



Fishing for the Future: Addressing Fisheries Discards and Increasing Export Value for New Zealand's Sustainable Fisheries

Prepared by
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Anastasia Telesetsky
Wellington, July 2016

EXECUTIVE SUMMARY

Discards are harvested fish, aquatic life and seaweed that are returned to the sea. In many cases, discards may be lawful because a fishing operator is either required to return something to the sea or is allowed to return certain species to the sea after reporting the quantity of marine biomass that is being discarded. Discards may become problematic when an organism that is returned to the sea is unlikely to survive or is dead. Three types of global discard practices are more likely to involve illegal practices: high grading for economic profit which often happens with the capture of smaller fish, unreported releases of fish to avoid regulatory enforcement, and unreported releases of aquatic life that exceed quota levels (or annual catch entitlements in the case of New Zealand). Discarding becomes a critical fisheries management issue whenever discards are substantial but are not reported. Since catch data may be critical to the establishment of a total allowable catch for a given fish stock, chronic underreporting can potentially undermine a fisheries management system.

This report reviews (1) the existing New Zealand law on discards and reporting found in the Fisheries Act and its regulations and (2) New Zealand's international commitments and obligations to reduce and report bycatch. The Ministry of Fisheries understood the importance of managing discards and created a working group around 2008. The work product of this group from 2010 was a proposal to require reporting of all fish captured (including non-quota species) in exchange for the establishment of Minimum Economic Sizes for some quota species that would serve as the size threshold for those fish that must be reported against a fisher's annual catch entitlement. The information about discards would be incorporated into the setting of the total allowable catch as "other sources of fishing mortality". After the Ministry of Fisheries became part of the Ministry for Primary Industries in 2012, the focus on reducing discards shifted to increasing monitoring and enforcement efforts.

New Zealand is not the only country to grapple with the challenge of managing fisheries discards. This report provides descriptions of how Norway, the European Union, and the United States have tried to reduce discards within their national/regional fisheries. By comparing a variety of approaches, it becomes clear that there is no simple or singular solution to a challenge driven by competing biological, social, and economic factors. This report offers a variety of policy suggestions that may independently or jointly be improvements over the existing status quo. The suggestions discussed in this report include:

1) Suggestions to improve quality of available information for fisheries science

A. Implementing integrated electronic monitoring and reporting system with buy-in from the fishing community

B. Increasing government investment in research including undertaking projects to provide dynamic mapping for species with actual or alleged high discard rates

C. Considering new destination codes for live and dead sub-MLS fish returned to sea with no requirement for ACE balancing

D. Ensuring electronic reporting improves the quality of information being reported

E. Improving data quality by creating a “collaborative information commons” with flowback of information to commercial fishers

2) Suggestions based on improving the operation of the existing quota system to reduce incentives to discard

F. Quota banking/risk pooling for multi-species fisheries or stocks crossing fishing management areas

G. Changing the incentives to ensure the use of ACE in the year for which ACE is issued

H. Introducing real-time temporary closures to reduce bycatch

I. Returning some percentage of quota to community-based fishers’ organisations

3) Suggestions based on improving selectivity

J. Additional development efforts for the Precision Seafood Harvesting System/Tiaki should be optimised to avoid catching non-target fish and increase survivability of fish that will be returned to sea

K. Promoting fisher’s innovations to reduce bycatch

4) Suggestions to Enhance Professionalism in the Fishing Industry

L. Investing in professional sustainability education for New Zealand’s fishers

M. Collaborating with fishers to understand the implications of “returning to the sea”

N. Providing regular “best practice” audits to support adoption of marine resource sustainability efforts

A number of the suggestions in this list are already programs being developed at MPI. In particular, there have been sizable investments in improving the precision seafood harvesting technology and electronic monitoring and reporting. Since the beginning of 2015, MPI has invested heavily in creating an “Integrated Electronic Monitoring and Reporting System” (IEMRS). This report suggests that MPI before implementing mandatory electronic monitoring for commercial fishing vessels should revisit its efforts to develop a discard policy that reflects some of the realities of commercial fishing practices particularly in multi-species fisheries.

While technological developments have the potential to change how fishing is done and reduce discards, MPI must also consider investing in building long-term cooperative relationships between the fishing industry and MPI. The frontline of protection of New Zealand’s fisheries resources should be the fishers themselves and fishers must be given more opportunity for and recognition for their investments in

building a sustainable industry. A number of the policy suggestions in this report focus on validating fisher's existing contributions to sustainable fishing efforts and enhancing fisher's knowledge about marine ecosystems.

The final part of this report suggests that as the world seeks sources of high-quality protein, the New Zealand marine commercial fishing economy may be in a position to increase in economic value. Two further ideas are presented here as means of increasing government engagement in the sector: sustainability assurances for government trading partners and "warrants of sustainability" for members of the New Zealand fishing industry.

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ABBREVIATIONS

ACE- Annual Catch Entitlement

FAO- Food and Agriculture Organisation

IEMRS- Integrated Electronic Monitoring and Reporting System

LFR- Licensed Fish Receiver

MES- Minimum Economic Size

MLS- Minimum Legal Size

MPI- Ministry for Primary Industries

NIWA- National Institute for Water and Atmospheric Research

QMS- Quota Management System

TAC- Total Allowable Catch

TACC- Total Allowable Commercial Catch

INTRODUCTION

The discarding and reporting issues are symptomatic of a QMS that operates on a win-lose basis at the level of the individual fisher, rather than providing the incentive for a collective win-win outcome. The QMS has not totally resolved the so-called ‘tragedy of the commons.’ If fisher A can high-grade or unlawfully discard with impunity, he can maximise his return at the expense of fisher B who acts within the rules and at the expense of the sustainability of the fishery as a whole.

Ministry of Fisheries Analysis (2008) ¹

Do you have any suggestions on how the Ministry of Fisheries can improve compliance with the fisheries regulations? ... A more honest discard system that allows fishermen to operate within the regulations.

Question posed by and response in a 2010 survey on Fisher’s Compliance conducted on behalf of the Ministry of Fisheries²

Fisheries are complex socio-ecological systems where “human resource” management is as important as natural resource management. Since humans first cast their nets into the sea and first dropped their hooks overboard, humans have been sorting between food to keep and food to dispose based on a variety of normative rules from tastiness of a particular fish species to the appearance of a given fish (e.g. too small, too bony, too damaged). Only in the past century with the advent of industrial fishing practices that have scaled up the quantity of fish being removed from the sea have discards become a topic of policy debate. Discards are harvested fish, aquatic life and seaweed that are returned to the sea.³ In many cases, discards may be lawful because a fishing operator is either required to return something to the sea or is allowed to return something to the sea after reporting the discard. In some instances, returning species alive to the sea is consistent with sustainable fisheries management because the

¹ Ministry of Fisheries, June 24 2008, Decision on the Scope of a Review of Discarding Practices

² B. Kazmierow, Kay Booth, and Elaine Mossman, Commercial Fishers’ Compliance Decisionmaking: Perceptions, Experiences and Factors Influencing Regulatory Compliance, Lindis Consulting (19 July 2010): 27.

³ Definitions of bycatch and discards are often inconsistent across jurisdictions. The term discards implies a return to the sea. The term bycatch is frequently used in laws and regulations and can refer to both discarded catch and incidental catch (non-target fish that are retained). This paper will use both terms but the substantive focus will only be on fish and shellfish returned to the sea and not related bycatch issues involving seabirds or sea mammals. The term “dumping” is often used to describe discarding activities including in the New Zealand Fisheries Act 1996. When this paper uses the phrase “illegal discards”, this term is understood to be synonymous with “dumping”.

practice returns a species with a high probability of survival (e.g. crab) or a healthy egg-bearing individual to the sea.⁴

Discards become problematic when an organism that is returned to the sea is unlikely to survive or is dead.⁵ Three types of discard practices are more likely to involve illegal practices: high grading for economic profit which often happens with the capture of smaller fish, unreported releases of discards to avoid regulatory enforcement, and unreported releases of aquatic life that exceed quota levels.⁶ Fishers will make rational economic decisions to discard fish that have little or no market value due to either the species or the size of the fish.⁷ In some cases a fisher “may decide to discard the day’s catch in order to save the quota for a day when the price is higher”.⁸ Fishers who are often operating at very narrow profit margins will endeavour to maximise valuable catch on board. The only way to do this safely is to throw back fish that are unlikely to receive premium prices.⁹ Likewise fishers want to avoid being charged with statutory or administrative fisheries law violations. If there are regulations limiting the catch of a particular species such as sharks or rays or a particular sized fish, fishers will frequently discard these fish and not report them so that they will not attract the attention of regulators who may demand that they change how or where they are fishing. Finally, in the context of a quota management system, fishers may feel constrained by the property right aspects of the quota system. If they take fish in excess of the quota that they have been assigned or that they expect to be able to access from the market (in systems where quota or catch entitlements can be obtained post-harvest), fishers will often discard overages in order to avoid regulatory penalties or to avoid attracting attention from regulators.

⁴ Jahn Petter Johnsen and Soren Eliassen, Solving Complex Fisheries Management Problems: What the EU can Learn from the Nordic Experiences of Reduction of Discards, 35 Marine Policy (2011): 130-139; Indrani Lutchman and Stephanie Newman, Briefing on Discards Institute for European Environmental Policy, *available at* https://improvements.msc.org/database/discards/documents/Briefing_discards.pdf/view (Describing how release of lobsters and crabs from pots can be consistent with good stock management)

⁵ Legasea, Snapper Wastage (30 October 2014) <http://www.legasea.co.nz/documents/Wastage%20of%20snapper-LegaSea-2.pdf> (Legasea, a recreational fishing advocacy group, suggests that the mortality rate for undersized snapper caught and discarded by trawlers is over 90% or possibly 20% of the snapper catch by weight.)

⁶ T.A. Branch and K. Rutherford, R. Hilborn, Replacing Trip Limits with Individual Transferable Quotas: Implications for Discarding 30 Marine Policy (2006): 281-292 at p. 282 (“The conditions for high-grading include relatively low costs of discarding, a large price differential between classes of fish, and low costs of catching fish to replace those that were discarded....ITQs may also induce discarding when some species in a multispecies fishery have constraining quotas, and the mix of quota does not match the mix of species that are caught”.)

⁷ For the purpose of this report, the term fishers is used as a gender-exclusive term in this report to include both men and women who participate in the fishing industry.

⁸ L. Antelo et al., Promoting an Optimal Networking of Fishing Actors to Organise a Responsible, Optimal and Sustainable Exploitation of Marine Resources: the FAROS Initiative (2011) http://digital.csic.es/bitstream/10261/44174/1/OCEANS_FAROS_final.doc

⁹ Modern fishing vessels have limited cold storage facilities that protect food safety.

In some fisheries, many of these discarding practices are not reported resulting in an under-reporting of catch. Discard practices have been identified as one of the possible reasons preventing stock recovery for some fisheries.¹⁰ While it is unclear that discards are causing problems for any specific New Zealand fishery, the lack of reporting of discards may have long-term ramifications for proper stock assessment if the assumptions on abundance of species are incorrect.¹¹ Addressing discards to increase fish abundance is critical for the long-term integrity of a fisheries management system since an abundance of commercial stocks increases financial profitability by reducing fishing costs.¹² As one group of fisheries researchers observed, “Minimising unwanted bycatch that might otherwise be discarded is relevant both to conservation and to economical and distributional aspects of fishing activities”.¹³ Given the possibility for potentially widespread underreporting, how do you achieve a so-called “honest” discard system that protects the stocks, ensures ecosystem health, and is capable of broad implementation that is not too costly?

Since 2008, the New Zealand government has been actively exploring policies to address particularly the under-reporting aspects associated with discards. This paper explores New Zealand’s current regulatory efforts to reduce illegal discards and ensure complete reporting. Based on a review of the types of discard practice in New Zealand, there can be no simple policy fix. A variety of potential policy reforms are offered in Part 6 including efforts that are already being implemented by MPI such as electronic monitoring and reporting. Some of the proposals look at selective fishing technologies. Other proposals examine whether there are cost-effective means to change the culture of fishing in New Zealand by further encouraging co-management efforts between regulators, fishers, and other interested ocean stakeholders. Some combination of a number of small and large policy interventions may provide the needed incentives for improving existing reporting of discards.

Commercial practices matter greatly for the long-term sustainability of New Zealand’s fisheries because most of the catch (97 species and 633 stocks) in New Zealand waters is commercially fished under the quota management system (QMS) based on percentage shares.¹⁴ While other countries use quota based systems to

¹⁰ G. Morandea, C. Macher, F. Sanchez, N. Bru, L. Fauconnet, and N. Caill-Milly, Why do Fishermen Discard? Distribution and Quantification of the Causes of Discards in the Southern Bay of Biscay passive gear fisheries, 48 *Marine Policy* (2014): 30-38.

¹¹ H.M. Condie, A. Grant, and T.L. Catchpole, Incentivising Selective Fishing under a Policy to Ban Discards; Lessons from European and Global Fisheries, 45 *Marine Policy* 45 (2014): 287-292.

¹² Branch et al. *supra* note 6 at p. 282 (“[A]ccurate stock assessments and management regulations require estimates of total fishing mortality from both landed fish and discarded fish. Biased estimates of discard fractions may therefore lead to the setting of TACs that are overly optimistic or pessimistic”.); Personal Communication D. Turner, MPI.

¹³ P. Gullestad, G. Blom, G. Bakke, and B. Bogstad, The ‘Discard Ban Package’: Experiences in Efforts to Improve the Exploitation Patterns in Norwegian Fisheries, 54 *Marine Policy* (2015): 1-9 at p.1.

¹⁴ Ministry for Primary Industries, New Zealand Fisheries at a Glance, Statement of Intent 2010-2015, (May 19, 2011) <http://www.fish.govt.nz/en-nz/Publications/Statements+of+Intent/SOI+2010+->

manage fish stocks (e.g. United States and European Union states), New Zealand has the most extensive system managing all significant commercial species. Most QMS species are managed independently but some species are managed as multiple species stocks because they are caught together (e.g. flatfish). Recreational fisheries can also have an impact on discard management and setting appropriate total allowable catches since recreational fishers are not required to report discards.

Sustainability matters to New Zealand's largest fishing companies and implementing discard reduction policies is increasingly part of the sustainability measures required by global markets. Yet implementing environmental sustainability measures for certain New Zealand fisheries is only beginning to have a broader impact. While industries can voluntarily seek sustainability certification and a number of New Zealand fisheries have been certified under the Marine Stewardship Council scheme, this paper explores a couple other models for improving recognition of New Zealand's seafood industry. The conclusion first discusses the possibility of designing a government sustainability assurance to provide a guarantee that New Zealand fish designated for export have been sustainably harvested according to best global fisheries management practice. While there may be reluctance on the part of a government to offer this type of assurance to an industry, there may be opportunities for the government to improve sustainable fishing practices by offering a "warrant of sustainability" to fishers and fish receivers that would help to identify those individuals and companies that are effectively implementing sustainable fishing practices. Over time, if these ideas were to be adopted, these ideas could give New Zealand a short-term competitive advantage in the trade of marine resources and might raise global standards for the international trade in fish product in the long-term.

+2015/New+Zealand+Fisheries+at+a+Glance.htm. Of the 439,262 tonnes of fish caught in 2009, approximately 409,449 tonnes was commercially fished under the quota management system.

1 BACKGROUND ON FISHERIES DISCARDS

The rate of global fisheries discards has sparked international attention. In 1996, the United Nation's Food and Agriculture Organisation (FAO) estimated a mean of 27.0 million metric tonnes of global discards, based on a target catch of 77 million metric tonnes resulting in a global discard range of 17.9 to 39.5 million metric tonnes (or approximately one-quarter of the world's catch).¹⁵ As of 2005, the reconstructed discard rate appears to be closer to 7 million tons or 8% of the global catch, with most of these discards appearing in Northeast Atlantic and Northwest Pacific fisheries.¹⁶ Mixed-species trawl fisheries can generate particularly high levels of discards.¹⁷ Globally, the shrimp and demersal finfish trawl industries are responsible for 50% of the discards and 22% of the total landings.¹⁸ It can be difficult to identify levels of discards for comparative purposes since different fisheries report discards in different formats; some use percentage discards and others use total weight. The use of percentages to define a discard "issue" can be misleading because very small fisheries of just a few boats, such as some shrimp fisheries, may have high percentages of discard but low weights of discarded species. In contrast a larger number of trawlers may have relatively low percentages of discards but, given the number of boats operating, are generating sizable weights in discards. This distinction between percentages and weights can make it difficult to decide where policymakers should focus their initial attention in thinking about managing discards.

Discarding practice as a symptom of overfishing has been identified as one of the causes of the collapse of cod stocks in Canada. In the case of the Newfoundland fisheries, the publicised discard rate of 2% of the weight of the catch was far less than reality.¹⁹ In one portion of the trawl fishery, trawlers were reportedly catching 500,000 fish and discarding 300,000 fish in order to be able to land 200,000 legal sized fish. Because of a decline in larger older cod due to overharvesting, discarding rates by commercial inshore trap catchers from the early 1980s to the late 1980s may have doubled.²⁰ A similar story may be true for the common skate in the Irish Sea

¹⁵ D. Alverson, M. Freeburg, S. Murawski, and J.G. Pope, A Global Assessment of Fisheries Bycatch and Discards. FAO Fisheries Technical Paper 339 (1996) available at <http://www.fao.org/docrep/003/T4890E/T4890E04.htm#ch2>

¹⁶ Johnsen and Eliassen *supra* note 4 at p. 131. (Indicating that 40% of the world's discards originate in the Northeast Atlantic and Northwest Pacific fisheries and some fisheries such as the North Sea have particularly large discard rates where one-tenth of the total biomass of fish harvested [about 1 million tonnes of fish] are discarded)

¹⁷ *Ibid.* (Describing how the discard rate in three North Sea fisheries reached up to 90% of the annual value of the fishery)

¹⁸ Kieran Kelleher, Food and Agriculture Organisation, Discards in the World's Marine Fisheries: An Update, Fisheries Technical Paper 470 (2005): 18

¹⁹ Jeffrey Hutchings, Spatial and temporal variation in the density of northern cod and a review of hypotheses for the stock's collapse, 53(5) Canadian Journal of Fisheries and Aquatic Sciences (1996): 943-962.

²⁰ *Ibid.*, at 957.

where evidence of discarding in the major groundfish fishery seems to be correlated with the rapid loss of skates.²¹

Certain regions of the world because of the diverse composition of the fisheries (from both a species and size perspective) have sizable discard rates. In EU fisheries, somewhere between 40-60% of catch is discarded by North Sea beam trawlers and 30% is discarded by bottom trawlers.²² In the past decade, researchers have begun to design empirical projects to understand the extent of discards. Using on-board observer reports from 2004 and 2011 for a series of fisheries “clusters” (e.g. Portuguese otter trawl for demersal fish, Portuguese otter trawl for crustaceans, Spanish otter trawl for demersal fish, and Spanish otter trawl for pelagic and demersal fish), a group of researchers in Portugal and Spain examined what sorts of conditions result in high discard, medium discard, and low discard trips.²³ They concluded that different fisheries clusters had different motives for discarding. In the Portuguese demersal fisheries, fishers tend to discard chub mackerel and blue jack mackerel for market reasons but discard hake because it is undersized or exceeds the quota.²⁴ In the Portuguese crustacean fisheries, fishers discard blue whiting because the value of blue whiting oscillates greatly in the market. In the Spanish fisheries, fishers discard blue whiting because of its limited market restricted to largely animal feed processors and hake because it was less than minimum legal size.²⁵ The authors concluded that in many instances targeted commercial species were being discarded and that more work needed to be done in the fisheries to avoid capturing fish that were ultimately discarded.

Fishers have a financial incentive particularly in a quota management system to under-report their discard rate in order to avoid penalties if they do not hold quota for a species that they have harvested and do not anticipate being able to acquire quota. Selective retention from a harvest is frequently driven by economic concerns of what the market is buying. Fishers will typically only retain fish that return the highest financial return per weight. Economic greed has been a strong motivator for large numbers of discards. For example, in a number of cases in New Zealand, fish have been dumped from large factory trawlers because the fishing effort of the vessels has outstripped the ability to do processing. In 2004, a vessel targeting southern blue whiting dumped tons of fish because it was unable to keep up with processing.²⁶ In

²¹ Alverson et. al. *supra* note 15.

²² H.M. Condie et. al. *supra* note 11 at 287. .

²³ A, Fernandes and N. Perez, N. Prista, J. Santos, M. Azvedo, Discards Composition from Iberian Trawl Fleets, 53 *Marine Policy* (2015): 33-44.

²⁴ *Ibid.* at 38.

²⁵ *Ibid.* at 40.

²⁶ *Ministry of Fisheries v. Lee Craig Harding*, CRI-2006-042-002909 (D.C. Nelson, 14 February 2008), Reserved Judgment of Judge John Walker

2011, a different vessel dumped approximately 1.5 tons of squid and 5.3 tons of hoki because a new catch had arrived before the previous catch had been processed.²⁷

In general the most common causes of discarding are high-grading in a fisheries system with catch limits imposed by quotas, a lack of quota to cover overages, low-value of a catch, catch of large numbers of juvenile fish, catch of fish that are smaller than desired commercial size, and catch of damaged fish that cannot or should not be sold for market or health reasons. These practices of discarding raise two primary policy issues.

First, from the perspective of the public there is the perception of unnecessary waste of fish that could otherwise be consumed by humans. This perception holds true for both legal and illegal discarding particularly when the fish being discarded are dead. The public perceive the discards as waste of a future economic resource that should have been more conscientiously exploited for human needs.²⁸ Low levels of survivability when fish are returned to the sea may be one of the basis for strong public perceptions that discards are a leading source of industry waste. Mortality can be high for discarded fish particularly when the fish are captured using fishing techniques such as trawling. In a 2005 FAO study, the author observes that capture stresses associated with trawling (e.g. net entrapment, crushing, wounding, sustained swimming until exhaustion and changes in pressure), fishing conditions (towing time, towing speed, light conditions, anoxia, time on deck, air and water temperature) and biological conditions (fragility of the fish, size of the fish) can all take their toll on fish mortality for discards.²⁹ The FAO study concludes that for trawling “generally, fish do not survive discarding processes well”. The study recommends “To improve the survival of these fish, they should escape before they are landed on the vessel deck, preferably at the depth of capture”.³⁰ Gear selectivity can make a large difference in reducing bycatch and improving survivability statistics.³¹

Even if small fish are capable of escaping from a net due to larger mesh size, it does not necessarily enhance their ability to survive. A number of studies have been done

²⁷ Ministry for Primary Industries v. Dae Jun Lee, CRI-2012-009-005144 (D.C. Christchurch, 03 September 2014), Sentencing Decision of Judge B.P. Callaghan

²⁸ Hugh Fearnley-Whittingstall, Fish Fight (Celebrity UK chef and broadcaster launched a media campaign to address discarding) <http://www.fishfight.net/story.html> ; Other European celebrity chefs and broadcasters in France, Poland, Spain, and Germany have launched their own campaigns. <http://www.fishfight.net/international.html>

²⁹ Petri Suuronen, Major Factors Causing Mortality of Trawl-Caught and Discarded Fish, Food and Agriculture Organisation, (2005) available at <http://www.fao.org/docrep/008/y6981e/y6981e06.htm#bm06.7> (Noting that to increase survivability of fish with swim bladders it is best to use selective gear that permits the fish to escape before being lifted to the water surface).

³⁰ Ibid.

³¹ Sarah. King, Robert Hannah, Steve Parker et al., Protecting Rockfish through Gear Design: Development of a Selective Flatfish Trawl for the U.S. West Coast Bottom Trawl Fishery, *Can. J. Fish. Aquat. Sci.* 61 (2004): 487-496

indicating that when juvenile fish are able to escape a trawl net due to larger mesh sizes, these fish often become subject to predation because the trawl-stressed fish are unable to resume cohesive, protective shoals.³² In addition, if fish lose a sufficient proportion of their scales they may become prone to secondary bacterial infections. This raises important questions about using technology to reduce commercial bycatch. If the deployment of technology still results in certain mortality levels, should the total allowable commercial catches be adjusted in order to account for these expected sources of fishing mortality?

Whether the level of waste reflected in public campaign rises to a level of future resource management crisis is unknown. In reality, dead fish that are discarded by fishers are not “wasted” but are often consumed by seabirds and marine mammals that follow commercial vessels or by bottom scavengers or through the detrital food chain. Some researchers query whether eliminating all fisheries discards like the EU proposes will have ecological consequences for some of these scavenging species.³³ In some fisheries, even when there have been documented large quantities of discards, the discard numbers are low when compared with the available biomass for the species. For example, in the 1992 Bering Sea pollock trawl fishery, while approximately 300 million pollock were discarded, this only represented 1.6% of the exploitable biomass of the pollock fishery.³⁴

Second, from the perspective of fisheries management, unreported discards can frustrate the ability to perform more accurate stock assessments and implement fisheries management plans designed to increase fish abundance and reduce costs associated with harvest. A recent report by the Institute for European Environmental Policy noted that “there are many unknowns regarding quantities of discarded and slipped fish, let alone the rate of mortality of discarded fish”.³⁵

Fisheries scientists and managers need to understand the mortality rates of fish in order to set reliable levels for total allowable catch. For example, if half of all fish in a net are discarded without reporting then estimates of population size may be off by 50%. If the fish that are discarded and not reported are fish of spawning age, this may have implications for fishing mortality because no fishing mortality would be assigned to these fish as part of stock assessment. In order to make reliable calculations for total allowable commercial catches, fisheries scientists need to understand how much catch has been retained and how much has been discarded within a given geographic space, over a given time frame, and by a variety of fishing

³² Clifford Ryer, Trawl Stress and Escapee Vulnerability to Predation in Juvenile Walleye Pollock: Is there an Unobserved Bycatch of Behaviourally Impaired Escapees? 232 Mar. Ecol. Prog. Ser.(2002): 269-272 available at <http://www.int-res.com/articles/meps2002/232/m232p269.pdf>

³³ M. Heath, R. Cook, A. Cameron, D. Morris, and D. Speirs, Cascading Ecological Effects of Eliminating Fishery Discards, Nature Communications 5 (3893) (13 May 2014): 1-8 available at <http://www.nature.com/ncomms/2014/140513/ncomms4893/pdf/ncomms4893.pdf>

³⁴ Alverson et al. *supra* note 15.

³⁵ Lutchman and Newman, *supra* note 4.

methods. Failure to have accurate statistics may lead to either underestimates of the productivity of a stock or overestimates of the abundance of a stock.

Knowing the quantity and identity of discards is important not just for making assessments of a particular population but also for implementing an ecosystem approach. Species assemblages can be changed on the basis of discard behaviour. In the Gulf of Alaska, fisheries scientists observed 1960s trawls being dominated by certain species including flatfish, Pacific cod, and Pacific perch. By the 1970s, in parallel with increased fishing effort from vessels flagged to the Soviet Union and Japan, the composition of the trawl catch changed, with for example Pacific perch abundance decreasing from 36.8 kg per trawl hour to 3.9 kg per trawl hour.³⁶

Under-reporting in a quota-based system can be particularly problematic because quota-based management requires accurate knowledge of both fishing rates and natural fish mortality. If a fisher has a relatively low quota for a given fish or there are many small fish in a given year, fishers may be more likely to increase discards of particular species. When the discards are not reported, there may be the appearance of increasing levels of fishing mortality and diminishing population size. Regulators responding to these signs may reduce total allowable catch and fishers may in response increase discarding in order to catch fish that are more economically profitable. As one U.S. National Academy of Science report noted, “Overall, undetected changes in discard rates and non-reporting rates can cause a downward spiralling negative feedback effect on assessments and fish populations”.³⁷ Having a detailed understanding of discard mortality and factors that influence this mortality such as tow duration is critical for understanding “potential community-level impacts not detectable from landing statistics alone”.³⁸

Discards in New Zealand

The discarding of fish is a major threat to the New Zealand fishing industry because of its potential to undermine the integrity of the quota management system if the discarding is not reported and factored into the cap set by the total allowable catch. Overall, the trend of reducing actual numbers of discards from the New Zealand commercial industry has been positive. Over the last ten years, recorded discard and bycatch rates in New Zealand have substantially decreased from a high of 114,000 tonnes in 2002 to 32,000 tonnes in 2012.³⁹ Before the adoption of the quota management system in 1986, discard rates were significantly higher in individual fisheries.

³⁶ Alverson et al. *supra* note 15.

³⁷ Ocean Studies Board, National Research Council Improving the Collection, Management, and Use of Marine Fisheries Data (National Academies Press, 2000): 42

³⁸ Alverson et. al. *supra* note 15.

³⁹ New Zealand Environmental Reporting Series, Environmental Indicators, *available at* http://www.stats.govt.nz/browse_for_stats/environment/environmental-reporting-series/environmental-indicators/Home/Marine/bycatch-sea-lion-fur-seal/bycatch-fish-invertebrates.aspx

Today in the deepwater fisheries, the percentage of discards is quite low; approximately 0.2 kg of bycatch are caught for each kilogram of targeted fish on vessels with a government observer.⁴⁰ Even though 11.7% of all average annual catches since 1991 are QMS bycatch species, almost all of these species have been retained since 1991 with only 2.4% of QMS species caught being discarded.⁴¹ The bycatch rate and discard rate for deepwater QMS species between 2008 and 2013 has been further reduced with vessels catching approximately 9.3% QMS bycatch but only discarding out of the total catch 1.1% of QMS species.⁴² The reduction of bycatch in the deepwater industry has been attributed to a combination of better fisheries management plans, observer coverage, and a change in the deepwater fishing culture.

This general trend is encouraging as reflected in a 2016 report released by the Ministry for Primary Industries which found that the majority of stocks with known status were not overfished.⁴³ However, discard practices vary among fisheries, with individual fisheries experiencing both increases and decreases of fish that are discarded over the years.⁴⁴ For example, the Southern blue whiting trawl fishery in 2010 experienced a spike in bycatch of silverside fish, the jack mackerel trawl fishery experienced a spike in pilchard bycatch in 2012, and the ling longline fishery experienced a spike in hairy conger bycatch in 2010.⁴⁵ Some low value fish species are regularly discarded such as spiny dogfish because they have a high abundance in target fisheries where they predate on other fish.

There are differences in New Zealand between the operation of the deepwater and inshore fisheries that have implications for discards. The statistics provided by NIWA on discard rates are specific to the deepwater fleet. Operators of smaller fishing boats in the inshore fisheries who do not hold quota but rely on annual catch entitlements are far more likely to engage in discarding practices than the deepwater fleet due to

⁴⁰ National Institute of Water and Air, Reported Target Catch and Estimated Bycatch, <https://www.niwa.co.nz/fisheries/tools-resources/deepwater-trawl-fisheries-bycatch-and-discards/reported-target-catch-and-estimated-bycatch> (Approximately one quarter of deepwater trawls carry an observer.)

⁴¹ Ibid.; National Institute of Water and Air, Reported Target Catch and Estimated Discards, <https://www.niwa.co.nz/fisheries/tools-resources/deepwater-trawl-fisheries-bycatch-and-discards/reported-target-catch-and-estimated-discards>

⁴² Ibid. (While capture of Non-QMS species bycatch for the last five years of available data of 2008-2013 [5%] has increased over the percentage of non-QMS species bycatch for the entire data period of 1991-2013 [2.9%], the discard rate for non-QMS species has decreased from the entire data period [4.2%] to the last five years of available data [3%])

⁴³ Ministry for Primary Industry, Status of New Zealand's Fisheries 2015 (February 2016) <http://fs.fish.govt.nz/Doc/24002/status-of-nz-fisheries-2015.pdf.ashx>

⁴⁴ O. Anderson, (2014). Fish and invertebrate bycatch in New Zealand deepwater fisheries from 1990–91 until 2011–12. New Zealand Aquatic Environment and Biodiversity Report No. 139.

⁴⁵ Id. at p. 5, 7, 11, and 12 (Noting that increase and decreases in fishery numbers may be attributed to a “substantial and persistent change in the area of operation of the fishery” rather than a decline in abundance.

market restraints and to a current lack of detection. Anecdotally, as part of the Fisheries Act Review Project, stakeholders suggest that “inshore...in some cases less than 50% of what is commercially harvested is counted for management”.⁴⁶ As part of trying to understand actual discarding behaviour by inshore fishers rather than reported discarding behaviour, the Ministry has piloted the effectiveness of electronic monitoring equipment on a number of inshore vessels. Based on reviewing the electronic footage, the Ministry observed higher than expected levels of discarding in the inshore fisheries off the East Coast of the South Island including QMS fish that do not meet the minimum economic size requirements of licensed fish receivers.⁴⁷

Some commentators have suggested that a QMS based on individual fishing quotas is too inflexible to address management issues for multispecies fisheries because there are insufficient measures to handle high levels of bycatch.⁴⁸ Questions of illegal discards have led to finger-pointing particularly at the commercial industry. In October 2015, for example, 6 km of dead snapper and gurnard washed up on an Auckland beach. An organisation representing recreational fishers pointed the finger at the trawling industry.⁴⁹ This incident followed a Ministry for Primary Industries investigation of large numbers of undersized dumped gurnard identified off the west Auckland coast.⁵⁰

⁴⁶Ministry for Primary Industries, Fisheries System Review (December 14, 2015) (Collecting responses from 88 respondents who considered themselves to be recreational fishers and 64 individuals who considered themselves to be commercial fishers.)

