

# NEW ZEALAND'S COMMERCIAL FISHING INDUSTRY: TOO MANY FISH IN THE SEA?

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*We are seeing the birth of a new perspective of the world, where ecology and economics are two sides of the same coin.*

— *Leif Johansson*

## **Introduction**

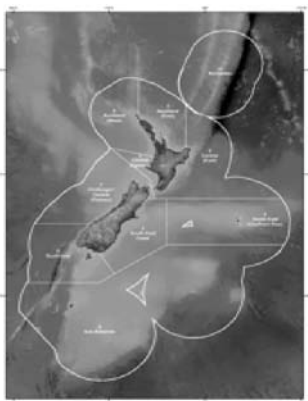
With the threat of global warming and the rapid consumption of the world's finite oil supply, sustainability has become a pressing global concern. Many people are beginning to more fully understand the imminent consequences of the steady degradation of our planet. Though many countries have begun addressing this glaring problem, New Zealand has in many ways emerged as a forerunner in sustainability. With regulatory policies addressing a range of problems, including renewable energy, CO<sub>2</sub> emissions, and (as I will discuss further in this article) the fishing industry, New Zealand has pioneered the global adoption of sustainable practices.

Like many other countries, New Zealand has experienced a steady decline of its fish stocks in the absence of fishing regulations; however, with the establishment of several key laws in the past twenty years, many of its previously failing fish populations are now back at sustainable levels. In this article I will detail several of the key problems plaguing the global fishing industry and the challenges to solve them. I will then explain New Zealand's solution to the problems in its fishing industry and present the implications for both the commercial and Maori fishing sectors. Finally, I will comment on the weaknesses of the current solution and outline several key issues that must be addressed in the next several years to ensure that New Zealand's fish stocks remain sustainable well into the future.

## Common Problems with Fisheries<sup>1</sup>

New Zealand has more than 300 wild marine fisheries in its coastal waters, accounting for approximately 80 percent of its total fisheries. These fisheries are all contained within New Zealand's Exclusive Economic Zone (EEZ)<sup>2</sup>, which represents approximately 4.4 million square kilometers of internationally exclusive fishing rights. (Seafood Industry Council, "Industry . . .") As shown in Figure 1, New Zealand's EEZ is far larger than its land mass. While New Zealand's EEZ is an extremely valuable asset, using this resource effectively requires a full understanding of the core issues involved.

**Figure 1. New Zealand's EEZ**



Source: Seafood Industry Council. "Management and Sustainability."

### The Tragedy of the Commons

Prior to New Zealand's recently enacted fishing regulations, the country's fishing industry had become a prime example of a classic economic problem: the tragedy of the commons. As defined by Hardin, the tragedy of the commons describes a situation in which multiple individuals acting independently in their own

self-interest can ultimately destroy a shared resource even though it is not in anyone's long term interest to do so. (Hardin, p. 1243)

This concept is overtly apparent in New Zealand's EEZ. In the past, ocean life had been assumed to be limitless and inexhaustible; it was unfathomable to think that humans could ever harvest fish into extinction. However, with the new technology and techniques available to today's fishermen, this concept is no longer farfetched. Without any incentive to preserve the fisheries, fishermen, acting in their own self-interest, will exhaust the resource. This phenomenon, commonly referred to as overfishing, has very much become a global problem.

### Overfishing

As the term implies, overfishing is the reduction of fish stocks below a sustainable level. Though it is a relatively simple concept, there are many different ways to define what a sustainable level is. The concept, however, is most easily understood in purely biological terms. Biological overfishing occurs when the fishing mortality rate reaches a level where the fish stocks have a negative marginal growth. (Nationmaster)

As stated above, overfishing has become a global issue. According to *Science*, about one-third of all species are currently collapsed.<sup>3</sup> While the current state of fisheries is problematic, the bigger threat to these fisheries is the increasing trend of overfishing. Leading scientists in the field predict that, given the recent trends, every species of fish will collapse by 2048. (Bio-Medicine)

In past years, overfishing has hit New Zealand fisheries particularly hard. For instance, between 1980 and 1990, orange roughy fish stocks decreased from 400,000 tons to about 150,000 tons. (Francis and Hilborn, p. 6) Rapid decreases in fish stocks, such as that of the orange roughy, not only involve the dying species, but can also disrupt some of the more delicate aquatic ecosystems in the New Zealand EEZ.

