SUSTAINABLE MANAGEMENT OF NEW ZEALAND'S HOKI FISHERIES

MSC Certification of hoki fisheries in 2001 and 2007

New Zealand's hoki fisheries were certified under the Marine Stewardship Council's (MSC) programme in 2001 and re-certified in 2007. The MSC programme does not manage fisheries. It provides an independent audit of the fisheries management processes in place by assessing their performance against a range of internationally accepted benchmarks of sustainability, based on the United Nations Food and Agriculture Organizations' Code of Conduct for Responsible Fishing.

It is the responsibility of the New Zealand Government and of industry to ensure that management processes are in place to ensure New Zealand hoki fisheries are being managed sustainably.

Hoki managed as two separate stocks

New Zealand's hoki fisheries are managed as two separate stocks, a western stock and an eastern stock. The Ministry of Fisheries (the Ministry) and hoki quota owners contract a range of research programmes to routinely monitor the fishery and undertake annual stock assessments on both stocks. The stock assessment process is open to all stakeholders. These science programmes are actively supported by hoki quota owners through the Deepwater Group Limited (DWG), a non-profit company established to represent quota owners' interests in fisheries science and management. DWG represents the interests of hoki quota owners who own 95% of the Total Allowable Commercial Catch (TACC).

A single TACC is set for HOK1 by regulation, within which quota owners manage their catches under agreed limits for each of the western and eastern stocks. Compliance with these measures is administered by DWG and audited by the Ministry.

Management changes since 2006

Since 2006 the following major management changes have been made to further improve sustainability outcomes:

- Management partnership between the Ministry and quota owners established
- TACC changes in response to research and stock assessments implemented
- Management Reference Points revised and implemented
- Rebuilding strategy developed and implemented
- Western stock rebuilt to within new management target range
- Management Strategy Evaluation completed and findings implemented
- Fisheries Plan completed, approved by Minister of Fisheries, and implemented
- Compliance Group established to achieve improved compliance
- Audits against agreed KPIs show compliance rates of 96-100% with management requirements
- Ecosystem indicators developed
- Ecological Risk Assessment completed and findings being implemented
- Bycatch and discard rates assessed
- Risk assessment of incidental interactions with seabirds completed
- Incidental interactions with seabirds reduced
- Incidental interactions with marine mammals mitigated and minimised
- Interactions with benthic communities assessed
- Benthic Protection Areas developed and implemented

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Biomass of both stocks above B_{MSY} and within management target range

Both hoki stocks are assessed to be increasing in size, to be above B_{MSY} (i.e. the biomass level that will provide the maximum sustainable yield over the long term), and to be within the management target range of 35-50% B_0 (B_0 is the estimated long-term spawning biomass that would exist in the absence of fishing).

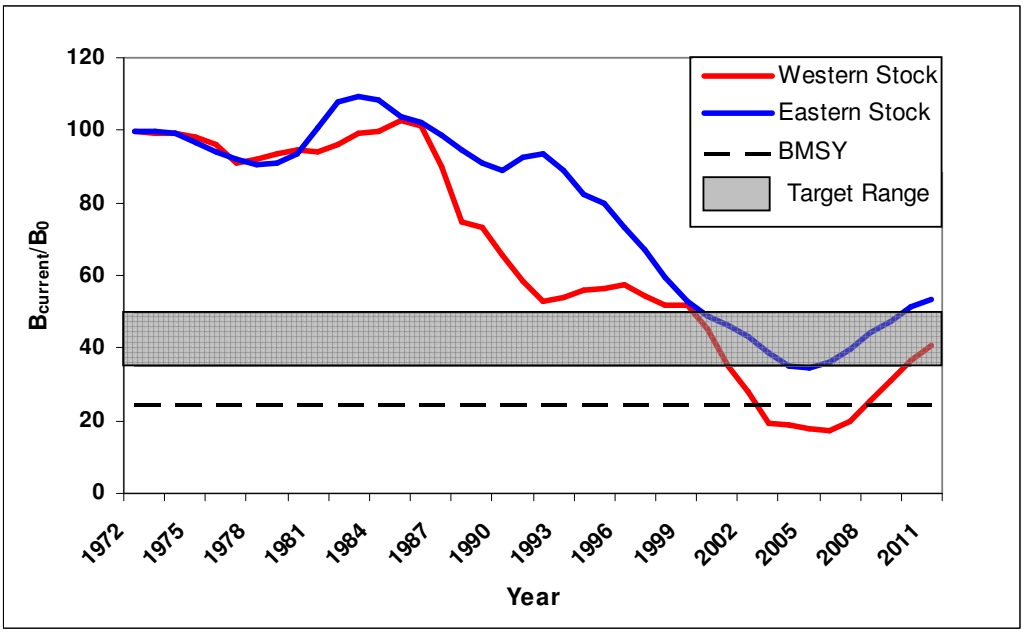

Figure 1: Spawning biomass trajectories for the western and eastern stocks between 1972 and 2011 (Model run 1.1) [1].

Hoki stock sizes fluctuate naturally

Most finfish stocks, including those for hoki, naturally fluctuate in size. These fluctuations are largely driven by variations in recruitment levels (i.e. annual variations in the numbers of young fish entering the fisheries) caused by environmental factors, such as the availability of plankton as food at the larval stage. Fluctuations in recruitment levels for hoki have been recorded to have varied 18-fold between successive years.

When recruitment levels decline and stock sizes decline, the management response is to reduce catch levels. Conversely, catch levels are increased when stocks increase in size (due to higher recruitment levels).

Recruitment into the western stock was above average between 1991 and 1994, supporting annual catches of 100,000 t to 140,000 t between 1997 and 2002. During the period 1995 to 2001, recruitment into the western stock was much lower resulting in a lower stock size and a managed reduction in catches down to 29,000 t by 2008.

Recent recruitment is estimated to have increased to near-average levels in both stocks (Figure 2) which, in combination with the lower catches, has resulted in an increased spawning stock biomass (Figure 1).

