

## **2. Setting Catch Levels to Ensure Sustainability**

ITQ based systems, such as the QMS, can be used to ensure sustainable utilisation of fisheries resources through direct control of harvest levels. To ensure sustainable utilisation, regulators must determine the spatial scale that species are managed at (and how adjustments are made to these areas), the process for setting sustainable harvest levels, the allocation of catch between the different fishing sectors and the definition of quota. Each of these issues is central to the system and strongly influences its success in ensuring fish stock sustainability. Thus, understanding how these issues are addressed in the QMS is the foundation for understanding how the system operates. This chapter discusses how these issues are dealt with in the QMS and outlines changes that have occurred.

Before harvest levels can be identified, the management areas for each species must be selected, so this chapter begins with a discussion of the processes involved in identifying and altering management areas. Significant changes have occurred in this system. When the QMS was first implemented, management areas could not be altered, but now boundaries can be altered both with and without the approval of quota holders. A discussion of this evolution is followed by an examination of the theoretical basis for setting sustainable catch levels, the proxies required due to the imperfect information available on fish populations and the allocation of catch levels between sectors. This chapter concludes with a discussion of an exemption used for some species whereby a total allowable catch is set which does not meet the usual theoretical requirements.

### **2.1 Managing Multiple Biological Populations**

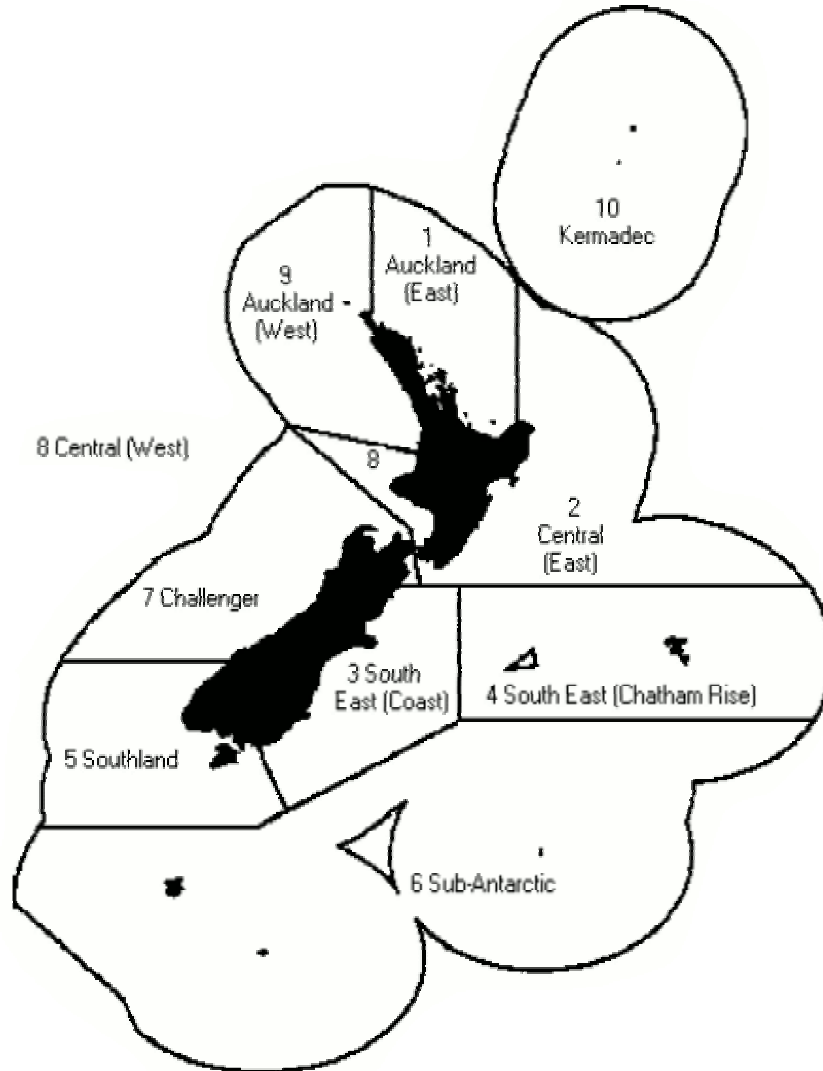
A fish species can consist of numerous geographically isolated and biologically distinct populations. This sometimes means that managing a particular species at a national level is not the optimal method. Thus, each fish species in the QMS is subdivided into separate fish stocks defined by Quota Management Areas (QMAs), each of which is managed independently to ensure sustainability of the stock.

