

Overview

DWG has contracted Innovative Solutions Limited (ISL, Patrick Cordue) to undertake four ORH stock assessments in 2014: for each of ORH MEC, ORH3B NWCR, ORH3B ESCR and ORH7A fisheries.

These assessments have now been completed and have been accepted by MPI's Deepwater Fishery Assessment Working Group. They will be assessed by the Plenary in May before they are accepted by MPI.

This will be followed by ISL undertaking a Management Strategy Evaluation (MSE) on each of these stocks to inform managers on the suitability of the current harvest strategy and to give guidance on the choice of the management target range. This additional work has been commissioned in response to misgivings expressed by MRAG's P1 assessor about our current management target range (set at 30% - 40% B_0) and about the robustness of our harvest strategy.

Three of these stocks (ORH3B NWCR, ORH3B ESCR and ORH7A) are assessed to be within the management target range and one (ORH MEC) is assessed to be well below.

The provisional results are discussed for each fishery in this briefing note for consideration by ORH quota owners, along with proposals on management and monitoring options, with the objective of reaching agreement on options at the Shareholders' meeting on 30 April 2014.

Overall, the prospects we face are:

- We will likely gain MSC Certification for ORH3B ESCR, ORH3B NWCR and ORH7A but not for ORH MEC (as the stock status is estimated to be 14% B_0 , which is both below the target and the MSC 'trigger point' of 20% B_0),
- We will need to implement a rebuilding plan for ORH MEC, and
- Once these stocks reach their optimum sizes, a doubling of the current annual catch is from these four fisheries is estimated to be sustainable (i.e. an increase from the current 5,280 t to 11,650 t).

Because we are relying on new stock assessments that are based on limited data, DWG advises quota owners to take a cautious approach to catch increases until we obtain MSC Certification and we can have more confidence in the assessment model.

Adopting a conservative management approach will also assist us to respond to the widespread negative international scrutiny that these orange roughy fisheries attract.

There are many who hold the view that the only acceptable way to manage orange roughy fisheries is closure. Consideration of both MSC Certification as well as a doubling of catches will not only require re-education but also the re-alignment of their existing beliefs. This will prove to be challenging for many.

In order to address the uncertainties in these new assessments as well as mitigate concern from our detractors, DWG proposes quota owners adopt the following approach:

- Set the long term catch at the yield estimated to provide a stock size of 40% B_0 , which requires an exploitation rate of around 4.5%. This is well above the estimates for B_{MSY} (22% to 25% B_0) and is at the upper end of the current management target range (30% to 40% B_0). The difference in the annual yield from a stock at 40% B_0 and one at 35% B_0 is around -5%. This target will greatly ease the acceptance of the management regime by the assessors for MSC Certification and will assist to allay overseas criticism, at the cost of only a minor loss in yield.
- Stage the catch increases over a three to five year period – with the rate of these increases to be reviewed as further information becomes available.

We require carefully developed science-based monitoring and assessment plans for each of these fisheries within the refreshed 10 Year Science and Monitoring Programme, which is

currently under development with the expectation of implementation from 1 July 2015.

This Programme will also require science-based monitoring to inform the management for: ORH1, ORH2A (North), ORH3B Puysegur, ORH3B Sub-Antarctic, and ORH7B.

ORH MEC 2014 Stock Assessment – Provisional Results

The current stock size is provisionally estimated to be 14% B_0 . The current annual catch is 930 t. The annual yield to maintain stock at around 40% B_0 is estimated to be 1,969 t. This is proposed as the long term management goal.

