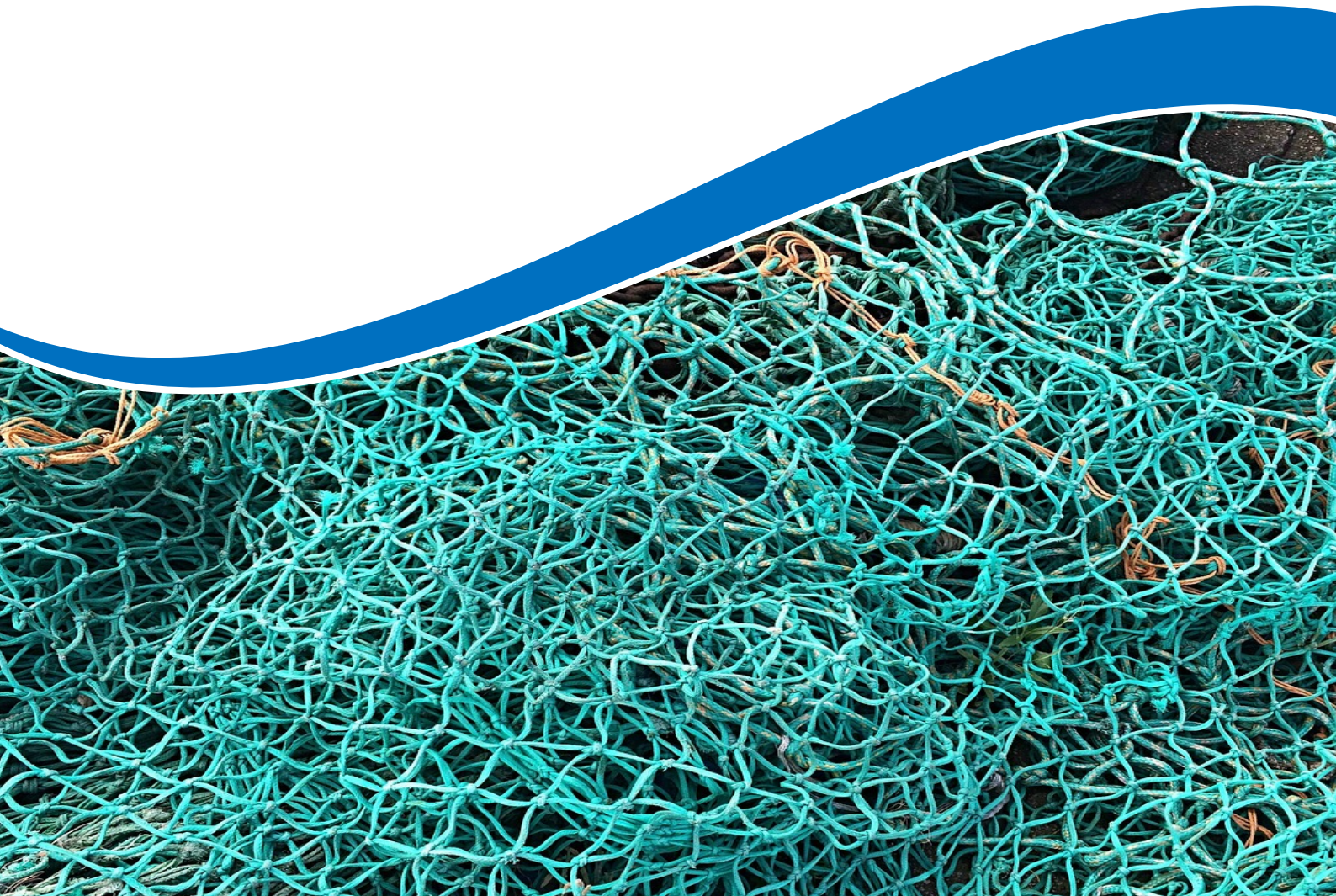
Australian Government

Australian Fisheries Management Authority

Five year *Blue Warehou Stock Rebuilding Strategy 2014* Review

October 2019



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Introduction

In 2008, the *Blue Warehou Stock Rebuilding Strategy* (the 2008 strategy) was implemented to support the recovery of eastern and western stocks of blue warehou to above 20 per cent of their unfished spawning biomass, the biomass limit reference point that has been adopted for the stocks. The 2008 Strategy was updated in 2012 to modify reporting requirements and to include the non-trawl sectors of the SESSF. AFMA undertook a more complete review in 2014 and the outcomes of that review formed the *Blue Warehou Stock Rebuilding Strategy 2014* (the Strategy).