QMAs are determined for each species based on the biological understanding of the stock distributions of the species at the time of its introduction in the QMS (Connor 2001a). The starting point for determining the QMA boundaries for each species are the 10 Fisheries Management Areas (FMAs) which define New Zealand's Exclusive Economic Zone (EEZ) (Fisheries Amendment Act 1986 S28B) (Figure 1). Due to the nature of fish populations, some QMAs incorporate multiple FMAs while others cover only part of a single FMA, leading to a varying number of QMAs per species. For example, some species, such as swordfish, have only a single QMA while others, such as paua, have eight.

By splitting fish stocks into smaller areas, it is possible to maintain more control over the population size thus ensuring that it approximates a stock level that can sustain the Maximum Sustainable Yield (MSY) (Batstone and Sharp 1999). But increasing the number of management areas also increases the costs associated with monitoring

enforcement and quota trading. So, the benefits of smaller management areas need to be considered alongside the increased costs.

Figure 1: Fisheries Management Areas (Source – New Zealand Ministry of Fisheries website<sup>1</sup>)



## 2.1.1 Alteration of QMAs

### 2.1.1.1 Fisheries Amendment Act 1986

Through time, knowledge regarding fish populations and the nature of their interactions may change. This may mean that the QMAs used to manage a species are no longer ideal. However, when the QMS was introduced with the Fisheries

<sup>1</sup> <http://www.fish.govt.nz/en/Publications/Ministerial+Briefing+04/Fisheries+Sector/Legislative+framework.htm>

Amendment Act 1986 there was no clear process set out in the legislation regarding the alteration of QMAs other than within Section 28C (2):

*“The Minister may ... specify separate total allowable catches for separately defined parts of any quota management area and may define total allowable catches by reference to methods of taking fish or the periods within which fish may be taken.”*

So the Minister was able to set different catch limits within a QMA, but was not able to alter the boundaries of the QMAs once they were set.

#### *2.1.1.2 Fisheries Act 1996*

The Fisheries Act 1996 changed this, giving the Governor-General (on recommendation of the Minister) the ability to amalgamate or split QMAs (Fisheries Act 1996 S25 (1)). Before making such a recommendation, the Minister would have to consider a number of factors including a stock's biological characteristics and non-commercial fishing interests and would have to consult with stakeholders. The proposed change also required the support of affected quota holders.<sup>2</sup> This support needed to be demonstrated through a public notification of their desire to have the boundaries altered and a written agreement supported by at least 75% of quota holders. This agreement would need to consider the proposed QMA boundaries, the species that comprised the stocks, quota share allocation in the new QMA and any other relevant matters.<sup>3</sup> Once the boundaries were altered, quota holders maintained all rights, obligations and liabilities that they held under the old QMA boundaries.

However, this system did not allow for changes in the QMAs when quota owners did not agree to an alteration. This could be important as the Minister may wish to alter the QMA boundaries based on a change in understanding, but quota owners maybe reluctant to agree if they feel that the change will alter the profitability of their business.

