Managing Catch Limits in Multi-Species, ITQ Fisheries

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Abstract. Management of individual species in a multi-species fishery poses a number of challenges for fishery management systems, including the problem of managing fish bycatch. Fish bycatch is sometimes identified as a particular problem associated with management systems based on individual transferable quotas (ITQs) but this has not always proven to be correct. Since the introduction of an ITQ-based fishery management system 15 years ago, New Zealand has used a number of mechanisms to manage fish bycatch, with variable success. In 2001, the system by which fishers' catches are balanced against their catching rights was significantly modified. Changes include the implementation of a fee schedule requiring fishers to pay higher fees for increased levels of catch in excess of the catching right they hold. This is designed to provide fishers with an economic disincentive to target fish stocks for which they have no catching right. The new catch-balancing regime has only been in operation for 8 months but initial results are encouraging. There are anecdotal reports of fishers shifting to alternative fishing grounds to avoid catching species for which they have insufficient catching rights and there is no evidence of increased discarding. The real test of the regime will occur when a shortage of catching rights for a bycatch species severely constrains a major target fishery.

Keywords: fish bycatch, individual transferable quotas, economic incentives

1. INTRODUCTION

The challenge of managing individual species within multi-species fisheries is one that faces fisheries managers everywhere since many fisheries target more than one species. The challenge arises because limiting the catch of one species in a multi-species fishery may result in fishers either discarding fish of that species or foregoing catch of other species (Squires *et al.*, 1998). The problem of fish bycatch—and particularly discarding of bycatch—has been suggested as a particular problem associated with Individual Transferable Quotas (ITQ) management systems (e.g. Copes, 1986). Managing fish bycatch is a challenge in the New Zealand ITQ-based management system (Annala *et al.*, 1991) but Boyd and Dewees (1992) suggest that the use of an ITQ management system in New Zealand has not added any new bycatch problems.

In most fisheries fishers can modify the mix of species in their catch to some extent, but usually at some cost. Therefore, in order to encourage fishers to change their fishing operations to limit the catch of some species, incentives are required. In this paper I briefly outline the fisheries management system used in New Zealand and then focus on the incentives that have been used to encourage fishers to stay within catch limits for individual species. I then describe the new incentive structure implemented in 2001, note some preliminary results, and suggest some challenges facing the management of multi-species fisheries.

2. NEW ZEALAND QUOTA MANAGEMENT SYSTEM

The NZ ITQ management system—or Quota Management System (QMS) as it more commonly known—operates within a wider fishery management system that includes typical fishery management controls such as method restrictions, area restrictions and minimum legal sizes. Only a brief description of the QMS is provided here. Details of the development and operation of the QMS are provided by Annala (1996), Batstone and Sharp (1999), and Hersoug (2002).

The QMS was implemented in 1986, initially with 161 fish stocks of 28 species or species groups. Since 1986 more species have been brought into the QMS and a recent acceleration of this process is likely to result in approximately 50 additional species being brought into the QMS within the next 3 years. For each fish stock there is an annual Total Allowable Catch (TAC) and a Total Allowable Commercial Catch (TACC). The TAC is set to allow the fish stock to be maintained at or move towards the stock size that supports the maximum sustainable yield. The difference between the TAC and the TACC comprises an allowance for recreational fishers and customary Maori fishers, and other sources of mortality. Each TACC is divided into ITQs that are,

in effect, shares of the TACC. The actual size of these shares varies as the TACC is increased or decreased on an annual basis.

The fish stock boundaries or Quota Management Areas (QMAs) for some species, such as Ling, follow the ten basic Fishery Management Areas (FMAs) (Figure 1). Fish stock boundaries for other species, such as Hoki, see a number of FMAs combined. In effect, the whole Hoki Fishery is managed as a single fish stock. Most species are divided into 3–10 fish stocks. Note that, due to the low productivity of many commercial fish stocks in the area, only nominal TACs are set for QMA 10 (top of the maps) and these fish stocks are excluded from the analysis in this paper.

