Introduction

General Approach

The Harvest Strategy Framework for the SESSF that is the basis for calculations of RBCs was largely unchanged in 2009. There is a target reference point of 48% of unfished spawning biomass or B_{48} as the default proxy for B_{MEY} that applies for the calculation of RBCs for Tier 1 species. For this harvest control rule the inflection point in the control rule, between the limit of B_{20} and the target of B_{48}, has been set at 35% of unfished biomass. Previous modifications made to the Tier 3 and Tier 4 rules to overcome some problems with them and make them more consistent with Tier 1 were applied again in 2009. The changes to the Harvest Strategy Framework have now largely been tested by management strategy evaluation and the current framework has been shown to be consistent with, and meeting the requirements of, the Commonwealth Harvest Strategy Policy (Wayte 2009).

The target reference point of 48% of unfished spawning biomass is the default economic target reference point for B_{MEY}. As before, SlopeRAG did not feel able to provide meaningful comment on the appropriateness of this as a target for any of the species it has considered. This is due to a combination of a lack of economic information available to it and a lack of economic expertise within the group. Previously, concern had been expressed about the ability to determine appropriate economic targets for individual species in a multi-species and multi-method fishery, and about the likelihood that any estimate of B_{MEY} would be very sensitive to inter-annual or within season changes in such things as market prices or fuel prices.

Estimates of total catches and discards used in assessments are detailed in Klaer (2009a). Standardised catch rates used in all assessments are detailed in Haddon (2009a) and figures from this report are used in the species summaries presented here.

Tier 1 Harvest Control Rule

Wherever possible, quantitative assessments for Tier 1 species have been implemented using the Stock Synthesis version 3 (SS3) package. The use of SS3 (or its predecessor SS2) for assessments in the SESSF is becoming the standard. The advantages of using this package include

- It is well-tested and flexible
- Provides a uniform approach to stock assessment for all SEF species
- Standard outputs will allow RAG members to more easily understand assessments
- Calculation of RBCs is incorporated into the software
- A standard approach allows stock assessment scientists to more easily understand (and therefore assist with or review) other assessments
- Excellent output software allows rapid model testing and development.

No species assessed by SlopeRAG were upgraded to Tier 1 from other tier levels in 2009, but there have been continued efforts on developing a Tier 1 assessment for western gemfish by BRS, and work was initiated on a Tier 1 assessment for mirror dory. The assessments for pink ling and silver warehou were moved from SS2 to SS3 in 2009. The assessment model for blue grenadier model is still in the process of being moved to Stock Synthesis. An updated assessment was not required for blue grenadier this year because of AFMA's decision to set a multi-year TAC for this species.

The default target reference point for the Tier 1 Harvest Control Rule for 2009 has again been set at B_{48} (the spawning biomass equal to 48% of unfished levels), the default proxy for B_{MEY} as specified in the Commonwealth Harvest Strategy Policy. The default limit reference point has also remained at B_{20}. The target level of fishing mortality is therefore F_{48}, the level that would lead to a spawning biomass of B_{48} if applied over the long term.

The break-point in the trajectory of fishing mortality between the limit and target was set at B_{35} last year based on an analysis for a range of SESSF species. Below this level of biomass, the level of fishing mortality will be set according to the old 20:40:40 rule. At biomasses above this level, but below the target, fishing mortality will be set at F_{48}.

Tier 3 Harvest Control Rule

The revised and improved version of the Tier 3 HCR that was developed, tested and adopted last year was applied again in 2009. The new rule overcomes problems with the previous rule by extending the period used for calculating recent catches and matching it with the years over which mortality is calculated, by incorporating a selectivity function into the calculations, and by incorporating targets

and limits into a new control rule that are more consistent with those used for Tier 1. The results for the Tier 3 analyses are provided in Klaer 2009b.

A decision is needed on whether a cap on the RBC for Tier 3 species should be introduced similar to that applied under the Tier 4 HCR.

Tier 4 Harvest Control Rule

The revised and improved version of the Tier 4 HCR that was developed, tested and adopted last year was applied again in 2009. The new rule overcomes problems with the previous rule by incorporating targets and limits into a new control rule to make it more consistent with those used for Tier 1. Results for Tier 4 analyses are provided in Haddon (2009b) and tables and figures from this report have been used in these species summaries.

Meta-Rules

In addition to the above harvest control rules, two of the three meta-rules introduced last year are to be applied again this year, according to the agreed TAC setting process.

The meta-rule that will not be applied this year is the one introduced in 2008 to reduce the impact of the new Tier 3 and Tier 4 harvest control rules by limiting the change due to the new rules to a maximum of 25% of the TAC.

The second meta-rule was proposed to deal with the lag in the assessment cycle. A rule was developed that allowed adjustment of the TAC upward or downward depending on whether recent standardised CPUE levels were above or below previous values. After trialling this rule for selected species last year it was agreed that it will now be applied to all species.

The third meta-rule was proposed to explicitly introduce more precaution in TAC setting under the Tier 3 and Tier 4 harvest control rules. It was proposed that RBCs be discounted by 5% for Tier 3 species and 15% for Tier 4 species. These discounts are the default ones that are to be applied, but the RAGs were requested to examine the need for their application on a species by species basis.

