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Development in fleet fishing capacity in rights based fisheries ☆

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ABSTRACT

Individual Transferable Quota (ITQ) fisheries management systems are supposed to remedy the over-capacity problem associated with traditional command-and-control management systems. This paper provides some insight with respect to the impact of ITQs on vessel numbers in six different countries. The results indicate that the number of vessels was reduced by at least 30% within a few years of the implementation of individual vessel quotas. Thereafter a slow reduction in vessel numbers continued, indicating that it may take time period before over-capacity is fully removed. Moreover, the total effect on vessel numbers is surprisingly similar across countries and fisheries despite different degrees of transferability in the different cases analysed.

1. Introducion

As is well known, open access fisheries are characterised by stock depletion and excessive harvesting effort that lead to dissipation of resource rent [1]. This is evidenced by the *Sunken Billions* report, which estimates an annual rent loss in world fisheries of around $ 50 billion [2]. Stock depletion can, at least in principle, be addressed by implementing and enforcing Total Allowable Catch quotas (TACs). However, unless there is also effective management of fishing effort, the economic waste associated with excessive effort remains. Increasingly, this is recognised as a serious problem in itself that may even contribute to overfishing if quotas are set endogenously in the management system [3]. As noted by Hannesson [4], the situation can be exacerbated by Illegal, Unregulated or Unreported (IUU) fishing.

Early attempts to deal with excessive effort include entry restrictions such as limited entry (licensing) and regulations of vessel size and fishing days as well as gear restrictions. However, these measures work poorly as fishermen find ways to substitute away from the regulated factors, giving rise to the class II open access fishery [5] or the regulated open access fishery [6]. While theory clearly predicts that effort will be too high under sub-optimal management, until the late 1990s there was limited knowledge with respect to what magnitudes were involved. Homans and Wilen [3] used a bioeconomic model to show that effort was 10 times higher than optimal under regulated open access in the BC halibut fishery, while Weninger [7] indicated that two-thirds of the fleet was redundant in the US Mid-Atlantic surf clam and ocean quahog fisheries. Asche et al. [8] show that the potential reduction in fleet size due to optimal management in five European fisheries is between one and two-thirds. In addition, a large number of studies have shown that many of the worlds fishing fleets can be characterised as having substantial over-capacity [9–11].

In the last 3 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 [12]. This is likely to lead to a reduction in fishing capacity and effort over time. Grafton, Squires and Fox [13] and Newel, Sanchirico and Kerr [14] note that when introducing individual quotas, the transition can take time, and this can be further augmented by uncertainties with respect to the regulations [15] and the sunk capital in the vessels [16–18].

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 [19]. In practice, the duration of the ITQs may be variable, from a few years to being permanent [1,20].

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IVQs as fisheries management systems were introduced in the 1980s, and have become increasingly popular. As of today, about 25% of the world harvest of capture fish comes from fisheries managed with individual quotas [21]. There has been a discussion with respect to what extent individual quota systems actually reduce fleet size [8]. As many of these systems have been in operation for a decade or more, we are now in a position to see how actual vessel numbers have developed in such fisheries.

In this paper we will report the results from an investigation on the effect on vessel numbers of the introduction of individual vessel quotas in seven different countries, namely the USA (Alaska), Canada (British Columbia), Chile, Norway, Denmark, Australia (Tasmania) and Iceland. In addition, we will present information from the Faroe Islands, where the groundfish fleet is regulated by an effort management system. This does not provide a final answer with respect to the impact of individual quotas systems on fleet size, particularly since there is substantial variation in the details of the management systems in these fisheries. However, it should be a useful complement to empirical studies focusing on specific fisheries and more theoretical studies, and the potential impacts of individual vessel quotas that are reported in such studies. The fisheries reported here are selected primarily because of easy data access, but are also fairly well spread over the world. The reporting period is chosen to show the situation before the introduction of quotas as well as the effect of quotas, subject to data availability, and as such, in some cases we have the fleet development for a period before the individual quotas were introduced, while in other, we primarily have the data from the time when the individual quotas were introduced.

2. Alaska

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' where the safety for the fishermen was at stake, the equipment was misused and product quality was deteriorating. The fleet was getting larger than what was economically sensible which made it difficult to manage.

The individual fishing quota (IFQ) management plan was approved November 9th, 1993 for the Pacific halibut and sablefish (black cod) fisheries of Alaska.