An annual review of the status of blue warehou stocks and performance against the objectives of the Strategy has been undertaken each year, with the intention to review the Strategy every five years.

The Strategy will be updated in 2020, with this report being an evaluation of the Strategy against its objectives.

Background

A rebuilding strategy for blue warehou was first developed and implemented in 2008 under the *Commonwealth Fisheries Harvest Strategy Policy 2007* (HSP), which required formal rebuilding strategies for all species below their biomass limit reference point. The Strategy is designed to pursue the objectives of the *Fisheries Management Act 1991* and be consistent with the HSP. The development and implementation of the stock rebuilding strategy is also a condition of the SESSF Wildlife Trade Operation accreditation under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Since the implementation of the Strategy, the TAC for blue warehou has been significantly reduced; primarily due to the AFMA Commission's concerns regarding the ability of the stocks to rebuild within a reasonable biological timeframe. There has been little sign of stock recovery to date.

The Strategy focuses on methods to reduce the overall fishing mortality of blue warehou while monitoring and assessing the stock status to ensure recovery.

Report of progress against objectives

Objectives

The strategy's objective to rebuild blue warehou stocks identifies three steps:

1. To rebuild blue warehou (east and west) stocks in the area of the SESSF to or above the default limit reference biomass point (B_{LIM}) of 20 per cent of the unfished spawning biomass within a biologically reasonable time frame; one mean generation time plus 10 years (approximately 16 years). That is, to reach or exceed B_{LIM} by no later than 2024.
2. Having reached B_{LIM} rebuild blue warehou (east and west) stocks in the area of the SESSF to the default maximum sustainable yield biomass level of 40 per cent of the unfished spawning biomass (B_{MSY}) using the harvest control rules outlined in the *SESSF Harvest Strategy Framework*.

3. Once B_{MSY} is reached, pursue the biomass level which aims to maximise net economic returns, currently 48 per cent of unfished spawning biomass (B_{MEY})

Outcome

Below is an overview of the current management arrangements in place and how they have contributed to achieving the objectives of the strategy.

Bycatch TAC

The blue warehou TAC is set at levels which cover the estimated minimum incidental catch while targeting other species.

Since the implementation of the Strategy in 2008 the TAC has decreased from 365 t in 2008/09 to an incidental TAC of 183 t in 2009/10 and 2010/11, 133 t in 2011/12, and 118 t in 2012/13. The TAC has remained at 118 t since.

SERAG, at their December 2019 meeting, recommended to maintain the bycatch TAC at 118 t for the 2020-21 season.

Table 1. Blue warehou TAC and total catch for fishing seasons 2008/09 to 2019/20 (as at 15 November 2019)

Fishing season	TAC (t)	Catches (t)
2008/09	365	167
2009/10	183	126
2010/11	183	147
2011/12	133	98
2012/13	118	49
2013/14	118	65
2014/15	118	16
2015/16	118	2
2016/17	118	17
2017/18	118	32
2018/19	118	57
2019/20	118	9

Move on provision

If an operator catches more than 200kg in a shot (retained or discarded), the operator must not fish within 3nm of the previous shot for 24 hours.

This measure was introduced for the 2019-20 season amid reports of large numbers of small fish becoming available to the fishery. The move-on rule aims to prevent operators shooting back on schools of blue warehou, but still allows for the small incidental catch when targeting other species. Enforcing the rule depends on AFMA's ability to monitor catches greater than 200 kg and determining whether the operator has moved away. AFMA has amended the wording of the rule to ensure an operator cannot shoot back in the same area.