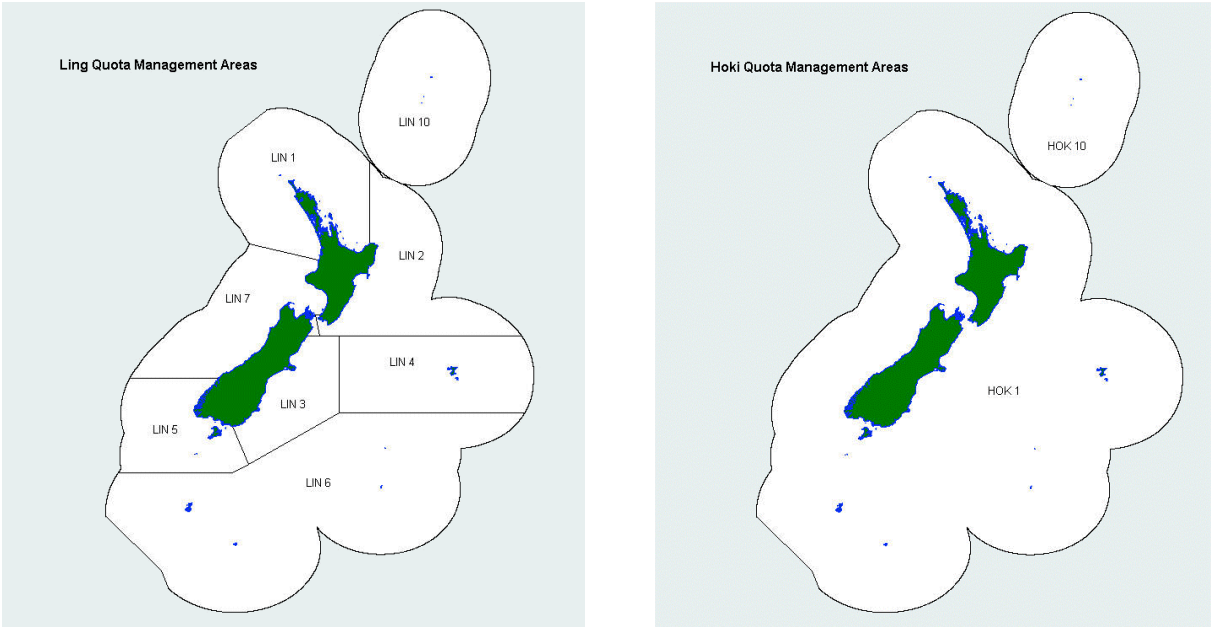

Figure 1. Ling and Hoki Fish Stock Boundaries

3. CATCH BALANCING 1986–2001

The catch-balancing regime is the term used to describe the system by which a fisher's catch is reconciled with the catching rights that he or she holds. From 1986 until 2001, the primary unit of the catch-balancing regime was ITQ. ITQ was both the long-term catching right and the within-year fishing right and could be bought or sold or leased. Fishers were required to have ITQ to cover their catch before they took any fish—it was a criminal offence not to do so—but there were a number defences available. A key element of all these defences was that any catch taken in excess of ITQ had to be taken as an inevitable consequence of taking other fish species for which the fisher did have a catching right. In practice, it proved easy for fishers to claim this defence—even where they were targeting species for which they had no catching right.

In addition to establishing an "inevitable consequence" defence, the fisher also had to 'balance the books'—that is to retrospectively cover their catch with some form of catching right. The six main methods by which this could be done are listed below. The first four methods are largely self-explanatory. More detail is provided on the last two methods.

- Carry-over up to 10% of ITQ from the previous year (uncaught ITQ only)
- Bring forward up to 10% of ITQ from the following year
- Surrender catch to the government
- Buy or lease uncaught ITQ by year-end
- Use the Bycatch Trade-Off System
- Pay a Deemed Value

Under the Bycatch Trade-Off System catch of one fish stock could be counted against ITQ of another fish stock taken in the same fishery. Trade-offs were only permitted between selected species and trade-off ratios were based on the relative values of the species being traded. The System was typically used by small fishing

operations that had difficulty obtaining ITQ for a particular species in a mixed-species fishery. However, the method was biologically unsound and some fishers used the System to target species for which they had little or no ITQ.