<sup>1</sup>A fishery is a body of water associated with an aquatic species that is harvested, such as an oyster fishery. This definition, and other general definitions pertaining to fisheries, are taken from the *Louisiana Sea Grant College Program*.

<sup>2</sup>An EEZ is the body of water extending 200 nautical miles from the coast of a given country within which exclusive fishing rights exist.

<sup>3</sup>A collapsed species is one that has experienced a 90 percent decline in the total undisturbed catch. The undisturbed catch is an approximation of the stock in the absence of fishing. (Bio-Medicine)

## New Zealand's Commercial Fishing Industry

The overfishing of NZ fish stocks presents a difficult situation in which some of the most marketable fish must be caught sparingly. Though promoting physical sustainability of the wild fisheries is important, the New Zealand government must also allow its fishing companies to compete globally while preserving an equitable fishing system. Weighing these issues, New Zealand has developed a system called the Quota Management System (QMS) that serves as the backbone for fishing regulations in its waters.

### The Quota Management System: A History

The QMS has had a complicated history in New Zealand. First introduced in the Fisheries Act of 1986, the QMS began from the following clause:

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. (Maori Act)

Though very general, this document established the foundation of a quota-based system of regulation in New Zealand fisheries. Unfortunately, the clause above did not mention any way for the Minister of Fisheries to change the quota once it was set. The inability to change the different fishing quotas made the system unusable for the first ten years it was in place. However, with the Fisheries Act of 1996, the Governor-General<sup>4</sup> was given the power to change the quotas in the different Quota Management Areas (QMA) if recommended by the Minister of Fisheries. While there were several future amendments to clarify the Fisheries Act of 1996, this new clause made the QMS much more flexible and allowed the Minister to use the QMS to effectively begin regulating fisheries in New Zealand. (Lock and Leslie, p. 5)

## The Concept of the QMS

The quota for each species of fish represents the Total Allowable Catch (TAC), which is the maximum tonnage of a specific species of fish that may be caught in a given year. Each TAC, which is set by the Minister of Fisheries, is calculated using mathematical models of fish populations over time. These models use stochastic methods<sup>5</sup> and consider a wide range of parameters, such as natural mortality rates, spawning rates, exploitation rates (rates at which fish die due to fishing), and the age structure of the species. (Starfish . . .) Once the TACs for all the species under the QMS are calculated, each TAC is then broken down further into three parts: the Total Allowable Commercial Catch (TACC), the Maori quota, and a recreational fishing allowance. (Lock and Leslie, pp. 32–33)

The QMS is best explained by analyzing the mainstream commercial fishing companies and the TACC. Among the three different types of quota, which vary depending on the year and the species of fish, the TACC typically represents about 75 percent of the total TAC. Once the TACC is established for the year, the value of the Individual Transferable Quotas (ITQ) and the Annual Catch Entitlements (ACE) are determined. An ITQ is effectively the individual right of the owner<sup>6</sup> to fish a percentage of the TACC in perpetuity. The ITQ, however, is not the direct right to catch a specific tonnage of fish. The direct quota instrument, the Annual Catch Entitlement (ACE), gives the owner the right to catch a specified tonnage of fish for one year at a given TACC. To explain further, the ITQ itself does not grant the right to catch a designated amount of fish; rather, every year it generates an ACE for the owner that he or she can either use or sell. Therefore, the ITQ, which generates a new ACE every year in perpetuity, essentially represents the right to fish a percentage of the TACC for a given species of fish forever. (Lock and Leslie, pp. 17–18) For exam-

<sup>5</sup>Different than deterministic methods, stochastic methods are a class of statistical processes that include uncertainty.