A simple analysis demonstrated that the move-on provision is being complied with, on the five occasions when there has been a shot with greater than 200 kg of blue warehou (retained or discarded), the operator has not fished within 3 nm of the previous shot for 24 hours. In most shots no blue warehou was caught in the 24 hour period; and on no occasion was more than 200 kg caught within the 24 hour period. There was an occasion where an operator discarded 800 kg (0 kg retained) within a 24 hour period and did not move on; but no single shot was greater than 160 kg.

AFMA undertook a targeting analysis based on previous targeting analyses, which assumes a species is targeted where it makes up more than 50% of the retained catch in a particular shot. The analysis showed no indication of targeting.

At their October 2019 meeting, SERAG recommended to maintain the move on provision for the 2020-21 season and to reinforce the message via educative campaigns.

Limited entry

Under the SESSF Management Plan 2003, access to the SESSF is limited to the number of concessions that currently exist. New operators can access the fishery only by purchasing an existing concession.

This rule was not implemented specifically for these strategies, however still limits effort in the fishery.

Gear requirements

Commonwealth trawl operators are required to use gear designed to reduce the mortality (catch and discards) of juvenile fish.

From the start of the 2019/ 20 season, the minimum mesh size in the codend of a Danish seine net was increased to 75 mm when targeting flathead. For demersal trawl, net mesh must not be less than 90 mm in any part of the net and in most cases a bycatch reduction device must be used. For gillnets the mesh size must be between 15cm and 16.5cm.

Various gear selectivity trials have demonstrated the effectiveness of increased mesh size towards excluding small fish. A project to quantify the performance of discard and bycatch reduction strategies in the GABT and CTS has recently been approved by FRDC (Project number 2019-027). Pending the outcomes of this research, additional gear requirements may be considered.

Spatial and temporal closures

Spatial and temporal closures – Fishery closures in the SESSF, while not specifically implemented for the purpose of protecting blue warehou, overlap with their distribution and provide some protection to stocks.

The area of the CTS that is closed to trawling add up to approximately 86 per cent of the fishery. Closures in the Gillnet Hook and Trap sector of the SESSF, of waters deeper than approximately 183m, prevent fishing in areas where blue warehou historically were targeted by gillnet fishers.

A spatial and temporal voluntary closure was in place for five years off eastern Victoria, inshore from Gabo Island to Lakes Entrance between mid-August to the end of September. However following a review in 2013 was not continued. This was because the patchiness and unpredictability of the species distribution meant that the closure was not providing the stock with significant protection. SERAG continues to monitor the location and time of blue warehou catches. AFMA will introduce closures if appropriate areas, such as those with high concentrations of blue warehou, are identified; to help achieve the objectives of this Strategy.

Reporting and monitoring

Catches are reported by operators and monitored by AFMA in accordance with the trigger limits under this Strategy (27 t in the east and 91 t in the west).

The east and west triggers are reviewed by SERAG annually and may be recalculated each fishing year depending on fishing effort and the requirements of protecting and rebuilding eastern and western stocks. AFMA is continuing to work with industry to improve the precision of discard information recorded by operators in catch and effort logbooks. Discards are monitored through AFMA's observer program to gain a more thorough estimate of discard rates across the fishery.

The discard estimates for blue warehou in the east in 2017 and 2018 were revised to account for a discrepancy between the logbook reported catch and the CDR catch; where some operators were recording 'black trevally' (a tropical species) in e-logs. This, in addition to revisions to the Tasmanian blue warehou catch, increased the 2017 estimate of discarded blue warehou from 151.7 to 215.8 t. SERAG noted the estimate remains highly uncertain, and is based on a discard rate obtained from a single Danish seine trip in 2017. The 2018 discard estimate has been reduced to 27.6 t; which is more consistent with previous estimates.

At their December 2019 meeting, SERAG recommended monitoring future discards but were not concerned that the potential high discards in 2017 had adversely impacted the stock.