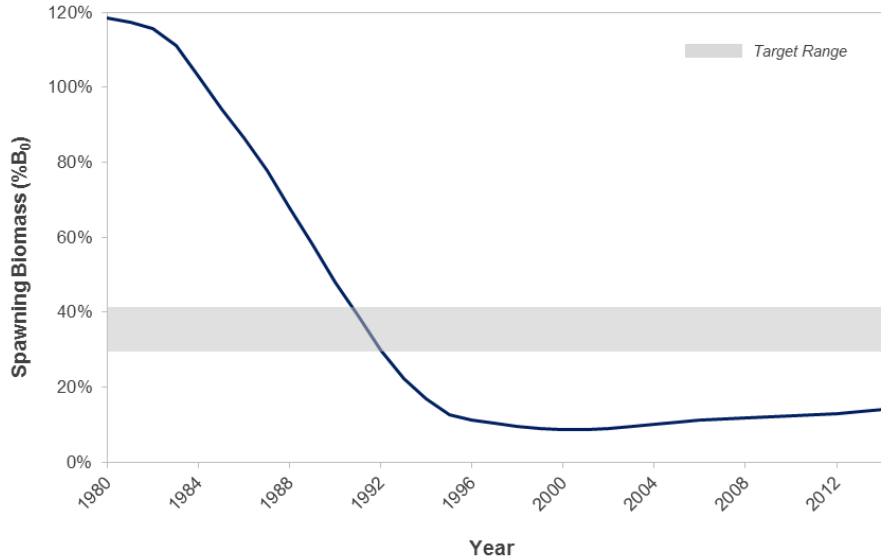


Figure 1: Estimated spawning biomass trajectory for ORH MEC.

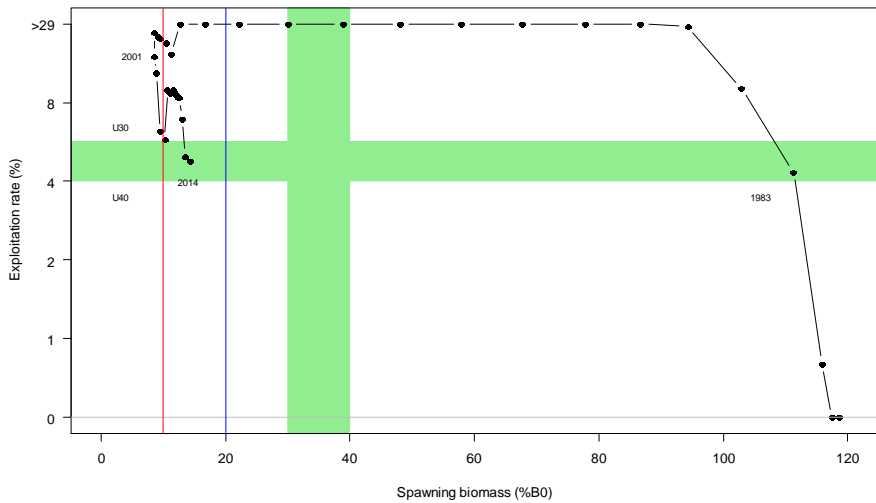


Figure 2: Biomass and exploitation rate plotted against the management targets for ORH MEC. Ideally, management measures would maintain the biomass at the centre of the green cross.

Table 1: ORH MEC Key Parameters (biomass [tonnes], stock status [percentage B_0], and exploitation rate (ER) [%].

B_0 (t)	$B_{current}$ (t)	$B_{current}$ (% B_0)	MSY		35% B_0		40% B_0	
			Yield (t)	ER (%)	Yield (t)	ER (%)	Yield (t)	ER (%)
95,000	13,500	14	2,214	7.7	2,075	5.1	1,969	4.3

The current exploitation rate is estimated to be 5%.

Although the 2013 assessment estimated the MEC stock status to be between 20% and 30% B_0 , the provisional results from the 2014 assessment estimate the MEC stock status to be 14% B_0 . This revision is primarily driven by a low biomass estimate (~4,500 t) from the 2013 AOS biomass survey.

ORH MEC Biomass Projections and Future Management Options

As the stock size is estimated to be 14% B_0 this fishery does not meet either the MPI Harvest Strategy Standard (HSS) or the MSC Fisheries Standard and needs to be rebuilt in size.

The HSS requires a formal rebuilding plan if a stock declines below the 20% B_0 such that it will rebuild to the management target (with greater than 70% probability) in not more than twice the time it would take to rebuild with no catch (i.e. $2 \times T_{\min}$, where T_{\min} is the time it would take to rebuild with no catch).

The MSC Fisheries Standard requires a stock to be rebuilt to the management target within 20 years with an 80% probability that it will be greater than 20% B_0 when rebuilt.

For the current management target in ORH MEC, ISL estimates T_{\min} to be ~21 years (i.e. if there is no catch, the ORH MEC stock would take 21 years to increase to 30% B_0).