Previously agreed rules regarding the deductions of catches in other jurisdictions and discards, and limiting changes in TACs to between 10% and 50% were again agreed to be implemented.

The exception to this occurred for western gemfish for which there were catches also taken in the GAB trawl fishery. Last year if the expected catch in the GAB had been deducted from the RBC it would have produced a zero RBC for the other areas of the SESSF. It is assumed that there is a single stock that is shared between the GAB trawl fishery and other fleets in the SESSF but nevertheless, the RAG again agreed that the application of this rule was not a sensible outcome and recommended that expected GAB catches not be subtracted off the RBCs when calculating the TAC.

AFMA will apply the above meta-rules to the RBC in developing their TAC advice to the MAC and Commission. The RAG has provided advice on whether there was justification for not applying discount factors to the Tier 3 and Tier 4 analyses. The RAG has also provided on whether the carryover of undercatch/overcatch was appropriate for each species.

2009 Stock Assessment Report for Blue eye trevalla *Hyperoglyphe antarctica*

RAG undertaking the assessment: SlopeRAG

Stock structure:
A single stock is assumed as there is no strong evidence of structuring within SESSF. Recent genetic studies found no evidence of structuring within the area of the SESSF. Otolith microchemistry (including both elemental and stable isotope analyses) has suggested some stock structuring, principally between the East Coast Deepwater and New Zealand regions (which appeared to form one group) and the rest of Australia's SESSF, and further suggested that areas off NSW could be an important site for mixing.

Biological indicators
Biological productivity: Low
Trophic level: 2?
Associated species: blue grenadier, silver warehou, ling
Percentage of otter trawl catch targeted: primarily by-product (Klaer 39%)
Suggested environmental drivers: Water temperature

Recent catch history:

	2004	2005	2006	2007[1]	2008[1]	2009[1]
Agreed TAC (Global)	621	621	560	560	560	560
Actual TAC (Global)	743	679	618	573	610	604
Trawl catch (SEF2 Comm.)	84	43	67	39	34	
Trawl Catch (SEF2 State)	0	0	0	0	0	
Non-trawl catch (SAN2)	567	451	494	536	339	
% actual TAC	88	73	91	100	61	
Estimated discards (SET)	0	0	0	0	0	
% Discards (SET)	0	0	0	0	0	
Estimated discards (NT)	1	0	0	0	0	
% Discards (NT)	<1	0	<1	0	0	
Trawl catch (GAB-logbook)	2	8	12	1	<1	
State catch	64	56	43	51	36	
Total catch	719	557	616	627	408	

[1] 2007 TACs are for the 12 months to December 2007. 2008 & 2009 TACs are for the new fishing year (May to April)
[Abbreviations – SEF2: landed weights as recorded in the landings records of trawlers; SAN2: landed weights as recorded in the landings records of the non-trawl sector; SET: south-east trawl sector; NT: non-trawl sector; GAB- Great Australian Bight trawl sector]

From 1998 to 2001, blue eye trevalla trawl and non-trawl catches were managed under a global agreed TAC of 630 t (530 t non-trawl, 100 t trawl sector). From 2001, up to 10% of the non-trawl quota was transferable to the trawl sector annually. Also from 2001, a bycatch trip limit and a 60 t total catch limit were introduced on the Lord Howe Rise, and the Cascade Plateau was closed to the non-trawl sector.

Synopsis of the 2008 fishery
The landed catch for the 2008 calendar year was 373 t. At the end of the quota year (April 2009) the landed catch was 435 t which represented 71% of the actual TAC. Discarding of blue eye trevalla is not an issue for either the trawl or the non-trawl sectors.

Industry reported that the distribution of fishing effort by the line sector around the fishery continues to be influenced by interactions with killer whales. This had previously produced a shift in effort from eastern Tasmania to around Kangaroo Island. Industry noted that when killer whales are found to have taken fish off long lines, fishers move their gear to different areas. The impacts of this depredation are reported to be significant at times but the details have not been recorded in logbooks so its effect on CPUE indices cannot be quantified.

In some years (e.g. 2005) the majority of the blue eye trevalla caught in longline fishery are less than 70 cm noting that size at maturity is greater than 70 cm. The absence of large fish in catch in many

years is a result of the combination of fish behaviour (fish migrating onto and off fishing grounds) and fishers targeting size classes that will maximise the value of the catch.

Industry had reported that 2006/07 was the best fishing year for blue-eye since quota had been introduced, with excellent catch rates observed. It was also reported last year that three of the main auto-longline vessels had stopped targeting blue-eye early due to the limited quota.

2009 assessment:
Blue eye trevalla were assessed as a Tier 4 species last year after detailed examination of the available size and age composition data. This showed substantial annual, seasonal and spatial variation in the size and age composition of the catch. Industry had also reported that the seasonal movement of fish and differences in the depth distribution of fish of different sizes contributed to this variation. As a result, SlopeRAG was not confident that the data available provided a consistent or robust basis for the estimation of mortality which was a prerequisite for applying the previously used Tier 3 harvest control rule.