Table 1. Blue warehou eastern and western triggers and total catch in each area for fishing seasons 2008/09 to 2019/20 (as at 15 November 2019)

Fishing season	Eastern trigger (t)	Catches (t)	Western trigger (t)	Catches (t)
2012/13	27	15	91	33
2013/14	27	7	91	60
2014/15	27	4	91	12
2015/16	27	6	91	1
2016/17	27	14	91	6
2017/18	27	5	91	14
2018/19	27	21	91	29
2019/20	27	1	91	7

Fishery Independent Surveys (FIS)

In 2007 a fishery wide survey was designed to provide an independent index of abundance of as many SESSF quota species as possible, including blue warehou.

To date a FIS has been conducted in 2008, 2010, 2012, 2014 and 2016 with further surveys proposed in future years.

To date, the surveys have not produced consistent estimates for blue warehou, however, the FIS has the potential to provide an index of abundance of blue warehou if the time series is continued. The large changes in variance and abundance of blue warehou from year to year may be a concern, but may represent the real dynamics of a spatially and temporally patchy stock distribution or availability.

Data collection

During 2011 industry started to collect lengths of blue warehou to supplement the ISMP program and improve the spatial and temporal data to be used in the stock assessments.

SERAG, at their October and December 2019 meetings noted the following:

- ISMP sampling had improved over the last 12 months; with observer coverage remaining critical for obtaining discard estimates.
- Avoidance by industry, unknown discards and low catches mean there is very little data to assess the effectiveness of the strategy and measuring the status of the stock. Some length and age data are being collected however otoliths have not yet been aged.
- Recreational catch data is provided by Tasmanian Department of Primary Industries, Parks, Water and Environment (DPIPWE).

- The data currently available may be able to show if there is a recruitment-driven recovery or an availability-driven recovery. There is no indication of range contraction and there appears to be a small increase in frequency of larger shots.
- Blue warehou is a Tier 4 species which relies on catch per unit of effort (CPUE) as an index of abundance. The introduction of a bycatch TAC and avoidance behaviour has likely compromised the CPUE series and it is unlikely to be useful as an index of abundance. An alternative primary index of abundance needs to be developed as a high priority for use in future stock assessments. This species should be considered as a candidate for application of close-kin genetics assessments.

Possible future management

As data availability increases, additional management measures may be adopted to support the objectives of the Strategy. These may include:

- Quota regionalisation – AFMA is currently exploring the potential of regionalising blue warehou quota SFRs to allow for management of the eastern and western stocks of blue warehou under separate TACs.
- Close-kin genetic assessments – CPUE for blue warehou is unlikely to be a useful index of abundance due to avoidance by industry, unknown discards and low catches. Close-kin genetic assessments can provide an estimate of absolute abundance and should be considered for this species. The 2020/21 SESSF research plan included a COMRAC proposal for a close-kin scoping study that includes blue warehou.

Stock Status

The HSP and the SESSF Harvest Strategy Framework are designed to pursue an exploitation rate that keeps fish stocks at a level equal to maximum economic yield (B_{MEY}) and to ensure stocks remain above a biomass limit level at least 90% of the time. The HSP allows for proxy settings for reference points when reference points are not available for the species. Consistent with the HSP, proxy settings for B_{LIM} of 20% of unfished biomass (B_{20}), B_{MSY} of 40% of unfished biomass (B_{40}) and B_{MEY} of 48% of unfished biomass (B_{48}) are used for blue warehou.

The 2013 Tier 4 assessment showed that the eastern and western stocks remained below their biomass limit, resulting in a RBC of zero for both stocks. The standardised catch rates showed a slight increasing biomass trend in the eastern stock since 2006, and a decreasing biomass trend in the western since 2006.

At its November 2013 meeting, ShelfRAG (now SERAG) acknowledged issues with the stock assessment. Given the avoidance of the species by fishers, a Tier 4 assessment was not believed to be a valid approach and the CPUE not reflective of abundance. Consequently, there continues to be uncertainties regarding the stock status and other indicators of abundance are required. Because of fisher avoidance and the sampling difficulties due to the patchy distribution and cohort-based schooling, the RAG noted that establishing an index of abundance is difficult for this species.

At their October 2019 meeting, SERAG discussed the designated rebuilding timeframe of 2024. A Tier 1 assessment in 2024 is unlikely due to the lack of data. It was noted that retained catch is

monitored but avoidance and discarding may be missed. Currently, the level of depletion and what the virgin biomass was remains unknown.