Fishers could also cover catch in excess of ITQ by paying a Deemed Value. The Minister of Fisheries was required to set a Deemed Value annually for each fish stock—in dollars per kilogram of catch in excess of ITQ. The Deemed Value was payable to the government monthly, based on the amount of catch in excess of ITQ, and was refunded if a fisher subsequently obtained ITQ to cover catch. The Minister was required to set Deemed Values at a level to achieve two objectives: to discourage fishers from targeting fish for which they held no ITQ; and to encourage fishers to bring any accidental bycatch ashore rather than discard it.

Deemed Values for a particular fish stock were usually based on the port price of the fish stock, qualified by factors such as the level of overfishing for that fish stock in previous years and whether it was a high, medium or low value species. The last factor was based on the assumption that there is a stronger incentive to target high value species. In practice, the variability in fishing operation cost structures meant that for some fish stocks it proved impossible to meet both objectives. For a given Deemed Value some fishers could make a profit and continue to target the fish stock while others would make a loss and were tempted to discard catches of the same fish stock.

Since 1986, additional mechanisms for covering catch with catching rights were incorporated in the catch-balancing regime until there were around 20 different mechanisms. The regime became very complicated and from month-to-month neither fishers nor the Ministry knew exactly how much uncaught ITQ each fisher had available. This made it difficult to take prosecutions against fishers for fishing in excess of ITQ, except where the offence was blatant. All these factors contributed to the catch of some stocks exceeding the TACC; some regularly, and some by a large amount.

Figure 2 shows the frequency of catches exceeding the TACC for all stocks in the QMS in the two fishing years 1990/91 and 2000/01. In 1990/91, total catches of about 17% of stocks exceeded the TACC. In only a few stocks, catch exceeded the TACC by a large amount. Ten years later, the number of stocks in the QMS had increased to 240. Of these, the percentage in which overfishing occurred had increased to about 27% and the frequency of overfishing was higher across the range. The main reason for this increase is that a number of the new species brought into the QMS were those for which there was little catch information on which to base the TAC and TACC. In some cases TACs were set at low levels and, not unexpectedly, catches exceeded TACCs. This catch information will be used in future reviews of the TACs and TACCs.