Tier 4
The CPUE series selected last year for use in the Tier 4 assessment was a combination of data from drop-lines and longlines, but excluding records from fishing on the Cascade Plateau and seamounts. The time series of catch data were combined using the unit of catch per shot. Last year an inspection of the distribution of the log of the catches was used as a basis for deciding that the two gear types could be sensibly combined. This was further examined this year by inspecting plots of the distributions of the log of the catch rates (Figure 1) which showed similar distributions albeit with higher catch rates from droplines.

The same time series was used again this year with the same reference period (1997-2006) and regarded blue eye to be fully fished by this period. Catch rates were relatively stable during this period and at a level that industry considered to be reasonable. SlopeRAG considered that there was no indication that catches during this period were unsustainable.

The CPUE series from the trawl sector has not been considered to be informative because blue eye has shifted from a target to a bycatch species for this sector and is now responsible for only a small proportion of the total catch. Nevertheless, a comparison of the two time series shows that they follow a similar trend during the years when they overlap (Figure 2).

There had been a suggestion that the CPUE series for blue eye trevalla should take account of targeting for ling in the same way that the ling CPUE series accounts for blue eye trevalla fishing. The approach used for ling is to classify shots that catch more blue eye trevalla than ling as targeted blue eye trevalla shots and to exclude them. An inspection of a scatter plot of the catches of ling and blue eye trevalla in individual shots, however, showed no clear separation between shots catching one or the other species suggesting that a classification based on the most abundant species in the catch would be an arbitrary one. This criterion was therefore not adopted for filtering of data to use in the CPUE standardisation for blue eye trevalla.

Recommended Tier Level
Tier 4.

RBC Calculations

The RBC calculated using the autolongline and dropline data was 536 t (Table 1, Figure 4) before any allowance for discards, State catches, discount factor or recent CPUE adjustment. The average CPUE over the last four years is lower than the average from the reference period producing a scaling factor less than 1 and an RBC that is below the average catch over this period (667t).

Additional Comments from the RAG
This year some industry members reported some level of concern about trends in the fishery. The fishery is now largely confined to the ‘hot-spots’ and the information coming from these areas is not reflective of what used to be a broader fishery. Some of what used to be ‘hot-spots’ (e.g. off the south coast of Tasmania) are also not producing as well as they used to and fish are not as spread out on diverse areas as they used to be. Most of the main areas of concentration were still producing fish but there was a noticeable difference from the early years of the fishery. Some ‘residential’ fish used to be found spread out along the shelf, but their numbers have now declined. This view was initially raised by the line sector but was supported by the trawl sector who also reported that blue eye were not as

prevalent as in the past, and that they were now needing less quota to cover what was essentially a by-catch for them.

It was also pointed out that one of the main areas of trawl catches of blue eye trevalla in the summer (near Gull Island) has now been made part of one of the MPAs off eastern Tasmania.

Discount factor
Whereas last year industry members strongly expressed the view that that the assessment for this species does not warrant the application of any RBC discount factor given the stable history of the fishery, this year there was agreement by SlopeRAG that the discount factor should apply. The change in sentiment was in response to the view that there was less stability than had been previously seen, and in recognition that even with a discount factor the TAC is likely to be above recent catch levels.

Overcatch/undercatch
The issue of overcatch and undercatch of quota was discussed and it was agreed that a figure of 10% should apply to blue eye trevalla. The assessment indicated that the CPUE was close to target levels and allowing carryover of un-caught quota would not pose any risk to the stock.

Tables and Figures
See also BRS report (Hobsbawn 2009 p41).

Table 1. Tier 4 RBC calculations for blue eye trevalla based on AutoLongLine combined with Dropline. C* (average reference catch (t)) and $CPUE_{targ}$ (target reference CPUE level) are calculated over the period 1997-2006, $CPUE_{Lim}$ (limit reference CPUE) is 40% of the target C_{max} = 1.25 C* and $\overline{CPUE}$ is the average standardised CPUE over the last four years (2005-2008). Scaling factor is the adjustment to C^* used to calculate the RBC (t). The RBC calculation does not account for predicted discards, predicted State catches, discount factor or recent CPUE adjustment.

1st Reference Year	1997
2nd Reference Year	2006
C*	666.609
C_{max}	833.261
CPUEtarg	1.0129
CPUELim	0.4052
CPUE	0.8942
Scaling Factor	0.8047
Wt_Discard	0.001
Wt_State	
RBC	536.403