The fishing mortality for blue warehou remains uncertain, however there is little evidence to suggest the stock is rebuilding, and it remains classified as overfished (ABARES, 2019). An alternative index of abundance is required, and a close-kin approach is being considered for this species under the SESSF 2020-21 Research Plan. Results from a close-kin assessment, if supported, would not be expected until after 2024.

Discussion and future recommendations

Consistent with the *Fisheries Management Act 1991*, the broad objective of the 2020 Strategy will be to return stocks to levels where they can be harvested in an ecologically sustainable manner consistent with the HSP and ultimately maximise the economic returns to the Australian community from this resource.

The management arrangements in the revised 2020 Strategy should follow on from the 2014 Strategy and focus on maintaining the overall low fishing mortality to promote stock recovery.

At their 2019 meetings, SERAG discussed and provided future recommendations for the following:

- Close-kin genetic assessments
    - CPUE for blue warehou is unlikely to be a useful index of abundance due to avoidance by industry, unknown discards and low catches. Close-kin genetic assessments can provide an estimate of absolute abundance and should be considered for this species. The 2020/21 SESSF research plan included a COMRAC proposal for a close-kin scoping study that includes blue warehou.
- Companion species
    - A companion species analysis using a métier analysis approach found that changes in the flathead TAC have the most impact on catches of redfish, and to a lesser extent, blue warehou and eastern gemfish. While the analysis does not provide an indication of targeting, this can be inferred from observations, catch composition or a combination of inputs
    - The RAG agreed that the métier approach could be used to update estimates of unavoidable bycatch and would complement the multi-species harvest strategy approach. However, the recent analysis only used SESSF logbook and ABARES price data for the period 2012-2017. SERAG supported this type of analysis in the future; provided it was using up to date information.
- ISMP Program
    - The RAG noted the importance of onboard observers for data collection, particularly discard estimates; and emphasised the need for this program to continue to collect data for this species.
- Recreational catches
    - Tasmania DPIPWE provide AFMA with recreational catch data.
    - Social media could be a useful tool for obtaining further information on recreational catch of blue warehou.

Move on provision

  - SERAG recommended that the move-on provision be retained for the 2020-21 fishing season.
  - Educative campaigns should be utilised to reinforce the message of this provision.

- Climate change
  - Concerns were raised about ecosystem shifts that may lead to non-recovery of some stocks.
  - There is a declining trend in commercial CPUE for 27 of the 34 SESSF quota stocks, despite a decrease in effort over time.
  - There is currently an FRDC-funded project to investigate changes in species' biological parameters that may be associated with climate change.
  - Dr Knuckey and Dr Little are in the process of drafting an application to utilise the CSIRO Research Vessel *Investigator* for an ongoing survey to collect periodic snapshots of environmental data and species distributions.

Blue warehou stock rebuilding strategy annual review 2019

Note: This report has been prepared as a preliminary review of available data and is to be completed in the meeting as per the annual review template.

Indications of how stock status is tracking against the Strategy objectives.

The rebuilding objectives are:

- To rebuild blue warehou (east and west) stocks in the area of the SESSF to or above the default limit reference biomass point (B_{LIM}) of 20 per cent of the unfished spawning biomass within a biologically reasonable time frame; one mean generation time plus 10 years (approximately 16 years). That is, to reach or exceed B_{LIM} by no later than 2024.
- Having reached B_{LIM} rebuild blue warehou (east and west) stocks in the area of the SESSF to the default maximum sustainable yield biomass level of 40 per cent of the unfished spawning biomass (B_{MSY}) using the harvest control rules outlined in the *SESSF Harvest Strategy Framework*.
- Once B_{MSY} is reached, pursue the biomass level which aims to maximise net economic returns, currently 48 per cent of unfished spawning biomass (B_{MEY}).

The 2013 assessment indicated that both the eastern and western stocks of blue warehou are likely to have remained below 20 per cent of their unfished spawning biomass.