<sup>6</sup>ITQs and ACEs are typically owned by fishing companies; however, as will be discussed later in the article, other entities, such as individuals or tribes, can also own these fishing rights.

<sup>4</sup>The Governor-General acts as the Head of State for NZ.

ple, if a fisherman owns an ITQ representing 8 percent of the TACC for cod and the TACC for the year is 10,000 tons for cod, the ITQ generates an ACE for the owner representing a quota of 800 tons of cod for that year. If in the following year the TACC changes to 11,000 tons of cod, the fisherman's ITQ will again generate an ACE; however, the ACE generated in the following year will represent 880 tons of cod.

In addition to using the ITQs and ACEs to catch fish, a company can choose to buy, sell, or lease these instruments on the open market. In fact, there is currently a very large market for ITQs and ACEs in New Zealand. The value of an ACE can be calculated by assuming a market price for the given species and deducting the cost of catching and processing the fish. The assumption of a market price allows people to invest short term in different species of fish. For instance, if an investor believes that the market price of rock lobster is going to rise, the investor can buy an ACE while the price is still low and sell it once the price has risen. Though much more speculative, ITQs can be valued in a similar way. By speculating on the future TACCs and the future market price for a given species of fish, one can calculate the present value of the yearly ACEs and determine the value of an ITQ. (Lock and Leslie, pp. 20–22) In effect, the ITQs are very similar to financial perpetuities<sup>7</sup> except, instead of the value changing with interest rates, the value changes with the year-to-year TACCs and the changing value of the species. (Neher et al., pp. 147–48)

The distinction between the ITQ and the ACE has two major advantages. First, by distinguishing between the two, fishing companies are able to make shorter term investments in certain species of fish by purchasing an ACE as opposed to the long term investment of purchasing an ITQ. Second, this provides a way for fishermen who have overfished or underfished their own ACE to buy or sell an additional fishing allowance just for that one year. Since it is difficult to know exactly how many fish are on board while at sea, fisher-

men often accidentally overfish their own ACE in a given year. To avoid paying heavy fees for overfishing, a company can buy an additional ACE from other companies to cover the additional fish it caught. The separation of the ITQ and the ACE, then, allows both the market and the industry to function more efficiently (Organisation . . . , pp. 5–8).

### **Regulation of New Zealand Fisheries**

This somewhat complex quota system hinges upon a reliable method of regulation. In theory, the QMS provides an ideal system in which the Minister of Fisheries, with the help of New Zealand biologists and fishing experts, can directly control the tonnage of each species of fish caught in a given year. The success of the system, however, depends on a reliable means of enforcement. New Zealand currently has a dock surveillance and tracking system in place that allows the government to keep track of the tonnage of fish caught by New Zealand fishermen.

In addition to surveillance, another major challenge lies in developing a way to solve what is known as the “Catch-Balancing Regime.” (Newell, p. 43) The Catch-Balancing Regime involves setting ideal rates for overfishing fees. In New Zealand, these rates are commonly referred to as “deemed values.” The primary function of deemed values is to remove the incentive of fishermen to catch different species of fish without the required ACE. Since the incentive itself is driven by the economic benefit fishermen get by overfishing highly valued fish, the best solution is to directly remove that economic benefit. While quota suspensions, fishing bans, and criminal penalties do sometimes occur, the primary method of regulating deliberate overfishing is through deemed values. Deemed values, however, must be set so that fishermen who accidentally catch too many fish do not just throw the excess fish back overboard. This undesired catch, which can be either excess fish or non-target fish, is commonly referred to as the “by-catch.” The by-catch often dies in the catching process, and, if still alive when thrown back into the sea, is usually far away from its original habitat. Deemed values must be set at precisely the right levels as to discourage both overfishing and discarding of the by-catch. (Newell, pp. 44–45)

<sup>7</sup>A financial perpetuity, though rarely used in practice, is a never-ending annual stream of fixed cash payments. The present value of this financial instrument can be calculated by dividing the annual payment by the current risk-free interest rate.