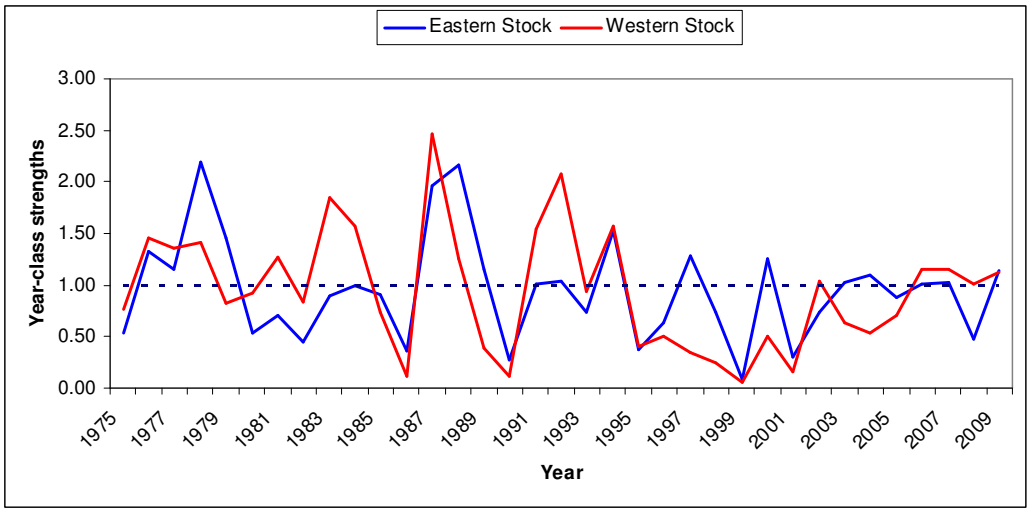

Figure 2: Recruitment variations in the eastern and western hoki stocks, based on the index of 1+ year-class strengths between 1975 and 2009 (Model run 1.1) [1]

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Current stock status and historical stock trajectory

The Ministry and DWG work together to ensure the hoki fisheries are adequately monitored and that research surveys and stock assessments are undertaken annually. Research has been contracted by the Ministry and by DWG to estimate biomass size in all of the main fishing grounds. All of this research is funded by hoki quota owners.

The 2011 stock assessment results[1] estimate:

- The biomass for the eastern stock to be 53% B_0 (above B_{MSY})
- The biomass of the western stock to be 41% B_0 (above B_{MSY})
- Both stocks have increased in size over recent years, attributable to increased recruitment and to lower exploitation rates (resultant from managed catch reductions implemented during the past 10 years)

Historical stock trajectories for the eastern (top) and western (bottom) stocks, shown in Figure 3, indicate that the eastern stock has never fallen below the current target management range while the western stock has been rebuilt from an estimated low of 17% B_0 in 2006, to above the target management level in 2011.

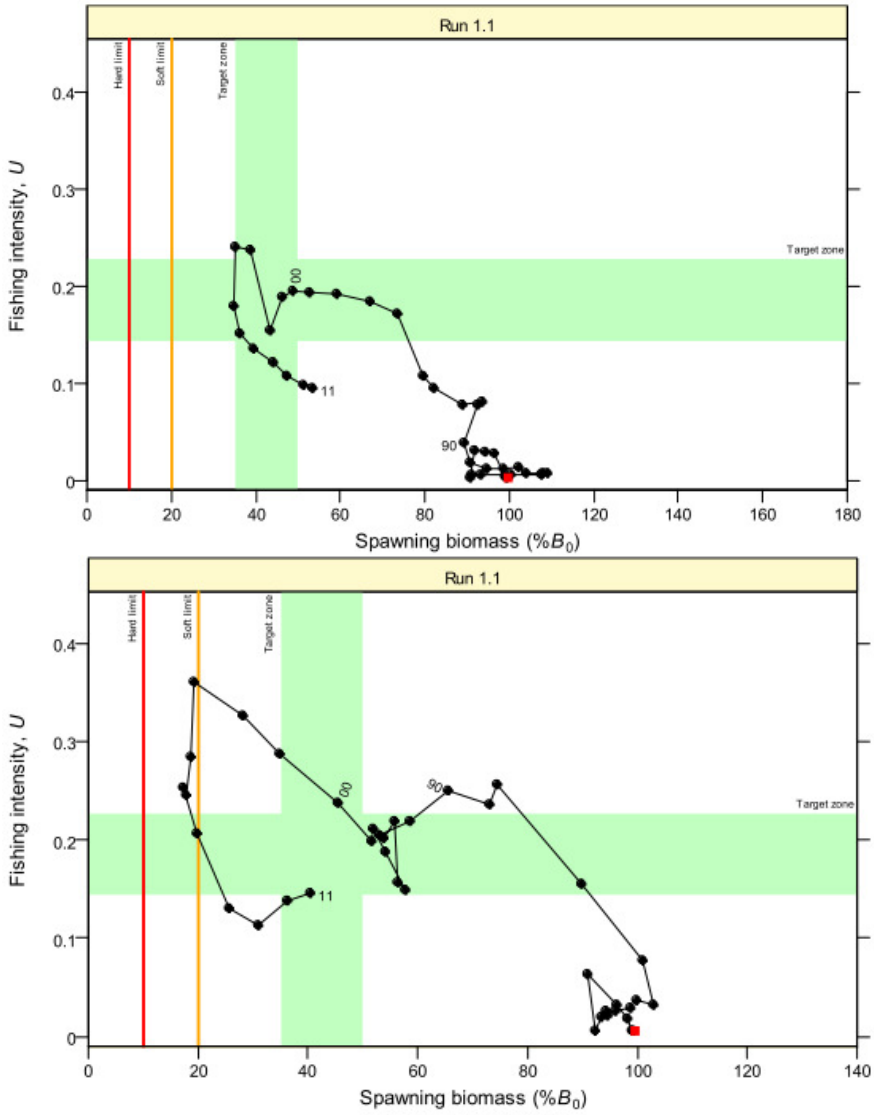

Figure 3: Trajectories of spawning biomass (%B_0), for the eastern (top) and western (bottom) hoki stocks between 1972 (represented by the red square) and 2011. The shaded area shows the management target ranges in biomass and in fishing intensity[1].