#### *2.1.1.3 Fisheries Act 1996 Amendment Act 1999*

The Fisheries Act 1996 Amendment Act 1999 allows the Minister to change QMA boundaries without the agreement of quota owners. This amendment allows two different methods for generating a change in the QMA boundaries. The Minister can still alter a QMA with the support of quota owners if he believes that the purpose of the Fisheries Act would be better achieved with the new boundaries, as he was able to do previously (S25A). However, if the Minister cannot obtain support of the quota owners, he can still recommend that the QMA is altered if he believes that the change is necessary to ensure the sustainability of the fish stock after considering all alternatives. To do this, he must approve a plan that outlines the new boundaries, the species involved and the allocation of the quota shares in the new QMAs and he must

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<sup>3</sup> If squid QMAs are involved then this agreement must also consider whether method restrictions should be in place in the new QMA(s).

publicly notify all persons on the Quota Register involved in the relevant QMAs of his intention.<sup>4</sup>

#### *2.1.1.4 Fisheries (Remedial Issues) Amendment Act 2001*

The Annual Catch Entitlement (ACE) was introduced into the system in 2001.<sup>5</sup> Thus, Section 6 of the Fisheries (Remedial Issues) Amendment Act 2001 was passed to ensure that ACE holders were kept informed of changes to QMA boundaries. Subsequent to this Act being passed, when the Minister proposed to alter the QMA boundaries without the agreement of quota owners, he was required to not only notify the quota owners, but also other parties holding ACE in the affected management areas. When the quota owners did provide an agreement to the Minister's proposal, they were required to inform parties who held ACE in the relevant QMA.

Despite the legislative power of the Minister to alter QMA boundaries, the provisions provided under Section 25 have never been used. Only once since the introduction of the QMS have QMA boundaries been altered and this occurred through a legislative change. The Fisheries Amendment Act 1995 subdivided a paua stock (PAU 5) into 3 separate QMAs (PAU 5A, PAU 5B and PAU 5D) through the introduction of Sections 28BB – 28BD into the 1983 Fisheries Act. Individuals who owned quota in the former stock received quota that was equivalent to a third of their PAU 5 quota holding in each of the three new stocks. In the four months following the amendment, individuals could purchase or lease less than 3 tonnes of quota despite the minimum trading restrictions in the QMS (See Section 3.6.2 for more details on trade restrictions). This allowed individuals to adjust their quota holdings in the new QMAs to match their requirements. After this four month period, holders of quota in these three areas could hold less than 3 tonnes and continue to participate in the industry, but any trades completed after this time were subject to minimum trading restrictions.

### **2.1.2 Multiple Species Stocks**

While most species in the QMS are managed independently, sometimes groups of species are considered together. These groups tend to be either groups of similar species or species that are often caught together, so they are combined in the system for administrative ease (Clement and Associates 2003). For example, two species of arrow squid (*Nototodarus gouldi* and *N. sloanii*) are considered as a single species group in the QMS due to their similarity. Other species that are often caught together such as Flatfish (which comprises eight species) are also managed together for simplicity (Sullivan *et al.* 2005). Therefore, a 'stock' in the QMS may include one or more species within a defined area (the QMA).

## **2.2 Maximum Sustainable Yield (MSY)**

In the QMS, the Minister of Fisheries is responsible for ensuring that fish stocks are maintained at or above a level that can produce the MSY (S13 of the 1996 Fisheries

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<sup>4</sup> If the plan is considering squid quota, the Minister must also consider whether method restrictions should apply.

<sup>5</sup> See Section 3.2.3 for more information on ACE and its introduction.

Act and 28D of the amended 1983 Fisheries Act).<sup>6</sup> This means that controls must be set so that the biomass level can support the maximum sustainable yield (BMSY). This provides the conditions to maximise the yield of the fishery without compromising sustainability. Once MSY is identified, the total allowable catch (TAC) of a species for a given year can be determined (see Section 2.4 for more details).

Although the concept of MSY is both theoretically and intuitively simple, in practice it is difficult to use MSY to determine the optimal total catch. Given the current low levels of understanding of fish population dynamics and information regarding specific species, it is very difficult to identify the true value of BMSY or MSY for any population. Therefore, it is necessary to use other measures as proxies for MSY. Two reference points are being used in New Zealand's QMS: a static measure (Maximum Constant Yield); and a dynamic measure (Current Annual Yield) (Sullivan *et al.* 2005).