**Table 1**  
**Classification of NZ's Fish**

Category	Definition
High-value, single-species fisheries stocks	High value (port price and ACE value); taken primarily with little by-catch
Low-knowledge stocks	Stocks with relatively little information on the fishery status; no sustainability concerns
Low/medium-value by-catch stocks	Low/medium value; majority of the catch taken as by-catch; TAC to be reviewed in the next few years; no sustainability concerns
All other (most) stocks	Stocks that do not necessarily have a high unit value and for which there is adequate information for the Ministry of Fisheries to have confidence in the TACC

Source: Newell, p. 56.

As stated above, deemed values are adjusted overfishing rates; the name “deemed values” comes from the way in which the rates are adjusted. In order to effectively discourage both overfishing and discarding of the by-catch, deemed values are dependent on many different criteria, including the tonnage of overfishing as a percentage of the fisherman’s ACE, the value of the species, the amount of information available on the fishery status, and the typical level of by-catch associated with the species. As shown in Table 1, fish species are classified into one of the four categories based on the above criteria.

These four main categories establish the base of the deemed value structure. The high-value stocks have the most stringent regulations: overfishing fees start around twice the current market price and increase rapidly with the quantity of overfishing. Since the high-valued species are the most consistently exploited, the fees and regulations ensure that overfishing these stocks is in no way economically beneficial to the fishermen. On the other hand, the low-knowledge and low/medium-value stocks have very light regulations. Since there is little indication that these species of fish are endangered and their value is typically low, overfishing of these stocks does not pose as serious a threat in comparison to the high-valued stocks. Consequently, these deemed values are more intended to discourage discarding of by-catch and are, on aver-

age, about 50 percent of the market price of the fish. All other species of fish fall in between these three main categories. Since regulations of these stocks must discourage both overfishing and discarding of the by-catch, setting economically efficient deemed values is difficult. Through rigorous economic analysis, deemed values are typically 75 percent of the port price and increase moderately with quantity of overfishing. (Newell, pp. 55–58)

### **Traditional Maori Fisheries**

As stated above, each year the TAC is broken down into the TACC, the recreational quota, and the Maori quota. The Maori quota represents the percentage of total TAC for all species that is allocated to Maori tribes (*iwi*) through the transfer of ITQs. The complexity of the QMS, however, makes direct ownership of ITQs by certain *iwi*, who may not have the capacity to efficiently harvest a quota, economically detrimental to the entire New Zealand fishing industry.

### **The Evolving Maori Quota**

The Maori quota, which was established in 1840, was by no means a quota in the general sense of the word. According to the Treaty of Waitangi, Maori were given “the full, exclusive, and undisturbed possession of their . . . fish-

eries and other possessions.” (History Group . . .) As New Zealand evolved, *pakehas* (people of European descent) began seeking fishing rights of their own. The first violation of the original Maori quota occurred with the Fisheries Act of 1983, which required all NZ fishermen to own fishing permits. These permits were given to any fisherman who made at least \$10,000 per year fishing, or whose income was at least 80 percent dependent on fishing. (Lock and Leslie, pp. 12–13) Many Maori, who made their living fishing for their individual tribes, were denied fishing permits and left without work. Three years later (1986) the QMS was first introduced, and the initial quota was allocated to fishermen based upon the amount of fish caught in previous years. Since few Maori had fishing permits, the majority missed out on the first allocation of ITQs. The next several years included many investigations, dialogues, and negotiations between Maori organizations and the government. Though there were some intermediate treaties, Maori fishing rights were to an extent restored in 1992 with the Treaty of Waitangi (Fisheries Claims) Settlement Act. This act settled all prior claims to Maori fishing rights, released the government from obligations detailed in the Treaty of Waitangi in regard to Maori fishing, and redefined Maori fishing rights for the future. In return, the Maori were given financial help from the government to buy Sealord Products LTD, which owned 25 percent of all fishing quotas at the time. They were also given 20 percent of the total fishing quota for any new species introduced into the QMS. These assets were transferred to the reformed Maori Fisheries Commission, renamed Te Ohu Kai Moana. The settlement of traditional and commercial Maori claims allowed the government to develop the QMS, which was fully implemented four years later in the Fisheries Act of 1996. (Day, pp. 1–3)