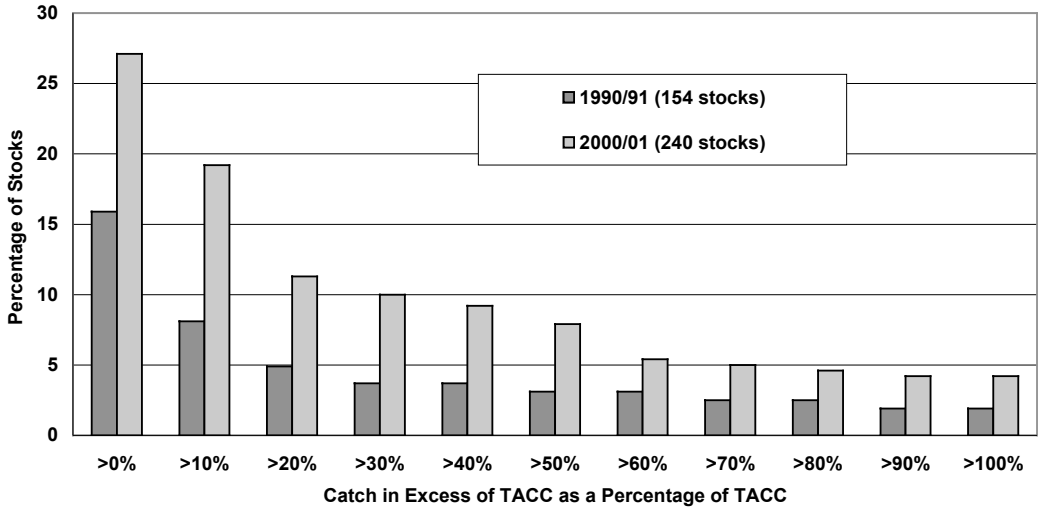

Figure 2. Frequency of Catch Exceeding TACCs

For some fish stocks, overcatch is a one-off or occasional event; for others, it occurs every year. SNA2 is an example of a fish stock for which there has been persistent overcatch. Figure 3 shows that in every year since 1986/87 catch has exceeded the TACC—even after the TACC was increased in 1993. Deemed Value setting for this fish stock is complicated by the fact that there is a target fishery for SNA2 and it is also taken as bycatch in

other fisheries. The landed value of snapper taken in the target longline fishery is typically higher than its value in trawl fisheries. Deemed Values were paid in respect of the catch in excess of the TACC so the Deemed Value was clearly not enough of an incentive to stop fishers taking snapper in this fishery. Fortunately, there are not many species for which such regular overfishing occurs, however, this is one of the problems that led to the redesign of the catch-balancing incentive structure.

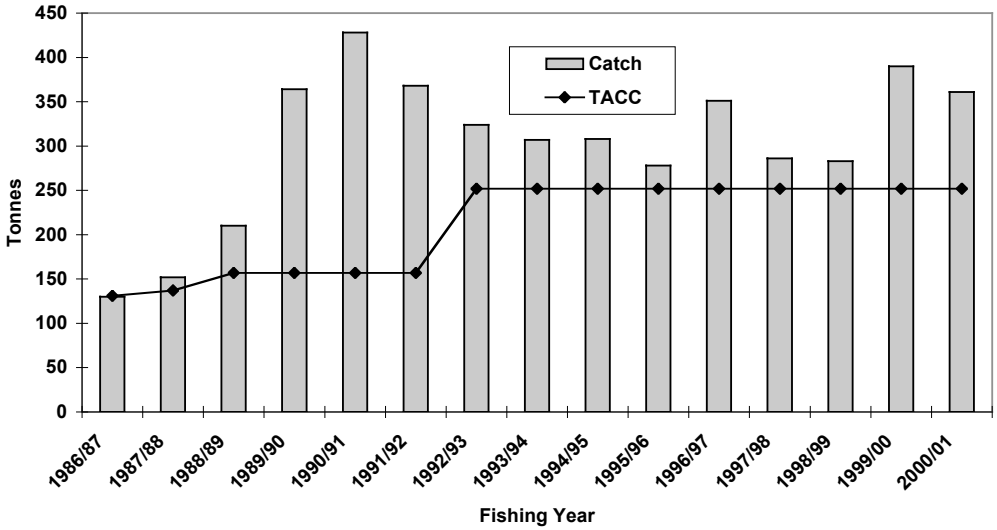

Figure 3. SNA2 Catch vs TACC

4. NEW CATCH BALANCING REGIME (2001–)

Under the new catch-balancing regime implemented in October 2001, ITQ remains the in-perpetuity right to receive a share of the TACC each year. At the start of each fishing year, the ITQ generates Annual Catch Entitlement (ACE) based on the share of the TACC. This ACE is allocated to the owner of the ITQ who can either use the ACE to cover catch of the relevant fish stock or sell it to other fishers. ACE is now the only currency for covering catch. There is no more leasing of ITQ or catching against another fisher's ITQ—only buying and selling of ACE. In most fisheries the only requirement before fishing is that a fisher hold a fishing permit. Commercial fishing without a permit is a serious criminal offence. Permit holders are required to obtain ACE to cover their catch or pay the appropriate Deemed Value. Most fishers obtain ACE before they go fishing; some obtain it after they have taken the catch. Both approaches are acceptable.

