2011 Compliance Risk Profile of the West Coast/East Coast South Island Hoki Fisheries

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Manager Compliance Central
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s 9(2)(a)

May 2012

Contents

1. Executive Summary

In line with the National Deep-water Plan the Ministry for Primary Industries (MPI) Operational Coordination team was tasked to deliver a risk profile on the 2011 West Coast South Island (WCSI) and East Coast South Island (ECSI) hoki fisheries. The profile is intended to provide MPI management, compliance and fishing industry participants with an assessment of compliance risks, as they relate to each fisheries area. The risk profile was not required to be delivered to an evidential standard. Where risks are identified quantification of that risk has been documented based on the data available. This includes an assessment of the severity of the risks in terms of fishing practice, occurrence and vessel/companies involved.

The hoki fishery has undergone significant reductions and changes in TACC levels since 2000. In 2000-01 the TACC was set at 250,000 tonnes. TACC reductions were made over preceding years because the hoki fishery was estimated to be below management target fishing levels. In 2010-11 the TACC was set at 120,000 tonnes increasing by 10,000 from the previous year. Because the hoki fishery is a high volume and a high value fishery it has continued to have significant commercial importance despite the reductions in the total allowable commercial catch.

In March 2001, the hoki fishery became the world's first large whitefish stock to achieve Marine Stewardship Council (MSC) certification. This eco-label gives endorsement that New Zealand hoki meets the MSC's guiding principles and criteria for a healthy, well managed sustainable fishery. The fishery was reassessed and recertified in 2006, and is currently undergoing a third assessment before the current certificate expires in November 2012.

To profile the WCSI hoki fishery an operation was commenced code named "Operation Bronto." The operation was coordinated to gather, examine and analyse data pertaining to the hoki fishery and a number of bycatch species. This was undertaken by Fishery Officers during 43 in port inspections and 20 at sea vessel inspections. In addition 11 vessel trips carried MPI observers who also collected data and carried out hoki length frequency work. The ECSI hoki fishery was profiled using MPI observer length frequency data and company hoki processing and grading specifications. Vessel TCEPR data was used and analysed for both MPI observed and unobserved vessels operating on the WCSI and ECSI hoki fisheries.

Whilst the 2011 hoki risk profile has identified a number of good fishing practises and procedures, there are a number of risks and issues in relation to: fisheries reporting, fishing practices, vessel electronic weighing and recording systems, carton weights, reporting of meal, vessel specific conversion factors, vessel processing specifications and undefined states, additional states and products, highgrading of hoki in both the WCSI & ECSI hoki fisheries, misreporting of bycatch, the misreporting of target species to circumvent the Deep Water Group Hoki Fishery Operational procedures in relation to HMAs.

It is estimated that the total greenweight of hoki unreported is between 3,414 t and 3,555 t (which equates to between 5.6% and 5.9% of the HOK1W sub-area TACC). It is worth noting that not all risks identified in this report have been able to be quantified due to insufficient data and for this reason the estimates provided are considered conservative.

A total of 44 recommendations have been made and are categorised according to where it is believed the risk can best be addressed: "Deep Water Group", "Working with the Company", "MPI Monitoring/Ongoing work", "Investigation and/or Fishery Officer Monitoring at District" and "Fact sheet".

2. Background

In collaboration with industry and environmental organisations, the Ministry for Primary Industries has developed a National Fisheries Plan for Deep-water and Middle-depth Fisheries. The Minister has approved this National Deep-water Plan. The National Deep-water Plan sets out the long-term goals and objectives for deep-water fisheries. It also sets the specific operational objectives that will be delivered annually for each key deep-water species, and establishes performance indicators to assess if the management strategy has been delivered.

The specific compliance services for 2011-12 contained in the National Deep-water Plan include the completion of risk profiles on the hoki fishery. These service requirements are in addition to the general monitoring and surveillance activities undertaken by the Compliance Directorate. A compliance overview is also provided within the National Deep-water Plan, as detailed below.

The hoki fishery is subject to an extensive range of regulatory measures aimed at improving the management of the entire fishery, including its effect on bycatch species. A number of compliance risks have been identified as being of particular relevance to the hoki fishery as listed in the Hoki Fisheries Plan. These risks are described below:

2.1 Discarding of Hoki and Bycatch Species

Discarding (returning of fish to the sea) is of particular concern in the hoki fishery and is prohibited under s 72 of the Fisheries Act 1996. There is no legal size limit for hoki and as such it is not a species which may be returned to the sea or other waters pursuant to the 6th Schedule of the Fisheries Act 1996.

Discarding enables fishers to increase their income by avoiding QMS related expenses such as purchase of annual catch entitlement (ACE) or paying deemed values. Hoki fishery bycatch species are especially vulnerable to this type of offending.

Fishers may also deliberately discard smaller, damaged or less valuable fish of a particular species to maximise their economic return. This practice is known as highgrading.

2.2 Misreported Catch

Misreporting occurs when fishers report incorrect weights, quantities, species, or landed states. The primary motive behind this type of offence is minimising ACE and related deemed value expenses.

2.3 Deployment of Seabird Mitigation Devices

Regulations require that all deep-water trawl vessels operating in the hoki fishery deploy bird mitigation devices to ensure that fishing activity does not cause unnecessary risks to seabirds.

With the assistance of the fishing industry, MPI undertakes risk analysis of the hoki fishery. Some risks were identified as a result of previous investigations and prosecutions.

Risk analysis and information sharing between MPI and industry allows the Ministry to adapt compliance efforts to current risks. It helps minimise opportunities for offending and facilitates the development and monitoring of the compliance standards necessary to achieve the objectives of the National Deep-water Plan.

3. The Hoki Fishery

The hoki fishery is a high volume and a high value fishery. In 2008 the estimated total market value of hoki quota was $730m[1] . Because of its commercial importance hoki is ranked as a Tier 1 fishery in the National Deep-water Plan.

3.1 *Hoki Biology*

Hoki (*Macruronus novaezealandiae*) is widely distributed throughout New Zealand waters, with greatest abundance between depths of 200 m to 600 m. Hoki is a relatively fast growing, medium-lived species. Hoki juveniles reach about 27-30 cm total length (TL) at the end of their first year. There is some variability in growth rates, but hoki reach about 40-45, 50-55 and 60-65 cm TL respectively in the following three years, as summarised in table 1 below.

Year	Total Length (cm)
1	27-30
2	40-45
3	50-55
4	60-65

Table 1 - Summary of total length by age

Males appear to mature at 60-65 cm TL at 4-5 years, while females mature at 65-70 cm TL. After the onset of maturity the growth rates of males and females differ. Males grow up to about 115 cm TL, while females grow to a maximum of 130 cm TL and up to 7 kg weight. The maximum age for hoki is between 20-25 years.

Hoki spawn for the first time between 3 and 5 years. Spawning occurs each year during the winter months at two main spawning grounds; the West Coast of the South Island (WCSI) and Cook Strait. The current hypothesis is that juveniles from both stocks mix on the Chatham Rise and recruit to their respective stocks as they approach sexual maturity (O'Driscoll, 2012). The hoki fishery is strongly recruitment driven and therefore vulnerable to large fluctuations in stock size. To manage the fishery and minimise potential risks, it is important to have some ability to predict recruitment into the fishery. Extensive sampling throughout the EEZ has shown that the Chatham Rise is the main nursery ground for hoki aged to 2 to 4 years (O'Driscoll, 2012).

The western stock of hoki lives mainly on the Southern Plateau and migrates to spawn off the WCSI in winter. The main hoki spawning fishery operates from mid-July to late-August on the WCSI, where hoki aggregate to spawn in depths of 300-700m around the Hokitika Canyon. A second major spawning fishery occurs in Cook Strait, where the season runs from late-June to mid-September, peaking in July and August. Small catches of spawning hoki are taken from other spawning grounds off East Coast South Island (ECSI) and, late in the season, at Puysegur Bank.

Outside the spawning season there is a substantial fishery on the Chatham Rise and a smaller fishery in the Sub-Antarctic. The Chatham Rise fishery generally has constant catch levels across all months except July to September, when catches are lower because fishing vessels

[1] See www.fish.govt.nz

move to the spawning grounds. In the Sub-Antarctic, catches typically peak in April to June. There is also a small East Coast North Island (ECNI) hoki fishery.

26 key bycatch species (QMS) are typically taken as a consequence of the hoki target fishery. A number of non-QMS species are also caught. These are usually discarded or rendered to fishmeal and are of little commercial value.

3.2 *Hoki Management*

Since 2002-03 the hoki fishery has been managed as two stocks under a single total allowable commercial catch (TACC), HOK1. The two stocks, which are illustrated in figure 1 below, are defined as:

1. Western hoki stock: WCSI, Sub-Antarctic and Puysegur Bank.
2. Eastern hoki stock: Cook Strait, Chatham Rise, ECSI and East Coast North Island (ECNI).

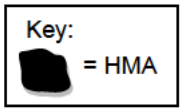


Figure 1 – Hoki fishery illustrating eastern and western stock boundaries in HOK1

Historically the WCSI hoki fishery was the largest with over 90% of the total hoki catch taken there during the spawning period. Catches from the WCSI fishery declined steadily from 1988 to 1996. Further declines in catches were also reported between the years 2001 to 2009. In 2001, quota owners implemented agreed catch limits within the TACC to manage catches from both the eastern and western stocks.

The proportions of the TACC taken from each stock were set according to annual stock assessments. From 2004 to 2007 the limits required that 60% of the TACC be taken from the eastern stock and 40% from the western stock. To provide for the rebuild of the western stock these proportions were adjusted in 2007 to 72% from the eastern stock and 28% from the

western stock. During the period 2004 to 2009, quota owners also agreed to the closure of the Hokitika Canyon spawning ground as a precautionary measure. This closure has since been lifted because the western hoki stock is no longer estimated to be below management target fishing levels[2].

In 2009-10, the permissible catch from the western fishing grounds was increased to 50,000t, within an overall TACC of 110,000 t. For the 2010-11 fishing year the permissible catch for the western and eastern stocks was 60,000 t from each area, within an overall TACC of 120,000 t. By agreement, quota owners manage the recommended catch limits for the western and eastern stocks, which are respectively designated areas HOK1W and HOK1E.

Quota owners have implemented other non-regulatory management measures to improve stock recruitment by reducing catches of juvenile hoki. These measures are currently administered by the Deepwater Group. The measures include the closure to target hoki fishing of four areas known to contain significant proportions of juvenile hoki. These areas, the Hoki Management Areas (HMAs), are still accessible to trawlers targeting other species such as scampi, ling, silver warehou and squid. See figure 1 above for location of HMAs.

3.3 *Hoki TACC Changes*

Between 2000-01 and 2008-09, substantial reductions in the hoki TACC meant that the TACC was reduced from 250,000 t to 90,000 t. These reductions were largely attributed to environmental factors. In 2009-10 the TACC was raised by 20,000 t to 110,000 t, and then by a further 10,000 t in 2010-11 to 120,000 t. For the 2011-12 fishing year, the Total Allowable Commercial Catch (TACC) for hoki was again increased by 10,000 t, from 120,000 to 130,000 t.

3.4 *Stock Assessment – Allowance for Illegal Catch*

The 2006 stock assessment stated that there may be some dumping of small fish, but the level was unknown. In 2005 *"A length based analysis of highgrading in the NZ WCSI hoki fishery"* (unpublished report)[3], provided a reliable estimate of the level of discarding, but was never incorporated in later hoki stock assessments. The 2011 stock assessment simply states that "no information is available about illegal catch". It was noted that under "other sources of fishing mortality" there may have been some discarding of small fish due to the prevalence of small hoki on the west coast of the South Island in recent years.

The TAC has a built-in allowance for "other sources of fishing mortality", which may include unreported burst bags, loss of catch, discarding of small fish and mortality of escapees from the net. In 2010-11 this allowance was set at 1,200 t[4].

3.5 *The Hoki Fleet*

The WCSI hoki fleet is made up of foreign chartered limited processing factory vessels (LPFVs[5]) and New Zealand factory fillet vessels[6] (producing fillet products) which are > 46m in overall length. These vessels are prohibited from fishing inside the 12 mile Territorial Sea

[2] Plenary Report 2011
[3] s 9(2)(a)
[4] Plenary Report 2011
[5] LPFVs are restricted to the following primary processing activities: washing, scaling, gutting; deheading, tubing and tailing; chilling and freezing; storage, packing and transport.
[6] Fillet vessels are required to have a Regulatory Management Plan for processing at sea.

as well as a 25 mile restricted fishing zone that closes much of the hoki spawning area in the Hokitika Canyon and most of the area south to the Cook Canyon to all vessels > 46 m in overall length. The primary reason for the 25 mile restricted fishing zone was to protect hoki spawning aggregations in the head of the Hokitika Canyon.

In recent years there has been an increase in the number of 'fresher' vessels (< 46 m in total length) operating in the WCSI hoki fishery and landing catches for onshore processing. These vessels generally operate within the 25 mile restricted fishing zone.

3.6 Marine Stewardship Council (MSC) Certification

In March 2001, the hoki fishery became the world's first large whitefish stock to achieve Marine Stewardship Council (MSC) certification. This eco-label gives endorsement that New Zealand hoki meets the MSC's guiding principles and criteria for a healthy, well managed sustainable fishery. The fishery was reassessed and recertified in 2006, and is currently undergoing a third assessment before the current certificate expires in November 2012.

3.7 Hoki Management Areas (HMAs)

In 2001 an industry "Code of Practice" (COP) was implemented for hoki target trawling with the aim of protecting small hoki less than 60 cm. The main components of this COP were:

1. A restriction on fishing in waters shallower than 450 m;
2. A rule requiring vessels to 'move on' if there are more than 10% small hoki in the catch;
3. Seasonal and area closures in spawning fisheries.

In 2009, the Deep-Water Group significantly revised the COP. By then the Group represented 95% of quota owners. The COP is intended to manage and monitor fishing effort within the four HMAs, which contain high abundances of juvenile hoki.

The HMAs are: the Narrows Basin of Cook Strait, Canterbury Banks, Mernoo Bank, and Puysegur Bank. These HMAs are closed to hoki target trawling by vessels greater than 28m. There is increased monitoring when targeting species other than hoki, but the HMA are still accessible to trawlers targeting other species such as scampi, ling, silver warehou and squid, but there is also a general recommendation that vessels move from areas where catches of juvenile hoki (now defined as less than 55 cm total length) comprise more than 20% of the hoki catch by number.

There is currently no industry code of practice in place regarding the catching of juvenile hoki in the Hokitika Canyon spawning ground (WCSI fishery).

3.8 Bird Mitigation Devices and Vessel Management Plans (VMPs)

Seabirds are killed or injured by trawl gear because they are either struck by the trawl warps (particularly larger seabirds such as albatross) or caught in the net when it is on the surface during deployment and retrieval (particularly smaller seabirds such as shearwaters and petrels). Regulations gazetted in 2005 require trawl vessels to deploy bird mitigation devices, such as tori lines, to scare the birds away from the danger zone around the stern of the vessel.

In addition to the mandatory requirement to deploy bird mitigation devices, all trawlers over 28 metres in length are required to have and comply with a Vessel Management Plan (VMP).

VMPs specify the measures that must be followed onboard the vessel to reduce the risk of incidental seabird captures. These measures include storing offal while shooting and hauling fishing gear, and making sure all fish is removed from the net before it is put back in the water. Vessels capable of producing fishmeal are better able to control offal, as they are able to process most offal into fishmeal. LPFVs, with no meal plant, may have several tonnes of offal and fish waste per day to manage and discard (Albert Times, 2007). The Ministry monitors vessels' performance against their VMPs. If a vessel is not complying with its VMP the Chief Executive of MPI has the option of imposing vessel-specific regulations to control offal management practices.

4. Fisheries Profiling

Monitoring and auditing the behaviour of vessels processing at sea is challenging in the absence of direct surveillance. Inferring behaviour from data analysis is often the only option. Profiling of deep-water fisheries can be undertaken using a number of analytical methods, ranging from comparing relatively simple indices derived from the data to sophisticated statistical modelling. These methods have provided indicators of behaviours such as illegal discarding of small and/or damaged fish and non-target or "bycatch" species.

Data from observed fishing trips has been a vital component of this profiling. There is substantial evidence, from New Zealand and elsewhere, that vessels with government observers aboard tend to report accurately, while those without frequently do not. Observed trip catch data thus provides a standard against which reported catch from unobserved trips can be assessed.

Past hoki fishery profiling has concentrated on the West Coast South Island (WCSI) hoki spawn fishery, as described in the example below. The Chatham Rise hoki fishery is more complex with respect to the topography of the fishing grounds, the composition and distribution of bycatch and the spatial behaviour of fishing vessels.

4.1 Profiling example "Operation Maxi"

The 2011 hoki risk profile drew on the operational design and findings of a Fisheries Compliance-directed operation that targeted the 2005 WCSI hoki spawn. This operation was code named "Operation Maxi." The main objectives of Operation Maxi were to quantify the amount of small and/or damaged hoki being caught and establish whether vessel operators were illegally highgrading and discarding their unwanted fish.

Not all fish caught by a fishing vessel have the same economic value. Fishers may be tempted to discard the least valuable part of their catch in order to maximise their profit. Rochet *et al* (2005) estimated that world fisheries discard almost a third of their total catch.

Highgrading is the action of sorting the catch of a marketable species of fish by some attribute (usually length or weight) and discarding the unwanted or less profitable fish. Doing so increases the economic value of the catch (Anderson, 1994).

In 2004 MPI observers reported unusually high volumes of small hoki being caught, less than 55 cm in length. As these fish could not be processed they were discarded under the authority of the observer. As a result a number of un-observed vessels were investigated in 2004 (Operation Mini) and this led to an extensive profiling operation of the WCSI hoki fishery in

2005 code named “Operation Maxi”. Operation Maxi’s initial hypothesis was that unobserved vessels fishing the WCSI were highgrading hoki. Unobserved vessels were likely to discard smaller fish and unprocessable damaged hoki due to their low or nil economic value.

1, 2 and 3 year old hoki are most at risk of highgrading. Removing these fish from the population could have implications on future recruitment and, ultimately, the health and sustainability of the fishery.

The Operation Maxi enquiry established that the unwanted hoki that were accurately reported in fishing returns were treated in one or more of the following three ways:

1) Packed green and reported accurately.
2) Mealed and/or minced and reported accurately.
3) Discarded under authority (if MPI observer or Fishery Officer onboard) and reported accurately.

Operation Maxi was conducted to determine the amount of hoki that went unreported as a consequence of highgrading.

Despite reductions in the TACC at the time Operation Maxi took place, the enquiry found evidence of vessels highgrading hoki. The estimated amount of small hoki (<55 cm total length) illegally discarded during the 2005 WCSI hoki fishery was between 596 and 1806 tonnes. The estimated range reflects the difference between estimates based on vessels’ processing specifications and estimates based on Fishery Officer landing observations. These tonnages equate to between 1.8% and 5.6% of the hoki catch taken by factory vessels >46 m operating in this fishery.

5. The WCSI & ECSI Hoki Risk Profile

The Operational Coordination team were tasked to deliver a risk profile on the West Coast South Island (WCSI) and East Coast South Island (ECSI) hoki fisheries. The profile is intended to provide fisheries management with an assessment of identified compliance risks, as they pertain to each area.

5.1 Part I – WCSI hoki fishery

To achieve this part of the profile an operation, code named “Operation Bronto”, was coordinated to gather, examine and analyse data pertaining to the WCSI hoki fishery. The operation involved deep-water vessels ≥ 46 m fishing beyond the 25 nm restricted zone and operating on the west coast hoki winter spawn from July to September 2011. Fishing activity predominantly occurred within statistical areas 034 and 035 during this time and is plotted in figure 2 below. Each black dot represents automatic location communicator (ALC) positions and therefore area fished. For the purposes of this profile vessels <46 m were excluded[7].

For this risk profile the collection and analysis of data relating to bycatch species was limited to Ling, Hake, Jack mackerel, Silver warehou, White warehou, Warehou, Frost fish and

[7] These vessels were excluded as they are predominantly ‘fresher’ vessels that operate within the 25 nm restriction zone and the 12 nm Territorial Sea. Because “Fresher’ vessels land hoki in a whole state little is known about the hoki length distribution, in the absence of onshore sampling of landings.

Lookdown dory. This is because these species are either listed as tier 1 species or are bycatch stocks managed in conjunction with hoki.

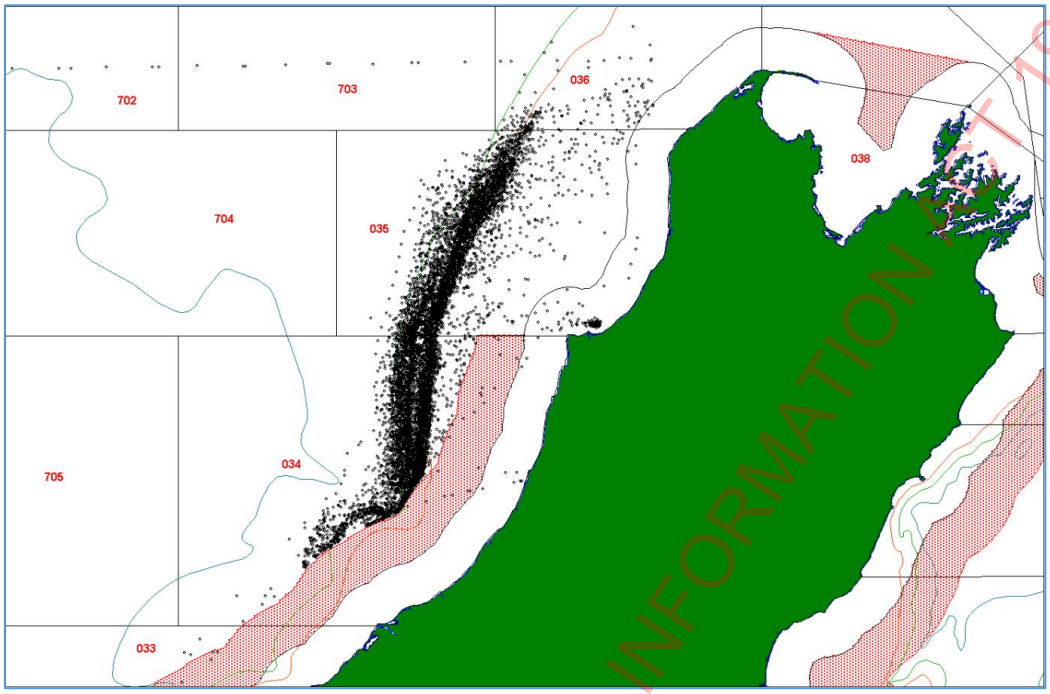


Figure 2 - Chart illustrating fishing activity during the 2010-11 WCSI hoki winter spawn.

Operation Bronto contained three phases as follows:

5.1 (a) Phase I – In-port inspections

Fisheries Officers responsible for conducting in-port inspections for this phase were tasked to gather information specific to vessels operating in the WCSI hoki fishery. Key taskings were as follows:

- Obtain copies of vessel processing specifications for hoki and bycatch species[8] processed by state and grade;
- Establish what hoki 'green block' contained (small and/or damaged hoki);
- Complete detailed reports on nets including obtaining net plans and taking measurements of cod-end meshes;
- Obtain copies of vessel unload manifests for the trip recording hoki and bycatch species[3] by state, grade, number of units and weight;
- Establish destination of hoki and bycatch product including (where applicable) shipping details for any exports, particularly where cartons are loaded straight into containers for export;
- Conduct carton checks of a random sample of hoki and bycatch species from each state and grade to determine number of fish (where applicable) per block and size differential (particularly important for smallest grade produced);
- Where possible establish minimum processing sizes for hoki and bycatch species and determine destination of unwanted hoki and bycatch species, i.e. green block, meal etc;
- Establish whether or not an industry observer was onboard for the trip being inspected.

[8] Bycatch species limited to LIN, HAK, JMA, SWA, WWA, WAR, FRO and LDO.

5.1 (b) Phase II – At-sea inspections

The at-sea phase was code named “Operation Apate”. Four teams of Fishery Officers were deployed from RNZN inshore patrol vessels HMNZS Pukaki and HMNZS Taupo to facilitate comprehensive at-sea boarding inspections of vessels operating in the WCSI hoki fishery. The patrols coincided with peak activity in the fishery.

The main purpose of this phase was to identify areas of risk associated with the vessel’s fishing operations and at the same time create a deterrent effect by having a compliance presence during the peak fishing activity in the WCSI hoki fishery. The boardings by Fishery Officers and Navy personnel provided opportunities to observe real-time fishing and factory operations.

Fishery officers deployed for this phase were briefed and tasked to obtain the following information, where possible:

- Fishing gear used (including mesh size);
- Factory setup and processing capability as related to hoki and bycatch species[9];
- Processing specifications for all states and grades associated with hoki and bycatch species;
- The status of discard chutes and macerators immediately on boarding;
- The results of examining hoki and bycatch product including green blocks (on those vessels without meal plants);
- Minimum processing sizes for hoki and bycatch species and determine destination of unwanted hoki and bycatch species, i.e. green block, meal etc;
- Measurements of cod-end meshes;
- Processed block test weights
- Glaze weight data.

The information obtained during this phase only captures a brief period of time in each vessel’s operation, but examining the vessel operating at sea provided:

- A better understanding of each vessel’s fishing and processing practices; and

- Information that complemented and corroborated information gathered during the other two operational phases, and that assisted with identifying areas of risk.

5.1 (c) Phase III – MPI observer coverage

MPI observers were tasked with collecting information in addition to their normal duties. This helped the Operational Coordination team gain a comprehensive understanding of fishing and at-sea processing operations. The key tasks requested of observers specific to this phase were:

- Obtain vessel processing and grading specifications for hoki and bycatch species[10] processed by state and grade;
- Provide detailed information about the processing, freezing and factory records (non statutory source documents) pertaining to the operation of the vessel;

[9] Bycatch species limited to LIN, HAK, JMA, SWA, WWA, WAR, FRO and LDO
[10] Bycatch species limited to LIN, HAK, JMA, SWA, WWA, WAR, FRO and LDO

- Quantify authorised hoki discard by size (hoki deemed unsuitable for processing due to small size) and damage (to include hoki that would otherwise have been processed);
- Collect information about the manufacturing of meal;
- Describe weighing and glaze application used on the vessel;
- Describe fishing effort and strategy deployed by senior crew;
- Provide detailed reports on nets including obtaining net plans and obtaining measurements of cod-end mesh; and
- Obtain copies of vessel unload manifests (for entire trip) which record all hoki by state, grade, number of units and weight.

5.2 Part II – ECSI hoki fishery

The hoki risk profile also included deep-water vessels operating on the ECSI hoki fishery. The East Coast Hoki Profile is covered in Part II of this report. The Cook Strait hoki fishery was not considered in the profile. Vessels operating in this fishery are < 46m and are predominantly small inshore 'fresher' vessels which land whole hoki.

The area studied in the ECSI profile is the Chatham Rise, comprising parts of Fisheries Management Areas SOE and SEC; and including statistical areas 020, 021,022,023, 401,402, 403, 407, 408, 409 and 410. The hoki catch in statistical area 404 during the 2010-11 fishing year was relatively small, and in areas 405 and 406 was less than 1 tonne. Figure 3 on the next page shows fishing activity in the areas where the majority of effort occurred during the 2010- 2011 fishing year. Each black dot represents a reported trawl.

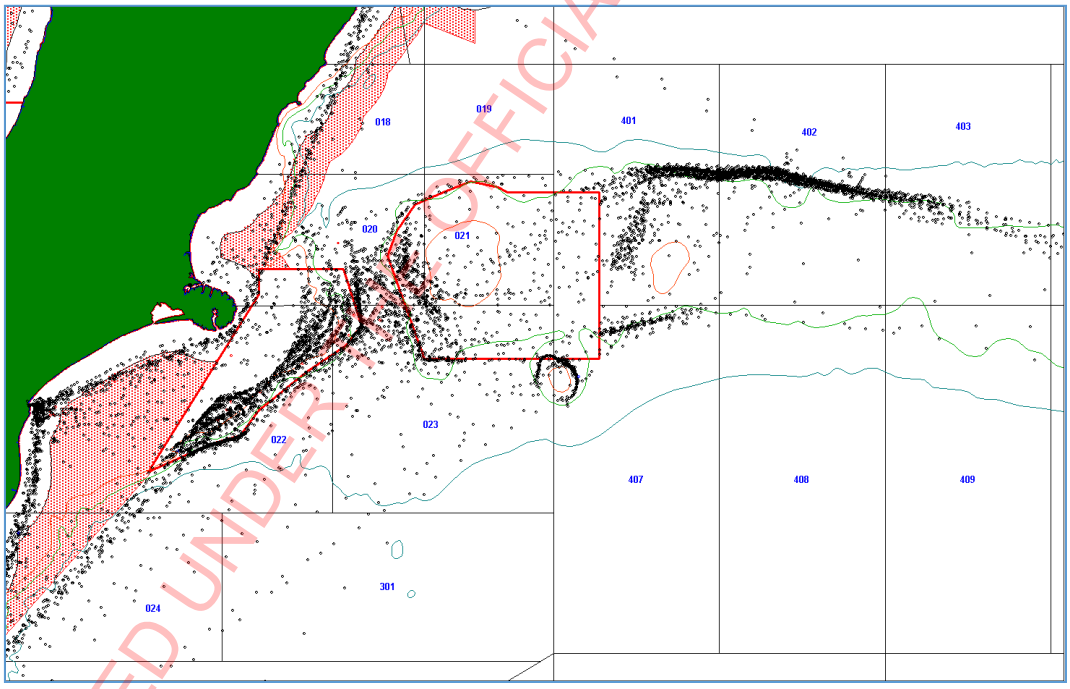


Figure 3 - Chart illustrating fishing activity during the 2010-11 fishing year by vessels fishing the ECSI hoki fishery

Data was obtained for the following:

1. Observer hoki length-frequency data, for the relevant areas, for the period 1986 to the 2010-11 fishing year.

2. Company hoki processing & grading specifications for those vessels operating in the ECSI hoki fishery. These specify processed piece weight thresholds between the

grades and were used to establish hoki length for each grade. This was limited to Korean LPFVs as no data was gathered for Ukraine or New Zealand flagged vessels.

6. PART I – WCSI Hoki Profile

6.1 *General Information*

During the period July to September 2011 approximately 38,442 t was reported as taken outside of the 25 mile restricted fishing zone by large factory processing trawlers capable of staying at sea for extended periods of time.

During the 2011 winter spawning season 23 factory trawlers fished hoki outside the 25 mile restricted fishing zone. The area they fished was approximately 130 nm long by 15 nm wide, typically fishing occurring between the 200 m and 500 m depth contours.

Seventeen of the factory trawlers, 74% of the large factory vessels operating in this fishery, were foreign owned and crewed. All 17 foreign owned vessels were chartered to New Zealand companies. The remaining six vessels were New Zealand owned and operated. All 23 vessels identified also operated in the WCSI hoki fishery during the 2010 winter spawning season. Table 2 on the next page lists the number of vessels by flag state.

Vessel's Nationality	Number of Vessels
Korea	11
Ukraine	6
New Zealand	6
Total	**23**

Table 2 - Summary of foreign charter and NZ vessels operating in the WCSI hoki fishery

The majority of captains commented that the 2010-11 hoki season was good, with good sized hoki and was comparable to the previous season. Bycatch quantities were considered normal, about the same as the previous fishing year and were mostly of good size. For a complete list of comments made by fishing vessel captains operating in the WCSI hoki fishery, see Appendix 1.

6.2 *Vessel Inspection Phases*

6.2 (a) In-Port Phase

In this phase of the operation Fishery Officers completed 43 comprehensive in-port inspections of vessels that had fished on the WCSI. Inspections occurred at the ports of Nelson, Lyttelton, Timaru, Dunedin and Bluff. The vessels inspected ranged in overall length from 52 m to 105 m. During the in-port inspections Fishery Officers examined and weighed approximately 32.5 t of hoki and 48 t of bycatch species.

Towards the end of the season (September) officers obtained documents from vessels relating to eight additional landings, but no further in-port vessel inspections were completed, as previous inspections had gathered the information required to complete the risk profile. Fisheries officers made carton weight checks during two of these eight additional landings.

6.2 (b) At-Sea Phase

Operation Apate, the RNZN/MPI at-sea phase utilising the HMNZS *Pukaki* and HMNZS *Taupo*, carried out 20 comprehensive inspections on 19 different vessels. One vessel was inspected twice. Fisheries officers made 11 of these inspections between the 18th and 29th July, and nine inspections between the 13h and 23rd August 2011. During the at-sea inspections Fishery Officers examined and weighed about 3 t of hoki and 1 t of bycatch.
All vessels inspected during in-port and at-sea phases had a current fishing permit, certificate of registration and ALC certificate on board. New Zealand and foreign charter vessels all had a current vessel manager and/or a charter representative responsible for the fishing operations of the vessel. In some instances the vessel manager and the charter representative were the same person.

6.2 (c) Observer Phase

Six trips that fished exclusively WCSI hoki carried MPI observers. One of these trips was only observed for one week due to the observer falling ill and requiring evacuation from the vessel. An additional five trips carrying MPI observers spent part of the trip fishing WCSI hoki. Other areas fished on these trips were FMA3, FMA4 and FMA6 (SBW).

Of the 43 inspected vessel trips, 11 trips carried MPI observers, providing 26% coverage of the vessels operating in the fishery.

Industry observers were on board vessels during 12 other trips. Industry observers have a different role to MPI observers. Past enquiries have demonstrated that the presence of Industry observers aboard a vessel does not act as a deterrent to illegal practices, such as highgrading.

6.3 *Trawling Statistics*

Table 3 below shows the number of tows and type of fishing gear deployed by the deep-water vessels operating in the WCSI hoki fishery during the 2010-11 spawning season.

	BT		MW		
	Number of tows (%)	Seabed depth range (m)	Number of tows (%)	Seabed depth range (m)	Average distance off seabed (m)
Korea	941 85%	122-755	168 15%	166-579	1
Ukraine			857 100%	148-785	12
New Zealand	680 73%	211-731	249 27%	304-780	75

Table 3 - Summary of TCEPR data illustrating number of tows and fishing depth by method and nationality

The data show that both Korean and New Zealand vessels primarily used bottom trawl (BT) gear whilst the Ukrainian vessels only used mid-water (MW) gear. When using MW gear, Korean vessels fished on or near the seabed floor, in contrast to the practice of both the Ukrainian and New Zealand vessels.

Table 4 below shows the number of tows conducted, the target species and the gear used (BT or MW) by nationality.

BT	MW

	Target Species			Target Species		
	HOK	Tier 1	Other ITQ	HOK	Tier 1	Other ITQ
Korea	238	612	91	159	5	4
Ukraine				753	104	
New Zealand	671	8	1	249		

Table 4 - Summary of TCEPR data illustrating number of tows by target species, method and nationality

Typically the Korean vessels reported targeting hake (Tier 1 species) more than hoki, in contrast to New Zealand domestic and Ukrainian vessels which principally targeted hoki.

Korean vessels targeted hake day and night from Hokitika Canyon to north of Cape Foulwind. They targeted hoki using both BT and MW trawls, primarily during daytime on the northern contours but not in the Hokitika Canyon. Regardless of gear used, they still fished on or near the seabed.

As discussed above, Ukrainian vessels used MW trawls exclusively not only on the northern contours but also in the Hokitika Canyon area where they primarily fished. Hoki was the main target species in both areas, for both day and night tows. Day tows were slightly more frequent. Jack mackerel (Tier 1 species) was predominantly targeted on northern contours at night.

The New Zealand deep-water fillet vessels used BT gear predominantly on the northern contours. They trawled mostly during the day, but sometimes at night. MW gear was sometimes used on both the northern contour and in the Hokitika Canyon area during day and night tows.

6.4 *Destination of Landed Fish*

According to the data collected, all landed fish product was either:

- Transported to onshore cold storage facilities either owned or part-owned by the permit holder/licensed fish receiver; or
- Landed to an independent cold storage facility.

No frozen product was loaded directly into refrigerated containers on the wharf by vessels who were registered as 'mobile LFRs' as had been the case in previous years. At present only one permit holder has their vessels registered as mobile LFRs.

Vessels that operate as mobile LFRs are a compliance risk, as product is loaded directly from the vessel into refrigerated containers on the wharf and shipped overseas, sometimes within days of landing. This type of operation restricts MPI's ability to conduct carton content and weight checks to ensure that product is consistent with carton labelling and therefore state definition and that greenweight is accurately reported. Although this was not an issue this hoki season, because no product was landed directly into containers, it may present as an issue in future years.

6.5 *Reporting Issues*

The following section addresses issues identified during both in-port and at-sea vessel inspections. The issues covered relate to the following:

- Reporting of effort data and processing data in the TCEPR;

- Timeliness of data entry in the CEEDT system onboard vessels; and
- The reporting of burst bags and use of destination type code "A".

6.5 (a) TCEPR estimated catch

Section 2 (10 & 11) of the Explanatory Notes to the TCEPR describe how the section *estimated catch by species in order of quantity* should be completed. As there is no requirement in the explanatory notes about when this information should be entered into the TCEPR (e.g. "as soon as practicable once the trawl net has been landed on the vessel"), Fishery Officers asked captains when this section of the TCEPR was completed and by whom.

When and how the captains completed the estimated catch section of the TCEPR generally fell into five categories:

a) Effort information is completed tow by tow. Estimated catch is determined by eyeball estimate of quantity while the cod-end is on the trawl deck. Species composition is best determined by looking at the catch in the pounds as it is easier to determine species mix times the quantity.

b) Completed at midnight based on completed tows, printed on a sheet with other material, entered directly into the TCEPR. Separate hard cover book used to capture each tow, position, depth, time, type, species and comments.

c) At the beginning and end of each tow. The information also goes into a ship's diary which is kept near the chart table.

d) Kept in ship's log and on the chart table and has the position, depth etc recorded. Estimated catch is obtained from the fish master and factory manager. The captain fills it in throughout the day depending on what he is doing – same as paper forms – shot by shot. Figures are brought up by the factory manager approximately 2½ hrs after the nets come onboard.

e) Each day on a tow by tow basis from factory processing figures and not estimates.

Fishery Officers who had inspected vessels suggested that there should be a requirement that accurate catch estimations be made by the captain and senior crew (e.g. from beckets when the net is on board and/or fish pound volumes) and entered into the TCEPR form prior to processing commencing.

This would have the effect of 'locking in' the quantity of the main top 5 species from each trawl shot, and the total estimated catch (quantity) for that tow. If this practice was put in place it would help to restrict a vessel's ability to illegally discard quota species (e.g. if hoki is small, damaged or spoiled through excessive time delay before processing).

Fishery Officers observed that the introduction of Catch Effort Data Return Information Capture (CEDRIC) may (in theory) provide less opportunity for vessels to dump fish but only in circumstances where the estimated catch data is entered prior to processing.

If a decision is made aboard a vessel to delay the entering of the tow by tow estimated catch data until the fish has been processed, that vessel retains the option to "back-capture" that data to ensure it agrees with the processing data.

Analysis of catch effort electronic data transfer (CEEDT) data has highlighted a number of issues relating to timeliness of data entry. As described below (section on "Analysis of CEEDT"), analysis of a sample of CEEDT data indicates those data are batch processed,

sometimes up to several days after the event. Without regulatory change, this practice is likely to continue. It gives vessels the opportunity to provide false information. The EDT system provides no more confidence in the reported data than the current paper-based TCEPR system.

In summary, Fishery Officers' concerns were that without a vessel committing itself to the actual catch quantity and species, large volumes of fish can potentially be illegally discarded and go unreported. Currently most vessels are back-capturing (retrospectively completing) the 'estimated catch' from the daily processing summary data, which may not accurately reflect the original catch quantity and species composition. Amending the TCEPR explanatory notes to cover this point is a necessary first step towards the timely completion of returns.

A member of the Operational Coordination team raised this issue at the Deep-Water Group meeting on 14 December 2011. It is an issue that requires further work.

6.5 (b) TCEPR daily processing summary

Section 3(1) of the Explanatory Notes to the TCEPR describes how the daily processing summary should be completed and instructs permit holders to "Fill out this section for the fish taken on the day written at the top of the form, whether or not it was processed on that day".

To check if this requirement was being complied with, Fishery Officers asked captains what 24 hour period was used in the TCEPR daily processing summary and when the forms were actually completed.

There were differences in when and how the captains completed the daily processing summary, and they generally fell into the following three main categories:

a) When all processing from the tows commenced on that day had been completed. Some of that fish may have actually been processed on the next day. This procedure is mainly used by the Korean flagged vessels. This is consistent with the reporting requirements, as detailed in the explanatory notes.

b) The factory manager gives the captain the processing information for the day's fishing at 2000 hrs. The captain completes the daily processing summary at this time. This often coincides with a crew shift. The processing information includes fish processed over the preceding 24 hours, but does not necessarily include all the fish caught on that day. Any fish from that day not already processed are reported on the next day's processing summary. This procedure is mainly used by the Ukrainian flagged vessels. This does not comply with the reporting requirements as detailed in the explanatory notes.

c) The captain completes the daily processing summary at the end of day (around midnight.) The factory manager provides processing information at the end of the midnight shift. The processing information includes fish processed over the preceding 24 hours, but does not necessarily include all the fish caught on that day. Any fish from that day not already processed are reported on the next day's processing summary. This procedure is mainly used by the New Zealand flagged vessels. This does not comply with the reporting requirements as detailed in the explanatory notes.

It is clear that a number of vessels, in particular New Zealand and Ukrainian vessels, are not completing the daily processing summary of the TCEPRs in accordance with the explanatory notes, which require that the processing information must be for the tows commenced on one day and include any processing completed on subsequent days for the day on which the tow commenced.

Fishery Officers commented that trying to reconcile the catch against the processing summary when the TCEPRs were not completed correctly made their job difficult. One Fishery Officer stated "the daily processing summaries on the TCEPR are not being completed on the page coinciding with the day that fishing occurred, but rather on the following day, so that multiple days processing are on the same page and are indistinguishable from one another.

The Operational Coordination team raised this issue at the Deep-Water Group meeting on 14 December 2011. It is an issue that requires further work.