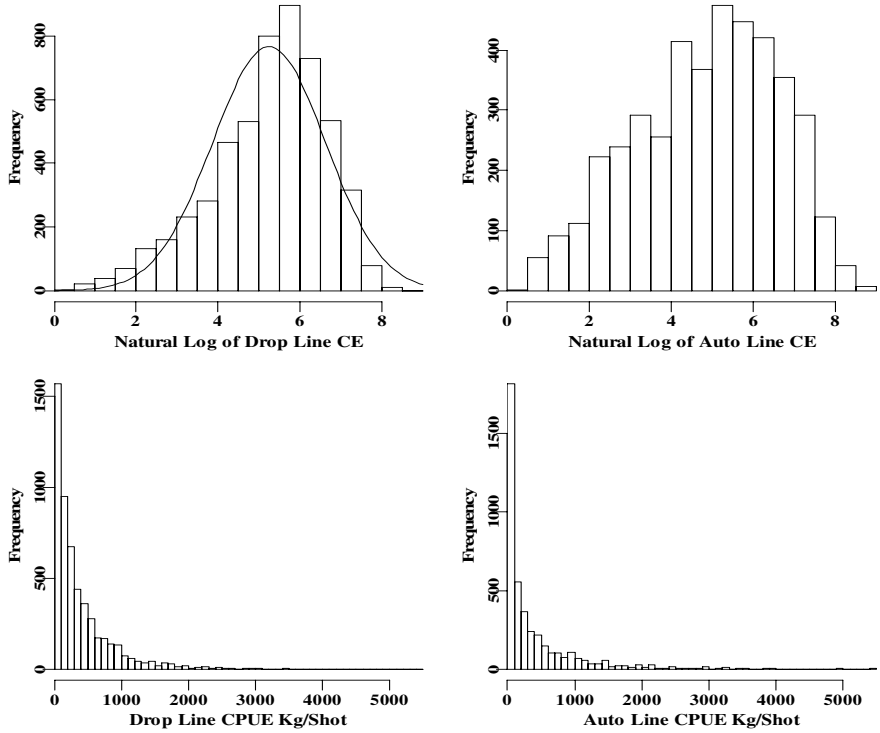

Figure 1. Comparison of the catch rates (both log-transformed and as kg per shot) for drop line (left hand graphs) and for auto-line (right hand graphs). The mean catch rate of blue eye for drop line was 188 kg/shot while for autolining it was 130 kg/shot. (from Haddon, 2009a).

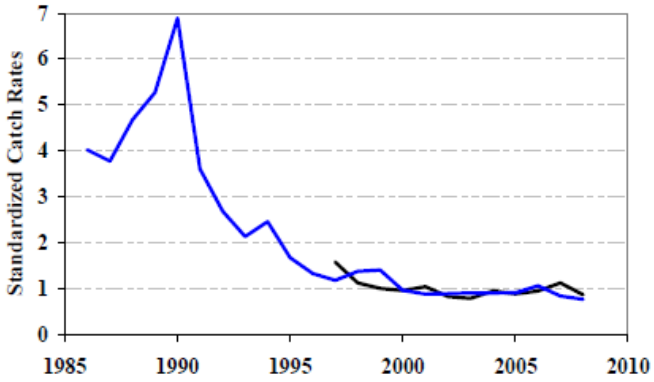

Figure 2. A comparison of the standardized trawl catch rate for blue eye trevalla with the Autoline and dropline standardized catch rates. Both series have been aligned by the average of the period 1997 to 2008. The long blue line represents the trawl catch rate while the shorter black line represents the non-trawl catch rates. (from Haddon 2009b).

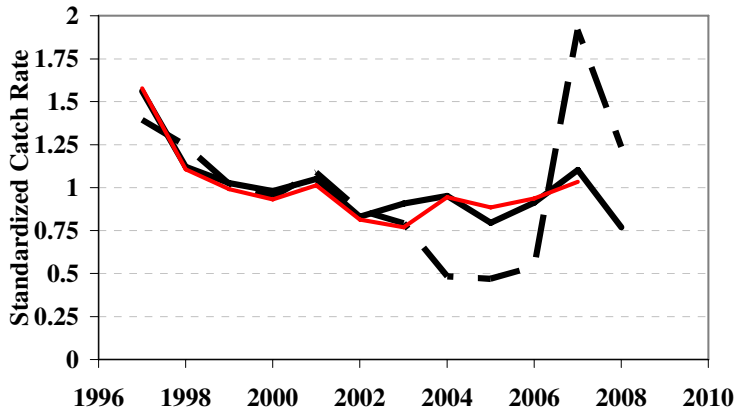

Figure 3. Blue eye reported from depths between 200 and 600 m, zones 10-50, 83-85. The graph is the standardized catch rates, with the dashed line representing the geometric mean and the solid line representing the optimum model. Catch rates have been essentially flat since 1998. The red line is last year's (2008) analysis (the GAB catches were not included last year). The graph standardizes catch rates relative to the mean of the standardized catch rates. (from Haddon, 2009a).