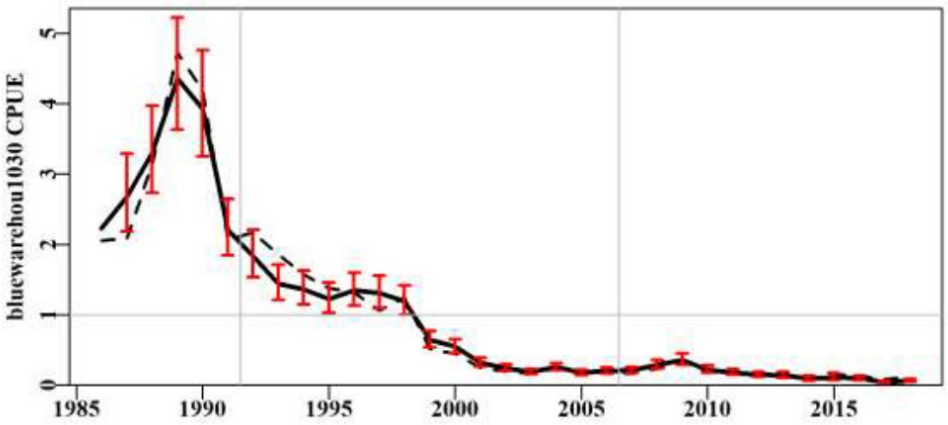

Figure 1:Blue warehou standardised CPUE (zones 10 to 30). The dashed black line represents the geometric mean catch rate, solid black line the standardised catch rates. The red bars are the 95% confidence intervals about the mean estimates. The graph scales both time-series of standardised catch rates relative to the mean of each time-series.

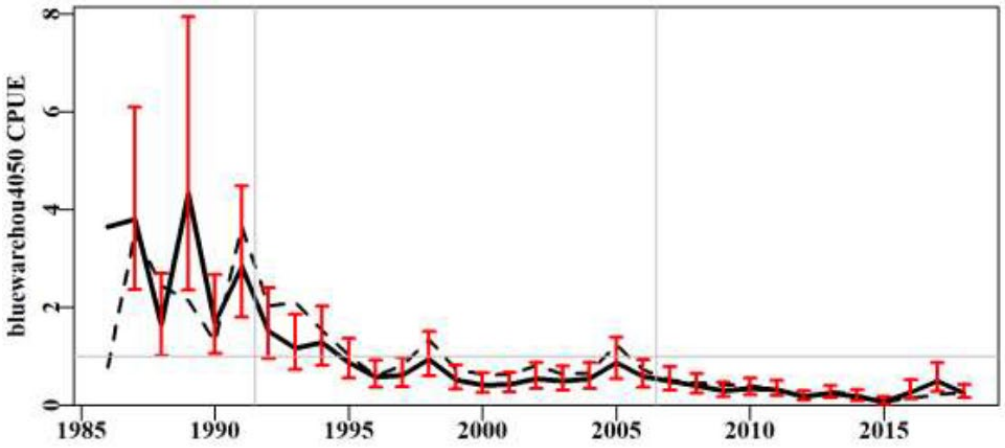

Figure 2: Blue warehou standardised CPUE (zones 40 to 50). The dashed black line represents the geometric mean catch rate, solid black line the standardised catch rates. The red bars are the 95% confidence intervals about the mean estimates. The graph scales both time-series of standardised catch rates relative to the mean of each time-series.