⁴⁷ Ministry for Primary Industries, Preliminary Investigation Report Dumping/Discarding (2013) (Observing illegal discarding of moki, kingfish, gurnard, elephant fish, rough skate, spiny dogfish, kahawai, and carpet shark by 5 out of 6 vessels)

⁴⁸ P. Copes (2000). Adverse Impacts of Individual Quota Systems on Conservation and Fish Harvest Productivity. Discussion Paper 0-22: 9-10. at http://oregonstate.edu/dept/IIFET/copes_morocco.pdf (“Suffice it to say that in multi-species fisheries ITQ systems inevitably will produce substantial catches in excess of quota for some species in the mix, leading to impairment of the management system with a variety of undesirable outcomes. Depending on design of regulations and success of enforcement, these surplus catches may be dumped (wasteful) or black-marketed (inequitable and illegal); or if the by-catches may be retained this may encourage operators “accidentally” to increase those by-catches and over-fish the stocks concerned. All of this plays havoc with proper biological management and puts the stocks at higher risk. Of course, alternative management systems may also face difficulties with multi-species fisheries. However, they are not constrained by any need to respect the right of operators to continue fishing until their individual quotas have been filled. Non-quota systems therefore have the flexibility of being able to act swiftly and close a fishery entirely, or set any other time or area restrictions needed to protect particular stock components or the fishery as a whole”.); *see also* J. Acheson, S. Apollonio, and J. Wilson, Individual Transferable Quotas and Conservation: A Critical Assessment, *Ecology and Society* 20(4) Art. 7 (2015) available at <http://www.ecologyandsociety.org/vol20/iss4/art7/>

⁴⁹ Shane Cowlshaw, Six Kilometres of Dead Fish along Muriwai Beach in Apparent Dumping Incident, <http://www.stuff.co.nz/auckland/73134759/Six-kilometres-of-dead-fish-along-Muriwai-Beach-in-apparent-dumping-incident> (October 20, 2015)

⁵⁰ Michael Field, Fish Dumping Investigated Off Auckland Coast (February 19, 2015), <http://www.stuff.co.nz/national/66395508/fish-dumping-investigated-off-auckland-coast.html>

In the last several years, there have been high-profile public cases of illegal discarding particularly by foreign flagged commercial vessels. New Zealand fined the foreign captain of the *Oyang 77* in 2014 for discarding squid, hoki, and barracouta at sea and then filing false or misleading catch returns.⁵¹ Foreign chartered vessels have been at the heart of a number of both social and environmental controversies. Due to under-capacity in deepwater fisheries, foreign vessels have been chartered by New Zealand suppliers to harvest approximately 60% of New Zealand's deepwater species.⁵² Journalists investigating some of these vessels imply that "high grading" may have been a "common practice" for foreign flagged vessels fishing under contract for New Zealand companies.⁵³ Ministry compliance investigations between 2006 and 2011 suggest that foreign chartered vessels have been the main offenders identified by Ministry compliance officers as engaging in discarding that can be characterised as a serious offence. As long as a New Zealand company held an appropriate fishing quota, it was, until May 2016, free to harvest its entitlement using foreign chartered vessels.⁵⁴ From 2016 on, only New Zealand flagged vessels are to operate within New Zealand waters meaning that licensed fish processors may only use New Zealand flagged vessels. In theory, this may improve agency response time to an alleged violation because no contact or communication with a foreign flag state will be necessary and the vessels will need to be fully compliant with New Zealand laws.

In 2016, a group of academics released a report entitled "Reconstruction of Marine Fisheries Catches for New Zealand (1950-2010)".⁵⁵ Designed to be part of a global series, this report attempted to reconstruct the fish catches using a "critical realist" approach. This approach relied heavily on interviews, particularly with foreign charter vessel crew, as well as FAO data, ministry reports, and licensed fish receiver returns.⁵⁶ The authors concluded that between 1950 and 2010, the commercial industry in New Zealand discarded 34.8% of the fish that it caught.⁵⁷ The authors suggest that the unreported discard rate for a New Zealand flagged fishing vessel in

⁵¹ Ministry for Primary Industries v. Dae Jun Lee, *supra* note 27.

⁵² Pamela Mace, Characteristics of Successful Fisheries Management Systems: New Zealand and the U.S. (March 2010)

⁵³ M. Morrah, Illegal Fish Dumping May be Common Practice, 3 News, Auckland, New Zealand (2012)

⁵⁴ B.M.H. Sharp, From Regulated Access to Transferable Harvesting Rights: Policy Insights from New Zealand. Marine Policy 21(6) (1997): 501-517; New Zealand Fisheries Act 1996, Public Act 1996 No. 88 (August 13, 1996) Section 103.

⁵⁵ Glenn Simmons, Graeme Bremner, Hugh Whittaker, et al. Institute for the Oceans Fisheries, The University of British Columbia, Sea Around Us, Reconstruction of Marine Fisheries Catches for New Zealand (1950-2010) (2016) available at http://www.seararoundus.org/doc/publications/wp/2016/Simmons_2016.pdf

⁵⁶ Id: 8 (Authors conducted 308 interviews with 200 interviews with foreign charter vessel crew members and 5 interviews with "longstanding New Zealand fishers".)

⁵⁷ Id. at 13.

2013 was 20% and for a foreign flagged vessel 50%.⁵⁸ While there is no argument among fisheries academics that vessels engage in both legal and illegal discarding behaviour as well as under-reporting, both the conclusion that New Zealand's fisheries catch between 1950 and 2013 might be 2.7 times the amount reported are disputed and the "critical realist" methodology used by the 2016 report is disputed by international fisheries scientists, MPI fisheries managers, and MPI fisheries scientists.⁵⁹

The following section examines the specific law and policy designed to manage discards in New Zealand. Because New Zealand allows participants in the QMS including the quota holders, annual catch entitlement holders, permit holders, vessel owners, and licensed fish receivers to make a number of decisions about when they will fish, where they will fish, and how they will fish, there are a number of unique factors that may be driving the type of illegal discarding detected under the system. Foremost among these factors is the economic factor. Fishers are likely to discard catch when the economic value of the catch is less than either the landing costs of the fish or the market price of fish and there is no credible monitoring of discard practices. In some fisheries, Annual Catch Entitlements (ACE) to cover bycatch can be difficult to obtain because the bycatch for one fishery is a target catch for another fishery. In other fisheries, the licensed fish receiver will not accept certain species or grades of fish due either to existing market conditions or the ability for a Licensed Fish Receiver (LFR) to handle a particular fish in light of processing concerns. Other factors may also contribute to illegal discarding under New Zealand's QMS. For

⁵⁸ Id. at 28

⁵⁹ Science Media Centre, Expert Reaction: NZ Fishery Catch Under-reported, (16 May 2016) Professor Matthew Dunn, Chair in Fisheries Science, Victoria University of Wellington <https://www.scimex.org/newsfeed/new-zealand-fishery-catch-estimated-at-2.7-times-more-than-reported-study> (Noting that:

"The question of how big the unreported catch may be is difficult. It sounds as if much of the information in the new report comes from interviews with fishers. Having used interviews in the past, I know these kinds of data are particularly uncertain, and often biased. Where estimates come from Ministry reports, we should remember that the Ministry tends to target fisheries where they think there could be a problem, so these estimates are likely to be higher than the norm. I would expect there to be great uncertainty, and potential for bias, around the estimate of '2.7 times'; See also Do "Catch Reconstructions" Really Implicate Overfishing (January 22, 2016) CFOOD, Science of Fisheries Sustainability, <http://cfooduw.org/do-catch-reconstructions-really-implicate-overfishing/#hilborn> (Providing responses from fishery scientists to "catch reconstruction" methodology who question the usefulness of the exercise. As one fishery scientist Ray Hilborn commented on the methodology "Pauly and Zeller have attempted to estimate the extent of unreported catch for all the fish stocks of the world. For any individual stock in the U.S. the hardest part of doing the stock assessment is often estimating the total catch. Historical discards are often unreported, species were often lumped in the historical catch data, recreational catch was poorly estimated, and illegal catch totally unreported. Scientists can spend months trying to reconstruct these data for an individual stock and it is recognised that these estimates may not be reliable. Pauly and Zeller's attempt to do this for thousands of global stocks with a consultant spending perhaps a few months to cover every fishery in an individual country just cannot be very reliable. We need to move beyond trying to understand the historical fish catches, and instead concentrate on understanding the status of fish stocks at present. If all the effort that had been spent in trying to estimate historical catches by Pauly and Zeller had instead been devoted to analysis of what we know about the status of a sample of fish stocks in different places, we would know much more about the status of world fisheries".)

example, under the quota system, the government largely does not dictate input controls such as gear use but leaves these decisions to the various participants within the quota system who may or may not choose to invest in gear that reduces incidental bycatch.

2 EXISTING LAW AND POLICY FOR NEW ZEALAND DISCARD MANAGEMENT

Discarding has been a long-standing practice in the fishing industry before any contemporary regulatory system. Fishers have made decisions for millennia about the costs and benefits of returning particular catch to shore. Since certain fish species have always been desired more than other fish, it has been a regular practice to sort catch based on desirability leading to high grading. Before the appearance of large-scale commercial and recreational fishing efforts, an *ad hoc* boat-by-boat discard policy was generally not problematic given a historical abundance of fisheries stocks and low fishing capacity. The decision to discard was largely an individual decision based on the preferences of each fisher (e.g. edibility, ease of preparation, storage) or on the ready availability of a market.

With the advent of regulatory systems to manage commercial fisheries and particularly the modern QMS designed to increase the long-term value of fisheries resources, the New Zealand government has introduced new factors for fishers to consider in their decision to discard or not discard. Now, to protect the public interest in sustainable national fisheries, fishing vessels are limited in what species and sizes can or cannot be discarded. Fishers are expected to closely adhere to the proscriptions under the Fisheries Act in order to avoid dumping.

Some practices under the QMS related to the handling of bycatch have evolved since the QMS came into force in New Zealand in 1986. Originally fishers were required to hold quota for target species before they would go fishing. Once they had caught fish including incidental bycatch, fishers had a number of options for how to handle the bycatch including paying a single-level deemed value, landing overages and surrendering them to the crown, or landing inshore species and counting them against under-caught quota for another species.⁶⁰ These approaches to handling bycatch were replaced when the 1996 Fisheries Act was amended in 2001 and a stepped deemed value was introduced to penalise fishers who exceeded by-catch quota but fishers were permitted to catch fish without holding quota at the time of fishing.

Fisheries Act- Section 72 and Schedule 6

The contemporary legal framework for managing discards is located in Section 72 of the New Zealand Fisheries Act 1996. The text of this section can be found at Appendix 1 to this report. This act conceives of fisheries as renewable resources and defines sustainability as “maintaining the potential of fisheries resources to meet the reasonably foreseeable needs of future generations and avoiding, remedying, or mitigating any adverse effects of fishing on the aquatic environment”.⁶¹

⁶⁰ Kelly Lock and Stefan Leslie, *New Zealand’s Quota Management System: A History of the First 20 Years*, Ministry of Fisheries (April 2007): 55-57. Available at http://motu-www.motu.org.nz/wpapers/07_02.pdf

⁶¹ New Zealand Fisheries Act 1996, Public Act 1996 No. 88 (August 13, 1996): Section 8 available at <http://www.legislation.govt.nz/act/public/1996/0088/latest/whole.html#DLM395389>

Discarding/dumping by commercial fishing operators of fish, aquatic life, or seaweed covered by the QMS is prohibited by this Act with a few exceptions.⁶² Specifically, a commercial fisher is not permitted to “return to or abandon in the sea or any other waters any fish, aquatic life, or seaweed of legal size...that is subject to the quota management system”. What this means in practice is that New Zealand operates a “discard ban”. A catch does not need to be brought on board a ship (e.g. “taken”) for it to be considered “abandoned” for purposes of Section 72 of the Fisheries Act.⁶³ Where QMS fish are caught but left dead at sea, a harvester has a duty to prevent dumping and “make reasonable efforts to retrieve” QMS fish or be subject to an improper abandonment offence.⁶⁴

Any QMS species that is not the minimum legal size (MLS) must be “immediately” returned “whether alive or dead to the sea or waters” where the fish or aquatic life were harvested.⁶⁵ Generally, sub-MLS catches do not need to be reported except for certain stocks such as Snapper (SNX). Minimum legal size depends on the fish stock and is a critical part of the regulations to protect juvenile fish.⁶⁶ It is generally set at the size at which 50% of a population becomes sexually mature.⁶⁷ Few species have been assigned a minimum legal size. Eleven finfish are covered by MLSs, namely blue cod, blue moki, butterfish, flatfish, kingfish, red cod, red moki, sand flounder, snapper, terakihi, and trevally. Rock lobsters, scallops, oysters, and paua also have minimum legal sizes set by regulations. MLSs are used across a number of global fisheries and according to some fisheries commentators, it is not always clear whether the various factors used by fisheries management agencies for setting a given MLS are also contributing to conservation objectives.⁶⁸ Among some New Zealand fishers, there is a strong desire to set additional MLS numbers for certain species such as gurnard in order to provide fishers with the opportunity to return juvenile gurnard to the sea and land more valuable catch.

⁶² New Zealand Fisheries Act 1996: Section 72(1)

⁶³ Ibid.

⁶⁴ *Harvey Fishing Ltd. v. Ministry of Fisheries*, CRI 2006-463-70 (High Ct. Rotorua 15 February 2007), Judgment of J. Wild at para. 35 (Describing a case where a fisheries officer observed dead snapper that met the MLS standard spread over a kilometre and the court’s finding that the fishers should have made reasonable efforts to retrieve fish).

⁶⁵ New Zealand Fisheries Act 1996: Section 72(3)

⁶⁶ Minimum legal size for blue cod is between 30-33 cm depending on the area. Trevally and snapper must be 25 cm.

⁶⁷ Ministry of Fisheries, *Review of Rock Lobster Commercial Concession Area Regulations*, Initial Position Paper (August 2011) p. 6

⁶⁸ Martin Pastoors, *Evaluation of the Minimum Landing Size for Mackerel in the North Sea and Western Waters* (March 30, 2015) available at <http://www.pelagic-ac.org/media/pdf/Pastoors%20Evaluation%20of%20the%20minimum%20landing%20size%20for%20mackerel.pdf> (Evaluating the rationale that has been used for setting MLS in European fishery and questioning whether the MLS demonstrate “strong scientific underpinning”)

Under Schedule 6 to the Fisheries Act, a fishing operator is authorised to legally discard thirty-two stocks in New Zealand if they comply with area requirements and practice requires. Three stocks—the Chatham Island scallop, the Coromandel scallop, and the northern scallop must be returned to the water if they are collected during a closed scallop fishery season or in an area that has been closed to scallop fishing. Other scallops and dredge oysters may be returned as long as the shellfish is likely to survive on return. Most of the fish and shellfish listed in Schedule 6 “may” be returned to “the waters from which it was taken” if 1) the species is “likely to survive on return” and 2) “the return takes places as soon as practicable” after the species has been taken. This introduces a degree of discretion for the skipper and his crew for the return of Schedule 6 listed species without any explicit duty spelled out in the Statute to report decisions regarding Schedule 6 discards. In practice, the Ministry under the Reporting Regulations discussed below requires that all Schedule 6 species returned to the seabe reported on both catch and landing returns even though Schedule 6 returns will not be counted against ACE.

In general Schedule 6 species are those species understood to have a high level of survivability when returned to the sea. The likelihood of survivability of the species included on Schedule 6t varies depending on a range of factors including the size of the net and the speed with which sorting of the harvest is done. Certain species such as cockles, scallops, oysters, mussels, lobsters, and clams are likely to have a high level of survival, depending on how they have been caught. Hard-shelled species, however, do not necessarily have a guaranteed high survival rate after discarding. As studies in southeastern Australia have demonstrated, the mortality rate for discarded spider crabs averaged more than 50%.⁶⁹ There are existing proposals to include Marlborough Sounds blue cod on Schedule 6 if it is returned alive. Even if a fish is alive when it is brought on the deck, however, fish such as cod with gas bladders that inflate after capture because of pressure changes are also less likely to survive the discarding process when they have been trawl-caught.⁷⁰ Species should not be included on Schedule 6 without rigorous testing of the survivability of the species even when it is returned alive.

It is unclear whether it is legal or not to discard/dump non-QMS species. The Fisheries Act is silent on this issue. The Fisheries Regulations discussed in the next section suggest that there may be some obligation to report discards of non-QMS species.⁷¹

There are a handful of other legal defences available for a fishing operator who discards fish to protect the fishers from potential prosecutions. For example, as long

⁶⁹ D.R. Currie and G.D. Parry. Impacts and efficiency of scallop dredging on different soft substrates. *Can. J. Fish. Aquat. Sci.*, 56 (1999): 539 - 555

⁷⁰ Petri Suuronen, Major Factors Causing Mortality of Trawl-Caught and Discarded Fish, Food and Agriculture Organisation, (2005) <http://www.fao.org/docrep/008/y6981e/y6981e06.htm#bm06.7> (Noting that to increase survivability of fish with swim bladders it is best to use selective gear that permits the fish to escape before being lifted to the water surface).

⁷¹ Fisheries Reporting Regulation 2001, Part 6.

as fishers report a discard as part of its returns, fishing operators may return any fish, aquatic life, and seaweed to the sea where a fisheries officer or observer was present when the marine life was taken, the officer or observer authorised the return of the marine life, and the commercial fisher returned the marine life under supervision of the officer or observer.⁷² Fishers may also legally discard parts of fish to the sea as long as the fish were lawfully processed and the parts of the fish that are retained on board allow for the accurate calculation of greenweight (weight of entire fish).⁷³ Fishing operators may also return catch where there are concerns for the safety of the vessel or crew.⁷⁴ The ability for a fisher to discard QMS species to protect the safety of a vessel is in place to avoid tragedies such as the sinking of the foreign charter boat *Oyang 70* in 2010 off the South coast when a 210 tonne bag of southern blue whiting that came on board compromised the stability of the ship leading to the ship sinking.⁷⁵ In the Fisheries Act, there is no explicit requirement to report QMS species that were “returned or abandoned to ensure the safety of the vessel or any crew member” even though the Ministry has an expectation that these species will be reported under the Fisheries (Reporting) Regulations on Catch Effort Returns.⁷⁶

Fisheries Reporting Regulations

Fishers are expected to report their catch in order to assist fisheries scientists and managers in determining appropriate total allowable catch for the fisheries. Yet the reporting obligations are not straightforward in terms of what fishers are expected to be reported. While it is an offence not to report discarded fish or other aquatic life that has been authorised by a fishery officer or observer, it is unclear what other information fishers are obliged to report regarding what they have discarded under the Fisheries Act to avoid a reporting offence.⁷⁷

For example, under Section 72 of the Fisheries Act 1996, even though there is no legal obligation to report fish returned to the waters that are below a minimum legal size, the Fisheries Reporting Regulations provides little additional clarity.⁷⁸ In

⁷² Fisheries Act 1996 at Section 72(5)(c)

⁷³ Ibid. at Section 72(5)(a)

⁷⁴ Ibid at Section 72(5)(b)

⁷⁵ Fishermen left to die as ship sank, (March 9, 2013) <http://www.stuff.co.nz/the-press/news/8403118/Fishermen-left-to-die-as-ship-sank>

⁷⁶ Compare Ibid., Section 72(6) explicitly requires that fish that have been returned or abandoned when a fishery officer gives permission to return the fish must be reported on the catch records. The same reporting requirement for Section 72(5)(c) is not explicitly made for fish abandoned for the safety of the vessel or crew member.

⁷⁷ Part 10 of the Fisheries Act covers recordkeeping, reporting, disposal of fish and provisions relating to taking and possession of fish for purpose of sale. There is no explicit discussion of reporting of discards in the Fisheries Act except Section 72(6) requiring that fish that have been returned or abandoned when a fishery officer gives permission to return the fish must be reported on the catch records.

⁷⁸ Fisheries Act 1996 Section 72(3)).

practice, MPI does not expect sub-MLS fish returned to the sea to be reported on catch effort returns except undersized Snapper (SNX) which must be reported in the catch effort returns in SNA1 but does not have to be put into the Monthly Harvesting Return. MPI has requested this information from fishers for SNA1 in order to test the value of undersized reporting for calculating stock assessments.

Because of a lack of explicit language in the Fisheries (Reporting) Regulation of 2001 regarding how to report discarded species, there may be some unintentional confusion regarding reporting of sub-MLS fish on catch returns due to guidance in explanatory notes that have been issued in the past. To assist fishers with complying with the reporting regulations, the Ministry has the authority under the Fisheries (Reporting) Regulation to provide to fishers an “explanatory note explaining terms used in the form, or explaining or elaborating on the manner in which the return must be completed or provided.”⁷⁹ Sometimes these notes may have created confusion about what must be reported. For example, explanatory notes on fishers’ catch returns issued in October 2007 indicated that “fish that are below the minimum legal size and are returned alive to the sea should not be reported on your TCER [Trawl Catch Effort Return].”⁸⁰ This leads to the inference that dead undersized quota species should be somehow reported on these returns.

In reality, sub-MLS fish, with the exception of undersized snapper, are typically not reported even though they could be reported and assigned Destination Code A.⁸¹ Some skippers are uncertain about whether they have an obligation or not to record undersized fish and in practice do not report sub-MLS fish.⁸² Given the ambiguity within the explanatory note, there would be no incentive for a skipper to report undersized dead QMS stocks on a catch return because under the current reporting regime (discussed below) the fisher might find himself or herself having to balance any reported sub-MLS fish against a fisher’s ACE.

This raises one issue regarding the potential burden of reporting for skippers. As an example, if a fisher brings in 100 tons of kingfish of which a quarter is undersized but alive, a quarter is undersized and dead, a quarter is above the minimum legal size and likely to survive a release, and the final quarter is above the minimum legal size but unlikely to survive a release, what would the recording of this catch look like? In theory, if one applies the inference from the Explanatory Note to report dead sub-MLS fish, the harvested fish should be divided into four categories for purposes of

⁷⁹ Fisheries (Reporting) Regulations 2001 Section 29 (3)(a)(iii)

⁸⁰ Trawl Catch Effort Return (October 2007): Section 2(11)
https://www.fishserve.co.nz/Media/Default/Documents/TCER_explanatory_notes.pdf; Lining Trip Catch Effort Return Explanatory Notes (October 2007): 3 available at
https://www.fishserve.co.nz/Media/Default/Documents/LTCER_explanatory_notes.pdf

⁸¹ Fisheries (Reporting) Regulations 2001 Part 6 Destination Code A “Fish or fish product of the species or classes of fish subject to the quota management system established under Part 4 of the Act that are returned to the sea, abandoned in the sea, or accidentally lost at sea, except for fish or fish product to which another destination type code applies.”

⁸² Kazmierow, Booth and Mossman (2010) *supra* note 2 : 28.

reporting with three of the categories being reported on catch returns. Depending on whether the fisher wants to retain the kingfish or not for landing, the fisher should have records of three-quarters of the fish caught which will either be assigned a designation code of A for the dead legally sized kingfish and the dead sub-MLS fish (requiring balancing against ACE) or X for the live legally sized kingfish (not requiring balancing against ACE). Applying the inference under the Explanatory Note, only the undersized but alive kingfish returned to the sea would not be reported on the catch effort return. This places the skipper in a difficult position. If the dead sub-MLS fish are reported, they will count against ACE. If the dead sub-MLS fish are not reported, this may run counter to the guidance in the Explanatory Notes.

Fishers may instead suggest that the discards were alive when released and there is no need to report back to the Ministry on half the catch. Where there is no observer providing verification of whether appropriate destination codes have been used for reporting or whether undersized fish were dead or alive when returned to the sea, there may be a gap in the type of stock data that MPI hopes to collect through its reporting requirements including the impact of commercial fishing on sub-MLS stocks.

In practice, a skipper must provide data on discards through two reporting schemes: Catch Effort Returns and Catch Landing Returns. The Catch Effort Returns require the recording of species codes and estimated greenweight. They are not comprehensive forms that reflect everything that may have been brought up in a trawl or on a longline. For example on the statutorily mandated Trawl Catch Effort and Processing Return (Figure 1 below) there is only room for five species and on the statutorily mandated Trawl Catch Effort Return, there is only room for eight species from a set (including both QMS and Non-QMS species) to be listed.⁸³ These forms appear to have been designed primarily for use in single-species fisheries rather than multiple species fisheries. Fishers operating in a multi-species fisheries are only required to provide an estimate of the weight of all other species that may have been caught in the set without identifying the species.⁸⁴

One of the potential concerns with the type of discard data that can be collected from this form is that it is based on fishers estimating weights which introduces a potentially large subjective component into reporting. A key diagnostic of reporting would be comparing a vessel's estimated weight of discards against actual weighed estimates by observers of discards. While providing additional data on this form may be considered to increase the reporting burden, this information could prove valuable for fisheries scientists who are trying to understand the extent of what is being discarded and where it is being discarded. MPI expects in the years to come that the efforts to design a comprehensive Integrated Electronic Monitoring and Reporting System (see Section 6) will improve the collection of more objective discard data.

⁸³ Fisheries Reporting Regulations (2001 Form 5D)

⁸⁴ Ibid.

Trawl, catch, effort, and processing return

To be completed on each day at sea

Date / /	Registration number of vessel (your vessel)	Name of vessel (your vessel)
	Registration number of other vessel (if not fishing)	
Position of midday (noon)		
Latitude	Longitude	E/W
S		
Water temperature at stow 1		
Surface	Depth	Page
		of

Stow	Time	Latitude		Longitude		Dog machine height	Dog gear system	Trawl type	Trawl length (V/W)	Quantity	Estimated catch by species in order of quantity			
		Deg	Min	Deg	Min						EW	Species code	Species code	Species code
1	START									Total (kg)				
	END									Total (kg)				
2	START									Total (kg)				
	END									Total (kg)				
3	START									Total (kg)				
	END									Total (kg)				
4	START									Total (kg)				
	END									Total (kg)				
5	START									Total (kg)				
	END									Total (kg)				
6	START									Total (kg)				
	END									Total (kg)				

Daily Processing Summary

Species	Processed state	Number of processed units	Unit weight (kg)	Processed catch weight (kg)	Conversion factor	Calculated weight before processing (kg)	Species	Processed state	Number of processed units	Unit weight (kg)	Processed catch weight (kg)	Conversion factor	Calculated weight before processing (kg)

I declare that the information I have given on this return is correct and complete, and that I have read and understood the explanatory notes supplied with this return.

Product from oil only Meal (kg)	Oil (litres)	Activity statement (Trawling, steaming etc.)	Name of permit holder	Client number of permit holder	Signature of permit holder or authorised person	Date signed / /
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1. Complete separate returns for each fishing trip and a separate column for each shot. Start a new return if you change gear during a trip.

2. Write the gear code design wingspread m and design headline height m of gear used for these shots.

Trawl catch effort return

Shot number (even shot of paired target species)	Shot no.	Target species	Shot no.	Target species	Shot no.	Target species	Shot no.	Target species
Date: start of shot (mm/yyyy)	/	/	/	/	/	/	/	/
Time: start of shot (24hr clock)	:	:	:	:	:	:	:	:
Latitude: start of shot (degrees minutes)	°	'	°	'	°	'	°	'
Longitude: start of shot (degrees minutes E/W)	°	'	°	'	°	'	°	'
Depth at start of shot	m	/	m	/	m	/	m	/
Ground/rope / Bottom								
Average trawling speed (knots)	·	·	·	·	·	·	·	·
Time: end of shot (24hr clock)	:	:	:	:	:	:	:	:
Non-fish / Protected species catch?	Yes	No	Yes	No	Yes	No	Yes	No
Write the species code and estimated greenweight of each quota and non-quota species caught during each shot.								
For example, if you catch 11000 kg of mullus, write: S N A 1 1 0 0 kg								
More than 8 species? List the 8 species that you caught most of (by greenweight).								
Weight of all other species caught this shot	All other species	kg	All other species	kg	All other species	kg	All other species	kg

Form Number **TCR**

3. Permit holder and vessel details

Name of permit holder

Client number of permit holder

Name of vessel

Registration number of vessel

Name of fisher (first letter of first name given first four letters of surname)

Registration number of other vessel (paired fishing)

Date signed / /

I declare that the information I have given on this return is correct and complete, and that I have read and understood the explanatory notes supplied with this return.

Signature of permit holder or authorised person

Do not forget that you need to complete a landing return. Send completed returns to PO Box 257, Wellington (NZ).

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Figure 1. Trawl, catch, effort, and processing return forms.

Fisheries reporting does not end with the catch effort return. Under the fisheries regulations, skippers must also submit catch landing returns (Figure 2) and monthly harvest returns. Every skipper must not sell or otherwise dispose of fish except to a licensed fish receiver.⁸⁵ When a skipper lands his fish and transfers it to a licensed fish receiver, he or she must provide a catch landing return. This form provides for

⁸⁵ Fisheries Act 1996 Section 191(1)

are reported under Destination Code A count against the fisher's ACE. The Ministry expects this code to be used for fish that have been accidentally lost if there is an equipment failure, parts of fish that are returned as part of an on-board processing, or fish that are returned to ensure the safety of vessel or crew members.

Discarded fish that are part of the QMS but are smaller than minimum legal size and returned "alive" are supposed to be reported under destination code D which covers fish that are "not subject to the quota management system" including non-QMS species. These fish are not counted against ACE and deemed value is not calculated for these species. Only dead undersized QMS fish should be reported as fish that have been "returned to the sea, abandoned in the sea, or accidentally lost at sea" under destination code A.

Fish that are returned under the authority of an observer or fisheries officer approving the return are assigned a J destination code. These can also include QMS species that are of Minimum Legal Size. These fish count against ACE allocations. New Zealand's deepwater fleet utilise this exception to the general no discard policy in consultation with onboard observers. Inshore fisheries vessels typically do not cover observers and do not make use of this destination code.

Discarded spiny dog fish are assigned a destination code of M. These fish, which are often perceived as "pest fish" because they predate on target fish and have high levels of abundance in the area of target fish, can be returned to the sea alive, near-alive, or dead. Spiny dogfish will come off ACE and deemed value may be assigned where ACE has been exceeded.

Fish that are listed in Schedule 6 (except for the spiny dogfish, blue shark, mako shark, and porbeagle shark) that are returned in compliance with Schedule 6 requirements are listed with destination code X. These fish will not be counted against ACE because there is a presumption of a high likelihood of survivability. Finally, dead or near dead blue sharks, mako sharks, and porbeagle sharks are assigned a destination code of Z in order to provide more transparency regarding shark finning. These listings will count against ACE. A summary of the reporting requirements and whether the reports count against ACE is provided in Table 1 below.

Monthly harvest returns are expected to include fish that are returned under destination code A as well as those returned with the approval of the observer and the various sharks (destination code J, M, and Z) because these require an ACE allocation and may be used to calculate deemed values. Monthly harvest returns do not need to include discards that have been returned in compliance with Schedule 6 requirements (destination code X) because of the presumption that there has not been a depletion of biomass.

Table 1. Summary of reporting requirements for different stocks related to returns.

Destination Code	Regulatory Destination	Counts Against ACE
A	QMS species that are returned to the sea, abandoned in the sea or accidentally lost at sea, except for fish to which other destination type codes apply.	Yes
D	Non QMS species that are returned to the sea, abandoned in the sea, or accidentally lost at sea	No
J	QMS species that have been returned to the sea with the approval of an observer	Yes
M	Spiny dogfish returns	Yes
X	QMS species listed on Schedule 6 of the Fisheries Act that do not have a separate destination code and are returned to the water in accordance with requirements of Schedule 6	No
Z	Blue shark, mako shark, and porbeagle shark discards that are dead or near dead ⁸⁶	Yes

Even though Section 72 of the Fisheries Act 1996 is not explicit about the need to report non-QMS species, there is requirement under the Fisheries Reporting Regulations to report non-QMS species. The catch landing return includes destination code D for species “not subject to the quota system” that “are returned to the sea, abandoned in the sea, or accidentally lost at sea”. There is a purported high level of

⁸⁶ If a blue shark, mako shark, or porbeagle shark is returned live then it is reported under Destination Code X.

reporting for discards of non-QMS species after the fishing industry observed the impact of not reporting spiny dogfish in the 1990s. When spiny dogfish was moved from being a non-QMS species to being a QMS species, the actual reported catches of dogfish were used for assigning catch allocations. Some members of the fishing industry indicated a desire to amend their reporting to include large quantities of discarded dogfish, but the Ministry of Fisheries did not permit these amendments. Subsequent to the spiny dogfish situation, fishers are now actively reporting non-QMS species on the chance that they may be moved into the QMS, and there is currently no financial penalty associated with reporting non-QMS species.

For most QMS species, the regulatory reporting mechanisms provide a vehicle for the collection of data. Rock lobsters are the one exception where the current regulations may be hindering the collection of accurate data on discards. New Zealand fisheries regulation requires that all rock lobsters captured by commercial fishers must be landed alive.⁸⁷ Schedule 6 of the Fisheries Act 1996 only permits fishers to discard rock lobster that are “likely to survive on return.” For lobsters caught in nets or pots that come up dead or near-dead, fishers will be discarding these catches because they are prohibited by regulation from landing dead lobsters. The current reporting schemes make it impossible to ascertain to what extent lobsters die in transport or as part of the harvest process. This could have implications for setting the total allowable commercial catch. Fishers that record their catch under Destination Code X where the catch have not been returned according to the standards of Section 6 may be prosecuted for failure to record under Destination Code A and have the catch counted against the ACE. There is obviously a strong incentive not to report under Code A when there is no viable market for the products even though it is a reporting offence.

There is some potential for disparities between landing records and catch effort estimates to occur. Ideally, all discards should be weighed before being discarded. There are some practical challenges with requiring weighing, including ensuring that every vessel has an appropriate weighing device, calibrating devices, and incorporating a weighing process into the current fish processing system.⁸⁸ Taking time to weigh fish that will ultimately be discarded could also increase the mortality rate for those fish when they are returned to the sea if there is delay between unpacking a trawl net and returning the fish to the sea. In an ideal situation, fish would be sorted into several categories—QMS fish that are either dead or alive and will be kept, QMS fish that are alive and likely to remain alive and will be discarded, QMS fish that are dead and will be discarded, non-QMS species that will be retained, and non-QMS species that will be returned. Attention on a vessel is typically only given to QMS fish that will be landed. It may be possible to make system-wide changes to the sorting process that would allow for more accurate calculations of discard weight than can currently be provided on the catch landing reports.⁸⁹ The modular harvest system being tested as part of the Precision Seafood Harvesting

⁸⁷ Fisheries (Commercial Fishing) Regulations 2001: Section 42.

⁸⁸ J. Callahan, C. Faunce, J. Bonney, and R. Swanson, A Field Test of Fisheries Observer Sampling Methods for Estimation of At-Sea Discards, *Fisheries Research* 174 (February 2016): 219-233.

⁸⁹ *Ibid.*

System (Tiaki System) may enhance the survivability of fish brought on board the deck before sorting and make it more feasible to both improve the accuracy of reporting and the survivability of fish returned to the sea.⁹⁰

Deemed Value for Overages Including Reported Discards

For all of the quota management stocks that are above the minimum legal size and not included in Schedule 6 of the Fisheries Act 1996, commercial vessels must by law retain the fish. Minimum legal sizes have only been set for 11 finfish species and 4 shellfish species. If the commercial fisher does not have sufficient annual catch entitlement for a given retained fish and are not able to acquire ACE post-harvest, they are expected to pay a deemed value rate. The deemed value rate is set at different rates depending on the species, the fishing management area, and the amount by which the catch exceeds the annual catch entitlement. The deemed value rate is intended to be a penalty to discourage fishing entities from fishing beyond the ACE that they are currently holding or that they can anticipate acquiring. Deemed values are not assigned to non-quota species so there is no incentive for avoiding these species.