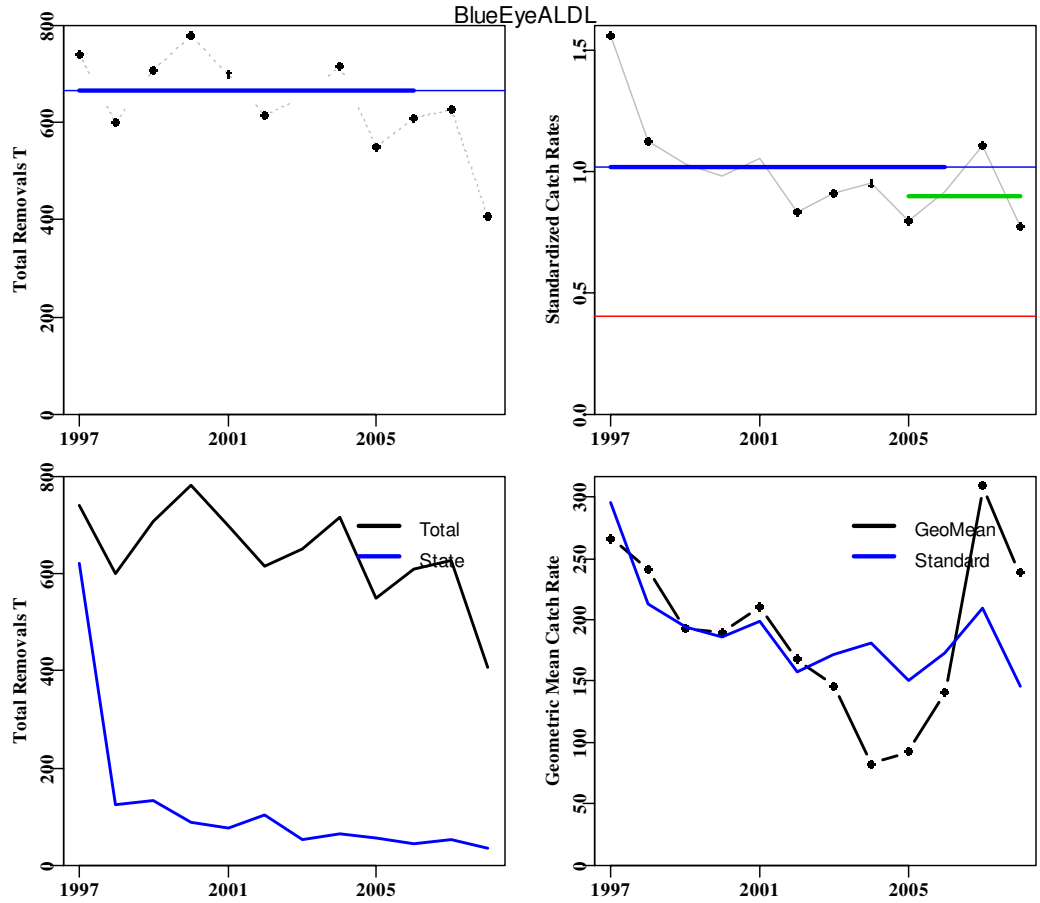

Figure 4. Blue Eye Trevalla. Top left is the total removals with the fine line illustrating the target catch. Top right represents the standardized catch rates with the upper fine line representing the target catch rate and the lower line the limit catch rate. Thickened lines represents the reference period for catches, catch rates, and the recent average catch rate (green) (from Haddon, 2009b).

2009 Stock Assessment Report for Silver warehou *Seriolella punctata*

RAG undertaking the assessment: SlopeRAG

Stock structure

A study has been completed on the stock structure of silver warehou using genetics (mtDNA), morphology, otolith shape and otolith microchemistry. Results did not indicate the presence of separate stocks east and west of Bass Strait although there were indications of some structuring around Tasmania. This study together with other information suggests that silver warehou should be considered as a single stock in the area of the SESSF.

Biological indicators
Biological productivity: Medium
Trophic level: 2
Associated species: blue grenadier, ling, blue warehou
Percentage of otter trawl catch targeted: 56%
Suggested environmental drivers: Not examined

Recent catch history

	2004	2005	2006	2007[1]	2008[1]	2009[1]
Agreed TAC (Global)	4,039	4,400	4,400	3,227	3,227	3,000
Actual TAC (Global)	4,478	4,400	4,775	3,227	3,603	3,249
Trawl catch (SEF2 Comm.)	3,311	2,908	2,362	2,004	1,522	
Trawl Catch (SEF2 State)	<1	0	0	0	0	
Non-trawl catch (SAN2)	<1	<1	<1	<1	<1	
% actual TAC	74	66	49	62	42	
Estimated discards (SET)	1,183	435	96	171	47	
% Discards (SET)	21	6	4	8	3	
Estimated discards (NT)	0	0	0	0	0	
% Discards (NT)	0	0	0	0	0	
Trawl catch (GAB-logbook)	13	33	70	19	3	
State catch	4	4	2	4	<1	
Total catch	4,510	3,378	2,532	2,187	1,523	

[1] 2007 TACs are for the 12 months to Dec 2007. 2008 & 2009 TACs are for the new fishing year (May to April).

Synopsis of 2008 fishery
The catch increased to over 4,000 t in 2003, but has since declined and was lower in 2008 than 2007 which was the lowest since 1993. The previous increases were largely due to catches taken on the west coast of Tasmania associated with the blue grenadier spawning fishery. The percentage of the TAC caught ranged between 61% and 77% between 2002 and 2005 but fell to 49% in 2006. The landed catch at the end of the 2008/09 fishing year was 1,545 t which represented 43% of the actual TAC.

Industry members again reiterated that marketing of the species remains a problem and that the species provides a relatively low economic return, which has also been impacted by the high value of the Australian dollar. These factors were considered to be responsible for the failure of the TAC to be caught and also, in part, responsible for the relatively high levels of discarding in the past. Industry had previously expressed its belief in the robust condition of the stock, but AFMA reported that they received some expressions of concern about the status of silver warehou from some industry members.