### **The Maori Fisheries Act of 2004**

The Treaty of Waitangi Settlement Act clearly defined Maori fishing rights for the future. The issue was no longer a lack of fishing rights and quotas, but that there was no way of effectively managing and distributing the collective Maori quota to the individual *iwi*. Problems included preserving their new fishing

rights, educating *iwi* about effectively using their quotas, commercially managing the value of the entire Maori quota in the new complex QMS, and ensuring that the solutions to these problems had the *iwi*'s best interests at heart. Up until the Maori Fisheries Act of 2004, the only organization that managed these problems was Te Ohu Kai Moana, the commission established after the Settlement Act in 1992. The Maori Fisheries Act of 2004 established four new organizations (as will be discussed below), each with a specialized purpose, but all of which fought for the rights and progress of the *iwi*. (“The Maori Act . . .”)

### **Te Ohu Kaimoana<sup>8</sup> and Its Structure**

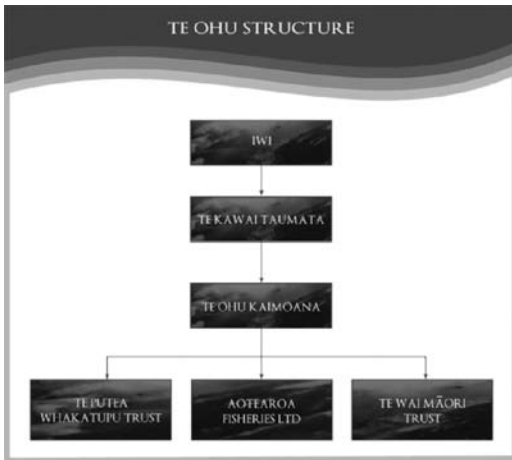
The Maori Fisheries Act of 2004, though containing a detailed list of duties and goals for each organization, created a very general structure of governance for the Maori fishing rights, as shown in Figure 2. Te Ohu Kaimoana (Te Ohu) is no longer responsible for all aspects of Maori fishing rights, but currently serves as the main governing body. Te Ohu is responsible for giving direction to the organizations below it and ensuring the *iwi* are getting the help they need to effectively use their resources. Te Kawai Taumata is the liaison between the *iwi* themselves and Te Ohu. Te Kawai Taumata is an electoral college with 11 representatives elected by the chiefs of the *iwi* and is solely responsible for appointing and removing directors of Te Ohu. (Te Ohu Kaimoana)

There are three main organizations below Te Ohu that perform specialized tasks. The first two, Te Wai Maori Trust and Te Putea Whakatupu Trust, are focused on educating the Maori on different aspects of the fishing industry. Te Wai Maori Trust is responsible for managing the trust fund to advance Maori interests in freshwater fisheries; this includes “research and education related to Maori interests in freshwater fishing, protection and enhancement of freshwater fisheries traditionally supported by the *iwi*, and promoting the establishment of new freshwater fisheries.” (Te Wai Maori, p. 6) Similarly, Te Putea

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<sup>8</sup>Note that Te Ohu Kaimoana, though spelled slightly differently, is the same organization as Te Ohu Kai Moana.

**Figure 2. Structure of Te Ohu**



Source: Te Ohu Kaimoana.