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Partnership between Ministry of Fisheries and hoki quota owners

In 2006, DWG and the Ministry entered into a formal partnership to enable collaboration in the management of New Zealand's deepwater fisheries, including the hoki fisheries.[2] This partnership has been updated in 2008 and in 2010 and has directly facilitated improved management of the hoki fishery in almost all respects through:

- A close working relationship under a shared and agreed vision, objectives and collaborative work plan
- Real-time open communication between DWG and the Ministry on information relevant to management measures, particularly from the Ministry's Scientific Observer Programme and commercial catching operations
- Agreement on a strategic plan for the management of New Zealand's EEZ fisheries
- Development and implementation of clear and agreed management objectives for all New Zealand's deepwater fisheries, including hoki, through fisheries plans
- Increased dialogue with the Department of Conservation (DOC) and with environmental NGOs (eNGOs) interested in the sustainable management of New Zealand's fisheries

TACC changes in response to western stock assessments

The 2009, 2010 and 2011 stock assessments estimated that the western stock is rebuilding and the Minister of Fisheries increased the TACC for each of the 2009-10 and 2010-11 fishing years. The western stock is now assessed to have been rebuilt and a further TACC increase is under consideration for 2011-12.

The TACCs and catch limits for the western and eastern stocks are shown in the table below.

Table 1: Hoki TACCs and agreed western and eastern stock catch limits for the each of the fishing years between 2003-04 and 2010-11.

Fishing Year	TACC (t)	W Catch Limit (t)	E Catch Limit (t)
2003-04	180,000	-	-
2004-05	100,000	40,000	60,000
2005-06	100,000	40,000	60,000
2006-07	100,000	40,000	60,000
2007-08	90,000	25,000	65,000
2008-09	90,000	25,000	65,000
2009-10	110,000	50,000	60,000
2010-11	120,000	60,000	60,000

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Rebuilding strategy developed and implemented for western stock

A reduction to the TACC and to the western stock catch limit in 2007 was in response to an agreed strategy to:

- Further reduce the fishing mortality on the western stock;
- Implement a formal rebuilding strategy; and
- Assess the performance of the western stock against this rebuilding strategy.

The rebuilding strategy has the objective of ensuring the stock biomass will rebuild at a rate not less than 50% of the rate that would exist in the absence of fishing. Projections are made over a five year period. In 2008, the western stock was modelled against the 2008 stock assessment and the 25,000 t catch limit in place, resulting in a projection that the western stock would rebuild to within the target biomass range (i.e. 35-50% B_0) by 2010.

Biomass for the western stock is estimated to have doubled from a historical low of 17% B_0 in 2006. The western stock is estimated to have likely been below the soft limit between 2003 and 2007 and has now rebuilt to within the target range.

Management reference points revised

Prior to 2009, the default target biomass range for hoki was 30-40% B_0.

During 2009, B_{MSY} was calculated to be 23-24% B_0, a Management Strategy Evaluation was undertaken, and a revised Harvest Strategy was implemented with a management target of 35-50% B_0, a 'soft' limit of 20% B_0 (triggering a formal 'time-constrained' rebuilding strategy), and a 'hard' limit of 10% B_0 (triggering consideration of fishery closure). Managers also asked scientists to report exploitation rates as outputs from hoki stock assessments along with estimates of 'optimum' exploitation rates that would provide for each stock to be maintained within the target biomass range.

Simply, these assessments estimate that if the fishery catches between 15-20% of available hoki (i.e. between 1-in-6 and 1-in-5 hoki), the stocks will be maintained within the target range of 35-50% B_0. Current exploitation rates (i.e. fishing intensity) are below this range and both stocks are assessed to be increasing in size. Fishing intensities on the eastern and western stocks are estimated to have decreased from around 25% and 30% in 2004 to around 10% and 14% in 2011, respectively (Figure 4). The 2011 stock assessment estimates that over the next five years and at current exploitation rates, both stocks will likely remain well above B_{MSY} and within or above the management target range of 35-50% B_0.

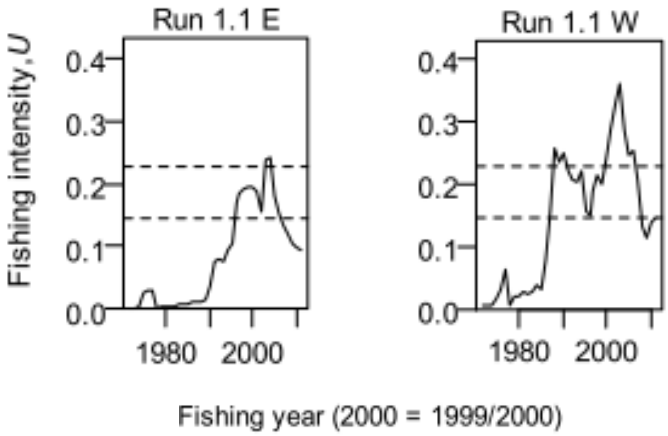

Figure 4: Fishing intensity for the eastern and western stocks. The broken lines are reference levels $U_{35\%}$ (upper line) and $U_{50\%}$ (lower line), are the upper and lower fishing intensities assessed to provide a spawning biomass of between 35-50% B_0[1].

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Fisheries Plan completed and approved by Minister of Fisheries

The Ministry and DWG, in consultation with stakeholders, have developed a National Fisheries Plan for Deepwater and Middle-depth fisheries, including those for hoki. This Fisheries Plan (the Plan) is a statutory document, which was approved by the Minister of Fisheries in October 2010.[3] This provides an enabling framework, outlining agreed management objectives, timelines, performance criteria and review processes, and has a life of 5 years between reviews.

The Plan specifies that the hoki fisheries will be assessed against agreed reference points for the management of hoki harvest, both in terms of biomass and fishing mortality. It prescribes a range of objectives and measures for bycatch management and for the mitigation of incidental interactions with protected species (such as marine mammals, certain sharks and seabirds).

The actual management measures and delivery outcomes in the Plan are will be specified in an Annual Operational Plan (AOP), which will be reviewed and updated annually. The first AOP will come into effect on 1 July 2011. In addition, an Annual Review Report (ARR) will assess performance against the AOP, and the Plan in general, and will be available to all stakeholders and interested parties.

Compliance Charter agreed between the Ministry and DWG

Within the partnership between the Ministry and DWG, agreement has been reached on a collaborative approach to improve compliance to provide an active programme to enhance compliance performance within the hoki fisheries[4].