The Ministry for Primary Industries intends to set deemed value rates at a level that creates “an effective incentive for individual commercial fishers to balance catch with Annual Catch Entitlement and for the overall catch to remain at or below the total available Annual Catch Entitlement in any one year”.⁹¹ The following principles govern the setting of deemed value as an economic tool for the Ministry:

Principle 1: Deemed Value Rates Must Generally be Set Between the ACE Price and the Landed Price

Principle 2: Deemed Value Rates Must Generally Exceed the ACE Price by Transaction Costs

Principle 3: Deemed Value Rates must Avoid Creating Incentives to Misreport

Principle 4: Deemed Value Rates for Constraining Bycatch Species May be Higher

Principle 5: Deemed Value Rates must Generally be Set at Twice the Landed Price for High Value Single Species Fisheries and For Species Subject to International Catch Limits

Principle 6: Deemed Value Rates for Chatham Island Landings may be Lower

Principle 7: Interim Deemed Value Rates must Generally be Set at 90% of the Annual Deemed Value Rate

⁹⁰ The Precision Seafood Harvesting System is discussed in Section 6 below.

⁹¹ Ministry for Primary Industries, Deemed Value Guidelines , MPI Technical Paper No. 2012/08 (4 July 2012)

Principle 8: Differential Deemed Value must Generally be Set to Reflect Impact of High-levels of Over-Catch on Sustainability⁹²

The deemed value is collected on a monthly basis and is tied to the catch reports. The concept of a monthly payment of deemed value was designed in order to assist individual fishing operations with managing risk associated with not holding adequate ACE at the time of fishing. The interim payments of deemed value, which are less than final deemed value payments, are intended to incentivize fishers to locate ACE before the end of the fishing year when final catch balancing takes place and to change fishing strategies. For example, the deemed values are tiered depending on the amount of fishing that has occurred in excess of existing ACE (e.g. 100%-110% in excess of ACE, 110-120% in excess of ACE). In practice, this means that a fisher who has been acquiring large interim deemed values should change fishing practices in order to avoid certain fish or should make a concerted effort to acquire ACE.

While fishers are expected to make good faith efforts to acquire annual catch entitlements in order to avoid paying deemed value, this can prove difficult. Some holders of ACE particularly for “choke species” in the market are reluctant to sell that ACE until the end of the year, and this may lead to increases in the price of the ACE that are beyond the capacity of some individual fishers to pay.⁹³ At the end of the year, MPI will review catch documentation and determine whether a given fisher covered his or her catch with ACE. A failure to purchase ACE to cover catch will result in a final deemed value payment. For fishers that do not think that they can acquire ACE, there are incentives to either misreport or discard.⁹⁴

Monies generated from payments of deemed value go into general government funds and are not specifically set aside for improved fisheries management. The rationale in not reassigning the funds to fisheries management is that the deemed value rate is intended to be a civil penalty to deter fishing beyond the available quota. While this is understood, counting almost all discards against a fisher’s ACE quota can provide a financial incentive for individual fishers to under-report catches.

The current system of deemed value operating to penalise fishers has been identified as one of the reasons that some fishers may be engaged in illegal dumping particularly in mixed fisheries with “choke species” that prevent additional harvesting of other species. For some species, there may be extremely limited access to ACE because it is

⁹² Ibid.

⁹³ “Choke species” refers to species with relatively low or restrictive quota allocations under a quota management system. Once these fish have been caught then it generally shuts down a mixed fishery to the capture of other species because of fears of fishers of capturing a “choke species” for which they have no remaining quota and no opportunity to acquire quota. In practice, this means that fishers may at the end of the year end up with unused quota. “Choke species” can be particularly problematic when the “choke species” is widely distributed.

⁹⁴ Ministry for Primary Industries, Tarakihi 1 para. 77 http://www.fish.govt.nz/NR/rdonlyres/71A70A42-EBA6-49AA-A278-515DF4D1D19B/0/ipp_07_08_tar1.pdf (Describing incentives to discard Tarahiki in Fishing Management Area 1 because ACE is often unavailable)

both a target species and a bycatch species and this, coupled with high deemed values that make landing the fish unprofitable, may lead some fishers to dump fish at sea. Because of a concern that in some cases licensed fish receivers (LFR) are encouraging illegal discarding by not covering the ACE for fishers who are fishing under a contract to deliver fish of a certain size there are proposals being considered within MPI to apply deemed value penalties equally to both a LFR and a permit holder in order to create an incentive for a LFR to find ACE to cover an overage for their contract fishers.

Observers and Discards

In order to reduce illegal discard practices, MPI has focused on enhancing compliance and has implemented observer programmes on board certain vessels to collect data for fisheries management purposes which include discarded quota species. Since 2005, MPI has more than doubled the number of observer days from under 5000 days at sea to more than 10,000 days at sea. When observers are on board, there is often a high level of adherence to discard policies and generally better reporting.⁹⁵ The use of observers to confirm results seems to have been effective for reducing illegal discards among many of the deepwater fisheries vessels and leading to a shift in fishing culture for the deepwater fleet. However, using observers has not been feasible on a wide scale for many inshore fisheries vessels due to the lack of space on these vessels and the more unpredictable fishing schedules due to weather and boat mechanical issues.

Even in the deepwater fishing fleet, not every vessel will be required to carry an observer because of limited resources. Fisheries scientists and compliance officers can request the deployment of an observer on board a vessel. Observers are required on all foreign-owned vessels even if they reflag to a New Zealand flag.⁹⁶ All commercial fishing vessels are now required to be registered under New Zealand law. A New Zealand owned vessel over 20 metres is not required to carry an observer unless MPI requests them to carry one. MPI is likely to assign observers to domestically owned deepwater vessels that have a high risk rating which is calculated based on past history of illegal discarding or misreporting, trucking (fishing in one QMS area but reporting the catch as coming from a different QMS area), labour violations, maritime safety concerns, or food safety concerns. Vessels at registration will know their risk status and whether they are likely to be asked to carry an observer.

Risk assessment for vessels has been limited to deepwater vessels but MPI is considering extending it to all vessels over 26 metres regardless of where they will be fishing. There has been resistance to carrying observers by some members of the inshore fleet because of concerns about the extra expense and, for a few vessels, the fear of having their discard practices more carefully scrutinised. There is a perceived

⁹⁵ This is referred to as the “observer effect”. *See e.g.* H. Benoit and J. Allard, Can the Data from At-Sea Observer Surveys be used to Make General Inferences about Catch Composition and Discards? *Can. J. Fish. Aquat. Sci.* 66 (2009): 2025-2039 (Finding strong “observer effects” across Gulf of St. Lawrence fisheries after controlling for several sources of variability)

⁹⁶ Claire Trevett, Fishing Changes: Foreign Vessels yet to Reflag with Government, (May 1, 2016), http://www.nzherald.co.nz/nz/news/article.cfm?c_id=1&objectid=11631799

need for more observers to be carried on inshore vessels and some discussion that these vessels should not be permitted to fish until they can accommodate an observer.

Observers, who generally have some science background or a fishing industry background, do not have enforcement powers. They are restricted to collecting data about on-vessel conditions, verifying data provided by the ship crew, and, in some instances, authorising quota discards. In order to authorise QMS discards, the observer must be able to quantify the amount of discards which are then recorded on a “discarded quota species” form within the observer report (See Figure 3 below). They will subsequently check their report against official catch reports submitted by the vessel. If they have concerns about fishing violations, they will report these to MPI compliance officers for further investigation. Observers do have the power to “inform and assist” in minor matters and may provide some informal education to vessel crew on good discard practices.

It is not necessarily easy for an observer to collect discard data. Usually, a vessel, unless it is a high-risk vessel, will only have one observer on board. Observers can only work 12 hours a day and have a number of verification tasks to accomplish on board so they cannot focus constant attention on the discard chutes. It is not uncommon on a ship with poor systems for calculating discarded fish that there will be discrepancies between the amount of discarded fish calculated by the vessel in its logbooks and catch returns and the amount of discarded fish calculated by the observer.

Using observers is considered a gold-standard for verifying compliance with various fisheries regulations. Recent research suggests that for observer data to be useful in terms of calculating discard rates, there may need to be some calibration of on-deck sampling methods under varying catch conditions and for different fisheries. Researchers who compared a number of discard calculation methods found variances between observers based on what data were being collected and what assumptions were being used.⁹⁷ The researchers concluded on the basis of data collected in the rockfish and arrowtooth flounder fisheries in the US that accuracy was higher for observers who used a stratified random sample collected from the portion of the catch that was to be discarded at sea rather than a random sample taken from the total catch of each haul.⁹⁸

⁹⁷ Callahan *supra* note 88.

⁹⁸ *Id.* at 232. (Researchers commented that while their research showed the stratified random sampling generating more accurate discard rates that this approach might not be able to be applied in a “one-size-fits-all” approach across all fisheries)

DISCARDED QUOTA SPECIES

Discard Authority/s fully furnished? (YES, NO, N/A)	NO
Has the skipper (or authorised person) recorded the discards on the processing summary of the TCEPR? (YES, NO, N/A)	YES
Number of authorities:	5

Species Code	Estimated Quantity (kg)	Assessment Method	Reason for discard
BAR	164	Vessel figure and weighed in full	Damaged or not processing.
GSH	535	Vessel figure, eyeball estimate, weighed in full.	Damaged or not processing.
HOK	534	Vessel figure, weighed in full.	Damaged or not processing.
RBM	13	Vessel figure, weighed in full.	Damaged or not processing.
RCO	108	Vessel figure, weighed in full.	Damaged or not processing.
SCH	537	Vessel figure, weighed in full.	Damaged or not processing.
STA	121	Vessel figure, weighed in full.	Damaged or not processing.
BCO	1	Weighed in full.	Damaged or not processing.
BWS	8	Weighed in full.	Damaged or not processing.
GSC	2589	Weighed in full.	Damaged or not processing.
LIN	14	Weighed in full.	Damaged or not processing.
RBT	17	Weighed in full.	Damaged or not processing.
RSK	12	Weighed in full.	Damaged or not processing.
SBW	3	Weighed in full.	Damaged or not processing.
SKI	1	Weighed in full.	Damaged or not processing.
SPE	3	Weighed in full.	Damaged or not processing.

Figure 3. Example of a discard quota list from an observer report.

Prosecutions for discarding

The Ministry for Primary Industries and its predecessor the Ministry of Fisheries (1995-2012) has prosecuted for dumping offences under the Fisheries Act 1996. Many of these cases were brought when the Ministry noted discrepancies in reporting, disgruntled crew made reports, or third-parties reported illegal discarding activities. For example, in 1998, the Ministry of Fisheries brought a case against a number of individuals whose on board operations were processing so many hoki and hake that quota species were also discarded without full reporting.⁹⁹ Again in 2007, the Ministry of Fisheries obtained a successful prosecution of the skipper, first mate and the factory operator on a hoki boat operating in the Southern Ocean in September 2004 who were bringing so many fish on board that they could not keep up with the

⁹⁹ Ministry of Fisheries v. William Thomas Dunwoodie and Peter Wylie, Reserved Judgment of Judge D.A. Ongley (D.C. Wellington, 25 March 1998): 81

processing.¹⁰⁰ With so many fish coming on board, the fish could not be processed before spoilage would begin. Instead of slowing the harvest, the first mate and factory operator directed that somewhere around 115 tons of southern blue whiting should be illegally dumped. These fish were either dumped over the side at night or discharged through the sump in the factory floor where they were minced before being released through a vessel waste pipe during the day. In one case, 20 tons of fish waiting in the fish storage area were discarded because a new catch was going to be unloaded.¹⁰¹ None of the dumped fish were declared.¹⁰²

In 2009, three Polish crewmen on the FV *Atria* were given a heavy sentence by the Christchurch District Court for fish dumping. The case was brought on the basis of testimony from nine Polish fishers who had first-hand evidence including cell phone video footage of poor fishing practices. The three crew members were assigned fines of \$147,500 to be paid within 28 days of the sentence. The three crewmen left New Zealand before the sentences were handed down so it is unclear whether the Crown was able to collect the fines.¹⁰³

It may be difficult to bring prosecutions due to the nature of evidence that must be marshalled and the need to prove that something happened beyond a reasonable doubt. For example, in a case that was considered for prosecution, even with the evidence of quota species being observed passing through a discard chute every 10 seconds when it was not being attended to by the crew, the Ministry opted not to prosecute the case due to evidentiary concerns but instead to warn the ship's master that he would be prosecuted if it did not better monitor its discards.

Dumping violations are strict liability offences and the Ministry does not need to prove intent.¹⁰⁴ A defendant can argue that the dumping was the result of an accident or "some other cause beyond the defendant's control" and "the defendant took reasonable precautions and exercised due diligence to avoid the contravention".¹⁰⁵ In 2007, the Court found that a fisher who left a kilometre long line of dead snapper in the wake of the boat did not take necessary precautions to avoid abandoning fish.¹⁰⁶

The sentences for dumping prosecution vary greatly. When a Court hands out a sentence, it is expected to take into account "the difficulties inherent in detecting fisheries offences" and "the need to maintain adequate deterrents against the

¹⁰⁰ Ministry of Fisheries v. Lee Craig Harding, *supra* note 26..

¹⁰¹ *Ibid.* at para. 31.

¹⁰² *Ibid.* at para. 6.

¹⁰³ Ministry for Primary Industries, Press Release, Heavy Sentencing Sends Clear Message to Commercial Fishers (17 March 2009)

¹⁰⁴ Fisheries Act 1996 Section 240.

¹⁰⁵ *Ibid.* at Section 241(1)(a)

¹⁰⁶ Harvey Fishing Limited v. Ministry of Fisheries, *supra* note 64 at para. 37.

commission of such offences”.¹⁰⁷ Aggravating features in relation to fisheries offences include the professional qualifications of the offender, whether substantial numbers of fish were dumped, the amount of profits, whether the dumping was repeat behaviour, and whether an offender knew that an offence was committed and was attempting to conceal the offence.¹⁰⁸ An individual who abandoned a kilometre of snapper was assigned a fine of \$3,500.¹⁰⁹ An individual who dumped 1 ton of snapper and had the potential to profit \$13,000 was fined \$27,000 because it was “a cynical dumping of a large quantity of a high value species for commercial gain, an offence that struck at the heart of the quota management regime”.¹¹⁰ An individual who discarded hoki, squid and barracoota was fined approximately \$80,000.¹¹¹ In some cases fines have been revised to take into consideration financial capacity to pay the fine.¹¹² The maximum available punishment for a violation of Section 72 is imprisonment. Discard violations can result in fishery prosecutions which are criminal offences with fines that can range up to \$250,000. A criminal prosecution for dumping includes a forfeiture of property used in the commission of the offence which would include a vessel. The high fines associated with discard violations and the forfeiture of vessels are justified by the low probability of being detected and the inference that once a fisher has been detected that they are likely to have been a repeat illegal discarder before the detected violation. In theory, an individual who commits a fisheries crime such as illegal discarding can be banned from fishing for up to three years if they are found to have committed more than two offences.

Relationship between 1996 Fisheries Law and other International Commitments

Even though the discard policy described above is relatively straightforward; i.e. fishing vessels must retain QMS species unless there is an exception under Schedule 6 and pay deemed value if they do not have adequate quota to cover the landing, this policy has the potential to conflict with other positions that the New Zealand government is taking on conservation. For example, as a party to the Convention on Migratory Species Memorandum of Understanding (CMS MOU) on sharks, New Zealand has agreed to non-legally binding international obligations involving the shortfin mako, longfin mako, porbeagle, and spiny dogfish.¹¹³ All of these shark species are currently listed in Schedule 6 as species that “may” be returned whether

¹⁰⁷ Ministry of Fisheries v. Ross Ian Harvey CRN 1008-7500-395 (D.C Whakatane, 16 September 2011) (Sentencing Remarks of Judge PA Moran)

¹⁰⁸ Ministry of Agriculture & Fisheries v. Lima 146/93 (High Ct. Auckland 26 August 1993)

¹⁰⁹ Harvey Fishing Limited *supra* note 64.

¹¹⁰ Ministry of Fisheries v. Ross Ian Harvey *supra* note 107: para. 27.

¹¹¹ Ministry for Primary Industries v. Dae Jun Lee, *supra* note 27..

¹¹² Ministry of Fisheries v. Ross Ian Harvey *supra* note 107: para. 40. (Original proposed fine was \$69,000)

¹¹³ Convention on Migratory Species, Memorandum of Understanding on the Conservation of Migratory Species (February 2016) *available at* <http://www.cms.int/sharks/en/page/sharks-mou-text>

alive, near-dead or dead. The shortfin mako, porbeagle, and spiny dogfish are identified as non-threatened and are part of the QMS.¹¹⁴ While New Zealand is in compliance with the MOU expectation that it record discards of these species,¹¹⁵ there is no specific national legislation on the conservation of these species and their habitats as encouraged by the CMS MOU. There is legislation prohibiting shark-finning. The option to allow discretionary discards of some of these species under Schedule 6 may raise issues under the CMS MOU.

In addition to the CMS MOU, New Zealand as a longstanding member of the Food and Agriculture Organisation Council endorsed the 1995 FAO Code of Conduct for Responsible Fisheries and the 2001 International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (IPOA-IUU). While these are both voluntary instruments and will not trigger state responsibility claims, both documents are still intended to provide a framework for FAO Member States to act both within areas under national jurisdiction and on the high seas. Both documents are relevant to understanding how New Zealand's policies of managing both legal and illegal discards measures up against best global practices. More recently, New Zealand has supported the development of the 2010 International Guidelines on Bycatch Management and Reduction of Discards.

i. FAO Code of Conduct for Responsible Fisheries

Of note for the topic of this paper, there is an expectation in the FAO Code of Conduct that "States and users of aquatic ecosystems should minimise waste, catch of non-target species, both fish and non-fish species, and impacts on associated or dependent species".¹¹⁶ Addressing discard practices is discussed in the Code as one key driver for ensuring responsible fisheries management. As management objectives, States should "adopt appropriate measures" to ensure that "waste, discards, catch by lost or abandoned gear, catch of non-target species, both fish and non-fish species, and impacts on associated or dependent species are minimised, through measures including, to the extent practicable, the development and use of selective, environmentally safe and cost-effective fishing gear and techniques".¹¹⁷ Long-term management objectives such as minimising waste or discards should be "formulated as a fisheries management plan or other management framework".¹¹⁸ States should collect "timely, complete and reliable statistics on catch and fishing effort...in sufficient detail to allow sound statistical analysis".¹¹⁹ The date should be "updated

¹¹⁴ Ministry for Primary Industries and Department of Conservation, National Plan of Action Sharks (2013):10.

¹¹⁵ Fisheries Regulations 2001 (Part 6 A and Part 6B)

¹¹⁶ Food and Agriculture Organisation, Code of Conduct for Responsible Fisheries, 2001: Section 6.6.

¹¹⁷ Ibid. at Section 7.2

¹¹⁸ Ibid. at Section 7.3.3

¹¹⁹ Ibid. at Section 7.4.4

regularly and verified through an appropriate system”.¹²⁰ The expectation that States minimise waste and discards is reiterated as a responsible fisheries management measure.¹²¹

While New Zealand definitely endeavours to collect fish catch and landing to support the operation of the quota system, it is less clear at the level of fisheries management plans that minimising discards has received much attention across all of New Zealand’s fisheries. In the deepwater fisheries, the fisheries plan requires the ministry to ensure that deepwater and middle-depth key bycatch fish stocks are managed to an agreed harvest strategy with avoidance or minimisation of adverse effects on incidental bycatch species.¹²² In contrast, in the 2011 Draft National Fisheries Plan for Inshore Finfish, there are only brief mentions that some stocks are likely to be caught as bycatch and a mention that high-grading and dumping pose risks to the fisheries.¹²³ Because the fisheries plans are interim plans focused on stock assessments, discards are handled separately.

ii. International Plan of Action to Prevent, Deter, and Eliminate Illegal, Unreported, and Unregulated Fishing (IPOA-IUU)

As noted in the introduction, there are two types of discards: legal and illegal discards. Given the historical practices of discarding and the current financial threat of deemed value in the New Zealand system, some catch information which should be reported under the Fisheries Act 1996 may not be ultimately reported. The IPOA-IUU was negotiated by State parties to the FAO to address underreporting of fish. Under the IPOA-IUU, each State is expected to develop and implement a national plan of action that is reviewed “at least every four years” after its adoption¹²⁴. As part of this plan States are expected to have an authorisation to fish which includes catch reporting conditions including “discard statistics”.¹²⁵ New Zealand has fishing authorisation requirements under Section 89 of the Fisheries Act which includes catch and effort reporting. Whether the existing reporting requirements are sufficient to serve as “discard statistics” for purposes of complying with the IPOA-IUU is an outstanding issue since the existing forms are limited in the scope of information that they collect particularly from some types of fisheries.

New Zealand has made a good faith effort through the implementation of its QMS and Section 72 of the Fisheries Act to address the issue of discards and potential

¹²⁰ Ibid.

¹²¹ Ibid. At Section 7.6.9

¹²² Ministry of Fisheries, National Fisheries Plan for Deepwater and Middle-Depth Fisheries, (2010) Management Objective 2.1 and Management Objective 2.4

¹²³ Ministry of Fisheries, Draft National Fisheries Plan for Inshore Finfish, July 2011

¹²⁴ Food and Agriculture Organisation, International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported, and Unregulated Fishing, (2001)

¹²⁵ Ibid. at para. 47.2.3

underreporting due to illegal discards. The contemporary challenge for New Zealand as discussed in Section 3 and 4 below is whether the Ministry for Primary Industries has the necessary data associated with discarding practices (both legal and illegal) to understand whether the government's fisheries management can continue to reliably support sustainable stocks.

iii. International Guidelines on Bycatch Management and Reduction of Discards Guidelines

Concerned that the 1995 Code of Conduct endorsed by all FAO members was not being fully implemented, the FAO Committee on Fisheries adopted a set of voluntary technical guidelines to assist States and Regional Fisheries Management Organisations (RFMOs) in better managing bycatch management and reduction of discards.¹²⁶ The FAO Committee on Fisheries indicated that despite a variety of efforts, “problems persist with the high levels of unwanted and often unreported bycatch and discards in many fisheries around the world, including the capture of juveniles of economically valuable and ecologically important fish”.¹²⁷ Of particular concern were unreported and unregulated landings of bycatch, discards, and pre-catch losses.¹²⁸

Governance over bycatch management and discard reduction should include flag States, port States, coastal State, or importing or exporting markets.¹²⁹ States are expected to “implement national policies, legal and institutional frameworks” that “should enable, *inter alia*” (a) the application of an ecosystem approach to fisheries; (b) use of effective input controls (e.g. number of fishing vessels, time duration for fishing, gear restrictions) and/or output control (e.g. total allowable landings, bycatch limits); (c) implementation where appropriate of co-management mechanisms, and (d) implementation of international fisheries measures (e.g. RFMO conservation measures).¹³⁰ As part of the strengthening of institutional and management frameworks, States and RFMOs are expected to “develop or amend” fisheries management plans “so that the plans include objectives for the use and management of that portion of the full catch of which bycatch and discards are subsets”, encourage fisher’s involvement in bycatch and discard reduction efforts, and “promote the use of appropriate incentives” for bycatch and discard reduction.¹³¹ Because no further explanation is offered in the guidelines on what constitutes best “use” of bycatch and discards, the expectation that States and RFMOs “develop or amend” fisheries management plans “for the use and management of that portion of the full catch of

¹²⁶ Food and Agriculture Organisation, *International Guidelines on Bycatch Management and Reduction of Discards* (2010) at para. 2.2.

¹²⁷ *Ibid.* at para. 1.3.

¹²⁸ *Ibid.* at para. 1.4.

¹²⁹ *Ibid.* at para. 3.1

¹³⁰ *Ibid.* at para. 3.1.2

¹³¹ *Ibid.* at para. 3.2.4.

which bycatch and discards are subsets” may be a complex guideline to implement.¹³² What is clear is that States both individually and within the context of RFMOs need to improve the collection of information on by-catch to ensure that fisheries management can be based on a scientific basis rather than on speculation about the health of a fishery.

The international guidelines offer a number of specific suggestions to States. Regarding management, States and RFMOs are expected to:

- (a) focus more attention on identifying and assessing fisheries where discards occur
- (b) perform risk assessments “to identify the specific nature and extent of bycatch and discard problems in the fishery as a basis for prioritisation and planning”
- (c) review “the effectiveness of existing initiatives to address the bycatch and discard problems”
- (d) review “the potential effectiveness of alternative methods to address the bycatch and discard problems identified in the risk assessment”
- (e) assess impacts of discard reduction measures on fishing operations and “on livelihoods to ascertain the potential effects of their implementation and the support necessary to facilitate their uptake”
- (f) review systems for regular monitoring of effectiveness of measures to reduce discards.¹³³

Measures to manage bycatch and reduce discards should be “binding; clear and direct; measurable; science-based; ecosystem based; ecologically efficient; practical and safe; socio-economically efficient; enforceable; collaboratively developed with industry and stakeholders; and fully implemented”.¹³⁴ Possible management tools for reducing bycatch include input/output controls; improvement of gear design for selectivity; spatial and temporal measures such as closures; quotas on bycatch; bans on discards; and “incentives for fishers to comply with measures to manage bycatch and reduce discards”.¹³⁵ Examples of incentives for compliance could include

¹³² *Ibid.* at para. 4.1.4 (iv)(e) (States are encouraged for the same stock or in the same fishery to “utilise the bycatch to the extent possible that continues to be taken under these measures in a manner that is consistent with the Code”.)

¹³³ *Ibid.* at para. 4.1.2

¹³⁴ *Ibid.* at para. 7.1

¹³⁵ *Ibid.* at para. 7.3

subsidised gear that reduces discards or access to fishing that would otherwise be closed if selective gear is used.¹³⁶

New Zealand has performed public risk assessments for protected species that may become incidental bycatch such as seabirds and marine mammals, and these assessments show progress in reducing bycatch. Between 2002 and 2014, the estimated number of seabirds incidentally caught declined from 7280 to 4380.¹³⁷ MPI has also conducted risk assessments for sharks and skates, with recommendations that “fisheries activity and shark distribution range” be examined at finer scales in order to understand the potential for impact within specific sub-regions rather than the whole EEZ.¹³⁸ Similar risk assessments have not yet been undertaken for discard species that are not sharks or skates, although plans are underway to conduct risk assessments for fish species. It may be advantageous to conduct these risk assessments particularly with an emphasis on understanding not just the levels of discards but also the social and economic drivers that may be contributing to high discard levels.

States are expected to support controlled trials to investigate the effectiveness of mitigation measures and to encourage discard reduction innovation through collaboration of relevant stakeholders.¹³⁹ New Zealand’s investment in Precision Seafood Harvesting technology discussed in Part 6 below conforms well to these guidelines. States are also expected to establish “appropriate and reliable monitoring and assessment techniques” in order to determine the effects of bycatch and discards on aquatic resources and make appropriate changes to better manage bycatch and reduce discards.¹⁴⁰ While New Zealand has a comprehensive reporting system in place and an active observer programme, there are still gaps in the monitoring and assessment system, particularly for some inshore fisheries where there have not been systematic reviews of the accuracy of vessel self-reporting. MPI is currently planning to improve its verification efforts by requiring all vessels to install IEMRS. MPI may also deploy more observers in certain fisheries in order to better understand discarding practices in the inshore fisheries.

¹³⁶ Ibid. at para. 7.8.

¹³⁷ Ministry for the Environment, Environment Aotearoa 2015 p. 97 available at <http://www.mfe.govt.nz/sites/default/files/media/Environmental%20reporting/environment-aotearoa-final.pdf>

¹³⁸ R.B. Ford et al. Qualitative (Level 1) Risk Assessment of the Impact of Commercial Fishing on New Zealand Chondrichthyans (September 2015) <https://www.mpi.govt.nz/document-vault/9803> (noting that risk assessment was undertaken as part of New Zealand’s obligation under its national plan of action on sharks)

¹³⁹ FAO Guidelines on Discard Reduction, *supra* note 126 at para. 7.5

¹⁴⁰ Ibid. at para. 5.1.1

3 NEW ZEALAND INDUSTRY AND INDIVIDUAL FISHERS PERSPECTIVES ON DISCARD MANAGEMENT

Many of New Zealand's fishers are keenly aware of the need to reduce discards in order to maximise economic yield. The more unwanted fish and other marine biomass that a fisher brings on board, the more work that a fisher has to take to sort the catch for valued fish. Fishers have taken measures including increasing minimum mesh size and preparing fisheries plans designed to minimise bycatch and discards. In doing so, members of the industry have reduced some of their economic costs associated with wasted fishing effort and post-harvest sorting.

As part of its pursuit of Marine Stewardship Council certification for certain fisheries, the deepwater industry has on its own initiative addressed some of the ongoing concerns over bycatch and discards by creating voluntary codes of practice for deepwater vessels.¹⁴¹ For example, the hoki fishery implemented a code of practice in 2001 which included a requirement for vessels to restrict their fishing in areas shallower than 450 metres and "move on" if too many juvenile fish were caught.¹⁴² In 2009, the deepwater fleet ceased implementing the "move on" rule and changed its fleetwide fishing practice to prohibit fishing for hoki in four areas by vessels longer than 28 metres where there are large concentrations of juvenile hoki.¹⁴³ Because New Zealand's deepwater fleet has approximately 60 vessels and there are ongoing personal and professional relationships between many of the skippers of these boats, some of the challenges associated with reducing bycatch are being managed collectively.

Discard management presents both social science and natural science challenges for New Zealand's fishing sector. Regarding the social science challenge aspect, regulatory agencies such as MPI and the fishing community may hold different perspectives on whether existing discard practices pose long-term concerns for fisheries resources. While compliance officers understand a violation of Section 72 and Schedule 6 to be a major violation of the Fisheries Act 1996, this is not a shared understanding with all fishers, depending on the nature of the discarding behaviour. Not all participants in the fisheries sector agree that what is legally an "illegal discard" (because it violates Section 72) is problematic from a fisheries management perspective.

In a 2010 consulting report prepared for the Ministry of Fisheries, fishers expressed a variety of perspectives about discarding. When interviewers suggested that "compliance" might be defined as "behaviour that meets fisheries regulations- with a focus on major harvest regulations: misreporting, dumping, using illegal gear or techniques or fishing within a prohibited area", respondents from the fishing

¹⁴¹ Organisation of Economic Cooperation and Development, Case Study: Rebuilding the Hoki Fishery in New Zealand. Available at http://www.oecd.org/tad/fisheries/New%20Zealand_Hoki.pdf

¹⁴² Ibid. at p. 5.

¹⁴³ Ibid.

community offered a variety of opinions.¹⁴⁴ One respondent who trawls called dumping “major wastage”.¹⁴⁵ Another respondent who trawls took a different perspective and suggested that dumping is not a major compliance issue because “[the] lack of minimum sizes for certain quota species is a major one that needs sorting. You often can’t get away from paddle crab where we’re trawling, they’re returned but technically we should record them and they would come off quota. Same for undersized fish. They call it ‘fish dumping’ whereas it is actually fish ‘recycling’”.¹⁴⁶ Members from the New Zealand fishing industry emphasise that, where survivability is high when fish or shellfish are released into the ocean after capture, the action should be considered “returning to the sea” not dumping or discarding.

Some of the differences in perspectives on the “problem” of illegal discards may have originated in response to the QMS because the original quota tonnages were set on the basis of reported landings and not on what vessels were actually catching but not reporting at the time the QMS was introduced. In practice, this meant that vessels at the time the QMS was created may have been capable of catching 2000 tons of a stock but for various reasons including market drivers only landed 1000 tons of the stock and discarded some amount. Where a catch limit was set at 1000 tons based on landing reports rather than on the actual capacity of the fishery (e.g. 2000 tons), commercial skippers no longer had any incentive to reduce the number of discards until the deemed values were introduced in the amended Fisheries Act 1996 to penalise fishers.¹⁴⁷ From the perspective of some members of the industry, the Fisheries Act has never really addressed the historical practice of discards.

Members of the industry are concerned that the current deemed value system with its emphasis of penalties creates incentives for illegal discarding among some fishers. Some species are particularly problematic for the industry. Spiny dogfish as a quota managed species presents a particular challenge for skippers who suggest that many fishing vessels “would normally release the net load of such unwanted quota fish and not record the catch” in order not to incur a high deemed value bill or use up their quota.¹⁴⁸ For many fishers this is an economically rational decision because fishing revenues are not increasing in spite of quota values increasing. Discarding may be particularly prevalent in fisheries where the deemed value rates exceed port prices.

¹⁴⁴ Kazmierow, Booth, and Mossman *supra* note 2 at 27.

¹⁴⁵ *Ibid.* at 28.

¹⁴⁶ *Ibid.*

¹⁴⁷ *Ibid.* at 86 (One fisher in the compliance survey explained that “Prior to the quota management system, fish with no commercial value was not landed or recorded. So what changed in 1986 [when the quota management system came into effect]? No fisher in his right mind would land fish which had no value, but would be weighed and deducted from the quota holding, so a way has to be found around this problem...It is a very serious indictment on the QMS that accurate figures for what is actually being caught and discarded are not available to our scientists”.)

¹⁴⁸ *Ibid.* at 42.

For example in 2011 and 2012, the deemed value prices for orange roughy and ling exceeded the port price.¹⁴⁹

While the quota system is intended to prevent overharvesting and encourage discard reduction behaviour, the quota system is difficult to implement in mixed stock fisheries where it is difficult to preferentially select target catch over non-target catch.¹⁵⁰ For example, in some mackerel fisheries, kingfish are frequently inadvertently captured as part of a trawl operation because predatory kingfish are often located in proximity to their mackerel prey. Industry members without the necessary annual catch entitlement will end up paying deemed value beyond what they can hope to recover in the market if they cannot acquire ACE. To the recurring frustration of some industry members, the dollar amounts for deemed value are not dynamically readjusted. Industry members suggest that deemed values have led to individual fishers paying excessive penalties in cases where avoidance of mixed-species capture is nearly impossible with the current fishing technologies that rely largely on mesh size. The limit on ACE for “choke species” in a number of mixed species fisheries has exacerbated problems with discarding in New Zealand, particularly within some inshore fisheries.