6.5 (c) Analysis of Catch Effort Electronic Data Transfer Returns (CEEDT)

A limited analysis of the CEEDT data obtained from the at-sea boarding phase was conducted.

It is apparent from a small sample of the CEEDT returns reviewed that the majority of the CEEDT return content is not being completed on the day that the fishing activity took place. In some cases there was a delay of several days before the data was entered into the CEDRIC system.

As an example, the data for the s 9(2)(a) was reviewed for the period of 3 and 4 July 2011. (Refer to the spreadsheet titled 'Analysis of Dates and Times in CE EDT Returns' in the full report attached as Appendix 2.)

Although the returns appear to have been created on the actual days to which they related to, the majority of the actual fishing related data was not entered into each return until 7 July 2011 (for both days' fishing activity), some three or four days after the actual fishing activity took place.

In addition, the data for the return dated 3 July 2011 was date and time-stamped two minutes before the data for the return dated 4 July 2011. It appears the practice on the vessels is to complete the returns in batches when time permits, which could be some days later.

The effort and processing data in those two sample TCEPR audit history files, generally exhibit the same date and time for each field where data has been entered. Clearly the data was not entered at the same time, as the time is recorded down to thousandths of a second, and is exactly the same. Due to the volume of data that was entered, it could not have been entered at exactly the same time, and that highlights an issue with the way in which the CEDRIC system is time stamping the data.

It appears that the audit history dates and times are only being applied to the entered data when the return is saved, and not when the data is actually being entered, hence all fields having exactly the same time stamp.

The issue of writing the data out to the CEDRIC database when it is actually entered and date/time stamping it at that point as well was one of the sticking points during the development phase. Compliance agreed to the postponement of that requirement for a defined period of time so that the CEEDT project could proceed, but that requirement was not to be dropped altogether, merely postponed.

Page 10 of the CEEDT Compliance Extract Guide produced by FishServe for MPI states:

"Note, you cannot assume that the date/time values will be correct, and therefore you cannot use 'date/time performed' to order audit records."

For compliance auditing purposes it is imperative that accurate time stamps are recorded against the entered data so as to enable analysis of the timeliness of the entered data to be undertaken as delaying data entry provides opportunity to falsify the reported catch. As this was a requirement of the CEEDT specifications, this issue needs to be referred back to FishServe to address.

Other EDT issues identified during the course of inspections included the following:

1) Inspection onboard the s 9(2)(a) (1/9/11) – EDT had crashed a number of times during the voyage and no paper backups (i.e. TCEPRs) were kept on the vessel.

2) Inspection onboard the s 9(2)(a) (23/8/11) – the laptop had been removed by the s 9(2)(b)(ii) vessel manager prior to inspection and therefore Fishery Officers could not access and copy CEEDT data in respect of the trip just completed. It was noted that the vessel was trialling CEDRIC at the time. Since it is absolutely essential that Fishery Officers have access to the electronic data at time of inspection, the practice of removing such equipment should not occur as it will compromise the integrity of the inspection and the administration of the Fishery Officer's duties.

The issues identified above in relation to CEEDT need to be addressed by the Deepwater Group.

6.5 (d) Method for Determining Greenweight from Accidental Loss (e.g. burst bags)

During vessel inspections Fishery Officers asked about the methods in place for determining and recording any lost fish as a result of a burst bag on hauling. Some of the captains' responses were as follows:

- One captain provided an example of a tow where 200 kg of hoki was lost and recorded in the TCEPR, using a best visual estimation method.
- Another captain advised his vessel has sensors on the cod-end which go off when the bag is over-weight. On the day of the inspection however the sensor had a flat battery and was not operational. The captain claimed to never have had a split bag as the nets were very well maintained.
- s 9(2)(a) uses a best guess method. It is easier to estimate if the bag is close to the vessel. During the trip they lost about 22 t of hoki. This was recorded in the wheelhouse log and in the TCEPR under the correct code, ACC, for later entry into the CLR.
- Another vessel's crew made estimates based on their experience and recorded the estimates in their own book. During the trip they lost 10 t of hoki which they recorded as 'A' in their record book and 'A' in the CLR.
- "Done by eye."
- For any fish lost, a record is kept in the logbook of the master. A white hard covered book lives on the bridge or in the radio room. They lost 1 t on 19/7/11 which was confirmed in the computer.
- Visual estimation of loss method was used and reported in the TCEPR as ACC.
- Losses would be worked out by becket, e.g. 2 t a becket.

- The skipper makes an eye estimate of the amount of fish lost. The skipper feels he over-estimates the amount of fish lost.

A review of CLR data where the destination type code 'A' was reported shows there were a total of 13 instances where this code was used.

Destination type code 'A' relates to fish or fish product of the species or classes of fish subject to the quota management system established under Part 4 of the Fisheries Act 1996 that are returned to, or abandoned in, or accidentally lost at sea.

Table 5 below provides a summary of this data.

Vessel	MPI observer onboard	Landing date	HOK	Key Bycatch	Other QMS	Non-ITQ	Total reported as 'A'
s 9(2)(a)	No	25/6/11				1,368	1,368
s 9(2)(a)	Yes	30/7/11	200		31		231
s 9(2)(a)	Yes	12/9/11	3,542				3,542
s 9(2)(a)	Yes	8/9/11	13,123	51	297		13,471
s 9(2)(a)	Yes	24/8/11	3,742	70	573		4,385
s 9(2)(a)	No	31/7/11		1,000	3,000		4,000
	No	25/8/11			400		400
s 9(2)(a)	Yes	18/8/11	11,270				11,270
	Yes	19/9/11	11,075		13,879		24,954
s 9(2)(a)	No	12/8/11	3,000		80		3,080
s 9(2)(a) s 9(2)(a)	No	23/8/11	200		500		700
s 9(2)(a)	No	1/8/11	10,000				10,000
s 9(2)(a)	No	2/8/11	2,200				2,200
Total			**58,352**	**1,121**	**18,760**	**1,368**	**79,601**

Table 5 - Summary of vessels reporting destination type code (DTC) "A" as reported on CLRs

Eleven vessels reported a total of 79,601 kg of fish as 'A' during the WCSI hoki season. This included 58,352 kg of hoki.

All the hoki observers recorded in trip reports as authorised discards was reported on the relevant CLRs.

74%, ie 43 t, of the hoki reported as 'A' on CLRs was from observed trips. 81%, equating to 15 t, of the 'Other QMS' category was reported as 'A' on trips carrying a MPI observer. Most of the hoki reported as 'A' was discards authorised by the observer rather than burst bags. Observers recorded less than 2 t as coming from burst bags. The remaining 26% of hoki reported as 'A' came from trips not carrying MPI observers, and therefore must relate to accidental losses associated with burst bags. This is because:

> *"Hoki is not a stock which may be returned to the sea unless authorised by a Fishery Officer or MAF observer".*

A comparison of TCEPR and CLR data where destination type code (DTC) 'A' was reported, found one instance where hoki reported against 'ACC' in the TCEPR was not fully accounted for on the CLR.

The discrepancy between TCEPR and CLR information concerned the s 9(2)(a) which reported 2,200 kg on CLR s 9(2)(a) against DTC 'A' (refer to figure 4 below) despite reporting 22,000 kgs in the processing summary of TCEPR s 9(2)(a) against the state code 'ACC' (refer to figure 5 on the next page). This means that approximately 20 t of hoki has not been reported on the CLR. Further analysis identified that this had also not been reported on the corresponding MHR. Therefore ACE has not been deducted for this reported accidental loss.

MINISTRY OF FISHERIES

Catch Landing Return

Trip Data s 9(2)(a)

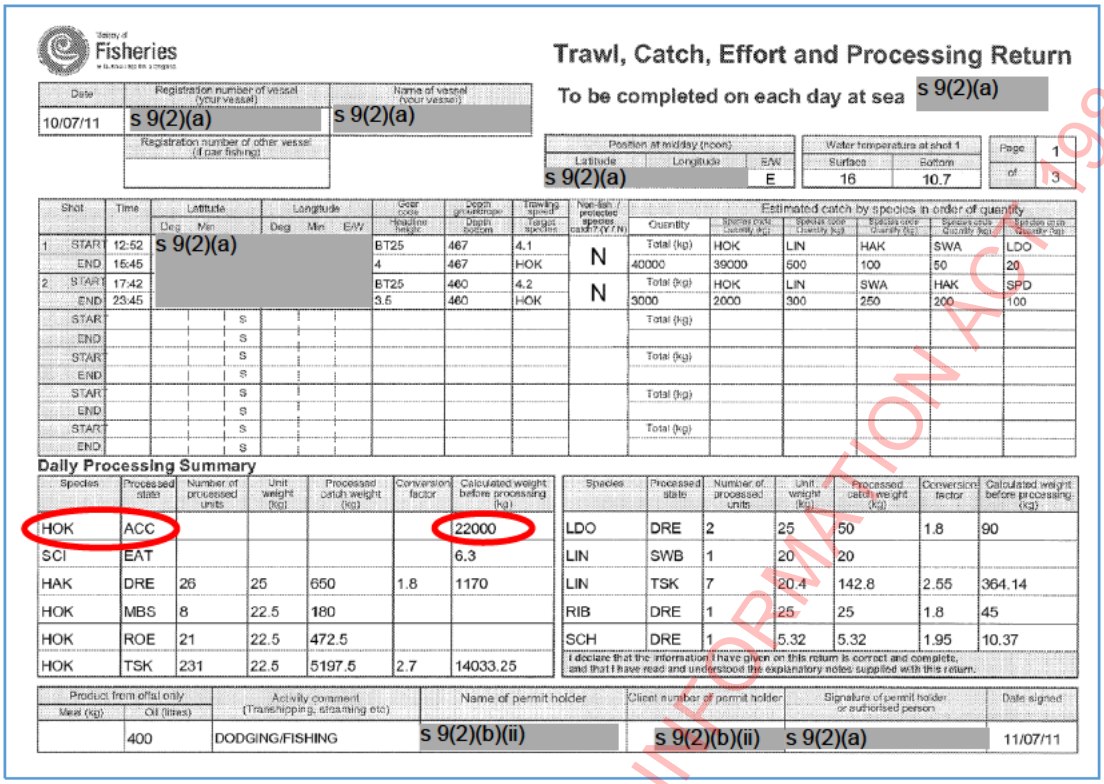
First day of trip	Last day of trip	Landing date	Vessel registration number	Vessel name	Vessel registration number of other vessel (if pair fishing)	Point of landing	Page	3
30/06/11	01/08/11	02/08/11	s 9(2)(a)	s 9(2)(a)		NELSON	of	4

Catch Landing Data

	Fishstock (Species/Area)	Landed state	Containers: Number	Containers: Type	Containers: Content weight	Destination: Type	Destination: LFR no. or vessel reg no.	Greenweight (kilograms)	Purchase tax invoice number from LFR
49	HOK1	ACC	1	CAR	22000	A	s 9(2)(a)	2200	ENT092A
50	[illegible]	DRE	2288	CAR	25	R		[illegible]	ENT092A
51	HOK1	MBS	1208	CAR	22.5	R			ENT092A
52	HOK1	ROE	1268	CAR	22.5	R			ENT092A
53	HOK1	TSK	15738	CAR	22.5	R		724261.5	ENT092A
54	LDO1	DRE	34	CAR	25	R		1530	ENT092A
55	LDO3	DRE	1	CAR	25	R		45	ENT092A
56	LIN3	TSK	4	CAR	20.4	R		208.8	ENT092A
57	LIN7	SWB	15	CAR	20	R			ENT092A
58	LIN7	TSK	682	CAR	20.4	R		35477.64	ENT092A
59	POS1	FIW	1	CAR	8.1	R		230.4	ENT092A
60	RBM1	DRE	28	CAR	25	R		1260	ENT092A
61	RIB7	DRE	7	CAR	25	R		315	ENT092A
62	SCH7	DRE	1	CAR	165.6	R		312.6	ENT092A
63	SKI7	DRE	6	CAR	25	R		232.5	ENT092A
64	SPE7	GRE	11	CAR	25	R		275	ENT092A
65	SQU1T	GRE	65	CAR	22.5	R		1462.5	ENT092A
66	SSK7	WRS	10	CAR	25	R		662.5	ENT092A
67	STA7	DVC	8	CAR	25	R		430	ENT092A
68	SWA1	DRE	774	CAR	21	R		26819.1	ENT092A
69	SWA1	ROE	1	CAR	22.5	R			ENT092A
70	HOK1	GRE	1	BAG	121.99	E		121.99	ENT092A
71	SCI7	GRE	1	BAG	50.87	E		50.87	ENT092A
72	WWA7	GRE	1	BAG	100.76	E		100.76	ENT092A

Start a new sheet for each landing. It is an offence to fail to complete this return or supply false information or make any material omission.	Permit holder's name	Permit holder's client number	Signature of master	Date signed
	s 9(2)(b)(ii)	8422125	s 9(2)(a)	02/08/11

Figure 4 - CLR s 9(2)(a)



Ministry of Fisheries

Trawl, Catch, Effort and Processing Return

To be completed on each day at sea s 9(2)(a)

Date	Registration number of vessel (your vessel)	Name of vessel (your vessel)
10/07/11	s 9(2)(a)	s 9(2)(a)

Registration number of other vessel (if pair fishing)

Position at midday (noon)			Water temperature at shot 1		Page	1
Latitude	Longitude	E/W	Surface	Bottom	of	3
s 9(2)(a)		E	16	10.7		

Shot	Time	Latitude	Longitude	Gear code / Headline height	Depth gear/drop / Depth bottom	Trawling speed / Target speed/tow	Non-fish / protected species catch (Y/ N)	Estimated catch by species in order of quantity					
		Deg Min	Deg Min E/W					Quantity	Species code / Quantity (kg)	Species code / Quantity (kg)	Species code / Quantity (kg)	Species code / Quantity (kg)	Species code / Quantity (kg)
1 START	12:52	s 9(2)(a)		BT25	467	4.1	N	Total (kg)	HOK	LIN	HAK	SWA	LDO
END	15:45			4	467	HOK		40000	39000	600	100	50	20
2 START	17:42			BT25	460	4.2	N	Total (kg)	HOK	LIN	SWA	HAK	SPD
END	23:45			3.6	460	HOK		3000	2000	300	250	200	100
START		S						Total (kg)					
END		S											
START		S						Total (kg)					
END		S											
START		S						Total (kg)					
END		S											
START		S						Total (kg)					
END		S											

Daily Processing Summary

Species	Processed state	Number of processed units	Unit weight (kg)	Processed catch weight (kg)	Conversion factor	Calculated weight before processing (kg)
HOK	ACC					22000
SCI	EAT					6.3
HAK	DRE	26	25	650	1.8	1170
HOK	MBS	8	22.5	180		
HOK	ROE	21	22.5	472.5		
HOK	TSK	231	22.5	5197.5	2.7	14033.25

Species	Processed state	Number of processed units	Unit weight (kg)	Processed catch weight (kg)	Conversion factor	Calculated weight before processing (kg)
LDO	DRE	2	25	50	1.8	90
LIN	SWB	1	20	20		
LIN	TSK	7	20.4	142.8	2.55	364.14
RIB	DRE	1	25	25	1.8	45
SCH	DRE	1	5.32	5.32	1.95	10.37

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 offal only		Activity comment (Transhipping, streaming etc)	Name of permit holder	Client number of permit holder	Signature of permit holder or authorised person	Date signed
Meal (kg)	Oil (litres)					
	400	DODGING/FISHING	s 9(2)(b)(ii)	s 9(2)(b)(ii)	s 9(2)(a)	11/07/11

Figure 5 - TCEPR s 9(2)(a)

The misreporting described above highlights the necessity to undertake discrepancy checks between the TCEPR, CLR and MHR to ensure that all fish product and states are accounted for in the QMS.

It is also evident from information gathered by Fishery Officers that there is a compliance risk associated with non-reporting or under-estimation of fish lost from burst bags. Data comparison, using MPI observer data as a benchmark, may identify if there are any issues in this area.

6.6 *Fishing Practices*

6.6 (a) Trawl Nets

All nets inspected by Fishery Officers during Operation Bronto were compliant and met the required 100mm mesh size. A summary of mesh sizes measured by Fishery Officers is provided in table 6 below.

Vessel Nationality	Mesh Size Range (mm)	Average Mesh Size (mm)
Korean	100-106	104.5
NZ	102-112	106.1
Ukraine	100-120	107.1

Table 6 - Summary of trawl net mesh sizes

Korean vessels generally used knotless, diamond mesh made from single yarn. The yarn was usually multi-filament, braided type, although one vessel used mono-filament twisted yarn. Nets on Korean vessels had between 14 and 21 becketts spaced from 1-3m apart.

The majority of domestic vessels used nets with knotless, diamond mesh made from single, multi-filament, yarn which was either twisted or braided. Nets had between 5 and 15 becketts, spaced 1-1.5 m apart. The only exception was the s 9(2)(a) , which used knotted mesh. This type of mesh can increase the amount of damage sustained by the fish in the net.

All Ukrainian vessels used knotless, diamond mesh with multi-filament twisted yarn. The number of becketts was from 15 to 22 and they were spaced at 1-1.2 m intervals.

6.6 (b) Depth and Duration of Tows

Observers note that mid-water trawls cause less damage to fish in the codend than bottom trawls do, mainly due to a difference in species composition. For example, fishing gear trawled hard on the seabed will include species such as spiny dogfish, which is known to cause damage to hoki.

Fishery officers noted that some vessels conducted long tows of 10 to 12 hours twice daily with large catches (up to 40–50 t). Examination of the processing records indicated only a small percentage of the catches were reported as green block, which is how the relevant vessels pack damaged fish or fish too small to process. Long tows cause considerably more damage to hoki than the short tows that characterised other vessels.

Conducting long tows may result in excess damage to hoki, which is a soft fish, and render them unsuitable for processing. Where this occurs hoki may be illegally discarded and/or mealed and go unreported. The practice of conducting long tows is an issue which should be addressed. Possible solutions for this could include a Code of Practice by members of the Deep-Water Group that require vessels to reduce the length of their tows.

6.6 (c) Soaking the Net

A practice known in the industry as 'soaking the net' was used by a number of vessels in the hoki fishery. Once a desired quantity of fish is in the cod-end during a tow, the bag is lifted off the bottom and the speed slowed to around 2 knots so that the hoki which are still alive can swim at a slow speed without getting squashed and are kept cool. This practice is referred to as fish been "kept in the fridge" and has been used in situations where unprocessed fish still remains in the pound. This method is meant to reduce the risk of fish deteriorating due to delayed processing. It is unclear whether hoki are still alive whilst the net is soaking. Observers have commented that the fish are dead when the trawl net is soaking. If this is the case, it is unlikely that damage to hoki would be minimised by this practice as essentially this type of practice is no different to a long tow as noted in 6.6 (b) above.

Instances where captains advised Fishery Officers that they used this practice are detailed in Appendix 3.

The practice of soaking the net may be a compliance issue. It is unclear whether soft fish, such as hoki, will remain in good condition for processing as a result of this practice. Where excess damage results from this practice hoki may be illegally discarded and/or mealed and go unreported. Gathering and analysis of empirical evidence could be undertaken to explore whether this is an issue. If this practice is found to increase spoilage, a possible solution could be to implement a Code of Practice whereby vessels take steps to mitigate the use of this method.

The practice of continuing to trawl and catch fish, when the factory and pounds are full, is questionable. This type of practice can lead to unnecessary dumping, as evidenced by the recent prosecution of the s 9(2)(a)

6.6 (d) On-board Handling of Hoki

Observers have noted that damage varies between vessels, due to differing handling practices with respect to emptying fish into the pounds and subsequent processing. Typically Ukrainian vessels try to minimise further damage to the hoki by using a zipper method which enables them to release a portion of their catch at a time into the pounds. By comparison, as a result of their deck and pound hatch configuration, New Zealand vessels hoist the cod-end and tip the entire contents into the pounds, which observers have identified as causing more damage to hoki. In addition, Ukrainian vessels also minimise the time that fish are in a non-chilled environment, including the use of refrigerated sea water in the pounds. Observers noted that this is not always the case on New Zealand or Korean vessels.

6.6 (e) Discard Chutes

Of the vessels inspected by Fishery Officers at sea, four vessels were using the discard chutes at the time the vessel was boarded. Fisheries officers did not record any instances of QMS species being illegally dumped.

Table 7 on the next page gives a summary of the number and location of discard chutes as recorded in vessel inspections.

Location	1 chute (port side only)	2 chutes (both sides)	Other
Fore		1 vessel	
Aft	2 vessels		
Middle	1 vessel	1 vessel	
Other	7 vessels	2 vessels	1 vessel, holding tank
Total	10 vessels	4 vessels	1 vessel

Table 7 - Summary of position and number of discard chutes

Of vessels inspected, ten had their discharge chutes above the water line and two had them below.

Fishery Officers reported that non-quota species such as SPD and OSD were being discarded, along with offal, heads and tails.

The disposal of whole fish via the discard chute has always been a concern and represents a significant compliance risk. Large volumes of unwanted fish can easily be routed by conveyors to the discard areas and disposed of without being recorded in the vessel's documentation or fishing returns. In addition, discarded fish attract birds, as previously discussed

6.6 (f) Vessel Management Plans and Bird Mitigation devices

There were no apparent instances of breaches of the Bird Mitigation Devices Regulations during at-sea inspections as part of Operation Bronto or by aerial surveillance.

A number of vessels have installed macerators in an attempt to reduce the number of bird capture instances.

6.6 (g) Macerators

Seven of the vessels Fishery Officers inspected at sea had macerators that chopped unwanted fish to small sized pieces before they were discarded via the discard chutes. Macerators were introduced to help mitigate the capture of sea birds.

The seven vessels were fitted with either one or two macerators. The operation of the macerators was described by the captains of different vessels as follows:

- Macerator runs as necessary, obviously more when fully processing. It is very noisy. The vessel crew "batch" all non-quota species as discards apart from SPD, as this species is very hard on the macerator due to its tough skin.
- Macerator operating for all offal and whole fish to return to the sea. Any fish left or put on the conveyor goes to the macerator then overboard.
- The macerator is on the floor with covers, the chopped fish flow into holding ponds full of water and are sucked out of the vessel into the sea. Small fish observed by Fishery Officers, e.g. lantern fish and silver sides.
- All the sharks/frost fish, mostly anything the meal plant will struggle with, go into the macerator.
- All offal goes to the macerator where it is chopped up and from there it is sent to the meal plant. There is a switch that needs to be flicked to send it over the side.
- One captain commented that the 'chute has a macerator and works full time'.

There are compliance issues with all vessels fitted with macerators, particularly vessels without meal plants, as these vessels can discard fish with little risk of detection compared, to vessels with discard chutes only. Once unreported fish has been macerated and discarded it is impossible to reconstruct the catch volume and mix. In past cases, vessels have been observed illegally dumping whole fish and prosecuted. It is practically impossible to determine if discharged macerated material contains illegally discarded fish.

Macerator example "Offal Hogger"

The Andar Offal Hogger (macerator) was developed for the handling of offal and non-quota discards to reduce the level of seabird attraction and warp strikes. All 3 s 9(2)(b)(ii) vessels, operated by s 9(2)(b)(ii), are fitted with these types of "Hogger" mincers. Onboard the vessel, the Hogger mincing equipment takes the offal and fish waste from the processing factory and shreds it. The offal then runs in to the factory sump cutter pump and is them pumped overboard (Albert Times, 2007). Figure 6 below is a photo of an Offal Hogger.

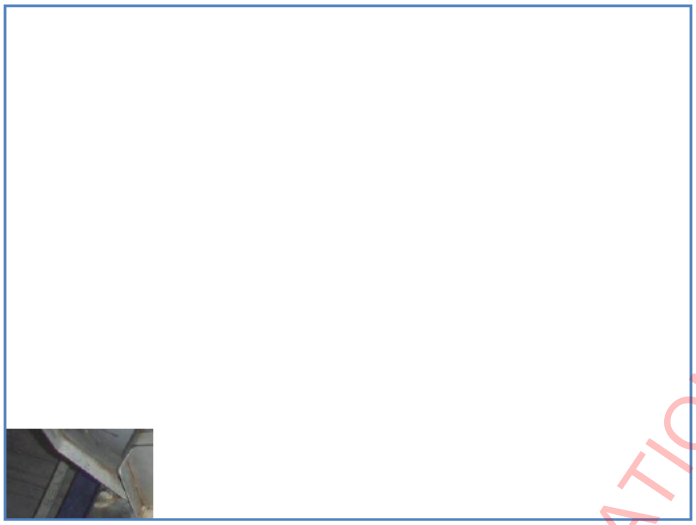


Figure 6 - Andar Offal Hogger

6.7 *Vessel Electronic Weighing and Recording Systems*

A number of vessels operating in the WCSI hoki fishery have weighing systems using Marel Marine scales installed in the processing area. These have the ability to record the weights of each carton produced.

These scales are designed for use onboard fishing vessels and are used throughout the world. They are motion compensated, which means they can weigh accurately in all but extreme sea states. Marel Marine scales can be connected to Innova intelligence production management system software. Linked to the Innova Marine Pack, the M1100 and M2200 Marel system scales can deliver packing and labelling information and on-line reports and information on quantities of fish harvested for each tow. The Marel system has an automatic tare setting capability for the recording of carton weight, and a filter option to select species. It comes with pre-defined label designs which can be altered according to need and traceability requirements. The system generates unique bar codes for each carton, which are printed on the labels attached to each carton[11].

During the vessel inspections Fishery Officers collected a number of computer generated fish product reports from s 9(2)(b)(ii) s 9(2)(b)(ii) chartered and domestic vessels and from s 9(2)(b) s 9(2)(b)(ii) vessels. Only s 9(2)(b)(ii) used the full Marel Innova Marine Pack system, specifically customised for their fish business operations. s 9(2)(b)(ii) and s 9(2)(b) used the Marel weighing and labelling component with alternative software packages.

Some of these computer generated reports made reference to 'actual' and 'nominal' weights, whilst other reports simply referred to a single weight. In the majority of instances the nominal weight was less than the actual weight for a given product line, with the exception of individually wrapped or bagged fish product. The nominal weight was thought to relate to a target weight packed to for a product line. The actual weight was thought to relate to the net weight of fish product contained (less packaging and glaze, if applicable). For various well-documented reasons it is impossible to consistently pack cartons to a nominal weight. To avoid marketing and regulatory problems, Industry practice is to over pack cartons, i.e. put a greater weight of fish than the nominal weight in them.

Comparison of these reports with the vessels' CLRs raised some concerns about whether the correct greenweight was being declared on the CLR. In the majority of instances the nominal

[11] www marel.com

weights, or a weight in between the nominal and actual weights, were used to report greenweight.

Members of the Operational Coordination team raised this issue at the December 2011 Deep-Water Group meeting. Discussions were held with s 9(2)(b)(ii) s 9(2)(b)(i) and s 9(2)(b)(ii) vessel managers and technical support personnel with a view to understanding vessel onboard weighing systems and how each company used weight data to determine the greenweight figure reported on the CLR.

6.7 (a) s 9(2)(b)(ii) Marel/Innova/Wisefish systems

s 9(2)(b)(ii) introduced the Marel system in 2008. It provided them with a customised on-board and on-shore catch reporting, product traceability and inventory system through to point-of-sale. The system also records the QMA/FMA the vessel is working in, but this is reliant on manual input.

Data captured by the Marel onboard weighing system is interfaced with the land-based Wisefish system. Text files are sent daily from each vessel's Innova server to the Innova server on land and the text data is entered into the Wisefish system that runs all the production and inventory systems at s 9(2)(b)(ii)

An example of a "Vessel Catch Landing Report" (VCLR) obtained during an in-port inspection is shown in figure 7 below. In this instance the greenweight figure provided is calculated using the nominal weight multiplied by the conversion factor. The nominal weight reported was, in the majority of cases, less than the actual weight. Exceptions were identified in relation to individually wrapped or bagged product where the 'actual' weight and the 'nominal' weight were the same.

Comparing VCLR data with the relevant CLRs demonstrated the reported greenweights were calculated using 'nominal' weights rather than 'actual' weights for s 9(2)(b)(ii) BATM fleet. This indicated that greenweight declarations on the CLR may be under-declared and as such clarification was sought regarding this matter.

s 9(2)(b)(ii)

Vessel Catch Landing Report

Date:29/06/2011 - 31/07/2011
Purchase order: = BUR10008, Product: = (All),

Landing type:

Area	Short Code	No. Units	Average Weight	Actual Weight	Nominal Weight	Conversion Factor	Greenweight
AGR7	ZMXMEA	3791	30.00	113,730.00	113,730.00	0.00	0.00
BAR7	BARHDS	25	20.45	511.36	500.00	0.00	0.00
BAR7	BARHGU	110	20.79	2,286.40	2,200.00	1.45	3,315.28
BNS7	BNSDRE	3	25.07	75.20	75.20	1.70	127.84
EMA7	EMADRE	1067	20.94	22,338.86	21,340.00	1.50	33,508.29
FRO7	FRODRE	186	20.87	3,881.25	3,720.00	1.50	5,821.87
HAK7	HAKDRE	199	25.67	5,108.01	5,108.01	1.80	9,194.42
HOK1W	HOKHGT	51269	21.12	1,104,655.62	1,082,995.73	1.65	1,786,942.92
HOK1W	HOKROE	2177	20.35	44,281.76	43,540.00	0.00	0.00
JMA7	JMADRE	4420	20.56	90,867.58	88,400.00	1.60	145,388.13
JMA7	JMAGRE	20	20.59	411.77	400.00	1.00	411.77
LDO1	LDODRE	12	20.12	241.41	240.00	1.80	434.54
LIN7	LINDRE	232	25.29	5,866.48	5,866.48	1.80	10,559.66
MAK1	MAKFIW	1	1.59	1.62	1.59	59.00	93.71
POS1	POSFIW	9	2.84	26.06	25.55	45.00	1,149.71
RBM1	RBMDRE	135	18.29	2,469.27	2,430.00	1.80	4,444.69
RBT7	RBTGRE	1378	20.19	27,822.99	27,560.00	1.00	27,822.99
SCH7	SCHDRE	3	13.83	41.48	41.48	1.95	80.89
SCH7	SCHSHF	3	1.01	3.09	3.03	0.00	0.00
SKI7	SKIDRE	7	23.95	167.68	167.68	1.55	259.90
SQU1T	SQUGRE	139	22.65	3,242.99	3,148.53	1.00	3,148.53
SWA1	SWADRE	225	20.49	4,609.29	4,500.00	1.65	7,605.33
WAR7	WARDRE	13	24.96	324.42	324.42	1.55	502.85
Total		**65424**	**21.57**	**1,432,984.5**	**1,406,317.7**		**2,040,813.32**

Landing type: Discarded

Area	Short Code	No. Units	Average Weight	Actual Weight	Nominal Weight	Conversion Factor	Greenweight
OSD7	OSDGRE	8	11.88	95.00	95.00	1.00	95.00
POP7	POPGRE	3	2.33	7.00	7.00	1.00	7.00
SUN7	SUNGRE	1	40.00	40.00	40.00	1.00	40.00
THR7	THRGRE	2	170.00	340.00	340.00	1.00	340.00
Total	**Discarded**	**14**	**34.43**	**482.00**	**482.00**		**482.00**

Landing type: Eaten on Board

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Page 1

31/07/2011 10:18

Figure 7 - Example of vessel catch landing report

s 9(2)(b)(ii) advised that the BATM fleet (LPFVs) deduct an allowance of 2% (or 3% for squid) for glaze on HGT and DRE product from the 'actual' weight (where 'actual' equates to gross weight less packaging) generated by the Marel weighing system. They report the remainder on the VCLR as the 'nominal' weight (where 'nominal' weight equates to 'actual' less 2% glaze). Therefore greenweight declarations on the CLR are calculated by s 9(2)(b)(ii) using 'nominal' weights for the BATM fleet.

s 9(2)(b)(ii) explained that onboard the fishing vessels s 9(2)(b)(ii), no glaze is applied to any fish product (includes fillets and dressed product), therefore greenweight is calculated from the 'actual' weight from the VCLR for the purposes of CLR declarations.

To test the s 9(2)(b)(ii) reporting system, it would be necessary to check the software coding that is used to generate the 'actual' and 'nominal' weights reported in the VCLR. In addition MPI observers could be tasked to assist and verify vessel weighing procedures.

6.7 (b) s 9(2)(b)(ii) weighing system

s 9(2)(b) advised that they use a weighing system onboard their vessels which allows the packing crew to weigh the processed fish to a fixed weight (or target net weight) which they

pack and sell to (although it is accepted that the 'fixed' weight is typically over-packed to satisfy international markets).

On the fillet vessels s 9(2)(b)(ii) use a RACE weighing system which has a touch screen where the product code is entered and two labels are produced for each carton. Each label displays: bar code; nominal weight; vessel name; date packed; packer and tow number. The scales are calibrated regularly to ensure they remain accurate s 9(2)(b)(ii) advised that the 'actual' weight of fish is not recorded however it is unclear whether or not the RACE system is able to generate an 'actual' weight.

"Random" carton checks on individual cartons are recorded each day. The process used by a vessel to select the "random" sample is unknown. During these tests packaging is removed and the net weight of fillets is recorded. Once all testing is completed the results are used to calculate an average (mean) "random" sample weight. Where glaze is applied (i.e.to states other than fillets) then the average random weight also excludes the weight attributable to glaze. The average random weight thus calculated should be the net weight of the fish product weighed and therefore should be used to calculate the greenweight reported on the CLR.

At the end of each voyage the captain generates an average carton weight summary which is sent to the Quota Manager for the completion of the CLR. The summary records the product line (e.g. HOK), the state and grade, the target net weight (as printed on the label), and the average "random" weight. A difference is calculated between the target net weight and the average "random" tested weight and shown as a percentage difference. Both the target net weight and the average "random" weight exclude packaging and glaze weights.

If the difference is less than 2% the product is declared on the CLR using the target net weight. If the percentage difference is 2.01% or more then the average "random" tested weight is used to declare greenweight on the CLR. The 2% allowance was described as a "buffer". According to s 9(2)(b)(ii) this was based on a historical allowance for drip loss.

Figure 8 on the next page illustrates the process s 9(2)(b)(ii) use for declaring greenweight on their CLR. In this example BNS was declared at the target weight of 25 kgs per unit because the overall calculated percentage difference was 0.24%. BYX was declared using the average "random" carton test weight because the calculated percentage difference was 3.90%.

ATTENTION : s 9(2)(a)

PRODUCT WEIGHT TESTING PROGRAMME

Vessel: s 9(2) Trip: s 9(2)(a) Docking Date: 19-Jan-12

Skipper: s 9(2)(a) Factory Manager: s 9(2)(a)

PRODUCT	STATE	GRADE	TARGET NET WEIGHT	AVE. WEIGHT RANDOM CTN	DIFF	% DIFF	REDECLARE INNER	REDECLARE OUTER
BNS	DRE		25.0	25.06	0.06	0.24		
BYX	DRE		10.0	10.39	0.39	3.90		10.39

NOTES

Target Net Weight As marked on each carton the weight which the vessel is packing to.

Age Random Carton Remove all packaging and weigh net weights of fillets. Selections by normal random sampling procedures.

Difference The weight difference between the (Ave Random) cartons and the target net weight cartons including moisture absorption, drip loss / over and under

Weight check sheets will be transferred to a final testing record sheet where any weight random variance shown will be redeclared by the Company's Quota Manager who will receive a weight test record sheet after each unload.

Example: Redeclare

PRODUCT	STATE	TARGET NET WEIGHT	AVE. WEIGHT RANDOM CTN	DIFF	% DIFF	REDECLARE INNER	REDECLARE OUTER
Hoki Fillet	TSK	6.8	6.94	0.14	2.11	6.94	20.82

* 2.01 % therefore redeclare
* Redeclare at the higher weight - 6.94
* 6.94 x 3 slides = 20.82

Copy Factory Manager ✓ Copy Quota Manager ✓

Figure 8 - Example of product weight testing sheet

Figure 9 on the next page illustrates another example where all of the corresponding calculated percentage differences were less than the 2.01% threshold. In all instances the target net weight was used for the calculation of greenweight on the CLR and not the average weight obtained from "random" onboard testing. In this example between 0.82% and 1.5% of fish product was not reported on the CLR and subsequent MHR.

ATTENTION : s 9(2)(a)

PRODUCT WEIGHT TESTING PROGRAMME

Vessel: s 9(2)(a) Trip: s 9(2)(a) Docking Date: 3-Feb-12

Skipper: s 9(2)(a) Factory Manager: s 9(2)(a)

PRODUCT	STATE	GRADE	TARGET NET WEIGHT	AVE. WEIGHT RANDOM CTN	DIFF	% DIFF	REDECLARE INNER	REDECLARE OUTER
HOK	TSK	AF	7.5	7.61	0.11	1.47		
HOK	TSK	BF	7.5	7.59	0.09	1.20		
HOK	TSK	A	7.5	7.59	0.09	1.20		
		MA	7.5	7.60	0.10	1.33		
HOK	TSK		6.8	6.89	0.09	1.32		
HOK	TRF		6.8	6.89	0.09	1.32		
HOK	TSK	FIAB	6.0	6.09	0.09	1.50		
HOK	TRF	FIAB-TRF	6.0	6.09	0.09	1.50		
HOK	TSK	5kg	5.0	5.07	0.07	1.40		
LIN	TSK		6.8	6.88	0.08	1.18		
LDO	SKF		6.8	6.89	0.09	1.32		
RIB	DRE		11.0	11.09	0.09	0.82		
SWA	DRE		11.0	11.10	0.10	0.91		
GSP	DRE		11.0	11.09	0.09	0.82		

NOTES

Target Net Weight — As marked on each carton the weight which the vessel is packing to.

Age Random Carton — Remove all packaging and weigh net weights of fillets. Selections by normal random sampling procedures.

Difference — The weight difference between the (Ave Random) cartons and the target net weight cartons including moisture absorption, drip loss / over and under

Weight check sheets will be transferred to a final testing record sheet where any weight random variance shown will be redeclared by the Company's Quota Manager who will receive a weight test record sheet after each unload.

Example: Redeclare

PRODUCT	STATE	TARGET NET WEIGHT	AVE. WEIGHT RANDOM CTN	DIFF	% DIFF	REDECLARE INNER	REDECLARE OUTER
Hoki Fillet	TSK	6.8	6.94	0.14	2.11	6.94	20.82

* 2.01 % therefore redeclare
* Redeclare at the higher weight - 6.94
* 6.94 x 3 slides = 20.82

Copy Factory Manager ✓ Copy Quota Manager ✓

Figure 9 - Example of product weight testing sheet

In the 2010-11 fishing year s 9(2)(b)(ii) processed up to 78,000 tonnes of fish greenweight. If the average percentage difference was 1% across all product lines processed by s 9(2)(b)(ii) that fell below the 2.01% threshold, approximately 780 tonnes of fish greenweight would not have been reported during the 2010-11 fishing year.

6.7 (c) s 9(2)(b)(ii) Weighing System

Prior to visiting s 9(2)(b)(ii) the Operation Bronto team analysed s 9(2)(b)(ii) vessels Cargo Tracking Reports obtained during a number in-port inspections. The reports contained two weight columns headed "Weight" and "Nominal Weight". The "Weight" values were slightly higher than the "Nominal Weight" values, apart from individually wrapped or bagged fish where both values were the same. When these two weight values were checked against the CLR, the reported greenweight figure was between the "Weight" and "Nominal Weight" values. It was not clear how s 9(2)(b)(ii) had established the greenweight. This aspect needed clarification together with an explanation of the weighing system and weighing reports generated and the allowances made for glaze and packaging.

s 9(2)(b)(ii) explained they use the Marel system on board their vessels only to produce labels and record the gross weight of each carton of fish, which includes packaging and glaze (where

applicable). s 9(2)(b)(ii) confirmed the Marel system produces a Cargo Tracking Report which provides both a 'weight' and 'nominal' weight. Neither of these figures is used for calculation of the greenweight reported on the CLR. s 9(2)(b)(ii) reasoning for this included;

1. It is the obligation of the LFR to determine greenweight; and

2. There is variability of scales and human error (crew can manipulate weights) which can cause problems.

In relation to point 2 above the same is true of their carton sampling protocol, which may be biased.

s 9(2)(b)(ii) advised they use the nominal weight their fish packers are packing to, e.g. 20.4 kg for TRF fillets. s 9(2)(b)(ii) carry out quality control checks (QC checks) on land by selecting a number of cartons and testing the packaging weight and fish weight, less an allowance for glaze (where applicable). s 9(2)(b)(ii) said the sample size is calculated for each product line using statistical tables. An average weight is calculated for the sample drawn and then compared to the nominal weight (e.g. 20.4 kg). If there is a difference between the two figures then they will use the greater of the two figures for the purposes of calculating greenweight.

There are no formal QC criteria for the selection of the cartons to be weight tested. The number of cartons required is taken by the unload crew at the time of landing. There is no random sampling protocol provided to the unload crew by s 9(2)(b)(ii) For this reason it is unlikely the cartons selected as part of the QC process is drawn at random. Confidence in the samples drawn for carton testing is of concern. The actual QC testing is completed by the shore based s 9(2)(b)(ii) QC team in isolation of the carton selection process. There was some suggestion that an attempt is made by the unload crew to select cartons covering the trip date range to ensure a representative sample is taken however this is unverified.

Figure 10 on the next page refers to an on shore s 9(2)(b)(ii) QC sampling sheet for the s 9(2)(a) s 9(2)(b)(ii) landing of 2 August 2011.