Discard levels have fallen from 21% in 2004 to 4% in 2006, had risen to 8% in 2007, and had fallen again to 3% in 2008. Industry have previously expressed concern that the marketing issues had affected targeting practises and therefore the CPUE series and the estimated strength of recent

recruitment. They have also expressed concern that the departure from the fishery of the most historically important catching vessels would also bias downwards fleet-wide estimates of CPUE.

2009 Assessment

In response to the expressions of concern about the status of silver warehou, SlopeRAG had requested that a full update of the assessment be undertaken this year. This was undertaken by CSIRO and a report on the updated assessment provided to SlopeRAG at their November meeting (Tuck and Fay 2009). The figures, tables and most of the text below describing the results of the assessment are drawn from that report.

This assessment used data up to 31 December 2008. The last full assessment was presented in Tuck and Punt (2007). In 2008, a basic update was performed by including landings data from 2007/08, with all other data, except for natural mortality which has been increased to 0.3yr-1 from 0.25yr-1, remaining the same as that in Tuck and Punt (2007). The 2009 assessment updates all data inputs (such as landings, discards, catch rates, length and age data), has been transferred from SS2 to SS3 and the data have been has been moved to a calendar year (previously they were grouped on a 'biological year' of May to April) to ensure data from 2008 are complete. Estimation of recruitment residuals has been limited to those cohorts for which length-composition data are available and hence estimated only until 2004. Other changes are the catch data have been updated to reflect total landings (not just logbook catches), including annual calendar year state data, and the weighting on the length frequency and the conditional age-at-length data have been altered in line with current agreed practice.

The fits to the catch rate indices (Figure 23) are very good and substantially better than those of previous assessments (Thomson, 2002a; Taylor and Smith, 2004; Tuck and Punt, 2007; Tuck, 2008).

When re-tuning the silver warehou assessment, the data series showed a clear conflict between (i) the length and cpue data, and (ii) the age data that requires further investigation. In the meantime, the RAG adopted a base-case model that maintained the data weighting on ages at the fixed value of λ = 0.25.

The spawning stock biomass in 2009 is estimated to be 44.3% of virgin stock biomass under the base-case parameter set (i.e. 2009 spawning biomass relative to virgin spawning biomass). The stock declined slowly from the beginning of the fishery in 1980, before a sharp decline in the late-1980s corresponding to an increase in catch (Figure 24). The recovery in the late-1990s was driven by the high 1993 and 1994 recruitments (Figure 25). After this, the stock declined due to several poor recruitments before a moderate increase following recruitments in 1999 and 2001.

Sensitivities

Sensitivities of the outputs to a range of options for input parameters or data weightings produce estimates of biomass depletion that ranged from 40% to 55%, 2010 RBCs that ranged from 1,838 to 3,853 t and long term RBCs that ranged from 2,147 to 3,394 t (Table 15). These extremes are mostly associated with lower and higher estimates of natural mortality than are used in the base case. The base case value ($M = 0.30\ y^{-1}$) was selected by the RAG in 2007 based on an examination of likelihood profiles for this parameter (Tuck and Punt 2007).

Recommended Tier Level

Tier 1

RBC Calculations

Projections of future RBCs and levels of depletion are shown in Table 16 and Figure 27.

The accepted base-case assessment estimates that the 2010 spawning stock biomass will be 47.9% of virgin stock biomass. The RBC from the base-case model for 2010 is 2,660 t for the 20:35:48 harvest control rule, with a long-term yield of 2,664 t. In comparison, last year's assessment estimated the 2008/09 and 2009/10 depletions to be 53% and 46% respectively, with corresponding RBCs of 2,488 t and 2,320 t, with a long-term yield of 2,282.

Additional Comments from the RAG

SlopeRAG concluded that the assessment provided little evidence for any concerns about the status of silver warehou.

Industry members reported that there had been periods in 2002 and 2003 when a large proportion of the TAC had been taken by factory vessels but that this was no longer the case. They were concerned that their departure would have reduced the fleet-wide CPUE but it was pointed out that the CPUE standardisation process should take this into account.

SlopeRAG has previously expressed confidence in the Tier 1 assessment and the calculated RBC. No other qualifying comments were made by the RAG this year and the proposed RBC was accepted.

Overcatch/undercatch
SlopeRAG considered that 10% overcatch/undercatch should be allowed for silver warehou.

Research needs, future assessments
Future development of the stock assessment for silver warehou should include a more in depth exploration of the raw data (e.g. spatial and temporal aspects of sampling), and potential changes in selectivity and growth (Tuck and Fay 2009).

Previously identified research needs:

- Further analyses of the catch and effort data need to be undertaken to better account for the impact of depth, area, season, and interactions with other species (particularly blue grenadier), by fleet.
- Additional sensitivity analyses including; treatment of CPUE, leaving out data from early years, and changing weights.
- Determine how discards as a function of fish length as well as catch could be modelled in future projection for each fleets.
- Further work on stock structure and spatial dynamics to clarify apparent differences around Tasmania.