At present some fishers who have caught low-value fish above minimum legal size do not want to apply difficult-to-obtain ACE to cover low-value fish unless they can offset what is perceived as a loss with high-value fish. If fishers cannot obtain ACE for a certain portion of the catch, they are reluctant to retain the catch in fear of having deemed values assigned. Some fishers suggest that deemed value would be more appropriately set as a percentage of landed catch value in order to encourage better compliance from fishers with reporting requirements and obtain more accurate reporting to inform stock assessments.¹⁵¹ Other fishers suggest that every quota managed stock should have a minimum size to provide clarity to the industry or the total allowable catches should be increased to take into consideration that historically fish had been discarded.¹⁵² Other fishers disagree that setting minimum legal sizes would improve fisheries management but that more effort needs to be put into changes in gear design and deployment.¹⁵³

¹⁴⁹ James Stewart and Jonathan Leaver, An Examination [of] the ACE Market in New Zealand: Efficiency and Deemed Value Mitigation (February 20, 2014): Appendix C. (Orange Roughy 2A’s port price was \$2.76. The lowest deemed value rate was \$5.00; Ling 5’s port price was \$2.35 and its lowest deemed value was \$2.38)

¹⁵⁰ Kazmierow, Booth, and Mossman *supra* note 2 at 85 (Quoting one respondent as indicating that “Deemed values are a joke in a mixed fishery. The latest rules have made it so there may be dumping of Elephant Fish 5 big time. The increase was not enough to fix problem. Then to make matters worse, they put the tier system back again”.)

¹⁵¹ *Ibid.* at 43.

¹⁵² *Ibid.*

¹⁵³ *Ibid.*

Members of industry have also expressed some concern about the emerging impacts of climate shifts on fishing management. They are concerned that shifting stocks may be leading to increased levels of harvested fish that cannot be legally discarded and for which deemed values will be owed. The overall impression of the industry was that existing fisheries management policies are not adaptively responsive to either changes in the prices of the wholesale fish markets or to long-term changes such as climate shifts

Industry understands that self-reporting alone may not lead to full compliance with fisheries regulations for all vessels. Having an observer on board may improve compliance with fisheries regulations on a given voyage, yet overall the fishing industry is transitioning from a compliance culture to what some members of the industry have called a “duty of care culture”. In order to speed this transition, one concern raised by the Deepwater Group involved the inadequate flowback of general scientific information to fishing vessels from the MPI. When vessels are reporting data including data about discards to the agency, it is not always obvious to the skippers charged with collecting this data what is being done with the data in aggregate and how it is being used in fisheries assessment studies. This perceived lack of information exchange may have consequences for resource stewardship. If skippers perceive record reporting to be simply a bureaucratic barrier, they may be less inclined to incorporate best practices in record reporting that would in aggregate improve stock management.

In a nation where there are no permits required for marine recreational fishing, both commercial fishers and commercial licensed fish receivers expressed frustration over the lack of regulatory oversight of the recreational industry beyond the bag limits. Members of the commercial fishing industry suggest that it is hard to co-exist cooperatively in a regulatory realm where commercial ventures are required to record fish catches while recreational fishers have no similar requirement. As a number of individuals in both the commercial and recreational fishing realm indicated, even though recreational fishers individually discard few fish, recreational fishers as a million-strong population cumulatively discard large numbers of fish in order to have better-quality fish in the bag. There is strong scepticism among commercial fishers that any of the voluntary reporting mechanisms available to recreational fishers are being used effectively. A number of individuals in the commercial industry, some of whom are also recreational fishers, suggest that New Zealand must create some system of permitting for marine recreational fishers that will inform recreational fishers about good fisheries management practices and why recreational fishers should not high-grade. A number of industry members proposed that for-profit recreational fishing charters should be more closely regulated by MPI.

4 DISCARDS AT SEA WORKING GROUP: NEW DIRECTIONS FOR DISCARD POLICY

Because discards reflect wasted fishing effort and raise questions about the credibility of fisheries management under the QMS, both the industry and government agencies have been concerned with addressing discard policies.¹⁵⁴ In 2003, SeaFIC representing the New Zealand Seafood Industry exchanged letters with the Ministry of Fisheries regarding language in the 2001 Fisheries Reporting Regulations. In 2003, the Ministry of Fisheries received internal legal advice suggesting that the Fisheries Regulations “may require fishers to report all catch of QMS stocks against ACE, notwithstanding any minimum legal size or the effect of the Sixth Schedule (return to the sea, if alive)”.¹⁵⁵ Because the legal interpretation was not definitive, the status quo of non-reporting for Section 6 discards and fish below MLS could also be a viable interpretation. The legal interpretation requiring reporting of all QMS catches was understood by the Ministry of Fisheries to be “contrary to established practice, which is not to report undersized fish and fish returned to the sea under the Sixth Schedule, and the prior common understanding of fishers and MFish”. In 2003, the Ministry of Fisheries concluded that, because there was now considerable uncertainty in terms of what might be expected from fishers, it was necessary to begin a process that could result in an amendment to the Fisheries Reporting Regulations to clarify the precise obligations for reporting of catch. In 2003, the Ministry of Fisheries concluded that “Until this matter is resolved fishers should continue with established practice”.¹⁵⁶

In 2007, after a high-profile large-scale dumping case under Section 72 of the Fisheries Act 1996 for high-grading practices, members of the inshore commercial industry through SeaFIC approached the Ministry of Fisheries to initiate a review of discard recordkeeping and reporting. The commercial industry was concerned that with an increase in fishing patrol capability, more species in the QMS, and increasing deemed value rates that there could be increasing problems for the industry in relation to discard recordkeeping and reporting. The industry hoped to clarify the meaning of Section 72 and to discuss whether it might be possible to create a discard policy that was both protective of natural resources but also cognisant of industry practices. The industry was particularly concerned with the costs associated with the handling and disposing of non-economic fish.

MFish understood the industry’s concerns over reporting requirements since it had internally identified inconsistencies in reporting requirements. The Ministry was concerned that the QMS continue to operate reliably and that all catch would be managed within the total allowable catch limits and balanced against ACE to ensure

¹⁵⁴ In a study conducted by Seafood New Zealand between November and December 2014 with four focus groups and 1002 online interviews, 3 out of 4 respondents spontaneously raised concerns with the fishing industry including overfishing, damage to sea life, and dumping/wastage. Seafood New Zealand, Debbie Hannan, Building Industry Reputation’s It’s Everyone’s Responsibility presented at 2015 New Zealand Federation of Commercial Fishermen Conference.

¹⁵⁵ Letter from Ministry of Fisheries to SeaFIC, December 9, 2003.

¹⁵⁶ Letter from Ministry of Fisheries to SeaFIC, November 6, 2003.

that resources continue to be managed with an emphasis on long-term stewardship of species. One of MFish’s primary concerns was to maintain integrity of the quota management system. MFish understood that when fishers fail to accurately report discards, they disrupt the ability to conduct assessments of stock health upon which appropriate total allowable commercial catches (TACCs) can be based. Without having a firm handle on the extent of discarding, MFish was concerned that chronic underreporting of discards could either unnecessarily restrict maximum utilisation of fisheries resources for some stocks or pose ongoing sustainability risk for other stocks. In 2008, MFish acknowledged that fishers did not have strong incentives to report discards and the Ministry itself did not have adequate resources to improve the reliability of reporting by the commercial industry.

In 2008, the MFish debated whether to review the issue using a “small-scale” or “large-scale” approach. The small-scale approach would focus on removing immediate inconsistencies in fisheries management that were leading to potential underreporting. A large-scale approach would endeavour to realign incentives under the QMS to ensure that fishing effort was concentrated on those fish that the fishers had a right to take. Under a large-scale approach, the Ministry would engage in larger policy debates, including how best to implement the QMS within mixed fisheries and how to promote sustainability values in a system that seemed to be rewarding some degree of individual opportunism. In 2008, Fisheries Operations recommended taking a “large-scale approach”. MPI is still seeking to take a “large-scale approach to reforming the QMS.”¹⁵⁷

As part of its “large-scale” effort to realign incentives under the QMS to support better reporting and better resource stewardship, the Ministry responded to industry concerns by organising a “Discards at Sea Working Group” that included active participation from several industry members to discuss the best approach for addressing information gaps and associated management issues arising from discarding practices. In 2008, MFish was particularly concerned that because it did not have a grasp on the extent of discarding, it could not address the integrity of reported information that it was receiving from fishers and was therefore working with an inadequate set of data from which to make fisheries management decisions. In its decision to form a working group to discuss discarding, the Ministry acknowledged that existing total allowable commercial catches for some fish stocks may not reflect the abundance of fish because the TACC was set with little knowledge about a given fish stock when the QMS was introduced and never revised to reflect new knowledge. For some fisheries, fishers may be discarding fish that might otherwise be covered by available ACE if the TACC had been properly revised.

Concerned about maximising the value of catch while also ensuring that New Zealand’s fisheries are sustainable, the group worked from 2008 to 2012. Over the course of the Working Group’s lifetime, it included members of the Ministry of Fisheries, the Deepwater Group, SeaFIC (now Seafood New Zealand), Te Ohu Kai Moana, and the New Zealand Federation of Commercial Fishermen. The Working Group investigated a number of policy approaches besides the status quo system

¹⁵⁷ In 2016, the Ministry for Primary Industries is involved in an ongoing review of the Fisheries Act.

requiring the reporting of all quota management catch and the availability of ACE to cover catch for most QMS species. Among the first discussions of the working group were agency proposals to land and report all QMS Catch from New Zealand waters. In practice, this approach would be easy to implement as long as there was adequate monitoring. The proposal was ultimately rejected because it would have led to large landings of species with almost no market values such as spiny dogfish. After a process of brainstorming, the Working Group ultimately identified three options described below for further consideration.

I. Introduction of Minimum Economic Sizes as a Discard Threshold

The government would have the option by regulation to set Minimum Economic Size (MES) that would be designated on the basis of what the market is purchasing (e.g. snapper ≥ 35 cm). Quota owners could propose a particular MES for a particular stock. Anything that met the threshold of the MES would be required to be landed unless it could be legally discarded under Schedule 6 of the Fisheries Act. Fishers would have the discretion to land fish that measure below the MES but are larger than the Minimum Legal Size (MLS) wherever a MLS has been set to ensure sustainability of a stock. All other fish could be returned to the sea if they are smaller than the MES.

Under this approach, fishers would need to report all catch including any fish that were discarded. It is unclear whether the proposal also included reporting of non-QMS catch. Only landed catch, however, would count against the ACE. Discarded catch would not count against the ACE. In order to ensure the sustainability of species, discarded catch instead would be attributed to “other mortality” and factored into future calculation of the total allowable catch. Fishers still would have an incentive to reduce the “other mortality” rates because high rates of “other mortality” coming from discards would eventually effect total allowable commercial catches.

While the proposal addresses some of the concerns of the industry, there remain the same outstanding concerns that are part of the existing discard system. Fishers must still carry or find ACE for any catch that is landed. Where a fisher who may have fish that meets MES does not have the ACE and does not anticipate being able to obtain the ACE, there remains some incentive to discard the fish to avoid deemed values. The success of this proposal in improving reporting would depend on whether the MES was set appropriately to track the market. If the MES were set appropriately, fishers may still be able to remain financially solvent as long as the deemed value set for a species tracked closely to the actual market price for the species.

This recommendation was the preferred approach of the Discards at Sea Working Group because it was anticipated that when implemented, it would address the primary source of unreported discards--- uneconomic fish --- while improving reporting because fishers would no longer face the potential penalty of an assessment of deemed value for uneconomic fish. The better information would, in theory, lead to better stock assessment and more comprehensive information upon which to total allowable catch.

The limitation of this approach is that it would require, at least in its initial stages, extensive monitoring to ensure that fishers were actually reporting their discards. To the extent that it requires monitoring for verification, the Minimum Economic Size approach to a discard policy would not be an improvement over the current system. The key difference between the two systems would be that the disincentive to report the catch of certain “uneconomic” fish would be eliminated. One potential downside to implementing this system is the time delay between individual reporting and potential benefits flowing to fishers. Because the Ministry would need to collect data for several years before making any adjustments to total allowable catches, this approach will not yield immediate dividends to reporting fishers. This could lead to a relapse in poor recordkeeping from some industry members who may not understand why they are collecting certain data.

In order to address some of the concerns that discards might still continue under this model, one proposal associated with this Minimum Economic Size model was for a levy or tax to be applied to individual fishers if their discarding rates exceed levels considered acceptable from a fisheries management perspective.

II. Reporting of all Mandatory Discards including discards that are smaller than minimum legal size.

This proposal tracked the current law as reflected in Section 72 of the Fisheries Act 1996 but was proposed as a clarification for fishers that they must also report fish smaller than minimum legal size. Currently, fishers do not need to report fish that are returned to the sea that are smaller than MLS and alive. The primary difference with this proposal is that any discarded catch would be attributed to “other sources of fishing related mortality”. While, in theory, this proposal would improve information available on discards of catches below the MLS, this approach requires substantial monitoring and may require more species to have MLS designated. Because this system is as inflexible as the current system, there were concerns among the industry that implementing it would impose excessive costs on the industry to ensure sufficient monitoring without any potential long-term economic benefit to the industry.

III. Reporting all QMS catch with flexibility on landing based on the discretion of the fishers to land or release to the sea

Under this proposal, all QMS catch would be reported but fishers would also have the independent option to discard any QMS catch for a variety of reasons including market requirements, ACE availability, or expected deemed values. In order to be able to discard under this system, all catch must be reported including both landed catch and any discarded catch.

The expectation under this proposed discard policy is that fishers would provide fuller reports if they had the option to discard. Under this policy proposal, individuals must still have ACE to cover any QMS species that is landed or discarded. Unfortunately, the same economic incentives to discard that exist today would be in operation under this proposal. Where the cost of ACE or deemed value is higher than the value of the fish caught, a fisher has

no economic incentive to report. Simply being able to make decisions to discard will not improve the financial stability of an operator. This proposal would be likely to require significant compliance and monitoring costs.

On the one hand, this option was attractive to fishers because it would allow for fishers to maximise the economic return from landed catch and could improve the potential accuracy of reporting for both retained and released catch. On the other hand, this option was concerning to environmental NGOs who predicted that additional flexibility would increase the quantity of discards without yielding better information.

The Working Group concluded its work in October 2011 with two suggestions. The first suggestion was implementing the Minimum Economic Size proposal described above as policy proposal 1. The Ministry hoped to pilot a policy implementation in a selected fishery to test the effectiveness of assigning “minimum economic size” to improve discard reporting. Proposed fisheries included the East Coast South Island flatfish trawl, the West Coast South Island flatfish trawl, Snapper 1, and selected fisheries off the West Coast North Island. MFish did not regard the MES proposal as a final solution to ensure long-term sustainability of stocks but as a transitional option until total allowable commercial catches could be re-evaluated in light of more realistic estimates of fishing mortality. The second suggestion from the working group was enhancing current compliance with existing discard policies.

The Working Group was dissolved in 2012. While both the Ministry members and industry agreed that a discard policy based on “minimum economic size” seemed reasonable, disagreement arose over how to best implement this policy. Ministry officials wanted to pilot a programme over the course of several years before any legislated changes would be made and to use independent verification to create baseline information on discards levels. Industry wanted to have shorter pilots and believed that, because incentives to illegally discard would be removed if the discard policy reflected the economic realities of fishing, voluntary compliance would be sufficient.

If the project had continued, a new project team would have been developed to make recommendations for consultation with stakeholders, and legislative policy changes. In October 2012, MPI had contemplated moving forward on testing the Minimum Economic Size programme under a special permit programme. Understanding that a transition from the status quo where some level of discarding occurs to a new situation where vessels capture minimal bycatch due to either fleet-wide changes in gear or fishing practices or where markets that could utilise bycatch are willing to do so would take some time, MPI suggested that during any tests of an MES programme fishers would not have to count all QMS catch against ACE. The hope was to solicit a more honest picture of the composition of catches for participating vessels because there would be no incentive to under-report and an incentive to report accurately by the industry in hopes of increasing certain TACCs based on actual abundance.

After 2012, MPI continued to address the policy concerns raised by bycatch and discard practices even though the discard working group did not continue to meet. Given the public attention on reducing incidental bycatch of seabirds and sharks, MPI

focused increasing agency attention on drafting and implementing National Plans of Action to reduce impacts on seabirds and sharks. The Ministry's work on these topics has materialised in the form of action plans to reduce impacts on seabirds and sharks, new legislation, and support for programmes such as Southern Seabird Solutions.¹⁵⁸

Industry members such as Fisheries Inshore New Zealand and the Deepwater Group have continued to support MPI efforts to trial a Minimum Economic Size in exchange for more comprehensive reporting. MPI became concerned that designating an MES could raise questions about the QMS regime by giving social license to waste limited resources. The MES was considered too simple of a solution to a complex problem which would fail to encourage new fishing practice or to encourage fishers to avoid small fish.

The information that the Ministry of Fisheries had hoped to collect in 2008 has not yet been forthcoming but may in the years to come become available under IEMRS. The advent of the electronic monitoring programme for commercial inshore vessels discussed below in the section on policy suggestions offers a different and likely more objective approach to obtaining data on discards and catches. As will be discussed below, MPI may want to consider creating a discard policy that takes into consideration some of the constraints of commercial fishing before it mandates IEMRS. Without this policy, MPI will be essentially enforcing a landing obligation that could economically destabilise portions of the fishing industry without providing any transitional arrangement. The socioeconomic challenge of a "discard ban" is discussed in section 5 below in relation to the European Union's recent change in its fisheries policy requiring all fish caught to be landed.

¹⁵⁸ New Zealand National Plan of Action for the Conservation and Management of Sharks (2013); New Zealand National Plan of Action to Reduce the Incidental Catch of Seabirds in New Zealand -Seabirds (2013) ; See Sponsors Southern Seabird Solutions Trust <http://www.southernseabirds.org/about-us/sponsors/>

5 COMPARATIVE LEGAL APPROACHES TO MANAGING FISHERY DISCARDS

The issue of discards is complex from a governance perspective. On the one hand, there are regulatory frameworks embodied by, for example, the Fisheries Act and the Fisheries Regulations designed to conserve ocean biomass. On the other hand, there are norms and social values that may be in direct conflict with the regulatory frameworks, including long-standing fishing practices that includes the discarding of low-value fish. This section of the report evaluates contemporary responses by Norway, the European Union and the United States to managing discards in a variety of regulated fisheries.

Norway

Norway is not a member of the European Union and has pursued its own fisheries management policies independently of the Common Fisheries Policy. In 1984, Norway introduced real-time closures of fishing areas where the government temporarily closes areas if evidence demonstrates that a certain number of fish below a minimum legal size are being caught or a certain percentage of the catch is composed of bycatch.¹⁵⁹ Norway uses specific quantitative criteria for the closures. For example, in the Northern shrimp fishery, a closure will happen if 8 cod are found for each 10 kg of shrimp, 20 haddock for each 10 kg of shrimp, 3 redfish for each 10 kg of shrimp, or 3 Greenland halibut for each 10 kg of shrimp.¹⁶⁰ In the trawl fisheries for cod, haddock, and saithe, if a fisher's net has 15% or more juveniles then the fisheries will be temporarily closed.¹⁶¹ Typically, Norway initiates 30-70 closures per year.¹⁶² The Norwegian Coast Guard is responsible for inspections, and requires vessels to move if there is a determination that the level of undersized catch or non-target species is too high.¹⁶³ In some cases, before an area is formally closed, the Norwegian Coast Guard will create a "precautionary area" to inform fishers that they are likely to be excessively impacting marine resources by fishing within the area.¹⁶⁴ These temporary closures "turned out to be an effective tool in situations where unwanted intermixture of fish varies from year to year and/or with respect to time and place".¹⁶⁵

¹⁵⁹ Gullestad *supra* note 13 at 1.

¹⁶⁰ *Ibid.*

¹⁶¹ *Ibid.* at 3.

¹⁶² *Ibid.*

¹⁶³ H. Condie, *supra* note 11 at 289.

¹⁶⁴ Gullestad *supra* note 13 at 3.

¹⁶⁵ Condie *supra* note 11 at 289.

Norway introduced its first discard ban in 1983 for all fishing vessels operating in the Norwegian exclusive economic zone, and the discard ban has grown to encompass increasingly more stocks.¹⁶⁶ Under this broad discard ban, when fish that would have otherwise been discarded are landed and forfeited to the government or to licensed sales organisations, the demersal fishers will receive 20% of the value of the catch as compensation to cover landing costs and counter the incentive to discard at sea.¹⁶⁷ Gear modifications such as the “Nordmore grid” that originally provided access to fisheries that were otherwise closed for recovery have now been required in some fisheries to reduce catches of undersized fishes.¹⁶⁸ While there have been reductions in discards and improvements in stock numbers for some fish, other fish such as coastal cod, golden redfish, and beaked redfish continue to be over-exploited in Norwegian waters.¹⁶⁹

Norway’s practices related to real-time closure systems have influenced the European Union, which has introduced some closure systems in the North Sea and Skagerrak to avoid catching undersized fish.¹⁷⁰ Some of the success of these temporary closures has been attributed to the “extensive” presence of the Norwegian Coast Guard, which conducts about 2000 inspections annually.¹⁷¹ While there have been proposals for voluntary closures, the system has continued to use formal closures.

In improving its fisheries management decisions, Norway is in the process of exploring various policy options to reduce discards, including the development of more selective gear technology, the distribution of bycatch quota before the allocation of target quotas, and shifting management attention on how best to ensure that only commercially acceptable fish are captured and landed (e.g. increasing minimum mesh size for trawls).¹⁷² Norway has already successfully increased the rate of adoption of certain types of selective gear by allowing individual fishers to continue fishing in an otherwise temporarily closed area if they use specific gear.¹⁷³

European Union

In a number of fisheries in the European Union (EU) fishers have high discard rates, including reports that in one fishery up to 90% of fish in a mixed-demersal trawl

¹⁶⁶ Ibid.

¹⁶⁷ Ibid.

¹⁶⁸ Ibid.

¹⁶⁹ Ibid. at 290.

¹⁷⁰ J.P. Johnsen *supra* note 4 at 139.

¹⁷¹ P. Gullestad et al. *supra* note 13 at 4.

¹⁷² Id. at 5-6.

¹⁷³ S. Siguroardottir, How can Discards in European Fisheries be Mitigated? Strengths, Weaknesses, Opportunities, and Threats of Potential Mitigation Methods 51 *Marine Policy* (2015): 366-374, 370.

fishery were being discarded.¹⁷⁴ The circulation of such statistics alarmed the European public, who have been calling since 2013 for a stronger effort by the government to manage discards.

In the EU, States have a mandate to collect discard data under the Data Collection Regulation.¹⁷⁵ Based on this data, the EU observed high discard rates, including between 20% and 60% of the catch weight for some demersal fisheries, with discard rates of 20-40% for bottom trawlers operating west of the British Isles and 30-60% for bottom trawlers operating in the south Atlantic region.¹⁷⁶ Galician offshore trawlers are estimated to discard 43.5% of their catch before landing.¹⁷⁷ Several important European fisheries are deemed to be in poor condition due to the biomass being primary small and immature fish that should not be harvested if stocks are to be restored.¹⁷⁸

A number of countries in the EU including Denmark have trialled new approaches to managing stocks and reducing discards through a catch quota management system. In countries promoting this system, all catch of quota species including discards are counted against a vessel's quota. The theory is that this approach will lead to fishers pursuing more selective fishing. In order to be able to participate in the voluntary system, each vessel is required to install CCTV camera and recording sensors. Starting in 2009, the EU introduced transitional technical measures that became permanent in March 2013 to reduce illegal discarding in fisheries with fishing quotas.¹⁷⁹ Specifically, high grading was identified as the failure to land a quota species unless landing the species is contrary to the EU's common fisheries policy.¹⁸⁰ In addition to the requirement to retain quota species, EU fishers were expected to also:

¹⁷⁴ Alyson Little, Coby Needle, Ray Hilborn, Daniel Holland and C. Tara Marshall, Real-time Spatial Management Approaches to Reduce Bycatch and Discards: Experiences from Europe and the United States, *Fish and Fisheries* 16 (2015): 576-602.

¹⁷⁵ EU Commission Regulation 1639/2001 (25 July 2001) (Establishing minimum levels of collection of data in the fisheries sector); EU Commission Regulation No. 199/2008 (25 February 2008) (Establishing Community-level framework for collection, management and use of data in fisheries to support the Common Fisheries Policy).

¹⁷⁶ Antelo *supra* note 8.

¹⁷⁷ I. Vazquez-Rowe, M. Moreira, and G. Fejoo, Estimating Global Discards and their Potential Reduction for the Galicians Fishing Fleet (NW Spain), *Marine Policy* 35 (2011): 140-147: 144.

¹⁷⁸ Johnsen and Eliassen *supra* note 4 at 132.

¹⁷⁹ Regulation (EU) No 227/2013 of the European Parliament and of the Council of 13 March 2013 amending Council Regulation (EC) No 850/98 for the conservation of fishery resources through technical measures for the protection of juveniles of marine organisms: Title IIIa (Measures to reduce Discarding)

¹⁸⁰ *Ibid.* Article 19a

- Move on- If the number of undersized mackerel, herring, or horse mackerel exceeds 10% of a haul net, then a vessel is expected to move to different fishing grounds ¹⁸¹
- No slipping- A vessel is not permitted to release mackerel, herring, or horse mackerel before a net is fully taken on board.¹⁸²

The European Commission proposed a discard ban in 2011.¹⁸³ In conjunction with the distribution of catch quotas, the European Union promulgated a legally binding discard ban (also known as the landing obligation) requiring the landing of all discards in order to address what has been deemed a resource waste problem.¹⁸⁴ The text of the landing obligation can be found in Appendix 2 of this report. The landing obligation was implemented for small pelagic fisheries,¹⁸⁵ large pelagic fisheries,¹⁸⁶ some Baltic demersal species, Baltic salmon, and certain industrial fisheries¹⁸⁷ by January 1, 2015.¹⁸⁸ The European Commission expected to have implementation plans for the remaining fisheries by January 1, 2016 to be phased in by January 1, 2019 with the exception of the Baltic Sea fisheries subject to catch limits that would have the landing obligations phased in by January 1, 2017.¹⁸⁹ By January 1, 2019, the expectation was that the remaining fisheries including cod, haddock, whiting, common sole, plaice, and hake would have landing obligations implemented.¹⁹⁰ By 2019, approximately 28 species will be covered by the discard ban.¹⁹¹

Individual States are implementing the discard ban within their jurisdictional waters. For example, in Scotland, the government requires vessels operating in the North Sea

¹⁸¹ Ibid. Article 19b

¹⁸² Ibid. Article 19b)

¹⁸³ European Commission, Proposal for a Regulation of the European Parliament and of the Council on the Common Fisheries Policy. COM (2011) 425 2011/0195.

¹⁸⁴ European Parliament and the Council Regulation (EU) No 1380/2013 of the European Parliament and of the Council of 11 December 2013 on the Common Fisheries Policy, amending Council Regulations (EC) No 1954/2003 and (EC) No 1224/2009 and repealing Council Regulations (EC) No 2371/ 2002 and (EC) No 639/2004 and Council Decision 2004/585/EC (This larger reform of the Common Fisheries policy includes the “discard ban” at Article 15) (Hereinafter “EU Discard Ban)

¹⁸⁵ Anchovy, Argentine, Blue whiting, Boarfish, Herring, Horse Mackerel, Mackerel, Sardines, Sprats

¹⁸⁶ Albacore Tuna, Bigeye Tuna, Bluefin Tuna, Swordfish, and White Marlin

¹⁸⁷ Capelin, Norwegian Pout, and Sandeel

¹⁸⁸ EU Discard Ban *supra* note 184 at Article 15(1)(a)

¹⁸⁹ Ibid at 15(1)(b) and (c)

¹⁹⁰ Ibid.

¹⁹¹ P. Veiga et al. The EU Landing Obligation and European Small-Scale Fisheries: What are the Odds for Success?, *Marine Policy* 64 (2016): 64-71, 67.

in 2016 using gear of 100 mm or more to land haddock, plaice, and northern prawn; vessels using gear between 80-99 mm must land all nephrops, common sole, and northern prawn; and all vessels, and all long line vessels must land hake.¹⁹² A different approach is taken in Northwest Waters, with Marine Scotland informing individual vessels of their requirements. For all vessels that had 10% or more of their 2013 and 2014 landings including some combination of cod, haddock, whiting, and saithe, all haddock must be landed. For vessels with 30% landing of nephrops in 2013 and 2014, all nephrops must be landed.¹⁹³

There are exceptions to the discard ban where a species is highly endangered or the European Community is convinced that there is a high chance of survival if a species is returned.¹⁹⁴ Vessels are also permitted to discard a “de minimis” amount (5% of total annual catch) if scientific evidence indicates that an increase in selectivity is difficult to achieve or the catches do not represent more than a certain percentage based on a plan of total annual catch based on a certain type of gear (e.g. Nephrops Fishery Agreement in North Sea between EU States and EU Commission).¹⁹⁵ Certain flexibilities have also been built into the implementation of the discard ban including the right of member states to allow landing of additional quantities of fish stocks up to 10% of the quota allocated to a Member State.¹⁹⁶ In order not to generate a new market for the capture of undersized fish, the EU is planning to establish minimum conservation sizes for fish below which the fish may not be sold for human consumption but only for low-value uses such as fish meal, pet food, or cosmetics.¹⁹⁷ The expectation from the EU is that vessels will adopt more selective gear and practices to avoid having to land low-value fish.

The ban has been criticised for its lack of attention to the challenges of demersal multi-species fishing versus pelagic fishing and to its lack of distinction between small-scale fishers and large-scale fleets.¹⁹⁸ Vessels are expected to land undersized fish, which is particularly upsetting to fishers who expect that some of their releases

¹⁹² Demersal and Nephrops Landing Obligation Form 2016, Scottish Government, <http://www.gov.scot/Topics/marine/Sea-Fisheries/discards/demersal>

¹⁹³ Ibid.

¹⁹⁴ EU Discard Ban *supra* note 173: Article 15 (4)(b)

¹⁹⁵ Ibid. at Article 15(5)(c); Veiga *supra* note 191 at 67 (Noting that small-scale fishers may not be eligible for the *de minimis* exception if they are unable to provide the necessary scientific and empirical information in a format that is acceptable to the European Commission)

¹⁹⁶ Ibid. at Article 15(10)

¹⁹⁷ Siguroardottir et al. *supra* note 173 at 373.

¹⁹⁸ Veiga *supra* note 191 at 65. (80% of EU’s fishing fleet are small-scale fishing vessels defined as vessels under 12 metres in length using static or passive gear)

of undersized fish survive.¹⁹⁹ The ban on discarding has also been criticised as unworkable in terms of adequate monitoring. If the EU hopes to have an effective ban, it will need to assist fishers in investing in monitoring and gear selectivity with more CCTV cameras on deck, broader deployments of government observers, and transition to new gear (e.g. prawn fishing nets that provide an electric shock that disturb prawns but not flatfish). Researchers do not expect the discard ban alone to incentivise more selective fishing without supplemental management measures such as output controls or technical measures.²⁰⁰ There is a question whether the discard ban as currently being implemented can be effective in protecting fish stocks if substantial efforts are not made to avoid capture of juvenile fish that are essential to ensure future productivity.

2015-2016 research suggest some resistance to the discard ban because of fears of exorbitant costs in implementing the ban.²⁰¹ Of particular concern is that the EU discard ban will lead to unintended bankruptcy of some fishing operators due to “choke species” that prevent quota from being utilised and increased labour costs that cannot be avoided through adoption of more selective gear.²⁰² Bio-economic models evaluating the introduction of the landing obligation including its additional policy measures to avoid excessive loss to the industry (e.g. catch allowances for stocks with no total allowable catch, quota top up, 5% *de minimis* discards, some interspecies flexibility, releases permitted on the basis of survivability) all indicate that the UK whitefish fleet, beam trawl fleet, and nephrops fleet by 2019 would receive significantly less than their 2013 revenue.²⁰³ This may spur widespread bankruptcy that cannot be addressed simply through fishing adaptation.

Fishers have also expressed profound distrust of the system because the fishing industry was not involved in its design but were simply informed that “the landing obligation is a fact”.²⁰⁴ Some fishers expressed concern that the discard ban did not take into consideration the diversity of fisheries across Europe and was simply a boon for the aquaculture, pharmaceutical, and cosmetic industries, which would receive

¹⁹⁹ B. de Vos et al. New Modes of Fisheries Governance: Implementation of the Landing Obligation in Four European Countries, *Marine Policy* 64(2016):1-8, 3 (Quoting fishers from the Netherlands: “We should not resort to massacring but assure that fish survives, so others get a chance”.)

²⁰⁰ H. Condie, A. Grant, and T. Catchpole, Does Banning Discards in an Otter Trawler Fishery Create Incentives for More Selective Fishing? *Fisheries Research* 148 (2013): 137-146

²⁰¹ Veiga *supra* note 191 at 67 (Predicting in Galicia annual €30-40 million of direct economic losses and €0 million of indirect losses and possible losses of 7000 jobs due to the direct and indirect losses)

²⁰² Scientists Predict Economic Losses as Result of EU Discard Ban, *Undercurrent News* (May 25, 2016)

²⁰³ Hazel Curtis and Arina Motova, *Seafish, Bio-Economic Scenario Analysis of Landing Obligation* (April 2016) http://www.seafish.org/media/1626386/dag_apr2016_loscenarioanalysis_seafish.pdf

²⁰⁴ B. de Vos *supra* note 199 at 3-6. (Observing that the discard ban in a world of unchanged fishing activity may cost the Dutch fleet between 5.6 and 12.3 million Euro or 2.8% to 6.2% of total revenues)

large amounts of low-value fish.²⁰⁵ In one set of interviews, it appears that one of the purposes of the discard ban may be defeated due to a lack of buy-in from fishers and low-levels of enforcement. As one interviewer commented, “How will the port authorities know if fishers have discarded fish or if they have sold undersized fish directly to restaurants? The fishing fleet is huge and the manpower of the authorities is quite limited. They would need a camera installed on every single boat, but there are certainly no funds for that”.²⁰⁶

The introduction of the catch shares system has been equally problematic for small fishers in the EU. For example, in the UK a number of the smallest community-based fishers are finding themselves having to dump fish in order to comply with the existing quota system. As described in a UK newspaper, a group of community fishers found themselves discarding seven boxes of fish that they otherwise could have sold because the quota for skate and plaice had already been exceeded, even though one of the fishers who had been fishing in the same waters for over 4 decades observed that “There are more plaice in the seas than when we started but we spend all our time trying to find places that have no plaice, which is insane”.²⁰⁷

The long-term success of the full discard ban which is expected to be fully in place by 2019 remains to be seen. At this juncture, it is proving difficult to implement, given the limited buy-in from the fishing community and the limited surveillance resources. As one fisher association’s policy officer commented in 2016, “From Galicia to Shetland, it is hard to imagine a more unwieldy set of rules. Completely inappropriate to real-life fishing, they were framed without the benefit of fishers’ practical knowledge and experience and could prove completely unworkable. The fishing industry accepts that the landings obligation is here to stay; the question is whether it can be implemented without destroying perfectly sustainable businesses and communities in the process”.²⁰⁸ Fishers in Northern Ireland have found themselves applying for a waste disposal licence to take “discarded” prawns that cannot be sold or processed back to sea because there is not yet a pipeline for discarded materials that doesn’t involve expensive disposal options on land.²⁰⁹ Even in light of these real concerns for fishing communities in Europe, there have still been some notable technical innovations under the ban including, for example, gear innovations such as

²⁰⁵ Id. at 5.