LANDING DATE: 02-Aug-11

TRIP NUMBER : s 9(2)(a)

SAMPLING

Species Breakdown	Nominal Carton weight (Kg)	Total Cartons produced	Total weight (Nominal) unloaded (Kg)	% OF CATCH	No. Cartons sampled For Compliance	Percentage of Product sampled	% of catch represented by samples
Packaging type: International Block liner, 3 box outer, liner bag							
HOK FLB / PB	22.5	16000	360,000	70.3 %	125	3.8 %	70.3 %
HOK DFT	22.5						
SQU GRE	22.5	1	23	0.0 %			
SQU DRE	22.5	20	450	0.1 %			
OTHER	22.5						
Packaging type: 3 box outer, interleaf plastic							
HOK TSK choice	20.4						
Packaging type: 6.8kg Shatterpack, 3 box outer, interleaf plastic							
HOK TSK	20.4	1000	20,400	4.4 %	32	3.2 %	4.4 %
HOK TRF	20.4	1365	27,846	6.0 %	32	2.3 %	6.0 %
LIN TSK	20.4	831	16,952	3.6 %			
HAK FIL	20.4	180	3,672	0.8 %			
SKI SKF	20.4	7	143	0.0 %			
OTHER	20.4						
Packaging type: 17kg carton							
LIN TSK	13						
OTHER							
Packaging type: Dyecatch outer, two liner bags							
BAR DRE	25						
BNS DRE	25						
GSH DRE	25	1	25	0.0 %			
HOK DRE	25	1675	41,875	7.4 %	32	1.9 %	7.4 %
GSP DRE	25						
HAK DRE	25	650	16,250	2.9 %			
LDO DRE	25	60	1,500	0.3 %			
RBM DRE	25	14	350	0.1 %			
RCO DRE	25						
RIB DRE	25	12	300	0.1 %			
SKI DRE	25	5	125	0.0 %			
SPE DRE	25	4	100	0.0 %			
STA DVC	25	15	375	0.1 %			
SWA DRE + 1Kg	21	915	19,215	4.0 %	32	3.5 %	4.0 %
SWA DRE - 1Kg	25	4	100	0.0 %			
WWA DRE + 1Kg	21						
WWA DRE - 1Kg	25						
WAR DRE	21						
TAR DRE	25						
SCH DRE	1	12	12	0.1 %			
TOTALS		22771	509,713	100.0 %	253	1.1 %	92.0 %
Secondary Processed States							
HOK MBS	22.5	600	13,500	24.7 %			
SQU BEAKS	22.5						
SQU HET	22.5	12	270	0.5 %			
OSD FIN	1						
HAK ROE	22.5	30	675	1.2 %			
HOK ROE	22.5	1750	39,375	72.1 %			
SWA ROE	22.5	35	788	1.4 %			
LIN HDS	25						
TOTALS		2427	54,608	100.0 %			
GRAND TOTAL		25,198	564,320		253		

DESTRUCTIVE TESTING / **RESULTS** / **NET AVERAGE CARTON WEIGHT**

Species	No. of Cartons sampled for: Non-Fish Weight	Frozen Checks	Thaw Checks	Average Gross Carton Weight	Average Non-Fish Weight	Glaze Percentage	Net Average Carton Weight	Varience from Nominal	Un-Tested Lines using Average Varience
HOK FLB / PB	21	21	21	23.70	1.019		22.68	0.82 %	
HOK DFT									
SQU GRE									22.80
SQU DRE				23.94	1.019		22.92	1.87 %	
OTHER									
(group average)								1.35 %	
HOK TSK choice									
HOK TSK	5	5	5	22.12	1.608		20.51	0.55 %	
HOK TRF	5	5	5	22.05	1.560		20.49	0.44 %	
LIN TSK	5	5	5	22.20	1.266		20.94	2.65 %	
HAK FIL				22.15	1.476		20.67	1.34 %	
SKI SKF									20.65
OTHER									
(group average)								1.25 %	
LIN TSK									
OTHER									
BAR DRE									
BNS DRE									
GSH DRE						0.80 %			25.24
HOK DRE	5	5	5	25.82	0.476	0.90 %	25.12	0.46 %	
GSP DRE									
HAK DRE	5	5	5	25.58	0.472	0.79 %	25.32	1.27 %	
LDO DRE						0.91 %			25.24
RBM DRE				25.09	0.469	1.00 %	25.36	1.46 %	
RCO DRE									
RIB DRE						1.10 %			25.24
SKI DRE						0.83 %			25.24
SPE DRE						0.71 %			25.24
STA DVC				25.67	0.469	0.91 %	25.17	0.68 %	
SWA DRE + 1Kg	5	5	5	21.88	0.460	0.95 %	21.22	1.03 %	
SWA DRE - 1Kg									25.24
WWA DRE + 1Kg									
WWA DRE - 1Kg									
WAR DRE									
TAR DRE									
SCH DRE									1.01
(group average)								0.98 %	
TOTALS	51	51	51						

KEY

- = Vessel Manager to fill in
- = Quality Co-ordinator to fill in
- = Calculated Results

Figure 10 - Example of s 9(2)(b)(ii) carton QC sampling

s 9(2)(b)(ii) explained their QC carton sampling system by referring to the first line in the sample sheet in figure 10 above, which relates to 16000 cartons of hoki fillets with a nominal carton net weight of 22.5 kg. s 9(2)(b)(ii) explained they used the following procedures to test the accuracy of the 22.5 kg net nominal carton weight for the purposes of greenweight declaration on the CLR.

From the 16,000 cartons s 9(2)(b)(ii) selected 125 cartons (or 0.8%) for QC checking. The carton sample size was taken from statistical tables based on the 16,000 units. From the sample taken 21 cartons were destructively tested to establish the weight of packaging (referred to as "non-fish weight" on the QC sample form). The gross average carton weight was calculated based on the tests conducted of the 125 cartons. The calculated average gross carton weight was 23.70 kg, average packaging weight 1.019 kg, and net average carton weight therefore 22.68 kg. As the net average weight was higher than the nominal weight (22.5 kg) s 9(2)(b)(ii) used the net average weight of 22.68 kgs for the greenweight declaration on the CLR.

s 9(2)(b)(ii) were asked why they didn't use the Marel weight data for the 16,000 cartons, instead of relying on weighing a small number of cartons on shore. Because glaze was not applied to this product, taring the scales to allow for packaging would have provided actual carton weights.

Initially s 9(2)(b)(ii) responded by suggesting they were not confident on accepting the at sea Marel weighing results as they thought they may not be reliable in heavy seas (although they are specially designed to function reliably in the maritime environment) and there could be human error resulting in the weights not always being accurate. They did accept however, when suggested, that they could use the results of the 16,000 carton weights to compare against the results from the on shore sampling. It is noted that s 9(2)(b)(ii) seem to be comfortable with the other scales onboard used to weigh blocks when the crew are packing to a nominal weight, in this case 22.5 kg. s 9(2)(b)(ii) explained that each carton had to weigh at least 22.5 kg (as labelled) or slightly more to meet international customer requirements and that anything less would result in customer complaints, rejection of the product and/or legal action.

Compliance risks identified are listed below:

1. Currently the vessel's onboard Marel weighing system records gross weight for each carton but no data is collected about the actual net weight of fish contained within each carton despite the availability of this functionality i.e. system can deduct for packaging. On the face of it, it appears that the weighing system is simply used for the purposes of: ensuring that nominal net weights are adhered to in the packing area; and that once labelled every carton can be traced.

2. s 9(2)(b)(ii) do not use gross carton weight information gathered at point of labelling, onboard the vessel, for purposes of calculating greenweight. Instead, s 9(2)(b)(ii) conduct an on shore QC process to obtain average carton weight figures for the purposes of greenweight declaration.

3. No formal random sampling procedure is used in the selection of cartons and therefore the validity of this type of random testing is questionable.

4. Only a fraction of the packaging is tested compared to the random sample size e.g. 21 units tested in above example compared to sample size of 125.

5. The Marel weighing system is only installed on NZ vessels and not on their foreign charter vessels (although it was noted by Fishery Officers during an inspection of the s 9(2)(a) that they were considering the installation of the MAREL weighing system onboard this vessel).

Catch greenweight should be reported accurately. The methodology s 9(2)(b)(ii) uses to calculate and report greenweight is obscure. Further monitoring and check weighing is advisable.
s 9(2)(b)(ii) using actual net weight data recorded at sea and a transparent, unbiased methodology for verifying and reporting greenweight might provide some confidence that their reporting is accurate.

6.8 *Carton Weight Checks & Examination*

The purpose of carrying out carton examinations and weight checks was to verify carton contents (e.g. species, state, and grade) and reported weight. Fishery Officer's selected a sample of 5-10 cartons from each species[12], state, and grade. For each carton, they recorded nominal weight recorded on the carton and weighed each block where applicable less any packaging. They recorded a count of the total number of fish (or pieces of fish) per block for those states where this was achievable i.e. DRE, HGT, GRE etc. Such counts were not feasible for states such as TSK, TRF and MKF because individual fillets and pieces were impossible to identify.

The average net weight for each product line landed by a vessel was calculated in order to test the veracity of greenweight declarations on the CLR. To achieve this, cartons were weighed at the majority of in-port inspections and on about half of all at-sea inspections. Total quantities of hoki and bycatch product inspected and checked, as described above, are shown in tables 8 & 9 below.

	Number of cartons	Total product weight (kg)	Number of green blocks	Total green block weight (kg)	Total weight (product + green) (kg)
Hoki	1,279	30,509	146	2,045	32,554
Bycatch	2,088	48,163	75	115	48,278

Table 8 - Summary of product examined during in-port inspections

	Number of cartons	Total product weight (kg)	Number of green blocks	Total green block weight (kg)	Total weight (product + green) (kg)
Hoki	161	3,067	16	232	3,299
Bycatch	56	1,024	0	0	1,024

Table 9 - Summary of product examined during at-sea inspections

6.8 (a) Carton Weight Check Results

Table 10 on the next page provides a comparison between the carton weights recorded by Fishery Officers at in-port inspections and the average unit weight calculated from the greenweight reported by the company on the CLR.

Currently many companies apply a 2% standard deduction for glaze added to frozen blocks of fish. Therefore in line with current industry practice, for LPFVs producing non-fillet states a

[12] Cartons checks of all hoki product lines as well as the following bycatch species LIN, HAK, JMA, SWA, WWA, WAR, FRO, LDO.

deduction of 2% to allow for glaze has been deducted from the average carton weight calculated from weight checks carried out by Fishery Officers. The deduction for glaze is not applicable for fillet product lines (TRF and TSK) as these products are not glazed. Only major product lines that had weight checks conducted by Fishery Officers at in-port inspections have been included in this table.

Vessel	Landing Date	State	FO Ave Carton Wgt (2% glaze allowance deducted for non-fillet states)	CLR Calculated Ave Unit Weight (from GW)	CLR # Units	Total Difference GW
s 9(2)(a)	27/7/11	HGT	20.71	20.53	28,008	-8,199
	16/8/11	HGT	20.45	20.46	42,330	516
s 9(2)(a)	1/8/11	HGT	20.98	21.12	51,269	11,690
s 9(2)(a)	30/7/11	TRF	21.42	20.4	9,580	-22,476
)	30/7/11	TSK	20.49	20.4	10,040	-2,305
	31/8/11	TSK	23.26	22.46	6,333	-12,918
s 9(2)(a)	2/8/11	TRF	21.11	20.4	13,074	-20,887
	2/8/11	TSK	20.44	20.41	10,127	-760
s 9(2)(a)	1/8/11	HGT	30.14	30.5	10,315	6,212
	23/8/11	HGT	30.14	30.32	11,709	3,574
	16/9/11	HGT	30.33	30.5	1,055	294
s 9(2)(a)	9/8/11	HGT	30.63	30.13	8,667	-7,079
	2/9/11	HGT	30.25	30.19	7,862	-812
s 9(2)(a)	16/8/11	HGT	30.13	29.97	13,034	-3,338
	8/9/11	HGT	30.39	29.9	5,970	-4,825
s 9(2)(a)	29/7/11	HGT	28.16	28.06	7,451	-1,173
	24/8/11	HGT	29.16	28.26	9,448	-14,106
	25/9/11	HGT	28.27	28.26	2,876	-61
s 9(2)(a)	4/8/11	HGT	20.43	20.22	58,510	-20,564
s 9(2)(a)	1/8/11	HGT	20.25	20.01	61,891	-24,182
	19/8/11	HGT	20.10	20.01	29,834	-4,420
s 9(2)(a)	4/8/11	HGT	26.03	26.14	11,150	2,046
	31/8/11	HGT	26.13	26.14	9,375	205
s 9(2)(a)	15/8/11	HGT	26.02	26.22	26,690	8,852
s 9(2)(a)	31/7/11	HGT	20.99	21.13	48,567	11,091
	25/8/11	HGT	21.39	21.12	27,613	-12,456
s 9(2)(a)	27/7/11	HGT	26.21	25.85	10,906	-6,392
	18/8/11	HGT	26.43	26.52	16,506	2,435
s 9(2)(a)	12/8/11	HGT	27.47	27.5	5,703	289
	6/9/11	HGT	27.62	27.5	3,820	-734
s 9(2)(a)	29/7/11	HGT	21.02	21.55	41,123	35,894
s 9(2)(a)	1/8/11	TSK	22.67	22.67	14,805	0
	13/9/11	TRF	22.6	20.6	5,502	-26,960
	19/9/11	TSK	22.63	22.9	10,674	8,214
s 9(2)(a)	9/8/11	TSK	23.34	22.74	18,891	-30,605
	1/9/11	TRF	21.88	20.43	1,256	-4,097
	1/9/11	TSK	23.67	22.64	4,041	-11,237
s 9(2)(a)	14/7/11	HGT	28.48	27.75	3,961	-4,764
	10/8/11	HGT	28.23	27.55	8,041	-9,072
	6/9/11	HGT	28.18	28.15	3,936	-162
s 9(2)(a)	29/7/11	HGT	28.08	28.06	8,410	-236
	26/8/11	HGT	28.81	28.74	5,702	-678

s 9(2)(a)	4/8/11	HGT	28.90	27.43	8,194	-19,878
	2/9/11	HGT	29.02	28.62	5,550	-3,643

Table 10 - Comparison of in-port inspection data and CLR data for main product lines of hoki produced by vessel/trip combination

During Operation Bronto, it was found that the majority of vessels were carrying out and documenting their own glaze weight tests at sea. In several instances it was noted that the glaze test results were less than 2% yet the vessels were still claiming the 2% threshold which for these vessels is advantageous when determining greenweight.

The total estimated under-reported greenweight (slippage) by fillet vessels in the above product lines was 132,245 kg, and by LPFVs was 146,774 kg, giving a combined total of unreported greenweight of 279,019 kg. This accounts for 68% of hoki product lines checked. Therefore potentially 279,019 kg of hoki has not been recorded in monthly harvest returns and attributed against ACE. The remaining 32% of hoki product lines inspected by Fishery Officer's appear to be overstated by approximately 91,312 kgs.

Table 11 below illustrates total hoki calculated as under-reported for each permit holder and associated vessel.

Company	Vessel	Estimated under-reported GW (kg)
s 9(2)(a)	s 9(2)(a)	37,699
		21,647
		59,346
		20,564
		28,602
		49,166
		8,199
		8,199
		15,340
		15,340
		7,891
		8,163
		734
		26,960
		45,939
		89,687
		12,456
		12,456
		13,998
		914
		23,521
		38,433
		6,392
		6,392
Grand Total		**279,019**

Table 11 - Summary of hoki under-reported by permit holder and vessel

6.8 (b) Glaze Application

On board six of the seven observed vessels s 9(2)(a) glaze is applied by spray as the pans go from plate freezers to the break out area. Salt water is pumped from sea and applied at

ambient temperature with no additives. On the vessel s 9(2)(a) no glaze was applied to any line of processed fish.

Only one observed vessel, the s 9(2)(a) conducted glaze weight tests. Four of the seven observed vessels do not test glaze weight at all. On one vessel the product was weighed prior to glazing and on the s 9(2)(a), glaze was not applied to any product line.

There is a potential compliance risk associated with companies deducting an allowance for glaze when calculating greenweight when in fact no glaze has been applied. This issue needs to be addressed to determine the extent of this practice.

6.8 (c) Fisheries (Conversion Factor) Notice 2005

Section 188 of The Fisheries Act 1996 provides for the setting of conversion factors. The Fisheries (Conversion Factor) Notice 2005 (FCFN) specifies conversion factors for a number of species, or classes of fish, and are used to convert the weight of fish to which it has been processed to (i.e. the defined state) to the greenweight. Conversion factors are important for stock assessment and reporting purposes to ensure that accurate quantities of fish harvest are accounted for. S188 (2) also provides for the determination of vessel specific conversion factors (VSCFs).

During their examination of fish product, Fishery Officers assessed a high standard of compliance with the defined processed states for HGT and DRE product, as listed in the FCFN for hoki and bycatch species.

On most LPFVs, factory manager, shift supervisor/ foreman or quality control officers ensured factory crew complied with processing specifications. Processing specifications illustrating defined states were often displayed in vessel factories for ease of reference by the crew.

Fishery Officers noted that frozen fillet product was very difficult to inspect at the time of landing. Figures 11A to 11D provide examples of the different states and grades produced on fillet vessels and highlight some of the difficulties that exist in identifying whether product complies with the FCFN once landed, eg depth of tail cut, angle and placement of anterior cut, presence of epaxial line and horizontal septum along full length of fillet, presence of hypaxial line from anus to posterior cut.

Figure 11A - Hoki TRF grade 4

Figure 11B - Hoki TSK standard shatterpac 4-6oz

Figure 11C - Hoki TSK 'AF' fillet block

Figure 11D - Hoki TSK 'BF' fillet block

Fishery Officers suggested that inspection at sea, while the product is being processed, is a more appropriate way of determining whether fillets are being processed in accordance with the FCFN. For example, figure 12 shows a fillet that is non-compliant with the FCFN as recorded on board a vessel during an at-sea inspection.

Figure 12 - TSK fillet processed beyond defined state

Given the difficulties in assessing compliance with FCFN, it is imperative that Fishery Officers are conversant with the various defined fillet states described in the notices.

6.9 *Issues with Fillet States*

Examination of company processing specifications for fillet vessels identified potential problems with determining if their greenweight has been reported accurately.

A single hoki may be processed to more than one state, depending on processing specifications and the condition and quality of the fish. These states could include a combination of: TRF, TSK (divided between different product lines), MKF, MBS and MEA.

The following company processing specifications for hoki TSK and MBS illustrate this point:

HOK TSK (Premium A Grade Skinless Fillet – in shatterpacs) where the loin and tail section must be intact. No partial or gaping fillets or ragged edges, whilst maintaining fillet form. These skinless boneless fillets are used in interleaved fillet production. The total number of allowable blemishes per fillet is a maximum of 3 (includes blood spots, bruising, or skin/belly flap). The maximum tolerance for pink fillets is 20% but this should only be packed if absolutely necessary. There is no tolerance for red fillets and they should never be packed, but should be consigned to "BF" block. Dark fat-line should be packed as "Standard Grade", not "A" grade.

HOK TSK (Standard Grade Skinless Fillet – in shatterpacs) where the loin and tail section must be intact. Up to 10% of slightly gaping fillets or ragged edges can be packed. Whilst maintaining fillet form. These skinless boneless fillets are used in interleaved fillet production. The total number of allowable blemishes per fillet is a maximum of 6 (includes blood spots, bruising, or skin/belly flap). The maximum tolerance for pink fillets is 60%. There is no tolerance for red fillets and they should never be packed, but should be consigned to "BF" block. Dark fat-line should be packed as "Standard Grade", not "A" grade.

Hoki TSK (AF) Block is made using boneless skinless fillets and may contain whole or part fillets of all sizes. Where a portion of the fillet contains some blood spots or bruising it should

be trimmed so that a portion can be consigned to "BF" block or mince depending on the severity of the defect, and the good portion packed as "AF". Fillets that are gaping or have ragged edges may be packed. Any fillets with trawl damage resulting in a sprinkling of small blood spots similar to bruising, should not be packed as "AF" but be consigned to "BF" block. No dark or discoloured fat-line to be packed as "AF".

Hoki TSK (BF) Block is made using boneless skinless fillets and is a by-product of "AF" block and interleaved fillet production. Block may contain whole or part fillets of all sizes. Any very dark blood spots or very dark bruising that exceed 1/3 of the fillet must be cut out and consigned to Mince (HM – company grade for mince by-product*). No whole fillets to go to Mince (HM). Any blood spotted parts of the fillet or other bruising should be trimmed out and consigned to "BF" and the good portion packed as "AF". Fillets that are gaping or have ragged edges may be packed. Pink fillets are allowable in this product. "BF" is to be packed as a by-product of other fillet and block production. It should be the first option for any off-cuts not conforming to the specifications.*

Hoki Mince block (MBS) – By-product/Off-cut mince. Mince is a by-product of block and fillet production. It is produced using a Baader Mincing machine. It is produced from the off cuts and trimmings from hoki production. Nothing else is added. Any fillet pieces larger than 20mm should not be minced, but be added to the appropriate block product. No whole fillets may be minced.

A single fish could be consigned to more than one product lines. For example, one fillet could be packed as a TSK Premium Hoki A Grade Skinless Fillet, as illustrated in figure 13.

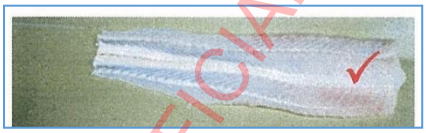

Figure 13 - TSK premium hoki A grade skinless fillet

If the other fillet of the same fish had been bruised or damaged (see figure 14 below) it might be consigned to 'BF' block.

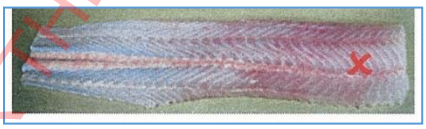

Figure 14 - Hoki TSK 'BF' block fillet

If only a portion of the fillet contained blood spots or bruising, the good portion might be packed as 'AF' Block and the remainder consigned to 'BF' Block or Mince. See figure 15. The FCFN does permit trimming of TSK fillets to remove blood spots and bruising.

If a portion of a fillet is consigned to mince, it might be declared as MKF or MBS. However, the company processing specifications described above do not provide specifications for MKF. If the fillet was trimmed according to the illustration in figure 15, it would in fact have been processed beyond the TSK state definition in the FCFN. All portions therefore are non-compliant. If the fillet was trimmed in this manner, and the trimmings reported as MBS, then the greenweight of the fish would be under-reported.

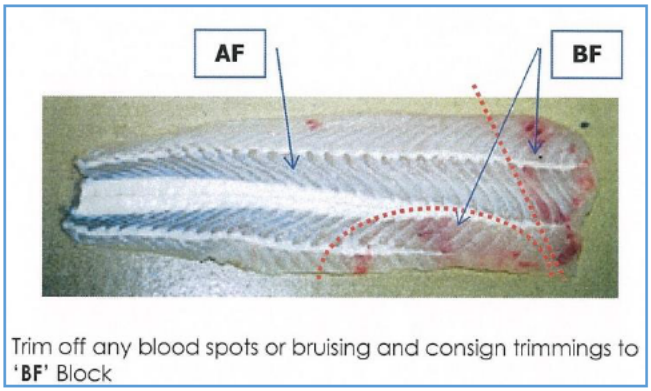

Figure 15 - Hoki TSK fillet divided into portions for 'AF' and 'BF' block

The processing specifications described earlier for AF and BF Block do not comply with the FCFN state definitions. According to the specifications, both block lines "*may contain whole or part fillets of all sizes*". The FCFN does not permit reporting part fillets as TSK, even if all the parts that make up the TSK fillet are being reported as principal landed state.

Company specifications for some product lines are contradictory. For example, a 'BF' Block specification states "*Any very dark blood spots or very dark bruising that* ***exceed 1/3 of the fillet*** *must be cut out and consigned to Mince (HM)*", while the Mince (MBS) specification states "*Any fillet pieces larger than 20mm should not be minced, but be added to the appropriate block product.*" It is unlikely that 1/3 of a fillet will be less than 20mm and in this instance you would expect it to be consigned to BF block, which is inconsistent with the processing specifications for that product. Therefore, if 1/3 of the fillet is removed, it is unlikely that any of the portions would comply with the TSK definition. If the trimmed portion is consigned to mince by-product (as per specifications) then the greenweight will be under-reported.

In theory, if portions of a fillet are consigned to more than one product line and the CF (or VSCF) relevant to that fillet state is applied to all those portions, greenweight will be reported accurately. The FCFN permits trimming a TSK fillet to remove blood spots or bruising, however the fillet must still be compliant with the FCFN post-trimming. The legitimate trimmings would normally be assigned to MBS (minced by-product, skin-off fillets) an additional state that does not attract a CF. However, it is extremely difficult for Fishery Officers to distinguish between legitimate trimmings and portions of the fillet that should be part of the principal landed state, even if the ratios of fillet weights to MBS weights are anomalous.

It is very difficult to audit a fillet vessel's catch after it has been processed, packed and frozen, let alone determine that all processed states have been reported accurately and subsequently counted against ACE. Industry frequently develops fillet products that are not compatible with a conversion factor system. These are usually premium products that generate relatively high returns. At times, vessel operators stopped producing such products because of compliance risks to the firm. However, the incentive to maximise profit ensures operators will continue to seek authorisation for producing high value products. See example below.

Example of value added hoki product

During the 2010-11 fishing year, the s 9(2)(a) produced small quantities of portions from a TSK fillet. They described these portions as *Hoki Steaks* and used the TSK Conversion Factor of 3.1 to calculate their greenweight for reporting purposes. The remainder of each fillet was packed in TSK fillet block. The TSK conversion factor was also applied to the remainder.

As previously discussed, it is very difficult to audit this type of product and determine if greenweight is reported accurately.

The company wrote to MPI requesting that their Vessel Specific Conversion Factor (VSCF) certificates be amended to allow for production of these fillet portions, as they were aware that they are not covered by the FCFN.

Between October and December 2011, the s 9(2)(a) had their VSCF certificates amended to enable hoki processed to TSK or TRF states to be divided further into portions.

Pursuant to their amended VSCF Certificates, the three vessels are required to:

- Report daily, in the comments section of the TCEPR what types of portions have been produced (steaks, goujons or strips from TSK or TRF – see figures 16A, 16B & 16C below);
- Report the number of units and unit weight of each product line that is comprised solely of fillet portions.
- Apply the relevant VSCF (for TSK or TRF) to all constituent portions of the original fillet.

Figure 16A - Example of fillet cut into square steak and tail end

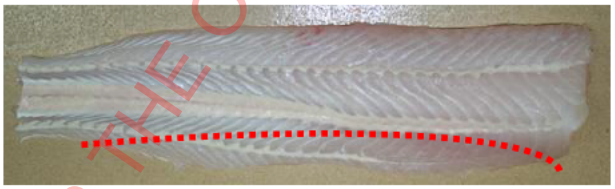

Figure 16B – Example of cut line for strip (goujon) off large fillet

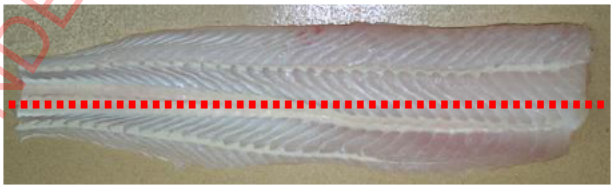

Figure 16C – Example of cut line for strip (goujon) in small fillet

All 3 vessels have since produced some fillet portions during Hoki trips. Only the s 9(2)(a) has complied with the reporting requirement and has specified type of fillet portion, the unit weight and unit number. The other two vessels have provided only the fillet portion and number of units, in one case on a daily basis, and in the other case a summary of production for the trip.
Fillet portions are reported in the TCEPRs Daily Processing Summary as Hoki TSK (or TRF if applicable) along with number of units, unit weight, processed weight and using the VSCF for TSK a greenweight is calculated. It appears that steaks are being produced in units of 18kg

(made up of 3 x 6kg pans). What is not clear from reviewing TCEPRs is what is happening to the remaining portions of the fillets (see figure 17 below).

Figure 17 - Steaks: square portions cut from skinless fillet - several portions can be cut from each fillet.

The vessels are presumably packing them as HOK block (22.5kg units) along with other whole or part fillets and applying the relevant CF. There is no way to tell if the correct proportions of tails/other pieces are being packed and reported as block in relation to the steaks produced. Equally, remaining portions could go to mince (and reported as either MBS where no CF is applied; or MKF where a CF is applied) or Hoki meal.

The company has stated that when producing steaks, the tail pieces could either be packed in shatterpac or block and when producing strips, if there is any fillet left over it will be packed to block. The company provided information relating to how they envisage packing all fillet parts when producing fillet portions. This is shown in Table 12 below, with those product lines in red type being unlikely (but possible) to be produced.

Table 12 - Expected packing procedure for s 9(2)(b) vessels producing fillet portions

Basic product type	Product lines consisting portions of fillets	Product lines consisting of portions and "whole TSK"
Steaks	Steaks (shatterpacked)	Tail piece + whole TSK (block packed)
	Tail pieces (shatterpacked)	
	Tail pieces (block packed)	
Strips	Strips (shatterpacked)	Remainder of fillet +whole TSK (block packed)
	Remainder of fillet i.e. larger than a strip (block packed)	

Overall there is a risk that in order to maximise quota available vessels may produce premium steak products without appropriately reporting other portions. While there should be a proportionate amount of block from tail pieces, where these are packed in with normal block from whole fillets it is not possible to monitor. In general not having an officially defined processed state for these portions makes it difficult to monitor what has or hasn't been produced on a trip further complicating the auditing of catch reporting. The current system is reliant on vessels to record in the comments section if fillet portions were produced.

There is a risk that the Ministry is not effectively keeping up with industry developments and market demand in terms of processed states and the ability for these to be incorporated into the current catch reporting regime.

6.10 Vessel Specific Conversion Factors

As discussed earlier section 188 of the Fisheries Act 1996 sets requirements for conversion factors. In general terms conversion factors are '*based on average recovery rates for a defined processed state and set after sampling by MPI Observers during processing at sea.*'[13]

S188 (2) also provides for the determination of vessel specific conversion factors (VSCFs):

> *The chief executive may, in respect of any vessel on which fish, aquatic life, or seaweed is processed, having regard to the method of processing or the processing history of the vessel and after consultation with the owner, operator, or master of the vessel, issue a certificate specifying conversion factors for that vessel which shall for all purposes (including any proceedings for an offence against this Act) be used to determine the weight of any fish, aquatic life, or seaweed processed by that vessel within the terms of the certificate.*

In order to obtain a VSCF certificate, testing is undertaken by MPI observers at sea over three fishing trips (pre spawn, spawn and post spawn). Certificates are issued by MPI based on recommendations contained in research reports prepared by NIWA. NIWA use published statistical methods to weight CFs by month in accordance to the proportion of catch landed from all sampled months. This effectively provides a weighted CF both in respect of lower values, typically obtained during pre and post spawn testing, and higher values typically obtained during the spawn.

Currently five factory vessels hold VSCF certificates for hoki, ling and hake. Comparisons of conversion factor data from standard observed trips (i.e. those where no VSCF testing takes place) with data from VSCF testing trips demonstrates that vessels often fail to meet their VSCFs during standard trips.

One of these vessels s 9(2)(a) was observed as part of a standard observer trip in August/September 2011. The vessel has VSCFs for hoki TRF and hoki TSK of 2.25 and 2.5 respectively. The gazetted conversion factors are 2.65 for hoki TRF and 3.1 for hoki TSK. The observer derived conversion factors for this trip were approximately 0.25 higher than the VSCFs. This resulted in a difference of -151,178kg in greenweight of hoki between what was reported in the CLR and observer derived figures. This equates to a difference of 9% of hoki reported for the trip. Table 13 below illustrates how the difference was calculated.

CLR #	State	CLR greenweight (kgs)	VSCF	observer average CF	calculated greenweight using obs CF	difference between CLR and calculated greenweight
2927733	TRF	220,595.00	2.25	2.5	245,259.00	- 24,664.00
	TRF	301,150.00	2.25	2.5	334,764.00	- 33,614.00
	TSK	12,525.00	2.5	2.736667	13,792.80	- 1,267.80
	TSK	63,954.00	2.5	2.736667	70,064.15	- 6,110.15
	TSK	98,100.00	2.5	2.736667	107,694.69	- 9,594.69
	TSK	20,888.00	2.5	2.736667	22,946.95	- 2,058.95
	TSK	320,484.00	2.5	2.736667	351,158.16	- 30,674.16
	TSK	458,888.00	2.5	2.736667	502,082.61	- 43,194.61
	Total	**1,496,584.00**			***Total***	***- 151,178.37***

Table 13 – Comparison of CLR greenweight and calculated greenweight (using observer CF data) for s 9(2)(a)

Analysis of 11 observed trips from 2010/11 found that during standard observer trips (6 trips where VSCF testing did not take place) most vessels processed, either very close to, or higher

[13] Fisheries (Conversion Factors) Notice 2005: Introduction and Background to Principal Landed State Definitions

than, their VSCF (and in one case up to 0.45 higher). All of these trips were well outside the spawn period except for one trip which was a late to post spawn trip.

During pre- or post-spawn trips recovery is typically higher and the CF therefore lower than trips undertaken during the spawn. Most vessels are able to achieve CFs below their VSCF during VSCF testing trips at pre- or post-spawn times. It is therefore of concern that during standard observer trips outside of the spawn (pre- or post-spawn) CFs in some cases were equal to or higher than the VSCFs held by the vessels.

There is also evidence vessels change their processing practices during VSCF testing trips. On these trips, at the completion of the 21 day VSCF testing period, post-testing CFs obtained by observers have been above the VSCFs and in some cases closer to the official CF. For example during the VSCF testing period onboard the s 9(2)(a) during December 2011-January 2012 the observers obtained a CF for HOK TSK of 2.87 which is close to their VSCF of 2.85. Following the testing period the observers reported a CF for HOK TSK of 3.18 which is higher than both the VSCF and the gazetted CF of 3.1,

There is a risk VSCFs may not be an accurate reflection of hoki processing in that some vessels are unable to achieve their VSCFs year round (pre, post and during spawn time) and that processing practices may alter during VSCF testing. The risk is that the amount of hoki being extracted from the fishery, mostly but not only during the spawn time, is not being accurately reported. Vessels may work harder to achieve lower VSCF during testing periods but then revert to 'normal' practice where the true CF may be somewhere in-between the official CF and the VSCF.

Table 14 on the next page compares VSCFs with actual CFs calculated by observers while on-board each vessel, for trips undertaken during the 2011 WCSI hoki season. 'Greenweight difference" is the difference between the reported greenweight calculated using the VSCF and the greenweight calculated using the recovery actually achieved during the voyage. This difference is an estimate of the hoki catch greenweight not reported during each voyage as a consequence of using the VSCF rather than the actual CF achieved during the voyage. Note that vessels are required to use their VSCF when reporting relevant catch. They may not use the gazetted CF or the actual CF.

The estimated total hoki greenweight not reported, as a consequence of using VSCFs, were 592,167 kgs by the three s 9(2)(b)(ii) fillet vessels; and between 202,369 kgs and 343,635 kgs by the two s 9(2)(b)(ii) fillet vessels.

Vessel	Trip Dates	Processed State	VSCF	Observer Calculated CF	Greenweight Difference (kg)
s 9(2)(a)	26/6/11 - 30/7/11	TRF	2.3	2.57	-52,673

	26/6/11 - 30/7/11	TSK	2.55	2.795	-77,571
	2/8/11 - 31/8/11	TRF	2.3	2.57	-44,740
	2/8/11 - 31/8/11	TSK	2.55	2.795	-74,054
s 9(2)(a)	22/6/11 - 2/8/11	TRF	2.25	2.5	-66,634
	22/6/11 - 2/8/11	TSK	2.5	2.736667	-69,668
	4/8/11 - 13/9/11	TRF	2.25	2.5	-58,278
	4/8/11 - 13/9/11	TSK	2.5	2.736667	-92,900
s 9(2)(a)	24/7/11 - 24/8/11	TRF	2.4	2.45	-9,617
	24/7/11 - 24/8/11	TSK	2.65	2.8	-46,033
s 9(2)(a)	17/5/11 - 29/6/11	TSK	2.7	2.5675*	65,930
				2.9*	-75,336
	30/6/11 - 9/8/11	TSK	2.7	2.895	-70,643
	10/8/11 - 1/9/11	TRF	2.35	2.525	-6,962
	10/8/11 - 1/9/11	TSK	2.7	2.895	-19,616
s 9(2)(a)	24/6/11 - 2/8/11	TRF	2.45	2.635	-6,142
	24/6/11 - 2/8/11	TSK	2.85	3.12	-87,920
	3/8/11 - 13/9/11	TRF	2.45	2.635	-18,119
	3/8/11 - 13/9/11	TSK	2.85	3.12	-58,898

Table 14 - Summary of greenweight difference using observer calculated CF instead of VSCF

	Observed trip with conversion factor tests undertaken during the trip
	Non-observed trip with observer conversion factors taken from other observed spawn trips
*	Observer did two different CF calculations onboard the s 9(2)(a) - one during the official VSCF re-testing period (2.5675), the other later (2.9)

This issue requires further examination and more in-depth analysis. There is an ongoing need to evaluate CFs in relation to observer testing procedures, fishing area, test type (random versus non random), processing equipment and the quantity of fish tested and particularly to evaluate the legitimacy of the VSCF system. Some of this work is in progress by fisheries managers. It is important VSCFs encourage efficiency, not provide vessel operators with a means of under-reporting catch. A full report on VSCF's is attached as Appendix 4.

6.11 Vessel Processing and Grading Specifications

All vessels operating in the hoki fishery produce products in line with company processing and grading specifications to meet the needs of their customers. A wide selection of species, sizes and quality grades are processed.

LPFVs typically process to HGT or DRE states which are packed to specific size grades and in some instances quality grades (such as 'A' and 'B'). Typically this product is destined for further processing offshore.

Price differentials exist between size grades for hoki HGT and DRE product. The differential is estimated to be between US$50-100 per tonne/grade, with the largest grade (i.e. 2L) being the most valuable.

NZ fillet vessels specialise in meeting the needs of their market by producing highly sought after product states such as trimmed skinless or skin-on fillets. These products are packed to specific size grades and quality specifications.

6.11 (a) Limited Processing Vessels

Table 15 below is a summary of hoki HGT processing and grading specifications by company which were obtained from the companies during vessel inspections.

The specifications relate to grades (i.e. S, M, L and 2L) produced and are generally defined by a weight range for processed fish and associated number of fish per block specific to that grade. For a complete list of vessel processing specifications see Appendix 5.

	S		M		L		2L	
s 9(2)(a)	Number of fish	Weight per fish (g)	Number of fish	Weight per fish (g)	Number of fish	Weight per fish (g)	Number of fish	Weight per fish (g)
	20-50	200-500	12-20	500-800	1-13	800+		
				300-500		500-800		800+
	60	230	28	520	20	680	14	1000+
	30-70	200-500	22-29	500-700	16-21	700-1000	1-15	1000+
		200-300		300-700		700-1250		1250+
	27+	-500	20-26	500-720	14-19	720-1000	1-13	1000+
	45	289	25	520	17	722	12	1000
	30-70		22-29		16-21		1-15	
	26-45		19-25		14-18		1-13	

Table 15 - Summary of hoki HGT processing specifications by company for LPFVs

Grading specifications facilitate comparison of the landed size mix reported by the vessel on unload manifests to the expected size mix calculated from observer length frequency data. Discrepancies between the reported and expected size mixes may indicate highgrading has occurred. This is described in more detail in section 6.12 below.

Values for both minimum and average fish piece weights were calculated using data obtained during Fishery Officer inspections. These weights were translated to lengths using the hoki length/weight relationship described by Francis (2003). Table 16 on the next page compares hoki lengths (minimum and average) as they relate to a vessel's smallest grade produced.

	Calculated Minimum values per piece	Calculated Average values per piece

Vessel Nationality	Vessel name	Observer	Smallest Grade Produced	Minimum hoki length (mm) [size cut off declared to FO's]	Weight (g)	Length equivalent (mm)	Weight (g)	Length equivalent (mm)
	s 9(2)(a)							
Ukraine		No	M		405	600	538	660
		Yes	S	470	272	520	302	540
		No	<500	470	420	610	487	640
		No	<500	**470**	388	**590**	411	**600**
		Yes	<500		401	**600**	432	**610**
		No	S	**470**	293	**530**	324	**550**
		No	S	**470**	229	**490**	344	**560**
						563		***594***
Korean		No	S	**480**	414	**600**	504	**650**
		No	S		418	600	494	640
		No	S		308	540	336	560
		Yes	S		408	600	441	**620**
		No	2S	600	157	430	217	480
		Yes	2S		181	450	234	**490**
		No	S	600	390	590	471	630
		No	S		451	620	495	640
		No	S	550	463	630	492	640
		Yes	S		401	600	504	**650**
		No	S	550	362	570	514	650
		No	S	500-640	401	600	468	630
		No	S	600	438	610	503	640
		No	S	**550-600**	489	**640**	515	**650**
		1 week only	S		422	**610**	477	**630**
	Korean Average					***579***		***613***
Average All Vessels						***574***		***607***

Table 16 - Summary of minimum and average lengths of hoki within smallest grade processed by LPFVs.

The Ukraine vessels all said that they processed hoki down to a length of 470mm and that any hoki less than this length were mealed. By comparison the Korean vessels said they processed hoki down to a lengths between 480-640mm and that any hoki outside of this size range would be packed whole (i.e. GRE). The data in table 16 compares these lengths to lengths calculated from carton inspection data. The data shows that on average the Ukraine vessels process hoki down to a length of 594mm for their smallest grade (with a minimum length of 563mm). By comparison the average hoki length processed down to by Korean vessels is 613mm (with a minimum length of 579mm). Based on this data, it appears that LPFVs have understated the length of hoki that they process down to.

When observers were onboard, the calculated lengths hoki were processed to were at times higher than when observers were absent. This may be because unwanted small hoki could be legally discarded under authority by a MPI observer. For example, the s 9(2)(a)

discarded 7.6 t of small hoki (<600mm) under authority and consequently the length of hoki processed down to was 60 mm more than on trips where no observer was on board.

All captains maintained that their crews do not pack small hoki into other grades and they pack to vessel specifications, that they don't mix grades, and that there is a need to maintain required standards. Analysis of data obtained by Fishery Officers at inspections generally supports this statement. There were some instances where product didn't meet the specifications for the grade recorded on the carton. Where this occurred, the contents of the block inspected usually met specifications for a grade larger than that recorded on the carton, eg a carton labelled 'M' containing 1 x 'M' block and 1 x 'L' block. This may suggest incorrect labelling at time of packing rather than a propensity to mix hoki of different grades. Refer to Appendix 6 for a summary of instances where grading specifications were not met.

Fishery Officers noted poor quality control on one vessel while opening cartons and checking their contents and grade. In this case during the examination of a carton of S (small) grade hoki HGT it was found that a block contained 2L (large) grade hoki HGT. In another carton of S grade hoki HGT a block of M (medium) hoki was present.