The purpose is to achieve improved compliance through a model of 'informed and assisted compliance' by:

- Building on the successful collaborative relationship that currently exists in deepwater fisheries with respect to fisheries management issues
- Establishing a relationship and creating improved understandings between industry operators and the Ministry on issues of compliance in deepwater fisheries
- Ensuring reliable and up-to-date information is available to all parties (internal and external) for assessing performance of the deepwater sector in terms of compliance

A joint Ministry/DWG Deepwater Compliance Group has been established and tasked with the implementation of an agreed work programme to achieve the following outputs:

- Agreement on shared compliance rates and measures, and regular benchmarking and reporting of performance against these measures
- Informing and promoting compliance by improving the ability of shore-based vessel operators to monitor at sea performance of vessels through retrospective analysis of catch, effort and other available information
- Active improvement of existing compliance relationships between deepwater companies and the Ministry
- Identifying current areas of legislation and management measures which may, inadvertently, be contributing to levels of non-compliance, and identifying ways to address these

The focus of this Group is to improve operator compliance with both regulatory and non-regulatory measures (such as adherence to Vessel Management Plans (VMPs) for seabird mitigation).

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Improved compliance with non-regulatory measures

In the hoki fisheries there are a mix of regulated and non-regulated management measures, the latter implemented by industry in agreement with the Minister of Fisheries and the Ministry (e.g. agreed catch limits for each of the eastern and western stocks; vessel-specific measures to mitigate incidental interactions with seabirds).

Since 2007, the Ministry and DWG have worked together to ensure that commercial catches are aligned with the agreed catch limits through the implementation of catch plan forecasting, in-season progress reports against these, and adjustments to the Deemed Value charges as a disincentive to catches being taken without ACE.

Total hoki catches taken in the years 2006-07, 2007-08, 2008-09 and 2009-10 were within ±1% of the TACC and alignment with the catch limits for the eastern and western stocks has significantly improved over this period.

The partnership between DWG and the Ministry has also led to better procedures for managing the non-regulatory measures, including an independent auditing and monitoring regime, and to the revision and update of the processes and protocols for these.

As a result a number of agreed Operational Procedures have been implemented with the objectives of:

- Reducing the level of fishing mortality on juvenile hoki;
- During the time when the western stock was below the desired level, providing a period during the spawning season when no fishing occurred;
- Minimising and monitoring incidental interactions with seabirds and marine mammals, particularly those with New Zealand fur seals.

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Hoki fishing and the broader marine environment

Hoki is a dominant species in the bottom fish community of the upper slope (i.e. 200 – 800 metres depth range), around much of New Zealand and is considered to be a key biological component of the slope ecosystem. Understanding the predator-prey relationships between hoki and other species in the slope community and the environmental trends and ecosystem changes of which hoki and the hoki fisheries are a part, provides context for interpreting the environmental effects of fishing, the status of the stocks, and for informing management actions.

On the Chatham Rise, hoki forage primarily on lantern fishes, other mid-water fishes and natant decapods, with little seasonal variation. Larger hoki (>80cm) consume proportionately more fish and squid than do smaller hoki. Hoki diet overlaps with those of alfonsino, arrow squid, hake, javelinfish, Ray's bream and shovelnose dogfish. In turn, hoki are prey to hake, ling, stargazers, smooth skates and several deep water shark species. The proportion of hoki in the diet of hake averages 38% by weight and has declined since 1992, possibly because of a decline in the relative abundance of hoki on the Chatham Rise between 1991 and 2007.[1]

Information from the time series of research trawl surveys in the Sub-Antarctic (1991–2005) and on the Chatham Rise (1992–2007) series has been used to derive ecosystem indicators based on diversity, fish size, and trophic level. Species-based measures of diversity appear to be the most useful in identifying changes correlated with fishing intensity. Between 1992 and 1999 the growth rates of hoki for all year-classes increased by 10% in all four fishery areas, but it is unclear what has caused this trend. Work is ongoing.[1]

Recent studies of marine primary production have been undertaken to assess the energy required to support hoki harvests. An assessment of primary productivity in the habitat range of hoki[15], in conjunction with a linear food-web assessment, shows that hoki harvests in the 2008-09 fishing year required about 3.6% of the energy produced within their habitat range. This result suggests that hoki fishery production is unlikely to be constrained by the available primary production.[5]

Ecological Risk Assessment completed

An Ecological Risk Assessment (ERA) of New Zealand's hoki fisheries has recently been completed by a panel of independent technical experts[20]. This ERA was undertaken in response to a Condition of the MSC Certification for hoki which required an update of the 2002 hoki risk assessment. A Risk Assessment is simply a strategic, systematic and transparent process that identifies the likelihood and the consequence of any event. Collectively, the likelihood and consequence(s) identified are then assessed to determine the risk posed by such an event. It is important to note that an ERA assesses risks posed by activities at the population level, not at the individual level.

This ERA assessed the risks posed by hoki fishing in five broad ecological components:

- Target species (hoki)
- By-catch species (including sharks and non-fish by-catch)
- Protected species (e.g. seabirds, fur seals, other marine mammals, certain corals)
- Benthic habitats
- Trophic interactions and wider effects on ecosystem structure and function

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Results of the Ecological Risk Assessment

The ERA concluded that risks posed by hoki fisheries to ecological components within New Zealand waters were of negligible to moderate consequence, with two exceptions (for which they recommended further analyses):

- Risks to the benthic environment within BOMEC Class 9 particularly for Chatham Rise and,
- Risks to trophic interactions for Chatham Rise and potentially for Sub-Antarctic

In addition, the Panel recommended more information be obtained and existing information be compiled to better assess risks to two further components:

- Risks to New Zealand fur seals for WCSI and Cook Strait, and
- Risks to protected corals

DWG and the Ministry have developed and implemented an ERA Response Plan to implement the findings and recommendations of the Expert Panel (summarised in Figure 5).