²⁰⁶ Id. (Quoting member of Greek fishing industry)

²⁰⁷ Ian Birrell, Sunk...by EU Quotacrats, UK DailyMail (November 30, 2014) <http://www.dailymail.co.uk/news/article-2854348/One-Dutch-trawler-gets-quarter-England-s-entire-fish-quota-English-fishermen-allowed-two-crates-worth-50.html>

²⁰⁸ Adrian Taum, Discarding the Past (June 14, 2016) Worldfishing & Aquaculture, <http://www.worldfishing.net/news101/Comment/analysis/discarding-the-past#sthash.UOtCBo6H.dpuf> (Quoting Maria Aria Martin from the Shetland Fishermen’s Association and explaining that in Northern Ireland so many prawns have been landed that one fishing cooperative has applied for a waste licence to return the prawns to sea after they had been counted because there was no market for such a large quantity of perishable material)

²⁰⁹ Ibid.

the release of a prawn trawl that reduces whitefish discards without reducing prawn catch.²¹⁰

United States

Under the Magnuson-Stevens Fishery Conservation and Management Act, every fishery management plan must “establish a standardised reporting methodology to assess the amount and type of bycatch occurring in the fishery”. Different fishery management councils have created standardised bycatch reporting methodology.²¹¹ As part of this effort, reports are published with aggregated data.²¹² Discard rates function as an important part of the assessments of stocks to set fishing limits.²¹³ Different regional fishery management councils use different assumption for calculating discards. For example, the New England and Mid-Atlantic fishery management plan for multi-species fisheries developed a “cumulative method” for measuring yellowtail flounder discards in the scallop fishery, haddock discards in the herring fishery, and butterfish discards in the longfin squid fishery.²¹⁴ The methodology required observers to record discards from each haul and calculate all discards and all landings and organise this information on the basis of stock area and gear type. This information is used to estimate discards for unobserved trips with similar gear types and fishing areas. As data continues to be reported, cumulative discard ratios may be adjusted. Discard estimates for some fisheries are understood to be uncertain.²¹⁵

Under the Magnuson-Stevens Act, commercial vessels from the US with a federal fishing permit may be required to submit “vessel monitoring system” catch reports or “vessel trip reports” that include information about the vessel’s fishing activity, including data on the catch composition (species and weight) of both landed and

²¹⁰ Ibid.

²¹¹ Magnuson-Stevens Fishery Conservation and Management Act 16 USC 1853; See e.g. Northeast Fisheries Service Centre, Standardised Bycatch Reporting Methodology and Sea Day Schedule, (May 13 2015)
http://www.nefsc.noaa.gov/fsb/SBRM/2015/2015_SBRM_Annual_Discard_Report_and_Observer_Sea_Day_Allocation_using_Apr16budget_05132015v2_rev.pdf (

²¹² Northeast Fisheries Service Centre, *supra* note 211 at p. 2. (Calculating estimated discards from July 2013 through June 2014 of 64, 795 metric tons of 14 federally regulated species groups such as large mesh groundfish, skate complexes)

²¹³ See e.g. 50 CFR 648.90 (Providing that the “total allowable limits” for various northern silver hake and southern whiting are set based on annual catch limits minus discard estimates based on most recent 3 year data) 50 CFR 648.163 (a) (Providing that annual catch limits will be set on the basis of total catch including both landings and dead discards)

²¹⁴ NOAA Fisheries, Greater Atlantic Region, Northeast Multispecies Sector Management, How Discards are Calculated for Groundfish Sectors and the Common Pool, (2010),
<http://www.greateratlantic.fisheries.noaa.gov/regs/infodocs/discardcalculations.pdf>

²¹⁵ 50 CFR 648.200 (b)(3) (Noting that discard rates for herring caught in federal and State waters are uncertain but must be considered when setting an annual catch limit)

discarded fish.²¹⁶ Reporting requirements are detailed in the U.S. Code for Regulations.²¹⁷ Some of the regulations are very specific in relation to commitments under regional fisheries management organisations' measures such as the Western and Central Pacific Fisheries Commission. For example, U.S. fishers operating with purse seines are expected to report all at-sea discards of bigeye tuna, yellowfin tuna and skipjack tuna on a specific form because these tuna should not be discarded unless the fish are unfit for human consumption, there is insufficient storage space for the fish, or a serious malfunction of equipment occurs requiring that fish be discarded.²¹⁸ In common pool fisheries in the Northeast, a vessel may not discard any legal-sized cod prior to reaching its landing limit.²¹⁹ In shared multi-species fisheries with Canada, under a current special access programme, U.S. fishers are expected to daily report every discard of haddock, cod, yellowtail flounder, winter flounder, witch flounder, American plaice, and white hake.²²⁰

Some of these reports will be drafted with observers on board a boat.²²¹ The observers operating in certain fisheries such as the Northeast multispecies fisheries are expected to help with monitoring by identifying potential incentives for reducing discarding by, for example, collecting information by various gear types to accurately calculate discard rates that can be used to verify self-reported discard rates. In some U.S. fisheries, electronic monitoring is being used to verify reporting. Other reports will be entirely self-reported with no verification. As with the case of other global fisheries, accurately calculating discard rates may be critical for ensuring sustainable allowable catches. How discard data is collected and obtained depends on the management approach for various regional Fisheries Management Commissions.²²²

The vessel trip reports can be submitted on paper forms or through electronic submissions. The VMS catch reports are electronically submitted. Some reports are submitted daily while others are on a weekly basis or even monthly basis.²²³ In order

²¹⁶ Some permits such as lobster permits are exempted from having to submit vessel trip reports.

²¹⁷ 50 CFR 300.218 (a) (Observing that commercial fishing operators must submit reports that identify amount of fish discarded as part of a trip to capture highly migratory species in the Pacific Ocean); 50 CFR 300.341 (Requiring that U.S. flagged high seas vessels record the amount of fish discarded)

²¹⁸ 50 CFR 300.218 (e) and 50 CFR 300.223 (d)

²¹⁹ 50 CFR 648.86 (a)(7)(vi)(C)

²²⁰ U.S./Canada Management and Special Access programs for Sector Vessels (May 21, 2015) <https://www.greateratlantic.fisheries.noaa.gov/regs/infodocs/sectoruscanadaandsaps.pdf>

²²¹ 50 CFR 648.2 (Noting the presence of at-sea monitors for the Northeast multispecies fishery who are responsible for observing, verifying and reporting catch and discards for all species during a voyage)

²²² See e.g. 50 CFR 648.25 (Mid-Atlantic Fisheries Management Commission can make adjustment to discard data collection as a management measure)

²²³ 50 CFR 648.7 ((b)(3)(i) (Requiring VMS catch reports from Atlantic herring owners including discards on a daily basis in each herring management area); 50 CFR 648.7(b)(3)(ii) (Requiring daily discard reports from holders of limited access Atlantic mackerel permits); Greater Atlantic Region,

to comply with the requirement to report discards, fishers are expected to provide the hail weight in pounds of each species discarded.²²⁴ Fishers operating in certain fisheries such as the Northeast fisheries may be required to provide separate listings of “large” and “small” skate discards.²²⁵ Fishers in both commercial and recreational fisheries are also expected to report on the discard of prohibited fish species such as thorny skate so that NOAA can “understand the distribution, seasonality, and level of bycatch in commercial fishing operations to better manage and protect these species”.²²⁶

In the U.S. Code of Federal Regulations implementing the Magnuson-Stevens Fishery Conservation and Management Act, discards are distinguished from slippage. In the Atlantic herring fishery, for example, catch that has been returned to the sea prior to being brought on board a vessel is considered to be slippage. Slippage also includes releasing catch “prior to the completion of pumping the catch aboard and the release of catch from a codend or seine while the codend or seine is in the water”.²²⁷ In the Atlantic mackerel and longfin squid fisheries, slippage also refers to the return to the sea of catch, but a fishing event is only classified as “slippage” when a National Marine Fisheries Service (NMFS) observer is on board.²²⁸

While there is a great deal of variety in how U.S. fishery management councils approach discards, some U.S. fisheries use similar practices to New Zealand. In the U.S. West Coast fisheries, for example, certain vessels participating in individual fishing quota (IFQ) programs may discard IFQ species as long as the species have been recorded and deducted from the quota package for the vessel. Certain species must be discarded such as Pacific Halibut when it is captured by the limited entry bottom trawl sector.²²⁹

Of particular interest to New Zealand in relation to its multispecies fisheries may be the U.S. regulations related to multispecies fisheries managed by “sectors”. In this context, “sectors” refer to a group of persons with a limited access vessel permit

Fishing Vessel Trip Report Instruction, December 5, 2014
http://www.greateratlantic.fisheries.noaa.gov/aps/evtr/vtr_inst.pdf (For example, reports for Atlantic Herring must be submitted weekly while reports for Monkfish must be submitted monthly)

²²⁴ Hail weight is the “a good-faith estimate in pounds...by species, of all species, or parts of species, such as monkfish livers, landed or discarded for each trip”. 50 CFR 648.2

²²⁵ 50 CFR 648.7 (b)

²²⁶ NOAA Fisheries, Vessel Trip Reporting Frequently Asked Question, (June 25, 2014) http://www.nmfs.noaa.gov/ole/docs/2014/vessel_trip_reporting_frequently_asked_questions.pdf

²²⁷ 50 CFR 648.2

²²⁸ 50 CFR 648.2

²²⁹ E. Heery, M.A. Bellman, and J. Majewski. 2010. Pacific halibut bycatch in the U.S. west coast groundfish fishery from 2002 through 2009. West Coast Groundfish Observer Programme. Northwest Fisheries Science Centre. Available at http://www.pcouncil.org/wp-content/uploads/D2b_NMFS_SEPT2010BB.pdf

operating under a fishery management plan who have received a shared total allowable catch and who have entered into a contract imposing certain fishing restrictions for the course of one year.²³⁰ In order to benefit from the sector total allowable catch (TAC) as well as several exemptions,²³¹ a sector must consist of at least three people who don't have ownership in each other's operations. The sector must be approved by the Council and each approved sector must submit a fisheries operation plan to National Oceanic and Atmospheric Administration's (NOAA) Fisheries Service including how it will handle discards.

In a multispecies sector, a sector must have ACE available for all stocks in the area even where it is targeting one fish such as monkfish. Any catch including discards of multispecies stocks will count against a sector's ACE but will not be included in information used to calculate a vessel's prohibited species catch.²³² Sectors must not discard any legal-sized groundfish of allocated stocks, including legal-sized, unmarketable fish of stocks allocated to the sectors, unless that vessel's sector is otherwise exempt. Legal sized but unmarketable fish must be landed.²³³ Undersized fish that are discarded must be reported daily. In addition, sector vessels are prohibited from retaining certain species such as ocean pout, windowpane flounder, and Atlantic wolffish. Sector vessels not fishing in exempted fisheries are also required to have in place an at-sea monitoring programme funded by the industry and to collect data on vessel operations and discards. Where there is problematic activity by a member of a sector, all members agree to comply with "stop fishing" order from the Sector until it can be decided how it should proceed.

Sector members are expected not to exceed ACE or the members may be held jointly and severally liable for ACE overages, discarding of legal sized fish, and misreporting catch including discards. Policy for multispecies fisheries is reviewed by the "Multispecies Oversight Committee", which includes representatives from the Northeast Fisheries Management Committee, Mid-Atlantic Fisheries Management Committee, NMFS, Northeast Fisheries Science Centre, industry, and affected states. Some of the multispecies fisheries such as groundfish fisheries are currently being regulated by sectors. Some sample language relevant to discard reporting from a 2016 Sector Membership Contract and Operating Plan is in Appendix 3 to this report.

In order to minimise discards in a variety of fisheries, the United States has a variety of discard management rules in place to enhance environmental stewardship; these include restrictions on harvesting juvenile fish, gear restrictions to minimise capture

²³⁰ For an example of sectors, see Sector Manager Contact Information (May 12, 2015) http://www.nefsc.noaa.gov/fsb/asm/sector_manager_contact.pdf

²³¹ Exemptions available for vessels participating in a sector include no trip limits on allocated stock, no groundfish Day at Seas restriction, no seasonal closures in certain designated fishing grounds, and the ability to use certain types of mesh.

²³² Sector Vessel Regulations Overview Fishing Year 2015, <https://www.greateratlantic.fisheries.noaa.gov/sustainable/species/multispecies/sector/2015sectorguide.pdf>

²³³ 50 CFR 648.87 (b)(1)(v)(A)

of non-target species, and prohibitions on fishing in known spawning areas. Occasionally, exemptions are made such as an exemption for summer flounder mesh size, but these exemptions may be revoked if a vessel is found to be discarding more than 1% of its catch of summer flounder per trip.²³⁴

In 2006, the North Pacific Fishery Management Council adopted Amendment 80 to the Bering Sea and Aleutian Islands Fishery Management Plan, providing for the formation of harvesting cooperatives in the Bering Sea and Aleutian Islands for non-pollock trawl groundfish.²³⁵ Under this amendment, cooperatives were given limited access privilege with the expectation that the members of the cooperatives would lower their discard rates and potentially improve the value of their harvested species. The reforms proved to be effective because they offered flexibility in the system, with fishers having a large choice of fishing grounds and no longer having to compete as actively with other fishing fleets in order to exercise harvest capacity.²³⁶

In 2009, the North Pacific Fishery Management Council implemented a new incentive plan agreement for managing discards in the Bering Sea Pollock Fishery as part of its “Fishery Management Plan for Groundfish of the Bering Sea and Aleutian Islands Management Area”. Under the incentive plan agreements, groups of pollock fishers operating as a “fleet” could agree to actively reduce their bycatch of chinook salmon in order to ensure access to productive fishing grounds. Each fleet would be assigned an aggregated available base cap which is shared at the outset among the vessels comprising the fleet.²³⁷ Fleets with low chinook salmon bycatch rates could continue to fish across the region, while fleets with average or high rates of bycatch would be excluded from fishing in areas where there were likely to be high levels of salmon bycatch. Once a fleet’s available cap had been reached, a fleet must stop fishing for pollock unless it can obtain additional “base cap” from another vessel, fleet, or sector to take chinook.

Fleets have an added incentive under the programme. If the fleet is able to keep its bycatch below the annual threshold, the vessels within the fleet would be awarded Salmon Savings Credits that permit them to exceed annual thresholds in years where there are inevitable high bycatch levels. Fleets that do not acquire these Salmon Savings Credits may not be able to operate in years where there is likely to be high salmon bycatch. Even though these credits expire after 3 years, fleets still have the

²³⁴ 50 CFR 648.108 (b)(3)

²³⁵ Bering Sea and Aleutian Island Fishery Management Plan, Allocation of Non-Pollock Groundfish and Development of a Cooperative Programme for the Non-AFA Trawl Catch Processor Sector, June 10, 2006, Amendment 80; http://www.npfmc.org/wp-content/PDFdocuments/catch_shares/AM80/IRIU80motion606.pdf (Providing Council Motion)

²³⁶ J. Abbott, A. Haynie, and M. Reimer “Hidden Flexibility: Institutions, Incentives and the Margins of Selectivity in Fishing” *Land Economics* 91 (1) February 2015: 169-195

²³⁷ Amendment 91, Fisheries Management Plan for Groundfish of the Bering Sea and Aleutian Islands Management Area, North Pacific Fishery Management Council (75 FR 53026, August 30, 2010); See e.g. Mothership Salmon Savings Incentive Plan Agreement (29 September 2010) https://alaskafisheries.noaa.gov/sites/default/files/mothership_salmon_savings.pdf

incentive to keep bycatch below the annual thresholds in order to receive additional bycatch credits. Revisions to the programme have been proposed in 2016, including extending discard reduction efforts to chum salmon and requiring the use of salmon excluders.²³⁸

Introducing a similar “incentive”-based model for bycatch reduction into New Zealand may be difficult under the New Zealand QMS, because the government does not typically play the same role as the U.S. government in defining bycatch “hotspots” or area closures. New Zealand ACE holder’s existing incentives to reduce bycatch are generally based on the ability to roll 10% of ACE forward for a limited number of species. If the U.S. bycatch management model based at a fleet level might be attractive as a means of managing New Zealand mixed species fisheries, it might be possible to implement such a fleet-based model as part of the Governor-General’s powers under the Fisheries Act 1996 to implement sustainability measures related to where fishing can take place and fishing methods. To implement this system, the Minister for Primary Industries would either need to provide notice in the *Gazette* or recommend the making of a regulation under Section 298 of the Fisheries Act.²³⁹

²³⁸ Proposed Rule (Amendment 111 to Fisheries Management Plan for Groundfish of the Bering Sea and Aleutian Islands Management Area), Fisheries of the Exclusive Economic Zone Off Alaska; Bycatch Management in the Bering Sea Pollock Fishery <https://www.federalregister.gov/articles/2016/02/03/2016-01890/fisheries-of-the-exclusive-economic-zone-off-alaska-bycatch-management-in-the-bering-sea-pollock>

²³⁹ Fisheries Act 1996, Section 11

6 POLICY SUGGESTIONS TO ADDRESS DISCARDS

Many of the concerns that the New Zealand Discard Working group grappled with between 2008 and 2012 remain today. For example, incentives to high-grade remain for certain low commercial value species. In theory some of these incentives could be addressed by creating new markets for fish that are otherwise being discarded. But this will not eliminate all of the underlying drivers for illegal discarding.

There is no single intervention that will eliminate the primary issues associated with existing discard practices—the ethical issue of waste and the management issue of accurate reporting. Because the challenges associated with discarding have multiple biological, economic, and social drivers, any response designed to reduce illegal discarding will need to be multi-faceted. There can be no single technological fix to what may be one of commercial fishing’s largest socio-ecological challenges. Technology will only be effective if there is also buy-in from the fishing community and that they understand why discards may be problematic for the resource and are willing to commit to changing behaviour.

This portion of the report focuses on a variety of approaches that, when combined and applied in the appropriate context, might further reduce existing practices of high-grading or discarding due to a lack of available quota and concerns over deemed value. As previously observed, there is no simple or singular fix. Some commentators have suggested that quota systems should be transformed into transferable effort controls.²⁴⁰ Other commentators have recommended limited entry licensing systems with non-transferable licenses and buy-back provisions.²⁴¹ While these types of suggestions may indeed reduce the practice of discarding by reducing the incentives to discard, implementing these suggestion would require an active legislative overhaul of New Zealand’s fishing management system. This is not politically desirable given that the quota system appears to be an effective management system when applied to some of New Zealand’s largest commercial fisheries.

The following suggestions include a number of ideas that are already in circulation at MPI among staff policymakers; some of these ideas have received traction within the Ministry while other ideas have not received much policy attention or have not yet been considered. None of these ideas are intended to seek any substantial departure from the existing QMS as New Zealand’s fisheries management system but rather to provide additional means to maintain the integrity of the QMS.

Any policy designed to improve discard policies must address the:

- 1) Need for more high-quality information to inform stock assessments

²⁴⁰ A. Rijnsdorp, N. Daan, W. Dekker, J. Poos, and W. van Densen, Sustainable Use of Flatfish Resources: Addressing the Credibility Crisis in Mixed Fisheries Management: *Journal of Sea Research* 57 (2007): 114-125.

²⁴¹ P. Copes *supra* note 48.

- 2) Need to ensure that fishers are able to use their quota/ACE without engaging in excessive overfishing and
- 3) Need to improve certain selectivity aspects of fishing to decrease the mortality rates of those fish that might be incidental bycatch

The following section identifies four general categories of policy suggestions intended to address these policy objectives.

- 1) Suggestions to improve the quality of available information
- 2) Suggestions to improve usage of existing quota/ACE
- 3) Suggestions to improve selectivity
- 4) Suggestion to enhance professionalism in the New Zealand fishing industry

All of these suggestions should be read in the context of two broader concerns for the Ministry. First, as will be noted below, IEMRS is the Ministry's favoured approach to addressing discards due to resistance from some members of the fishing industry to carrying observers perhaps in part because of fears of observing problematic discard behavior. Effectively implementing this approach will require some degree of buy-in from the fishing community and this social policy aspect of implementing new technology should not be ignored. Second, if the Ministry hopes to increase economic value within the fishing industry, it will need to play a leading role in helping to grow a professional fishing industry. The Ministry should actively seek opportunities to engage with New Zealand fishers, particularly the new generation, through education and sustainability training programs.

- 1) Suggestions to improve the quality of available information for fisheries science

As noted in previous sections, fisheries science requires high quality information in order to be able to assess stock abundance and stock status. There is nothing simple about designing fisheries models, but the more information available to fisheries scientists, the more factors they can consider in assessing stock health and ecosystem health. More comprehensive stock assessments can lead to a more reliable calculation of the total allowable catch which informs the amount of ACE available to fishers.

From 2008-2012, the Discards at Sea Working Group including both members of MFish and the industry brainstormed pragmatic solutions to collecting better information. The final conclusion of the group was to try a pilot to see whether the setting of a Minimum Economic Size would improve reporting and whether this additional reporting would actually change assumptions used to inform the calculation of the Total Allowable Catch. While there appeared to be good faith from all members of the Discards at Sea Working group which would have gone a long way towards the potential success of this proposal, the proposal depended largely on the ability to implement the age-old advice of "trust but verify". If MPI does not fully trust the industry, verification of the reporting would require substantial initial investments in monitoring to confirm that more comprehensive reporting was actually taking place across the fishing sector and this would require the deployment of substantial

resources. At some level, the Ministry should be able to trust the industry and rely on the industry's self-reporting because the introduction of a MES policy resolves one of the daily dilemmas of fishers. The Ministry might have further increased the effective implementation of this policy as a reporting enhancement measure through face-to-face interactions with commercial fishers that could include a pledge or even an individual legal contract to adhere to accurate reporting as part of obtaining a commercial permit. While FishServe offers the chance to acquire a commercial fishing permit for 5 years, fishers could be required to sign an annual contract to indicate that they will adhere to permitting as a means of reinforcing the agreement to comprehensively report.

There is no broad support at MPI to revive the efforts of the Discards at Sea Working Group. Part of the reluctance is that while introducing a MES might improve reporting, it may have insufficient impact on fishing selectivity. Just as with the introduction of MLSs for various species that require returns to sea but are not required to be recorded, there would be no immediate incentive based on the MES alone for fishers to actively avoid certain sub-MES fish since they would be able to simply return the fish to the sea without having to take any deduction of ACE. Fishers who were thinking about the long-term would avoid sub-MES fish because they would recognise that any sub-MES fish returned to the sea must be factored into the "other sources of fishing-related mortality" which would lead to an eventual reduction in the TACC for stocks with large catches of sub-MES fish. Even if the returning of sub-MES fish to the sea is addressed at the fisheries management level by a reduction in TACC, the MES approach would still not address the ongoing concerns to reduce the mortality of fish that are returned to the sea. From the short-sighted perspective of some fishers, as long as the fish was alive when returned to the sea and the fisher doesn't have to count it against his or her ACE, the survivability of the fish doesn't matter much.

The following begins with the policy suggestion of electronic monitoring and reporting that is already being implemented at MPI. The remaining suggestions focus on increasing government investment in stock assessments, simple changes to reporting forms that may improve reporting accuracy, and devising methods to increase information exchange with commercial fishers.

A. Implementing Integrated Electronic Monitoring and Reporting System with Buy-In from the Fishing Community

The presence of observers on board vessels seems to improve compliance levels with government regulations.²⁴² Yet, on-board human observers are expensive and may not have complete information because they cannot be in two places at the same time as two commercial fishing processes may be taking place (e.g. harvesting and processing). Some fishing associations have started calling for the implementation of electronic monitoring to replace observers in order to improve information collection in the industry and reduce costs. For example, in Alaska, a group of longliners in the Alaska Longline Fishermen's Associations are hoping to integrate electronic

²⁴² H. Benoit and J. Allard *supra* note 95.

monitoring for sablefish and halibut fishing trips which will record the image of every fish harvested. The association prefers the electronic monitoring to the payment of a 1.25% tax on the post-season adjusted price per pound on groundfish and halibut to cover the costs of the observer programme.²⁴³

MPI is focused on adopting new fisheries monitoring technology in order to improve the reporting of fishing activities for use in fisheries management decision-making. The IEMRS program will in the years to come be mandated for all vessels fishing in New Zealand. The proposed system will include electronic real-time catch reporting, on-vessel cameras, and a GPS vessel monitoring system. The system may in some cases be a substitute for observers to monitor fishing practices and compare practices to self-reporting in fleets where there is low-observer coverage. Other regulatory benefits of the cameras may be to document food safety handling, improve maritime safety, and ensure compliance with labour laws. The government has the power to regulate these aspects of commercial fishing.²⁴⁴ The commercial vessels in the Snapper 1 fishery (SNA1) are currently using cameras as part of trials for electronic monitoring in New Zealand. The proposed requirement for all vessels of a certain size to carry cameras has stimulated debate among some industry members. Some commercial fishing entities have embraced the possibility of electronic monitoring as a means of assisting with data collection.²⁴⁵ Others have rejected it as unfair unless all ocean users including recreational fishers are monitored.

The Trident Fisheye system is one monitoring system that has been trialled in New Zealand.²⁴⁶ A camera is mounted on a vessel that is capable of taking a full hemisphere view and providing a 360 X 180 degree image. As it records footage, the system records GPS locations. This information is delivered by wireless or 3G networks to secure servers where vessel operators can access the data and then relay the data to government staff. The system offers a remote monitoring option where vessels operating within the range of a 3G network can relay reports and images at specified time intervals and the camera operation can be monitored while the vessel is at sea.

²⁴³ Shannon Haugland, Longliners Pitch for Electronic Monitoring, Daily Sitka Sentinel (March 21, 2014)

²⁴⁴ Fisheries Act, Section 297 (ca)(Authorising the government to prescribe “requirements or matters relating to the installation and maintenance of equipment (including electronic equipment) to observe fishing or transportation, and to the payment of any associated prescribed fees and charges”.)

²⁴⁵ Sanford Limited, Sanford Welcomes Greater Transparency with Cameras (March 22, 2016) <http://www.scoop.co.nz/stories/BU1603/S00716/sanford-welcomes-greater-transparency-with-cameras.htm>

²⁴⁶ Trident Systems, Fisheye, Video and Monitoring Solutions for the Seafood Industry, www.tridentsystems.co.nz (As of 2016, no commercial provider has been certified by MPI but it is expected that several commercial providers will be certified as the programme gains momentum.)

As observed in trials with cameras operating on board vessels in a Danish cod fishery, there are number of advantages to deploying cameras.²⁴⁷ First, some fishers will quickly reduce their illegal discard rates without the implementation of additional technical rules because of the deterrence effect of cameras.²⁴⁸ Second, fishers are more likely to improve their recording in logbooks because the video can be used for verification. Over time, these same benefits are likely to manifest themselves in New Zealand.

There are several outstanding issues in deploying cameras effectively to reduce illegal discards. First, a workable discard policy under the QMS needs to be finalised so as not to unduly penalise fishers. As of 2016, in spite of years of effort on the part of the various ministries responsible for fisheries management, there has been no public articulation of the Ministry's policies regarding how MPI will implement the Fisheries Act 1996 prohibition on dumping in light of the fact that some level of discarding is a long-term practice in commercial and recreational fisheries.

Otherwise, the value of electronic monitoring as a means of collecting critical data for stock assessment may be resisted by fishers who fear the worst-case scenario of losing their vessel or other assets for what would otherwise be a minor violation. Currently the Fisheries Act (Section 72) provides that the discarding of even a small number of QMS fish that cannot be returned under the Sixth Schedule or are not below a minimum legal size would be a strict liability "offence" with the potential of liability up to \$250,000 depending on the Court's decision regarding the need to maintain a deterrent effect.²⁴⁹ The system is structured to be one based on low-detection and high consequences.

While a court may not impose a liability at this level, any conviction under the Fisheries Act for dumping opens a fisher up to the possibility of having to forfeit "any property used in the commission of the offence" which would include the fishing vessel and equipment "unless the court for special reasons relating to the offence orders otherwise".²⁵⁰ If some form of an agency discard policy that is not simply a reinforcement of the "discard ban" is not implemented before requiring electronic monitoring, either 1) New Zealand courts will have full dockets and find themselves in a position of having to issue "special reasons" for why property used in the commission of a dumping offence should not be forfeited to the Crown or 2) the Ministry will have to make the decision not to enforce the Fisheries Act under the existing terms of the Act that call for a "discard ban" with only a very limited number

²⁴⁷ Clara Ulrich et al. Discarding of Cod in the Danish Fully Documented Fisheries Trials, *ICES J. Mar. Sci.* (2015) doi: 10.1093/icesjms/fsv028

²⁴⁸ Road Safety Camera Programme, Victoria Auditor-General Report (31 August 2011) <http://www.audit.vic.gov.au/publications/2011-12/20110831-Road-Safety-Cameras/20110831-Road-Safety-Cameras.html> (Concluding that speed cameras reduce speeding and improve behaviour of drivers)

²⁴⁹ Fisheries Act 1996, Section 228 and 252(3)(b) (Listing dumping of fish as a potentially more serious offense than other offenses covered by the Fisheries Act in terms of the level of the penalty cap).

²⁵⁰ *Id.* at Section 255C(2)

of exceptions available in Schedule 6. Neither of these are politically palatable outcomes. IEMRS is currently focused on structuring a high detection and “graduated consequence” penalty system where penalties might depend on a variety of factors such as the amount that is discarded, the reasons for discarding, and whether the party discarding is a repeat offender.

Leaving the *status quo* for the discard policy with its limited Schedule 6 exceptions may improve fisher compliance and reporting. However, over time it could lead to further strains on the fishing community as individual fishers find themselves economically unable to fish under the existing ACE/deemed value system where there is no developed market to recoup the costs associated with landing some of the more commonly captured and discarded QMS species. A “discard ban” in New Zealand may have the same adverse effects on fishers as the “discard ban” in the European Union appears to be having. What this might mean from an industry view is that fewer and fewer individuals are willing to pursue the profession of fishing until there is a crisis in attracting qualified labour.

If no changes are made to the penalty structure of the Fisheries Act before electronic monitoring and reporting are broadly adopted, MPI should invest in additional work to identify and legislate what would constitute an excessive discard threshold. For example, MPI might authorise fishers in the first year of electronic monitoring to discard 3% of the catch of a given stock without requiring balancing of those discards against ACE of 5% of the catch of a given stock. This “discard threshold” could be reduced in subsequent years with the expectation that fishers will be actively seeking means to adapt. This would contribute to a better transitional framework for fishers and provide them with the opportunity to progressively implement gear innovations or new operational practices. The Ministry may want to offer temporary interpretations of Section 72 to assist fishers in understanding what level of discarding would be tolerated as part of a sustainable but pragmatic practice of commercial fishing. The “tolerated” level of discarding should be factored into any process to set a TAC as an additional source of mortality and should be legislated to protect fishers as they transition to practices that would eliminate discards. MPI officials have indicated that a *de minimis* threshold may be difficult to introduce because of public concerns about any waste of limited fishing resources.

While at some level this may seem to be condoning practices that the public finds ethically distasteful, this proposal of a “discard threshold” that is ratcheted down as gear adaptation improves provides a reality-check for the industry. At this juncture, no other industry in New Zealand is required by law to have an enforceable zero-waste mandate with no buffer provided for some degree of operational wastes. Even when there are discards, as explained earlier, the discards are not ecologically wasted but are typically consumed at some point in the marine food chain.

A second pragmatic challenge for MPI in implementing electronic monitoring and reporting as a means to acquire better data will be the need to have someone actually watch the footage that has been collected unless there is some means of processing “big data” to identify anomalous behaviour on the deck. This is likely to be a recurring human resource issue for MPI which is likely to require careful training. While some fish species are easy to identify based on colour, size, or other identifying features, there are likely to be other fish that are difficult to quickly identify from video footage.

Third, the use of cameras has the potential to raise issues of rights to individual privacy particularly because most industries are not subject to this level of potential surveillance. If ostensibly the cameras are in place to regulate fishing practices, the cameras may also capture other behaviours on the deck where the cameras are collecting data that do not relate to fisheries management (e.g. immigration or vessel safety management). The question remains as to whether information ostensibly collected for fisheries management purposes can also be used for labour, health and safety enforcement. In theory, it can be used for these purposes, but this raises questions of whether every vessel operating in New Zealand waters of a certain size should have to operate with a camera recording potential fishing behaviour. Some commercial fishers have suggested that recreational fishers, particularly recreational charter vessels, should also be subject to electronic monitoring.

Fourth, there still remain some uncertainties with reporting requirements. As discussed in Section 3 above, it is not always clear to some fishers whether they are required to report non-QMS catches. Any camera surveillance programme should be implemented in parallel with clarified reporting expectations. Otherwise, the camera programme might generate active resistance from parties that find themselves under scrutiny for activities that they were not aware might be violations of the Fisheries Act.