Some vessels also report damaged and mixed size fish grades for which there are no packing specifications. An assessment has been made of the size of fish being packed into these grades according to numbers of fish and weights recorded by Fishery Officers. Only 2% of the damaged/mixed fish cartons inspected would have been consistent with small size grades (ie 2S/S). Hence it is evident that this is not where any missing small fish are being packed.

Table 17A shows proportions of hoki landed by grade for Korean LPFVs, as recorded on vessel unload manifests.

Vessel Name	Observer	HGT						DRE	GRE	
		N/A*	2S	S	M	L	2L	N/A*	N/A*	ACC
s 9(2)(a)										
	No	0.1%		7.6%	18.7%	28.0%	43.7%		1.8%	
	No	1.7%		5.6%	17.1%	30.4%	44.4%		0.7%	
	No	0.6%		6.0%	21.6%	30.4%	39.7%	0.4%	1.1%	
	Yes	0.1%		11.9%	26.7%	23.7%	32.9%		0.4%	4.2%
	No			6.8%	19.1%	31.1%	42.6%			0.5%
	No			5.8%	12.4%	23.4%	56.3%		2.1%	
	No			6.5%	13.1%	27.5%	50.9%		2.0%	
	1 week			9.8%	17.5%	27.4%	43.7%		1.5%	
	No			11.6%	15.2%	25.1%	46.7%		1.5%	
	No			2.9%	9.4%	26.7%	58.7%		2.4%	
	No			4.4%	11.0%	29.6%	53.3%		1.8%	
	No		0.3%	11.6%	16.8%	29.5%	39.8%		2.1%	
	Yes		0.2%	5.7%	11.8%	28.5%	52.9%			0.8%
	No			8.1%	14.8%	31.8%	42.8%		2.5%	
	Yes			9.2%	16.3%	30.4%	41.6%			2.5%

Table 17A - Proportions of hoki landed by grade for Korean LPFVs. ***(* No size grade recorded. Note: HGT, DRE and GRE Block ('N/A') figures taken from unload schedule; GRE ACC figures taken from CLR).***

On average, 74% of hoki product landed was represented by 2L and L grades on vessel unload manifests. Therefore, the remaining 26% was largely made up of M, S and 2S, with less than 2% accounting for green block.

Table 17B shows proportions of hoki landed by size grade for Ukrainian LPFVs, as recorded on vessel unload manifests.

Vessel Name	Observer	HGT					MEA	GRE
		N/A*	S	M	L	2L	N/A*	ACC
s 9(2)(a)								
	No	2.0%		1.5%	20.3%	75.0%	1.2%	
	Yes	0.4%	0.5%	21.4%	46.0%	30.4%	1.3%	
	No	0.3%	0.2%	21.0%	50.3%	27.5%	0.8%	
	No	0.2%	0.4%	23.5%	48.2%	26.9%	0.7%	<0.1%

Table 17B - Proportions of hoki landed by grade for Ukraine LPFVs using size grades. *(* No size grade recorded. Note: HGT, DRE and GRE Block ('N/A') figures taken from unload schedule, GRE ACC figures taken from CLR).*

According to processing specifications, the s 9(2)(a) has no grade for fish under 300g/piece (processed weight), unlike the three s 9(2)(b)(ii) vessels that have an 'S' grade for 200-300g fish pieces. The specifications for 'M', 'L' and '2L' are also different for the s 9(2)(a), hence the large difference in proportions between this vessel and the other three.

On average, 76% of hoki product landed by s 9(2)(b)(ii) vessels was represented by 2L and L grades on vessel unload manifests, which is similar to the Korean vessels' data. The remaining 24% was largely made up of M grade, with 1% on average accounting for fishmeal.

Table 17C shows proportions of hoki landed by weight grade for Ukrainian LPFVs, as recorded on vessel unload manifests. These vessels do not report by size grade (ie 'S', 'L') but by a weight grade. As these weight gradings do not entirely match those used by vessels in table 17B, they have been displayed separately.

Vessel Name	Observer	HGT				MEA
		N/A*	<500	500-800	>800	N/A*
s 9(2)(a)						
	No	2.7%	4.4%	21.7%	70.9%	0.3%
	No	0.6%	3.8%	24.9%	70.4%	0.2%
	Yes	0.7%	8.2%	26.8%	62.6%	1.8%

Table 17C - Proportions of hoki landed by grade for Ukraine LPFVs using weight grades. *(* No size grade recorded. Note: HGT, DRE and GRE Block ('N/A') figures taken from unload schedule, GRE ACC figures taken from CLR).*

On average 92% is accounted for by the largest two grades (that is, hoki ≥ 500 g per processed piece).

6.11 (b) Fillet vessels

Table 18 on the next page is a summary of processing and grading specifications for NZ fillet vessels obtained from the companies during vessel inspections. The specifications provide information relating to states TSK, TRF and UTF. The grades relate to a fillet piece weight and/or a count of fillet pieces which are produced typically for shatterpac product lines. For a complete list of vessel processing specifications see Appendix 5.

	Processed State	Grade '2'	Grade '4'	Grade '6'	Grade '8'	Grade '12'	Grade '16+'
s 9(2)(a)	TRF	2-4oz	4-6oz	6-8oz	8-12oz	12+oz	16+oz
	TSK	2-4oz	4-6oz	6-8oz	8-12oz	12+oz	16+oz
	TRF	60-115g, 60+ count	115-175g, 40-60 count	175-230g, 30-40 count	230-340g, 20-30 count	340g+, 1-20 count	453.5g+, 1-13 count
	TSK	60-115g, 60+ count	115-175g, 40-60 count	175-225g, 30-40 count	225-340g, 20-30 count	340g+, 1-20 count	
	TRF	2-4oz/ 55-115g	4-6oz/ 115-170g	6-8oz/ 170-225g	8-12oz/ 225-340g	12-16oz/ 340-450g	16+oz/ 450g+
	TSK		4-6oz/ 115-170g	6-8oz/ 170-225g	8-12oz/ 225-340g	12+oz/ 340g+	
	UTF				8-12oz/ 225-340g	12-16oz/ 340-450g	16+oz/ 450g+
	TRF	60-110g ('S' grade)	110-175g ('M' grade)	175-225g ('L' grade)	225-340g ('LL' grade)	340g+ ('3L' grade)	
	TSK		110-170g ('M' grade)	170-225g ('L' grade)	225g+ ('LL' grade)		

Table 18 - Summary of fillet vessel processing specifications for hoki

It is not currently possible to use grading specifications for fillet vessels to undertake a length based analysis as a large proportion of landed catch is ungraded in fish block. However for these vessels any unreported whole hoki should be reported as meal (MEA) but may be declared as meal derived from offal (MEB). This is described in more detail in section 6.12 below.

Table 19 below provides a comparison of the minimum size of hoki that will be filleted by a vessel, as declared to Fishery Officers at inspections, with the length equivalent to the smallest size fillet described in the company processing specifications for that vessel. The length equivalent has been calculated using the Francis (2003) predictions from greenweight after applying the VSCF to the fillet weight (assuming two fillets produced per hoki).

Vessel Name	Processing Specification for Smallest Fillet Grade	Declared Minimum Size (mm)
s 9(2)(a)	2oz=57g~450mm	460
	60g~460mm	280-300 or 550
	60g~450mm	400
	110g?~580mm	400-450 (cut length)
	60g~460mm	300
	TRF2oz/55g~450mm TSK4oz/115g~610mm	470

Table 19 - Comparison of processing specifications for smallest grade and declared minimum size processed

The s 9(2)(a) have specifications that are comparable with the minimum size processed as declared to Fishery Officers. The s 9(2)(a) gave two quite different responses at different inspections with regard to the smallest length fish processed, neither of which matches the processing specifications for the vessel. The s 9(2)(a) all declared to Fishery Officers that they process smaller fish than appear to be allowed for by the processing specifications.

Poor quality control was noted during the s 9(2)(a) inspection on 1 September. In this instance two cartons of HAK (grade 3L) contained hoki. For a further 10 cartons out of 108 opened and inspected, there was a 20% error rate found where the species recorded on the

carton did not match its contents. The vessel's factory manager was advised and it was arranged for all 108 cartons to be opened and inspected as some re-declaration was required.

Tables 20A and 20B show proportions of hoki landed by grade for fillet vessels, as recorded on vessel unload schedules.

Vessel Name	Observer	<4oz/ 115g	4-6oz/ 110-170g	6-8oz	8-12oz	>12oz	>6oz	(a)	5kg	Block
s 9(2)(a)	No	1.8%	6.5%	8.3%	18.5%	24.9%	4.4%			35.5%
	No		7.9%	10.5%	24.4%	23.3%	2.2%			31.8%
	Yes		7.6%	10.2%	23.6%	33.4%	5.2%			20.0%
	No		5.5%	14.2%	26.9%	28.1%	8.4%		0.6%	16.3%
	Yes	0.3%	5.1%	8.8%	20.4%	23.5%	2.5%	0.1%	2.2%	37.1%
	Yes		5.2%	8.5%	9.2%	13.5%	4.3%			59.2%

Table 20A - Proportion of hoki landed by grade for fillet vessels using weight grades

In the majority of cases fish block and large size grade fillets (i.e. 8-12oz and >12oz) accounted for on average 78% of a vessel's landing. The remaining 22% was typically accounted for by smaller size fillet grades (such as < 4 oz, 4-6 oz, 6-8 oz and > 6 oz).

Vessel Name	Observer	M	L	LL	LLL	FB (fillet block)	PB (piece block)	Block	UG standard Block
s 9(2)(a)	No	2.8%	1.5%	9.1%	9.8%			37.7%	39.0%
	No	1.0%	1.1%	2.7%	2.0%	12.3%	3.4%	19.1%	58.3%

Table 20B - Proportion of hoki landed by grade for fillet vessels using size grades

For the s 9(2)(a) 85% (on average) were made up of A grade and standard fish block.

6.11 (c) Reporting of 'B' Grade Hoki

One vessel reported during the processing of a 31 tonne tow, 50 blocks of small and /or damaged hoki had been produced. Between 10-20% of it was damaged hoki which was rejected after it had been processed to a HGT state. A total of 50 blocks were reported for this day made up of hoki HGT 'B' block and whole fish packed as green block. The decision to downgrade the HGT hoki to B block was made after the fish had been processed. The captain said that the "high percentage of damaged fish was due to the large size of the bag".
The practice of downgrading product after it has been processed may not be representative of the fishery, however, it illustrates the potential for fishers to discard any fish that does not meet 'A' grade specification.

There is anecdotal information suggesting that some vessels report 'B' grade hoki as a means of disguising illegal discarding of small and/or damaged hoki. Where this has happened product has been subsequently relabelled as "A" grade product after reprocessing offshore as it met the "A" grade specification and not that of the "B" grade.

There may be a compliance risk in that small and/or damaged hoki are discarded and therefore not reported. The monitoring of 'B' grade product may be required in order to determine if this product meets packing specifications. This can be achieved through vessel inspections at sea and in-port carton contents inspections of reported 'B' grade hoki product.

6.11 (d) Small Hoki

Limited Processing Vessels

According to information provided by their captains, LPFVs intend to process hoki down to between 470 mm and 640 mm total length. Hoki below that size are either packed into green block or mealed. A MPI observer onboard the s 9(2)(a) noted that small hoki were difficult to avoid, and this occurred regularly in catches of mostly larger hoki.

The main compliance risk with LPFVs is that unwanted small hoki are illegally discarded and not reported (where there is no meal plant); or unwanted small hoki are mealed and the quantity to MEA (primary state) is under reported whilst the quantity of MEB (by-product) produced is inflated.

Fillet vessels

According to information provided by their captains, NZ fillet vessels intend to process hoki down to between 280 mm and 470 mm total length. Hoki below that size is mealed. MPI observers noted there were no significant changes to fishing strategy to avoid catching small hoki apart from the s 9(2)(a) which would move well away from an area if it caught small hoki.

On fillet vessels HOK is sorted by the factory so it can be processed on the different Baader filleting machines (such as the 190,192 and 212) depending on the size and state the vessel is processing to. Sorting and processing small fish may take longer than the equivalent weight of large fish.

The main compliance risk on fillet vessels is that unwanted small hoki are are mealed and the quantity to MEA (primary state) is under reported whilst the quantity of MEB (by-product) produced is inflated.

6.11 (e) Whole Hoki to Green Block

Fishery Officers asked the captains of all vessels what they did with whole damaged and/or small hoki that was not suitable for processing.

In general LPFVs said that they either: mealed or packed green, small or damaged hoki. In instances where at least 1 side of a damaged hoki could be recovered then the fish was considered suitable for processing. However there were exceptions to this as noted below:

- The captains of the s 9(2)(a) said they only processed hoki to one grade. If it was damaged or didn't meet the grade specifications it was packed to green block. The captain of the s 9(2)(a) said that green block is virtually worthless and does not provide any financial return for himself or the crew.

On average, vessels reported 1.8% whole hoki to green block on trips where no MPI observer was present. By comparison, in the presence of MPI observers, the average reported hoki green block was higher, at 2.67%.

The majority of fillet vessels commented that they do not produce green block, as small and damaged hoki is mealed via the meal plant. Generally all damaged QMS species were binned and quantified. All other species were time sampled or binned, and then weights were calculated and recorded on paper, before the fish was mealed.

6.11 (f) Species to Meal

Twelve vessels inspected had meal plants. Captains were asked about the operation of the meal plant and under what circumstances whole fish would be mealed. Some of their comments were as follows:

- Small and damaged HOK, RBT, SDO, small FRO and other incidental quantities of quota and non-quota fish are sent to meal.
- All non-processed non-discarded fish mealed along with heads and trimmings etc of processed whole fish. Mealing is a big part of the operation. Non-processed fish includes small and damaged quota species assessed by time sampling.
- All species may go to meal including fillets that have fallen on the factory floor. All fish product is weighed before it goes into the meal plant.
- Captains of some NZ fillet vessels said they only produce white fish meal made from damaged and/or small whole fish such as hoki, southern blue whiting and frostfish.
- Some Ukrainian vessels produce both white and brown fish meal. Brown fish meal is made from the more oily fish such as barracouta, jack mackerel, redbait and silver warehou.

There are compliance risks associated with meal plants, in particular mealing and reporting of whole quota species to meal. As most vessels meal offal, frames, and damaged and small fish, mealed quota species may be under-reported or not reported at all. The amount of offal meal may be over-reported to conceal the true amount of whole fish going to meal product.

Table 21 below compares percentage of hoki meal (i.e. MEA reported) to total hoki greenweight. Three trips with <1% of meal reported stand out. Data from previous investigations and prosecutions concerning reporting whole hoki to meal indicate these reported percentages highlighted yellow are improbable.

Vessel Name	Observed Trip	Hoki Meal GW	Hoki Primary Product GW	% Hoki Meal
s 9(2)(a)	No	29,194	2,378,288	1.2%
	No	960	89,833	1.1%
	Yes	36,561	2,696,612	1.3%
	No	19,742	1,301,101	1.5%
	No	11,793	1,143,906	1.0%
	Yes	12,822	1,268,364	1.0%
	No	50,551	1,364,043	3.6%
	Yes	58,426	1,926,906	2.9%
	No	11,431	3,246,398	0.4%
	No	5,051	2,043,096	0.2%
	Yes	21,104	1,237,896	1.7%
	No	21,316	1,812,745	1.2%
	No	19,224	2,787,509	0.7%
	Yes	24,150	1,471,506	1.6%
	No	132,646	2,396,745	5.2%
	No	56,689	2,708,654	2.0%
	Yes	53,659	1,168,375	4.4%

Table 21 - Comparison of hoki meal to primary product reported on CLR

Two vessels reported significantly less whole hoki to meal on non-observed trips than when carrying MPI observers. This suggests that in the absence of MPI observers some whole hoki are being mealed but not reported.

The captains of s 9(2)(a) reported that there had been no meal plant breakdowns during the trip. The captain of the s 9(2)(a) advised that if the meal plant broke down the fish would be stored in the hopper, until the plant was fixed. The captain said if a major breakdown occurred that could not be fixed, the vessel could return to port to have it serviced.

Operation of the meal plant (on MPI Observed vessels)

Of the seven vessels carrying MPI observers (s 9(2)(a) three vessels had meal plants on board. All three vessels had specialist meal plant operators. Engineers assisted with the maintenance of the plant.

The observers noted that only small and damaged hoki is mealed. In addition all offal, frames, low value and non-quota species are mealed along with whole hoki to produce a white meal. Moisture content of the meal is checked to make sure it is < 10%. Barox Antioxidant is added to the meal during processing.

The observers onboard the fillet vessels reported that small (≤ 60cm) and damaged hoki are sent to meal. Some small hoki ≤ 60cm can be put through the baader 212 and the fillets are then minced.

Observers explained that, to assess the greenweight of the fish going to meal, either:

- whole fish is weighed in full, or
- crews use 'number of bins' x 'average weight of bins'.

The sorting crew calculate greenweight and normally record them on a whiteboard. Totals are then recorded in a log book by the factory shift managers tow by tow.

All three vessels reported that they mealed 100% of their offal. The observers explained that offal is calculated by a count of meal sacks x 30 kgs x the Conversion Factor of 5.6, less weights for whole fish to meal. The meal plant operator keeps a count of sacks in a log which is given to the factory manager for entry into the daily processing summary of the TCEPR.

Of the three observed vessels with meal plants, two experienced a meal plant breakdown. One breakdown was minor and took 30 minutes to repair. The other took 3 hours to repair. Hoki and other species were either held in the hopper or in bins until the breakdown was rectified.

Captains described the quantification of whole fish to meal as:

> *The whole fish going to meal is weighed. In one instance the hopper held 100kg of fish and the number of full hoppers is marked on a sheet. The crew can calculate the species and amount going to meal and the difference is calculated as offal. Offal is often on a separate line and goes directly to the meal plant. Bycatch is often binned and weighed and recorded as whole fish.*

Compliance risks are:

- Not all whole quota species going to meal are recorded
- The offal quantity to meal (MEB) is too high indicating that some whole fish to meal is unreported

Reporting of Meal in Catch Effort Returns

In July 2008, MFish sent a letter to industry regarding revised reporting procedure of Fishmeal (MEA) and Fishmeal By-product (MEB) (Refer Appendix 7). Bags of meal contain whole fish and parts of fish of many species; hence greenweight for MEA can't be back calculated using the Conversion Factor as it usually can for other processed product.

The letter stated that Fishing Industry and MFish Representatives had collaborated to develop a system for reporting of meal. This system required that the total number of bags of meal produced be entered for one species (with the other species all recording nil). The unit weight was to be entered for all species contributing to the total amount of meal. Greenweight was to be entered for each MEA species as per the calculation done on board prior to mealing, with MEB greenweights recording nil.

If this reporting procedure is used, then the amount of MEB produced, for all species combined, should be able to be calculated as follows:

(Total Number Bags Meal * Bag Weight * Conversion Factor) – Reported MEA Greenweight.

The letter stated that this was an interim measure while more robust alternatives were discussed, and was to be reviewed annually after the 2008/09 fishing year. We are unaware of any reviews having taken place.

The method of reporting of meal varies across the fleet. Half report the number of bags in total against just one line of MEA or MEB (as suggested in the above letter); and the remainder report bag totals against both MEA and MEB which add to the number of bags produced.

The recording of meal needs to be addressed by the Deep water Group using the July 2008 letter as a reference. There needs to be clarity and consistency on the reporting of MEA and MEB in the TCEPR and CLR.

6.11 (g) HOKI Mince Produced

Hoki mince is produced only by the New Zealand fillet vessels. It is either produced as MKF (hoki mince skin-off fillets) as a primary state (which comprises of pieces from a TSK hoki fillet) and therefore comes off ACE, or it is produced to MBS (minced by-product skin-off fillets) which are trimmings from the TSK hoki fillets and therefore does not come off ACE and is considered a secondary state.

Fishery Officers asked the New Zealand captains of fillet vessels a number of general questions about the different parts of the hoki fillet that go to make up the mince. Appendix 8 lists a few responses from the captains.

6.11 (h) Identification of factory processing compliance issues from at-sea phase

1. Fish mis-cut by processing machinery, due to size, condition, machinery malfunction and/or human error.

Processing factories can process large volumes of hoki within a short space of time. Conveyors feed fish from the fish pounds to sorting and processing areas within the factories so fish receive minimal handling. Fish can by mis-cut when they are not correctly fed into processing machinery or slip through a machine when a large volume comes through. Fish of incorrect size (too small or too large) may also be mis-cut during processing. Occasionally faults with filleting machines can also damage fish.

2. Fish lost off conveyors sorting trays to floor

As vessels are moving (in rough weather more so) and fish is slippery it is not uncommon for fish to be lost off conveyors or from sorting areas onto the floor. Fish can also be 'dropped' out of processing machinery. When factory staff are busy processing large volumes of fish, fish lost to the floor may not be retrieved until the end of shift or sometimes not for several days.

3. Fish jammed under conveyors / other processing areas

With large volumes of hoki moving through a factory, fish occasionally get jammed between conveyors and other parts of processing areas. Some fish is damaged as a result.

4. Quantifying damaged fish to meal or green block

During Op Bronto observations were made of how fish was handled and quantified prior to being mealed and/or packed whole. On many vessels damaged or small fish is separated into fish bins ready to be weighed or counted. On other vessels it was not immediately obvious how this fish was quantified.

5. Torn/damaged fillets from skinning machines

Vessels producing HOK TSK (skin off trimmed fillets) skin the fillets using skinning machines. Occasionally these machines malfunction causing damage to fillets. Also if fillets are old, soft or slightly damaged the fillets may break or tear during the skinning process.

6. Stickers – fish caught and damaged in net

'Stickers' is the name given to fish caught in the net mesh or wings of the trawl net. Many 'stickers' are removed while the net is on the trawl deck to a trawl prior to it being re-shot. This is to help mitigate incidents of non-fish by-catch or mortalities. 'Stickers' are often damaged or unable to be processed and should be reported and quantified when sent to meal or green block.

These issues identified above were observed, occasionally photographed and/or videoed, during Hoki patrols in 2011. While these issues in themselves are not compliance risks as such it is important all damaged, lost or small fish is quantified correctly and accurately accounted for. The risk is that without a MPI presence, such as a fishery officer or observer onboard, fish that is damaged, small, or mis-cut may be discarded or mealed and not reported in the appropriate returns.

6.12 Hoki Highgrading in the WCSI hoki fishery

The deliberate discarding of smaller, damaged or less valuable hoki to maximise economic return is referred to worldwide as highgrading, as detailed earlier in this report.

It is estimated that during the 2011 season, at least 1,541 t of hoki catch went unreported. This total consists of at least 559 t attributed to LPFVs and at least 982 t to fillet vessels.

During the in-port inspections every landing and every net of every large factory vessel was inspected and measured, and the processing and grading specifications from each vessel were obtained.

Observers at sea measured over 25,000 fish to construct a length frequency curve for the fishery. In the absence of highgrading one would expect the length frequency of the landings

to approximate the length frequency of the fish seen by the observers. Figure 18 below illustrates hoki length frequency data for the 2010-11 WCSI hoki spawn.

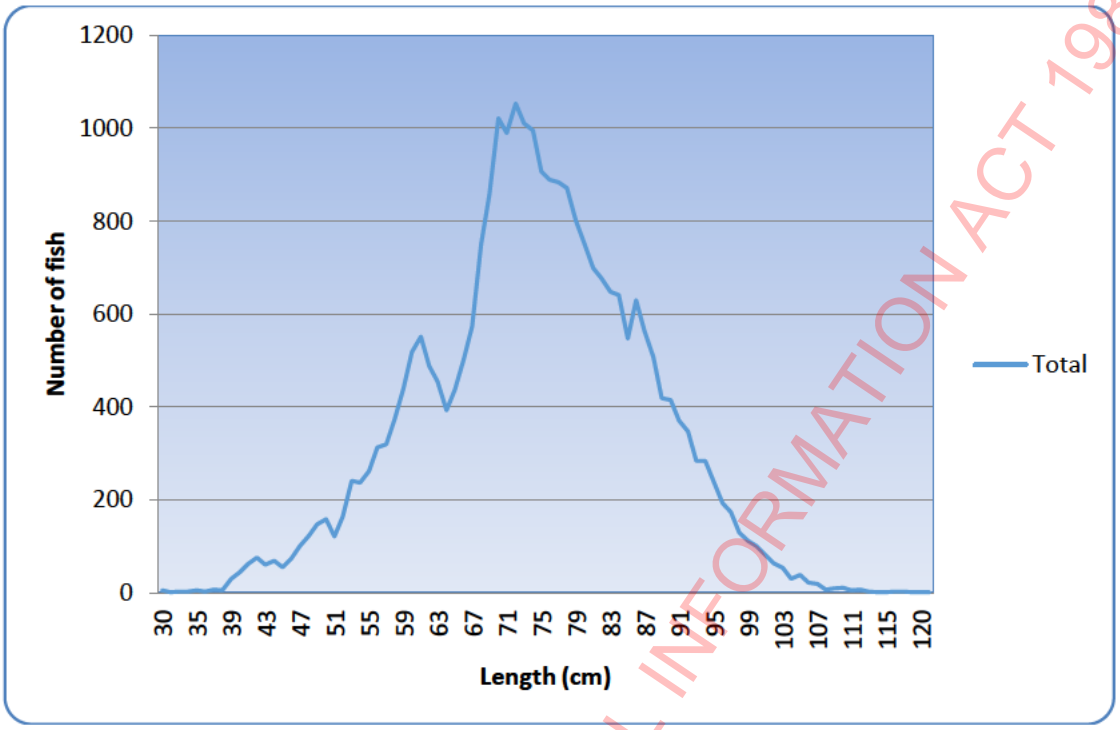

Figure 18 - Observer length frequency data for the WCSI hoki winter season.

In theory highgrading is most likely to occur in fisheries where:

1. There is a wide price difference between large and small fish; and
2. The proportion of large fish expected in future catches is high; and
3. The cost of additional fishing effort is low; and
4. The fishery is managed under a system of individual limits on landings.

The WCSI hoki fishery exhibits all four of these characteristics.

6.12 (a) Length based analysis

In order to identify the extent of highgrading in the WCSI hoki fishery a length-based analysis was carried out by s 9(2)(a) . The results of this analysis found that the landings of the LPFVs contained a smaller proportion of small hoki than expected. It was estimated that the LPFVs omitted to report at least 559 t of small fish, or about 30% of the small fish that they caught. However the true quantity is probably higher due to the conservative assumption that all the net damaged hoki going to meal or green block are small.

Table 22 on the next page shows the amount of reported hoki smaller than 'M' grade as a percentage of the expected amount as calculated from observer length frequency data.

Vessel	Trip	%age of expected	Observer

		hoki < M grade	
s 9(2)(a)		*61	MPI
		141	MPI
		* 37	Ind
		* 21	Ind
		94	Ind
		74	Ind
		213	Ind
		88	Ind
		91	Ind
		130	MPI
		88	Ind
		100	None
		* 65	MPI
		210	None
		73	None
		* 41	None
		99	MPI
		* 71	None
		79	None
		82	None
		72	None
		94	None
		72	MPI
		84	Ind
		* 42	Ind
		* 71	Ind
		* 54	None
		85	Ind
		* 50	None
		101	None
		112	MPI
		266	None
		* 72	Ind
		175	None
		* 66	None

Table 22 - Hoki smaller than M grade cutoff size in landings as a percentage expected weight. Trips marked with a * are outside the 95% confidence bound

Note that although trips with "industry" observers on average land a lower percentage of small hoki than do those carrying MPI observers (81 vs 97%) the comparison is invalid. Vessels with MPI observers aboard can and do make authorised discards of hoki at sea, but the size frequency of these discards is not recorded. This creates some difficulty in interpreting the figures for vessels with MPI observers in the Table above. For example, s 9(2)(a) discarded 3.7 tonnes of hoki on trip 5553924. If most of the fish were small then we can't expect the proportion of small fish landed to reflect the proportion of small fish in the catch.

Two unobserved vessels that stand out as having particularly low proportions of small fish in their landing are the s 9(2)(a) and these would make good targets for further investigation in the coming hoki season.

6.12 (b) Meal By-product analysis

The filleting vessels are producing ungraded products (e.g. fillet block), so a length-based analysis of landings is not possible. However all of the fillet boats do have meal plants, and we expect that any small hoki not wanted for other processing will be converted to fish meal. For these vessels we compared the amount of fish meal said to have been produced from offal with the amount of offal available as a by-product of processing. In most cases the production of fishmeal from offal is unrealistically high and the offal supply has presumably been supplemented with unreported whole fish. At least 982 t, but probably more than 2,000 t, of whole fish would be required to meet the deficit. Whether or not these unreported whole fish are hoki is unknown, and there is a possibility that the discrepancy is due to unrealistic vessel specific conversion factors.

In addition to the fillet vessels, Operation Bronto included 16 trips by LPFVs with meal plants. In total, these trips reported about 75% of the expected amount of MEB, the difference potentially being attributable to losses of offal and offcuts which don't make it to the meal plant. The figures for fillet vessels are quite the opposite. There were 11 trips by fillet vessels, of which three carried MPI observers. The unobserved trips reported 115% of the expected amount of MEB, while the observed trips reported 100.5%. The difference in offal meal production of filleting and LPFVs is shown in Table 23.

Vessel	Trip	MEB as %age of theoretical possibility	Observer
LPFVs			
s 9(2)(a)		92	None
		76	MPI
		71	MPI
		83	Ind
		74	Ind
		75	None
		75	None
		96	MPI
		81	None
		72	MPI
		95	None
		75	None
		97	None
		73	Ind
		53	None
Vessels filleting at sea			
s 9(2)(a)		115	MPI
		114	None
		108	None
		97	MPI
		110	None
		90	MPI
		130	None
		126	None
		101	None
		108	None
		140	None

Table 23 - Reported production of meal from offal (MEB) as a percentage of production possibility given the offal available

The difference between the filleting and LPFVs could arise for several reasons. There may be a systematic difference in the shipboard meal plants of the two fleets. There may also be some differences in the accuracy of the calculation of the amount of offal available. The

greenweights for processed product reported by the vessels are derived from the processed weights: the whole fish are not actually weighed before processing. If the conversion factors used by the vessels to do this back calculation are incorrect this will flow through into the calculation of offal available.

The LPFVs all use the standard gazetted conversion factors, while the fillet vessels typically have vessel specific conversion factors (VSCFs). As a VSCF is valuable to the company, the "demonstration of unusually efficient processing" required for provision of a VSCF will often involve heroic efforts by the factory staff which may not be maintained after the VSCF has been obtained. If the standard of processing is not maintained, the actual greenweight caught will be underestimated on future trips, as will the amount of offal available.

On an observed trip by the s 9(2)(a) the observers took the opportunity to test the processing efficiency being achieved in production of hoki fillets. The VSCF was not matched on any of these tests. Table 24 below shows the effect of incorrect VSCFs on the MEB percentage.

Conversion factor used	MEB %age of theoretical maximum
VSCF	115
Observer estimates from this trip	97
Gazetted conversion factor	84

Table 24 - Sensitivity of MEB percentage calculation to hoki conversion factors used: s 9(2)(a)

It is clear that there is a reporting issue that needs to be addressed, and that the MEB production by the filleting vessels is out of balance with the greenweight being reported.

The results of this analysis have shown that:

(i) The number of small hoki being caught and seen by MPI observers is not matched by the number of small hoki being landed by the LPFVs; and
(ii) The amount of offal meal being produced by most of the vessels filleting at sea is much higher than would be expected.

This suggests that the greenweight of hoki being removed from this fishery is being systematically understated. The difference in offal meal production between limited processing and filleting vessels also suggests that the current Vessel Specific Conversion Factors regime is in need of overhaul because it is failing to meet the policy objective of obtaining a more accurate and reliable calculation of greenweight.

For a full copy of s 9(2)(a) report refer to Appendix 9.

Operation Maxi, which looked at the prevalence of highgrading in this fishery in 2005 found essentially the same result.

6.13 Reporting of Bycatch

6.13 (a) General information

Fishery Officers noted the number and volume of reported bycatch species on some vessels appeared to be less than other vessels inspected during the same week and fishing in the same area. Fishery Officers also noted that vessels that undertook mid-water trawling when targeting hoki, at times reported catching only small quantities of bycatch (such as HAK, SWA, FRO and SKI).

Generally vessels without meal plants would pack whole bycatch to green block if damaged or below minimum specification. Overall species included JMA, BAR, SQU, SSI, RBT, GSH, BYX, LIN, HAK, SWA, FRO, LDO, SSK, and SPD.

The captains were asked what happened to the small bycatch species. Overall the captains responded that their vessels do pack small bycatch species to green block unless there is a meal plant onboard, and some of it might go to the galley and be reported as eats. The fish is weighed or a time sample is undertaken to estimate the weight of the fish.

During the examination of four cartons of LIN HGT one carton was found to contain ling that had been processed to a DRE state. No other instances of fish being processed beyond declared state were found in relation to processing by LPFVs. This indicates that the level of compliance in this area was to a high standard during Operation Bronto.

A number of captains were asked what happened to the damaged bycatch and how that damage was assessed. Their responses are in Appendix 10.

There is a compliance risk associated with vessels not reporting small un-processable bycatch as green block or meal.

6.13 (b) Reporting of Ling Heads

In 2005, as a result of analysis from Operation Maxi, it was identified that some vessels were landing large quantities of ling heads (as a by-product), much more than would be expected from the total greenweight of bodies (HGT/DRE) reported as landed. It was recommended that any vessel landing a proportion of heads of >30% of primary product greenweight be examined. This analysis has been done for the 2011 season data and four trips (out of 42 trips in total) have been identified as having a proportion greater than 30%. These are detailed in table 25 below.

	Vessel	Trip start date	Trip end date	LIN HDS processed weight	Total LIN GW from primary product	Proportion of HDS
s 9(2)(a)		8/7/2011	16/8/2011	26,136	77,441	34%
		2/6/2011	7/7/2011	12,172	36,826	33%
		1/8/2011	23/8/2011	2,304	7,232	32%
		28/6/2011	1/8/2011	15,168	47,770	32%

Table 25 - Comparison of ling heads to bodies by weight

The ratios calculated indicate that the above vessels have not reported sufficient greenweight as the weight of the heads is more than what would be expected. This suggests in respect of the four trips identified that unwanted ling bodies have been discarded and/or mealed, and gone unreported, but that the heads for which there is a market have been retained. The motivation for discarding ling bodies could relate to a lack of sufficient ACE, inability to source additional ACE, the possibility of incurring annual deemed values, or discarding and/or mealing damaged ling due to it's low value.

In all remaining trips (total of 38 trips) that reported producing ling heads, the proportion of HDS ranged from between 3% and 28% which is considered to be within the acceptable range.

The LIN7 TACC was over-caught by 13% in the 2010-2011 fishing year, and as such there was an incentive for operators to minimise any ACE liability for over-fishing their annual catch entitlement by dumping the ling bodies but retaining the heads.

6.13 (c) Analysis of unreported Bycatch

A study of unreported bycatch in the WCSI hoki fishery conducted in 2005 by s 9(2)(a) et al (2009) showed that the reported catch of unobserved vessels was different to the observed catch of similar vessels in the fishery. For that season 18% of the catch by weight was related to incidental bycatch. The study provided evidence of the misreporting of both quota and non-quota species. Species misreporting was found to be widespread amongst the vessels with meal plants but was not solely limited to this group.

For the 2011 season, many species that MPI observers recorded as being caught were quite different to what the fleet as a whole reported catching. The results are illustrated in tables 26 to 30 below.

Reported catch (adjusted TCEPR) is the sum of the TCEPR processed catches, multiplied by the ratio of CLR to TCEPR reported catches for all trips. Predicted catch, U95 and L95 is the median catch, and the upper and lower bounds of the 95% confidence interval derived from the observer CELB data. Percentage Reported is the reported catch as a percentage of the predicted catch. When the reported catch lies somewhere within the 95% confidence interval the percentage reported is described as "Ok".

(i) Major QMS bycatch species

The vessels in this fishery do report targeting species other than hoki, especially early in the season whilst waiting for the hoki to gather for spawning. These alternative target species are HAK, JMA, EMA, SWA and FRO.

These alternative target species create difficulties for this analysis. It is possible that the processing of large bags of (say) JMA may carry over into the next day which is exclusively targeting hoki, inflating the reported catch attributed to the hoki fishing. It is also possible that some vessels seek to maximize bycatch whilst also targeting hoki, violating the underlying assumption of the analysis is that the catches of each non-target species are random, at least within each stratum. For this reason JMA, EMA, SWA and FRO have been omitted from the analysis. The remaining QMS bycatch species likely to result in catches over 50 tonnes are shown in Table 26 below.

Species	Reported catch	Predicted catch	U95	L95	% reported
BAR	51546	73760	104343	48404	Ok
HAK	500370	1221932	1341928	1110233	43
LIN	591124	570055	622291	515060	Ok
RIB	10802	79661	92533	67995	15

Table 26 - Reported (adjusted TCEPR) and predicted catches of major QMS bycatch species in the 2011 WCSI hoki fishery

Hake is included here despite being an alternate target species because of the history of hake misreporting in this fishery. The May 2010 Plenary Document notes that historically….

There is some evidence to suggest that catches of hake were not always fully reported. Comparison of catches from vessels carrying observers with those not carrying observers, particularly in HAK7 from 1988-89 to 1990-91, suggested that actual catches were probably considerably higher than reported catches…..

The Plenary Document goes on to show that reported catch as a percentage of estimated catch was 78%, 56% and 75% in 1989, 1990 and 1991 respectively, and concludes with the

statement *More recently, the level of such misreporting has not been estimated and is not known.*

Ribaldo (RIB) is another species which has had reporting issues identified in the past. The Plenary document notes that

Discarding of ribaldo has been common, and the species has not been consistently reported on the forms, although there has been an increase in reported catch since the entry of ribaldo into the QMS.

It seems based on the results of this analysis that reporting problems with both HAK and RIB have yet to be resolved.

(ii) Minor QMS bycatch

There are a number of QMS species which are only a minor bycatch of the hoki fishery, with a total predicted catch of 50 tonnes or below. They are all common catches in other fisheries, and should present no problems of identification to the vessel crews.

The factory vessels in the hoki fishery are equipped to pack bycatch as dressed trunks in 24 kg cartons. To fill a 24 kg carton will require at least 40 kg of whole fish. Catches of these bycatch species will frequently be under 40 kg per tow and often under 40 kg per day. Small catches create logistical problems on the factory deck. The information systems on the vessels are also arranged around counting either cartons or blocks rather than weighing individually frozen fish, so these minor bycatch species may also present recording problems. The comparison of reported and predicted catch is shown in Table 27 below.

Species	Reported catch	Predicted catch	U95	L95	% reported
BNS	2913	3875	4793	3127	75
BYX	4246	9527	12410	7237	45
CDL	63	192	256	137	34
HPB	918	1159	1618	758	Ok
LDO	29629	50072	56529	45275	62
RBM	28080	30173	36941	24965	Ok
RBY	119	348	637	108	Ok
RCO	2020	3205	3785	2662	66
SCI	890	1639	1883	1407	54
SPE	24117	30601	35182	27519	82
STA	17776	12401	14691	10134	162
STN	876	1200	2150	400	Ok
SWO	2878	4490	6530	2575	Ok
TAR	225	325	606	115	Ok
WAR	1030	645	1225	224	Ok
WWA	5896	9772	15076	6116	69

Table 27 - Reported (adjusted TCEPR) and predicted catches of minor QMS bycatch species in the 2011 WCSI hoki fishery

It seems clear that many of these minor bycatch species are not being reported accurately. Although the quantity of fish going unreported on each tow is presumably quite small the aggregate effect is significant. For example, the Fisheries Assessment Plenary Document shows that annual reported catch of BYX7 is typically around 20 t, so under-reporting of 5 t by the factory vessels in the West Coast South Island hoki fishery is relatively large.

(iii) The reporting of sharks

Widespread concern over the lack of management of shark fisheries and declining shark populations led to the adoption and endorsement of the UN FAO International Plan of Action for the Conservation and Management of Sharks in 1999. This is aimed at ensuring the conservation and management of sharks and their long-term sustainable use, with particular emphasis on improving species-specific catch and landings data collection, and the monitoring and management of shark fisheries. The FAO recommended that each country should develop a more detailed "National Plan of Action" to effect the goals of the International Plan. The New Zealand National Plan of Action was adopted in 2008 following extensive consultation with industry.

The National Plan of Action *inter alia* noted that many shark species were of little economic interest and only infrequently encountered by fishermen; and in consequence about 5% of the chondrichthyan catch was reported under "generic" codes like "OSD" (= other sharks and dogfish) rather than the correct species code. The Plan envisaged production of an identification guide, and set a target that only 1% of the total shark catch would be reported under the "generic" codes by 2012.

Reporting issues with respect to sharks are not confined to the use of "generic" codes, of course - like other fish sharks can be reported deliberately or inadvertently as another species or simply not reported at all, though the presence of "generic" codes makes it more difficult to untangle what has happened. The Plan was silent on these matters, but Operation Bronto provides a window to see just how well the various shark, skate and ray species are being reported by the deepwater trawling fleet. The comparison of reported and observed catches is shown in Table 28 below.

Species	Reported catch	Predicted catch	U95	L95	% reported
BSH	837	1496	1977	1091	61
CAR	443	271	499	124	Ok
CSQ	0	4005	5293	3039	0
DWD	1040				
ERA	927	2291	3149	1710	41
LCH	243	1491	2042	1080	27
NSD	17271	9538	13661	6407	173
OSD	25808	12981	14939	11257	222
OSK	0	2064	2403	1741	Ok
RAY	0	28	54	10	0
SEV	0	359	556	187	0
SND	3256	17349	23495	12831	19
SSH	3920	10277	12712	8169	46
THR	550	395	730	110	Ok
GSH	7039	8795	11143	6716	Ok
GSP	1026	4953	6488	3736	24
MAK	635	405	810	90	Ok
POS	7896	5876	7507	4408	150
RSK	9327	1150	1639	743	311
SCH	9964	8865	11597	6839	Ok
SPD	307256	173161	204241	147356	187
SSK	33483	32188	36570	27862	Ok

Table 28 – Reported (adjusted TCEPR) and predicted catches of sharks, rays, skates and chimaeras in the 2011 WCSI hoki fishery. Species currently included in the QMS are shown in bold.