DWG contracted ISL to run a range of future stock size projections to assess the catch to rebuild to 30% B_0 . The key results are:

- To meet the HSS, the annual catch that allows the stock to increase to 30% B_0 in 42 years (with greater than 70% probability of being 30% B_0) is 850 t
- To meet MSC Standard, the annual catch that allows the stock to increase to 30% B_0 in 20 years (with an 80% probability of being greater than 20% B_0) is 150 t

Given the success in rebuilding ORH7A and the Chatham Rise stocks, industry should have confidence that we can also do this for MEC and likely in shorter timeframes than the model predicts (but we shall see...).

It is important to note that for all of these projections the estimated growth in stock size is based on the average recruitment. If recruitment over the next few years were to be greater than average, the rebuild times will be shorter. Conversely, if recruitment were to be lower than average, then the rebuild times will be longer.

ISL has advised that if a future survey can estimate ~13,000 t of spawning biomass then the stock assessment will likely estimate the stock status to be ~30% B_0 .

MPI and DWG are developing a management, monitoring and assessment plan (within the revised 10 Year Science and Monitoring Plan) that includes research surveys to estimate biomass and updated stock assessments. The next MEC survey could occur in 2015, providing new information for a revised stock assessment in 2016 and for a review of management as early as 2016-17.

DWG has again asked MPI to provide a scientific basis upon which ORH3A is considered to be part of the MEC stock and that this be undertaken as a matter of urgency.

Mandate Request

DWG seeks a mandate from MEC quota owners to:

- 1. A long-term management goal that maintains the stock at the upper bound (40%) of the management target range, with an annual yield of 1,950 t and an exploitation rate of around 4.5%.**
 - 2. The implementation of a formal rebuilding plan that:**
 - 2.1 Sets the annual MEC catch at 0 t to maximise the rate of stock size rebuild and, when the stock size is larger than 20% B_0 , increase the catch in line with the Harvest Strategy agreed by quota owners and MPI and in a way that meets any MSC Condition to return the stock to 'fluctuating around the target'. This is the quickest path to the management target and to MSC Certification, but is the most costly in terms of reduced/foregone catches. OR,**
 - 2.2 Sets the annual MEC catch at 150 t to rebuild the stock size to 30% B_0 in not less than 20 years (a requirement to meet the MSC Standard), increase the catch in line with the Harvest Strategy agreed by quota owners and MPI and in a way that meets any MSC Condition to return the stock to 'fluctuating around the target'– this is estimated to take about 20 years. This path will take longer to achieve but provides some interim catches within the rebuild strategy. OR,**
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2.3 Sets the annual MEC catch at 850 t to rebuild the stock size to 30% B_0 in $2 \times T_{min}$ increasing catches to 4.5% of $B_{current}$ when the stock size is greater than 30% B_0 – this is estimated to take around 42 years. Although this approach meets the minimum requirements of the MPI Harvest Strategy Standards, it does not meet the MSC Standards. This path would maintain a reasonable fishery while the stock is very slowly rebuilt in size.

ORH3B NWCR 2014 Stock Assessment – Provisional Results

The current stock size is provisionally estimated to be 37% B_0 . The current annual catch is 750 t. This fishery was closed by industry for three years to promote rebuild. The annual yield to maintain stock at around 40% B_0 is estimated to be 1,250 t. This is proposed as the long term management goal.