Milestones	Tasks
14 Dec 2009	Workshop to assess ERA Methodological Options – facilitated by E-Systems Pty Ltd
19 Feb 2010	Final Workshop report received from E-Systems Pty Ltd
Feb-Jul 2010	Proposals to update hoki ERA invited from service providers, proposals considered, ERA process revised to align with proposed methodologies and costs.
Aug 2010	Boyd Fisheries Consultants Ltd contracted to undertake Level 1 ERA of hoki fisheries
Aug-Nov 2010	Preparatory work, finalising methodologies, assessing and compiling relevant documentation, and inviting key participants and organising workshop
30 Nov 2010	Notification of ERA workshop dates, invitations to participants, documentation provided
13-14 Dec 2010	ERA workshop held to identify risks of impacts of hoki fishing on target species, by-catch species, seabirds, marine mammals, benthic habitats and trophic/ecosystem functioning – facilitated by Boyd Fisheries Consultants Ltd
23 Dec 2010	ERA workshop record and draft of assessments provided to Panel members for review
31 Jan 2011	ERA Draft Report provided to Panel Members for review
17 Mar 2011	Final ERA Report provided to DWG, proposed management response plan developed
8 Apr 2011	Independent high level review of ERA process and adequacy commissioned from Enfocus Consulting Ltd
13 May 2011	Draft Review Report received by DWG for review
May 2011	Invite key participants for consultation meeting on ERA outcomes
7 Jun 2011	DWG Board to consider outcomes of hoki ERA and proposed management response plan.
30 June 2011	Consultation meeting on ERA outcomes with stakeholders, key science advisors and interested parties.
July 2011	Finalise and implement Operational Plan to achieve agreed objectives
1 Sep 2001 to 30 Oct 2012	Ongoing review and monitoring of Operational Plan results, periodic and annual reports to Ministry and to DWG Board.

Figure 5: The Deepwater Group Ltd and Ministry of Fisheries Ecological Risk Assessment Response Plan

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Hoki fishery bycatch and discard rates

More than 85% of the catch is hoki in the hoki target trawl fishery and 10% of the catch is of species that are also managed under the Quota Management System (QMS)[3]. Approximately 5% of the catch comprises non-QMS bycatch species, much of which is retained (including sharks in recent years). The hoki fishery has a very low discard rate relative to other trawl fisheries in New Zealand and internationally[1].

Bycatch and discards in the New Zealand hoki, hake and ling trawl fisheries, based on Ministry of Fisheries Scientific Observer Programme and commercial catch data, have been analysed for the period 2000-01 to 2006-07[6]. These analyses indicate that while over 470 species or species groups have been identified in the hoki, hake and ling target fisheries[1]:

- 97% of the catch is made up of only 16 species, or species groups (some categories, e.g. 'rattails', comprise several species and are referenced as 'species groups'). Most of the remaining species are caught in very low numbers
- Within these top 16 species/species groups, non-ITQ species comprise less than 4% of the catch. These include javelinfish, rattails, shovelnose dogfish and seal shark
- Over 95% of the catch in these three trawl fisheries comprises QMS species for which Total Allowable Commercial Catch limits (TACCs) are in place
- Discarded hoki, hake and ling makes up less than 10% of the total observed discards
- A 'discard index' (i.e. % catch x % discard) illustrates that spiny dogfish, javelinfish, rattails, hoki, shovelnose dogfish and seal shark make up the bulk of the discard by weight (see below).

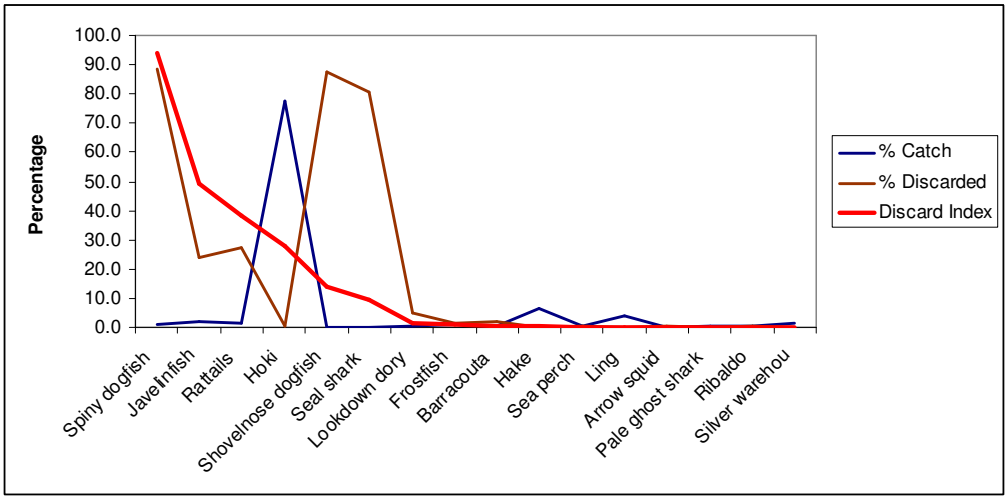

Figure 6: The percentage contribution of the top 16 species/species groups to the total catch and the total discard fractions in the hoki, hake and ling trawl fisheries. A 'discard index' (red curve) is used to illustrate the main discard species/species groups.

A recent scientific paper proposes that a balanced harvesting regime, which harvests a range of species at similar exploitation rates, may be more beneficial in maintaining healthy marine ecosystems than selective harvest of a few key species. The authors suggest that a balanced harvest approach may be more effective in achieving the ecosystem-based fishery management objective. The paper warns that traditional, selective fishing approaches may harm, rather than protect, ecosystems and fisheries[7].

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Reduced interactions with seabirds

Seabirds and fur seals may at times, through their attraction to fishing vessels as an opportunistic source of food, unwittingly put themselves at risk of harm, injury or death. They seek easy access to food, they think and they modify their behaviours to overcome obstacles. They can be very strategic and clever which proves frustrating when trying to set in place measures to deter them from putting themselves at risk. Patterns of 'at risk' behaviour by seabirds vary seasonally, by species, and are dependent on their desire to feed in proximity to vessels and nets.

Incidental interactions with seabirds have been significantly reduced through improved and proven seabird mitigation measures. These measures involve a mix of targeted regulatory and non-regulatory measures. Regulatory measures are enforced, and non-regulatory controls are implemented by industry and audited by the Ministry.

Since 2006, all trawlers over 28 metres in length in the hoki fishery have been required (by law) to deploy warp mitigation devices when trawling. DWG also requires trawlers over 28 metres to implement individual Vessel Management Plans (VMPs), which prescribe agreed offal discard management measures with the sole objective of reducing the risks of injury or death to foraging seabirds. VMPs, administered by DWG and supported by the Minister, are audited by the Ministry and are required by the Ministry as a part of permit reviews for all Foreign Charter Vessels (FCVs).

DWG is working with the Ministry, the Department of Conservation (DOC) and eNGOs on the development of national standards for seabird mitigation and a National Plan of Action (NPOA) for seabirds. It is envisioned that the NPOA will be implemented via Fisheries Plans, in this case the National Fisheries Plan for Middle-Depth and Deepwater Fisheries (the Plan).