Fifth, to the extent that the cameras resolve the issue of detection because they record all relevant catch activity, the Ministry must be prepared to act in a timely fashion on any information that it gains from the video feeds. Fishers must expect that any loss of privacy from round-the-clock detection would ultimately exceed any continued gain of breaking rules (e.g. continuing illegal discarding behaviour). The cameras must have a real deterrent effect. What this means in practice is that the Ministry's prosecution teams must be prepared to bring timely prosecutions shortly after a fishing trip ends. Otherwise, inappropriate discarding behaviour is likely to continue in future trips. From a human resource perspective, this means that the Ministry must increase its capacity to pursue rapid prosecutions. While some cases might be clear cut, there are cases that are likely to be less well-defined because of the quality of the video attainable due to lighting conditions or weather. For example, the Ministry might accuse a fisher of dumping a quota species but the fisher might argue that the fish in question particularly if it resembles another species is a non-quota species. At this juncture, Ministry lawyers should be preparing legal briefs that are responsive to the types of legal evidentiary issues that might be raised by a fisher accused of dumping only on the basis of video footage.

Finally, as noted above, the social policy aspect of implementing this new technology should be considered very carefully by MPI before simply mandating electronic monitoring and reporting. This could include the Government offering financial incentives to assist with the uptake of the technology particularly by some of the less well capitalised boats that otherwise may not be able to afford the initial investment. Government agencies have supported similar types of subsidies in other areas including for example subsidising insulation costs for individual homes under the Warm Up New Zealand Healthy Homes initiative. If the cameras are to become a substantial part of how MPI collects data for managing and protecting fisheries resources, it would be fair for some amount of the purchase and installation costs to be covered by government funding for those fishers living on the economic margins.

Social policy should cover more than simply costs of installing the technology. There needs to be a collaborative effort established between MPI and the fishing sector to ensure the success of the cameras. As current trials in the United States indicate, there are various ways that fishers could aggravate already existing “technical hurdles” including fogged lenses, glare, and low light. Fishers will not make the potentially necessary efforts to clean the lens, position their boat to prevent glare, or properly light a discard area if they do not have a shared interest in ensuring the success of the programme.²⁵¹

One area where camera technology can yield useful results for Ministry data collection efforts might be on conveyor belts on boats that have offshore processing capacities before discarding. In a selection of reports from between 2012 and 2016, observers have noted various difficulties including technical difficulties in measuring discards. In some instances, observer stations available on a boat do not provide a clear view of the conveyor or discard shoot, making it difficult for an observer to measure discards unless they stop the processing. In other instances, it is difficult for an observer to make initial species’ estimates because sorting occurs immediately after the fish are landed and it can be difficult for an observer to count fish while multiple crew members are working in an area. Observers have also noted that it can also be especially difficult when a net primarily consisting of bycatch is brought on board and then moved straight to the discard chute. In other observer reports, observers noted that sorting and discarding is done very rapidly on commercial vessels which has the potential to impact the ability to accurately calculate discard rates.

Simply having a camera giving a birds-eye view of the conveyor belt may not yield sufficient information for fisheries analysts watching remotely to gather fisheries discard statistics. It may be possible, however, to use a camera with automatic pattern recognition software to better estimate what is being discarded. In 2013, Danish researchers developed cameras that can be used for sorting fish by taking digital photos of catch and then using the photos for identification of species.²⁵² The 2013 model identified fish correctly 98 per cent of the time and required 1/10 of a second for identification.²⁵³ A conveyor-based camera and sorting system may improve accuracy of discard statistics both in terms of weights discarded and species. This type of pattern recognition could be particularly useful for long-liners where fish are individually unhooked or for conveyor belts. This can be important for vessels with inexperienced crew. As evidenced in a 2016 investigation of illegal discard practices by MPI, fishing masters who have limited experience in New Zealand waters, and presumably apprentice fishers may be unable to rapidly identify QMS species during

²⁵¹ Rich Press, NOAA Fisheries, Electronic Monitoring: Different Fisheries Require Different Solutions (February 16, 2016) http://www.nmfs.noaa.gov/stories/2016/02/electronic_monitoring.html

²⁵² Elinsor Schang (4 February 2013) Camera Could Help Sort Fish, Save Stocks www.planetark.com/dailynewsstory.cfm/newsid/23814/story.htm

²⁵³ Id.

a high-intensity sorting process.²⁵⁴ A camera system such as that developed by the Danish COWI group, an engineering consultancy group, may help with this identification for purposes of accurate reporting.²⁵⁵

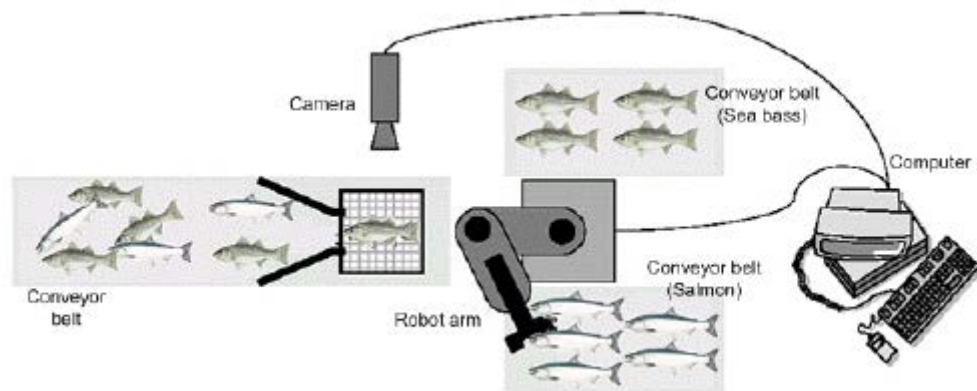


Figure 4. Schematic of camera use on a fish processing line

There may be additional opportunities for a camera to assist MPI in its efforts to understand stock health. As part of its efforts to invest in electronic monitoring across the commercial fleet, MPI may want to consider incorporating biomass estimator optical systems to provide direct data from the fishing sector to fisheries managers to allow for more flexible management measures such as temporary closures of areas where there are large amounts of bycatch being caught.

B. Increasing government investment in prioritised assessment of New Zealand’s living marine resources and dynamic mapping for species with actual or alleged high discard rates

A repeated concern raised by Ministry staff and members of the commercial industry is that some stock assessments that form the basis of total allowable catches may be relying on old data even when there is evidence that environmental conditions have changed since the original data were collected. Also, some stocks particularly stocks of a low commercial value have not been recently re-assessed because it is expensive to conduct a scientifically-based stock assessment. In part, because the stock assessments are fully or partially funded through cost-recovery from the industry, the number of stock assessments remains low and only focuses on those species with the highest commercial value or volume, or those for which there may be a sustainability

²⁵⁴ Sometimes when an observer is focused on one task, they fail to record other data. This is famously represented by the so-called “moonwalking bear” or “invisible gorilla” in the experiment where participants are asked to count the number of times that a basketball exchanges hand. Meanwhile, a person dressed in a bear or gorilla costume crosses the screen and remains unnoticed by many observers. This is called “change blindness”. See e.g. D. Simons and C. Chabris, “Gorillas in our midst: sustained inattention blindness for dynamic events” *Perception* 28 (9) (1999): 1059–1074

²⁵⁵ The Danish group is also in the process of developing a camera which could operate underwater and assist with sorting fish before they are brought on board. See e.g. COWI, *Fish Can Be Sorted Under the Water* (January 16, 2004) <http://www.cowi.com/menu/newsandmedia/news/newsarchive/fishcanbesortedunderthewater>

issue. In New Zealand, certain aspects of fisheries management are funded by cost recovery mechanisms from the industry under the Fisheries Act which can create a disincentive for funding stock assessments for stocks with low commercial value or ecosystem-based assessments to evaluate species outside of the QMS²⁵⁶. Currently, two-thirds of New Zealand's research budget is cost-recovered.

Given that the fisheries resources belong to all New Zealanders, there needs to be a commitment from the Government to support basic fisheries research. The current government support for this type of research has been waning. The current research budget for stock assessment research is approximately 45% of what it was in the early 1990s even though the number of QMS stocks has increased 3.5 times since that time.²⁵⁷ Under Section 262 of the Fisheries Act 1996, the cost of conservation services provided for the general public interest are not recoverable from the industry. Basic science to support robust stock assessments are costs that should at least partially be underwritten by the New Zealand government as the public's trustee for marine resource protection.

From a policy perspective, this may require the government investing additional money from tax-payers to support research into the integrity of commercial fisheries rather than relying on industry cost-recovery efforts to finance a large portion of basic science on commercial species. Addressing the always challenging question of how many fish there are in the sea and the health of ecosystems is not simply a question of interest to the commercial fishing fleet but should be of interest to New Zealanders as a whole, given that New Zealand is a leading oceanic nation with the 5th largest exclusive economic zone in the world. Because the healthy, abundant fish stocks of New Zealand are a public resource, ongoing research to estimate fish stock numbers and ecosystem health should be regarded as a public good, with benefits flowing to the public by providing open access high-quality information about the integrity of marine resources to all interested stakeholders.

Given the importance of research to ensure the robustness of the QMS, it is surprising that research funding continues to wane. Different countries invest substantially different amounts in basic marine science. For example, the United States in 2009 spent approximately \$853,000,000 USD of government funds on a combined programme of fisheries research and fisheries management including compliance and observers for national fisheries capturing 4.3 million tonnes worth \$4.1 billion USD with almost no cost recovery.²⁵⁸ In 2009, New Zealand spent approximately \$68,200,000 NZD of government funds on a combined programme of fisheries research and fisheries management including compliance and observers for its national fisheries with a portion of this programme cost-recovered from industry.²⁵⁹ While it is acknowledged that New Zealand has a vastly smaller population than the

²⁵⁶ Fisheries Act 1996 Section 262; Fisheries (Cost Recovery) Rules 2001.

²⁵⁷ P. Mace. Pers. Comm.

²⁵⁸ P. Mace Pers. Comm.

²⁵⁹ Ibid.

United States and therefore less ability to distribute costs among its taxpayers, the ability of New Zealand to understand the ecological status of its marine resources may be jeopardised in the long-term if government investments do not increase for basic research that industry is unlikely to fund. As of 2015, MPI does not know the depletion (overfished) status of 22.3% of QMS stocks as measured by value and 31.45% of QMS stocks as measured by volume.²⁶⁰

If investments are made in basic marine science to improve the quality and quantity of the data underlying the QMS, then there should be additional Ministry-led investments made in proposing discard models that can be used to inform total allowable catch numbers. When stocks assessments are done, there may be such limited information about actual discard practices that discards are not being sufficiently accounted for in calculations of fishing mortality. As some fisheries commentators have observed, the amount of discards is not necessarily proportional to catch or effort leading to potential calculation errors in total allowable catches.²⁶¹ As a result, TACCs may be set either too high or too low or need to be reconfigured in order to reflect the realities of mixed species fisheries. In many cases, however, New Zealand does account for discards in stock assessments, either explicitly or implicitly. Research funding to test the current assumptions on which discard rates are being included in stock assessments would benefit New Zealand because it would support both sustainability and optimal resource use objectives.

Public investment in estimating discards is essential to ensure that any adjustments to TACs reflect best scientific understanding of biological factors, regulatory drivers, and market realities. Modelling of market realities can be particularly challenging for the Ministry since MPI no longer has a staff member who specifically looks at fisheries economics. Market information such as the alleged sale of New Zealand snapper under 250 mm in the Sydney fish market is critical, not just for enforcement purposes but also for making assessment decisions.²⁶² Ongoing underreporting that is not incorporated into TACs will undermine the ability of the QMS to ensure sustainability.

Finally, as part of the public contribution to understanding the ecological health of New Zealand's marine living resources, MPI may want to consider as part of its research programme the introduction of ongoing dynamic mapping of the distributions of species for those species where there is suspected dumping occurring due to a lack of ACE, a perceived lack of opportunity to obtain ACE, or low value for the stock. This type of data may become more easily accessible through the mandatory electronic reporting that MPI intends to implement in the coming years.

²⁶⁰ Ibid.

²⁶¹ M. Rochet and V. Trenkel, Factors for the Variability of Discards: Assumptions and Field Evidence, *Canadian Journal of Fisheries and Aquatic Sciences* 62 (2005): 224-235.

²⁶² Aaron Leaman, Baby Snapper Ending Up in Overseas Fish Market, *Waikato Times* (February 28, 2014) (Describing market observations from a former fisheries officer)

These dynamic bycatch maps could then be compared to real-time maps of fishing effort developed based on a combination of VMS data and electronic fishing logs. The maps could be distributed to the public to raise awareness of species interaction within a fishery. Fishers could use these maps to help them in designing individual fishing trips that are more likely to avoid bycatch. The maps might even potentially become a future basis for voluntary industry or mandated Ministry “move-on” requirements in mixed-species areas where bycatch may be exceeding target catch. Ideally, any such real-time dynamic map would be able to reflect seasonal differences in species interactions that might be driving some discarding behaviour.²⁶³

C. Considering New Destination Codes for Live and Dead Sub-MLS fish Returned to Sea with no requirement for ACE Balancing

One of the reasons for MPI to mainstream electronic monitoring is to enhance reporting so that better fisheries management decisions can be made. As explained in Section 2, there has been historically some confusion over what should be reported as a return to the sea and what should not be reported, particularly for sub-MLS fish.

Today, fishers return sub-MLS fish to the sea without any obligation to report these fish except for undersized snapper in SNA 1. Information about what sub-MLS fish are returned to the sea and whether they are dead or alive at the time of release is useful information for fisheries scientists. MPI may want to consider requiring some basic reporting for these fish and creating a new destination code that would enable fishers to report this information. At present, if a fisher were to report these fish, they would be assigned a Destination Code A and be counted against a fisher’s ACE. Because there is no incentive to report something that has already been returned to the sea and for which there is no possibility of financial revenue, it would be advisable to create a new Code to measure these returns that does not count against a fisher’s ACE.

Currently, this suggestion would only apply to the 11 finfish stocks and the 4 shellfish stocks with MLS. It has been argued by some that nothing that has been captured by a commercial fishing vessel should be returned to the sea, but this perspective fails to understand that good fisheries management does not rely on all fish caught being landed for human use.²⁶⁴ Many fish of certain species that are returned to the sea will survive and for those fish that will not survive, they will contribute essential nutrients to the marine food chain.

If a new reporting code is created and MPI works with fishers to help them understand the importance of reporting sub-MLS fish that are returned to the sea, it

²⁶³ C. Gray, D. Johnson, M. Broadhurst, and D. Young. Seasonal, Spatial and Gear-related Influences on Relationships between Retained and Discarded Catches in a Multi-species Gillnet Fishery, *Fisheries Research* 75 (2005): 56-72.

²⁶⁴ See e.g. Blue Economy Summit Discusses Implementation of SDGs, Paris Agreement, IISD Reporting Services (January 2016) <http://nr.iisd.org/news/blue-economy-summit-discusses-implementation-of-sdgs-paris-agreement/> (Describing President of Iceland’s call to “use 99%” of all fish captured)

may be possible to improve fishery management for at least 15 stocks (11 finfish and 4 shellfish). MPI may want to work in collaboration with fishers and other government research agencies to assist in how to improve “return to sea” practices. While sub-MLS fish are returned to the sea, they have been treated by some fishers as secondary to target fish that will be kept during the sorting process. Ideally, sub-MLS fish that are likely to survive a return should be quickly identified, a greenweight should be calculated for these fish, and the fish should be rapidly returned rather than being left on the deck or placed in a bin to be dealt with later. A separate greenweight for dead sub-MLS fish should also be calculated as a factor to potentially incorporate into total allowable catches

D. Ensuring Electronic Reporting Improves Quality of Information Being Reported

MPI is mainstreaming a programme to replace paper-based returns with real-time catch reporting through IEMRS. The hope is that fishers will transition to the use of real-time electronic reporting by 2017 or 2018. If MPI is able to collect the type of data that it hopes to collect, it will have more detailed spatial and temporary information needed to manage fisheries. All of the data collected through the IEMRS program can be made available to industry for use in fisheries management inputs, fishers for business planning purposes, the government for monitoring and verification, and third party verifiers such as the Marine Stewardship Council. IEMRS should reduce costs to industry.

From a regulatory perspective, revisions will need to be made to the Fisheries Reporting Regulations so that the electronic design will not be constrained by the current limitations of the current forms. For example, fishers have only been required to report on the top five or top eight species that they catch, depending on the particular form. Given that in mixed fisheries fishers are often catching far more species than they are required to report, the reporting requirements have artificially limited the information available to fisheries scientists.

FishServe has begun to address some of the issues with paper reporting by offering an electronic application (CEDRIC) that can be used to create a Monthly Harvesting Return. Use of a CEDRIC is free. Operators can use the software to calculate trawl effort, processing, landing, and non-fish reports.

In implementing electronic monitoring, MPI must be careful not to provide unintended disincentives to reporting. For example, Monthly Harvesting Returns (MHR) and Licensed Fishing Receiver Returns (LFRR) submitted through FishServe are each assigned processing fees on the basis of each stock that is listed. While the fees are minor (\$4.60 per line for a manual LFRR/MHR or \$1.15 per line for an electronic LFRR/MHR), the small fee may provide yet another disincentive for a given record-keeper from listing any QMS or non-QMS species that do not already appear on the catch effort returns.²⁶⁵ This minor barrier could be remedied either by

²⁶⁵ FishServe, Fees and Levies, <https://www.fishserve.co.nz/information/fees-and-levies>

waiving the processing fee for the reporting of more than the maximum number of stocks that can be listed on a catch effort return depending on the gear type

As electronic real-time catch effort reporting is rolled out, it may be worth exploring whether the basic real-time catch reporting infrastructure should be underwritten by the Government rather than being cost-recovered from the industry. Accurate reporting is essential for the integrity of the QMS and underwriting the equipment necessary for this reporting is in the best interest of New Zealand to ensure there are no barriers to improving reporting.

While electronic reporting and training may address the ability of a data reporter to supply usable information, they are less likely to have an impact on a data reporter whose integrity may be already compromised. Here, there may be some behavioural interventions that could elicit better information for both paper forms and electronic reporting. One minor intervention might be to provide as part of the record-keeping practice a reminder that “X out of 10 people correctly report their catch”. Social scientists have found that such nudges have increased payment of taxes because most individuals do not want to be in criminal outlier groups within an identified community.²⁶⁶ In another simple test, researchers discovered that signing a form such as a tax return or an insurance form that depends on honest reporting – at the beginning of the form – increases accurate self-reporting.²⁶⁷ Incorporating this change into reporting forms would be inexpensive and potentially useful in terms of collecting a broader set of data. In order to test the usefulness of this type of intervention, it might be possible to compare data in a fishery known to have sizable discards collected by an agency observer against self-reported data collected on forms where record-keepers signed a pledge at the beginning against self-reported data collected on the original forms.

E. Improving data quality by creating a “collaborative information commons” with flowback of information to commercial fishers

One of the primary issues raised by the New Zealand Discards at Sea Working Group was insufficient information being available to understand how well the New Zealand discard policy was operating in practice. In spite of the requirement to report, no one really knows the extent of discarding practices, particularly in the multi-species fisheries because the primary information available is self-reported data and these data can only be verified in limited cases by correlating observer data. Self-reported data collection is always rife with challenges. Two of the larger challenges in relying on these data is being able to (1) verify the skill of the data reporter in collecting data that will be usable by others and (2) ensure that the data reporter is honest.

²⁶⁶ Patricia Cohen, *If the IRS is Watching You, You’ll Pay Up*, 4 January 2016, <http://www.cnn.com/2016/01/04/if-the-irs-is-watching-you-youll-pay-up.html>

²⁶⁷ Lisa Shu, Nina Mazar, Francesco Gino, Dan Ariely, and Max Bazerman, *Signing at the Beginning to Make Ethics Salient and Decreases Dishonest Self-Report in Comparison to Signing at the End Proc Natl Acad Sci U S A.* 2012 Sep 18; 109(38): 15197–15200.

On the issue of collecting data, one significant issue raised by the fishing industry is that skippers and other parties involved in record-keeping often do not understand how the data that they have been collecting is actually used to inform fisheries management decisions. For many fishers, the collection of data is regarded as more of a bureaucratic hurdle to clear than as an essential step for ensuring sustainable resource management. IEMRS is expected to simplify some of the collection of data that can then be used by industry, MPI, and third-party verification agencies. Deciphering agency science for members of the fishing community may yield large dividends in terms of improving the quality of data reported by the fishing industry.

While MPI encourages involvement of the fishing community in the scientific stock assessment process, MPI may also want to offer voluntary training to vessel record keepers such as skippers and fishing masters as IEMRS is adopted in such a manner that is likely to attract a high-level participation and to boost the quality of reporting, e.g. payment for *per diem* costs to attend the training. This training could be mandated for foreign skippers who may have less familiarity with New Zealand fisheries reporting practices.

Government-supported skipper training to improve sustainable fisheries practices already exists. Seabird SMART training workshops have been financed and developed by the Department of Conservation, Ministry for Primary Industries, and the fishing industry.²⁶⁸ This proposed record-keeping and IEMRS training would share best practices in data collection and explain how data collected in log books or the data collected in real-time catch reporting will be used within the agency.

This training would also provide MPI with the opportunity to consider how qualitative information from skippers might also be incorporated into data collection. The key to making the training mutually valuable would be to regard it as an opportunity for building a network of trust between the agency and fishers. In exchange for participating in the training and perhaps passing a certification test, skippers might be given some sort of government-approved qualification that could then be used to solicit future business from seafood processors. Broadly advertising the existence of such a qualification to potential charterers of commercial vessels should increase the value of the qualification.²⁶⁹

After offering record-keeping and IEMRS training, MPI might commit to taking concrete steps to increasing the flowback of information from MPI to fishing skippers who have participated in the training. Under IEMRS, fishing skippers will be entitled to access the information collected by their vessel. A flowback of information to fishers might include regular updates to members of the fishing industry about how

²⁶⁸ Seabird SMART Training Workshops, <http://www.southernseabirds.org/about-us/projects/seabird-smart-training-workshops/> (training 200 fishers from 127 vessels)

²⁶⁹ Anecdotally, the Seabird SMART workshops generated interest among some of the commercial fishing industry who wanted to be able to distinguish themselves as commercial fishers who care about resource stewardship. The sector energy around reducing seabird mitigation is encouraging as fishers have continued to innovate and develop new mitigation methods including one group of fishers who are trying to figure out how to sort their net while it is still in the water.

the reported data has been used by MPI for fisheries decisions in a format that would be both interesting and accessible to fishers; e.g. podcasts or a newsletter.²⁷⁰ This goal would enhance MPI's objective to improve its service to the public. At least one member of the fishing industry suggested that this type of project would be well-received because many participants in the fishing industry are curious to learn more about the larger ocean processes beyond their own experiences on their vessel.

Increased involvement of stakeholders in resource governance through skipper training, information flowback, and information exchange has been theorised to improve management outcomes in part because it enhances the legitimacy of an agency's final decision, integrates local knowledge, and creates the conditions for social learning.²⁷¹ Typically, the higher the level of involvement from fishers in the decision-making process, the more likely a measure will be respected and adhered to.²⁷² When a regulatory agency is not interested in fisher's working experiences, fishers may have a decreased level of compliance when they perceive that they have not been given basic validation and respect as professionals.²⁷³ This can be contrasted to the situation where fishers actively seek to comply with regulatory frameworks because they have been actively engaged in management and data-gathering processes.²⁷⁴ For individual fishers, having representation through a commercial fisher's group that can liaise with the Ministry is often not sufficient because of concerns over vested interests and conflict of interests.²⁷⁵

The social learning aspect is particularly important in the development of a "collaborative information commons" where local knowledge and agency knowledge might be more actively exchanged than in the current condition. Social learning has the potential to play a significant role in developing leadership and community

²⁷⁰ Examples of newsletters that might convey information in a manner more likely to be consumed are the newsletter of the Wellington Island Bay Marine Education Centre reporting on the "Deep-Sea Purple Sock Mystery Solved". <http://www.octopus.org.nz/content/deep-sea-purple-sock-mystery-solved>

²⁷¹ M. Van Vliet, K. Kok, and T. Veldkamp, Linking Stakeholders and Modellers in Scenario Studies: the Use of Fuzzy Cognitive maps as a Communication and Learning Tool, *Futures* (42) (2010): 1-14.

²⁷² B. de Vos et al. *supra* note 193 at p. 2.

²⁷³ Anecdotally based on discussions with fishers across New Zealand, many individual fishers feel that MPI in general cares only about fish and not about fishers.

²⁷⁴ I. Kaplan, Regulation and compliance in the New England Conch Fishery: a case for co-management. *Mar. Policy*. 22 (1998):327-335

²⁷⁵ K.L. Yates, View from the Wheelhouse: perceptions on Marine Management from the Fishing Community and Suggestions for Improvement, *Mar. Policy* 48 (2014): 39-50. (Noting that other frustrations of the North Irish fishers include "poor relations with the government departments that manage the marine environment" due to "poor communications and feeling ignored, confusing regulations, lack of understanding of fishers by managers and management choices of fishers... insufficient enforcement which indirectly penalises the responsible fisher, and what they saw as the uneven playing field across the fishing industry".)

cohesion capable of promoting sustainable fisheries.²⁷⁶ The process of social learning may also provide enhanced environmental stewardship by creating a shared worldview between a regulatory agency and fishers at least in regard to data. Currently, scientists and commercial fishers often differ in terms of their outlook on what data is relevant, how the data should be gathered, how to analyse it, and how to interpret it.²⁷⁷ Having an open dialogue on these critical matters has the potential to build trust between fishers and regulators that may not be present and allows for the “ground-truthing of management options”.²⁷⁸

2) Suggestions based on improving the operation of the existing quota system to reduce incentives to discard

One of the recurring themes as part of this research project was that the current quota system as implemented has exacerbated the incentives for discarding due to “choke species” in multi-species fisheries, deemed value, and quota concentration in the hands of LFRs or non-fishing entities. The QMS generally works well for single target fish species, with licensed fish receivers offering and delivering ACE for the single fish species and some amount of bycatch. Ensuring that there is ACE to cover bycatch becomes much trickier in a multi-species fisheries because in some cases the ACE that might have been used to cover bycatch is also being used to cover a target fishery or ACE holders are holding onto their ACE in hopes of restricting market competition.

The following section offers a number of suggestions including introducing bycatch risk pooling into New Zealand fisheries management and considering redistributing some amount of commercially valuable quota to community fishing organisations that commit to sustainable fishing practices.

F. Quota Banking/Risk Pooling for Multi-Species Fisheries or Stocks Crossing Fisheries Management Areas

Under the Fisheries Act 1996, commercial fishers are required to file fishing reports detailing where they are fishing, what they have caught, and how they were fishing. These reports serve an important traceability role and also form the basis for calculating deemed values for catch for which a fisher does not hold adequate ACE. This can prove problematic for fishing entities who hold ACE for a given target

²⁷⁶ Nicolas Gutierrez, Ray Hilborn and Omar Defeo, Leadership, Social Capital and Incentives Promote Successful Fisheries, *Nature* 470 (February 17, 2011): 386-389. (Observing that successful co-managed fisheries tended to have community leaders guided by collective interests and community cohesion and recommending that “additional resources should be spent on efforts to identify community leaders and build social capital rather than only imposing management tactics without users’ involvement”.)

²⁷⁷ E.M. Smith, The nature of Nature: Conflict and consensus in fisheries management *Aquatic Living Resources* 8(3) (1995): 209-213

²⁷⁸ Yates *supra* note 269 at 48. (Noting that fishers are best placed “to anticipate the possible ways fishers might bend the rules or bypass management measures” so that involving fishers in the development of management measures “should help make management more effective”.)

species such as mackerel but not for a non-target species such as kingfish that frequently occurs as a co-mingled stock.

In a proposed “quota banking” system, a fishing operation would have preferential market access to a certain amount of ACE that is only intended to cover bycatch for the non-target species within multi-species fisheries if the fishers agrees not to discard fish. “Quota banking” offers the opportunity for two or more vessels to collaborate in increasing value across multi-species fisheries.

This proposal is not the same as historical bycatch quota trade-offs, in which fishers could, in the early days of the QMS, trade their quota of a limited number of species for another different set of species on the basis of specified ratios set by the Ministry of Fisheries.²⁷⁹ This proposal also differs from the current practice of “banking quotas” whereby an ACE holder can transfer from one fishing season to another up to 10% of the ACE.²⁸⁰ The “quota banking” proposal encourages instead the use of all ACE within the fishing season, although it was originally designated to cover the inevitable harvest of species that are non-target species but still commercially valuable.

This type of “quota bank” operates in the United States red snapper and red grouper fisheries in the western part of the Gulf of Mexico.²⁸¹ In the case of the Gulf fisheries, a successful rebuilding of red snapper stocks led to an increase of red snapper incidental bycatch for the red grouper fishers in Florida. Fishers from Texas who held approximately 50,000 pounds of red snapper quota agreed to preferentially lease their donated red snapper quota through a fisher’s alliance in order to cover the Florida grouper fisher’s bycatch. To qualify for the leasing, fishers must use the quota only to cover bycatch and not for target fisheries, must land all legal-sized red snapper, minimise post-release mortality of undersized red snapper, offer the Shareholders’ Alliance a first refusal on any unused quota that is leased, report catch data electronically, and be open to using electronic video monitoring in the future.²⁸² All fishers participating in the programme are expected to adhere to a set of best business practices. The fishers understand this fisher-designed programme as “1) reducing wasteful red snapper discarding; 2) increasing the profitability of grouper fishing and 3) promoting industry solutions as support for the next generation of fishers”.²⁸³

One advantage of this proposal is that it gives the fishing industry operating in a known multi-species fisheries the ability to ensure that non-targeted but still commercially viable fish can be economically utilised rather than discarded. The

²⁷⁹ Kelly Lock and Stefan Leslie, *New Zealand’s Quota Management System: A History of the First 20 Years* (April 2007): 56.

²⁸⁰ *Ibid.* at 60.

²⁸¹ Shareholders Alliance, *Quota Bank*, <http://www.shareholdersalliance.org/quota-bank.php>

²⁸² Shareholders Alliance, *Gulf of Mexico Reef Fish Quota Bank, Summary* (December 2015) <http://www.shareholdersalliance.org/documents/QuotaBankSummary.pdf>

²⁸³ *Ibid.*

success of a “quota bank” to address potential waste in fish harvesting depends on the ability of ACE holders to cooperate. Cooperating fishers who do not take advantage of the use of bycatch shares to try to enter into a target fishery should be able to now maximise the value of each fishing trip because of the ability to legally harvest what would otherwise be bycatch.

The “quota bank” approach might also be appealing for vessels that regularly operate between fisheries management areas. In practice, some vessels will fish in adjacent fisheries management areas but only report catches for the fishing management areas where they hold quota (a practice called “trucking”). Fishing vessels who can participate in a “quota bank” that spans fishing management areas may be willing to more accurately report the location of QMS catches, which is important for improving stock assessments.

Similar to “quota banking” is the practice in the U.S. West Coast groundfish fisheries of bycatch risk pools.²⁸⁴ This approach could be useful in a fishery where there are relatively few participants. Under this approach, fishers can pool their bycatch quota together and then draw on the bycatch pool when they land their harvest. This requires a fair amount of coordination and trust between various industry players. Where risk pooling has been implemented, if it doesn’t create moral hazard problems, it can lead to fishers sharing more real-time information about the presence of bycatch with each other in order to avoid overdrafting the pool and possibly leading to better practices (e.g. short tows). One example of a “risk pool” is the small pool of 10-12 vessels organised by The Nature Conservancy in partnership with the Fort Bragg Groundfish Association, the Central California Seafood Marketing Association, and the Half Moon Bay Groundfish Marketing Association. Fishers have access to the pool once they submit their bycatch quota to the pool, agree to adhere to spatial fishing plans, and agree to use a particular electronic logbook system that allows fishers to share information in real-time.²⁸⁵ The challenge with managing bycatch and discards through risk pools is that all vessels fishing in the area need to participate to ensure that operators who are not part of the bycatch risk pool do not end up closing fishing because they have exceeded the bycatch limits.

G. Changing the Incentives to Use ACE in the Year for which ACE was Issued

One of the repeated assertions made about the QMS from both permit holders and regulators is that small fishers who do not hold quota and depend on obtaining ACE from a larger actor in the fishing industry often find themselves unable to procure ACE in a timely manner before deemed value is finalised at the end of the year. This inability to procure ACE can drive discarding behaviour. It appears that at least for some fisheries, not all ACE is used by the end of the year. In some cases, this may be

²⁸⁴ Daniel Holland and Jason Jannot, Bycatch Risk Pools for the U.S. West Coast Groundfish Fishery, *Ecological Economics* 78 (June 2012): 132-147.

²⁸⁵ California Risk Pool: A Co-management model to advance fisheries Resource Stewardship <https://www.conservationgateway.org/ConservationPractices/Marine/Documents/California%20Risk%20Pool%20-%20Labrum%20FISH4.pdf>

because owners wish to carry the ACE over to the next year, making it particularly hard for some of the smallest entities to balance their catch.²⁸⁶

This practice of holding over ACE and not releasing it into the market could be a source of financial stress when fishers reach the end-of-year balancing if they are not able to obtain the needed ACE. One possibility for government intervention that may alleviate the pressure to discard would be the introduction of a requirement for ACE holders to use or trade their ACE before a selected deadline that would be several weeks before deemed values are finalised. Failure to use or trade the ACE would result in the ACE being “released” at a “fair” market rate after the last trading day for ACE at a rate set just below the deemed value rate. Implementing this suggestion has the potential to free up ACE which may otherwise remain underutilised.

H. Introducing Real-time Temporary Closures to Reduce Bycatch

Information about fisheries resources is typically jealously guarded by members of the fishing industry because it can offer competitive advantage. Yet, sometimes, if information was shared more widely, it would greatly benefit the ecosystem by reducing fishing pressures on non-target species or fish below the minimum legal size. Information shared in real-time among vessels operating in a fisheries management area could result in temporary closures of fishing areas as vessels either agree or are required to move-on.

Within New Zealand, there are number of existing move-on rules for particular geographical areas or stocks. For example, the South Pacific Regional Fisheries Management Organisation during bottom fishing activities requires that vessels cease fishing and move-on 5 nautical miles from any area where there is evidence of a “vulnerable marine ecosystem”.²⁸⁷ In one of the snapper fishery management areas (SNA 1), commercial fishers agreed in 2013 to move-on when a vessel encounters a large number of undersized fish and to record the catch of undersized fish.²⁸⁸ The deepwater fleet has voluntarily agreed to introduce triggers in the Deepwater Fisheries Operational Procedures requiring any capture of a basking shark to be reported within 24 hours and communicated widely allowing for better real-time responses from the

²⁸⁶ There may be other legitimate reasons for non-use including the existence of “choke species” that effectively shut down a multi-species fisheries to additional fishing effort. In many cases, while it might be desirable to increase catch levels of “choke species” so that other fish can continue to be caught, allowing for increases in the catch of “choke species” would undermine efforts to rebuild some low-productivity species such as snapper.