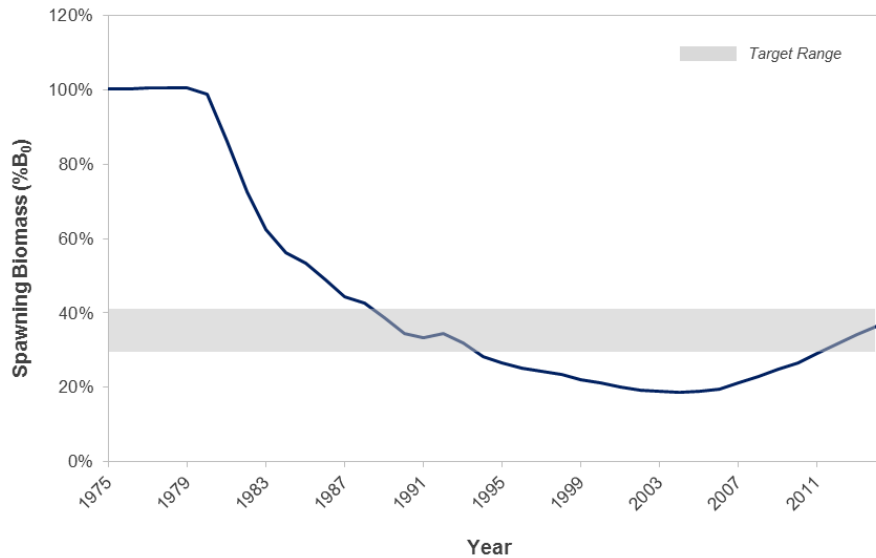


Figure 3: Estimated spawning biomass trajectory for ORH3B NWCR.

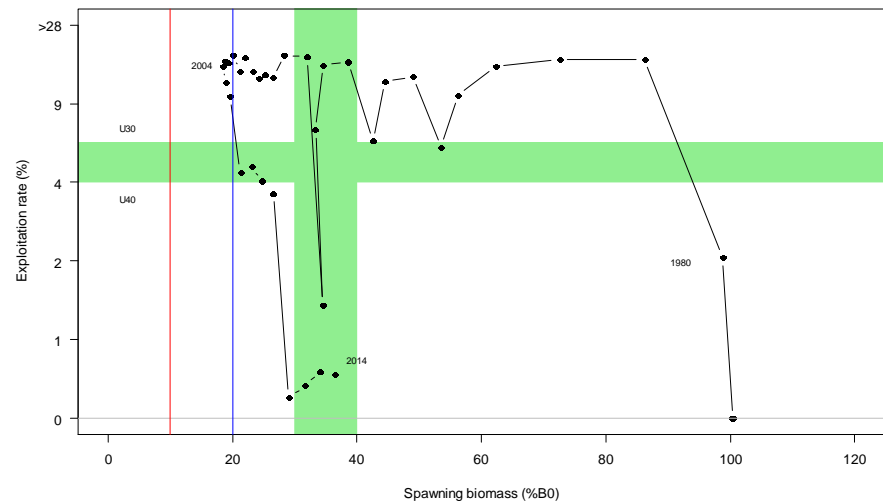


Figure 4: Biomass and exploitation rate plotted against the management targets for ORH3B NWCR. Ideally, management measures would maintain the biomass at the centre of the green cross.

Table 2: ORH3B NWCR Key Parameters (biomass [tonnes], stock status [percentage B_0], and exploitation rate (ER) [%]).

B_0 (t)	$B_{current}$ (t)	$B_{current}$ (% B_0)	MSY		35% B_0		40% B_0	
			Yield (t)	ER (%)	Yield (t)	ER (%)	Yield (t)	ER (%)
66,000	24,000	37	1,391	8.1	1,322	5.3	1,250	4.5

The current exploitation rate (for a catch of 750 t) is estimated to be 3.1% (note Figure 4 above is calculated with a 2013-14 catch of 110 t).

ORH3B NWCR Biomass Projections and Future Management Options

On the basis of the provisional 2014 stock assessment results, ORH3B quota owners have elected to re-open this fishery during the balance of the 2013-14 year and to fish against the agreed catch limit of 750 t.

With a stock status of 37% B_0 , this fishery meets both the MPI Harvest Strategy Standard and the MSC Fishery Standard.

DWG contracted ISL to run further future stock size projections under various catch scenarios, to inform options that will meet the New Zealand management targets and the MSC Standard. These results are shown in Table 3 and the projected biomass trajectories are shown in Figure 5 below:

Table 3: ORH3B NWCR Future Catch Options.