Tables and Figures
See also BRS report (Hobsbawn 2009 p 47)

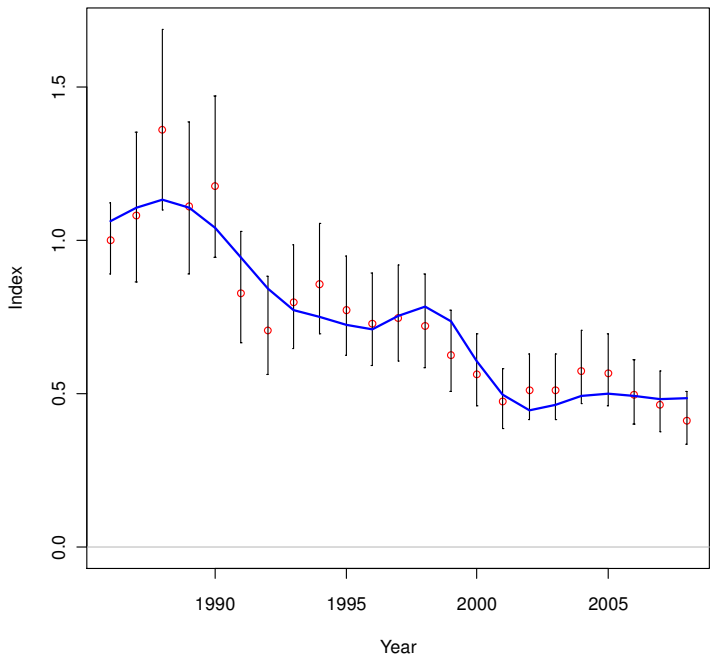

Figure 23. Observed (solid dots) and model-predicted (lines) catch-rates versus year for silver warehou. The vertical lines indicate approximate 95% confidence intervals for the data. (from Tuck and Fay 2009)

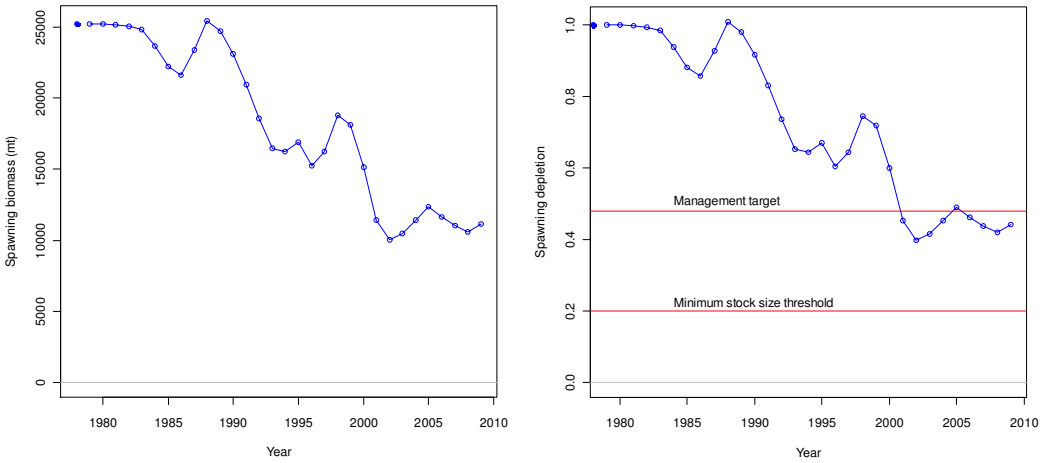

Figure 24. Silver warehou. The time-trajectories of total spawning biomass, and spawning biomass depletion corresponding to the MPD estimates under the base-case model. (from Tuck and Fay 2009)

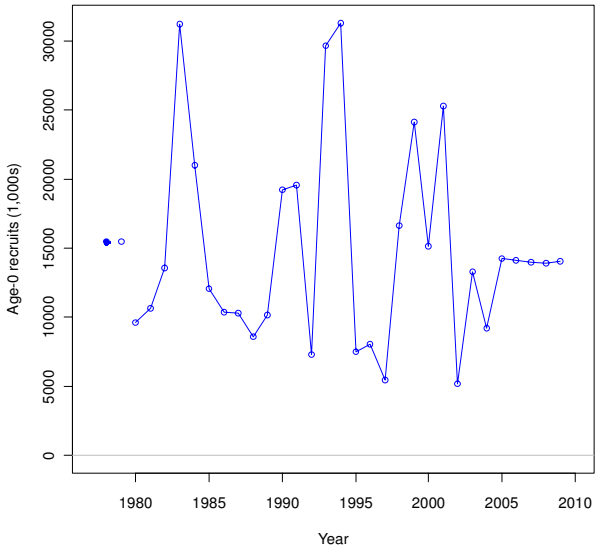

Figure 25. Silver warehou. The time-trajectory of recruitment for the base-case analysis. (from Tuck and Fay 2009)

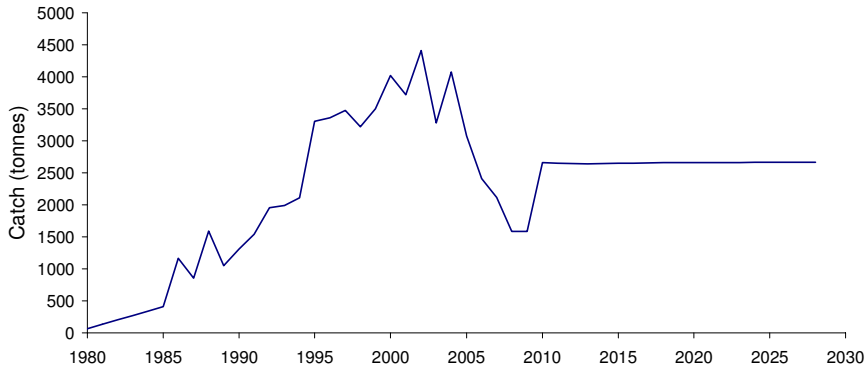

Figure 26. The projection of catch and RBCs under the 20:35:48 rule for silver warehou. (from Tuck and Fay 2009)