In this table the generic codes 'OSD", "OSK" and "RAY" are used for those species which do not have their own code in Part 2 of Schedule 3 in the Fisheries (Reporting) Regulations 2001, with "OSK" being all Rajidae excepting RSK and SSK; "Ray" being all species of all families of ray excepting BRA, ERA, EGR and WRA, and "OSD" being all other chondrichthyans without their own species code in Part 2. "DWD" meaning deepwater dogfish doesn't seem to occur in either Part 2 of Schedule 3 or the explanatory notes, but is used on some returns. It presumably should be included in the "OSD" reported catch.

Reporting of the various shark species seems to be chaotic, and we seem to have made little progress toward achieving the goals of the International Plan of Action. The National Plan of Action is due to be reviewed this year so MPI will soon be forced to deal with this issue.

(iv) Non-QMS bycatch

Results from Operation Maxi showed that some bycatch species outside the quota management system (and most notably RAT and JAV) were being over-reported. This over-reporting was characteristic of vessels with on board fish meal plants and may have been motivated by species misreporting. At that time vessels were reporting whole fish to meal by proportional back calculation. Under-declaration of QMS species going to meal resulted in automatic inflation of the reported non-QMS bycatch. The basis of calculating whole fish to meal has subsequently been changed, and there should now be no financial benefit in overstating the catch of non-QMS species. At least for rat-tails and javelin fish the situation is now reversed: the unobserved trips are reporting much lower catches than the observed trips. A selection of non-QMS bycatch species is shown in Table 29 below.

Species	Reported catch	Predicted catch	U95	L95	% reported
BBE	69	687	941	488	10
BEL	575	101	157	63	582
BEN	14438	7741	9343	6282	187
DEA	527	708	891	541	77
EPL	96	2781	4860	1395	3
EPR	360	37	60	21	984
FHD	5573	8061	9188	7106	71
JAV	61909	111803	134572	92531	58
RAT	52735	98418	110155	87738	56
RDO	1620	2627	4652	1143	64
RHY	13035	3347	4315	2663	386
RUD	1457	2307	2749	1896	72
SBO	162	421	623	262	39
SDO	17187	5376	9815	2131	416
SLK	169	1028	1359	745	17
SSI	3557	1000	1363	688	359
TOA	411	1268	1592	983	33

Table 29 - Reported (adjusted TCEPR) and predicted catches of non-QMS species in the 2011 WCSI hoki fishery

The results from this analysis suggest that: (i) banded bellowsfish (BBE) is probably being inadvertently misidentified as bellowsfish (BEL); (ii) BEN (scabbardfish) is probably being used fraudulently to cover the mealing or discarding of frostfish; (iii) RDO and SDO (rosy dory and silver dory) are probably being used fraudulently to cover the mealing or discarding of lookdown dory; (iv) there is probably some confusion over the correct identification of the three *Epigonus* species (EPL, EPR and small CDL); and (v) those non-ITQ species which are not being confused deliberately or inadvertently with another species are generally being reported only haphazardly, even though there is no financial incentive not to report them. These species are typically discarded or mealed, so there is no independent count of landed catch.

Example1: reporting of BEN (Scabbardfish)

The reporting of BEN (= scabbardfish) and FRO by the Ukrainian fleet is unusual. It seems highly likely that much of the scabbardfish reported by the Ukrainian vessels is not scabbardfish. Based on the observer CELB data for the whole fishery the ratios of reported catch for the vessels without MPI observers are not credible. Scabbardfish and frostfish are

in the same family and have the same general shape, so it is likely that the excess scabbardfish on the Ukrainian vessels are probably misreported frostfish. Two vessels of particular concern in this respect are the s 9(2)(a) and the s 9(2)(a)

The reporting of frostfish by the Koreans is largely unexceptional, and the reporting of scabbardfish by NZ boats is non-existent.

Since the scabbardfish reported is all being mealed it is difficult to obtain direct evidence of misidentification, but this needn't preclude MPI from approaching the companies to address this issue.

Example2: reporting of EPR (robust cardinal fish)

EPR is a small animal, maximum length 12 cm, and s 9(2)(a) give its depth range as 700 to 2000 m. It is not very likely to turn up as a bycatch of hoki fishing, and MPI observers reported only a few fish for the whole WCSI hoki season.

CDL (Cardinal) on the other hand crops up in smallish quantities in most of the observer reports.

The s 9(2)(a) reported no CDL at all for landing 27/7/11, but they have reported 248 kg of EPR. All the EPR being reported was caught by Korean vessels and CDL reporting is certainly less than one would expect. This indicates that Korean vessels are having trouble (deliberately or inadvertently) with CDL identification.

(v) Eels

The Fisheries (Reporting) Regulations 2001 include a number of "eels" in the list of mandatory species codes (Schedule 3 Part 2). Those likely to be encountered in the West Coast South Island hoki fishery are basketwork eels (BEE), conger eels (CON) and swollen-headed congers (SCO). The observer data shows that most bottom trawls in the fishery will catch a few of these fish. However, they often go unreported even by those vessels with a MPI observer embarked. It is as if the eels themselves and the regulatory requirement to report them are both invisible. The adjusted TCEPR catch is contrasted with the predicted catch in Table 30 below.

Species	Reported catch	Predicted catch	U95	L95	% reported
BEE	65	2224	3070	1599	3
CON	3151	16840	23871	13931	19
SCO	0	12041	16007	8662	0

Table 30 - Reported (adjusted TCEPR) and predicted catches of "eels" in the 2011 WCSI hoki fishery

It seems that reporting of eel captures leaves a great deal to be desired.

For a full copy of s 9(2)(a) report refer to Appendix 11.

6.14 Annual Catch Entitlement (ACE)

6.14 (a) Fishing Catch Plan and ACE Allocation

Generally vessel captains reported that they fish to a 'fish plan' and know what ACE has been allocated to their particular vessel and/or to other company vessels for the WCSI hoki season.

Vessel captains said they will fish to that fish plan knowing there is ACE available in target species such as hoki and bycatch species such as hake, ling and silver warehou.

The ACE holding and fishing capacity in the hoki fishery is dominated by the large fishing companies comprising of s 9(2)(b)(ii) s 9(2)(b)(ii) and the s 9(2)(b)(ii) group of companies. During the year the above companies caught 71% of the hoki catch. The top 13 companies caught 96% of the hoki catch. Some of these companies either owned ACE directly or through related companies while many others purchased the ACE from the other large companies. A large portion of these ACE transactions occurred in October 2010.

Approximately 5% of the ACE remained uncaught at the end of the year and therefore ACE should have been available to any permit holders who over-caught their ACE holdings during the year, minimising any risks that fishers who over-caught their ACE allocations would face a deemed value situation. There were many ACE transactions in the period 1-15 October 2011 to cover the over-catch situations present as at 30 September 2011.

The hake fishery off the WCSI is relatively small and is dominated by five large companies having the ACE holding and fishing capacity. During the year two companies, s 9(2)(b)(ii) and s 9(2)(b)(ii) caught 77% of the HAK catch off the WCSI. s 9(2)(b)(ii) owned the HAK7 ACE while s 9(2)(b)(ii) were required to purchase ACE from s 9(2)(b) Over 56% of the ACE remained uncaught at the end of the year and therefore ACE would have been available to any permit holder who over-caught their ACE holdings during the year.

Since the 2006-07 fishing year (where the HAK7 TACC was 100% caught) the HAK7 fishery remains significantly under-caught. Although there doesn't appear to be any compliance risk concerning over fishing and possible highgrading, the ongoing low catches and more fishing effort when targeting hake on the WCSI, is of concern.

The LIN7 fishery is dominated by three large companies, s 9(2)(b)(ii) s 9(2)(b)(ii) and s 9(2)(b)(ii) who own the majority of the ACE holding. The catching of the LIN7 is undertaken by a number of permit holders, many of which obtain their ACE from the above large companies.

During the year, seven companies caught 68% of the LIN7. Most of these companies sourced their ACE from the large companies and most of the LIN7 was caught in the July to September period.

As the LIN7 fishery was over caught by nearly 10% or 244 tonnes, it is of concern. The over-catch occurred due to large catches in the September fishing period which also coincides with the end of the WCSI hoki spawn fishery.

During the year in the silver warehou fishery on the WCSI (SWA1) four companies, s 9(2)(b)(ii) s 9(2)(b)(ii) s 9(2)(b)(ii) and s 9(2)(b)(ii) caught 63% of the catch. s 9(2)(b)(ii) owned the SWA1 ACE while the other three companies purchased their ACE from the other companies.

As over 72% of the ACE remained uncaught at the end of the year, ACE would have been available in any over-catch situation. There does not appear to be any compliance risk to the SWA1 fishery, apart from the fact that SWA1 was again significantly under-caught (TACC under-caught since the 2001-02 fishing year) which is of concern.

Overall there is a compliance risk for vessel captains that cannot access additional ACE to the allocation made to their vessel. The risks stem from the possibility that vessel captains and senior crew may resort to illegally discarding the fish caught and processed over and above the species ACE allocation. As captains and senior crew are paid a bonus on the amount and

quality of fish landed there may be a tendency to illegally discard any unwanted fish and land premium grade fish to fall within the ACE allocation assigned to their vessel, avoiding any interim deemed value penalties for any over catch. There is also anecdotal data that suggests any deemed value generated by over fishing are deducted from the bonuses paid to the vessels captain and crew, particularly for the FCV's.

Therefore the possibility of dumping unwanted fish is high when vessels are allocated a specific amount of ACE per species (both target species and bycatch species) and the chance of obtaining additional ACE is uncertain. In the case of a vessel overfishing its ACE, the vessel captain would merely be asking for more ACE to cover any unwanted fish if that fish was retained onboard and not dumped.

6.14 (b) ACE Balancing

Captains advised the Fishery Officers that an ACE running balance of species is not generally maintained, therefore there are no source documents recording this activity. However as noted the captains know what ACE they have to fish against and would know what they had caught. Therefore the captain would have a good idea of what ACE was over-caught and what ACE was under-caught. In reality, the vessel captains keep daily tow by tow catch records and a running total of species caught to date, therefore it would not be difficult to determine what ACE they have caught and what ACE is remaining.

In the case where vessel captains do not keep a running balance of ACE, this may pose a risk of over fishing which may lead to an interim deemed value situation if additional ACE is not held by the company or available to be purchased because it is a sought after fish stock. The overall effect could be that the fish stock or TACC is unnecessarily over-fished.

7. PART II – East Coast South Island Hoki Fishery Profile

7.1 General Information

The study area relevant to this section of the report is the Chatham Rise, comprising parts of Fisheries Management Areas SOE and SEC; and including statistical areas 020, 021,022,023, 401,402, 403, 407, 408, 409 and 410. The hoki catch in statistical area 404 during the 2010-11 fishing year was relatively small, and in areas 405 and 406 was less than 1 tonne.

The total estimated hoki catch from statistical areas 020-023 and 401-410 during 2010-11 was 36,659 tonnes. Total hoki landings over this period were 120,588 tonnes. The Chatham Rise fishery thus accounts for about 30% of all hoki landings, but it tends to be a fill-in fishery exploited between the major events of the hoki spawn and the squid fisheries. Many vessels that fish hoki on the Chatham Rise do so as part of a trip that includes several FMAs and a variety of target species. Significant hoki catches were reported in other East Coast areas, particularly statistical area 026.

In 2007 two Hoki Management Areas (HMA) were set up on the western Chatham Rise, Canterbury Banks HMA and Mernoo Bank HMA. These areas were recognised as holding relatively high abundances of juvenile Hoki, i.e. fish under 55 cm total length. As previously mentioned HMAs are managed by the Deepwater Group, under a voluntary code arrangement, outlined in the *Hoki Fishery Operational Procedures.*

Figure 19 illustrates ECSI statistical areas and HMA's.

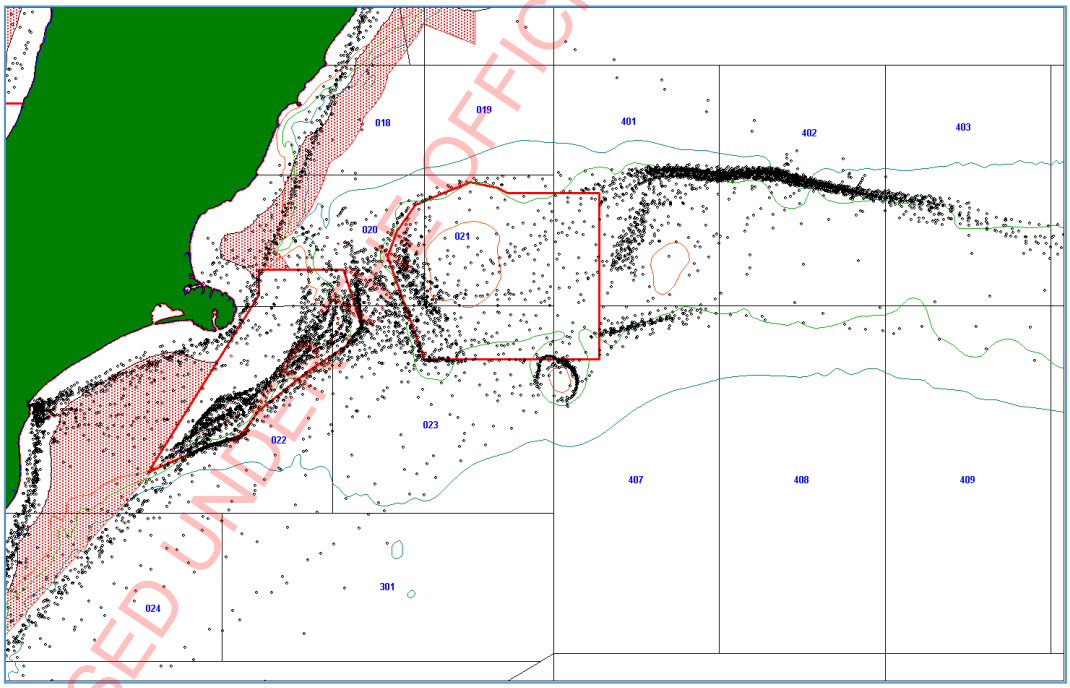

Figure 19 – Chart illustrating fishing activity during the 2010-11 fishing year by vessels fishing the ECSI hoki fishery

Table 31 on the next page shows that during the 2010-11 fishing year some statistical areas were fished more intensely than others. For instance the largest catches were taken from statistical areas 020 and 023 both of which include parts of the boundaries of the Mernoo Bank and Canterbury Bight HMAs. Relatively high catches were also reported in 402 and 022.

	Total estimated catch tonnes	Number of tows	% tows targeting HOK
Stat area	2010-11	2010-11	2010-11
020	8,996	1,210	85
021	1,169	168	78
022	3,177	552	53
023	8,800	1,046	94
401	2,055	514	47
402	5,256	526	94
403	1175	121	99
404	72	96	14
405	1	0	
406	1	0	
407	572	141	48
408	1,629	181	98
409	1,849	205	92
410	1,907	223	81

Table 31 - Chatham Rise hoki fishery catch, effort and targeting data

The Canterbury Banks HMA is predominantly situated in statistical area 022 but overlaps statistical areas 020 and 023 as shown in figure 19 above. The Mernoo Bank HMA is predominantly situated in statistical area 021 but also overlaps statistical areas 020, 023, 401 and 407 as also shown in figure 19.

For the 2010-11 fishing year 24,769 tonnes of hoki was taken in or adjacent to the ECSI HMAs. This represents 67.5% of the hoki taken in the entire ECSI hoki fishery. The majority of fishing effort (i.e. number of tows) occurred in areas 020, 021, 022 and 023 where juvenile hoki abundances are relatively high. See table 32 below.

7.2 *Hoki Highgrading in the ECSI hoki fishery*

In order to identify the extent of highgrading in the ECSI hoki fishery, observer length frequency data was obtained to calculate expected proportions by weight for size grades typically processed to by limited processing factory vessels operating in the fishery. The proportions calculated from the observer LF data were then compared to calculated proportions, based on unload manifest data, for individual vessel/trip combinations. The results are described in sections 1 and 2 below.

1. Observer expected weight proportions by vessel processing grades

Tables 32 & 33 illustrate the expected percentage by weight of hoki by statistical area and processed grade for HGT (including size range in cm). These results were obtained by converting hoki length frequency data (as reported by observers) to processed weight using the equation published by Francis (2003). The small or "S" grade percentages are calculated both including and excluding juvenile fish, i.e. fish of less than 55cm total length.

Table 32 provides expected weight percentage data using all observer length frequency data collected for the period 1986 to 2011. Table 33 provides expected weight percentage data using observer length frequency data collected for the period 2010-11 only. The data in both instances indicate that small grade fish would be expected to make up a high proportion of the catch, particularly on the western Chatham Rise.

	Statistical Area								
	Western Chatham Rise					Eastern Chatham Rise			
Grade	**020**	**021**	**022**	**023**	**401**	**402**	**407**	**408**	**409**
< 55 cm length	6	8	5	5	4	3	4	2	0.5
S ≥ 55 cm	35	36	34	32	37	26	31	26	16
All S (≤ 66 cm)	41	44	39	37	41	29	35	28	17
M (> 66 ≤ 74 cm)	28	21	31	32	27	30	39	44	44
L (> 74 ≤ 84 cm)	16	16	18	19	16	20	19	22	31
2L (>84 cm)	16	19	12	11	16	21	7	6	8

Table 32 - Expected Percentage by weight of HOK HGT grades, by statistical area using all observer LF data (1986-2011)

	Statistical Area								
	Western Chatham Rise					Eastern Chatham Rise			
Grade	**020**	**021**	**022**	**023**	**401**	**402**	**407**	**408**	**409**
< 55 cm length	7	8	6	4	15	5	1	2	0.5
S ≥ 55 cm	37	29	32	32	33	37	49	35	25
All S (≤ 66 cm)	44	37	38	36	48	42	50	37	25
M (> 66 ≤ 74 cm)	31	42	31	38	26	39	36	41	47
L (> 74 ≤ 84 cm)	15	14	17	17	15	12	8	16	20
2L (>84 cm)	10	8	13	9	11	7	6	6	8

Table 33 - Expected Percentage by weight of HOK HGT grades, by statistical area using 2010-11 observer LF data only

2. Vessel/trip expected weight proportions derived from trips completed

Table 34 shows Hoki grade percentages for 11 landings by vessels that fished the Chatham Rise for at least part of the relevant trip. The geographical distribution of effort on the Rise varied during these trips, but all tended to concentrate on the western Rise and all included some time in either or both of the Chatham Rise HMAs.

Reported percentages of small grade hoki for most of the s 9(2)(a) vessel landings appear consistent with the expected percentages. Observer report 3227, November-December 2011, noted the s 9(2)(a) did not discard small and damaged hoki. Other landings included lower than expected percentages of small grade Hoki, notably the landing by s 9(2)(a) and two landings by s 9(2)(a). Aspects of the behaviour of the s 9(2)(a) are discussed respectively in sections A and B below.

	Vessel, trip data										
	s 9(2)(a)										
Grade											
S	49	46	44	31	43	21	38	28	24	24	29
M	30	33	36	36	33	43	37	42	52	52	42
L	11	12	12	21	11	20	18	20	19	19	15
2L	8	7	4	8	8	12	6	8	5	4	9
Dam, GRE	3	3	4	5	4	4	2	2		1	5

Table 34 - Percentages by weight for landings made by vessels during the 2010-11 fishing year

A. s 9(2)(a) activity in the Canterbury Banks HMA

Figure 20 displays TCEPR 1890671, which reported on the vessel's activity on 01/10/2010. The three trawls the vessel reported on that day all occurred well within the Mernoo Banks HMA. All occurred in depths that substantial hoki catches might be expected but all reported the target species as SWA, albeit the target species for the second trawl was altered to "SWA" from "HOK." In all three trawls the estimated catch of HOK was substantially greater than the estimated catch of SWA.

As part of Op Bronto, on February 16th 2011 FO s 9(2)(a) discussed the vessel's fishing activity around the Canterbury Banks HMA with the s 9(2)(a) master. The master informed FO s 9(2)(a) that the target species was determined by his knowledge of fishing in the area. During the previous trip the vessel fished inside the Canterbury Banks HMA on three consecutive days, reportedly targeting SWA, and reported one tow per day just outside the HMA boundary targeting HOK. They reported no HOK catch inside the boundary. A FAS observer was aboard during this trip.

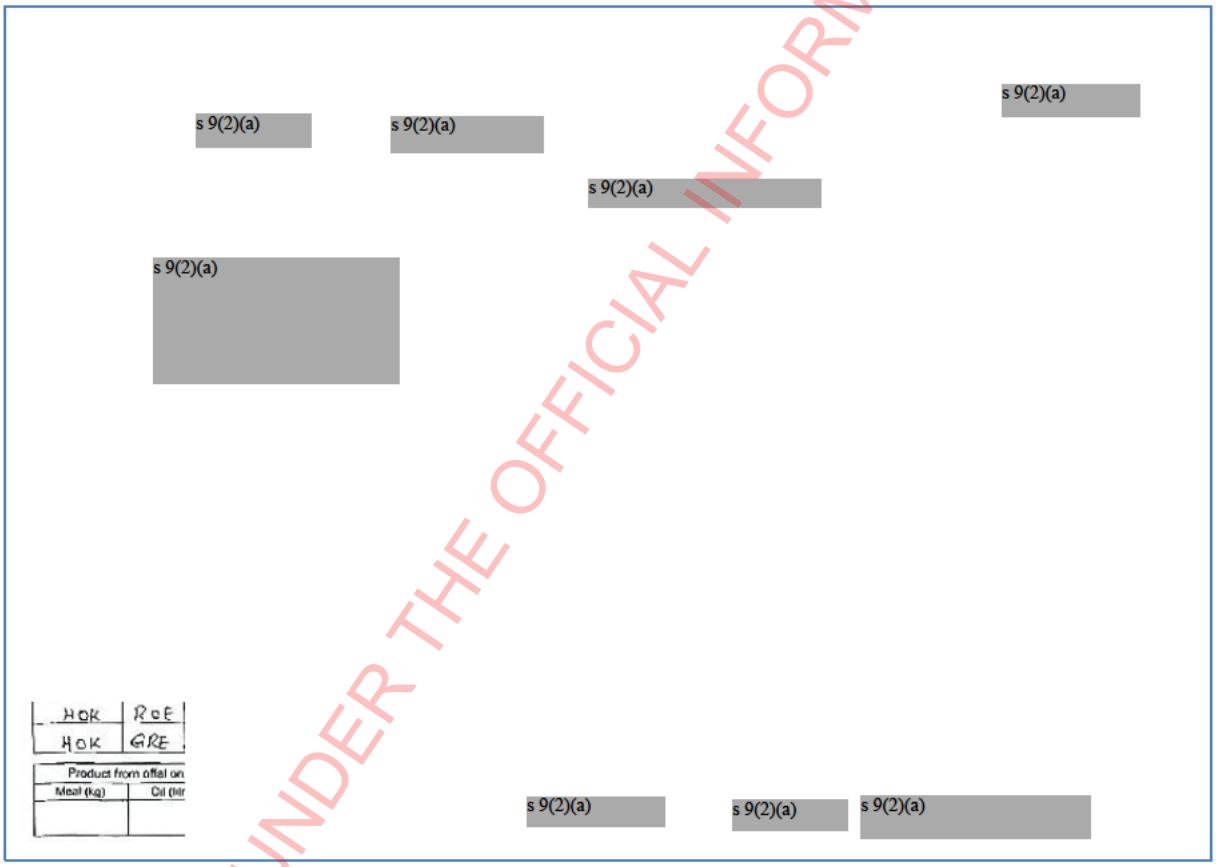

Figure 20 - TCEPR s 9(2)(a) for the s 9(2)(a)

B. s 9(2)(a) reporting of small hoki

Table 35 on the next page shows grade percentages for landings from s 9(2)(a) for successive landings, on 26th November 2010 and 24th January 2011. The reported grade percentages for the two trips are effectively the same. However, the earlier trip had a Ministry of Fisheries observer aboard and the later did not. The observer on the earlier trip reported 18,669 kg of approved HOK discards, which would have represented about 17% by weight of the total hoki catch for the trip. If the discarded hoki were predominately small and damaged, the total percentage of small and damaged for the trip would have been about 41%, in good agreement with the expected percentages of small grade shown in tables 32 & 33 above.

Vessel, trip date	Pac 2611	Pac 2401
Grade		
2L	5	4
L	19	19
M	52	52
S	24	24
Dam, GRE		1

Table 35 - Percentages by weight for landings made by the s 9(2)(a) during the 2010-11 fishing year

Both trips included hoki fishing on the east coast of the South Island, but the earlier trip covered more territory than the later. During the latter trip fishing effort on the Rise was confined to the Canterbury Banks HMA (see figure 21 below). During the earlier trip, in addition to the Canterbury Banks HMA, Pacinui fished the Mernoo Banks HMA and statistical areas 402 and 403. The observer noted that hoki from FMA SOE, i.e. from statistical areas 402 and 403, were significantly larger than from FMA SEC, i.e. the HMAs.

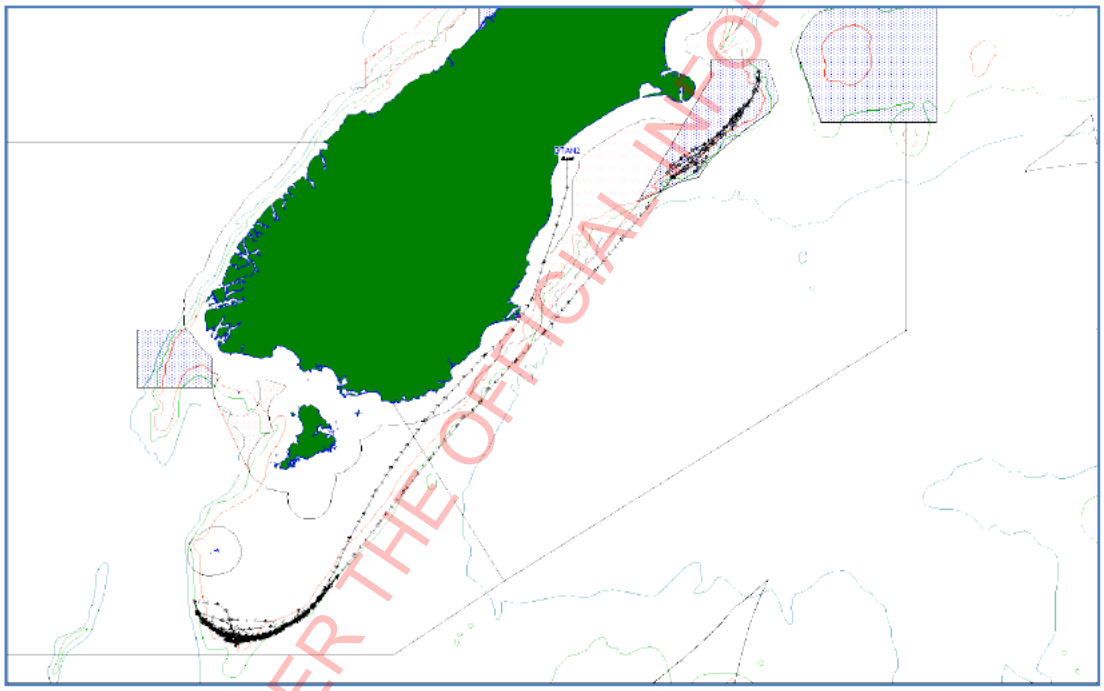

Figure 21 -VMS chart illustrating ALC positions for the s 9(2)(a) 30/12/10 to 24/01/11

During the later trip (30/12/10 to 2401/11) the s 9(2)(a) reported making six tows in the Canterbury Banks HMA from the 31st of December 2010 until the 3rd of January 2011. All tows reportedly targeted SWA, although they occurred in a variety of depths. In most of the trawls the catch of HOK exceeded the catch of SWA. In some instances the difference in quantity was substantial. After exiting the HMA and steaming south the vessel reported one trawl in statistical area 026 on 4th January 2011. The reported target species for this tow was also SWA. The estimated catch of SWA was 300 kg compared to 20,900 kg of HOK. Despite reporting a large catch of hoki the s 9(2)(a) did not continue fishing in area 026. In past investigations, this sort of pattern often indicated area misreporting. Some of the hoki reported as caught in 026 may have actually been caught in the HMA. The remainder of the trip was spent south of the Snares, in statistical area 028.

Simulation of individual fishing trips by vessels using so-called "Monte Carlo" methods provides a statistically robust method of assessing whether particular vessels reported catch

accurately. Trips were simulated by drawing, with replacement, an appropriate number of observed trawls from appropriate spatial areas. One thousand simulated voyages were generated, using observer length frequency data. The simulation maxima and minima thus describe 99.9% confidence intervals around the simulated mean catch percentages by weight of each grade. Simulation of this trip using observer length frequency data generated an expected value for the mean small grade hoki percentage of 44%, with maximum and minimum percentages of 75% and 20%. The reported landing of 24 percent by weight small grade could therefore be regarded as possible but unlikely. Repeated landings from similar trips with similar low proportions of small hoki are extremely unlikely. Half of all landings from a similar fishing trip could be expected to contain between 39% and 49% by weight of small grade hoki.

7.3 Discarding of non-target species or bycatch

Compared to the West Coast Hoki fishery, East Coast fishery bycatch composition is complex. Of 403 species identified in observed trawls, 36 occurred in 10% or more of all trawls. Sixty-three species occurred in 10% or more of trawls in at least one statistical area.
Some species are relatively common in Hoki bycatch on both coasts, notably ling and hake. Bluenose, small quantities of which are near to ubiquitous in hoki trawls on the West Coast, only occurred in 4% of all observed trawls on the East Coast.

Relatively few species comprised more than 1% by weight of all observed trawls on the East Coast.

For statistical areas 020, 021, 022, 023, 024, and 026 a number of species comprised more than 1% by weight of observed trawls (n. trawls = 8426.). See table 36 below for details.

SQA	2.52%
SSO	5.41%
SWA	5.33%
Total	96.78%

Table 36 - Species % by weight

For areas 401, 402, 403, 404, 405, 406, 407, 408, 409 and 410 a number of species comprised more than 1% by weight of observed trawls (n. trawls = 3388.) See table 37 on the next page for details.

SPE	2.74%
SSO	1.16%
SWA	2.43%
Total	90.54%

Table 37 - Species by % weight

The species mix is different in each case. The primary differences are the presence of BAR and JMA in the catch from the Western Rise (020 series statistical areas), species caught in a shallower depth range than the optimum HOK range; and BOE and a higher proportion of SSO in the western Rise, species caught in a deeper depth range than the optimum HOK range. No bycatch species were ubiquitous, i.e. present in all trawls.

7.4 *Multivariate and Monte Carlo bycatch analyses*

Analysis of the raw data thus indicates there are spatial, i.e. depth and positional trends in the abundance and percentage by weight of some species. Simple comparisons of TCEPR estimated catch and processing data with CLR and landing records data, indicated that vessels did report a wide range of bycatch species during observed and unobserved trips.

To assess whether it was feasible to characterise the expected catch species mix from different vessels and areas, discriminant function multivariate analyses of observed trawl catch data was computed. Discriminant function analysis is used to determine which variables distinguish between naturally occurring groups. In this case, it was found that there is an apparent lack of discrimination between statistical areas (the groups) by species weight percentages (the variables), using the species that comprised more than 1% by weight of observed catches.

There was some discrimination by catch weight percentage between vessels, and the grouping seems to have a spatial element. Small New Zealand-registered vessels that predominately fished statistical area 401 formed a separate group, as did some vessels that predominately fished the south slope of the Chatham Rise. Vessels that tended to fish the Hoki Management Areas for at least part of a trip formed a tight group. Discriminant function analysis may have some ongoing value in this context to monitor changes in reporting behaviour by vessels.

Simulation of fishing trips was used to assess reported bycatch of individual fishing trips. In this application of simulation, trips were simulated by drawing, with replacement, observed trawl species catch weight data from appropriate spatial areas.

1. Example of bycatch simulation for the s 9(2)(a)

Table 38 displays results of a simulation of a voyage by s 9(2)(a) from 24/10/2010 until 20/11/2010. Nine days of the trip were spent on the western Chatham Rise, particularly the Canterbury Banks HMA, and in statistical area 026. The remainder of the trip included

fishing to the east and south-east of Stewart Island and on the Puysegur Banks. Only the East Coast South Island portion of the trip was simulated.

The simulated values for each species are greenweight percentages of the total catch of all species for the simulated trip.

One thousand simulated voyages were generated. The simulation maxima and minima thus describe 99.9% confidence intervals around the simulated mean catch percentages by weight. The confidence intervals for many species are wide, reflecting the variability and complexity of the fishery. Note that the minima for some species are zero, indicating that it is possible, although unlikely, that a vessel may make a voyage similar to the one simulated without catching any of that species.

			Simulation		
Species	Reported total processed GW	Reported % total catch	mean %	min %	max %
BAR	50184	22.771	20.64	1.171	48.04
BOE	0	0.000	5.441	0.000	22.59
HAK	594	0.270	0.345	0.081	1.07
HOK	69746	31.648	34.11	10.920	58.57
JAV	14510	6.584	3.086	0.603	11.68
JMA	695	0.315	4.726	0.000	23.64
LIN	2742	1.244	1.169	0.463	2.348
RAT	10820	4.910	3.027	0.990	7.646
SPD	13261	6.017	4.794	0.207	21.7
SSO	0	0.000	4.934	0.000	23.21
SWA	42569	19.316	7.18	0.399	39.39

Table 38 - Bycatch simulation for s 9(2)(a) voyage

The total simulated greenweight and many of the simulated mean percentages by weight are in good agreement with the vessel's catch reporting. All reported catches are within the simulation maxima and minima. s 9(2)(a) reported no BOE or SSO catch for the relevant trip, but the simulation minima for both these species is zero. The vessel reported no SSO catch for the entire 2010-2011 fishing year.

The reported SWA catch percentage by weight is within the 99.9% confidence interval but is more than twice the simulated mean. Little can be reliably inferred from one anomaly between reported and simulated values, but further scrutiny is warranted, particularly given the manipulation of SWA "targeting" within the HMAs and instances of SWA area misreporting demonstrated during other investigations.

7.5 *Hoki targeting in Hoki Management Areas*

Requirement 1 of the *Hoki Fishery Operational Procedures* is as follows: "Trawlers greater than 28m (i.e. > 28m LOA) are **not permitted to target hoki** inside any of the HMAs listed in this operating procedure" (emphasis *sic.*)

Vessels targeting other species in an HMA are required to notify the Deepwater Group of their intentions and also to inform the Deepwater Group when they enter and exit an HMA. Hoki catch was reported in both the Canterbury Banks and Mernoo Banks HMAs during the 2010-11 fishing year but effort and catch was substantially greater in the Canterbury Banks. From the length frequency data, the expected percentage of small grade hoki in the Mernoo Bank is substantially higher than in the Canterbury Banks, i.e. 61% compared to 43%.

In 2010-11, total estimated catch (from TCEPRs) of HOK in the Canterbury Banks HMA was 3 469 tonnes. This was about 9% of the total Chatham Rise Hoki catch. This estimate only includes catch data from tows where the reported starting position of the tow was inside the Canterbury Banks HMA. It is a conservative estimate of the actual amount of hoki taken within the Canterbury Banks HMA. The data does not include tows that were reported as starting outside the HMA but which ended inside, nor does it include tows that towed through the HMA but had reported start and end positions outside of the HMA.

For an area delineated as the HMA boundary extended by one nautical mile, the total estimated 2010-11 hoki catch increases to 4,981 tonne. This indicates that a substantial amount of hoki is taken in and around the Canterbury Banks HMA boundaries. Table 39 shows the number of tows and reported estimated catch for various target species, for tows within the Canterbury Banks HMA during 2010-11. As explained previously, the number of tows and total estimated hoki catch are considered conservative estimates.

Target species	No. Tows	Estimated HOK catch (tonnes)	HOK Catch/ tow (tonnes)
HOK	228	1,796.4	7.9
SWA	203	1,630.0	8.0
BAR	9	26.0	2.9
JMA	1	0.1	0.1
LIN	1	0.1	0.1
RCO	2	0.4	0.2
SQU	19	17.0	0.9
TAR	2	0.2	0.1
Total tows	465		

Table 39 - Trawls reporting HOK in TCEPR estimated catch, Canterbury Banks, 2010-11.

It is evident that:

1) The prohibition on vessels targeting HOK within the HMA was frequently violated.
2) Vessels "targeting" SWA in the Canterbury Banks HMA caught nearly as much hoki as vessels explicitly targeting HOK.

s 9(2)(a) spatial analysis[14] of fishing effort in the Canterbury Banks HMA indicates the vessels that reported targeting SWA did tend to fish shallower depths, where the relative abundance of SWA might be expected to be greater. Observer reports make similar observations. Despite this, the mean catch rate of HOK per tow was not significantly different between tows targeting HOK and those targeting SWA. In both cases it was about 8 tonnes

[14] HMA Analysis: 2010/11 fishing year

per tow. The data indicate that it is impossible to consistently target HOK and SWA separately in the HMAs as the depth ranges of these two species overlap.

The observer report for trip 3269, February- March 2011, comments as follows on s 9(2)(a) fishing practices in HMAs:

"The vessel had a copy of the Deep Water Group Hoki Fishery Operational procedures on board. Key personnel were aware of its contents. The vessel completed 10 tows within the Mernoo and Canterbury Banks Hoki Management Areas. Whilst fishing within the HMA the vessel declared SWA as the target species. Catch composition from tows within the HMA was 85% HOK, 2% SWA and 13% other ITQ and non ITQ species. The percentage of HOK < 55cm from these tows averaged 23%. One tow caught within the HMA was 27t total green weight. The percentage of HOK< 55cm in this tow was 55%. From this tow 14.5t green weight of small and damaged HOK was processed into fish meal and 10t green weight of HOK was processed into frozen product."

The above information was made available in the observer trip report released to the company.

In addition to the above comments the observer added in the "Potential Regulatory Breaches" section of the observer trip report (MPI version) that:

"Misreporting of target species....In the observer's opinion the vessel was misreporting the target species to circumvent the Deep Water Group Hoki Fishery Operational procedures in order to target juvenile HOK. This practice is widespread throughout the domestic and foreign charter fleet".

Fisheries analyst s 9(2)(a) makes the following observations regarding the s 9(2)(a):

> *"a preliminary examination of activity has shown that at least four tows (and very likely more) were conducted within the HOK management areas. Two days where these tows took place (were) the 6th and the 9th of December 2011. The four tows that have at this stage been identified as being inside the HOK Management areas list SWA as the target species for the activity, as the voluntary agreement prohibits vessels from directly targeting HOK in the HMA's. However on each of these tows HOK makes up between 86% and 96% of the estimated catch, and whilst WWA does appear in the estimated catch data in nominal quantities in three of these tows, SWA does not appear in the estimated catch data for any of these tows."*

Of 431 tows targeting either HOK or SWA where some hoki catch was reported, in 363 (84%) the estimated catch of HOK was greater than the estimated catch of SWA, often by a substantial margin. The common practice of reporting the target species as SWA apparently provides a means of exploiting a loophole in the *Hoki Fishery Operational Procedures*.

s 9(2)(a) analysis also shows the requirements for vessels to report their intention to fish in the HMAs and to report on entry to and exit from the HMAs are frequently ignored.

Many vessels fishing for hoki on the east coast of the South Island actually apply the majority of their fishing effort in the HMAs, i.e. they are preferentially exploiting rather than avoiding these areas. Under the current regime, the value of the HMAs as a management tool is questionable.

1. Summary of Identified Issues and Compliance Risks

8.1 *WCSI Hoki Fishery Profile*

Overall there was very good co-operation from captains of vessels and permit holders when Fishery Officers carried out extensive in-port inspections of documentation, nets and fish product. The at-sea phase of boarding and inspection of hoki vessels was also carried out in a co-operative manner. Fishery Officers reported that the captains were willing to answer their questions and provide assistance where necessary.

Fishery Officers reported that all vessels inspected were carrying a current fishing permit, registration, certifications and hoki management plans.

Captains reported that the hoki fishery was about the same as last year with good catches of hoki and bycatch. All nets inspected were compliant and there were no instances of breaches of the Bird Mitigation Devices Regulations during the at sea inspections or by aerial surveillance or mentioned by MPI Observers.

About 32% of carton weights checked by Fishery Officers appeared to be over reported. Fishery Officers assessed a high standard of compliance with the defined processed states for HGT and DRE product.

Captains of vessels reported that they either mealed or pa cked whole green damaged hoki or small hoki too small to process. In addition MPI Observers noted that all offal, frames, low value and non-quota species are mealed.

8.1 (a) Reporting

1. There is potential for large volumes of fish to be illegally discarded and go unreported where vessels do not commit to reporting the actual catch quantity and species mix in the effort section of the TCEPR. Currently most vessels are back-capturing (retrospectively completing) the 'estimated catch' from the daily processing summary data, which may not accurately reflect the original catch quantity and species composition.

2. A number of vessels are not completing the daily processing summary of the TCEPRs in accordance with the explanatory notes, which require that the processing information must be for the tows commenced on one day and include any processing completed on subsequent days for the day on which the tow commenced. Reconciliation of catch against processing summary information is difficult in these circumstances.

3. There is evidence that CEEDT returns are not being completed on the day that the fishing activity took place and were in some instances delayed by several days. In

addition CEEDT audit history dates and times are only being applied to the entered data when the return is saved, and not when the data is actually being entered, hence all fields having exactly the same time stamp. Time delays in CEEDT data entry provide opportunity for vessels to falsify the reported catch.

8.1 (b) Fishing practices & processes

4. There is evidence to suggest that fish lost from burst bags are either unreported or are under-estimated.

5. Conducting long tows or soaking the net may result in excess damage to hoki, which is a soft fish, and render them unsuitable for processing. In these instances this hoki may be illegally discarded and/or mealed and go unreported.

6. The disposal of whole fish via the discard chute has always been a concern and represents a significant compliance risk. Large volumes of unwanted fish can easily be routed by conveyors to the discard areas and disposed of without being recorded in the vessel's documentation or fishing returns. In addition, discarded fish attract birds and increase the risk of bird capture.