	2014-15	2015-16	2016-17
Scenario 1	900 t	1,050 t	1,200 t
Scenario 2	750 t	990 t	1,200 t
Long term Catch	1,250 t	1,250 t	1,250 t

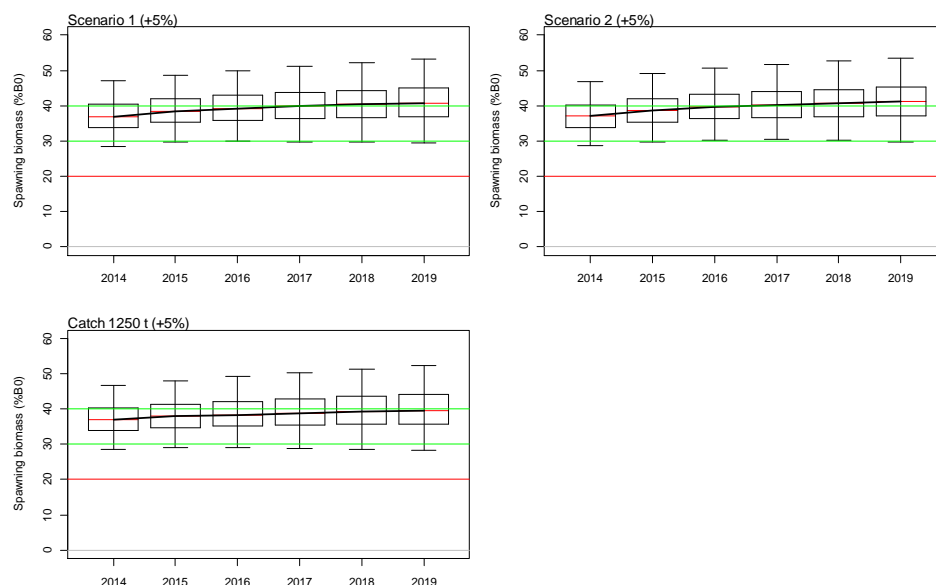


Figure 5: Base model long-term projections for three catch scenarios.

MPI and DWG are developing a management, monitoring and assessment plan (within the revised 10 Year Science and Monitoring Plan) that may include further research surveys to better estimate biomass here in 2015, 2017 and 2019. This could provide new information for revised stock assessments in 2016, 2018 and 2020.

Mandate Request

DWG seeks a mandate from ORH3B quota owners for the NWCR fishery to :

- 1. A long-term management goal that maintains the stock at the upper bound (40%) of the management target range, with an annual yield of 1,250 t and an exploitation rate of around 4.5%.**
- 2. A conservative plan to stage catch increases from 750 t to 1250 t over three years – 750 t in 2014-15, 1,000 t in 2015-16 to 1,250 t in 2016-17 - and ending with a catch set at around 4.5% x $B_{current}$.**

ORH3B ESCR 2014 Stock Assessment – Provisional Results

The current stock size is provisionally estimated to be around 30% B_0 . The current annual catch is 3,100 t. The annual yield to maintain stock at around 40% B_0 is estimated to be 6,789 t. This is proposed as the long term management goal.

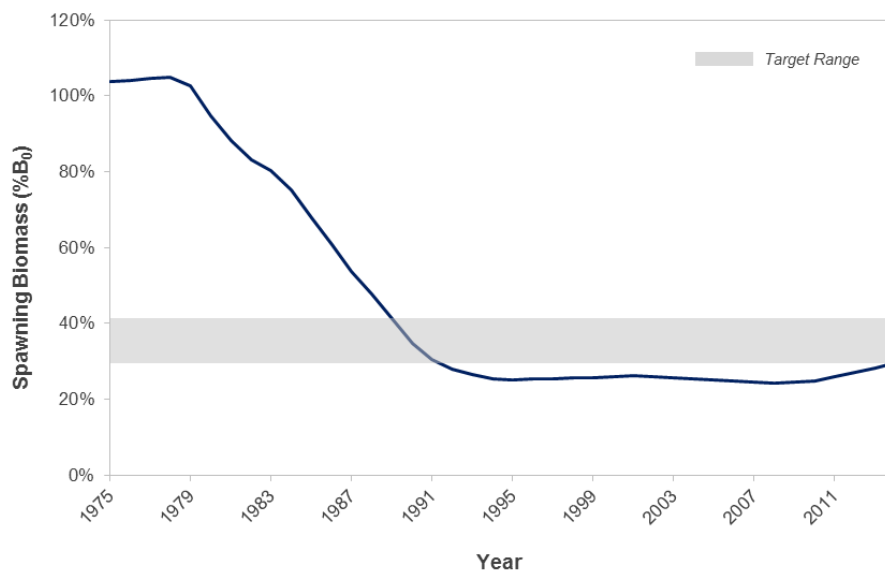


Figure 6: Estimated spawning biomass trajectory for ORH3B ESCR.