The new catch-balancing regime represents a major shift from a criminal offence-based regime to an administrative regime based on economic incentives. It is no longer a criminal offence to catch in excess of ACE and Deemed Values are now the primary deterrent to fishers taking catch they will not be able to cover with ACE. If Deemed Values are not paid, a fisher's permit is suspended and fishing without a valid permit is a criminal offence. In effect, there is now an administrative regime nested within a criminal offence regime. Penalties for criminal fishing offences in New Zealand are very high including forfeiture of vessel and quota, and even the possibility of a jail term. Accurate reporting of catch is critical for the successful operation of the system and, therefore, misreporting is also a criminal offence.

There is a 'backstop' mechanism available to restrict catching in excess of TACC in the event that high Deemed Values prove inadequate. If necessary, an overfishing threshold can be set for a fish stock. If a fisher's catch exceeds the ACE owned by the fisher by more than the overfishing threshold the fisher's permit is conditioned to exclude the fisher from the fishery. However, overfishing thresholds will likely be used only rarely in mixed species fisheries and Deemed Values are the primary deterrent to catching in excess of ACE.

With Deemed Values being the primary disincentive against overfishing, it is very important that they are set at an appropriate level. When setting Deemed Values each year there is no longer a requirement to balance the two objectives of discouraging targeting of fish for which no ACE is held and discouraging discarding. Instead, the primary objective is to provide an incentive for fishers to cover catch with ACE. A range of factors is still

considered when setting Deemed Values but the most important factor is whether the Deemed Value provides adequate incentive for fishers to cover catch with ACE. The new system has two separate Deemed Values; a refundable Interim Deemed Value paid at month-end, and a non-refundable Annual Deemed Value payable at year-end. The Interim Deemed Value is set at a lower rate than the Annual Deemed Value and is designed to remind fishers of the need to cover their catch with ACE by year-end.

A new feature of the Deemed Value setting mechanism gives fishery managers considerable flexibility to 'tune' the incentive structure to the particular circumstances of a fishery. Not only can managers adjust the basic deemed value rate, they can also adjust the rate at which it increases for increasing levels of catch in excess of ACE. Figure 4 shows the current default Annual Deemed Values regime applicable for most fish stocks. When a fisher's catch of a fish stock is less than or equal to the amount of ACE he or she owns, no Deemed Value is payable. For levels of catch in excess of ACE of up to 20%, the basic Annual Deemed Value for that fish stock is charged. For levels of catch in excess of ACE between 20% and 100%, the Annual Deemed Value is charged at an increasing proportion of the basic rate, until the catch is twice the ACE owned when the Deemed Value charged is twice the basic Annual Deemed Value. This is designed to remove any profit from catching this fish stock since even the basic Deemed Value is usually a significant proportion of the port price. The increasing level of disincentive for larger amounts of overcatch reflects the seriousness of greater levels of overcatch. Thus the regime provides flexibility to all fishing operations to cope with the unpredictability inherent in mixed-species fisheries but strong incentives for fishers to avoid fish for which no ACE can be obtained.

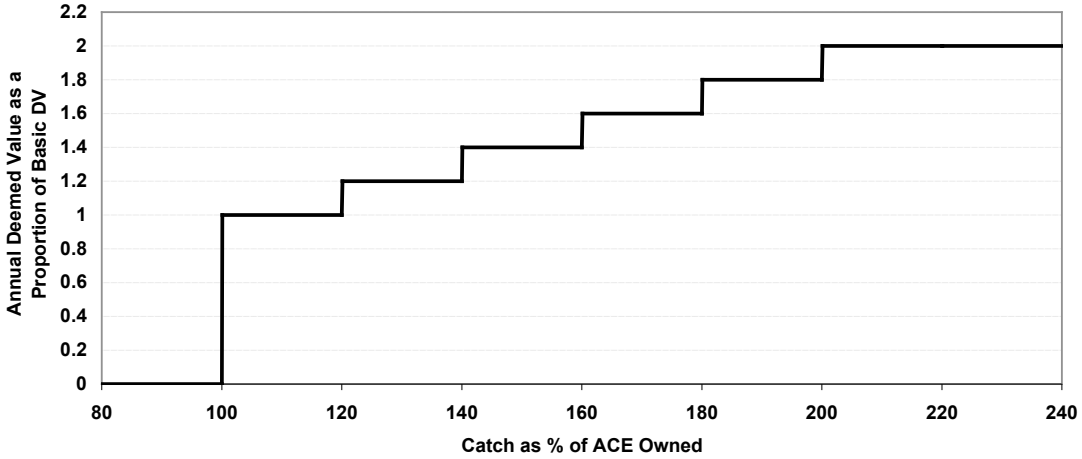

Figure 4. Graduated Deemed Values (Default)