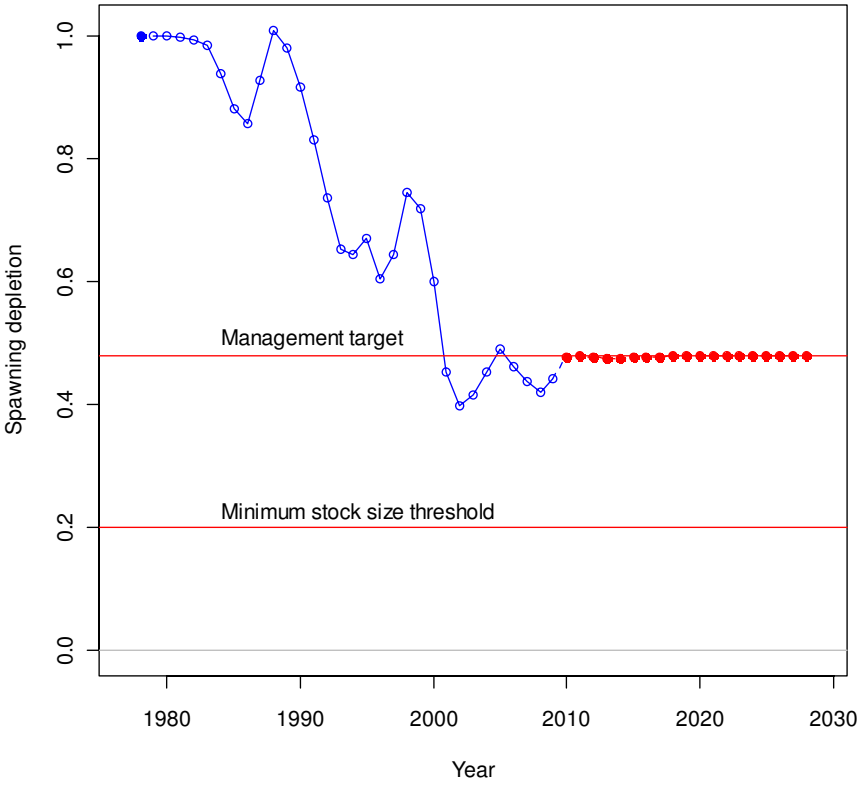

Figure 27. The relative spawning biomass assuming catches follow the RBC under the 20:35:48 rule for silver warehou as estimated by the model (blue line up to 2009) and predicted from 2010 onwards (red line). (from Tuck and Fay 2009)

Table 15. Summary of results for the base-case analysis and sensitivities for silver warehou. (from Tuck and Fay 2009)

Model	-ln L	SB_0	SB_{2010}	SB_{2010}/SB_0	20:35:48 harvest strategy 2010 RBC (t)	Long term RBC (t)
Base-case (M=0.30, h=0.75, λ=0.25, $\sigma_R = 0.52$)	1,128	25,193	12,055	0.479	2,660	2,664
M=0.25	1,134	24,712	10,029	0.406	1,838	2,147
M=0.35	1,126	26,984	14,803	0.549	3,853	3,394
$\sigma_R = 0.42$	1,134	24,525	11,925	0.486	2,629	2,594
$\sigma_R = 0.62$	1,125	26,113	12,269	0.469	2,710	2,761
$h = 0.85$	1,128	24,771	12,213	0.493	2,908	2,831
$h = 0.65$	1,128	25,784	11,860	0.460	2,366	2,459
Halve weight on lengths	951	25,297	11,475	0.454	2,496	2,620
Double weight on lengths	1,436	2,6156	13,561	0.518	2,972	2,762
Last Recruit Est 2006 (tuned)	1,121	25,905	13,221	0.510	2,939	2,731
Increase age weight λ=1.0 (tuned)	3,159	30,741	12,217	0.397	2,635	3,108

Table 16. Silver warehou. Summary of the annual RBCs and corresponding depletion for the base-case analysis under the 20:35:48 harvest control rule. (from Tuck and Fay 2009)

	20:35:48	
	RBC (t)	Depletion
2009	1,582	0.443
2010	2,660	0.479
2011	2,653	0.479
2012	2,647	0.477
2013	2,644	0.476
2014	2,645	0.476
2015	2,649	0.477
2016	2,653	0.478
2017	2,656	0.478
2018	2,658	0.479
2019	2,660	0.479
2020	2,661	0.479
2021	2,662	0.479
2022	2,662	0.480
2023	2,663	0.480
2024	2,663	0.480
2025	2,663	0.480
2026	2,664	0.480
2027	2,664	0.480
2028	2,664	0.480

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