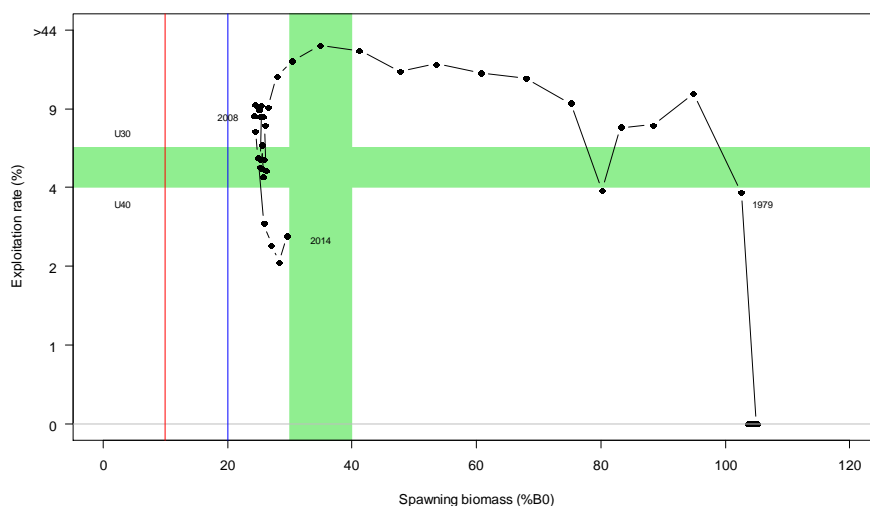


Figure 7: Biomass and exploitation rate plotted against the management targets for ORH3B ESCR. Ideally, management measures would maintain the biomass at the centre of the green cross.

Table 4: ORH3B ESCR Key Parameters (biomass [tonnes], stock status [percentage B_0], and exploitation rate (ER) [%]).

B_0 (t)	$B_{current}$ (t)	$B_{current}$ (% B_0)	MSY		35% B_0		40% B_0	
			Yield (t)	ER (%)	Yield (t)	ER (%)	Yield (t)	ER (%)
320,000	93,000	30	7,716	8.7	7,175	5.3	6,789	4.5

The current exploitation rate is estimated to be 2.9%.

ORH3B ESCR Biomass Projections and Future Management Options

With an estimated stock status of 30% B_0 , this fishery meets the MPI Harvest Strategy Standard.

It also meets the MSC Fisheries Standard in part but not completely as the biomass cannot be described as 'fluctuating around the management target' because it has been below the target for the last two decades (i.e. it should pass but with a condition to increase the stock status to 'fluctuating around the management target' over a relatively short period, probably 5 years).

DWG contracted ISL to run further stock size projections under different catch scenarios to inform future management options. The key results are listed below and the projected biomass trajectories are shown in Figure 8:

- The time the stock would take to get to 40% B_0 with no catch is 5-6 years
- The annual catch that allows the stock to increase to 35% B_0 in 5 years with 90% probability of being above 20% B_0 (a requirement to meet the MSC Fisheries Standard) is 4,400 t.