The steepness of the increasing Annual Deemed Value rate can be adjusted on a stock-by-stock basis. Figure 5 shows a theoretical curve of Annual Deemed Value against levels of catch in excess of ACE. In this example there is a slower increase in Deemed Value and the Annual Deemed Value is 1.5 times the basic Deemed Value when the catch reaches twice the amount of ACE owned. Figure 6 shows a second theoretical curve of Annual Deemed Value against levels of catch in excess of ACE. In this example there is a very steep increase in deemed value. When the catch is twice the level of ACE owned, the Deemed Value is 5 times the basic deemed value. This might be required if the species that is being over-caught is a small bycatch in a larger, very profitable fishery. In such a situation, the Deemed Value paid in respect of the bycatch has to remove the profit from the whole fishing operation—not just the profits from the bycatch for which insufficient ACE is owned. The rate of increase in deemed values can be adjusted in any manner to suit the particular fishery.

5. INITIAL RESULTS

The new catch-balancing regime has only been in operation for 8 months but initial results are encouraging. There are anecdotal reports of fishers shifting to alternative fishing grounds to avoid catching species for which they have insufficient ACE. This is the sort of behavioural change the new regime was designed to achieve. There are reports of the price of ACE for some fish stocks increasing towards the Annual Deemed Value for that

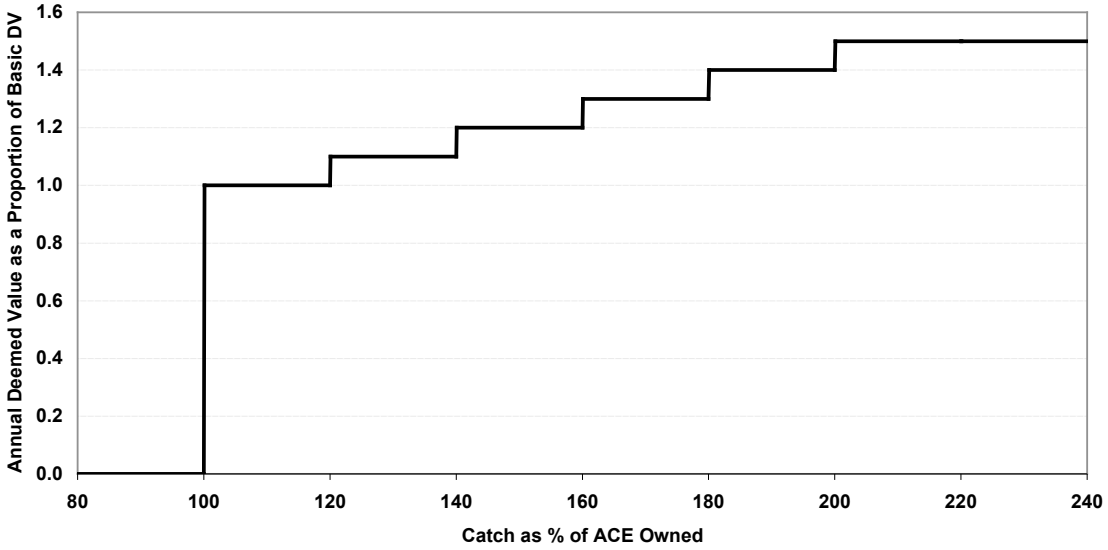

Figure 5. Graduated Deemed Values (Alternative 1)