²⁸⁷ Andrew Penney, Steven Parker and James Brown, Protection Measures Implemented by New Zealand for Vulnerable Marine Ecosystems in the South Pacific Ocean, *Mar. Ecol. Prog. Ser.* 397 (2009): 341-354

²⁸⁸ Press Release, Ministry for Primary Industries, New Information on Important Fishery (August 28, 2015) available at <http://www.scoop.co.nz/stories/SC1508/S00057/new-information-on-important-fishery.htm>

Ministry and the industry.²⁸⁹ In a similar vein, the deepwater industry members have agreed to communicate with each other when trawl vessels catch larger numbers of giant spider crabs in order to assist other vessels in avoiding the same tow line.²⁹⁰

These same “move-on” or “move over” models could also be applied to large levels of bycatch in a target fishery. In the United States West Coast and Alaskan groundfish and the Alaskan pollock fisheries, real-time collection and dissemination of bycatch information by observers at the level of individual vessels has reduced the level of bycatch by allowing for rapid temporary closures when a fishery-specific bycatch level has been exceeded leading to a bycatch “hotspot”.²⁹¹ One estimate suggests that the real time closure approach has reduced halibut bycatch in the U.S. Alaskan groundfish fisheries by 33%.²⁹² In Iceland, real time closures of at least 2 weeks are triggered when the quantity of juvenile fish exceed a percentage threshold based on minimum legal size.²⁹³ In Scotland, a multispecies fisheries will be closed when more than 40 cod of any size are caught per hour of fishing effort.²⁹⁴ In the Faroe Islands, temporary closures may be imposed if juvenile cod, haddock, or saithe constitute more than 30% of the catch or if 4% or more of the total trip catch consists of cod of less than 40 cm.²⁹⁵ Norway imposes temporary closure whenever more than 15% of the total catch of a target species is undersized cod, haddock or saithe.²⁹⁶ If this condition is triggered, vessels are expected to move at least 5 nautical miles to a new fishing ground where they are less likely to encounter undersized fish.²⁹⁷

It could be possible to explore the implementation of additional real-time closures in multi-species fisheries beyond the existing voluntary snapper and hoki closures. The nature of any temporary closure or move-on rule will be fishery dependent. For example, move-rules in the New Zealand hoki fishery were unable to be fully implemented because of the proliferation of small hoki in a given year across a broad geographical range. Fishing vessels that were complying with the move-on rule were finding themselves in a Catch-22 situation when the new location had an abundance of small fish. Such closures should be implemented only in consultation with the

²⁸⁹ Ministry for Primary Industries, Annual Review Report for Deepwater Fisheries for 2014/2015, MPI Technical Paper No. 2016/09.

²⁹⁰ *Id.* at 14.

²⁹¹ Little et. al *supra* note 174 at pp. 588-591.

²⁹² E.L. Gilman, P. Dazell, and S. Martin, Fleet Communication to Abate Fisheries Bycatch, Marine Policy 30 (2006): 360-366.

²⁹³ *Id.* at p. 588. (E.g. a real time closure may take place is more than 25% of the cod and saithe caught are less than 55 centimetres.)

²⁹⁴ *Id.* at p. 586.

²⁹⁵ H.M. Condie *supra* note 11 ___ et. al. at pp. 288-289

²⁹⁶ *Id.* at 289.

²⁹⁷ *Id.*

fishing industry and might be facilitated through voluntary fleet-based risk pooling agreements like those currently implemented in the U.S. groundfish fisheries. These programmes can be challenging to implement. Even where there are large reductions in bycatch limits and restrictions on allowable gear, there can still be excessive catch.²⁹⁸ To ensure that the programme is not undermined, there would need to be some verification of bycatch by an observer as in the U.S. groundfish fleet or by some sort of electronic verification system such as the cameras discussed above. All vessels operating in an area must be actively providing information for temporary closures to be effective or risk the problem of insufficient information being available upon which to base a decision. Compliance with any temporary closure could be relatively easily monitored by reviewing a vessel's track recorded by its vessel monitoring system.

I. *Returning some percentage of quota to community-based fishers' organisations*

Some commercial fishers suggest that the quota system is missing sustainability opportunities because the property right of quota shares are often not held by commercial fishers who are active in the industry but rather by "slipper skippers" who do not play an active role in the industry but only trade quota for profit. The separation of quota holders from the individuals actually doing the fishing has decreased one of the monetary incentives for fishers to enter or stay in the industry. As one fisher interviewed on a study on the ACE market commented, "The QMS is supposedly the best in the world for managing fishery's [sic] but 28 years on it would seem it managed the stocks but made fishers the endangered species".²⁹⁹

While the current separation of fishing quota from active members of the fishing community is the product of decisions made by owner-operators over the course of the life of the QMS, the issue of small scale fishers having no reasonable opportunity to own quota due to the exorbitant costs of commercially valuable quota may need to be addressed in any potential revisions of the QMS.

With the separation between the vested property interests of the QMS and the participants in the QMS, there may be lost opportunities for improving environmental stewardship.³⁰⁰ In the current system, fishers without any quota who simply rely on leasing ACE have nothing to lose in not reporting fellow fishers who may be dumping quota stocks because they do not have any specific property interest to protect. To reconfigure the quota system to realign fisher's incentives with environmental stewardship may require government intervention in the form of buying back quota shares for redistribution to fishers' organisations that make a formal commitment to adhering to sustainability practices. The quota would be held by the organisation for its members who would be required to agree to implement best practices in the

²⁹⁸ Id. at 290 (Describing excessive catch of coastal cod, golden redfish, and beaked redfish in spite of the establishment of bycatch limits and gear restrictions).

²⁹⁹ Stewart and Leaver (2014) *supra* note 149 at p. 31.

³⁰⁰ There is some debate as to whether the ITQ system contributes to environmental stewardship.

industry. A failure of a member to adhere to agreed-upon conditions could result in the fishers' organisation being required to forfeit a certain amount of quota to the government.

This type of model has been implemented in Morro Bay, California, where the Nature Conservancy purchased trawl permits/quota shares in a troubled groundfish industry and then eventually, after the groundfish industry began to recover, transferred them to the Morro Bay Community Quota Fund on the basis that the vessels using the permits/quota shares would adhere to certain best fishing practices or lose permanent or temporary access to permits /quota shares.³⁰¹ This model of shared quota being held in common by a non-profit fishing organisation on behalf of its fishers might be considered for implementation in New Zealand's inshore fisheries, where it can be demonstrated that fishers cannot realistically purchase quota and there is a need to improve certain fishing practices across the management area. Facilitating community-based quota programmes has the potential to both strengthen the viability of existing small-scale fishing communities in New Zealand that are under market pressures to disappear while enhancing sustainability practices among fishers.

(3) Suggestion to Improve Selectivity

Gear improvements to reduce discards by increasing selectivity is not a new idea. Minimum mesh sizes have been used for decades as a means of reducing the incidental catches of juvenile fish that would be subsequently discarded. Unfortunately, as a recent FAO report observes, it may not be a "fair assumption" that "effective selectivity automatically guarantees good survival".³⁰² There are some basic "design principles" for fisheries methods including trawling that can increase selectivity while also reducing mortality for fish that are returned to the sea. These principles include:

- Developing knowledge of the behavioural differences of target catch and bycatch;
- Reducing the time that fish swim with trawl gear by reducing the capture process time;
- Allowing fish to escape before they reach a codend through an escape panel or selection device;
- Facilitating rapid and voluntary escape through management of water flow or introducing visual elements into a net that guide undersized fish out of the net;
- Preventing debris from entering the codend;

³⁰¹ See generally Morro Bay Community Quota Fund, Potential 2015 Groundfish Fishing Opportunity, <http://www.morro-bay.ca.us/DocumentCenter/View/7820>

³⁰² Food and Agriculture Organisation, Mortality of Fish Escaping Trawl Gears at www.fao.org/docrep/008/y6981e/y6981e09.htm#bm9

- Avoiding excessive catch sizes;
- Increasing the use of selective ground trawls; and
- Modifying fishing strategies to avoid areas where young fish or non-target species are abundant.³⁰³

Ideally all fishers would have the essential knowledge to apply these “design principles”. Some of these principles appear in theory easy to implement for a fisher with only basic experience, for example reducing capture process time or pulling the net back on deck when there are enough fish to process efficiently. Other principles may be more difficult to implement for fishers, for example properly installing escape panels or understanding the behavioural differences of catch versus bycatch, and this would depend on the experience of the individual fisher. This paper offers two suggestions related to improving fishing selectivity: 1) additional development efforts for the Precision Seafood Harvesting System/Tiaki should be optimised to avoid non-target fish and increase survivability of fish that will be returned to sea and 2) more financing attention should be given to fishers’ innovations to reduce bycatch.

It bears repeating that selectivity measures are only one part of a much larger set of policy solutions to reduce discards. Increasing selectivity of fishing gear may indeed decrease discards but this approach if taken in isolation could have its own unintended consequences. As one FAO report observed, selective fishing may be “more likely to alter the balance of species in the ecosystem and across the trophic levels”.³⁰⁴ The challenges of proper fisheries management cannot be “solved” by simply abandoning certain gear in favour of other gear. Even when fishers are successful in isolating larger higher-value fish in the net, intensive fishing may still lead to changes in the size and age structure of a population, with implications for both future harvests and for ecosystem health.

J. Additional development efforts for the Precision Seafood Harvesting System/Tiaki should be optimised to avoid catching non-target fish and increase survivability of fish that will be returned to sea

The “holy grail” for bycatch reduction is creating a piece of gear that catches target fish and leaves alive non-target fish. An existing cooperative research project between the government and commercial fishing companies may enhance the survivability of non-target fish. Initially focused on improving the post-harvest quality of fish in order to improve economic returns, the Ministry for Primary Industries, the New Zealand Institute of Plant and Food Research, and the fishing industry (Aotearoa Fisheries, Sanford, and Sealord) created the “Precision Seafood Harvesting System”. (PSH)/Tiaki. The partners in this initiative recognised that a great deal of fish was not receiving its potential economic value market due to damage to target fish in trawl nets. PSH systems have been focused on improving the physical quality of hoki,

³⁰³ Ibid.

³⁰⁴ Kieran Kelleher, Food and Agriculture Organisation, Discards in the World’s Marine Fisheries: An Update, Fisheries Technical Paper 470 (2005): 70

snapper, and more recently squid in hopes of being able to sell into more valuable markets. The programme began in April 2012 and has a combined government and industry budget of \$48 million with expected economic benefits of \$43 million per year by 2025.

The PSH has the potential to fundamentally change how industrial fishing vessels handle fish. Instead of lifting fish out of the sea in a trawl net, the fish remain in water in a flexible PVC liner (modular harvest system) as they are brought onto the deck of the boat and then sorted into storage containers. Because the fish remain in some water when landed, the PSH should increase the survivability of the fish that are returned to the sea and allow for the release of species. Current pilots indicate that the post-harvest survival rate for juvenile snapper is higher than that of juvenile snapper caught in mesh trawls.³⁰⁵ The design of the modular harvest system continues to be modified to promote juvenile fish escapement, to improve on-boarding grading and sorting systems that will improve survivability for discards, and to improve deployment in high-volume spawning aggregations. More studies remain to be done to understand the potential environmental benefits of the PSH versus existing fishing gear. Any additional development efforts for the PSH should focus on avoiding fish and increasing survivability of fish that are returned to sea. If the PSH is to become the commercial standard, escapement of non-target fish should be a priority. Strategies for promoting escapement will depend on understanding the escape behaviour of the non-target fish. The development team for PSH may want to seek advice from other global design teams. For example, in the United States, Superior Trawl has created a trawl net that it calls “The Eliminator”TM which has 2.4 metre mesh size in the front of the trawl which allows for bottom-dwelling fish to escape while fish in the middle of the water column are still captured.³⁰⁶ In trial, the nets have reduced the amount of cod captured while maintaining haddock and whiting harvests.³⁰⁷ In the United States, fishers will use a standard trawl to catch a groundfish quota and then switch to the “Eliminator” to catch haddock and squid without exceeding their cod quota. The PSH is not currently legal under New Zealand law because it does not comply with minimum mesh sizes and there is no regulatory regime for modular harvest systems in the Fisheries Regulations. This can be addressed through revisions to the Fisheries Act 1996 and the 2001 Fisheries Regulations to add modular harvest systems as a fishing method with its own reporting requirements.³⁰⁸ During its pilot stages, the PSH is being deployed by the

³⁰⁵ Precision Seafood harvesting, Summary of Progress (January-March 2015)

³⁰⁶ http://superiortrawl.com/the_eliminator.html

³⁰⁷ Andy Revill, First Results from a Pilot Study ‘North Sea fishing trials using the Eliminator trawl’, Centre for Environment, Fisheries and Aquaculture Science, (11 December 2007) available at <https://www.cefas.co.uk/publications/files/Eliminator-trawl-trials.pdf> (“The results from these paired-hauls indicated that the Eliminator trawl can be used to selectively target haddock and whiting in a mixed demersal fishery.”)

³⁰⁸ Fisheries Act, Section 297 (Providing the government with the power to make regulations “regulating...use of any kind of gear, equipment, or device used for, or related to, fishing”)

fishing industry such as Sealord under special permits.³⁰⁹ Some proponents of PSH would like to see the PSH ultimately replace other fishing technologies like standard trawls so that certain boats operating in New Zealand would be required to use PSH technology. If PSH technology does become the standard for New Zealand's commercial fisheries, the social and economic consequences of introducing new gear should be considered as part of the investment in adopting new technology.

K. Promoting Fishers' Innovations to Reduce Bycatch

While the Precision Seafood Harvesting system may reduce the number of dead discards being returned to the sea by improving the mortality rate for those fish that are capable of being returned, the ultimate affordability of this technology for the majority of fishers is unlikely for an inshore skipper whose salary ranges between \$40,000 and \$80,000. Meanwhile, other fishers have begun investing in their own bycatch reduction technology. For example, various fishers have been experimenting with different mesh size, different mesh orientation, and novel escape panels to improve escape rates for fish under the minimum legal size. NIWA has assisted these fishers by installing cameras on the trawls and scientifically verifying whether certain gear choices lead to better outcomes in terms of reducing unwanted bycatch. Little government investment has been made in supporting individual fishers in their efforts to reduce bycatch.

MPI should in conjunction with NIWA and fisher's associations continue to identify and publicise best practices related to gear deployment and gear design. For example, in response to the problem of New Zealand purse seiners capturing large numbers of protected devil rays that coexist with tuna, one vessel found a means of improving the survivability of the devil rays without compromising the catch. A large-mesh net that was large enough to allow passage of tuna but not devil rays was installed over the storage area. After the catch was released, the crew was then able to take the devil rays and return them in better condition to the sea than if they had had to sort through the hold to locate the rays. While this is a relatively straightforward practical innovation, this fishing practice has not yet been mainstreamed across the fleet.

Fishers have successfully created and implemented gear designs to solve problems associated with discards. Karl Warr, a 20 year commercial fisher out of Napier, created a fishing cage to replace his net in order to increase the survival rate for undersized fish.³¹⁰ Using the cage, small fish are able to escape, and he has reduced the number of small fish in his catch from 50% to 5%. His innovation has been locally recognised, with some restaurants only sourcing from him. Karl and his wife are continuing to innovate with the development of automated fish screeners to increase selectivity³¹¹.

³⁰⁹ Fisheries Act, Section 97.

³¹⁰ 2016 Hyundai Country Calendar, Episode 9- Sustainable Seas, <http://tvnz.co.nz/country-calendar/episode-9-sustainable-seas-6458015>

³¹¹ Id.

In order to generate more involvement from the fishing community in discard reduction strategies, MPI may want to consider creating an innovation competition with the possibility for individuals to win some cash, have their idea scientifically tested, and possibly have their idea disseminated to a wider market with the possibility of earning royalties depending on the nature of the innovation. A model for a New Zealand innovation competition could be the World Wildlife Fund sponsored International Smart Gear Competition that has been held since 2004.³¹² Approximately \$65,000 of prizes are distributed, generating a variety of selectivity ideas. Among the winning ideas in 2014 were an air-powered sampling device that permitted a vessel to take a representative sample of what was in the purse seine before it was winched up, a shark repellent that could be inserted into longline bait, and an innovation for trawl gear that works with the morphology of flatfish versus roundfish. An MPI competition should be limited to either fishers or crews who fish in waters under New Zealand jurisdiction or to New Zealand crewmembers operating on the high seas. In order to generate participation across the fishing communities, the grand prize money would need to be worth the investment of time to enter the contest and the lead time for the contest would need to be at least one year. Perhaps in order to encourage yet more ongoing involvement from the fishing community, early entrants would be able to receive some feedback from fisheries scientists and other experts on the feasibility of their ideas for resubmission for the final competition.

Close collaboration between fishers and scientists has happened in other fisheries with good results. For example, the UK “Project 50%” funded by UK Centre for Environment, Fisheries and Aquaculture Science offered fishers the opportunity in collaboration with scientists to develop their own equipment capable of reducing discards by 50%. At the end of the project, changes in the structure of the net and mesh size led to reduction of discards by 52%.³¹³ The UK Government has continued to build fisheries science partnerships, helping fishers to commission science projects that involve improvements to gear or collection of fisheries data. In 2016-2017, the UK was hoping to solicit project ideas on mixed-fisheries approaches, selectivity improvements, discard-survivability studies, and spatial adaptation.³¹⁴

Using more selective gear is not without behavioural hurdles. One of the most important challenges with implementing use of more effective gear will be convincing fishers to ensure that any gear that enhances selectivity has maximum effectiveness. Fishers have been reluctant to adopt selective gear that reduces the amount of discards if it reduces target catches.³¹⁵ There may need to be incentives offered to fishers to

³¹² World Wildlife Fund, International Smart Gear Competition, <http://www.worldwildlife.org/initiatives/international-smart-gear-competition>

³¹³ S. Armstrong and A. Revill. Project 50% Final Report (2010).

³¹⁴ Centre for Environment Fisheries and Aquaculture Science, Research at CEFAS <https://www.gov.uk/government/organisations/centre-for-environment-fisheries-and-aquaculture-science/about/research>

³¹⁵ T. Catchpole, O. van Keelen, T. Gray, and G. Piet, The Discard Problem- A Comparative Analysis of Two Fisheries: The English Nephrops Fishery and the Dutch Beam Trawl Fishery, 51 *Ocean and Coastal Management* (2008): 772-778, 774.

mainstream selective gear. For example, fishers may agree to adopt gear that may limit their target catch but perhaps only in exchange for access rights to fish in an area that is closed for conservation purposes to less selective gear.³¹⁶ Fishers may agree to adopt more selective equipment and improve their discard and reporting practices simply by receiving additional recognition by the political system.³¹⁷

(4) Suggestion to Enhance Professionalism in the Fishing Industry

L. Investing in Professional Sustainability Education for New Zealand's Fishers

Fishers typically learn their trade at sea. Fishers develop professional ethics and perspectives on the basis of their day-to-day interactions. Little attention has been given to how to instill a stewardship ethic among fishers. The government expectation has been that the quota management system on the basis of generating a property right instills an active stewardship ethic on the part of individual fishers who wish to protect the value of their property right. Whether ITQ systems actually improve resource stewardship at the level of the individual fishers, particularly where quota has become concentrated in the hands of processors and investors, has not been empirically tested.³¹⁸

While the marine commercial fishing industry may not be a large industry in New Zealand, it would benefit the Government to invest government funds in offering structured fishery management training for existing and emerging leaders within the industry. At present, training for professional fishers in New Zealand is limited in scope. Primary ITO offers a variety of maritime training certificates including a National Certificate in Seafood Vessel Operations and a National Certificate in Seafood Risk Management.³¹⁹ Seafood New Zealand recommends the Primary ITO programmes as training for future fishers. Sustainable fishing practices is not a priority for this training, which focuses largely on navigation and safety. Only one of the Primary ITO certificates from Primary ITO offers a unit on “the sustainable use of

³¹⁶ *Id.*

³¹⁷ *Id.* at 777 (“[A]t least some of the features of fishers’ behaviour in relation to the discard problem could be addressed by greater engagement of fishers in discard reduction decision-making...One practical way in which such suggested engagement could (and does) occur is through co-operative research between fishers and scientists”)

³¹⁸ I. van Patten et al. Individual Transferable Quota Contribution to Environmental Stewardship: A Theory in Need of Validation, *Ecology and Society* 19(2) (2014): 35. ([A]lthough active lease fishers are concerned for their future livelihoods and may still be included toward stewardship on this account, it is unknown if they are less inclined than when they were regular fishers in a non-ITQ [individual transferable quota] fishery. Indeed, it may be true that ITQs can result in fishers feeling less attachment to their profession because it becomes less a way of life and more an impersonal business, thus also affecting their environmental stewardship. How these opposing forces balance out in practice is currently unknown, and determination of motivational drivers and behavioural change for various stakeholder groups may be an important area of future research focus”.)

³¹⁹ A Career in Vessel Operations, Primary ITO, available at www.primaryito.ac.nz.

fish stocks” and “harvest practices”.³²⁰ The Nelson Marlborough Institute of Technology offers a Bachelor of Aquaculture and Marine Conservation but no similar class for marine fishers. All of NIMT’s classes for marine fishers are focused on navigation, vessel safety, and maritime legislation. This existing lack of curriculum for sustainable fisheries management curriculum represents an untapped education opportunity that can be addressed by MPI through developing ongoing training for both new and existing fishers. Proposals have been offered within New Zealand for the development of a Responsible Fisheries Scheme for New Zealand.³²¹ This scheme would be created to assist individual fishers with learning more about how to improve sustainable business practices. There is a need for enhancing existing knowledge among fishers and assisting fishers with both growing knowledge and incorporating knowledge into their practices. For example, in the 2007 New Zealand Inshore Trawl Gear and Operations Survey, the authors concluded that while fishers were very knowledgeable on certain matters, they did not have a great deal of knowledge about “the angle of attack of their trawl doors” which has potentially major impacts for various ecosystems.³²² The authors noted that “knowledge transfer” among fishers is a “major hurdle to better performance”.³²³ In general, fishers like other professionals are curious and once they have some confidence in the efficacy of a given innovation may be willing as individuals to progressively adopt new innovations. These individual efforts can be bolstered by group support, as reflected in the successes of the Seabird SMART training workshops. Failure to maintain collective momentum around a given innovation or a given initiative can lead to a resumption of “business as usual” practices. For example, NIWA observed that, in a survey of a number of individual fishers, many of the fishers successfully implemented new practices that reduced bycatch during one fishing season while maintaining adequate levels of target catch. Unfortunately in subsequent fishing seasons, many of the fishers who had originally adopted new practices had not maintained these practices for a variety of reasons including a lack of group momentum.³²⁴

Three potential models for a New Zealand-based programme are the South Africa Responsible Fisheries Alliance (an NGO and private stakeholder programme), the United Kingdom Responsible Fisheries Scheme (industry programme), and the National Seafood Industry Leadership Programme (industry programme in Australia).

³²⁰ This topic is covered for the certification for “Seafood Vessel Operations Level 2”. The topic is not provided for in subsequent certification. It is surprising that the Seafood Risk Management: Vessel Operation Compliance does not explicitly cover sustainable fisheries management, given the potential long-term risks posed by bycatch for fisheries management.

³²¹ Creating Proud, Responsible New Zealand Fisherman: A Responsible Fisheries Education & Training Scheme for New Zealand, www.fish4all.co.nz (Describing a joint effort among Terra Moana Ltd. Aotearoa Fisheries Ltd., and RMD Marine)

³²² Clement & Associates, Ltd. New Zealand Inshore Trawl Gear and Operations Survey: A Report Commissioned by Seafood Innovations Ltd. & SEAFIC, October 2007: p. 22.

³²³ Id.at 23

³²⁴ New Zealand Commercial Fishermen’s Federation Annual Meeting (June 2016), Christchurch, New Zealand.

All of these programmes provide some amount of education and training. The South African Responsible Fisheries Alliance has been running since 2009 with the support of World Wildlife Fund, Oceana Group Ltd., Viking Fishing Company, Sea Harvest, I & J, Bird Life South Africa, and Pioneer Fishing who exchange information particularly on ecosystem-based approaches to fisheries.³²⁵ In 2014, the Alliance developed a Code of Conduct for responsible fisheries designed to address a number of the most difficult issues in the fishing industry including "pollution, bycatch, discarding of waste, and overfishing".³²⁶ The Code of Conduct was designed in the form of a generic template to be applied to individual fisheries within South Africa.³²⁷ Notably the Codes are expected to be self-enforcing with "disciplinary action taken against transgressing members".³²⁸ Among the expectations under the code are for "vessel owners and skippers" to commit to "accurately report catch, effort and landings information" and "move to alternative fishing grounds when excessive quantities of non-target species and unfavourable size classes of target species or non-target species are caught".³²⁹ Vessel owners and skippers are expected to provide signed individual endorsements that include their name and association when they agree to the Code.³³⁰

The United Kingdom Responsible Fishing Scheme also offers educational opportunities as part of its voluntary vessel-based programme to ensure good labour and environmental protection standards. The Scheme, which relies on independent, third-party auditing, is focused at the vessel level and requires each skipper to demonstrate best practices in five areas before being eligible for a certificate:

1. Safety, health and welfare ■ A commitment to generating a culture of integrity and respect (e.g. no forced labour) will be demonstrated; ■ Requirements established also draw from other relevant safety management and ethical and welfare initiatives to improve safety of the crew and promote decent working conditions.

2. Training and professional development ■ Covers accessible training for the key priority areas, especially safety; ■ Focus is on improving skills, knowledge and understanding; ■ Commitment to raise standards, open up new opportunities and cooperate with management authorities.

³²⁵ South Africa Responsible Fisheries Alliance, <http://www.rfalliance.org.za/>

³²⁶ South Africa Responsible Fisheries Alliance, Code of Conduct for Responsible Fisheries Developed in South Africa (September 11, 2014)

³²⁷ The Industry Code of Conduct for Responsible Fisheries in South Africa (2014) available at <http://www.rfalliance.org.za/wp-content/uploads/2014/09/Code-of-Conduct-for-Responsible-Fisheries-29-01-2014-.pdf>

³²⁸ Id. at p. 7.

³²⁹ Id. at pp. 9 and 10.

³³⁰ Id. at p. 23.

3. The vessel and its mission ■ Statement detailing vessel's mission (e.g. fishing area; catch focus; gear type etc.); ■ The vessel and its gear are in compliance with all current legislation; ■ All [activities are] legal with the right documentation in place; ■ Full cooperation with Voluntary Agreements in existence in the fisheries.

4. Care of the catch ■ Focus on supplying safe, high quality, wholesome product with known provenance; ■ Hygienic handling and storage at appropriate temperatures; ■ Full traceability from catch to quayside; ■ Responsible capture & landing of live products.; ■ Commitment to maintaining the value of the catch.

5. Care for the environment ■ Responsible practice & respecting the environment (management of litter, lost fishing gear recovery, wildlife interaction records); ■ Supporting fisheries science (e.g. observers, science partnerships, etc.); ■ Tie-in with other voluntary schemes.³³¹

In Australia, the National Seafood Industry Leadership Programme has been a programme originally delivered by the Industry with support from the Australian Fisheries Academy to improve leadership for the Australian industry. The programme is today supported by the Australian government's Fisheries Research and Development Corporation as well as the Sydney Fish Market.³³² Participants include seafood executives, government officials, and crew members. Over the course of six months, participants engage in three residential sessions that allow them to develop and hopefully implement a project that demonstrates their leadership skills within the fishing sector. New Zealand has sent a few individuals to the programme. These individuals have spoken highly of the opportunity and hope that either there can be more engagement in the Australian based programme for New Zealand fishers through funding of scholarships or possibly a similar programme organised in New Zealand.³³³

Of these possible three models for improving training for fishers, the Australian model of leadership academy is the most attractive because it provides existing fishers with a structured opportunity to apply new ideas to their existing practices, new fishers with an introduction to best practices, and a network for both existing and new fishers to share ideas including sustainability practices. While it can be argued that this type of initiative should be funded entirely by the industry, the New Zealand industry has not created these opportunities. Investing in high-quality education for future fishers is an opportunity for MPI to help to cultivate an environmental ethic and

³³¹ Seafish Responsible Fishing Scheme, Overview, <http://www.seafish.org/rfs/index.php/about/about-rfs/>

³³² National Seafood Industry Leadership Programme 2015, Programme Information http://www.ruraltraininginitiatives.com.au/home/component/remository/function/download/39/chk,562150ab2d5f6086dc6d07f201514d33/no_html,1/

³³³ Personal Communication, Participants in the National Seafood Industry Leadership Programme, New Zealand Commercial Federation Annual Meeting, Christchurch, New Zealand (June 2016)

build professionalism among New Zealand’s approximately 20,000 individuals working in New Zealand’s commercial fishing industry.

M. Collaborating with fishers to understand the implications of “returning to the sea”

For fisheries scientists and managers, there is often a gap in knowledge regarding post-release mortality. While many of the species in Section 72 Schedule 6, including shellfish and sharks, often have known high rates of survivability, it is less clear what the survivability rates are for other species that may be returned to the waters. MPI may want to work with National Institute of Water and Atmospheric Research (NIWA) and Plant and Food Research to design projects with fishers to determine bycatch mortality rates particularly for “choke species” that may be driving some discard behaviour. This work may be particularly important for inshore fisheries where smaller quantities of fish are handled. There may be collaborative opportunities to develop a set of best capture and handling practices to enhance survivability for some species. This type of research may also help the Ministry to understand which species have high levels of post-release mortality so that they may encourage either retention of the species or a more active programme of temporary closures where there are high percentages of certain bycatch.

N. Providing regular “best practice” audits to support Adoption of Marine Resource Sustainability Efforts

In New Zealand, Maritime New Zealand has introduced since July 1, 2014, regular audits for safety as part of the Maritime Operator Safety System designed to improve safety on all New Zealand vessels.³³⁴ Within two years of the receipt of a Maritime Transport Operator Certificate, Maritime New Zealand will conduct an audit of an operator’s safety system. During the audit, the items covered include maintenance of the vessel, responsibility chain, crew training, operator plan, management of safety risks and hazards, harm prevention, and protection of the environment.³³⁵ Protection of the environment in this case refers to pollution avoidance obligations under agreements such as the MARPOL Convention. Subsequent audits will be conducted up to four years apart depending on the risk profile for a given vessel. This model of regular audits offers an opportunity for Maritime New Zealand to interact with vessel owners.

It may be worth exploring whether a “fisheries audit” might be developed by MPI that could be applied in conjunction with the safety audit to allow for greater interaction between an agency and the marine catch industry. In order for these audits to ensure a

³³⁴ Maritime New Zealand, Maritime Operator Safety System <http://www.maritimenz.govt.nz/Commercial/Safety-management-systems/MOSS/default.asp>

³³⁵ Maritime New Zealand, Maritime Operator Safety System (MOSS) Audit- What Maritime Operators Need to Know, <http://www.maritimenz.govt.nz/Publications-and-forms/Commercial-operations/MOSS/moss-audit-operators.pdf>

meaningful investment of resources on both the part of MPI and the fishing industry, it will be important that the terms of the audit are clearly defined. In the case of discards, for example, an audit may ask questions about how a given fisher acquires an ACE package and develops a fishing plan, how crew deploy equipment to reduce excess bycatch, how crew sort bycatch from target fish, how a fishing operation makes decisions about fishing in the light of large amounts of bycatch, how decisions are made about returns to sea, how bycatch are measured for reporting, how a vessel measures Minimum Legal Size for a fish, how the discard chute is set up, and how fishers manage fish for the bycatch market. For purposes of distilling information, it may be advisable to structure the questions as yes/no questions or multiple choice questions, with the option to provide additional commentary. An audit on the basis of answering yes/no or limited response questions allows for greater consistency between audits across an organisation.

This type of auditing process offers members of an industry the opportunity to understand what the best practices are within the industry and compare their practices to a set of practices deemed to be best discard reduction practices. Just as the existing Maritime New Zealand audits are intended to create a “safety culture”, the proposed fisheries audits may contribute to a “sustainability culture” that would boost the professionalism of the fishing industry. Ideally a fishing practice audit could be conducted at the same time as the safety audit in order to reduce the burden on individual vessel owners. Any report generated from the fishing practice audit should provide immediate feedback for fishing entities that may be used to improve existing practices. Fishing operators that “pass” an audit could be included on a publicly available roster of “sustainable operators”.

7 ENHANCING TRADE OPPORTUNITIES FOR NEW ZEALAND'S SUSTAINABLE FISHERIES THROUGH SUSTAINABILITY ASSURANCES

While the central topic of this paper is discards with an obvious focus on New Zealand as the coastal State regulating fishing activity, there is also a key role to be played by States as market players in reducing illegal discarding. As the FAO International Guidelines on Bycatch Management and Discards indicate, States have an important role to play as importing or exporting markets in reducing discards.³³⁶ States exporting fish should have good discard data that is reflected in how they set TACs. States importing fish should be importing from countries with robust fisheries management measures in effect.