A Level 1 Risk Assessment of incidental interactions between seabirds and middle depth finfish fisheries (including those for hoki) has been undertaken by DOC. This assessment found four species could be categorised as being at 'high risk' should no management/mitigation measures be implemented. This finding was reduced to two species (i.e. sooty shearwaters and white chinned petrels) following due consideration of the existing effective management/mitigation measures. Net captures were identified as the risk requiring further action and research has since been carried out in this area[8].

A Level 2 Risk Assessment has been since undertaken to better identify problem species and to better define risks[21].

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Reduced interactions with seabirds

The observed seabird capture rates in hoki trawl fisheries (i.e. the numbers captured per 100 observed tows, including those released alive) peaked in 2000-01 at 8.85. Annual capture rates reduced to a low of 1.31 in 2006-07, when an estimated 140 seabirds of all species were captured. The rate increased to 1.61 in 2007-08 (138 captures) and to 2.23 in 2008-09 (202 captures)[9, 10]. Numbers of seabirds captured are scaled estimates, based on independent observer data, and provide an index of the level of interactions for the fleet rather than the actual numbers of interactions. In recent years, approximately 20-30% of seabirds recorded as being captured in trawl nets have been released alive. These capture statistics may therefore overestimate net capture mortalities, but may underestimate warp strike mortalities.

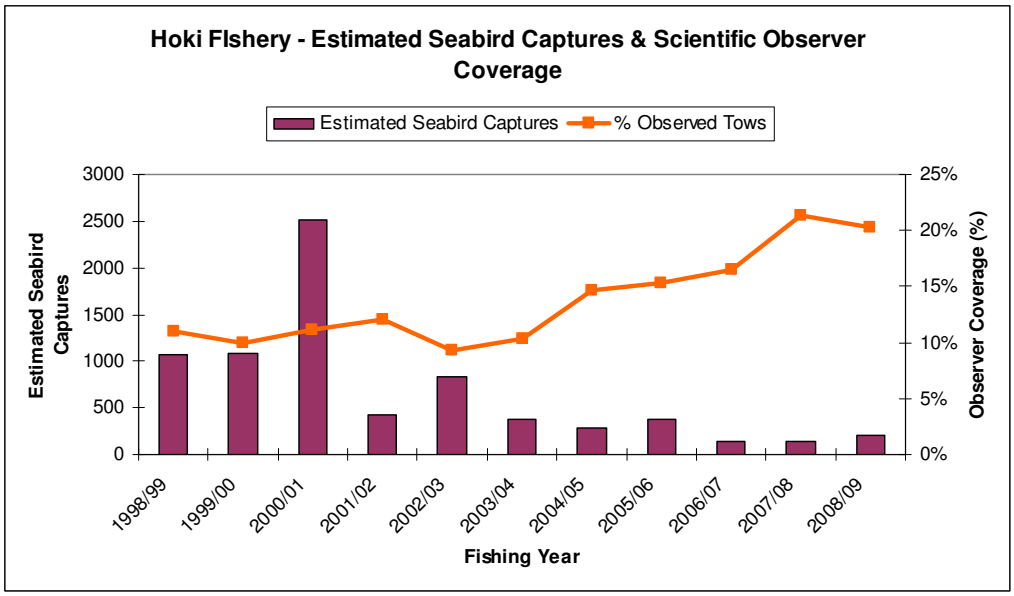

Figure 7: Estimated total seabird captures, based on scaled scientific observer records, and the level of observer coverage in the hoki fishery from 1998-99 to 2008-09.

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Incidental interactions with New Zealand fur seals

Incidental interactions between New Zealand (NZ) fur seals and trawlers in the hoki fisheries mostly occur because fur seals have learnt to feed opportunistically on catches in trawl nets as these approach the surface. This foraging behaviour puts them at considerable risk and some animals become trapped and drown as a result.

Interactions between trawlers and NZ fur seals have increased as their population size and distribution ranges have increased. Most interactions with NZ fur seals occur at or near the surface, rather than when the net is at operational depth, and are therefore viewed as being incidental rather than as a bycatch of the hoki fisheries.

Over recent years industry and the Ministry have worked closely with scientists and eNGOs to develop and implement effective procedures to reduce these incidental interactions to the lowest possible levels. This has involved recognising and managing fishing practices that exacerbate the risk to NZ fur seals from their feeding behaviours, such as reducing the time fishing gear is on or near to the surface during hauling. Although effective at minimizing interactions, any proposal to prevent all captures will be very challenging. It will require methods that prevent NZ fur seals actively putting themselves at risk of harm while enjoying ready access to easy food.

Fisheries managers continue to work closely with vessel operators to minimise these incidental interactions. Mitigation procedures currently in place, for all trawlers over 28 metres in length in the hoki fishery, are:

- Ensure no offal is released when hauling and shooting the net - to reduce the level of surface attractant to foraging seals around the vessel
- Minimise the time the net is at or near the surface when hauling – to reduce the interaction time for seals to 'steal' a meal
- Remove 'stickers' (meshed fish) from the net before shooting – to eliminate these as a source of food which attracts seals to nets at/near the surface
- Provide one designated crew member to observe all shooting and hauling of nets - to determine if fur seals have been captured and to organise timely humane assistance to release them alive and unharmed (as many are)
- Manage trawl gear failures to minimise risk to fur seals – through keeping trawl gear at least 50 m, and preferably 100 m, deep in the water while attending to gear failure, or bringing the trawl gear fully aboard, or manoeuvring the gear to ensure the net mouth remains closed
- Real-time reporting to DWG if more than 2 captures in 24 hours, or more than 5 captures in any 7-day period – to enable on-shore assessment of the factors that may be causing the increased risks to fur seals and to advise on how to reduce these risks.

Each vessel's performance against these standards is audited by the Ministry.