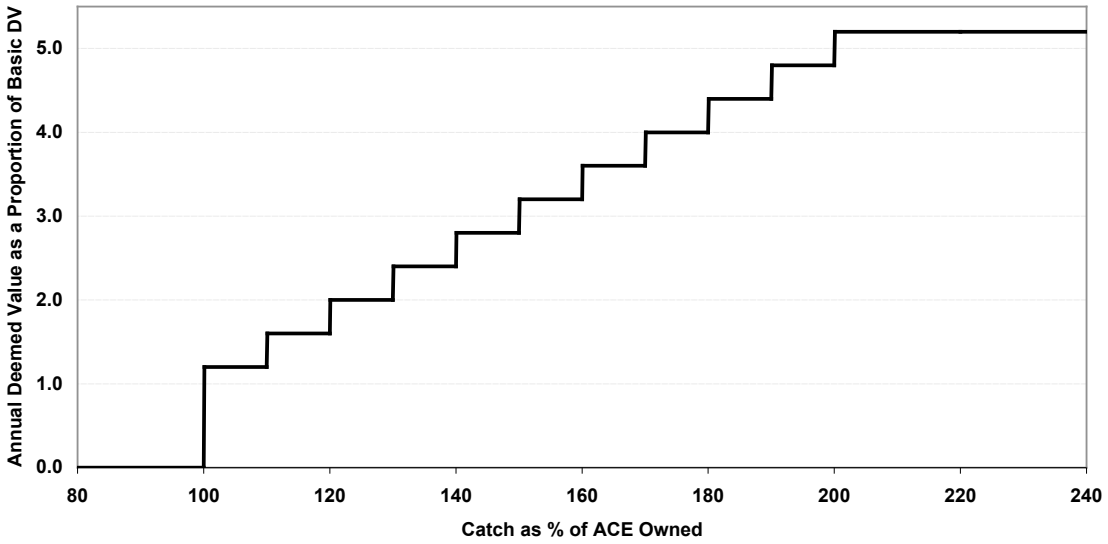

Figure 6. Graduated Deemed Values (Alternative 2)

fish stock. There is no evidence of increased discarding. However, the real test will come at the end of the fishing year when there will likely be a shortage of ACE for some fish stocks.

Although full-year results are unavailable, it is possible to compare monthly year-to-date catches for the current year and for previous years. Figure 7 shows the monthly year-to-date catches for SNA2—one of the fisheries in which there has been persistent overcatch. The graph shows the percentage of the TACC remaining uncaught at the end of each month. The continuous and dotted lines show the situation for 1999/2000 and 2000/2001—both under the old catch-balancing regime. In these years the TACC was fully caught by May (after 8 months of the fishing year) and was over-caught by around 50% by the end of the fishing year. The dashed line shows the same data for the current year. It shows that at the end of May there was still 27% of the TACC uncaught. The current trajectory indicates that the level of overcatch at the end of the fishing year will be considerably less than in the last two years. Assuming similar availability of fish in each of the three years, this would suggest that the new balancing regime is reducing the level of catch of fish stocks that have usually been over-caught. Hopefully this is as a result of changed fishing behaviour and not increased discarding.