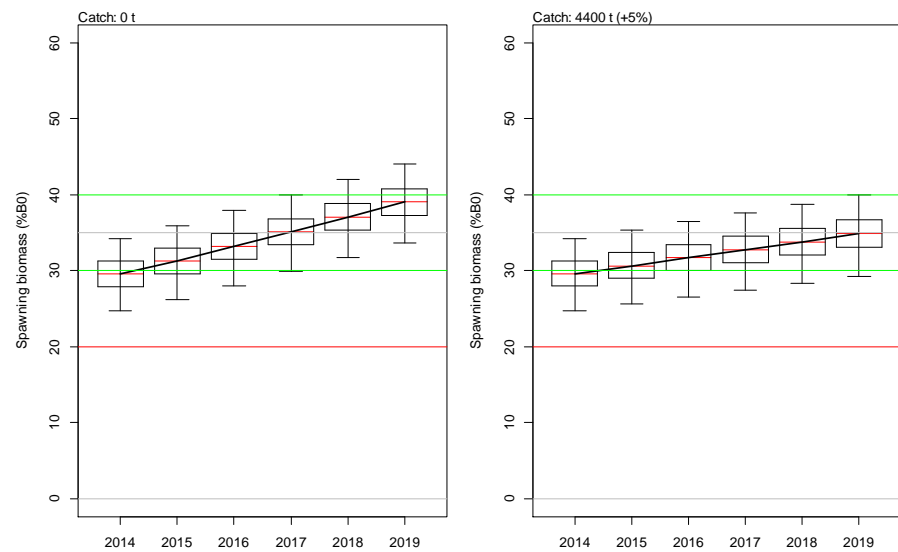


Figure 8: Base model long-term projections for annual catches of 0 t and 4,400 t.

Given the uncertainties in the 2014 stock assessment and the knowledge that a further biomass survey is planned for July 2014, which we can follow with an updated stock assessment in 2015, DWG proposes that the current catch limit of 3,100 t should be retained for 2014-15 with the a review of the catch limit for the 2015-16 fishing year.

MPI and DWG are developing a management, monitoring and assessment plan (within the revised 10 Year Science and Monitoring Plan) that includes further research surveys and stock assessments to estimate biomass and stock status.

Mandate Request

DWG seeks a mandate from ORH3B quota owners for the ESCR fishery to:

- 1. A long-term management goal that maintains the stock at the upper bound (40%) of the management target range, with an annual yield of 6,800 t and an exploitation rate of around 4.5%.**
- 2. Maintain the annual catch at the current level of 3,100 t for at least one more year and review this based on information from the 2014 biomass surveys and an updated 2015 stock assessments. OR,**
- 3. Maintain the annual catch at 3,100 t until the stock size reaches 35% B_0 (projected to take four years) and then set the catch to provide an exploitation rate of 4.5% to enable the stock size to increase to 40% B_0 .**

ORH7A 2014 Stock Assessment – Provisional Results

The current stock size is provisionally estimated to be 40% B_0 . The current annual catch is 500 t. The annual yield to maintain stock at around 40% B_0 is estimated to be 1,660 t. This is proposed as the long term management goal.

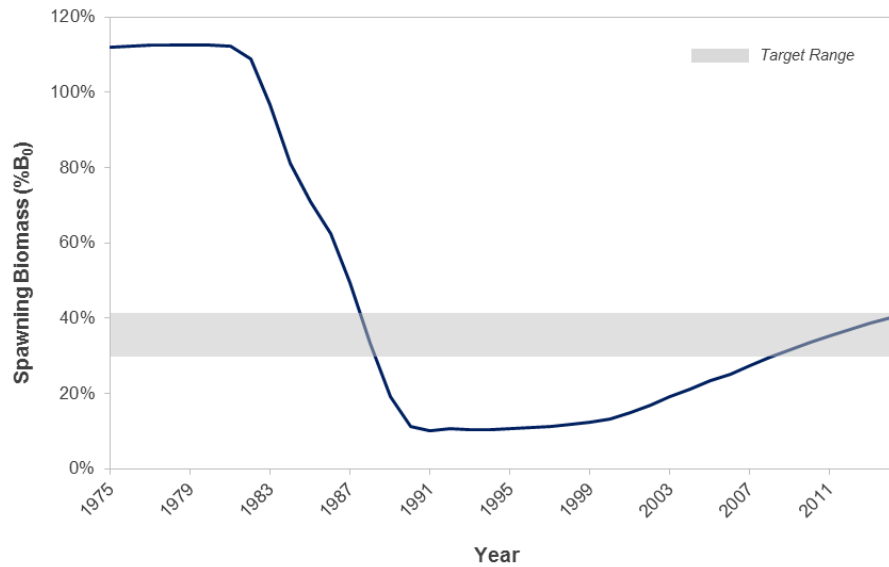


Figure 9: Estimated spawning biomass trajectory for ORH7A.