7. There are compliance issues with vessels fitted with macerators (which shred whole fish), as these vessels can discard fish with little risk of detection. It is impossible to determine if discharged macerated material contains illegally discarded whole fish.

8.1 (c) Electronic fish weighing

8. Information gathered suggests that a number of vessels operating electronic weighing and labelling systems may not be reporting the net weight of fish accurately or have robust systems in place to determine greenweight.

8.1 (d) Misreporting

9. A number of vessels were carrying out and documenting glaze weight tests at sea. In several instances it was noted that the glaze test results were less than 2% yet the vessels were still deducting a 2% threshold for glaze which for these vessels is advantageous when reporting greenweight. In addition there is some concern that vessels may be deducting 2% for glaze when no glaze has been applied to the fish product.

10. The total estimated under-reported greenweight (slippage) by fillet vessels was 132,245 kg, and by LPFVs was 146,743 kg, giving an estimated total of unreported greenweight of 279,019 kg. The practice of over-packing but underreporting fish is an ongoing problem. In the absence of carton weight checks this form of misreporting would remain undetected.

11. It is very difficult to audit a fillet vessel's catch after it has been processed, packed and frozen, let alone determine that all processed states have been reported accurately and subsequently counted against ACE (e.g. all TSK products including fish block made up of pieces). Industry frequently develops fillet products that are not compatible with a conversion factor system (e.g. steaks, tails, loins and goujons). These are usually premium products that generate relatively high returns. There is a risk that the

Ministry is not effectively keeping up with industry developments and market demand in terms of processed states and the ability for these to be incorporated into the current catch reporting regime.

12. There is evidence some vessels are unable to achieve their VSCFs year round (pre, post and during spawn time) and that processing practices may alter during VSCF testing. The risk is that the amount of hoki being extracted from the fishery, mostly but not only during the spawn time, is not being accurately reported. Vessels may work harder to achieve lower VSCF during testing periods but then revert to 'normal' practice where the true CF may be somewhere in-between the official CF and the VSCF.

13. There were instances of vessels reporting 'B' grade hoki as a way of disguising that small and/or damaged fish had been illegally discarded and unreported. Where this has happened product has been subsequently relabelled as "A" grade product after reprocessing offshore as it met the "A" grade specification and not that of the "B" grade.

14. Vessels that operate as mobile LFRs where product is loaded directly from the vessel into refrigerated containers and shipped overseas inhibit MPI's ability to conduct carton content and weight checks to ensure that product is consistent with carton labelling and therefore state definition and that greenweight is accurately reported. Although this was not an issue this hoki season it may present as an issue in future years.

8.1 (e) Highgrading

15. The results of a hoki length-based analysis found that the landings of hoki reported by LPFVs contained a smaller proportion of small hoki than expected. It was estimated that these vessels omitted to report at least 559 t of small fish, or about 30% of the small fish that they caught.

16. Fillet vessels produce ungraded products (e.g. fillet block), so a length-based analysis of landings was not possible. However all of the fillet vessels do have meal plants, and are likely to meal any small hoki unsuitable for processing. For these vessels the amount of fish meal reported as produced from offal was compared with the amount of offal available as a by-product of processing. In most cases the production of fishmeal from offal was unrealistically high and the offal supply may have been supplemented with unreported whole fish. If this is the case, at least 982 t, but probably more than 2,000 t, of whole fish would be required to meet the deficit. Whether or not these unreported whole fish are hoki is unknown, and there is a possibility that the discrepancy is due to unrealistic vessel specific conversion factors.

8.1 (f) Quantification of misreported hoki (WCSI)

Table 40 below provides a summary of total estimated hoki greenweight misreported in relation to the risks identified in the WCSI profile. Between 3,414 and 3,555 tonnes of hoki has been estimated as not been reported in fishing returns.

Compliance Risk	Quantity (t)
Misreporting of Burst Bag	19
Misreporting greenweight by 1% (Amaltal)	780
Carton weight underreporting	279
VSCF slippage	794 - 935
Highgrading (LPFVs)	559
Misreporting of MEA & MEB (potential overlap with VSCFs)	982
Total	***3,414- 3,555***

Table 40 - Summary of misreported hoki as identified in WCSI hoki profile

8.1 (g) Bycatch

17. Comparison of ling heads to body ratios indicates that some vessels have not reported sufficient greenweight as the weight of the heads is more than what would be expected. This suggests that unwanted ling bodies have been discarded and/or mealed, and gone unreported, but that the heads for which there is a market have been retained. The LIN7 TACC was over-caught by 13% in the 2010/2011 fishing year, and as such there may have been an incentive for operators to minimise any ACE liability for over-fishing their annual catch entitlement by dumping the ling bodies but retaining the heads.

18. The results of this analysis show that the factory vessels operating in the WCSI hoki fishery are good at reporting landings but poor at reporting catches. For non-QMS species this is only important if MPI intend using the data for management purposes, in which case MPI will inevitably be misled. More reliable data is available from the observer programme and should be used in lieu of commercial data for fisheries management purposes. With respect to the QMS species poor reporting of catches is more problematic. The catch limits and the economic instruments intended to ensure they are not exceeded are supposed to apply to catches and not landings, and will be ineffective if catches are misreported. There are some major issues that need to be addressed – issues that in some cases have been evident for several decades – and will require a range of solutions to tackle them.

    Some species misreporting (e.g. BEL for BBE; GSH for GSP; and probably EPR or EPL for CDL) is probably inadvertent. Other misreporting is probably intentional (BEN for FRO, and RDO/SDO for LDO), and when the vessel has a meal plant the evidence is usually being landed, albeit in unrecognizable form.

19. The poor reporting of shark bycatch may be due in part to confusion between the TCEPR explanatory notes and Schedule 3 Part 2 of the Reporting Regulations. The explanatory notes provide a list of species codes, but do not make it clear that the list is only a subset of those in Schedule 3. This does nothing to encourage accurate reporting. Furthermore, the description of “OSD” in the explanatory notes is simply “sharks and dogfish not otherwise specified”, but it is not clear whether “otherwise specified” refers only to the sharks and dogfish with their own codes in the explanatory notes or to all the codes available in Schedule 3 Part 2. The explanatory notes are often read by people for whom English may be a third or fourth language, and any ambiguity is unhelpful. Furthermore, any ambiguity will certainly be exploited by defence counsel if we progress up the VADE spectrum and attempt to enforce the reporting requirements.

20. Less than carton catch is an issue that has also cropped up in interviews of foreign fishing crew by Auckland University academics, with suggestions that catches of < 40 kg per day of intrinsically valuable bycatch species such as ling are routinely discarded when observers are not embarked. (Note that this phenomenon may occur with most species, but it is only likely to be evident in the data at hand in those with low catch rates. The reporting of ling appears unexceptional in this analysis, and even if every vessel discarded 40 kg of ling per day this would amount to only 25% of the width of the confidence interval).

21. Hake and ribaldo are not being reported correctly. They cannot be mistaken for other species, and the under-reporting is presumably intentional. A trip by trip comparison

of predicted and reported catches may provide further insight into what is occurring. Hake is an inevitable and valuable bycatch of the hoki fishery, and is also a target species in its own right. Ideally, those who are certain that they will catch hake as a bycatch and have insufficient quota to cover their expected catch should purchase Annual Catch Entitlement from those who would normally be targeting the species, and the latter should reduce the amount of effort they put into hake fishing. This is how the QMS is supposed to work.

An alternative (and illegal) solution is for those taking hake as an inevitable bycatch to simply discard it without reporting the catch. This is attractive in circumstances where enforcement is weak, there is uncertainty over the likely abundance or eventual market price of the hake, or the market price of ACE threatens to remove the profit from landing the hake bycatch. In these circumstances the Quota Management System fails to constrain catches and maximizes neither sustainability nor utilization.

As it happens the total reported catch of HAK7 last winter was well below the TACC and ACE should have been readily available at bargain prices at the end of the season. However, discarding decisions are not made at the end of the season, but rather day by day as the fish are being caught.

8.2 ECSI Hoki Fishery Profile

8.2 (a) Highgrading

22. Observer length-frequency data indicate small hoki (defined in this study as less than or equal to 66 cm total length) comprise a high proportion of hoki catch on the ECSI and Chatham Rise, particularly in the western Chatham Rise where the majority of effort occurs and the majority of hoki are caught. The data indicate it is not possible to consistently avoid small hoki in the western Rise statistical areas that encapsulate the Hoki Management Areas.

23. The eleven fishing trips examined all concentrated on the western Rise. Analyses indicated that about one quarter of similar trips could be expected to land less than 39% by weight of small hoki. Six of the examined trips landed less than this. Two vessels landed percentages of small hoki close to the one-in-a-thousand minima obtained from fishing trip simulation. An observed trip by one of these vessels included authorised discards of small hoki amounting to 17% by weight of all hoki caught during the trip.

24. The analyses completed in this study strongly indicate that:
    - Vessels are consistently fishing areas where small hoki cannot be avoided
    - Some vessels are not landing as much small hoki as could be expected.
    - Significant quantities of small hoki are being illegally discarded.

8.2 (b) Bycatch

25. A large number of non-target or bycatch species (403 in observed trawls) have been reported in ECSI and Chatham Rise hoki fisheries. Relatively few species consistently comprise more than 1% of total catch weights. There are some spatial patterns in bycatch distribution, but they were not enough to facilitate auditing of reported catch using standard multivariate methods. Fishing trip simulation does offer a cost effective method for monitoring bycatch.

26. The analyses completed in this study did not demonstrate substantial illegal bycatch discarding, but anomalies that justify further monitoring were observed. Some of these anomalies may be symptomatic of other behaviours, such as fishing in HMAs.

8.2 (c) Fishing in Hoki Management Areas

27. Many vessels fishing for hoki on the east coast of the South Island preferentially exploit rather than avoid the Hoki Management Areas. Fishing trips which systematically concentrate on these areas occur repeatedly.

28. Reporting other species such as SWA to cover targeting of hoki within HMAs is common. The data show that catch rates of hoki in these areas are similar irrespective of whether HOK or SWA are the reported target species. Vessels fishing these areas within hoki depth ranges cannot consistently avoid catching hoki, and they cannot consistently avoid small and juvenile hoki.

29. Fishing patterns indicative of area misreporting were also evident. In one example, a vessel made several consecutive trawls inside the Canterbury Banks HMA but reported very little hoki catch. It then steamed to statistical area 026 and reported a substantial catch of hoki from a single trawl in that area before continuing south into FMA5/SOU.

30. Industry has collectively acknowledged the importance of Hoki Management Areas to hoki fisheries. Despite this, violations of the *Hoki Fishery Operational Procedures* are frequent, unrestrained and involve vessels operated by most of the deepwater fishing companies.

31. Voluntary compliance and stakeholder administration appears to be ineffectual. Given appropriate regulation, the Ministry has the tools to monitor and if necessary enforce compliance in the Hoki Management Areas. The acknowledged risks to the sustainability of hoki fisheries due to uncontrolled fishing in these areas require effective action.

2. Recommendations

There are 44 recommendations resulting from the hoki profile report of the WCSI and ECSI covering a wide range of topics. For ease of reference the recommendations have been placed under the following headings: “Deep Water Group”, “Working with the Company”, “MPI Monitoring/Ongoing work”, “Investigation and/or Fishery Officer Monitoring at District” and “Fact sheet”.

9.1 Deep Water Group

We anticipate the Deep Water Group will consider the following recommendations and report back to MPI (Director Compliance) on their findings.

Landing Documentation

1. That permit holders be required to provide MPI with a copy of unload documentation for all vessel landings throughout the fishing year, detailing the species, state, grade number of units, unit weight (where applicable) of all fish product. The documentation could be provided at the time of vessel landing inspection, or by email or fax if not inspected.

Code of Practice

2. That the development of a code of practice is considered and the use of real time and sub-area closures (e.g. HMA) to protect juvenile hoki caught as a consequence of fishing spawning aggregations in the WCSI hoki fishery.

3. That there be an examination as to why some vessels are not fishing in accordance with the ECSI HMA code of practice; consideration be given to the overall impact of taking large volumes of juvenile hoki as well as implementing other input controls such as closing the ECSI HMAs to trawling.

4. That consideration be given to developing a ‘code of practice’ to reduce the occurrences of long tows, in order to minimise the damage to hoki undertaken by some vessels in the WCSI hoki fishery.

5. That consideration be given to a ‘code of practice’ to reduce the occurrences of WCSI hoki vessels “soaking their nets”, in order to minimise the damage to hoki, and/or the discarding of hoki.

Reporting of Greenweight

6. That an examination of the current practice of applying a maximum 2% glaze deduction for glazed product be undertaken and that a determination made as to whether fishers should instead be using the actual glaze percentage measured by at-sea testing instead, if it is less than 2%.

7. That an examination be made of the benefits of installing MAREL weighing and recording systems (or equivalent) on all vessels to accurately record the actual net weight of processed catch.

8. There is evidence that QMS species are routinely discarded where less than 40 kgs is caught a day as this is insufficient to fill a carton. In these circumstances companies should be encouraged to land this product for sale into the domestic market. The Deepwater Group and MPI should consider this matter further.

9.2 *Working with the Company*

The following recommendations are for Regional Operations Managers to advocate and to report back to the Operational Coordination group, the National Programmes Manager and the Director Compliance with their findings.

9. That Fishery Officers evaluate the s 9(2)(b)(ii) at sea Marel and Wisefish coding, weighing, labelling, inventory and reporting system, to determine its ability to provide accurate catch greenweights.

10. That Fishery Officers liaise with s 9(2)(b)(ii) to ensure they are reporting the accurate greenweight of fish on the CLR. The 2% carton weight "buffer" s 9(2)(b)(ii) currently apply is believed to be non-compliant. Fishery Officers need to: direct s 9(2)(b)(ii) to stop this practise; require s 9(2)(b)(ii) to provide a summary of landings for past 2 years; and determine whether these landings (CLRs and MHRs) be re-declared.

11. That Fishery Officers determine whether the on shore sampling protocol s 9(2)(b)(ii) uses as part of its QC processes is statistically robust and sufficient to provide accurate greenweights.

12. To investigate the s 9(2)(a) reporting 22,000 kg of hoki on a TCEPR as "ACC" but reporting only 2,200 kg as "A" on the relevant CLR, a discrepancy of approximately 20 tonne of hoki. This matter needs to be resolved with s 9(2)(b)(ii).

13. To address the possible under-reporting of 279 tonnes of hoki identified through comparisons of carton weight checks and vessel greenweight declarations.

9.3 *MPI Monitoring/Ongoing work*

The following recommendations are for the Fisheries Management Deepwater team and/or Regional Operations Managers to advocate and report back to the Operational Coordination group, the National Programmes Manager and the Director Compliance with their findings.

Reporting

14. That the Explanatory Notes are amended to require real-time reporting of effort and estimated catch information on both TCEPRs and CEEDT.

15. That an examination of the current practices for the completion of the processing data in the TCEPR be undertaken and that it be determined whether any changes in the Explanatory Notes are required.

16. That the recording of meal in the TCEPR and CLR needs to be addressed using the MPI July 2008 letter as a reference. There needs to be clarity and consistency on the reporting of whole fish to meal (MEA) and offal to meal (MEB).

Conversion Factors

17. That MPI reviews the VSCF setting process, considers appropriate changes to the VSCF testing regime, and monitors whether vessels comply with their VSCFs outside of testing trips.

18. That current reporting procedures for vessels (at present s 9(2)(b)(ii) vessels) producing hoki fillet portions are reviewed, so it can be immediately determined from fishing returns

whether a vessel has fillet portions. Packing of fillet portions should comply with guidelines that facilitate auditing whether all parts have been reported correctly.

19. That Fishery Officers are provided training to enable them to identify non-compliance of fillet states with the Fisheries Conversion Factor Notices (2005).

HMAs

20. That monitoring of vessels fishing Hoki Management Areas continues. Vessels identified as preferentially fishing HMAs will be required to carry observers on all subsequent fishing trips. The recommended first-priority vessels for observer coverage are s 9(2)(a)

21. That when a vessel is fishing in a Hoki Management Area, observers record quantities of small and damaged hoki caught, irrespective of whether those fish are discarded under authorisation. These records of small and damaged hoki catch will be forwarded to Fisheries Management Deep Water team.

Reporting Greenweight

22. That MPI observers are tasked to identify and document processes vessels use to establish whole fish to meal. The observers will assess the accuracy of the reporting of meal both on LPFVs and NZ fillet vessels.

23. Identify vessels and companies that deduct a glaze allowance when no glaze has been applied to product.

24. That further work is carried out to determine whether 'B' grade fish is being accurately labelled. This can be achieved through vessel inspections at sea and in-port inspections of carton contents of reported 'B' grade fish. Examining carton contents would help establish whether a product line contains damaged fish.

25. That consideration be given to adding hoki to schedule 5A of the Fisheries Act 1996, which means that under-fishing rights will not be carried forward to the next year. This will circumvent the carrying forward of rights which may have been utilised and not reported including but not limited to: illegal discards, incorrect carton weights, misreporting of whole fish to meal (including parts), incorrect fish states, application of CFs and VSCFs.

Catch Effort EDT

26. That the manner in which dates and times are written out to the CEEDT event fields needs to be amended to accurately record when the data was entered, in-accordance with the original CEEDT specifications.

27. That an analysis tool to process the CEEDT audit history data exported from the FishServe system is developed to enable prompt and accurate data analysis.

28. That the analysis tool to process the Compliance Management Tool (CMT) exported CEEDT audit history data needs to be further developed as only an early draft version of an analysis tool has been prepared at this stage.

Species Reporting

29. Education in species identification across industry, as part of the VADE model, may alleviate some misreporting of species (e.g. BEL for BBE; BEN for FRO; GSH for GSP; and probably EPR or EPL for CDL). This should be possible for species like GSH/GSP where they are being landed at the end of each trip.

30. To improve the reporting of shark species MPI could either remove the list of shark species codes from the explanatory notes entirely and replace it with a direction to consult the regulations themselves; and/or alternatively preface the existing list of codes with a note that these are just some of the more commonly used codes and the complete list is elsewhere. This issue also exists for other species and should be considered here.

31. MPI develops techniques for quantitative speciation of fish meal and that engagement with factory managers, company representatives and skippers is progressed in order that accurate reporting of meal is achieved.

Profiling

32. That for future hoki profiles (WCSI and ECSI) the inshore "Fresher" vessels that operate inside the territorial sea and 25nm closed area and vessels operating in the Cook Strait fishery are included in the hoki profile.

33. MPI Compliance bases its procedures for all further in-port and at-sea inspections on the inspections carried out and the templates used to gather information and documents about the hoki fishery during Operation Bronto.

34. Observer catch effort logbook data should be made available to all staff via the MPI data warehouse to better inform decisions across all fishstocks.

35. That there is ongoing monitoring and an automated process developed to flag if there are discrepancies between the following:

- The destination code "ACC" on TCEPRs versus CLRs and MHRs.
- Observer authorised discards versus CLRs & MHRs.
- Amounts by species/state/destination on TCEPR versus CLR As part of Cedric, companies should have checks for data entry errors.
- Observer reported species mix versus TCEPR & CLR species mix

Mobile LFRs

36. That no vessels are given mobile LFR status. This restricts MPI's ability to conduct carton content and weight checks because product may already be in containers, on the carrier vessel, have left the country or cannot be examined on the wharf due to food safety requirements. Any current mobile LFR status should be cancelled.

Highgrading

37. That an allowance for illegal catch is built in to the hoki TAC, commensurate with Bronto (2011) estimates of highgrading in the WCSI hoki fishery.

9.4 Investigation and/or Fishery Officer Monitoring at District

The following recommendations are for the Regional Operations Managers to advocate and to report back to the Operational Coordination group, the National Programmes Manager and the Director Compliance with their findings.

According to the MSC hoki report, the Ministry creates an effective deterrence and "takes hardline enforcement and prosecution action against deliberate serious offending …" To improve compliance against the illegal discarding of fish the following two recommendations are appropriate:

38. That MPI investigates the most serious offending vessel(s) identified in the hoki high-grading report for the illegal discarding of hoki on the WCSI. The s 9(2)(a) would be worth targeting in the coming hoki season.

39. That MPI investigate whether significant quantities of small hoki are being illegally discarded when vessels are consistently fishing areas within the ECSI HMAs where small hoki cannot be avoided and not landing as much small hoki as could be expected.

40. That MPI investigate why two vessels, the s 9(2)(a), reported much less whole hoki to meal when unobserved than when MPI observers were on board.

41. That MPI investigate whether vessels fishing HMAs are providing false or misleading information in their TCEPRs about the target species and amount of hoki taken during tows.

42. That MPI investigates whether high ratios of ling heads to ling bodies evident on the vessels s 9(2)(a) indicates illegal discarding of ling bodies.

9.5 Fact Sheet

The following recommendations are for the Fisheries Management Deepwater team to manage in conjunction with the Deepwater group and Compliance Directorate.

43. That the OCG compiles a "Fact Sheet" that:
    - informs the Fishing Industry about the WCSI hoki high grading analysis results
    - reminds Industry high grading is unlawful
    - advises that the Ministry will be monitoring the fishery with the intention of taking further action against any vessel/company in breach of the Fisheries Act 1996 and its regulations.

44. That if the ECSI Hoki Management Areas (HMAs) are not closed to trawling in line with recommendation 8 above, OCG will compile a "FACT Sheet" that:
    - reminds fishers about the current HMA Code of Practice,
    - documents how some fishers are abusing the HMAs
    - advises that, unless abuse of the HMAs stops, the Ministry will take action to ensure compliance with the COP.
    - reminds fishers the misreporting of target species and hoki catch inside HMAs are offences against the Fisheries Act 1996.

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APPENDICES

Appendix 1 - Comments about the Hoki Season

Fishery Officers asked the captains some general questions about the hoki season. Whether the catch rate and species mix was similar, better, worse than in previous years, whether the hoki was bigger or smaller than in previous years and any other comments. The captains' comments are as follows:

- s 9(2)(a) inspection of 27 July. The captain stated that the size of the hoki was bigger this season than in previous seasons.
- s 9(2)(a) inspection of 29 July. Captain said the size of the fish this year was good and it was comparable with the last couple of years.
- s 9(2)(a) inspection of 29 July. - Catch is less than last year. By catch is normal. Sizes of HOK about the same as per previous years.
- s 9(2)(a) inspection of 31 July. Most of the bycatch caught this trip was good sized including the LIN and HOK. Overall there was 8% bycatch this trip.
- s 9(2)(a) inspection of 1 August. – The captain stated that generally last year he caught slightly larger fish, except hoki in the canyon area where the size of fish were smaller. The year before that the fish in the Canyon was smaller than this year. HOK less than S grade represented about 1.5 tonne out of the trip so generally very little small hoki was caught at this stage in the season. The Hoki caught in the canyon was mainly by catch. The flat areas up North from 41'50 to 42'20 were where the smaller fish were taken (this area is known as the 'flats').
- s 9(2)(a) inspection of 1 August. The captain reported good catches of Hoki and that the Hoki was of good size.
- s 9(2)(a) inspection of 1 August. The captain reported that large size hoki had been caught so far this season and the bycatch catch rates are similar to previous years.
- s 9(2)(a) inspection of 2 August. The captain stated that the fishing is very similar to last year and the LIN catches are better than for a similar period last year. The by-catches are dependent on where the HOK schools are forming and the depths fished. For example the HAK are found in deeper water while the LIN is in shallower water.
- lv inspection of 4 August. The captain stated that the LIN catches are down from previous years and this is mainly due to midwater trawling (as LIN is found on the seabed).
- s 9(2)(a) inspection of 16 August. The captain advised that the HOK fishing has been good this season and just a bit better than last season. The by-catch amount is similar to last year.
- s 9(2)(a) inspection of 8 August. Captain felt HOK size was generally bigger this year compared to last year.
- s 9(2)(a) inspection of 4 August. Captain advised the fishing was very good all around, with mainly large size fish. The captain provided one example of a good tow completed north on the way home, which targeted large size HOK and had lots of roe present. The general fishing conditions were excellent, the fish size was good, and

the roe was good, trawling in the traditional fishing grounds. His vessel did not fish the canyons this year (which were further south). The captain reported good catch of HAK in the same area as well.

- s 9(2)(a) inspection of 12 August. Captain felt this season was about the same as last season, and he fished similar areas as last years.
- s 9(2)(a) At-Sea inspection of 27 July. Captain advised there was a good fish size and low by-catch this season, when fishing with a mid-water net on the bottom, observed by FOs during the inspection. Captain was unsure whether HOK is in recovery at present and stated the hoki was still patchy with no fish marks to speak of in the trench at present.
- s 9(2)(a) At Sea inspection of 27 July. The captain said that the fish was of a good size with a low by-catch when trawling using a mid-water net just off the seabed. This was seen by FOs during inspection.
- s 9(2)(a) At Sea inspection of 28 July. Despite good current catches the Captain said fishing had been a little up and down so far this season. However he said the fish was of a good size and the by-catch was low, when fishing with a mid-water net on bottom. This was seen by FOs during inspection.
- s 9(2)(a) At Sea inspection of 28 July. Generally speaking the Captain said the Hokitika trench had been poor so far this year and fishing on the flat (northern grounds) had been up and down. He said there was a good fish size and low by-catch when fishing with mid-water net on bottom. This was seen by FOs during inspection.
- s 9(2)(a) At Sea inspection of 29 July. The captain advised that he has caught good fish size with by-catch of largely HAK when fishing with BT net. This was seen by Fishery Officers during the inspection. Some small HAK GRE was seen in pans and in processing summaries but small quantities. Most HAK seen was large. Not much LIN seen while Fishery Officers were onboard.
- s 9(2)(a) At Sea inspection of 29 July. Captain advised this season is one of the better ones for WCSI hoki, with the mid water sign much earlier than last year, a good spread of fish all over the hoki grounds (100 mile stretch), good sized fish, and boat numbers similar to last year. The SBW vessels are leaving the hoki fishery earlier this year. On second wave of hoki spawning fish and sometimes all males, sometimes all females caught.
- s 9(2)(a) At Sea inspection of 20 August. Captain said during last tow approximately 25 T was caught which will take 12 hours to process. Trawl depth was approximately 290m. Size of hoki was good with very little small hoki. Very little fish to meal, due to size of hoki and lack of bycatch. For past week have been mid water trawling to avoid ling. Average sizes of bags are between 10 to 20 t. Hoki if in good condition can be processed below 50cm if needed.
- s 9(2)(a) inspection of 25 August. Captain said he was catching generally clean bags of HOK of a large size during this trip. Only a small percentage of small hoki has been taken.
- s 9(2)(a) inspection of 23 August. Captain stated that bigger HOK caught on second HOK trip for the season, using mid water trawling gear. Small quantities of by catch are taken when conducting mid water trawling, with some clean bags of HOKI.
- s 9(2)(a) inspection of 29 August. Captain said that fish marks very good for the 10 days fished in WCSI Hoki fishery on this trip (trip 3). Fished same

areas and depth as trip 2. Better catches during night time, and different than second trip where HOKI catches in mid water at night were not as good.

- s 9(2)(a) inspection of 2 September. Captain advised that there were more fish (HOK) on the grounds this season. Little difference in small size HOK catches between this year and last year. HAKE, LIN and SWA catches about the same as last year. Hoki season was coming to an end. Vessel will do one more trip targeting HOK and HAK.

- s 9(2)(a) inspection of 1 September. Captain said there were less spawning fish (biomass), more medium size fish and less large fish this season. There were a lot of LIN around about 90% if bottom trawling. Fish tended to be on the bottom during daylight hours especially on clear sunlight days. Cloudy weather did not produce the same effect. The captain advised that HOK fishing outside the spawn time is day time fishing only. HOK will come off the bottom at night but disperse in mid water and are hard to catch as they are not schooled up. His vessel targeted HOK for the whole 3 week trip. HOK caught in the spawn are not as good condition as fish caught outside the spawn. More to TSK block during spawn time as fish are not in as good condition.

- s 9(2)(a) inspection of 16 August. The captain stated that it was a very good season with very good sized fish.

- s 9(2)(a) inspection of 2 September. The captain stated that this HOK season was better than last season, as there were more fish on the grounds and the size is better. However they were fishing shallower water (500m) compared to last season's depth of ≥700m. He advised the HOK spawn was nearly over and the hoki were dispersing.

- s 9(2)(a) inspection of 7 September. Captain advised his vessel was targeting HAK/BAR and HOK. HOK was of a large size at the beginning of the trip, however the size decreased as the trip progressed.

- s 9(2)(a) inspection of 6 September. Captain said this year's HOK season was very good with large HOK and a good catch rate. He advised the HOK was starting to leave the grounds. This year was similar to last season. Small and damaged HOK this trip was about 3.5% (has been as low as 1.5% on previous trips).

- s 9(2)(a) inspection of 13 September. Captain said that fishing this trip was exceptional and described it as the best fishing he has ever seen as skipper. Some days the net having about 1 hour bottom time. Did not catch huge amount of by catch and had no LIN 7 ACE so he tried to avoid catching it. He fished mid water predominantly so less by catch as bottom trawling will invariably get more. Aiming for a couple of 12T bags during the day and try for a 30T later in the day to see processing through the quieter spell at night. During day the HOK is generally on the bottom except at Pegasus. At night they move up. Definitely more LIN on West Coast but tried to avoid as much as was possible. Conducted bottom trawling during day and mid water at night except in the Pegasus it was all mid water. Describes the HOK season as better than last season. Hard to judge whether rebuilding on just this last trip but feels it has definitely improved over last 5 years. No issues at all with foreign vessels - plenty of them however most have finished up and moved on to SBW. No HAK was targeted on this trip.

- s 9(2)(a) inspection of 23 August. The captain reported the water temperature is still very warm averaging 11.7˚C on the surface / 13˚C at depth. (May be attributed to poor fishing this trip). Fishing dropped away at a similar time last season, but overall this year has been better - bigger fish with large ROE (about 10% recovery). By catch minimal - due to midwater trawling. Some JMA this trip post rough weather

(vessel did shelter for one day this trip). No LDO at all this trip of any great number/volume. Very little HAK in by catch.

- s 9(2)(a) At Sea inspection of 21 August. The water temp was up approx 2% more than last year. Most fishing done above 42° for HAK. About 5yrs ago would fish for hake in Hokitika Trench with MW trawl but with water temperature being warmer, HAK is deeper so use BT gear.
- s 9(2)(a) inspection of 26 August. HOK not as prevalent as last trip. Fishing slower in 2nd Trip ending August.
- s 9(2)(a) inspection of 23 August. Did do a few bottom trawls looking to find fish - as fishing was slower this trip.
- s 9(2)(a) inspection of 27 July. HOK starting to school in midwater during last 3 days of trip (23-26 July).
- s 9(2)(a) inspection of 1 August. HOKI spawning in mid water towards end of trip so vessel now mid water trawling.
- s 9(2)(a) inspection of 4 August. TCEPR stated from 22/7/11 HOK started to school mid water through to the end of the trip.
- s 9(2)(a) inspection of 26 August. Captain expects to catch smaller amounts of HOK this trip as most of the fish (HOK) appears to be in the midwater column.
- s 9(2)(a) inspection of 27 July. HAK fishery not very good this season.

Appendix 2 - Catch Effort Electronic Data Transfer Returns

The following section summarises the limited review of the CEEDT data obtained from the 'at sea boarding' phase of Op BRONTO.

1.0 CEEDT, CEDRIC and CMT Ironkeys

The electronic based catch effort electronic data transfer ('CEEDT') system known as Catch Effort Data Reporting Information Capture ('CEDRIC') was launched by FishServe towards the end of 2010. Uptake of the CEDRIC system has been slow, with 23 vessels from 7 permit holders being registered for CEEDT as at 28th February 2012.

The CEDRIC system requires users (permit holders, vessels and persons) to be registered and to become 'authorised persons' to create, edit, sign and submit CEEDT returns. The CEDRIC software is designed to be run on the vessels computers and at the permit holder. Security to the CEDRIC system is controlled by Ironkey USB tokens with password access.

FishServe was also tasked with developing in-conjunction with MFish a Compliance Monitoring Tool ('CMT') which would be available only to MFish, and would enable an officer (using a special CMT Ironkey) to preview and export copies of the CEEDT returns. The CMT enables the officer to view audit history data detailing the various changes (if any) that have been to the data, and when those changes were made and by whom.

The development of the CMT tool was commenced after the CEDRIC application had been released by FishServe.

2.0 CEEDT and CMT Training - Pre Op BRONTO

Due to a number of factors, the Compliance Management Tool ('CMT') Ironkeys were not available to be issued to the boarding parties for Op BRONTO, and therefore formal training in the CEEDT system and CMT Ironkey usage was not given.

An overview of the CEEDT/CEDRIC system, the use of the CMT Ironkey and an alternative method to obtain the CEEDT using the vessels own CEEDT Ironkey (and a MFish supplied USB flash drive for data storage) was given to several boarding party members. Further instructions on how to obtain the CEEDT data using the vessels own CEEDT Ironkey was provided to some of the other members of the boarding teams.

The demonstration of the CEEDT system and the CMT Ironkey to several officers highlighted that there is definitely a need for hands on training in the use of the CEEDT system so that our officers understand how (and when) the users will use the system to open/create a return, enter/edit/modify and export data, and to sign and submit returns.

The use of the CMT to obtain a copy of the data will require officers to be confident in their knowledge of the CEEDT system and data, and also in what our CMT can and cannot do; for example, it cannot modify or delete data from the user CEEDT system.

Not all officers are likely to be confident or proficient enough in the use of the CMT to be issued with a CMT Ironkey.

3.0 Securing CEEDT Data - OP BRONTO

As the CMT Ironkeys were not available, each boarding party was issued with, or requested to obtain a number of new USB flash drives onto which the CEEDT data could be saved.

In order to prevent concerns about viruses being introduced onto the vessels computer systems, and also so as to avoid issues relating to accidently copying one vessels CEEDT data from one vessel to another vessel, the boarding parties were instructed to use a new USB flash drive for each CEEDT vessel boarded where data was to be obtained, and to open the packaging for the USB flash drive in front of the person they were dealing with in-respect of the CEEDT system and data.

Generally the obtaining of the CEEDT data by the boarding parties went well, except that in a couple of instances not all the available data was obtained or the data was not obtained in the required format, thereby hindering the detailed analysis of the audit history.

The CEEDT data that was obtained was made available to s 9(2)(a) Forensic Analyst, for analysis with his CMT tool.

4.0 Analysis and Findings from Review of CEEDT Data from Op BRONTO

As not all the available data for the trips of interest for the vessels operating CEEDT was obtained during the 'at sea boardings' it was necessary to obtain the missing data from FishServe. Whilst FishServe were able to provide the missing data, it did highlight that FishServe did not have a method for actually making the data available in a user friendly format.

A limited review of the audit history data was undertaken for a sample of vessels boarded during Op BRONTO. A decision to limit the review was made after the preliminary analysis identified several issues with the manner in which the returns were being completed, and the date/time stamps that were being recorded against the entered data.

4.1 Return 'Opening' Events

The analysis of the CEEDT audit history 'Opened' events identifies at what date and times a return was 'Opened'.

Using return number s 9(2)(a) dated 4th July 2011 from the s 9(2)(a) as an example, that return had the following 'Opened' events logged:

Event ID	Event Date	Event Time
Opened	2011-07-04	01:58:12.933
Opened	2011-07-04	05:39:21.377
Opened	2011-07-04	11:15:10.520
Opened	2011-07-05	07:00:51.427
Opened	2011-07-05	09:22:49.20
Opened	2011-07-06	03:56:44.20
Opened	2011-07-07	23:31:00.450

4.2 Return 'Signing' Events

The analysis of the CE EDT audit history 'Signed' events identifies at what date and times a return was 'Signed'.

Using return number s 9(2)(a) dated 4th July 2011 from the s 9(2)(a) as an example, that return had the following 'Signed' events logged:

Event ID	Event Date	Event Time
Signed	2011-07-07	00:04:13.980
Signed	2011-07-10	22:34:14.877

4.3 Timing of Completion of CEEDT Returns

It is apparent from a small sample of the CEEDT returns reviewed that the majority of the CEEDT return content is not being completed on the day that the fishing activity took place. In some cases, there was a delay of several days before the data was entered into the CEDRIC system.

Using the s 9(2)(a) ia as an example, I reviewed the data for the dates of 3rd and 4th July 2011.

Whilst the returns appear to have been created on the actual days to which they related to, the majority of the actual fishing related data was not entered into each return until the 7 h July 2011 (for both the days fishing activity), some three or four days after the actual fishing activity took place.

In-addition, the data for the return dated 3rd July 2011 was date and time-stamped two (2) minutes before the data for the returned dated 4th July 2011.

It appears as though the practice on the vessels is to complete the returns possibly in batches when time permits, and that could be some days later.

In looking at the effort and processing data (in those two sample TCEPR audit history files) generally the data with each return has the same date and time for each field where data has been entered. Clearly the data was not entered at the same time, as the time is recorded down to thousandths of a second, and is exactly the same. Due to the volume of data that was entered, it could not have been entered at exactly the same time, and that highlights an issue with the way in which the CEDRIC system is time stamping the data.

It appears that the audit history dates and times are only being applied to the entered data when the return is saved, and not when the data is actually being entered, hence all fields having exactly the same time stamp.

The issue of writing the data out to the CEDRIC database when it is actually entered and date/time stamping it at that point as well was one of the sticking points that Compliance agreed to the postponement of that requirement for a defined period of time (so that the CE EDT project would not fall over), but that requirement was not to be dropped altogether, merely postponed. The period for postponement has passed, and I raised this issue with s 9(2)(a) on 21st October 2011.

4.4 Non-Representative Date and Time Stamps Recorded in CEEDT Data

Page 10 of the CEEDT Compliance Extract Guide produced by FishServe for MPI states that:

> "Note, you cannot assume that the date/time values will be correct, and therefore you cannot use 'date/time performed' to order audit records."

As has been noted in section 4.3 above, the issue of what time stamp is being recorded for the entered data was identified from a review of sample returns from the Op BRONTO boardings.

It is important that accurate timestamps are recorded against the entered data so as to enable analysis of the timeliness of the entered data to be undertaken. As this was a requirement of the CEEDT specifications, this issue needs to be referred back to FishServe to address as noted in section 4.3 above.

5.0 Follow up Action

The following issues need to be addressed:

5.1 The requirements (whether in regulation or explanatory notes) as to the timing of when the various sections of the CE returns (and other applicable returns types) are required to be completed needs to be reviewed and changes made to better clarify when the data must be entered.

5.2 The manner in which dates and times are written out to the CEEDT event fields needs to be amended to more accurately reflect when the data was entered, in-accordance with the original CEEDT specifications.

5.3 An analysis tool to process the CEEDT audit history data exported from the FishServe system needs to be developed to enable prompt and accurate data analysis to be undertaken.

5.4 The analysis tool to process the CMT exported CEEDT audit history data needs to be further developed as only an early draft version of an analysis tool has been prepared at this stage.

Analysis of Dates and Times in CE EDT Returns

Note: Only selected fields from the available CEEDT data fields have been included in this analysis

			Ref #1	Ref #2	Ref #3	Ref #4	Ref #5	Ref #6	Ref #7	Ref #8	Ref #9	Ref #10	Ref #11	Ref #12	Ref #13	Ref #14	Ref #15	Ref #16	Ref #17	Ref #18	Ref #19	Ref #20	Ref #21	Ref #22	Ref #23	Ref #24	Ref #25	Ref #26	Ref #27	Ref #28	Ref #29
								Shot 1																						
Vessel Name	Vessel Number	CE EDT Return Number	Return Date	Created Date	Created Time	Midday Position Latitude - Degrees	Midday Position Latitude - Degrees	Activity Comment (Updated) Date	Activity Comment (Updated) Time	Shot Collection Created Date	Shot Collection Created Time	Effort Created Date	Effort Created Time	Start Time Created Date	Start Time Created Time	Start Latitude Degrees Created Date	Start Latitude Degrees Created Time	End Time Created Date	End Time Created Time	End Latitude Degrees Created Date	End Latitude Degrees Created Time	Trawling Speed Created Date	Trawling Speed Created Time	Target Species Created Date	Target Species Created Time	Total Weight Created Date	Total Weight Created Time	Species Code Created Date	Species Code Created Time	Estimated Weight Created Date	Estimated Weight Created Time
s 9(2)(a)		50000875	3/07/2011	3/07/2011	00:09:35.773	7/07/2011	00:02:23.470	7/07/2011	00:02:23.470	3/07/2011	00:09:35.750	7/07/2011	00:02:23.470	7/07/2011	00:02:23.470	7/07/2011	00:02:23.470	7/07/2011	00:02:23.470	7/07/2011	00:02:23.470	7/07/2011	00:02:23.470	7/07/2011	00:02:23.470	7/07/2011	00:02:23.470	7/07/2011	00:02:23.470	7/07/2011	00:02:23.470
		50000876	4/07/2011	4/07/2011	01:58:12.933	7/07/2011	00:04:13.767	7/07/2011	00:04:13.767	4/07/2011	01:58:11.530	7/07/2011	00:04:13.767	7/07/2011	00:04:13.767	7/07/2011	00:04:13.767	7/07/2011	00:04:13.767	7/07/2011	00:04:13.767	7/07/2011	00:04:13.767	7/07/2011	00:04:13.767	7/07/2011	00:04:13.767	7/07/2011	00:04:13.767	7/07/2011	00:04:13.767

Note1: Updated date means that the contents of that field were amended from the original 'created' values

Appendix 3 - Soaking the Net

Instances where Fishery Officers were advised by captains that used this practise are as follows:.

s 9(2)(a) inspection 31 July – the vessel utilised the practice of soaking the net/gear. Fishery Officers noted this enables them to process the fish already on board, so that they don't haul the gear until they have at least 3 pounds empty. The pounds are preferentially used from the port side as that is the hottest being closest to the meal plant.

s 9(2)(a) inspection 1 August – although not a standard practice as the captain tries to catch small processable amounts, the vessel can soak nets so that fish from the previous trawl is emptied from pound.

s 9(2)(a) inspection 7 September – the vessel used bottom trawl gear this trip targeting specifically HAK and BAR. For BAR and HOK trawls the captain advised he can soak the net for 2 to 3 hours. For the HAK trawls he can soak the net for up to 10 hours.

s 9(2)(a) (observer trip s 9(2)(a) – Observers noted there were catch sensors on cod end which allows the captain to lift the gear once the net has sufficient fish. The captain can soak the net (tow around in non-fishing depth) and wait for the pounds to empty before hauling on board. Observers advised that there was no real technique to this practise, other than fishing depths, to avoid catching small hoki.

s 9(2)(a) inspection 24 August – Captain advised that he does soak the net for 2 to 3 hours.

s 9(2)(a) At-Sea Inspection 20 July – the vessel ended up soaking the catch for 1 hour because the factory crew hadn't finished processing. The Fishery Officers observed a clean 30 tonne bag being hauled, mainly of HOK, before departing the vessel. Fishery Officers also observed a clean bag of HOK caught in the previous tow and 1 bin of mixed RBT/BYX/SPD/RBM/FRO/SQU and SPE.

s 9(2)(a) inspection 7 September - Vessel used bottom trawl gear this trip, targeting specifically HAK and BAR. Typically both BAR and HOK had 2-3 hour soak time, with HAK having up to a maximum of 10 hours soaking time.