### **2.2.1 Maximum Constant Yield (MCY)**

The maximum constant yield (MCY) defines a constant catch level that is estimated to be sustainable, with an acceptable level of risk, at all probable future levels of biomass (Sullivan *et al.* 2005). Thus, this catch level should be able to be harvested each year without depleting the fish stock (Newell 2004). Since this figure is constant by definition, when the fish stock decreases, the proportion of the stock that is removed through fishing actually increases. Therefore, the estimates of the MCY must be set sufficiently low to ensure that the future viability of the population is not compromised, particularly in times of low abundance (Sullivan *et al.* 2005). So while the MCY provides a static measure of MSY, it is also one that varies annually as a proportion of the fishable biomass.

### **2.2.2 Current Annual Yield (CAY)**

Fish populations naturally vary from year to year due to a number of factors including interspecies interactions and changes in the environment, as well as human fishing pressure (Bjørnstad *et al.* 1999). Thus, to get the maximum sustainable yield from a fishery, it may be necessary to alter the total allowable catch each year to incorporate these fluctuations in population size (Sullivan *et al.* 2005). The current annual yield (CAY) is calculated yearly and it incorporates these fluctuations by applying a fixed reference level of fish mortality to the current fishable biomass (Newell 2004). So the CAY will provide a time varying estimate of the MSY, but will remain a constant proportion of the fish population (Sullivan *et al.* 2004).

## **2.3 Estimation of MSY**

For each stock, estimates of MCY and CAY are reported, where possible, in the annual report from the Fishery Assessment Plenary (e.g. Sullivan *et al.* 2005). The Plenary Reports are produced each year following meetings of each of the 14

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<sup>6</sup> MSY is defined in the 1996 Fisheries Act as “the greatest yield that can be achieved over time while maintaining the stock’s productive capacity, having regard to the population dynamics of the stock and any environmental factors that influence the stock”.

Fisheries Assessment Working Groups. Each of these groups covers different issues and species within the QMS and is made up of Ministry of Fisheries staff, science providers and representatives of stakeholder groups (see Sullivan *et al.* 2005 or any of the earlier reports for more details).

The bulk of the Plenary Report contains a report on most of the species managed under the QMS and key non-QMS species. These reports contain information on the fishing activity, biology and stocks and areas including any new data available on the species. Stock assessment is also included which provides estimates of the biomass, MCY and CAY where possible. Based on the stock assessment, the working groups put forward a recommendation on the status of the stocks which suggests whether the current harvest yield is sustainable or could be increased or decreased. This recommendation gives the Minister insight into whether the harvest is currently moving the stock to a level above, below or approximately at the BMSY. The amount of information that is available on each species determines the size of the species summary report in the Plenary Report and also the accuracy of the estimates of MCY and CAY.

## **2.4 Total Allowable Catch**

Using the estimates given in the Plenary Report regarding the MSY, various other sources of information, and an assessment of risk, the Minister determines how much of the fish stock should be harvested in a given year, or the total allowable catch (TAC).<sup>7</sup> The Minister is required to set the TAC at a level which ensures that the fish stock will remain at a stock size that is able to sustain the MSY or will allow the stock to move towards this size (S13 of the FA96).<sup>8</sup> This level of catch considers the total harvest from commercial, recreational and customary fishing. Thus, while the Plenary Report provides guidance to the Minister, recommendations are not necessarily followed through and most TACs remain constant from year to year (Sanchirico *et al.* 2006). Some species may have the same recommendation in the plenary report for a number of years before changes are made. In other species, there may be either no new science suggesting alteration of the TAC or no new science available.