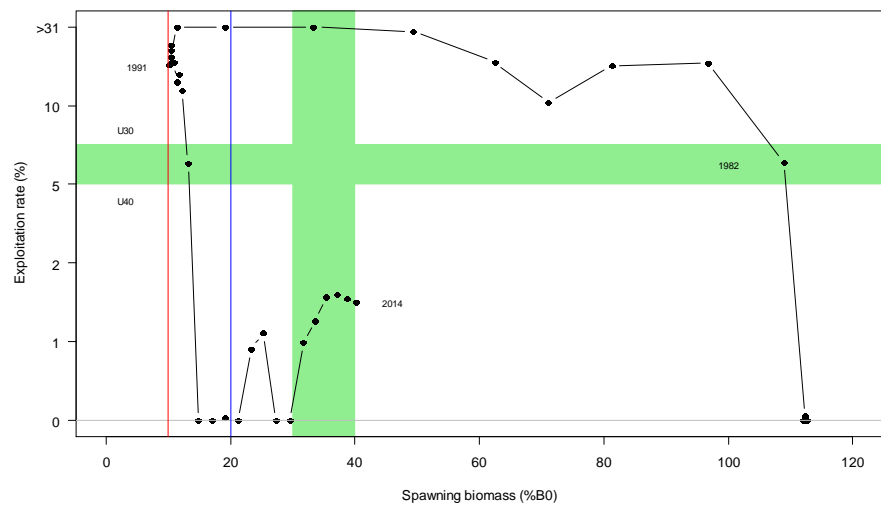


Figure 10: Biomass and exploitation rate plotted against the management targets for ORH7A. Ideally, management measures would maintain the biomass at the centre of the green cross.

Table 5: ORH7A Key Parameters (biomass [tonnes], stock status [percentage B_0], and exploitation rate (ER) [%]).

B_0 (t)	$B_{current}$ (t)	$B_{current}$ (% B_0)	MSY		35% B_0		40% B_0	
			Yield (t)	ER (%)	Yield (t)	ER (%)	Yield (t)	ER (%)
87,000	35,000	40	1,829	8.0	1,741	5.5	1,660	4.6

The current exploitation rate is estimated to be 1.5%.

ORH7A Biomass Projections and Future Management Options

With an estimated stock status of 40% B_0 , this fishery meets both the MPI Harvest Strategy Standard and the MSC Fisheries Standard.

DWG proposes a conservative stage up of annual catches from 500 t to 1,650 t over three years and to then set the catch at a level that provides an exploitation rate of 4.5% to maintain the stock size at around 40% B_0 .

MPI and DWG are developing a management, monitoring and assessment plan (within the revised 10 Year Science and Monitoring Plan) that includes further research surveys and stock assessments to better estimate stock status of ORH7A. Note that Sealord propose an AOS survey on Westpac Bank during June/July 2014 to better estimate species composition within aggregations on hills. These surveys will be used to re-assess previous acoustic surveys with the expectation that they will result in improved estimates of ORH biomass for use in an updated 2015 stock assessment.

Mandate Request

DWG seeks a mandate from ORH7A quota owners to:

- 1. A long-term management goal that maintains the stock at the upper bound (40%) of the management target range, with an annual yield of 1,650 t and an exploitation rate of around 4.5%.**
- 2. Stage annual catch increases from 500 t to 1,650 t over three years - 900 t in 2014-15, 1,300 t in 2015-16, and 1,650 t in 2016-17 - and then set the catch to provide an exploitation rate of 4.5% x B_{current} to maintain the stock size at around 40% B_0 .**

Summary of Future Catch Options

In summary, given the implementation of these proposals, the future possible catches from these four ORH fisheries over the next three years and the long term yields are summarised in Table 6. The actual catches will be subject to the final outcomes from this year's stock assessments, the outcomes from this year's MSEs, the results from future monitoring/surveys, and the results from future stock assessments:

Table 6: Possible catches (t) from the four ORH fisheries

	2013-14	2014-15	2015-16	2016-17	Long Term*
ORH MEC	930	0	0	0	1,950
ORH3B NWCR	750	750	1,000	1,250	1,250
ORH3B ESCR	3,100	3,100	4,400	4,400	6,800
ORH7A	500	900	1,300	1,650	1,650
Totals	5,280	4,750	6,700	7,300	11,650

* Estimated yields to maintain stock at 40% B_0 , rounded to nearest 50 t.

George Clement
CEO
23 April 2014