Fig. 1 shows the development in numbers of vessels for 1992–2009. For halibut the number of vessels fell drastically from 3450 in 1994 to 2057 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 1 year for halibut and of 48.2% for sablefish. Thereafter, one can observe a gradual decline in the number of vessels in both fleets. In 2009 there were 1090 vessels left in the halibut fishery or less than a third of the number of vessels when the IFQs were introduced. The median vessel length for halibut vessels has had a slight increase from 40 ft in 1995/1996 to 42 ft in 2005. The median vessel size was still at 42 ft in 2009 [22].

Although not directly applicable to these fisheries, Abbot et al. [23] show for the Alaskan crab fisheries that while crew numbers were significantly down after the introduction of vessel quotas in line with the number of vessels, total number of manyears was virtually unchanged. This provides an indication that a significant part of the overcapacity is capital, and that most of the reduction in effort is a reduction in capital rather than labour.

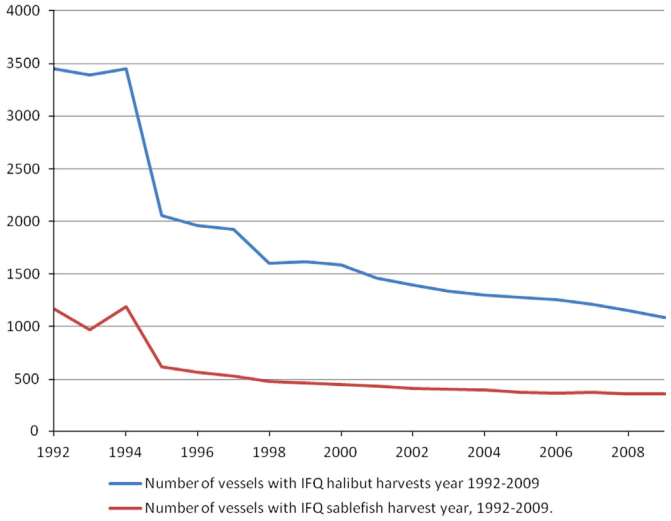

Fig. 1. Number of vessels in the Alaska halibut and sablefish fisheries, 1992–2009. *Source*: taken from [22].

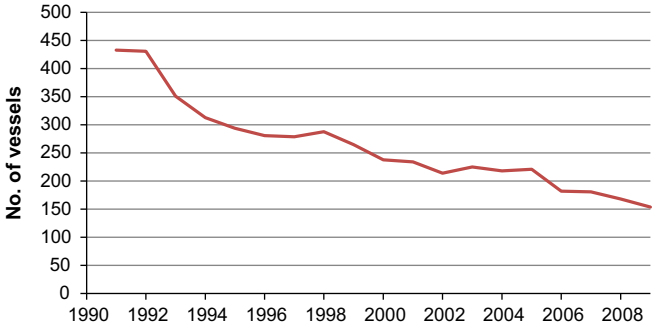

Fig. 2. Number of vessels in the BC halibut fishery, 1991–2009. *Source*: taken from [25].

3. British Columbia

The halibut fishery in British Columbia is the Canadian counterpart to the Alaska halibut fishery discussed in the previous section. The individual fishing quota system was introduced somewhat earlier, in 1991, and has been the focus of several studies [24,3,13]. Prior to the introduction of individual vessel quotas, the fishery was operating under a limited entry programme. This programme started in 1979 and had 435 licenced vessels.

During the 1980s the fishing capacity increased despite the limited entry programme, as the crews were getting larger and vessels invested in more efficient gear. Because of the better technology and equipment, the fishing season kept getting shorter, as the fishermen caught the TACs faster and faster. In the late 1980s it was down to 1–2 days in some major areas, even with a larger overall harvest quota. The fishery was at this time characterised by the race for fish, with dangerous fishing conditions for the fishermen, equipment being lost and ruined and reduced quality of the fish [24].

The development in vessel numbers from 1990, 2 years before the individual vessel quotas took effect is shown in Fig. 2. In the 1st year, the number of vessels was reduced from 433 to 350, or by 19.2%. Subsequently, there has been a steady decline in numbers of vessels, although with slight increases in some years. The number of vessels was reduced from 433 in 1991 to 154 vessels in 2009, a reduction of 64.4%.

As noted above, Grafton, Squires and Fox [13] observed that full adjustment to a change in management system takes time, and this is certainly the case in this fishery. The number of vessels is