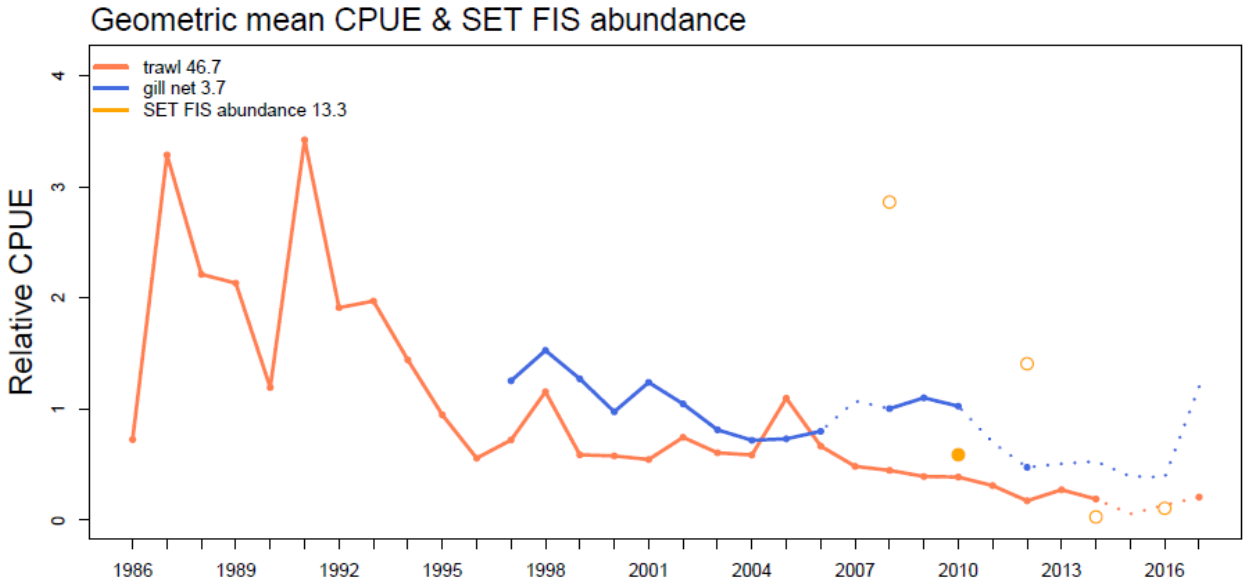

Figure 3: Blue warehou geometric mean CPUE and SET FIS abundance (zones 40 to 50)

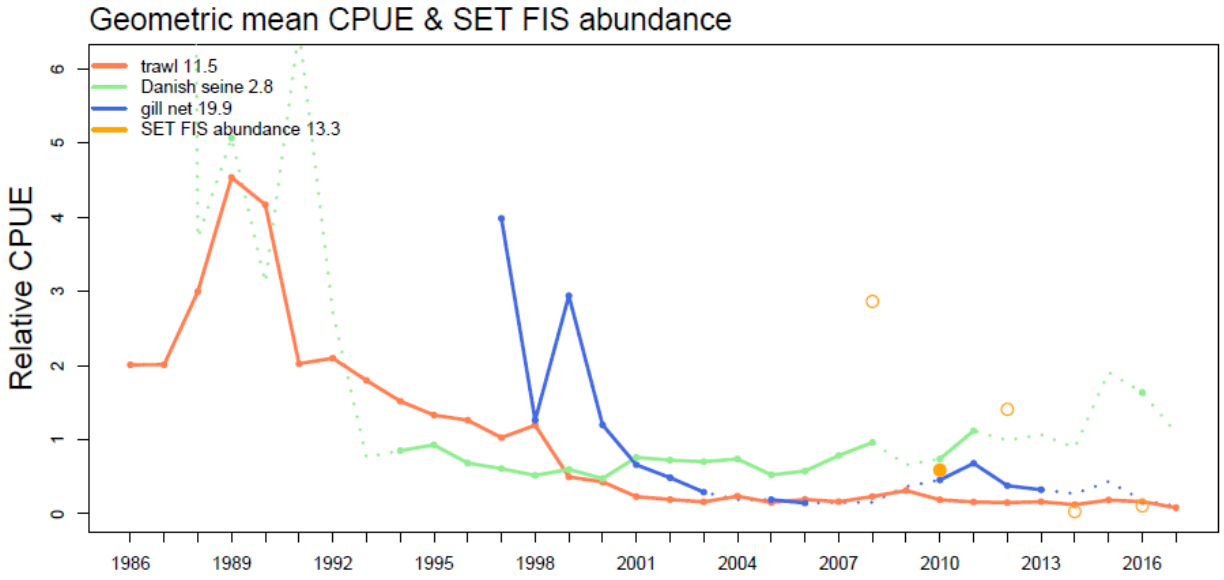

Figure 3: Blue warehou geometric mean CPUE and SET FIS abundance (zones 10 to 30)

Catch and discards

- 63% of the estimated discarded catch (12.35 t) pertains to the Danish seine fishery of Eden/ Lakes Entrance
- ISMP sampling observed 15 shots (11%) with blue warehou caught in this strata in 2018
- Mean discarded kg/ observed shot in this strata was 7.13
- Only one trip of the 178 in the west when blue warehou was caught in 2018 was observed.
- 2018 was the highest catch in the last five years, with a reduction in discards after a high rate in 2017.