Appendix 4 – VSCF Report

Date: 28 February 2012
Memo:
To: s 9(2)(a), Fisheries Investigator, OCU – Compliance & Response
From: s 9(2)(a), Fisheries Investigator, OCU – Compliance & Response
Re: Op Bronto -Vessel Specific Conversion Factors (VSCF)– Issues relating to Hoki fishery

Background

During Operation Bronto, a Ministry of Fisheries Observer provided feedback with regard to differences in recovery rates of Hoki fillet states onboard vessels holding Vessel Specific Conversion Factors (VSCF) certificates. It was suggested that the conversion factors (CFs) were lower during VSCF testing trips compared to standard observer trips. The implication was that the vessels process more carefully with a) observers onboard and b) during VSCF testing, with processing practices less precise without observers onboard. This report subsequently examines this issue namely by examining observer CF data from VSCF testing trips and standard observed trips. This preliminary analysis concludes there is a real risk that vessels are unable to comply with VSCF and as a consequence Hoki catch is under reported. This issue also requires further analysis and could be aligned with work already being undertaken by Fisheries Management in relation to VSCF testing.

This report also outlines briefly work in progress as a result of a CF meeting in December 2011 for your information.

Conversion Factors

Conversion factors are used to translate the weight of processed fish to the greenweight, or total weight of the fish when it was caught. Conversion factors are important for stock assessment and reporting purposes to ensure that accurate quantities of fish harvest are accounted for.

Part 10 of the Fisheries Act 1996 (Recordkeeping, reporting, disposal of fish, and provisions relating to taking and possession of fish for purpose of sale), section 188 sets out the requirements in relation to conversion factors.

Under s188(1) the chief executive may set conversion factors which shall, ... be used to determine the weight of any fish, ... and such conversion factors shall be used to translate (a) the weight of the fish, ...in the state to which it has been processed to the greenweight.

In general terms conversion factors are '*based on **average recovery rates** for a defined processed state and set after sampling by MFish Observers during processing at sea.*'[1]

S188 (2) also provides for the determination of vessel specific conversion factors (VSCFs)

> *The chief executive may, in respect of any vessel on which fish, aquatic life, or seaweed is processed, having regard to the method of processing or the processing history of the vessel and after consultation with the owner, operator, or master of the vessel, issue a certificate specifying conversion factors for that vessel which shall for all purposes (including any proceedings for an offence against this Act) be used to determine the weight of any fish, aquatic life, or seaweed processed by that vessel within the terms of the certificate.*

Overview of VSCF certificates for 2011 - Factory Fillet vessels

During the 2011 Hoki fishing season, 5 factory vessels held VSCF certificates. These were two trawlers operated by s 9(2)(b)(ii) (s 9(2)(a)) and three trawlers operated by s 9(2)(b)(ii) s 9(2)(a).

[1] Fisheries (Conversion Factors) Notice 2005: Introduction and Background to Principal Landed State Definitions

In normal circumstances VSCF certificates are valid for 3 years. Refer to VSCF certificate start and end dates below:

Vessel Name	Callsign	START	END
s 9(2)(a)		24/03/2011	23/03/2014
		1/03/2011	28/02/2014
		1/10/2010	30/09/2013
		1/10/2010	30/09/2013
		1/10/2010	30/09/2013

In brief, VSCF testing is undertaken by observers at sea over three fishing trips. Certificates are issued by the Ministry of Fisheries based on recommendations contained in research reports prepared by NIWA. This method is explained in more detail later in the report. For all 5 vessels, the VSCFs have been issued for fillet states relating to the species Hoki, Hake and Ling. The current VSCFs issued for each species and state are summarised in the table below:

Vessel Name	HOK TRF (2.65)	HOK TSK (3.1)	LIN TSK (2.95)	HAK FIL (2.30)	HAK TSK
s 9(2)(a)	2.45	2.85	2.7	2	-
	2.25	2.7	2.55	1.95	-
	2.4	2.65	2.55	-	2.2
	2.3	2.55	2.55	-	2.15
	2.25	2.5	2.5	-	2.1

Compliance of vessels with VSCFs for Hoki (VSCF trip vs normal CF trip)

Observer trip reports from 2010/2011, pertaining to the 5 factory vessels, were reviewed to ascertain if vessels holding VSCF certificates were meeting the VSCF during normal processing and testing on standard observer trips.

There have been 11 observed Hoki trips onboard vessels with VSCF certificates since 1 October 2010. All 5 vessels were observed at least once while targeting Hoki either pre, during or post the spawn. Six of the observed trips were general observer trips whereby CF testing was undertaken as a part of normal observer duties. The other 5 trips were VSCF testing trips where observers prioritised VSCF tests for the first 21 days of each trip.

Two of the 5 vessels listed above were observed during the 2011 Hoki spawn season. The s 9(2)(a) was observed from the 29 June to the 30 July 2011 for the purpose of VSCF testing.
The s 9(2)(a) also had observers onboard but for a standard observed trip during the spawn beginning 4 August to 13 September 2011. This vessel fished in FMA 7 targeting Hoki for most of the trip apart from the last 10 days of fishing where the vessel targeted Hoki on the East Coast. During this trip standard Conversion Factor (CF) testing was undertaken by observers on HOK TSK and HOK TRF using both random and non-random tests.

For HOK TRF the observers obtained CFs ranging from 2.43 (in FMA 3) to 2.58 (in FMA 7). The average was approximately 2.5. The official CF for Hoki TRF is 2.65. The VSCF that this vessel is using is 2.25. There is a difference of at least 0.25 between what the vessel is reporting using the VSCF and how processing was actually occurring.

For this trip the total quantity of Hoki that was processed to TRF has been reported in the CLR as 521,745kg using the VSCF of 2.25. Using the averaged observer derived CF for this trip the calculated greenweight would be **58, 278kg more** than what has been declared.

Similarly, for the same trip, for HOK TSK the observers derived CFs ranging from 2.62 (in FMA3) to 2.8 (in FMA 7). The average was approximately 2.736. The official CF for HOK TSK is 3.1. The VSCF that this vessel has been issued is 2.5. This is a difference of at least 0.23 between what the vessel is reporting using the VSCF and how processing was actually occurring.

The quantity of Hoki that was processed to TSK has been reported in the CLR as 974,839kg using the VSCF of 2.5. Using the averaged observer derived CF for this trip the calculated greenweight would be **92,900kg more** than what has been declared.

For both HOK TRF and HOK TSK combined for this one trip this has resulted in up to **151,178kg** of Hoki being under reported due to difference between the observer derived CF and the VSCF. Overall this is a difference of 9% of total hoki reported. This example shows that even a small difference in the CF used (in this case 0.25) may significantly affect the greenweight reported.

It is noted that the recovery rate during the spawn is typically less due to the weight of roe in the spawning fish. i.e. the CF will be higher. In obtaining a VSCF observers conduct three testing trips (pre spawn, spawn and post spawn) and this data is statistically analysed by NIWA using a method where CFs are weighted by month in accordance to the proportion of catch landed from all sampled months. This effectively provides a weighted CF both in respect of lower values, typically obtained during pre and post spawn testing, and higher values typically obtained during the spawn. Based on this methodology, it is therefore reasonable to expect that vessels with VSCFs fishing during the Hoki spawn will unlikely be processing fish with a recovery that accurately reflects the VSCF issued to them (as seen in the example above).

Following this it would possibly be expected the opposite to be true i.e. that vessels fishing during pre and post spawn trips would be processing to a CF slightly lower than the VSCF (since the VSCF is a weighted average of low pre/post spawn and high spawn values).

The table below summarises CF results obtained from the 6 standard observed trips in 2010/11. These are trips where observers **are not** gathering data for VSCF certificates.

Vessel	Date	Date	SPE	STATE	Trip CF	VSCF	DIFF	Off CF	Season	VSCF trip	Trip no
s 9(2)(a)	2-Feb-11	22-Mar-11	HOK	TSK	3.2	2.75	**0.45**	3.1	Post	N	s 9(2)(a)
	4-Aug-11	13-Sep-11	HOK	TRF	2.42	2.25	**0.17**	2.65	Spawn/Post	N	
	7-Oct-11	14-Nov-11	HOK	TSK	2.66	2.55	**0.11**	3.1	Post	N	
	12-Oct-10	15-Nov-10	HOK	TSK	2.54	2.5	0.04	3.1	Post	N	
	29-Oct-11	7-Dec-11	HOK	TSK	2.53	2.5	0.03	3.1	Post	N	
	4-Aug-11	13-Sep-11	HOK	TSK	2.52	2.5	0.02	3.1	Spawn/Post	N	
	12-Oct-10	15-Nov-10	HOK	TRF	2.26	2.25	0.01	2.65	Post	N	

s 9(2)(a)										s 9(2)(a)
	31-Mar-11	11-May-11	HOK	TSK	2.61	2.65	-0.04	3.1	Pre	N
	2-Feb-11	22-Mar-11	HOK	TRF	2.29	2.4	-0.11	2.65	Post	N

On at least 5 of the trips and for one of the processed states (TRF or TSK) the VSCF was not achieved by the vessel. In the case of 3 vessels, the CF achieved is 0.10 or more above the VSCF. As nearly all of these trips were pre or post the Hoki spawn time it does not appear that vessels process at a rate where the CF is lower than the VSCF (and as a consequence would be over reporting the amount of hoki processed during a trip, there is no incentive to do so). In fact from these examples most vessels are processing close to their VSCF or higher than their VSCF. As a result it appears vessels may gain from having a lower VSCF during the spawn time.

The table below shows the CF results obtained from the remaining 5 observed trips from 2010/11 which were all VSCF testing trips. It should be noted that although vessels hold recent VSCF certificates, testing trips continue to take place in order to ensure there is sufficient data over a 3 year time period in which certificates are renewed.

Vessel	Date	Date	SPE	STATE	Trip CF	VSCF	DIFF	Off CF	Season	VSCF trip	Trip no
s 9(2)(a)	29-Jun-11	30-Jul-11	HOK	TRF	2.59	2.3	0.29	2.65	Spawn	Y	s 9(2)(a)
	29-Jun-11	30-Jul-11	HOK	TSK	2.84	2.55	0.29	3.1	Spawn	Y	
	23-Nov-11	19-Dec-11	HOK	TSK	2.71	2.65	0.06	3.1	Post	Y	
	13-Dec-11	17-Jan-12	HOK	TSK	2.87	2.85	0.02	3.1	Post	Y	
	13-Dec-11	17-Jan-12	HOK	TRF	2.45	2.45	0.00	2.65	Post	Y	
	19-May-11	29-Jun-11	HOK	TRF	2.23	2.25	-0.02	2.65	Pre	Y	
	31-Mar-11	8-May-11	HOK	TSK	2.48	2.5	-0.02	3.1	Pre	Y	
	31-Mar-11	8-May-11	HOK	TRF	2.18	2.25	-0.07	2.65	Pre	Y	
	23-Nov-11	19-Dec-11	HOK	TRF	2.31	2.4	-0.09	2.65	Post	Y	
	19-May-11	29-Jun-11	HOK	TSK	2.54	2.7	-0.16	3.1	Pre	Y	

This table shows that most of the vessels are able to achieve CFs below or very close to their VSCF during VSCF testing trips. The exception is the s 9(2)(a) for which testing took place during a spawn trip (difference of 0.29 for both HOK TSK and HOK TRF). This has resulted in up to **130,244kg** of Hoki not being reported due to difference between the observer derived CF for this trip and the VSCF. Overall this is a difference of 9% of total hoki reported.

There is also some evidence that processing practices may alter during VSCF testing trips. Currently VSCF data is gathered during the first 21 days of a fishing trip following which observers return to standard observer duties (or other priorities as directed). The summary table below shows data relating to a recent trip by the s 9(2)(a) This was a VSCF trip where the vessel was targeting Hoki. During the 21 day testing period, the observers obtained a CF of 2.87 for HOK TSK, close to the vessels VSCF of 2.85. The observers continued to gather CF data following the 21 day VSCF testing period whereby the CF for HOK TSK was calculated at 3.18, closer to the official CF of 3.1. The observer test results showing CF by area and test type is included in Appendix 1.

Vessel	Date	Date	SPE	STATE	Trip CF	VSCF	DIFF	Off CF	Season	VSCF trip	Trip no
s 9(2)(a)	13-Dec-11	17-Jan-12	HOK	TSK	3.18	2.85	0.33	3.1	Post	Y (post test results)	s 9(2)(a)
	13-Dec-11	17-Jan-12	HOK	TSK	2.87	2.85	0.02	3.1	Post	Y	
	13-Dec-11	17-Jan-12	HOK	TRF	2.45	2.45	0.00	2.65	Post	Y	

This same issue also occurs with a trip undertaken by the s 9(2)(a) in May/June 2011. During the 21 day testing period, the observers obtained a CF of 2.54 for HOK TSK and 2.23 for HOK TRF, both less than the vessels VSCFs of 2.7 for HOK TSK and 2.25 for HOK TRF. The observers continued to gather CF data following the 21 day VSCF testing period whereby the CF for HOK TSK was calculated at 2.89, nearly 0.20 higher than its VSCF. The observer test results showing CF by area and test type is included in Appendix 1.

Vessel	Date	Date	SPE	STATE	Trip CF	VSCF	DIFF	Off CF	Season	VSCF trip	Trip no
s 9(2)(a)	19-May-11	29-Jun-11	HOK	TSK	2.89	2.7	0.19	3.1	Pre	Y (post test results)	s 9(2)(a)
	19-May-11	29-Jun-11	HOK	TRF	2.23	2.25	-0.02	2.65	Pre	Y	
	19-May-11	29-Jun-11	HOK	TSK	2.54	2.7	-0.16	3.1	Pre	Y	

In summary there appears to be a risk with VSCFs may not be an accurate reflection of Hoki processing in that vessels are unable to achieve their VSCFs year round and that processing practices may alter during VSCF testing. The risk is that the amount of Hoki being extracted from the fishery, mostly but not only during the spawn time, is not being accurately reported.

This issue requires further examination and more in depth analysis. In this report no allowance has been made for differences in CF in relation to observer testing procedures, fishing area, test type (random versus non random), processing equipment and the quantity of fish tested. The examples given above are a preliminary indication of the possible risk.

Other Issues with VSCF (methodology and testing)

Relevant to the above issue, a Conversion Factor meeting was held in December 2011 when this matter was being examined as part of Op Bronto. Fisheries Managers met with MPI Scientists, NIWA, SeaFic and an MPI Observer to discuss possible improvements to current VSCF testing procedures[2].

[2] Refer internal memorandum dated 5 August 2011 from s 9(2)(a) (Appendix 3).

The key issue discussed was the appropriateness of the current testing regime, more specifically the accuracy of random versus non-random tests. NIWA and MPI Scientists are concerned the CFs obtained from non-random tests is consistently lower than the CFs from random tests, suggesting altered behaviour during testing. That is the non-random tests are able to be influenced by changes in behaviour (less trimming, careful handling, general awareness testing is occurring) while during random testing there is less chance for this to happen.

In calculating the VSCFs for four of the five vessels in the fishery in 2011, NIWA removed the non-random test results from the procedure due to this bias. This was disputed by the fishing companies and as a consequence VSCFs calculated using the non-random and random data were issued (and were all lower than those calculated using only random data).

As a result of this meeting there is additional work being undertaken in relation to VSCF testing. This includes:

- Investigating options for random testing only during VSCF trips.
- Reviewing observer testing procedures to make these more robust.
- Developing VSCF test protocols for each vessel to ensure consistency across observers.

The meeting also noted that there is currently no monitoring regime outside of the VSCF testing process to ensure vessels continually achieve VSCF.

Appendix 1: s 9(2)(a) – VSCF trip – 13 Dec 2011 to 17 Jan 2012

CONVERSION FACTOR AVERAGE TEST RESULTS FOR TRIP

Total tows for vessel specific test period:	80	Total tows sampled:	47

SPECIES	STATE	No. OF TESTS	TOTAL No. OF FISH	A GREENWEIGHT	B PROCESSED WEIGHT	A ÷ B CF	OFFICIAL CF	FMA	RANDOM OR NON RANDOM
HOK	TSK	17	2100	2420.72	834.32	2.90	3.10	SEC	R
HOK	TSK	18	2265	2508.75	879.77	2.85	3.10	SEC	NR
HOK	TSK	4	430	604.98	205.83	2.94	3.10	SOE	R
HOK	TSK	4	419	582.66	210.02	2.77	3.10	SOE	NR
HOK	TRF	16	2085	2304.00	923.90	2.49	2.65	SEC	R
HOK	TRF	16	1985	2293.62	947.18	2.42	2.65	SEC	NR
HOK	TRF	2	180	305.52	127.31	2.40	2.65	SOE	R
HOK	TRF	1	90	149.14	63.93	2.33	2.65	SOE	NR
LIN	TSK	19	681	2006.84	748.37	2.68	2.95	SEC	NR
LIN	TSK	4	90	360.40	130.11	2.77	2.95	SOE	NR
HAK	FIL	25	483	1899.55	911.32	2.08	2.30	SEC	NR
HAK	FIL	8	112	406.79	203.43	2.00	2.30	SOE	NR

Total tows for non vessel specific test period:	43	Total tows sampled:	8

SPECIES	STATE	No. OF TESTS	TOTAL No. OF FISH	A GREENWEIGHT	B PROCESSED WEIGHT	A ÷ B CF	OFFICIAL CF	FMA	RANDOM OR NON RANDOM
HOK	TSK	4	600	541.14	170.26	3.18	3.10	SEC	R
HOK	TSK	4	600	555.90	175.02	3.18	3.10	SEC	NR

Appendix 2: s 9(2)(a) – VSCF trip – 19 May to 29 June 2011

CONVERSION FACTOR AVERAGE TEST RESULTS FOR TRIP

Total tows for trip:	138	Total tows sampled:	52

SPECIES	STATE	No. OF TESTS	TOTAL No. OF FISH	A GREENWEIGHT	B PROCESSED WEIGHT	A ÷ B CF	OFFICIAL CF	FMA	RANDOM OR NON RANDOM
VS Tests									
HOK	TSK	17	2817	2328.08	928.65	2.51	3.10	SEC	N
HOK	TSK	14	1995	1846.30	723.54	2.55	3.10	SEC	R
HOK	TSK	1	110	147.82	58.11	2.54	3.10	CHA	N
HOK	TSK	2	340	289.04	108.38	2.67	3.10	CHA	R
HOK	TRF	16	2199	2289.02	1044.07	2.19	2.65	SEC	N
HOK	TRF	13	2050	1833.94	803.25	2.28	2.65	SEC	R
LIN	TSK	11	403	1597.44	624.45	2.56	2.95	SEC	N
LIN	TSK	3	101	427.44	142.72	2.99	2.95	SEC	R
HAK	FIL	15	472	2083.69	1078.12	1.93	2.30	SEC	N
Post VS									
HOK	TSK	5	675	728.84	259.51	2.81	3.10	CHA	N
HOK	TSK	5	547	723.12	242.07	2.99	3.10	CHA	R
LIN	TSK	3	64	433.91	174.31	2.49	2.95	CHA	N
LIN	TSK	1	21	137.08	62.25	2.20	2.95	CHA	R

APPENDIX 5 Summary of Hoki Processing Specifications by Vessel for 2011 Season

HGT/DRE Vessels

s 9(2)(a)

Vessel Name	State	S		M		L		2L		Other
		Number Fish	Weight per Fish	Number Fish	Weight per Fish	Number Fish	Weight per Fish	Number Fish	Weight per Fish	
	HGT				300-500		500-800		800+	MAN = manual grade (1 good fillet can be made); ROC = run of catch (mixed sizes)
	DRE		200-300		301-700		701-1250		1250+	
	HGT	30-70	220-510	22-29	520-710	16-21	720-990	1-15	1000+	
	DRE	32-75	200-469	23-31	484-652	17-22	682-882	1-16	938+	
	HGT	30-70	214-500	22-29	517-682	16-21	714-938	1-15	1000+	
	DRE	32-75		23-31		17-22		1-16		
	HGT	65	220	27	520	20	700	14	1000	Also 2S: 155g, 93fish. Specifications taken during At-Sea & In-Port Inspections.
	HGT	60	230	28	520	20	680	14	1000	Observer photo of paper attached to factory wall.
	HGT				-500		500-800		800+	
	HGT	20-50	200-500	12-20	500-800	1-13	800+			Minimum size 200g.
	HGT	26-45		19-25		14-18		1-13		
	HGT	30-70		22-29		16-21		1-15		
	HGT		200-300		300-700		700-1250		1250+	ROC
	HGT	45		25		17		12		
	HGT		200-300		300-700		700-1250		1250+	ROC
	HGT	30-70	200-500	22-29	500-700	16-21	700-1000	1-15	1000+	UG = ungraded/mixed
	DRE	29+	-490	22-28	500-670	16-21	680-920	1-15	930+	
	HGT	27+	-500	20-26	500-720	14-19	720-1000	1-13	1000+	

Fillet Vessels

s 9(2)(a)

Vessel Name	State	2	4	6	8	12	16+			Other
	TRF	2-4oz	4-6oz	6-8oz	8-12oz	12+oz	16+oz			
	TSK	2-4oz	4-6oz	6-8oz	8-12oz	12+oz	16+oz			Also: 6+oz, 6-12oz, 3-4oz, 3-6oz, 4-5oz, 5-6oz,
	TRF	60-115g, 60+ count	115-175g, 40-60 count	175-225g, 30-40 count	225-340g, 20-30 count	340g+, 1-20 count				
	TSK	60-115g, 60+ count	115-175g, 40-60 count	175-225g, 30-40 count	225-340g, 20-30 count	340g+, 1-20 count				
	TRF	60-115g, 60+ count	115-175g, 40-60 count	175-230g, 30-40 count	230-340g, 20-30 count	340g+, 1-20 count	453.5g+, 1-13 count			
	TSK	60-115g, 60+ count	115-175g, 40-60 count	175-225g, 30-40 count	225-340g, 20-30 count	340g+, 1-20 count				Also: 4-6 (110-170g), 6+ (170g+).
	TRF	2-4oz/ 55-115g	4-6oz/ 115-170g	6-8oz/ 170-225g	8-12oz/ 225-340g	12-16oz/ 340-450g	16+oz/ 450g+			Also: over 12oz/over 340g
	TSK		4-6oz/ 115-170g	6-8oz/ 170-225g	8-12oz/ 225-340g	12+oz/ 340g+				Also: 6-12oz/ 170-340g
	UTF				8-12oz/ 225-340g	12-16oz/ 340-450g	16+oz/ 450g+			Also: over 12oz/over 340g
	TSK		110-170g ('M' grade)	170-225g ('L' grade)	225g+ ('LL' grade)					Also: 180g+ ('P' grade)
	TRF	60-110g ('S' grade)	110-175g ('M' grade)	175-225g ('L' grade)	225-340g ('LL' grade)	340g+ ('3L' grade)				

Appendix 6 – Summary of Times Processing Specifications not met

The table below provides a summary illustrating the number of times, by percentage, that processing specifications for hoki grades were not adhered to, as identified by Fishery Officers. This data relates solely to limited processing vessels producing HGT and/or DRE product.

Grade	% times grade packing specifications not met*	% times packed to larger grade than labelled	% times packed to smaller grade than labelled
2S/S	31%	31%	0%
M	22%	21%	1%
L	16%	12%	4%
2L	3%	0%	3%
<500g	7%	7%	0%
500-800g	3%	3%	0%
>800g	0%	0%	0%

Summary of carton inspections where grading specifications Not Met*.

** "Not met" means in this instance that the block weight (and therefore average piece weight) and/or the number of fish/block are not consistent with the packing specifications of a grade.*

It appears that smaller grades are more likely to be mislabelled and therefore inconsistent with grading specifications than larger grades. This indicates larger fish may at times be packed into smaller grade boxes but the reverse is much less common. Analyses of the amount of small fish landed sometimes rely on the declared grades as recorded in vessel unload schedules. The implication of this is if larger fish are being packed into smaller grades then fewer small fish are being landed than it would seem when unload schedule data is assessed. The issue then is what is happening to the small fish that we would expect to be in the small grades – is it being dumped or mealed and not reported?

Appendix 7 – Letter from MFish to Industry re: Reporting of Fishmeal

Ministry of Fisheries
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0800 4 POACHER

10 July 2008

File Ref: 22/9/0

s 9(2)(a)

Dear s 9(2)(a)

REPORTING OF FISH MEAL – TRAWLERS

The purpose of this letter is to inform you of revised reporting procedures for trawlers processing and landing fish meal (MEA) and fish meal by-product (MEB).

Fish meal is defined in the Fisheries (Conversion Factors) Notice 2005 (the Notice) as whole fish that has been rendered or cooked into a dried form. The conversion factor for processed weight to greenweight for fish meal is 5.60. The additional landed state of fish meal by-product is defined in the Fisheries (Reporting) Regulations 2001 as the state in which offcuts and offal from whole fish have been rendered or cooked into a dried form.

For most fish product, the greenweight is derived by multiplying the number of cartons by the carton weight and then by the relevant CF as prescribed in the Notice. However –

- Meal is not packed into bags by individual species – it is a combination of many species of whole fish, heads, frames and offal;
- For meal, the greenweight of each species is obtained by a combination of methods, including time sampling of species along conveyor belts leading to the meal plant, or weighing the fish in bins where it is practicable to do so. The greenweight for each species is then entered by the vessel master on to the catch effort return;

Figure 1

expressed in decimal points of the number of bags;

- The master of the vessel then enters that number of bags and part bags on their catch effort returns for each species or fishstock. This can run to many lines, or even pages, on the catch effort return, depending on the number of stocks being reported.

MFish believes the practice does not comply with Regulation 36(3)(a) of the Fisheries (Reporting) Regulations 2001, which requires that all weights of fish must be recorded in greenweight kilograms using, if appropriate to the landed state of the fish, the CF stated in the *Gazette* Notice. Although a CF is applied in this practice, it is not applied to the 'product' to derive a greenweight.

Fishing Industry representatives and MFish have collaborated on developing an alternative system for reporting of fish meal that we believe meets the objective of providing information on reasonable estimates of bags of fish meal, while doing away with a system that is inherently time-wasting and bureaucratic and has no real management purpose.

Acting under delegated authority, pursuant to Regulation 41(1) of the Fisheries (Reporting) Regulations 2001, as from the date of this letter I direct that all trawlers registered to your company and landing fish in the 'fish meal' state provide relevant returns by the following method:

Trawl Catch Effort and Processing Return (Daily Processing Summary)

- In the 'Species' column, enter the species code. If you have produced meal from offal, you may use the species code "OFF" for the species on this row;
- In the 'Processed state' column, enter the processed state code, e.g., MEA (for fish meal) or MEB (for fish meal by-product);
- In the 'Number of processed units' column enter the total number of bags of fishmeal produced on one of the rows and put a dash to indicate that the value is NULL for all other rows of MEA and MEB;
- In the 'Unit weight (kg)' column enter the unit weight and indicate with brackets or an arrow which species that unit weight relates to;
- In the 'Processed catch weight (kg)' column put a dash to indicate that no processed weight has been calculated;
- In the 'Conversion factor' column put a dash to indicate that no conversion factor is being used;
- In the 'Calculated weight before processing (kg)' column, enter the calculated greenweight in kilograms for each species processed to MEA. Enter a dash in this column for offal processed to MEB.
- In the 'Product from offal only/Meal (kg)" box put a dash to indicate that this box is not being used

Catch Landing Return

- Enter each fishstock in the 'Fishstock (species/area)' column;
- Enter the state code (e.g. 'MEA' or 'MEB') in the 'Landed state' column and indicate by an arrow or brackets the fishstocks to which it relates;
- In the 'Containers/Number' column enter the total number of bags of fishmeal produced during the trip on one of the rows and put a dash to indicate that the value is NULL for all other rows of MEA and MEB;
- In the 'Containers/Type' column enter 'BAG' and indicate by an arrow or brackets the fishstocks to which it relates;
- In the 'Containers/Content weight' column enter the content weight and indicate by an arrow or brackets the fishstocks to which it relates;
- In the 'Destination/Type' column enter the type of destination (eg, R = Retained on board), and indicate by an arrow or brackets the fishstocks to which it relates;
- In the 'Destination/LFR no or vessel reg no' column enter the relevant licensed fish receiver number or vessel registration number, and indicate by an arrow or brackets the fishstocks to which it relates;
- In the 'Greenweight (kilograms)' column, enter the greenweight in kilograms for each fishstock processed to MEA. Enter a dash in this column for offal processed to MEB.
- In the 'Purchase tax invoice number from LFR' column write the number of the purchase tax invoice (or equivalent document) used by the LFR in relation to this fish.

I have attached, for illustrative purposes only, examples of how a TCEPR and a CLR are to be completed using the above procedures.

Please note that MFish is instituting these procedures as an interim measure for the 2007/08 and 2008/09 fishing years, and subject to annual review thereafter, while MFish and Industry address more robust alternatives to the current system of conversion factors. MFish has initiated discussion with Industry representatives on greenweight weighing as an alternative to the CF system. The time sampling system used by vessel operators to calculate meal is in effect a variation on greenweight weighing, and as such could form part of a wider solution.

If you have any questions about these issues, or need assistance filling out your returns, you should contact FishServe (04) 460 9555 or seek legal advice.

Yours sincerely

s 9(2)(a)

Manager Regulatory and Information
Ministry of Fisheries

In exercise of delegated authority

MINISTRY OF FISHERIES
Te Tautiaki i nga tini a Tangaroa

Catch Landing Return
Trip Data

2860153

First day of trip	Last day of trip	Landing date	Vessel registration number	Vessel name	Vessel registration number of other vessel (if pair fishing)	Point of landing	Page
1/6/08	30/6/08	30/6/08	12345	A VESSEL	—	WELLINGTON	of

Catch Landing Data

Fishstock (Species/Area)	Landed state	Containers			Destination		Greenweight (kilograms)	Purchase tax invoice number from LFR
		Number	Type	Content weight	Type	LFR no. or vessel reg no.		
HOK 1	TSK	453	CAR	22.5	L	9990000	27519.8	19876
LDO 3	DRE	4	CAR	25	↓	↓	180.0	↓
HAK 1	DRE	6	CAR	25			270.0	
HOK 1	MEA	33	BAG	30			336.0	
JAV 3	↓	—	↓	↓			2856.0	
GSP 3		—					22.0	
HOK 1	MBS	8	CAR	22.5			—	
OFF	MEB	48	BAG	30			—	
RAT 3	MEA	—	↓	↓			2352.0	

Start a new sheet for each landing. It is an offence to fail to complete this return or supply false information or make any material omission.

Permit holder's name	Permit holder's ... number	Signature of master	Date signed
A. FISHER	9781234	A Fisher	30/6/08

MINISTRY OF FISHERIES
Te Tautiaki i nga Tini a Tangaroa

s 9(2)(a) E-MAIL 17/7/08 3.38pm

Trawl, Catch, Effort and Processing Return

To be completed on each day at sea 515304

Date	Vessel's registration number (your vessel)	Vessel name (your vessel)
2016/08	12345	A VESSEL
	Vessel registration number of other vessel (if pair fishing)	

Position at midday (noon)				Water temperature at shot 1		Page	1
Latitude		Longitude	E/W	Surface	Bottom	of	1
45.06	S	174.45	E	13.5	7.0		

Shot	Time	Latitude Deg	Min		Longitude Deg	Min	E/W	Gear code / Headline height	Depth groundrope / Depth bottom	Trawling speed	Target species	Estimated catch by species in order of quantity: Quantity	Species code / Quantity (kg)	Species code / Quantity (kg)	Species code / Quantity (kg)	Species code / Quantity (kg)	Species code / Quantity (kg)
1 START	0045	44	58	S	174	26	E	BT25	570	4.5	HOK	Total (kg)	HOK	JAV	RAT	GSP	
END	0615	45	01	S	174	34	E	3.5	570			13150	10700	2000	400	50	
2 START	0717	45	01	S	174	34	E	BT25	561	4.5	HOK	Total (kg)	HOK	RAT	LDO		
END	1143	45	06	S	174	45	E	3.5	561			8180	7000	1000	180		
3 START	1955	45	00	S	176	43	E	BT25	502	4.5	HOK	Total (kg)	HOK	RAT	JAV	HAK	
END	2350	44	58	S	174	42	E	3.5	502			12270	10000	1000	1000	270	
4 START				S								Total (kg)					
END				S													
5 START				S								Total (kg)					
END				S													
6 START				S								Total (kg)					
END				S													

Daily Processing Summary

Species	Processed state	Number of processed units	Unit weight (kg)	Processed catch weight (kg)	Conversion factor	Calculated weight before processing (kg)
HOK	TRF	462	22.5	10395	2.65	27546.8
LDO	DRE	4	25	100.0	1.80	180.0
HAK	DRE	6	25	150.0	1.80	270.0
HOK	MBS	8	22.5	180.0	—	—
HOK	MEA	81	30	—	—	336.0
JAV	↓	—	↓	—	—	2856.0

Species	Processed state	Number of processed units	Unit weight (kg)	Processed catch weight (kg)	Conversion factor	Calculated weight before processing (kg)
GSP	↓	—	↓	—	—	22.0
RAT	↓	—	↓	—	—	2352.0
OFF	MEB	—	↓	—	—	—

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 offal only		Activity comment (Transhipping, steaming etc)	Permit holder's name	Permit holder's client number	Signature of master	Date signed
Meal (kg)	Oil (litres)					
—			A. FISHER	9701234	A. Fisher	20/7/08

Appendix 8 – Hoki Mince

Hoki Mince Produced

Fishery Officers asked the NZ captains of fillet vessels a number of general questions about the different parts of the Hoki fillet that go to make up the mince. Some of their responses are as follows:

All Hoki trimmings go to mince.

The vessel produces MKF (minced skinned fillet), and as they didn't want to produce a BF block (B grade fillet block) all B grade fillets were minced.

All Hoki trimmings and bloodspots go to MBS which is a secondary state (doesn't come off ACE), and damaged fillets go to MKF which is a primary state and does come off ACE.

No whole fillets go to mince, only trimmings. At some times of the year we do produce a MKF but not now.

HOKI off cuts and trimmings go to mince.

Any fillet under 100g that cannot be processed by the baader machines and the trimmings off the fillets go to mince.

Quantification of Hoki Fillets to Mince

Captains made a number of comments to Fishery Officers on how the Hoki mince is quantified and recorded. Their responses are as follows:

Damaged fillets are weighed on board and recorded as MKF. Total mince quantity minus the MKF equals the MBS. Mince is recorded on the 24hr production summary and then recorded on the TCEPR.

No fillets to mince were produced.

Fillets are weighed prior to mincing.

Don't have fillets going to mince this trip, but if did would be declared as MKF using the official conversion factor (CF). Fillets are processed completely separate from trimmings so just matter of weighing the end product and applying the CF.

Hoki fillets under 55g and/or MKF fillets go to mince and all product is weighed.

Appendix 9 - A length based analysis of hoki highgrading in the 2011 West Coast Hoki Fishery

Prepared by s 9(2)(a)

Summary

In the 2011 WCSI hoki fishery every landing and every net of every large factory vessel was inspected and measured as part of Operation Bronto. During the vessel inspections fishery officers also collected the processing and grading specifications from each vessel. Observers at sea measured over 25,000 fish to construct a length frequency curve for the fishery. In the absence of high-grading one would expect the length frequency of the landings to approximate the length frequency of the fish seen by the observers.
The fleet is comprised of several components, one of which produces headed, gutted and tailed hoki for further processing onshore (the "limited processing" vessels), and the other of which produces filleted products. The landings of the limited processing vessels contain a smaller proportion of small hoki than expected, and we estimate that they have omitted to report at least 559 tonnes of small fish, or about 30% of the small fish that they catch.

The filleting vessels are producing ungraded products (e.g. fillet block), so a length based analysis of landings is not possible. However, all of the fillet boats do have meal plants, and it is anticipated that any small hoki not wanted for other processing will be converted to fish meal. For these vessels we compared the amount of fish meal said to have been produced from offal with the amount of offal available as a byproduct of processing. In most cases the production of fishmeal from offal is unrealistically high and the offal supply has presumably been supplemented with unreported whole fish. At least 982 tonnes of whole fish would be required to meet the deficit. The mechanism by which this fish escapes reporting is unclear, but gaming of the vessel specific conversion factor system is suspected. Whether or not these unreported whole fish are hoki is unknown.

Introduction

Management of fisheries by way of an individual transferable quota (ITQ) system provides several perverse incentives to quota holders. One of these is an incentive to fill his or her quota by retaining large, high value fish and discard the less valuable smaller fish of the same species without reporting their capture. This behaviour is known as highgrading. Failing to report fish that have been caught has obvious potential to subvert the ITQ system, and is a serious offence under the NZ Fisheries Act.

In theory highgrading is most likely to occur in fisheries where:

1. There is a wide price difference between large and small fish; and
2. The proportion of large fish expected in future catches is high; and
3. The cost of additional fishing effort is low; and
4. The fishery is managed under a system of individual limits on landings.

The West Coast South Island hoki fishery exhibits all four of these characteristics.
Highgrading is of course just one way to avoid reporting catch – in circumstances where enforcement is weak it may be possible to land the small fish without reporting them at all, or to declare them as a different species not subject to ITQ management. Few of the small fish will be so small as to be of no intrinsic value.
One of the objectives of Operation Bronto was to ascertain whether or not highgrading of hoki was occurring in the West Coast South Island Hoki Fishery and to estimate how much fish (if any) was going unreported.

The study fishery

The fishery for hoki is the largest and most valuable fishery in New Zealand waters. The total allowable catch for the 2010/2011 fishing year was 121,240 tonnes.
Since 1989 the hoki population has been assessed as two stocks, eastern and western. Hoki are widely distributed, but historically the main fishing ground has been off the West Coast of the South Island. Hoki from the western stock migrate here to spawn each winter. The spawning aggregations begin to concentrate in depths of 300 to 700m around the Hokitika Canyon in June, and have dispersed again by the end of September. Catch in this spawning fishery has been limited to 40,000 tonnes p.a. by voluntary agreement in recent years and substantial fisheries have developed elsewhere.

Notwithstanding this geographical dispersion of effort there is still an intense trawl fishery off the west Coast of the South Island during the spawning season. Most of the fish is taken by large factory trawlers, and in 2011 there were 23 of these fishing in an area about 130 nautical miles long by 15 NM wide. The vessels ranged in length from 50 to 105 m, and collectively they made 60 trips . Vessels over 46m in length are prohibited from fishing within 25 miles of this coast, and this prevents the factory fleet from fishing at the head of the Hokitika Canyon where the densest aggregations of spawning hoki are found. When fishing is poor in the Hokitika Canyon the factory fleet tend to take long tows (up to 12 hours) along the contour of the continental slope to the north, taking fish moving to and from the spawning ground. They may alternatively make excursions into shallower water to target jack mackerel. Some vessels target hake and/or ling on the West Coast grounds whilst waiting for the main hoki season to start.

The factory fleet is comprised of two components, one of which produces headed, gutted and tailed hoki for further processing onshore (the "limited processing" vessels), and the other of which produces filleted products. All of the filleting vessels have onboard fishmeal plants, whilst only the largest of the limited processing vessels have these. Any hoki not wanted for other processing will typically be converted to fish meal on vessels which have a fishmeal plant, and should be reported under the MEA code on the vessel returns. On vessels without a fishmeal plant any unwanted fish are packed whole in (typically) 15 kg "green blocks".

Vessels operating in this fishery carry MPI observers from time to time. During 2011 there were 13 observed trips made by 12 vessels. Some vessels also carried "industry" observers, these being either company representatives or employees of private observer services engaged as agents of the permit holders. During the 2011 season 15 of the 60 trips were known to have carried an "industry" observer of some type.

Methods

Analysis of the observer length frequency data showed that the length frequency of hoki catches or bycatches in this fishery did not vary with depth, latitude, month, time of day, towing speed, fishing method or target species. This was not surprising since (i) we obtained the same result in 2005; and (ii) the fish caught are believed to be visiting the area rather than resident.

The standard method of detecting highgrading is that of s 9(2)(a) (1997), in which the length frequency of landed fish is compared with the length frequency in observed catches. We employed this method for the limited processing vessels as follows:

(a) Trips which included tows outside the West Coast management area (FMA7) targeting hoki (HOK), hake (HAK), ling (LIN), silver warehou (SWA) or white warehou

(WWA) were excluded from the analysis. Trips including tows outside FMA7 targeting jack mackerel (JMA) or southern blue whiting (SBW) were included since hoki is only a very minor bycatch of these species. Six of the 60 trips in the frame were excluded because the vessel had probably taken a significant proportion of her hoki catch outside FMA7.

(b) For each remaining trip the number of tows (*ntows)* targeting HOK, HAK or LIN were taken from the statutory Trawl Catch Effort Processing Returns (TCEPRs).

(c) The observer hoki length frequency samples from all the observed vessels were then used as an external reference distribution following Box, Hunter & Hunter (1978), and a random sample of size *ntows* was drawn with replacement. This resampling from the observer data was repeated 1000 times for each trip.