Through the research for this project, it became clear that certain parts of the fishing industry had transformed their approach to fishing in the hope of benefiting from the social licence and the added economic value that should, in theory, accompany better sustainability practices through access to high-value consumer markets. Given the current sustainability achievements of a number of New Zealand fisheries particularly the deepwater fisheries in achieving Marine Stewardship Council certification for several species, New Zealand should have a comparative advantage in the context of international trade in terms of the environmental quality of its products even though its exports only account for 0.5% of global seafood production and less than 2% of global sales.³³⁷ Most of New Zealand's existing fisheries production including fish, crustaceans and molluscs is exported and while seafood represents a smaller proportion of New Zealand's export commodities than other sectors,³³⁸ there are many opportunities for increasing the value of this market particularly within States which are concerned that fish are sustainably harvested.³³⁹ The deepwater fisheries are particularly important for New Zealand because six out of the ten largest wild-caught fish export markets are deepwater fisheries stocks.³⁴⁰ A number of the deepwater

³³⁶ FAO International Guidelines on Bycatch Management and Reduction of Discards, *supra* 126 note at para 3.1.1

³³⁷ Seafood New Zealand, Fact Sheet, Why Is Our Seafood Industry so Special?, http://www.seafoodnewzealand.org.nz/fileadmin/documents/Fact_Sheets/factsheet-why-is-our-seafood-industry-so-special.pdf

³³⁸ The seafood industry's export earnings in 2015 were approximately 1.5 billion as compared to total commodity exports of 49 billion. Seafood New Zealand, Economic Review of the Seafood Industry-to December 2015, http://www.seafoodnewzealand.org.nz/fileadmin/documents/Economic_reviews/Economic_Review_December_2015.pdf .,

³³⁹ Seafood New Zealand, Fact Sheet,

³⁴⁰ Ministry for Primary Industries, Annual Review Report for Deepwater Fisheries for 2013/14 (April 2015): 1. <http://www.mpi.govt.nz/document-vault/7248> (Six out of the ten largest wild-caught fish export markets are deepwater fisheries)

fisheries are certified by the Marine Stewardship Council and these MSC exports were valued at \$19,621,686 NZD in 2015.³⁴¹

While not all States to which New Zealand exports are equally concerned about sustainability, sustainability has become an increasing concern for three of the larger markets for New Zealand fisheries products- Australia, the European Union and the United States. Adoption of particular international and domestic measures by these trading partners to ensure fisheries sustainability could favour New Zealand products which can be demonstrated to have been sustainably produced. For example Australia, New Zealand and the United States have all ratified the Port State Measures Agreement to combat the entry of illegal, unreported, or unregulated fishery products into their ports.³⁴² The ratification of the Port State Measures Agreement is relevant to this paper on discards because a fisheries management system that has a firm handle on discard reporting will not be selling underreported fish into export markets. Countries that have ratified the Port State Measures Agreement may seek out preferential trade opportunities with other States that have ratified the agreement.³⁴³ The European Union has recently implemented landing obligations as part of the sustainability measures under the Common Fisheries Policy.³⁴⁴ Based on this policy, the European Union may in the future actively seek to enhance trade relations with States that can demonstrate adequate discard policies that protect fisheries resources. If New Zealand is able to demonstrate that its plans for electronic monitoring and reporting are able to improve fisheries management and reduce underreporting, then New Zealand may be in a position to increase the value of its products in some of its larger markets. China is New Zealand's largest export market for seafood, with \$515,605,314 NZD of seafood exported in 2015. While sustainable production of seafood is less important as an entry into the high-value portions of the current Chinese market, this may change over time as Chinese consumers become more concerned about the sustainable sourcing of their food.

New Zealand has established as part of its Business Growth Agenda a goal to double the value of New Zealand's primary industry exports by 2025. In order to achieve this goal, the Government had explored options such as introducing "SmartMark". This initiative, which the government is not proceeding with, was designed to improve

³⁴¹ Marine Stewardship Council certified fish in New Zealand include Albacore Tuna (troll), Hake (trawl), Hoki, Ling (trawl and longline), and Southern Blue Whiting. The 2015 export Albacore Tuna (troll) fishery was valued at \$9,029,691; the 2015 export Hake fishery was valued at \$3,003,018; the 2015 export Hoki fishery was valued at \$4,004,138; the 2015 export Ling fishery was worth \$742,880 and the 2015 export Blue Whiting fishery was worth \$2,841,959. See New Zealand Seafood Exports, Report 10a, Seafood Exports by Species by Country Calendar Year to December 2015 (final) http://www.seafoodnewzealand.org.nz/fileadmin/documents/Export_data/15.12.10a.pdf

³⁴² Status of Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing http://www.fao.org/fileadmin/user_upload/legal/docs/037s-e.pdf (Australia ratified on July 20, 2015, New Zealand ratified on February 21, 2014, and the United States ratified on February 26, 2016)

³⁴³ Trans-Pacific Partnership art. 20.16(14)(c).

³⁴⁴ See Part 5 above on Comparative Legal Approaches to Discard Policy.

information access for consumers who might wish to have more information about a producer, how a product is made, the ecological standards of a company, the working conditions of a company and other information. The presence of the mark was expected to provide a visual assurance that a given product was produced in New Zealand.

While the “SmartMark” was designed to influence consumer decision-making, New Zealand may to explore other approaches that could offer specific types of sustainability assurances. New Zealand already has the practice of offering government legal assurances to trading partners in the field of food safety on the basis of sanitary and phytosanitary requirements. This section explains the idea of a “sustainability assurance”.

(1) Sustainability Assurance

The proposal to design and offer a “sustainability assurance” to trading partners receiving wild fish or other sustainable New Zealand products would represent a new direction for MPI but has the potential to broadly raise the standards of industry performers across a number of fisheries to achieve best practices. A government assurance, in theory, should send a powerful message to external parties about the quality of production related to New Zealand fisheries while also increasing the investment of domestic industries in best available sustainability practices. Some larger players in the New Zealand wild fishing industry have already taken steps through private MSC certification to boost industry reputation.³⁴⁵ Additional interaction with the government has the potential to further boost the legitimacy of the already existing MSC certifications by providing an additional voice of authority weighing in on the sustainability of existing fishing practices.

The idea of a government providing a clear statement about the sustainability of its fisheries management is not unprecedented. The United States recently announced a peer-reviewed self-assessment of its fisheries management system under the Magnuson-Stevens Act based on comparing NOAA’s fisheries management practices to the Food and Agriculture Organisation Guidelines for the Ecolabelling of Fish and Fishery Products from Marine Capture Fisheries.³⁴⁶ The assessment measured three types of evidence: internal evidence where the management system says it does something, outcome evidence where the management system does what it says it will do, and independent evidence based on independent experts reviewing the system.³⁴⁷ Overall, the system was measured as being effective in achieving its objectives with

³⁴⁵ The Marine Stewardship Council is a global non-profit organisation established by Unilever, the world’s largest purchaser of seafood, and the World Wildlife Fund in the late 1990s. It became an independent organisation shortly afterwards. The MSC created an environmental standard for fisheries. For parties that meet the standards, they may use the MSC certification label.

³⁴⁶ M.L. Walsh et al. Comparative Analysis of U.S. Federal Fishery Management to the FAO Ecolabelling Guidelines: A Self-Assessment, NOAA Technical Memorandum NMFS-OSF-1 (April 2015) http://www.nmfs.noaa.gov/sfa/publications/technical-memos/nmfs_osf_tm1.pdf

³⁴⁷ Id. at 6.

specific recommendations.³⁴⁸ Regarding bycatch, the report found that internal evidence was strong, based on the Magnuson-Stevens Act and the National Standard Guidelines requiring that bycatch be addressed within a fisheries management plan. Outcome evidence was also strong with evidence of observers on board boats, reporting of bycatch, time and area closures, gear restrictions, catch share management, a U.S. National Bycatch Strategy, and a bycatch engineering programme.³⁴⁹ The evidence from outside experts was more mixed, with some experts applauding the US for implementing mandated fishing gear to avoid bycatch but also observing that a number of the overfished stocks were stocks that were incidental bycatch, including some sharks, skates, butterfish, flounder, and red snapper.³⁵⁰

If such an assurance was to be designed, a number of criteria would need to be devised as the basis for any government assurance. The government might look to the ongoing work of the Global Seafood Sustainability Initiative (GSSI) to offer some guidance on what types of criteria are deemed by seafood suppliers, NGOs, governmental organisations, intergovernmental organisations, and seafood exporters to be mandatory criteria for acceptable seafood sustainability certification.³⁵¹ For example, under the GSSI benchmarking standard, a fisheries sustainability standard must have in place:

Non-Target Catches: [M]anagement objectives that seek to ensure that non-target catches and discards by the unit of certification of stocks other than the stock under consideration and any associated culture and enhancement activity do not threaten those non-target stocks with recruitment overfishing or other impacts that are likely to be irreversible or very slowly reversible.³⁵²

[E]xistence of management measures that minimise unwanted catch and discards, where appropriate, and reduce post-released mortality where incidental catch is unavoidable.³⁵³

Stock Assessment: [A]ssessment of the current status and trends of the stock under consideration considers total fishing mortality on that stock from all sources including discards, unobserved mortality, incidental mortality,

³⁴⁸ Id. at 132-133 (Recommendations on addressing bycatch in U.S. fisheries and fish markets included managing stocks on the basis of separating managed stocks into target species and non-target species and possible other additional management measures including “no-discard or 100% retention regulations”.)

³⁴⁹ Id. at 131.

³⁵⁰ Id.

³⁵¹ Global Seafood Sustainability Initiative, Global Benchmarking Tool (October 2015) <http://www.ourgssi.org/assets/GSSI-Benchmarking-Tool/GSSI-Global-Benchmark-Tool-V.1-October-2015.pdf>

³⁵² Id. at p. 179

³⁵³ Id. at p. 190

unreported catches and catches in all fisheries over its entire area of distribution.³⁵⁴

Additional criteria regarding active discard reduction efforts through, for example, move-on policies for vessels could also be incorporated into a government assurance process. The development of any national criteria should be done in consultation with all interested stakeholders in a public process so as to ensure a robust dialogue about what sustainability means for the commercial fishing industry in New Zealand waters.

There are risks involved in offering an assurance. First, other States or civil society groups might suggest that the sustainability criteria selected by the Ministry do not reflect the most important criteria for ensuring long-term sustainable fisheries. For example, even where the government might be willing to assure that a given TAC has been properly set for a QMS species leading to recovery, it may be unwilling to assure that fishing for a given QMS stock also meets certain long-term ecosystem recovery goals. Second, if a government agency is willing to offer an assurance to enhance the credibility of sustainability claims, it must also be prepared to revoke an assurance whenever an industry practice violates assurance criteria. This may have serious implications for the public perceptions of an industry. Third, assurances are beginning to be viewed sceptically by at least some commentators who worry that the certification is driven to meet demand of expanding markets without necessarily offering robust stewardship protection.³⁵⁵

(2) Warrant of Sustainability

While the development of any export-oriented government assurance programme must be secondary to addressing the existing strong incentives to discard and inaccurately report catches, the government in the interim could develop for itself a means of recognising industry leaders in both the deepwater and inshore fisheries. A number of commercial fishing industry players have observed that the media is quick to report on any failings of the fishing industry but reluctant to report on positive steps that the industry is taking to change historical practices. Government recognition of industry leaders may assist members of the fishing industry in making the progressive corporate changes and on-vessel changes needed to ensure sustainable fisheries. Based on selecting a number of achievable measurable indicators, the Ministry could offer a “warrant of sustainability” to licensed fish receivers and vessels that qualify. Examples of indicators for vessels that could be verified might include the installation

³⁵⁴ Id. at p. 207

³⁵⁵ M. Hadjimichael and T. Hegland, Really Sustainable? Inherent Risks of Eco-Labeling in Fisheries, *Fisheries Research* 174 (2016): 129-135 (Critiquing the Marine Stewardship Council Certification as potentially weak in application by pointing to certified fisheries such as the Australian Northern Prawn Fisheries that has not yet managed “bulk biomass” discarding for species that are not threatened, not endangered, and not protected.); R. Selden et. al. Evaluating Seafood Eco-Labeling as a Mechanism to Reduce Collateral Impacts of Fisheries in an Ecosystem-Based Fisheries Management Context, *Marine Policy* 64(2016): 102-115 (Observing that one of the MSC’s proposed approach to managing discards would be to require fisheries to incorporate “as appropriate” bycatch minimisation strategies. For the MSC a fisher need only incorporate “as appropriate” if the strategies allow for a comparably efficient harvesting of target catch.)

of an electronic monitoring system, a check that all crew members have no fisheries-related convictions in the past 5 years, the installation of calibrated scales to measure the weight of catch and discards, a demonstration of knowledge of best gear handling practices to minimise ecological damage, and an independent audit indicating no major or ongoing violation of the Fisheries Act 1996 and its regulations. Examples of possible sustainability indicators for licensed fish receivers might include demonstration of some level of company investments to support sustainability outcomes for fishers (e.g. subsidising electronic monitoring), company policies to buy QMS stocks including bycatch stocks at rates that cover the purchase of ACE, ongoing sustainability training for contract fishers, and independent audits to demonstrate that the companies are not perversely incentivising discarding. This type of “warrant of sustainability” programme could over time provide potential incentives for changing behaviour as individuals and corporations are rewarded with reputational benefits of demonstrating sustainable practices.

This type of “warrant of sustainability” programme based on specific articulated standards is already being explored by several international fisheries. As of July 2016, Global Trust/SAI Global is evaluating the U.S. Alaska Salmon Commercial Fisheries, the U.S. Alaska Pacific Halibut Commercial Fisheries, and the U.S. Alaska Sablefish Commercial Fisheries to determine whether these fisheries comply with a FAO Based Responsible Fisheries Management Certification.³⁵⁶ The certification programme does not create new standards but instead compares specific fisheries to standards set in the FAO Code of Conduct for Responsible Fisheries, the FAO Guidelines for Ecolabelling of Fish and Fishery Products from Marine Capture Fisheries, and other FAO criteria.³⁵⁷

While it is easy to criticise the proliferation of standards and suggest that greater attention should be given to the more prominent standards such as those developed under the Marine Stewardship Council, this proposal for a “warrant of sustainability” is intended to be a standard that all New Zealand producers should attain as a minimum. The impact of establishing such a programme would be largely about shaping norms for the industry. While MPI has been largely hands-off in terms of defining industry sustainability practices, this proposal would help to distinguish between seafood industry leaders and seafood industry laggards.³⁵⁸ Over time, the leaders may provide a pathway for laggards that will strengthen the overall credibility of New Zealand’s seafood industry.

³⁵⁶ In doing this certification, Global Trust follows the conformity assessment required under the ISO 17065 for certification bodies to ensure that fisheries meet specified requirements.

³⁵⁷ Global Trust, FAO Based Responsible Fisheries Management Certification, <http://www.gtcert.com/fao-based/>

³⁵⁸ See generally N. Gunningham and D. Sinclair, *Leaders and Laggards: Next Generation Environment Regulation*, Greenleaf Press, UK, 2002. (Describing how environmental leaders assist in setting standards for the industry)

8 CONCLUSION

Discard practices pose an ongoing complex challenge for the fishing industry globally. In many fisheries, an unknown amount of fish is discarded for biological reasons (e.g. too small) or for social reasons (economic motivation to high grade or regulatory requirements). The New Zealand Government, in designing the quota management system in the 1980s, understood the significance of discard practices and designed a system that required all fish to be counted, required most fish to be landed, and introduced a presumption that a fish or other species returned to the sea must be likely to survive its return. In creating its innovative quota management system, the New Zealand Government had not anticipated the difficulty for individual fishers in obtaining coverage under the quota system for certain species leading to an unexpected driver for illegal discarding in New Zealand waters. The threat of large deemed values combined with the inability in some cases to obtain Annual Catch Entitlement offers a justification for some fishers to participate in illegal discarding practices. Knowledge gaps definitely remain regarding the extent of this discard behaviour particularly in inshore fisheries.

In order to be able to accurately set Total Allowable Commercial Catches that ensure future abundance, the Ministry for Primary Industries must understand the various levels of discarding across fisheries for both commercial and recreational users. Because illegal discarding is the culmination of a variety of independent drivers that vary depending on the fishery and the regulatory frameworks, there is no “one size fits all” approach to eliminating discards, as demonstrated by the variety of approaches taken across different legal jurisdictions including the European Union and the United States. While there is no single reliable solution to addressing discards, there are a number of possibilities for policy changes within New Zealand that may alleviate some of the pressures driving discard behaviour. The following ideas have been detailed in this policy report:

1) Suggestions to improve quality of available information for fisheries science

A. Implementing integrated electronic monitoring and reporting system with buy-in from the fishing community

B. Increasing government investment in research, including undertaking projects to provide dynamic mapping for species with actual or alleged high discard rates

C. Considering new destination codes for live and dead sub-MLS fish returned to sea with no requirement for ACE balancing

D. Ensuring electronic reporting improves the quality of information being reported

E. Improving data quality by creating a “collaborative information commons” with flowback of information to commercial fishers

2) Suggestions based on improving the operation of the existing quota system to reduce incentives to discard

F. *Quota banking/risk pooling for multi-species fisheries or stocks crossing fishing management areas*

G. *Changing the incentives to ensure the use of ACE in the year for which ACE is issued*

H. *Introducing real-time temporary closures to reduce bycatch*

I. *Returning some percentage of quota to community-based fishers' organisations*

3) Suggestions based on improving selectivity

J. *Additional development efforts for the Precision Seafood Harvesting System/Tiaki should be optimised to avoid catching non-target fish and increase survivability of fish that will be returned to sea*

K. *Promoting fisher's innovations to reduce bycatch*

4) Suggestions to Enhance Professionalism in the Fishing Industry

L. *Investing in professional sustainability education for New Zealand's fishers*

M. *Collaborating with fishers to understand the implications of "returning to the sea"*

N. *Providing regular "best practice" audits to support adoption of marine resource sustainability efforts*

While it would be impossible to apply a formula on how to undertake potential policy reforms, one thing is clear based on the research in this paper. To support both the objective of sustainable fisheries and the continuation of a commercial industry in New Zealand, MPI must design a discard policy that reflects both the current realities of commercial fishing and the aspiration that all fish caught in New Zealand waters become part of an economic value chain. Eliminating existing discard practices will not happen overnight, but will be part of a longer-term change in fishing culture. While some fishers will be quick to adopt new practices, other fishers will require a transition period to learn new fishing practices such as gear deployment to reduce non-target catches. Before electronic monitoring is implemented, MPI must make important decisions about how it intends to handle future discard incidents. Will New Zealand attempt to implement a full "discard ban" such as that in the European Union and risk potential bankruptcy of some portions of the fishing industry which cannot afford to land fish with low or no-value? Or will New Zealand recognise some threshold of legal operational discarding that will not have cumulative impacts on marine resources?

For the electronic monitoring system to be a success in enhancing data collection for fisheries management, MPI will need some degree of credible buy-in from the fishing

community. This social policy aspect of implementing new technology should not be ignored in the rush to implement. Understanding the potential social and economic consequences of introducing electronic reporting, vessel monitoring systems, and onboard cameras should be considered as part of the government's investment in mandating new technology. Likewise, MPI should invest in the vocation of fishing to ensure that fishers have the knowledge about science and ecosystems that will help them support the sustainability goals and objectives of the QMS. Enhancing the professionalism of fishers by offering government-funded training in sustainability practices will benefit New Zealand and New Zealand's renewable fishery resources by ensuring that future fishers have essential working knowledge regarding the basics of sustainable fisheries management and can use this knowledge to promote ecosystem based management.

Countries such as New Zealand can help to create markets for some incidental catch by enhancing the competitiveness of fisheries products. One long-term means of increasing competitiveness is to distinguish New Zealand's sustainability record from other States. In the future, New Zealand which has been exploring the possibility of creating a Smartmark for marketing of certain products may wish to offer government assurances to its trading partners that its exported marine fisheries products have been sustainably produced. Such assurances might enhance market access for New Zealand products to those States that are concerned with importing sustainable fisheries products. Even if the Government is unwilling to make assurances for one export industry or one portion of an industry, it might still consider creating a "warrant of sustainability" programme that would offer fishers and licensed fish receivers a government-issued certificate indicating basic compliance with measures designated to promote sustainability. An example of a sustainability measure might be a requirement to demonstrate implementation of some system to reduce discards. For example, a fisher might be able to show through log records, observer reports or other evidence the regular use of certain gear designed to reduce bycatch. A licensed fish receiver might be able to demonstrate through sharing harvest records and purchase receipts that they purchase all fish captured by contracted fishers at prices that will cover the ACE for the landed fish.

Even though New Zealand's current export market for marine fish is relatively small in comparison to other key industries, it is a sector that can increase in value particularly if it can credibly demonstrate its sustainability to a global market. Fish offers high-quality protein and important fatty acids that are likely to be a key part of future strategies for food security. With the fifth largest exclusive economic zone in the world and relatively clean waters, New Zealand has a comparative advantage for exporting marine fisheries products. Since the introduction of the Quota Management System, New Zealand's fisheries management system has improved the abundance of many commercial stocks. Addressing the remaining data gaps associated with existing discard practices will further strengthen the fisheries management system and protect New Zealand's fisheries resources for this generation and future generations of New Zealanders.

In closing, the question is whether marine fisheries management will be regarded as a political priority for New Zealand. Because policy changes require Cabinet approval, there needs to be high-level political will to reasonably address the resource

sustainability challenge posed by discards. While 21st century New Zealand has many competing social and environmental priorities, fisheries management should be given greater attention so that the “big fish” abundance that Maui experienced in his mythical fishing trip can continue to be the legacy of New Zealanders today.

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APPENDICES

Appendix 1- New Zealand Fisheries Act Section 72 Dumping of Fish Prohibited

72 Dumping of fish prohibited

(1) No commercial fisher shall return to or abandon in the sea or any other waters any fish, aquatic life, or seaweed of legal size, or for which no legal size is set, that is subject to the quota management system.

(2) Subsection (1) does not apply if the stock is listed in Schedule 6 and the commercial fisher complies with the requirements set out in that schedule.

(3) Any commercial fisher who takes any fish, aquatic life, or seaweed subject to the quota management system that is not of legal size shall immediately return that fish, aquatic life, or seaweed, whether alive or dead, to the sea or waters from which the fish, aquatic life, or seaweed was taken.

(4) Every person commits an offence and is liable to the penalty set out in section 252(3) who contravenes subsection (1) or subsection (3).

(5) Without limiting the application of section 241, it is a defence to any offence under subsection (4) if—

(a) the return was a return of parts of fish, aquatic life, or seaweed lawfully processed on a vessel; or

(b) the fish, aquatic life, or seaweed was returned or abandoned to ensure the safety of the vessel or any crew member; or

(c) the following provisions were complied with, namely,—

(i) a fishery officer or observer was present when the fish, aquatic life, or seaweed was taken; and

(ii) the fishery officer or observer authorised the return or abandonment of the fish, aquatic life, or seaweed; and

(iii) the commercial fisher returned or abandoned the fish, aquatic life, or seaweed under the supervision of the fishery officer or observer, and complied with any directions of the fishery officer or observer; and

(iv) the amount of fish, aquatic life, or seaweed was included in the returns for the appropriate period that are required to be made by the commercial fisher under this Act.

(6) Any fish, aquatic life, or seaweed returned or abandoned in accordance with subsection (5)(c) shall be included in the commercial fisher's reported catch for the purposes of section 76.

(7) The Governor-General may from time to time, by Order in Council made on the recommendation of the Minister, add or omit from Schedule 6 the name of any stock, or amend any provision in that schedule or add new provisions to that schedule.

Appendix 2- EU Discard Ban- Article 15 (European Parliament and the Council Regulation (EU) No 1380/2013 of the European Parliament and of the Council of 11 December 2013 on the Common Fisheries Policy)

Landing obligation

1. All catches of species which are subject to catch limits and, in the Mediterranean, also catches of species which are subject to minimum sizes as defined in Annex III to Regulation (EC) No 1967/2006, caught during fishing activities in Union waters or by Union fishing vessels outside Union waters in waters not subject to third countries' sovereignty or jurisdiction, in the fisheries and geographical areas listed below shall be brought and retained on board the fishing vessels, recorded, landed and counted against the quotas where applicable, except when used as live bait, in accordance with the following time-frames:

(a) From 1 January 2015 at the latest:

- small pelagic fisheries (i.e. fisheries for mackerel, herring, horse mackerel, blue whiting, boarfish, anchovy, argentine, sardine, sprat);
- large pelagic fisheries (i.e. fisheries for bluefin tuna, swordfish, albacore tuna, bigeye tuna, blue and white marlin);
- fisheries for industrial purposes (inter alia, fisheries for capelin, sandeel and Norwegian pout);
- fisheries for salmon in the Baltic Sea.

(b) From 1 January 2015 at the latest for species which define the fisheries and from 1 January 2017 at the latest for all other species in fisheries in Union waters of the Baltic Sea for species subject to catch limits other than those covered by point (a).

(c) From 1 January 2016 at the latest for the species which define the fisheries and from 1 January 2019 at the latest for all other species in:

(i) the North Sea

- fisheries for cod, haddock, whiting, saithe;
- fisheries for Norway lobster;
- fisheries for common sole and plaice;
- fisheries for hake;

- fisheries for Northern prawn;
 - (ii) North Western waters
 - fisheries for cod, haddock, whiting, saithe;
 - fisheries for Norway lobster;
 - fisheries for common sole and plaice;
 - fisheries for hake;
 - (iii) South Western waters
 - fisheries for Norway lobster;
 - fisheries for common sole and plaice;
 - fisheries for hake;
 - (iv) other fisheries for species subject to catch limits.
- (d) From 1 January 2017 at the latest for species which define the fisheries and from 1 January 2019 at the latest for all other species in fisheries not covered by point (a) in the Mediterranean, in the Black Sea and in all other Union waters and in non-Union waters not subject to third countries' sovereignty or jurisdiction.
2. Paragraph 1 shall be without prejudice to the Union's international obligations. The Commission shall be empowered to adopt delegated acts, in accordance with Article 46, for the purpose of implementing such international obligations into Union law, including, in particular, derogations from the landing obligation under this Article.
3. Where all the Member States having a direct management interest in a particular fishery agree that the landing obligation should apply to species other than those listed in paragraph 1, they may submit a joint recommendation for the purpose of extending the application of the landing obligation to such other species. For this purpose, Article 18(1) to (6) shall apply *mutatis mutandis*. Where such a joint recommendation is submitted, the Commission shall be empowered to adopt delegated acts, in accordance with Article 46, containing such measures.
4. The landing obligation referred to in paragraph 1 shall not apply to:
- (a) species in respect of which fishing is prohibited and which are identified as such in a Union legal act adopted in the area of the CFP;
 - (b) species for which scientific evidence demonstrates high survival rates, taking into account the characteristics of the gear, of the fishing practices and of the

ecosystem;

(c) catches falling under de minimis exemptions.

5. Details of the implementation of the landing obligation referred to in paragraph 1 shall be specified in multiannual plans referred to in Articles 9 and 10 and, where relevant, further specified in accordance with Article 18, including:

(a) specific provisions regarding fisheries or species covered by the landing obligation referred to in paragraph 1;

(b) the specification of exemptions to the landing obligation of species referred to in point (b) of paragraph 4;

(c) provisions for de minimis exemptions of up to 5 % of total annual catches of all species subject to the landing obligation referred to in paragraph 1. The de minimis exemption shall apply in the following cases:

(i) where scientific evidence indicates that increases in selectivity are very difficult to achieve; or

(ii) to avoid disproportionate costs of handling unwanted catches, for those fishing gears where unwanted catches per fishing gear do not represent more than a certain percentage, to be established in a plan, of total annual catch of that gear.

Catches under the provisions referred to in this point shall not be counted against the relevant quotas; however, all such catches shall be fully recorded.

For a transitional period of four years, the percentage of the total annual catches referred to in this point shall increase:

(i) by two percentage points in the first two years of application of the landing obligation; and

(ii) by one percentage point in the subsequent two years;

(d) provisions on documentation of catches;

(e) where appropriate, the fixing of minimum conservation reference sizes in accordance with paragraph 10.

6. Where no multiannual plan, or no management plan in accordance with Article 18 of Regulation (EC) No 1967/2006, is adopted for the fishery in question, the Commission shall be empowered to adopt, in accordance with Article 18 of this Regulation, delegated acts in accordance with Article 46 of this Regulation, laying down on a temporary basis and for a period of no more than three years a specific discard plan containing the specifications referred to in points (a) to (e) of paragraph 5

of this Article. Member States may cooperate, in accordance with Article 18 of this Regulation, in the drawing up of such a plan with a view to the Commission adopting such acts or submitting a proposal in accordance with the ordinary legislative procedure.

7. Where no measures have been adopted for the purpose of specifying the de minimis exemption either in a multiannual plan in accordance with paragraph 5 or in a specific discard plan in accordance with paragraph 6, the Commission shall adopt delegated acts, in accordance with Article 46, setting the de minimis exemption referred to in point (c) of paragraph 4 which shall, subject to the conditions set out in point (c)(i) or (ii) of paragraph 5, amount to no more than 5 % of total annual catches of all species to which the landing obligation applies under paragraph 1. That de minimis exemption shall be adopted so as to apply from the date of application of the relevant landing obligation.

8. By way of derogation from the obligation to count catches against the relevant quotas in accordance with paragraph 1, catches of species that are subject to the landing obligation and that are caught in excess of quotas of the stocks in question, or catches of species in respect of which the Member State has no quota, may be deducted from the quota of the target species provided that they do not exceed 9 % of the quota of the target species. This provision shall only apply where the stock of the non-target species is within safe biological limits.

9. For stocks subject to the landing obligation, Member States may use a year-to-year flexibility of up to 10 % of their permitted landings. For this purpose, a Member State may allow landing of additional quantities of the stock that is subject to the landing obligation provided that such quantities do not exceed 10 % of the quota allocated to that Member State. Article 105 of Regulation (EC) No 1224/2009 shall apply.

10. Minimum conservation reference sizes may be established with the aim of ensuring the protection of juveniles of marine organisms.

11. For the species subject to the landing obligation as specified in paragraph 1, the use of catches of species below the minimum conservation reference size shall be restricted to purposes other than direct human consumption, including fish meal, fish oil, pet food, food additives, pharmaceuticals and cosmetics.

12. For species that are not subject to the landing obligation as specified in paragraph 1, the catches of species below the minimum conservation reference size shall not be retained on board, but shall be returned immediately to the sea.

13. For the purpose of monitoring compliance with the landing obligation, Member States shall ensure detailed and accurate documentation of all fishing trips and adequate capacity and means, such as observers, closed-circuit television (CCTV) and others. In doing so, Member States shall respect the principle of efficiency and proportionality.

Appendix 3: Sample language from a Sector-based Membership Contract and Sector Operating Plans related to reducing discards and reporting discards

(Full language of Membership Contract and Sample Sector Operating Plan Available at:

http://www.greateratlantic.fisheries.noaa.gov/sustainable/species/multispecies/sector/docs/fy2016/160513_shs_2_fy_16_ops_plan.pdf)

Membership Contract:

Section 2.7 Sector and Member Reporting Requirements

The Sector Manager is required to aggregate all participating vessel catch information from participating vessels' sector trips and report weekly to the National Marine Fisheries Service (NMFS), up until a certain threshold is reached, at which time reporting to NMFS will be required on a daily basis. The reporting frequency for the sector manager's ACE Status Report will be increased to daily when 90% of any of the sector's ACEs is reached.

The Sector Manager, or a designated representative, must notify NMFS immediately by email if the threshold that triggers daily reporting has been reached. During the period when a sector has reached or exceeded 90% of any of its ACEs, daily ACE Status Reports must be submitted only on a day when a member vessel lands, or when the sector engages in an ACE transfer of a stock that is exceeding the 90% threshold. An alternative threshold for triggering daily reporting may be implemented during FY 2016 if agreed upon by the sector and NMFS. Additionally, the Sector is required to submit an Annual Report of all landings of all species caught by sector vessels for the entire fishing year within 60 days of the end of the multispecies fishing year.

Weekly reports to NMFS may include a section notifying NMFS of outstanding catch records. Any resolutions and / or ongoing internal sector investigations may be noted as required.

The Manager will develop and submit reports to NMFS by gathering and aggregating data from all available data sources, including but not limited to:

1. Vessel Trip Reports (VTRs), (including electronically transmitted VTRs);
2. Dealers, (including paper dealer receipts from each offload transmitted to the Manager within 24 hours of the vessel offloading, as well as dealer reports posted on the NMFS sector information management web portal);
3. Discards and assumed discard rates (as calculated by NMFS based on the Northeast Fishery Observer Programme (NEFOP) and At-Sea Monitoring);

and

4. Any other data sources as they are available.

To enable each Member and the Sector to monitor the Members' compliance with this

Agreement, each Member agrees to report each of its Participating Vessels' entire catch from sector trips (including discards) by pounds, by species, and by broad groundfish stock area to the Sector Manager so the Manager can determine which stock of a species has been caught.

All members agree that they are responsible for transmitting all catch information from all sector trips to the Manager within 24 hours of the Participating Vessels' unloading. The minimum information that must be transmitted to the Sector Manager includes a complete and legible VTR and dealer weigh-out receipt. Members and vessel operators may be subject to investigation and/ or penalty, including a Stop Fishing Order, if they do not meet the 24 hour deadline for submitting catch information. Such information may be transmitted electronically or by fax or other means as determined by the Manager as long as it is transmitted within 24 hours of each landing.

The Manager shall maintain all catch records and shall, upon the request of any Member, provide the Member with the Sector's aggregate catch information that is generated from such records. Sector vessels which do not fish on sector trips agree that the Sector Manager will use VTR and dealer data as submitted to NMFS to compile the annual report.

Each member acknowledges and agrees that, in addition to reporting to the sector manager, all participating vessels are responsible for complying with all permitting requirements, recordkeeping, catch reporting, and VMS requirements described in the federal regulations for the fishery (50 CFR part 648).

Section 2.9 Joint and Several Liabilities

Sector members acknowledge and agree that they and the sector may be held jointly and severally liable if they or their hired captain or crew

1. discard legal sized fish for which the sector has an allocation; and/or
2. misreport catch; and/or
3. cause the sector to exceed its Annual Catch Entitlement (ACE) for any allocated stock (an overage) as specified in Federal regulations.

Sector Operating Plan:

2.2.5. Discards

The Sector manager (or his/her designated representative) will derive stock specific discards for each trip. If the trip is observed by either an at-sea monitor or a Northeast Fisheries Observer Programme (NEFOP) observer, discards will be derived based on data collected during that trip and will account for all hauls (observed and unobserved) on that trip. If the trip is not observed, discards will be derived using the NMFS-provided discard rate resulting from the NMFS method to estimate 'in-season' discard rates, which may not include data from research trips or sector trips using certain exemptions.

5.2. Restrictions on Fishing Activity

The Members acknowledge they may be held jointly and severally liable for civil

penalties to NMFS that result from any member causing the Sector to exceed its ACE; any member discarding legal sized allocated groundfish; any member or vessel operator misreporting their own catch and discards of allocated groundfish species to NMFS or the Sector Manager;

The Members further acknowledge and agree that monetary penalties could be inadequate recourse under such circumstances.

Therefore, the Members acknowledge and agree that each of them will comply with a “stop fishing” order from the Sector, which shall be issued by the Board, the Manager or the Infractions Committee, and each of the Members further agrees that if any Member fails to comply with such order, the Sector shall have the authority to obtain an injunction, restraining order or other equivalent form of equitable relief to give effect to such “stop fishing” order.

5.3. Joint and Several Liabilities

Sector members acknowledge and agree that they and the sector may be held jointly and severally liable for discarding legal sized fish, misreporting, and Annual Catch Entitlement (ACE) overages as specified in Federal regulations.