Whakatapu Trust is responsible for educating the Maori on the fishing industry, but focuses on creating Maori leaders within the fishing industry through different leadership programs and educational opportunities. (Te Putea Whakatapu) As compared to Te Wai Maori, which focuses on developing the resource, Te Putea Whakatapu focuses on developing the people.

In addition to these two Maori development organizations, Aotearoa Fisheries LTD (Aotearoa) is responsible for maximizing the value of the Maori quota. Aotearoa is actively involved in the QMS and provides the financial and economic support for Te Ohu. Currently, Aotearoa owns 50 percent of Sealord and Prepared Foods Ltd, and 100 percent of Moana Pacific Fisheries, Chatham Processing, Pacific Marine Farms, and Prepared Foods Processing. (Aotearoa . . .)

### ***Iwi* Registration**

Though the Maori have rightfully regained their fishing rights, many *iwi* are still not ready to receive their assets; economic quota ownership requires substantial knowledge of the QMS, adequate fishing equipment, and refined fishing processes. As a result, Te Ohu has created an exhaustive registration process that all *iwi* must complete that verifies the tribe is prepared on all levels to receive a portion of the Maori quota. *Iwi* that do not meet

all requirements receive help from Te Ohu and other support organizations. These organizations ensure that *iwi* seeking fishing rights are willing to work toward preparing their tribe to effectively use the assets. (Nga Iwi . . .)

In summary, the Maori Fisheries Act of 2004 and the movement from one organization, Te Ohu Kai Moana, to a system of well-aligned organizations, each with very specific and defined goals, allow for a more targeted approach to Maori development in the fishing industry. By implementing a stringent registration process and a strong support system, the Maori are in a position to effectively use the resources allocated by the Treaty of Waitangi Settlement Act.

## **The Future of New Zealand's Fisheries**

From an economic perspective, the QMS is an extremely effective means of fishery regulation. Heavy overfishing fees ensure that fishermen obtain ACEs, which are bought and sold in an open market, for all of their catches. The QMS maximizes economic value while ensuring that each fishery sustains itself. There are, however, several major problems that continue to plague the QMS and its implementation in New Zealand.

### **Poaching and Dumping**

As mentioned above, illegal fishing and dumping (throwing fish back overboard to avoid overfishing penalties) are two of the biggest threats to the sustainability of fisheries all over the world. This is especially true under the QMS. According to Ministry of Fisheries executives, "Dumping of QMS species is viewed . . . as possibly the greatest threat to the integrity of the QMS system." ("QMS Open . . .") Furthermore, Jim Anderton, the Minister of Fisheries, continues to express his "disgust" with the level of poaching in New Zealand waters. According to the Ministry of Fisheries, "Nearly three hundred tons of paua<sup>9</sup> are taken illegally . . . every year." (Anderton, p. 6)

<sup>9</sup>Paua is a very valuable shellfish that is harvested for its meat (abalone) and its colorful shell.

The TAC, which represents the total sustainable yield for a given year, is completely allocated to commercial, Maori, and recreational fishers. Any unaccounted increase in total catch or fishing mortality rates results in an unsustainable total catch for a given fishery. Illegal fishing creates a scenario where unknown amounts of fish are caught without the knowledge of the NZ government; and over time the fishery stock experiences net negative growth. Similarly, the dumping of fish in excess of a given fisherman's ACE introduces unaccounted fishing mortality. Fishery officers measure a fisherman's catch by the amount landed (the tonnage of fish unloaded at a dock). Should a fisherman discard a portion of his catch at sea, the discarded fish, which almost always die in the catching process, represent an unaccounted increase in fishing mortality. (Newell, p. 19) In essence, this is worse than simple over-fishing because the increase in fish mortality is unknown and the dead fish are thrown away and not harvested. These unknown variables make efficient and sustainable fishery management nearly impossible.