In early 2008 the Ministry, DOC and DWG combined resources to undertake the first census of the New Zealand fur seal population along the west coast of the South Island[11] This is the area identified to be of most potential concern because of the number of incidental interactions between hoki trawlers and foraging fur seals. The population estimate from the census was used to estimate of the level of 'Potential Biological Removals' (PBRs, i.e. the number of fur seals that could be removed without detriment to the population size), using internationally accepted scientific methods. These analyses established that the level of 'captures' was lower than the PBR and that, by this measure, the hoki fishery was not having any unsustainable impacts on the fur seal population in this region.[12] These analyses have recently been repeated by independent scientists and the provisional results (yet to be presented) confirm this outcome.[13]

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Incidental interactions with fur seals declining

The observed NZ fur seal capture rate in hoki trawl fisheries (i.e. the numbers captured per 100 observed tows, including those released alive) peaked at 5.63 in 2004-05, when an estimated 1033 were captured, and has since reduced to 2.23 in 2008-09, when an estimated 264 were captured[9, 10] (Figure 8).

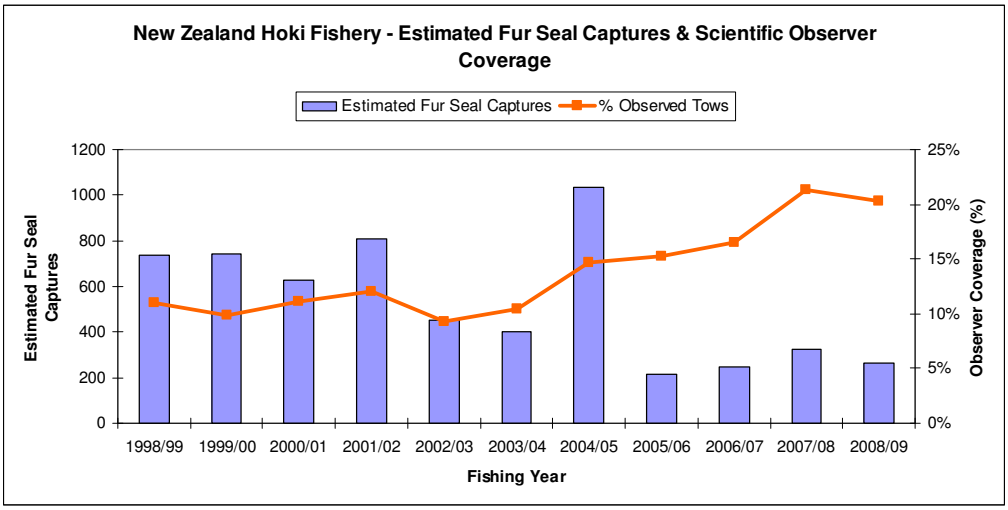

Figure 8: Estimated total fur seal captures, based on scaled scientific observer records, and the level of observer coverage in the hoki fishery from 1998-99 to 2008-09.

From the total observed fur seal captures (Figure 8), 10–34% have been subsequently released alive (Table 2).

Table 2: CSP Observer Report figures for hoki, hake, ling and warehou trawl fisheries combined (K. Ramm, pers. comm.).

Fishing Year	Live Captures	Fatal Captures	Total Captures	Released Alive
2005/06	11	101	112	10%
2006/07	13	72	85	15%
2007/08	11	42	53	21%
2008/09	25	49	74	34%
2009/10	9	48	57	16%

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Interactions with Benthic Communities

Hoki are caught using bottom and midwater trawl gear. Bottom trawling is the main fishing method outside of the spawning season, particularly in the Chatham Rise and the Sub-Antarctic fisheries, mainly on soft sediment habitats[1]. Midwater trawling is used more frequently during the spawn to target aggregations occurring above the seabed.

Concerns have been expressed about the effects bottom trawling may be having on benthic communities. The impacts of bottom trawling on soft sediment habitats in depths of 400-800 metres have not been extensively studied and research in this field is expensive. The Ministry and DWG have therefore adopted a spatial management approach and closed large, broadly representative areas to bottom trawling (see next section). In total, over 30% of the New Zealand Exclusive Economic Zone is closed by law to bottom trawling. Within this, 6.2% of the hoki habitat range is closed to bottom trawling.

The number of hoki-targeted bottom and midwater tows has decreased as the TACC has been reduced and as hoki fishing has become more efficient. The annual number of tows peaked at 30,354 in 1997-98 and has since progressively declined to 6,599 in 2008-09. During this period, there has been a move away from a dependence on fishing during the spawning season towards year-round fishing and, consequently, the proportion of bottom tows has increased from 58% to 80%[1].

Spatial analyses have been undertaken to assess the location and extent of hoki bottom trawl grounds[14]. The extent of hoki bottom trawl grounds has been calculated by determining the total area swept by bottom trawls (i.e. using TCEPR records to establish trawl start and finish locations and using the average distance between the trawl doors for each of the trawl gear types used in the fishery to establish swept area)[15]. During the period 1989-90 to 2008-09 the area contacted one or more times by trawls targeting hoki covered 13.5% of the habitat range. In 2008-09, a total 6,462 bottom tows occurred (i.e. including midwater tows where the gear touched the seabed), which covered only 1.5% of the hoki habitat range[14]. By these measures, the extent of the hoki bottom trawl grounds is only a very small part of the known habitat range and has decreased over recent years (see map next page).