(d) The vessels typically pack the hoki in four grades – 2L, L, M and S in order of decreasing size. The name of the grades varies by company, as does the cutoff size between grades. We are primarily interested in the cutoff between the M and S grades, and obtained this from the vessel's grading specifications. The proportion of M, L and 2L grade fish in each landing was calculated. For convenience it was assumed that all whole hoki reported as fishmeal or green block was too small to process.

(e) The proportion of large fish in each landing was then compared with the proportion of large fish in the resampled observer data. Because each vessel has its own grading specification the observer data proportions had to be recalculated for each vessel.

(f) Two statistics are of interest. At the level of the fleet, we are interested in the difference between the proportions of small fish in the landings and the proportions of small fish in the catches. At the level of the trip, we are interested to know whether the vessel reported an improbably small proportion of small fish. The resampled observer data can be used to construct a 95% confidence interval around the expected proportion. In fact we are interested only in a one sided confidence interval because of the assumption made in (d). A one sided confidence interval was therefore constructed for each trip, and the proportion of small fish landed was contrasted with this.

It was not possible to undertake a length based analysis of the landings of the fillet vessels because a substantial proportion of each catch was comprised of ungraded products. However, for these vessels we expect that any unreported whole hoki will be processed as fish meal and be declared as meal derived from offal (MEB). The amount of offal available for the manufacture of meal can be calculated as

$$\text{offal available} = \sum(\text{processed weight} - \text{greenweight})$$

across all product lines of all species. The amount of MEB that could be produced from this is then derived by dividing by the offal available by the gazetted conversion factor of 5.6. During Operation Bronto the codend mesh sizes of all nets used in the fishery were measured, and six cartons per grade for each landing were opened and inspected to check for fish being packed out of grade. These measurements were made by the fishery officers.

Results

Limited processing vessels

Across the limited processing fleet the proportion of small hoki landed is smaller than the proportion of small hoki seen being caught by the observers. The best estimate of the quantity of unreported small fish is 559 tonnes, but the true quantity is probably higher due to the conservative assumption that all the net damaged hoki going to meal or green block are small. During Operation Mini in 2004 we thawed and measured all the fish packed as green block by a limited processing vessel. Close to 10% of the green block content by weight was damaged fish > 60 cm in length. We do not believe that the discrepancy between observed and unobserved trips is due to differences in codend mesh size or failure to adhere to grading standards. All vessels used codend mesh of similar dimensions, and the fishery officer inspections found no examples of small fish being mistakenly packed in a larger grade carton. The inspections did suggest that low-grading might be occurring, as larger fish were sometimes found in the smaller grades.
The individual results for each trip are shown in Table 1 below. Note that falling outside the confidence interval simply means that chance is an unlikely explanation for the discrepancy in the proportion of small fish landed. At the level of the fleet it is difficult to imagine any factor that would apply only to those trips carrying government observers, since observer assignment was unbiased. At the level of an individual trip there are other factors which may come into play. For example, the operculum plate on the factory heading saw may be set to maximise recovery of large fish, but result in a poorer recovery of smaller fish, or the green block weights may be under-reported.

Table 1: Hoki smaller than M grade cutoff size in landings as a percentage of expected weight. Trips marked with a * are outside the 95% confidence bound.

Vessel	Trip	%age of expected hoki < M grade	Observer
s 9(2)(a)		*61	MPI
		141	MPI
		* 37	Ind
		* 21	Ind
		94	Ind
		74	Ind
		213	Ind
		88	Ind
		91	Ind
		130	MPI
		88	Ind
		100	None
		* 65	MPI
		210	None
		73	None
		* 41	None
		99	MPI
		* 71	None
		79	None
		82	None
		72	None
		94	None

s 9(2)(a)	72	MPI
	84	Ind
	* 42	Ind
	* 71	Ind
	* 54	None
	85	Ind
	* 50	None
	101	None
	112	MPI
	266	None
	* 72	Ind
	175	None
	* 66	None

Note that although trips with "industry" observers on average land a lower percentage of small hoki than do those carrying MPI observers (81 vs 97%) the comparison is invalid. Vessels with MPI observers aboard can and do make authorised discards of hoki at sea, but the size frequency of these discards is not recorded. This creates some difficulty in interpreting the figures for vessels with MPI observers in the Table above. For example, the s 9(2)(a) discarded 3.7 tonnes of hoki on trip s 9(2)(a). If most of the fish were small then we can't expect the proportion of small fish landed to reflect the proportion of small fish in the catch.

Two unobserved vessels that stand out as having particularly low proportions of small fish in their landing are the s 9(2)(a) and the s 9(2)(a), and these would make good targets for further investigation in the coming hoki season.

Filleting vessels

Across the filleting fleet most vessels seemed to be producing more MEB than would be possible from the amount of offal that should be available from processing. On the face of it the difference equates to at least 982 tonnes of unreported whole fish, and is probably in excess of 2000 tonnes for the reasons discussed below. Some of this is presumably due to highgrading of whole small hoki. One of the trips reporting more MEB than expected was by the s 9(2)(a). This trip carried two MPI observers, and they estimated that the vessel sent 2 tonnes more whole hoki to the meal plant than was reported on the returns. Most of these fish would have been small. However, the vessel reported about 24 tonnes more MEB than would be expected, and two tonnes of whole hoki could account for only 1.5% of the difference. There must be another factor at work.

On these vessels MEB is typically calculated by difference. The total quantity of meal produced on the trip is known, and the vessel keeps records on the quantity of whole fish going to the meal plant. The quantity of meal produced from the whole fish is calculated using the gazetted conversion factor, and this is subtracted from the total production. What is left is declared as MEB. This calculation is made by all the vessels with meal plants, regardless of whether they are filleting on board or conducting only limited processing.

Operation Bronto included 16 trips by limited processing vessels with meal plants. These 16 trips produced enough offal to make (theoretically) 1612 tonnes of MEB, but the vessels reported only 1219 tonnes, or roughly 75% of the expected value. The difference is not surprising, since calculating offal as processed weight minus greenweight ignores losses that occur during processing. Blood, semi-liquid gut contents and extracellular fluid extruded during plate freezing will inevitably form a separate waste stream that is not captured by the meal plant.

There were 11 trips by filleting vessels, of which three carried MPI observers. The unobserved trips produced enough offal to make (theoretically) 1002 tonnes of MEB and reported producing 1153 tonnes, or 115% of the expected value. The comparable figures for the observed trips are 474 tonnes, 476 tonnes and 100.5% respectively. The data are insufficient to draw a robust conclusion about whether or not the difference is a genuine observer effect. (The signs are not encouraging. In the winter fishery in 2010 the s 9(2)(a) made two hoki trips, one of which was observed and the other not, permitting a direct comparison. The observed trip produced 88% of the expected MEB; the unobserved trip produced 122%.) However, there is a major difference between the meal production of the filleting and limited processing vessels, as can be seen in Table 2 below.

Table 2: Reported production of meal from offal (MEB) as a percentage of production possibility given the offal available.

Vessel	Trip	MEB as %age of theoretical possibility	Observer
Limited processing vessels			
s 9(2)(a)		92	None
		76	MPI
		71	MPI
		83	Ind
		74	Ind
		75	None
		75	None
		96	MPI
		81	None
		72	MPI
		95	None
		75	None
		97	None
		73	Ind
		53	None
Vessels filleting at sea			
s 9(2)(a)		115	MPI
		114	None
		108	None
		97	MPI
		110	None
		90	MPI
		130	None
		126	None
		101	None
		108	None
		140	None

The difference between the filleting and limited processing vessels could arise for several reasons. There may be a systematic difference in the shipboard meal plants of the two fleets, with the fillet vessels producing meal (i) more efficiently; or (ii) with a higher moisture content; or (iii) packed in systematically underpacked sacks. Installation of a centrifugal separator to recover solids from the stickwater stream could potentially boost meal production by 15 to

20%, and it is possible but unlikely that the fillet boats have these and the limited processing boats do not. However, the difference between the two fleets is too great to be explained by differences in relative efficiency of meal plants alone.

There may also be some differences in the accuracy of the calculation of the amount of offal available. The greenweights reported by the vessels are derived from the processed weights: the whole fish are not actually weighed before processing. If the conversion factors used by the vessels to do this back calculation are incorrect this will flow through into the calculation of offal available. The limited processing vessels all use the standard gazetted conversion factors, while the fillet vessels typically have vessel specific conversion factors (VSCFs). A vessel that can demonstrate unusually efficient processing can apply to the Chief Executive for a VSCF, the rationale being that this will result in more accurate back calculation of greenweight than would be obtained by using the gazetted conversion factor. A VSCF is valuable to the company concerned since ACE, deemed values and levies are all denominated in greenweight, and the VSCF reduces the cost of these. In consequence the "demonstration of unusually efficient processing" will involve heroic efforts by the factory staff which may not be maintained after the VSCF has been obtained. If the standard of processing has not been maintained the actual greenweight caught will be underestimated on future trips, as will the amount of offal available.

On trip s 9(2)(a) by the s 9(2)(a), the observers took the opportunity to make 37 tests (involving 3250 fish) of the conversion efficiency being achieved in the production of hoki trimmed fillets (TRF) and trimmed skinned fillets (TSK). The vessel did not match her VSCF on any of these tests. Table 3 shows the comparison of MEB percentages that would be obtained for the trip using the VSCF, the conversion efficiency actually recorded by the observers and the standard gazetted conversion factors. It is clear from this table that the MEB percentage calculation is strongly influenced by the conversion factor used.

Table 3: Sensitivity of MEB percentage calculation to hoki conversion factors used: s 9(2)(a)

Conversion factor used	MEB %age of theoretical maximum
VSCF	115
Observer estimates from this trip	97
Gazetted conversion factor	84

Given that five of the six filleting vessels in the study fishery had VSCFs this season (the exception being the s 9(2)(a)) and the VSCFs are different it is difficult to make inter-vessel comparisons, and the data we possess is not adequate to disentangle the effect of highgrading from the effect of failure to meet the demonstrated processing efficiency. However, it is clear that we have a reporting issue that needs to be addressed, and that the MEB production by the filleting vessels is out of balance with the greenweight being reported.

Discussion

Under-reporting of catches deprives quota holders of rent; creates problems when commercial catch data is used in stock assessment, and subverts fisheries management initiatives, so accurate reporting one of the major pre-requisites of any ITQ management system.

It is clear from our results that (i) the number of small hoki being caught and seen by MPI observers is not matched by the number of small hoki being landed by the limited processing vessels; and (ii) the amount of offal meal being produced by most of the vessels filleting at sea is much higher than would be expected. This suggests that the greenweight of hoki being removed from this fishery is being systematically understated. The difference in offal meal

production between limited processing and filleting vessels also suggests that the current Vessel Specific Conversion Factors regime is in need of overhaul because it is failing to meet the policy objective.

The highgrading result should not be surprising. There is a lot of theoretical literature available which explores the perverse incentives inherent in ITQ systems (eg. Anderson 1994, Arnason 1994, Vestergaard 1996), and high grading seems to be universally accepted as one of those incentives. Furthermore, Operation Maxi, which looked at the prevalence of highgrading in this fishery in 2005 found essentially the same result. What options do we have for overcoming this problem, in this fishery?

1. Reduce the size based price differential by imposing a size based landings levy.

2. Improve the marketability of small and damaged hoki.

3. Enforce the criminal sanctions against highgrading

4. Move to 100% observer coverage

5. Regulate for improvements to gear to reduce the catch of small hoki

6. Adjust the allowance for unreported mortality and illegal take when the TACC is next set, and continue to monitor the prevalence of highgrading periodically.

I briefly describe each of these below.

Reduce the size based price differential

It is inevitable that small hoki will be less attractive economically than larger ones since the processing costs incurred toi obtain the same amount of flesh are higher. In the case of a filleting vessel these costs are incurred by the catching sector, whilst for a limited processing vessel the costs are shared between the catching and the processing sectors.

Smith (2007) notes that size based pricing differentials are (i) common, and (ii) sometimes exceed 100%, and he suggests that they need to be addressed by their own distinct policy instrument. Smith &Gopalakrishnan (2011) suggest that when managers know the price-by-size distribution and the size distribution of the population, total revenues and total catch weight by vessel it is possible to design "a schedule of revenue-neutral individualised landings taxes that eliminate the incentive to highgrade…" It would clearly be possible to devise a system of size based taxes and subsidies that would reduce or eliminate the incentive to highgrade at the level of the firm, and the authors have named this concept the "individualised landings tax" (ILT). The ILT is intended to supplement and not replace the ITQ as a management tool.

Turner (1996) effectively suggests incorporating an ILT into the ITQ system by denominating quotas in terms of landed value rather than weight. Under Turner's proposal small fish of zero value would effectively not be counted against quota, so landing them would be subsidised by the quota holders. The cost in ACE of landing a kg of hoki is currently around 50c. This is probably insufficient to encourage landing the small fish since shore based meal plants already charge vessels a similar price per kg to accept unwanted catch.

Whilst both the value based quota and the ILT proposals may work in theory they may prove difficult to implement and easy to subvert, at least without a simultaneous move to dockside monitoring of landings.

Improve the marketability of small and damaged hoki

Small and damaged hoki are not without uses.
It is often possible to obtain one usable fillet from a net damaged fish, and if graded and cartoned separately HGT hoki seconds may find a domestic bulk market. MPI had some experience of disposing of seized HGT product that had left the export chain, and it was keenly sought by institutions, drug rehabilitation halfway houses, night shelters and soup kitchens. Such customers are generally driven by considerations of price rather than quality, and often have their own on-site free labour for processing.

Frozen green fish is also a desirable protein source in some Third World countries. For example, whole frozen mackerel are distributed and sold from the back of utes in Mozambique. These sales would not meet NZ food safety standards, but are an effective way for very poor people to obtain a cheap protein source. Cartoned small green hoki could conceivably be used as food aid in selected situations too.
Small and damaged hoki could also be used without any processing as an aquaculture feedstock for large predatory fish. We don't currently farm large predatory fish, but neither do we advertise the availability of a potential cheep feed source to prospective investors.

It may be worthwhile for MPI to explore with industry alternative ways in which small and damaged hoki could be utilised and marketed in the hope of reducing the financial disincentive to landing them.

Enforce the criminal sanctions against highgrading

The ITQ management system currently relies on criminal sanctions to enforce the landing and reporting of small and damaged hoki. Since there is an economic disincentive to land and report these fish, the deterrent effect of the current criminal sanctions is presumably responsible for the fact that any are reported at all. In 2004 some limited processing vessels in this fishery were failing to declare any green block, and the improvement in reporting since may be due in part to the deterrent effect of Operations Mini, Maxi, Mitre, Mega and Bronto. Industry members may already fear that any particularly egregious case of highgrading will result in prosecution, and this fear would presumably be enhanced if a vessel was successfully prosecuted. However, enforcement actions are expensive, and the outcome of a case which would inevitably rely heavily on probabilistic evidence is something of a lottery.

Move to 100% observer coverage

On average, in both Operations Maxi and Bronto we have found that the proportion of small hoki reported by vessels carrying a MPI observer is greater than that reported by vessels that do not. In neither operation was observer assignment based on any prior knowledge of highgrading tendencies. It seems certain that carrying MPI observers does have some influence on vessel behaviour in this regard, but carrying observers cannot completely prevent highgrading either. Prevention is particularly difficult on vessels with meal plants, since the observer cannot constantly watch the conveyors, and in any case the presence of whole hoki on the meal conveyor is unremarkable. However, we believe that 100% observer coverage would improve the reporting of small hoki by the limited processing fleet. The data from Operation Bronto are inconclusive with respect to whether industry observers are equally effective, but the numbers at least suggest that they are not.

Gear improvement

The best solution would undoubtedly be to find a cheap way to leave most or all of the smaller hoki currently being caught alive in the ocean. During Operations Maxi and Bronto the fishery officers measured codend mesh sizes and collected net plans for all the nets in use by all of the vessels. Overall there seems to have been no change over the intervening period, and we are unaware of any experiments aimed at improving the size selectivity of the gear in use. It may be useful for MPI to commission some research on this topic, but any changes to gear design would impose costs on the industry, which would see no direct financial benefit in the short term at least. The outcome of any research may have to be imposed by regulation. Other measures to conserve small fish which have relied on voluntary compliance (e.g. the hoki management areas, and the 5 nm movement rule) have generally been ignored.

Adjust the allowance for "other mortality" when the hoki TACC is set next
The current TAC makes a 1000 tonne allowance for illegal and unreported take from all sources nationwide. Highgrading is only one source of unreported mortality, which also includes carton weight fraud, species misreporting, conversion factor fraud etc. The West Coast South Island factory fishery also comprises less than 40% of the national hoki fishery, and it seems reasonable to suspect that other geographical areas and the fresher fleet have their own issues of non-compliance. Once the Chatham Rise hoki profile is complete we should be in a better position to advise the Minister on a more realistic allowance.

There is no silver bullet amongst these options, but they are not mutually exclusive. Closer engagement with industry members may elicit additional options also.

The apparent under-reporting of whole fish by the filleting at sea fleet is a different problem. It is certainly possible that whole fish, from time to time, do make their way to fishmeal plants without being reported. However, as noted above, the MEB percentage calculation is highly sensitive to the conversion factor being used.

It seems obvious that there must be a serious problem with the conversion factor regime for hoki fillet states. The gazetted conversion factors are supposed to represent an average across the fleet and across the seasons. There are currently seven deepwater vessels producing hoki fillets at sea, and MPI has given VSCFs to five of these vessels to reflect the fact that they have more efficient processing than the gazetted "average" CF. This is reminiscent of Lake Wobegon, where "all the women are strong, all the men are good looking, and all the children are above average". There are only three possibilities: either the gazetted conversion factor is too high; or the two vessels without VSCFs are exceptionally inefficient at filleting hoki; or the VSCFs granted are not really justified.

The policy definition for section 188 of the Fisheries Act 1996 says (*inter alia*)

..the conversion factors are essential to the operation of the reporting and record keeping provisions. Similarly, evidence for criminal and civil proceedings will often be based on processed weight using conversion factors.

In order to support these provisions, the conversion factors must accurately and reliably convert processed weight to greenweight.

The Act recognises that, in some cases, there are substantial differences between the processing operations of different vessels. Therefore the purpose of conversion factors may

not always be achieved by applying a uniform conversion factor to all vessels. Vessel specific conversion factors are the mechanism to provide for individual differences between vessels.

If a vessel does make heroic efforts at efficient processing when being assessed for a VSCF but does not maintain this standard on subsequent trips then the policy intent of the Fisheries Act is not met. Greenweight will be systematically under-reported.

Issues with VSCFs will not be confined to the WCSI hoki fishery, and deserve wider examination. However, the extra MEB landed by the filleting vessels last winter must have come from somewhere. A closer examination of the VSCF regime seems to be a good place to start looking.

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Appendix 10 - Bycatch Processing Specifications

A number of Captains explained what happened to the damaged by-catch and how that damage was assessed:

The crew on the heading saw determine the extent of damage.

B grade means that one side is damaged.

More damage than one side then goes to green block (naked block).

For LIN, HAK and HOKI the fish is considered damaged if unable to yield at least one fillet out of a single fish. With other by-catch species the damage is assessed by looking at the extent to which damage has penetrated into the muscle tissue.

Only Factory Manager or First Officer knows. Captain said he doesn't get damaged fish very often.

If both sides of the fish is damaged it goes to meal. If one side is damaged it goes to special a grade called "DAM". This trip the vessel had no "DAM" other species.

Vessel specifications spells out damage limitations and quality control checks monitor this.

All by-catch species under S grade are not processed and go to naked block or mealed or eaten.

APPENDIX 11 - Reporting of Bycatch in the 2011 West Coast Hoki Fishery

Prepared by s 9(2)(a)

The vessels involved in the West Coast hoki fishery are required to report the fish they catch.

All the vessels in the factory fleet complete a trawl catch effort and processing return (TCEPR) on each day at sea, and a Catch Landing Return (CLR) on landing.

Accurate reporting on these returns underpins the quota management system. The two returns are used for different purposes: the catch and effort information from the TCEPR is used for stock assessment, and thus has some influence on setting catch limits; whilst the catch reported on a CLR goes on to become "reported catch" for the purposes of balancing catch against Annual Catch Entitlement. The quota management system uses economic instruments to prevent overfishing, and the operation of these instruments is triggered by the catch balance of the fishing permit holder.

Unfortunately the economic instruments designed to discourage overfishing also provide an incentive for dishonest reporting of catch. The quota management system relies on criminal sanctions to deter dishonest reporting, but detection and prosecution are difficult. It was very clear from Operation Maxi in 2005 that reporting of bycatch in this fishery was incomplete, and also that the segment of the fleet equipped with meal plants were also engaged in species misreporting. Some bycatch species which were managed outside the quota management system were being over-reported, perhaps to account for the amount of meal being made from QMS species which were being under-reported. The method of calculating and reporting whole fish going to the meal plant has subsequently been changed, but the underlying incentives for dishonest reporting of QMS bycatch remain.

Anyone connected with the quota management system has a deep interest in knowing just how accurate the reporting catch actually is. Dishonest catch reporting affects sustainability decisions, and also deprives quota owners of rentals and disguises opportunities for development of new product lines. However, it is not an easy topic of discussion. There are severe penalties for deliberate falsification of returns, and fishermen will, naturally, maintain that no fish ever goes unreported on their vessel.

This phase of Operation Bronto was aimed at fleet wide estimation of the amount (if any) of unreported bycatch. The question of interest is whether all the bycatch that should be reported has been reported.

The 2011 WCSI hoki fishery

The WCSI hoki fishery runs from June to September each year, and involves fishing both the spawning aggregations of hoki in the Hokitika Canyon and the fish travelling to and from the Canyon along the broad continental slope to the north. The edge of the canyon seems to be an important boundary for many species, so bycatch on the northern continental slope is rather different to that inside the Hokitika Canyon. For example, alfonsino seems to be a fish of the northern slope but is a rare bycatch inside the canyon, whereas basketwork eels are a common catch inside the canyon but are rare on the northern slope. Bycatch is also influenced by fishing method: bottom trawls catch species that midwater trawls generally do not and vice versa. Deep sea flathead, for example, are a purely benthic, dorsoventrally flattened species, and as one might expect are ten times more common in bottom trawls than in midwater ones. Frostfish are caught predominantly by midwater trawls.

If hoki catches are low vessels may make excursions into shallower water on the northern slope to target jack mackerel. At other times during the season there are opportunities to target spawning hake, and some Korean vessels occasionally report targeting frostfish..

During the 2011 WCSI hoki fishery the combined fleet of factory trawlers made 60 trips. Thirteen of these trips (by twelve vessels) carried MPI observers. Of these 60 trips 28 fished both inside and outside the study area; and only 20 trips spent the entire trip fishing inside the study area and study depth range.

Fifteen of the 60 trips carried an "industry" observer of some type, being either a company representative or an employee of a private observer service engaged as an agent of the permit holder.

It is the presence of MPI observers and the independent catch reports that they provide that make this analysis possible.

Methods

In concept, estimation of catches is straightforward. A proportion of the vessels in the fleet are carrying MPI observers, and the observers make an independent record of the fish caught in each observed tow in their catch effort logbook (CELB). If observer assignment is unbiased, then the unobserved vessels should be making similar catches, and the average catch per species per tow from the CELB data should be similar to the average catch per species per tow of the unobserved vessels.

In practice, direct estimation in this way leads to very wide confidence intervals around the estimates. Bycatch will vary through space and time; with fishing method and with depth. Some species will only be caught by bottom trawling; others only by midwater trawls. Some tows are long and some are short, and though the codend mesh size varies little across the fleet wingspread and headline height used by the various vessels differs greatly. Average catch per species per tow inevitably exhibits very high variance.

This variance can be greatly reduced by stratification. Further reduction may be possible by replacing "per tow" with "per swept hectare" or "per filtered cubic kilometer" depending on whether the species of interest is a bottom dwelling or midwater species.

The success of various stratification schemes can be examined within the observer CELB data by comparing formal information criteria. This approach was used in Operation Maxi, and a stratification scheme was developed independently for each species of interest. Operation Maxi was primarily aimed at detecting non-complying trips rather than fleet wide estimation, so minimizing variance was particularly important.

The emphasis in Operation Bronto is on estimation at the level of the fishery. To reduce the computational burden I decided to use a uniform stratification scheme for all species, based on method (bottom trawling (BT) vs midwater trawling (MW)) and latitude (north or south of latitude -42.1 S). The latitudinal division basically separates those tows inside the Hoktika Canyon area from those on the broad continental slope to the north. This seems to mark a major change in abundance for many of the species of interest.

In practice the comparison is rather complicated since (i) the vessels make a comprehensive report of catch only once each day, rather than tow by tow; and (ii) the catch reported on CLRs is often greater than the sum of the TCEPRs.

So, what we want to compare is just the catch reported by vessels on days when they were fishing exclusively for hoki inside FMA7 with the observer reports for tows targeting hoki in the

same area. This was done by grooming the commercial catch data and eliminating all records where the vessel had reported one or more tows targeting an alternative species or outside the FMA7 area during the course of the day. From the remaining data I calculated the number of tows across the fleet in each stratum, and also the total processed catch of each species. Because of the tendency for CLR catch to exceed TCEPR reported catch I then multiplied the "total processed catch" of each species by the ratio of CLR to TCEPR reported catches across all sixty trips. The adjustment normally increased the "total processed catch" by 1 or two percent.

The observer CELB data was stratified in the same fashion, but of course needed no adjustment.

The observer CELB data was then used tow by tow as an external reference distribution. The requisite number of tows per strata were randomly selected (with replacement) and the aggregate catch of each species was established. The random sampling was repeated 1000 times and the resulting sampling distribution was used to calculate 95% confidence intervals about the median value for each species. The adjusted "total processed catch" was then contrasted with the resampled median and 95% confidence interval. If the adjusted total processed catch falls outside the 95% confidence interval this is a good indication that chance is an improbable explanation for the discrepancy.

Results

For many species what the MPI observers see being caught and what the fleet as a whole reports catching are rather different. The results are presented below in a series of tables, with the various species grouped to illustrate various facets of the overall problem, but each table is in the same format. "Reported catch" is the sum of the TCEPR processed catches, multiplied by the ratio of CLR to TCEPR reported catches for all trips. Predicted catch, U95 and L95 is the median catch, and the upper and lower bounds of the 95% confidence interval derived from the observer CELB data. %Reported is the reported catch as a percentage of the predicted catch. When the reported catch lies somewhere within the 95% confidence interval the % reported is described as "Ok".

(a) The invisible eels

The Fisheries (Reporting) Regulations 2001 include a number of "eels" in the list of mandatory species codes (Schedule 3 Part 2). Those likely to be encountered in the West Coast South Island hoki fishery are basketwork eels (BEE), conger eels (CON) and swollen-headed congers (SCO). The observer data shows that most bottom trawls in the fishery will catch a few of these fish. However, they often go unreported even by those vessels with a MPI observer embarked. It is as if the eels themselves and the regulatory requirement to report them are both invisible. The adjusted TCEPR catch is contrasted with the predicted catch in Table 1 below.

Table 1: Reported (adjusted TCEPR) and predicted catches of "eels" in the 2011 WCSI hoki fishery

Species	Reported catch	Predicted catch	U95	L95	% reported
BEE	65	2224	3070	1599	3
CON	3151	16840	23871	13931	19
SCO	0	12041	16007	8662	0

It seems that reporting of eel captures leaves a great deal to be desired.

(b) The reporting of sharks

Widespread concern over the lack of management of shark fisheries and declining shark populations led to the adoption and endorsement of the UN FAO International Plan of Action for the Conservation and Management of Sharks in 1999. This is aimed at ensuring the conservation and management of sharks and their long-term sustainable use, with particular emphasis on improving species-specific catch and landings data collection, and the monitoring and management of shark fisheries. The FAO recommended that each country should develop a more detailed "National Plan of Action" to effect the goals of the International Plan. The New Zealand National Plan of Action was adopted in 2008 following extensive consultation with industry.

The National Plan of Action *inter alia* noted that many shark species were of little economic interest and only infrequently encountered by fishermen; and in consequence about 5% of the chondrichthyan catch was reported under "generic" codes like "OSD" (= other sharks and dogfish) rather than the correct species code. The Plan envisaged production of an identification guide, and set a target that only 1% of the total shark catch would be reported under the "generic" codes by 2012.

Reporting issues with respect to sharks are not confined to the use of "generic" codes, of course - like other fish sharks can be reported deliberately or inadvertently as another species or simply not reported at all, though the presence of "generic" codes makes it more difficult to untangle what has happened. The Plan was silent on these matters, but Operation Bronto provides a window to see just how well the various shark, skate and ray species are being reported by the deepwater trawling fleet. The comparison of reported and observed catches is shown in Table 2 below.

Table 2: Reported (adjusted TCEPR) and predicted catches of sharks, rays, skates and chimaeras in the 2011 WCSI hoki fishery. Species currently included in the QMS are shown in bold.

Species	Reported catch	Predicted catch	U95	L95	% reported
BSH	837	1496	1977	1091	61
CAR	443	271	499	124	Ok
CSQ	0	4005	5293	3039	0
DWD	1040				
ERA	927	2291	3149	1710	41
LCH	243	1491	2042	1080	27
NSD	17271	9538	13661	6407	173
OSD	25808	12981	14939	11257	222
OSK	0	2064	2403	1741	Ok
RAY	0	28	54	10	0
SEV	0	359	556	187	0
SND	3256	17349	23495	12831	19
SSH	3920	10277	12712	8169	46
THR	550	395	730	110	Ok
GSH	7039	8795	11143	6716	Ok
GSP	1026	4953	6488	3736	24
MAK	635	405	810	90	Ok
POS	7896	5876	7507	4408	150
RSK	9327	1150	1639	743	311
SCH	9964	8865	11597	6839	Ok

SPD	307256	173161	204241	147356	187
SSK	33483	32188	36570	27862	Ok

In this table the generic codes 'OSD", "OSK" and "RAY" are used for those species which do not have their own code in Part 2 of Schedule 3 in the Fisheries (Reporting) Regulations 2001, with "OSK" being all Rajidae excepting RSK and SSK; "Ray" being all species of all families of ray excepting BRA, ERA, EGR and WRA, and "OSD" being all other chondrichthyans without their own species code in Part 2. "DWD" meaning deepwater dogfish doesn't seem to occur in either Part 2 of Schedule 3 or the explanatory notes, but is used on some returns. It presumably should be included in the "OSD" reported catch.

Reporting of the various shark species seems to be chaotic, and we seem to have made little progress toward achieving the goals of the International Plan of Action. The National Plan of Action is due to be reviewed this year so we will soon be forced to confront this issue.

(c) Minor QMS bycatch

There are a number of QMS species which are only a minor bycatch of the hoki fishery, with a total predicted catch of 50 tonnes or below. They are all common catches in other fisheries, and should present no problems of identification to the vessel crews.

But …..the factory vessels in the hoki fishery are equipped to pack bycatch as dressed trunks in 24 kg cartons. To fill a 24 kg carton will require at least 40 kg of whole fish. Catches of these bycatch species will frequently be under 40 kg per tow and often under 40 kg per day. Small catches create logistical problems on the factory deck. The information systems on the vessels are also arranged around counting either cartons or blocks rather than weighing individually frozen fish, so these minor bycatch species may also present recording problems. The comparison of reported and predicted catch is shown in Table 3 below.

Table 3: Reported (adjusted TCEPR) and predicted catches of minor QMS bycatch species in the 2011 WCSI hoki fishery

Species	Reported catch	Predicted catch	U95	L95	% reported
BNS	2913	3875	4793	3127	75
BYX	4246	9527	12410	7237	45
CDL	63	192	256	137	34
HPB	918	1159	1618	758	Ok
LDO	29629	50072	56529	45275	62
RBM	28080	30173	36941	24965	Ok
RBY	119	348	637	108	Ok
RCO	2020	3205	3785	2662	66
SCI	890	1639	1883	1407	54
SPE	24117	30601	35182	27519	82
STA	17776	12401	14691	10134	162
STN	876	1200	2150	400	Ok
SWO	2878	4490	6530	2575	Ok
TAR	225	325	606	115	Ok
WAR	1030	645	1225	224	Ok
WWA	5896	9772	15076	6116	69

It seems clear that many of these minor bycatch species are not being reported accurately. Although the quantity of fish going unreported on each tow is presumably quite small the aggregate effect is significant. For example, the Fisheries Assessment Plenary Document

shows that annual reported catch of BYX7 is typically around 20 tonnes, so under-reporting of 5 tonnes by the factory vessels in the West Coast South Island hoki fishery is relatively large.

(d) Non-QMS bycatch

During Operation Maxi we discovered that some bycatch species outside the quota management system (and most notably RAT and JAV) were being over-reported. This over-reporting was characteristic of vessels with on board fish meal plants, and we surmised that the underlying motive was species misreporting. At that time vessels were reporting whole fish to meal by proportional back calculation. Under-declaration of QMS species going to meal resulted in automatic inflation of the reported non-QMS bycatch. The basis of calculating whole fish to meal has subsequently been changed, and there should now be no financial benefit in overstating the catch of non-QMS species. At least for rat-tails and javelin fish the situation is now reversed: the unobserved trips are reporting much lower catches than the observed trips. A selection of non-QMS bycatch species is shown in Table 4 below.

Table 4: Reported (adjusted TCEPR) and predicted catches of non-QMS species in the 2011 WCSI hoki fishery

Species	Reported catch	Predicted catch	U95	L95	% reported
BBE	69	687	941	488	10
BEL	575	101	157	63	582
BEN	14438	7741	9343	6282	187
DEA	527	708	891	541	77
EPL	96	2781	4860	1395	3
EPR	360	37	60	21	984
FHD	5573	8061	9188	7106	71
JAV	61909	111803	134572	92531	58
RAT	52735	98418	110155	87738	56
RDO	1620	2627	4652	1143	64
RHY	13035	3347	4315	2663	386
RUD	1457	2307	2749	1896	72
SBO	162	421	623	262	39
SDO	17187	5376	9815	2131	416
SLK	169	1028	1359	745	17
SSI	3557	1000	1363	688	359
TOA	411	1268	1592	983	33

My interpretation of this table is that (i) banded bellowsfish (BBE) is probably being inadvertently misidentified as bellowsfish (BEL); (ii) BEN (scabbardfish) is probably being used fraudulently to cover the mealing or discarding of frostfish; (iii) RDO and SDO (rosy dory and silver dory) are probably being used fraudulently to cover the mealing or discarding of lookdown dory; (iv) there is probably some confusion over the correct identification of the three *Epigonus* species (EPL, EPR and small CDL); and (v) those non-ITQ species which are not being confused deliberately or inadvertently with another species are generally being reported only haphazardly, even though there is no financial incentive not to report them. These species are typically discarded or mealed, so there is no independent count of landed catch.

(e) Major QMS bycatch species

The vessels in this fishery do report targeting species other than hoki, especially early in the season whilst waiting for the hoki to gather for spawning. These alternative target species are HAK, JMA, EMA, SWA and FRO.

These alternative target species create difficulties for this analysis. It is possible that the processing of large bags of (say) JMA may carry over into the next day which is exclusively targeting hoki, inflating the reported catch attributed to the hoki fishing. It is also possible that some vessels seek to maximize bycatch whilst also targeting hoki, violating the underlying assumption of the analysis is that the catches of each non-target species are random, at least within each stratum. I have therefore omitted JMA, EMA, SWA and FRO from the analysis. The remaining QMS bycatch species likely to result in catches over 50 tonnes are shown in Table 5 below.

Table 5: Reported (adjusted TCEPR) and predicted catches of major QMS bycatch species in the 2011 WCSI hoki fishery

Species	Reported catch	Predicted catch	U95	L95	% reported
BAR	51546	73760	104343	48404	Ok
HAK	500370	1221932	1341928	1110233	43
LIN	591124	570055	622291	515060	Ok
RIB	10802	79661	92533	67995	15

Hake is included here despite being an alternate target species because of the history of hake misreporting in this fishery. The May 2010 Plenary Document notes that historically….

There is some evidence to suggest that catches of hake were not always fully reported. Comparison of catches from vessels carrying observers with those not carrying observers, particularly in HAK7 from 1988-89 to 1990-91, suggested that actual catches were probably considerably higher than reported catches…..

The Plenary Document goes on to show that reported catch as a percentage of estimated catch was 78%, 56% and 75% in 1989, 1990 and 1991 respectively, and concludes with the statement *More recently, the level of such misreporting has not been estimated and is not known.*

Ribaldo (RIB) is another species which has had reporting issues identified in the past. The Plenary document notes that

Discarding of ribald has been common, and the species has not been consistently reported on the forms, although there has been an increase in reported catch since the entry of ribald into the QMS.

It seems that reporting problems with both HAK and RIB have yet to be resolved.

Discussion

The results of this analysis show that the factory vessels operating in the WCSI hoki fishery are good at reporting landings but poor at reporting catches.

For non-QMS species this is only important if we intend using the data for management purposes, in which case we will inevitably be misled. We have other and more reliable data coming in from the observer programme, and if we are genuinely interested in the catch of non-QMS species in the WCSI fishery we should be making use of it. This observation presumably applies to all of the deepwater fisheries. Unfortunately the commercial catch data is readily available to fisheries management staff via canned reports and the MPI data warehouse whilst observer data is not, but this situation could be remedied.

With respect to the QMS species poor reporting of catches is more problematic. The catch limits and the economic instruments intended to ensure they are not exceeded are supposed to apply to catches and not landings, and will be ineffective if catches are misreported. We clearly have some major issues that need to be addressed – issues that in some cases have been evident for several decades – but we may need a range of solutions.

Some species misreporting (e.g. BEL for BBE; GSH for GSP; and probably EPR or EPL for CDL) is probably inadvertent, and may respond to education. I hold little hope for this: the educational effort directed at improving shark identification and reporting as part of the National Plan of Action on Shark Conservation seems to have had minimal result thus far. However, we can draw species misreporting issues to the attention of industry and gradually progress up the VADE spectrum, at least for those like GSH/GSP where the evidence is being landed at the end of each trip.

Some species misreporting (BEN for FRO, and RDO/SDO for LDO) is probably intentional, and when the vessel has a meal plant the evidence is usually being landed, albeit in unrecognizable form. MPI IDC are intending to do some work on the feasibility of quantitative speciation of fish meal, and we may in time develop forensic methods to deal with this problem. In the interim there is much we could do by both statistical analysis and face to face engagement with factory managers, company representatives and skippers to get a better grasp of the problem and spread the idea that we are aware of its occurrence.

The shambolic reporting of shark bycatch may be due in part to confusion between the TCEPR explanatory notes and Schedule 3 Part 2 of the Reporting Regulations. The explanatory notes provide a list of species codes, but do not make it clear that the list is only a subset of those in Schedule 3. GSH is in the subset, and GSP is not. SPD is in, but SND is out. To my mind this does nothing to encourage accurate reporting. Furthermore, the description of "OSD" in the explanatory notes is simply "sharks and dogfish not otherwise specified", but it is not clear whether "otherwise specified" refers only to the sharks and dogfish with their own codes in the explanatory notes or to all the codes available in Schedule 3 Part 2. The explanatory notes are often read by people for whom English may be a third or fourth language, and any ambiguity is unhelpful. Furthermore, any ambiguity will certainly be exploited by defence counsel if we progress up the VADE spectrum and attempt to enforce the reporting requirements.
I believe it would be preferable to remove the list of species codes from the explanatory notes entirely and replace it with a direction to consult the regulations themselves; or alternatively preface the existing list of codes with a note that these are just some of the more commonly used codes and the complete list is elsewhere. Some legal notes on this topic from Prosecutor s 9(2)(a) are available for internal circulation.

For the smaller sharks the "less than carton catch" issue may be an additional problem. DNA testing of the cartoned shark livers from one of the s 9(2)(a) vessels last May found a mixture of genera rather than just the *Etmopterus spp* described on the label. Shark livers are destined for a rendering plant, and although the legislative framework envisages the livers of the various species being packed separately the commercial imperative is simply to produce filled cartons. The catch by species will seldom be large enough to accommodate both requirements.

Less than carton catch is an issue that has also cropped up in interviews of foreign fishing crew by Auckland University academics, with suggestions that catches of < 40 kg per day of intrinsically valuable bycatch species such as ling are routinely discarded when observers are not embarked. (Note that this phenomenon may occur with most species, but it is only likely to be evident in the data at hand in those with low catch rates. The reporting of ling appears unexceptional in this analysis, and even if every vessel discarded 40 kg of ling per day this would amount to only 25% of the width of the confidence interval). Fish discarded in this way would have a ready sale on the domestic market if it were landed, and there may be a straightforward economic solution. The companies operating the vessels are often commodity traders with no presence in the domestic market themselves, but could potentially land dolavs of individually frozen mixed fish to medium scale domestic LFRs. I believe that the MPI should initiate discussions with industry along these lines.

Finally, the phenomenon most feared by those managing an ITQ fishery is quota induced discarding, a form of market failure in which otherwise valuable fish are discarded simply because the cost of quota is or might be too high. We may have this with hake. Hake is an inevitable and valuable bycatch of the hoki fishery, and is also a target species in its own right. Ideally, those who are certain that they will catch hake as a bycatch and have insufficient quota to cover their expected catch should purchase Annual Catch Entitlement from those who would normally be targeting the species, and the latter should reduce the amount of effort they put into hake fishing. This is how the QMS is supposed to work.

An alternative (and illegal) solution is for those taking hake as an inevitable bycatch to simply discard it without reporting the catch. This is attractive in circumstances where enforcement is weak, there is uncertainty over the likely abundance or eventual market price of the hake, or the market price of ACE threatens to remove the profit from landing the hake bycatch. In these circumstances the Quota Management System fails to constrain catches and maximizes neither sustainability nor utilization.

As it happens the total reported catch of HAK7 last winter was well below the TACC and ACE should have been readily available at bargain prices at the end of the season.
However, discarding decisions are not made at the end of the season, but rather day by day as the fish are being caught.

Whatever the motivation it is clear that hake and ribaldo are not being reported correctly. They cannot be being mistaken for other species, and the under-reporting is presumably intentional. A trip by trip comparison of predicted and reported catches may provide further insight into what is occurring, and any opportunities should be taken to have quiet conversations with ex crew members and skippers. The WCSI hoki fishery will start again in 3 months, and we could also single out several egregious offenders for targeted enforcement.