### **The TAC and the Harvest Strategy Standard**

Differences between the TAC and the actual total catch are often magnified due to the manner in which the TAC is calculated. The QMS attempts to provide sound biological regulation of fisheries while ensuring that the industry remains economically efficient. The TAC, therefore, is not set to maximize the stock of each fishery, but instead to maximize the sustainable tonnage of fish that can be caught in a given year. In fact, fishery experts in New Zealand have found that due to factors such as food availability and egg survival, the maximum sustainable yield (MSY) is typically 40 percent of the undisturbed fish population. (Ministry of Fisheries, p. 4) The TAC is then set so that the total catch corresponds with the MSY.

On October 31, 2008, the Ministry of Fisheries announced the Harvest Strategy Standard, which constitutes the formal process of setting the TAC and determining whether different fisheries are healthy, failing, or nearing extinction. Though the statistical theory behind this process is very complex, the classification of

fishery health is based on the MSY: fisheries that remain at the MSY are considered healthy; fisheries whose stocks fall to half of the MSY undergo a rebuilding process; and fisheries that decline to one-fourth of the MSY are typically closed until stocks have again risen to an acceptable level. Note that fisheries are only closed when they decline to one-fourth MSY, or a mere 10 percent of their undisturbed stock. If in a given year there is a spike in the amount of illegal fishing and dumping and docks fail to record all fish landed, there can be a significant threat to the survival of a given fishery. (Ministry of Fisheries, pp. 5–7)

### **Potential Shortcomings of the QMS**

In general, the shortcomings of the QMS can be broadly classified into two categories: unaccounted catch and inadequate knowledge of fisheries. Problems such as dumping, poaching, and misreporting of catch all result in unaccounted catch and cause fishing over the sustainable yield. Furthermore, limited knowledge of fisheries and the absence of reliable numbers about certain fish, including spawning rates, natural mortality rates, and current stock, result in uncertainty and risk in setting the TAC.

To ensure that the QMS protects the health of New Zealand's fisheries and continues to remain economically efficient, the following suggestions<sup>10</sup> must be considered in the years to come:

- There must be an increase in fishery monitoring to combat illegal fishing. This could be accomplished by a GPS method of tracking ships in NZ's waters, an increase in fishery officers, and/or added incentives for current NZ fishermen to report poaching through the "Poaching Is Theft" program.<sup>11</sup>
- There must be an increase in fishery security to prevent dumping. This

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<sup>10</sup>The suggestions are those of the author and are based on sources both listed and unlisted in the references.

<sup>11</sup>Created in October 2006, the "Poaching Is Theft" program aims to raise public awareness of the impacts of poaching in New Zealand's waters. Part of the program initiative was the creation of a poaching hotline which all fishers are encouraged to contact if poaching is suspected.

could be done by providing incentives and encouragement for NZ shipmates to report dumping and/or a real-time method of tracking catch.

- Fishery scientists and experts must receive more research funding to better estimate and determine the status of NZ's fisheries.
- Fisheries for which scientists have limited information must be harvested more cautiously. Overfishing fees should not be as low as they currently are for fisheries that are classified as "low-knowledge" stocks.
- Fishing techniques must be refined and recreated to reduce undesired by catch and prevent destruction of delicate marine ecosystems.

## **Conclusion**

Since its full implementation in the Fisheries Act of 1996, the QMS has revolutionized

fishery management in New Zealand. The system has attacked one of the most difficult economic problems, the tragedy of the commons, and is currently providing NZ with a sound foundation for economic growth in the fishing industry. However, as I have outlined above, there are still several problems with the actual implementation of the QMS. Though instituting an effective and efficient system is extremely difficult considering the sheer size of New Zealand's EEZ, the success of the QMS hinges on the elimination of poaching and dumping and the continuing research into fisheries and their interactions with the environment. Will New Zealand find effective solutions to these problems? Will the rapid growth of the fishing industry outpace regulation and drastically affect the health of NZ's fisheries? What remains clear is that New Zealand has once again emerged at the forefront of sustainable practice and proven its awareness that ecology and economics are, as Leif Johansson observes, indeed two sides of the same coin.

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