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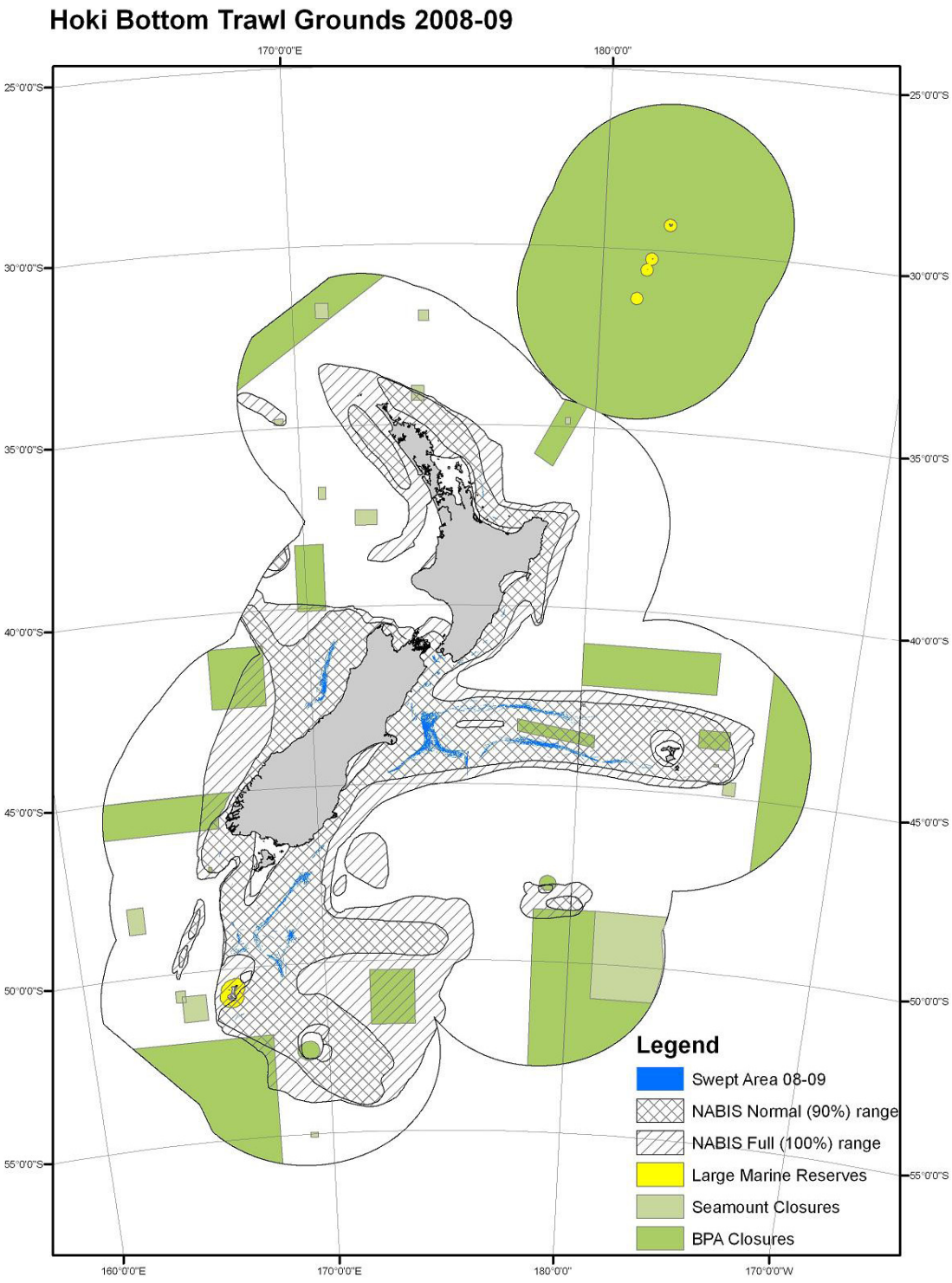
Hoki bottom trawl grounds



Benthic Protection Areas introduced

In 2007, after receiving a proposal from DWG, the New Zealand Government closed 17 Benthic Protection Areas (BPAs) to bottom trawling and dredging by regulation. In total these BPAs close 30% of the New Zealand Exclusive Economic Zone (EEZ, the maritime region extending from 12-200 miles offshore). When combined with the existing "seamount" closures, this provides protection under law to 33% of the benthic habitat within the EEZ from bottom trawling and dredging - a total area of more that 1.1 million square kilometres. Together these comprise the largest Marine Protected Area network for benthic marine biodiversity in any EEZ in the world and 25% of the total areas closed under MPAs globally[16].

The objective of closing these large areas was to protect a broadly representative range of seabed habitats and their associated benthic biodiversity, most of which is untouched.

These closures comprise an area close to four times the total area that has ever been fished by bottom trawl in the EEZ (i.e. 7.1% of the EEZ has been trawled one or more times).

The selection of BPA locations was based on the government's Marine Environment Classification (MEC) scheme, completed in 2005[17]. The MEC was produced by a multi-disciplinary assessment of the available information on marine habitats by government departments and scientists. MEC categories were the best available at the time and, although the categories in the EEZ are based predominantly on physical variables (i.e. depth, sea surface temp, seabed slope, solar radiation) and are not expressly predictive of benthic ecosystems, they do include factors likely to influence benthic ecosystems (such as depth, substrate type, oceanographic conditions, geographic location). DWG and the Government accepted that while, the MEC requires further refinement, it could be used to provide a basis for delineating and implementing BPAs as a first major step in marine conservation in the EEZ.

The BPA closures were selected under the following key criteria:

- Large areas – to ensure widespread protection at the broad ecosystem level
- Broadly representative of the range of benthic habitats in the EEZ – based on the MEC and on consideration of WWF-NZ's report *"Shining a spotlight on the biodiversity of New Zealand's marine ecoregion"*[18]
- Simple boundaries - to facilitate ease of compliance
- Unmodified - areas that are largely pristine (i.e. untouched by fishing)

In addition, selection of areas were made on consideration of:

- Knowledge of habitats rich in corals and sponges
- Closure of not less than 10% of each MEC class within the EEZ
- For each class, closures were spread among two or more BPAs
- The closures were evenly spread east and west of the tectonic boundary, which runs through the centre of the NZ EEZ
- Closures were evenly spread north and south within the EEZ, which runs from sub-tropical waters to sub-Antarctic waters

The Government has recently revised its MEC system to include information on benthic biota (i.e. the Benthic Optimised Marine Environment Classification system, BOMEC[19]). Industry has committed to assist the Government in ensuring adequate protection is afforded to benthic ecosystems and communities within the EEZ, including further studies and analyses proposed by DWG and the Ministry in their recent ERA Response Plan (see page 9).

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In Summary

The effectiveness of New Zealand's hoki fisheries management is evidenced by the successful interventions that have lead to the rebuilding of the western hoki stock to the target range. The low bycatch rate and reduced interactions between seabirds and fur seals in recent years point to a responsible and successful associated-species management approach. Analyses of the areal extent of the bottom trawl grounds has revealed a significant reduction in recent years and the very small areas fished in relation to the habitat range of hoki. Ongoing environmental risk assessment work will further inform the efficacy of the overall hoki fisheries management approach.

These improved measures encompass all the elements of responsible management, as required by the Marine Stewardship Council certification standards.

Hoki quota owners, in collaboration with the Ministry, DOC and eNGOs, will continue to collaborate towards ensuring that the New Zealand hoki stocks are managed sustainably and to the highest international standards.

Seafood consumers can be reassured that New Zealand hoki is a sustainable seafood resource, the harvesting of which is demonstrably undertaken with due regard for, and stewardship of, the broader marine environment.

20 June 2011

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