels down to 11 meters from 2007. This made individual vessel quotas the prevailing management system for all but the smallest vessels in the Norwegian fisheries. *These quotas are not directly transferable.*
- The development in number of vessels is shown in figure 6. Through the 1990s, there was a slow increase in vessel numbers, with a peak of 1,169 in 1998. Buyback programmes and other capacity reducing measures had an impact in the period 1998 to 2003. This reduced the number of vessels to 1,029 vessels in 2003, the last year before the individual vessel quotas. Between 2003 and 2004 there is a clear kink as vessels are leaving the fleet much faster. From 2003 to 2006 the fleet was reduced by 256 vessels. The figure also clearly shows how the extension of the IVQ system to smaller vessels in 2007 led to a new wave of vessels leaving the fleet, whereafter vessels continued to leave the fleet at a slower pace. In 2010 the coastal fleet consisted of 629 vessels, a reduction of 38.9% since the introduction of the individual vessel quotas.



Fishermen cooperatives: the United States

- The United States provides an example of fisherman cooperatives, and their close relative, sector TAC allocations. This is the Pollock Conservation Cooperative (PCC), established in 1999, with the express approval and support of the American government.
- The PCC consists of a group of companies operating catcher/processor vessels in the offshore pollock fishery in the Bering Sea. The PCC is allocated a quota, a segment of the overall pollock TAC, which the company members allocate among themselves.
- As a result of the establishment of the PCC season length was greatly increased and the product quality was substantially improved (At Sea Processors Association, 2011; Holland, 2010).

Summary and and some tentative conclusions

- In the last three decades, rights based fisheries management systems where fishermen get individual quotas, have been introduced in a number of fisheries around the world to address the problems of excessive effort and stock depletion.
- These systems change fishermen's incentives from maximising their share of the harvest to minimising the cost of harvesting a given quantity of fish. This is likely to lead to a reduction in fishing capacity and effort over time.
- Rights based fisheries management also comes in different forms. With Individual Vessel Quotas (IVQs), vessels have individual quotas which may or may not be transferable. In the case of Individual Transferable Quotas (ITQs), fishing quotas are fully transferable through sale, lease or exchange, and in principle the quota market can lead to optimal effort levels.
- FAO characterised more than 80% of the world's fisheries as fully utilised, overfished or recovering. It is then not surprising that many of the world's fishing fleets are characterised by excessive effort and overcapacity. When the starting point is a fishery characterised by excess effort or over-capacity, management systems with individual vessel quotas are predicted to reduce this wasteful use of resources.

Some tentative conclusions

- Theoretical analysis suggests, and empirical case studies confirm that catch rights based management (CRBM) will cause a reduction in, or possibly even elimination of, excess capacity in a fishery.
- A consequence has also been improved profitability, at the fleet as well as vessel level. CRBS systems considered include i) ITQs, ii) IVQs, iii) TURFs and iv) sectoral allocation systems.
- The reduction in excess capacity, with fewer boats prosecuting a fishery over a longer season, also improves fuel efficiency and thereby reduces GHG footprints.
- It is essential that fleet rationalisation is achieved in the context of a "cooperative" game, where all relevant stakeholders are included.
- Returns in many fisheries (e.g. BC groundfish, halibut, crab) have also been substantially improved due to higher prices related to improved product quality. Greater concern for sustainably sourced seafood can cause further improvements in price to fishers.
- Social concerns often relate to potential reduction in employment. In this context the results of Abbot *et al.* are very interesting, showing for Alaskan crab fisheries that while crew numbers were significantly down after introduction of vessel quotas, in line with the number of vessels, total number of person-years was virtually unchanged.
- Similarly for Denmark reduction in employment is less than reduction in vessel numbers due to the use of 2nd crews. Moreover, longer fishing seasons and improved fish quality may give room to higher employment in the processing sector.
- Scope for improvement exists is numerous fisheries worldwide; in many cases, there is still tremendous concern about the transition to improved management which must be handled with great care. It is emphasised that this may lead not only to reduced costs but also improved prices/revenues. If handled well, negative effects on employment can be minimised.