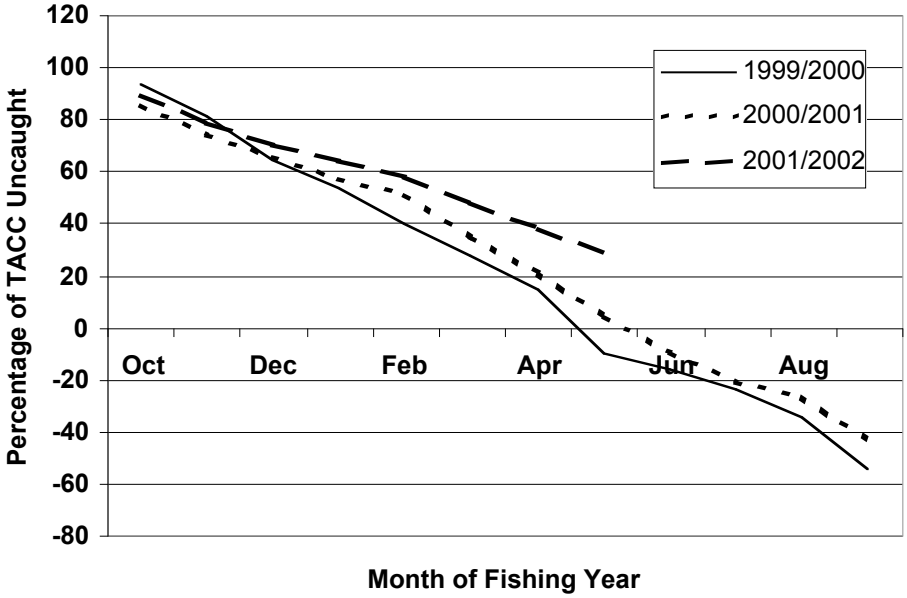

Figure 7. Within-Year SNA2 Catch

6. CONCLUSION AND FUTURE CHALLENGES

For more than a decade, New Zealand has used economic incentives to encourage fishers not to take fish for which they cannot obtain a catching right. The catch-balancing regime through which these economic incentives are applied has evolved over time and in 2001 was significantly changed. Initial results indicate that the new catch-balancing regime is having the intended effect of discouraging fishers from catching for fish for which they do not have, or are unlikely to obtain, a catching right.

The new catch-balancing regime, like any mechanism designed to encourage fishers to balance catch with catching rights, faces major challenges. In particular, increasing Deemed Values to discourage fishers from taking fish for which they do not obtain ACE also provides a greater incentive for them to discard fish. In New Zealand it is illegal to discard most species managed in the QMS. To ensure there is no increase in discarding, it may be necessary to deploy more observers and compliance personnel into high-risk fisheries. Within the new regime high-risk fisheries are likely to be those for which the Deemed Value exceeds the landed value of the species. It may also be necessary for compliance personnel to make greater use of catch profiling to identify instances of discarding where no observer was present.

The catch-balancing regime will be fully tested when shortages of ACE for one bycatch fish stock results in a multi-species fishery closing because high Deemed Value payments make fishing uneconomic. Some opposition from the fishing industry would be inevitable. However, the fishing industry already has experience with fishery closures based on sustainability concerns. One New Zealand fishery closes early most years when the bycatch of marine mammals exceeds a pre-determined limit. The new catch-balancing regime is designed to provide the capability to extend similar protection to fish species. Another challenge is to ensure that the TAC and TACC setting process can respond quickly to new information so that catch limits reflect the real state of each fish stock and utilisation of fish stocks can be maximised within sustainability constraints. For the moment, it appears that the new catch-balancing regime provides New Zealand with strong and flexible incentives with which to significantly improve the management of multi-species fisheries.

7. REFERENCES

Annala, J., New Zealand's ITQ system: have the first eight years been a success or failure? *Reviews in Fish Biology*, 6, 43–62, 1996.

Annala, J., K.J. Sullivan and A.J. Hore, Management of multispecies fisheries in New Zealand by individual transferable quotas, *ICES mar. Sci. Symp*, 193, 321–329, 1991.

Batstone, C.J. and B.M.H. Sharp, New Zealand's quota management system: the first ten years, *Marine Policy*, 23(2), 177–190, 1999.

Boyd, R.O. and C.M. Dewees, Putting theory into practice: Individual Transferable Quotas in New Zealand's Fisheries. *Society and Natural Resources*, 5, 179–198.

Copes, P., A critical review of the individual quota as a device in fisheries management. *Land Economics*, 62, 278–291, 1986.

Hersoug, B., Unfinished Business: New Zealand's experience with rights-based fisheries management, Eburon, Delft, 246 pp, 2002.

Squires, D., H. Campbell, S Cunningham, C. Dewees, R.Q. Grafton, S.F. Herrick Jr, J. Kirkley, S. Pascoe, K. Salvanes, B. Shallard, B. Turris and N. Vestergaard, Individual transferable quotas in multispecies fisheries, *Marine Policy*, 22(2), 135–159, 1998.