## **2.5 Total Allowable Commercial Catch (TACC)**

Before any commercial fishing can take place, the Minister must identify the share of the TAC that can be harvested commercially -- the total allowable commercial catch (TACC) -- for each QMA and quota stock. The Minister must set this limit with regard to the level of non-commercial fishing, including both customary and recreational fishing (Fisheries Amendment Act 1986 S10 and Fisheries Act 1996 Ss20 21). Under current policy, when the Minister is allocating catch levels between fishing sectors he must first identify the allowance of customary catch. This allowance must

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<sup>7</sup> While the Plenary Report provides guidance to the Minister, recommendations are not necessarily followed through and most TACs remain constant from year to year (Sanchirico *et al.* 2006). Some species may have the same recommendation in the plenary report for a number of years before changes are made.

<sup>8</sup> However, species listed in the Third Schedule are an exception to this (See Section 2.6 for more details).

be sufficient to satisfy all customary requirements so that it does not constrain the level of customary catch. Once the customary allowance is identified, the remainder of the TAC can then be allocated to the commercial sector, as the TACC, and the recreational sector. The allocation of catch between these two sectors is made by the Minister at his discretion. Neither of these sectors has priority in the legislation; the decision on the allowance for each sector is considered simultaneously.<sup>9</sup>

When the QMS was first introduced with the passing of the Fisheries Amendment Act 1986 there was no requirement for the Minister to report a total allowable catch, as it is known now. Instead, the Minister was only required to report the total allowable commercial catch, which was deemed the TAC in the 1983 Act.

Subsequent to the introduction of the Fisheries Act 1996, the Minister had further requirements placed upon him before making a decision regarding the level of the TACC. This Act restricts the Minister to setting the TACC after the TAC and to ensuring that the TACC does not exceed the TAC (S20). He must also consider the level of stock mortality that the fishing itself is causing and must consult with individuals and organisations that have an interest in the level of the TACC (S10).

Once the TACC is set for the year, fishing rights are distributed to quota owners through the QMS (See Section 3.2 for more detail).

## **2.6 Alternative TACs for species on the Third Schedule**

Section 14 of the Fisheries Act 1996 allows the Minister to set alternative TACs for the sixteen species listed in the Third Schedule. As outlined above in Section 2.4, under Section 13 of the Fisheries Act 1996, the Minister is required to set a TAC which moves the population toward, or maintains the population at, a level that can support the MSY. However, for species listed in the Third Schedule, the Minister is able to set a TAC at a level that does not fit these requirements as long as he considers that the purpose of the Act will be better served with an alternative TAC.

Species are included in the Third Schedule if it is not possible to estimate the MSY, if a national allocation for New Zealand has been set through international agreements or if the stock is managed on a rotational or enhanced basis (e.g. scallops). In 2004, this was expanded to allow the addition of stocks that contain one or more highly migratory species (Fisheries Amendment Act (No. 3) 2004). Some of these species are covered under the Third Schedule for only some of their QMAs (e.g. Green-lipped mussels) while other species are covered for all of their QMAs (e.g. Blue shark). Only the Governor-General, by Order of the Council, is able to add or remove species from the Third Schedule if they fit the requirements listed above.

Further changes were made to this section of the Act with the passing of the Fisheries Act 1996 Amendment Act 1999 which added Sections 14A and 14B to the legislation. These sections allow some stocks in a multispecies fishery to be fished to a level below the level required to support the MSY if this would increase the value

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<sup>9</sup> See Chapter 5 for more information on the interaction between recreational and commercial fishing sectors including a discussion of the issues relating to allocation of catch between these two sectors.

generated by the group of stocks. Following a proposal by quota holders and a recommendation by the Fisheries Minister and the Minister responsible for the Environment Act 1986, the Governor-General can apply section 14B to the quota management stocks listed in the Third Schedule. Under this section, the Minister must set a TAC that will maintain the stock above a level which will ensure the long-term viability of the population. In doing this, the Minister must be satisfied that quota owners have taken, and will continue to take, all reasonable steps to minimise the take of the stock (e.g. modifying fishing methods and areas). To use this section, 95% of the quota holders must support the proposal. To date, this section of the Act has never been used.