Catches in other fisheries

Blue warehou has been reported as being caught in the Coral Sea Fishery (18 kg retained in 2017), Small Pelagic Fishery (93 kg discarded in 2016) and High Seas Fishery (4 kg retained in 2013).

Recreational catches:

- Tasmanian recreational catches from December 2017 to November 2018 were approximately 0.8 t (per communications with Jeremy Lyle, UTAS)

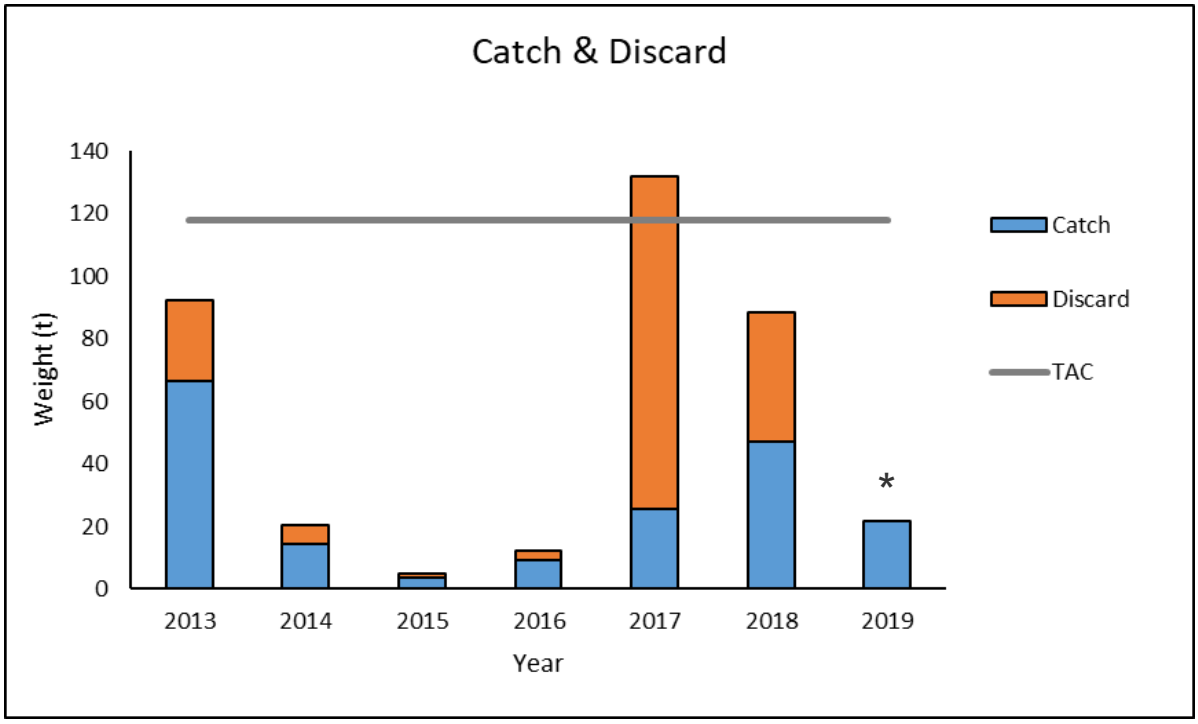

*Figure 4: Commonwealth blue warehou landed catch and discards against TAC. * Year to date (as at 9 October 2019).*

Analysis of management measures implemented

Management measures in the rebuilding strategy include a bycatch TAC, limited entry, gear requirements, fishery closures, triggers for east and west and an industry code of practice.

In 2019 AFMA implemented a move-on provision which requires 'If the holder catches more than 200 kg of blue warehou in any shot, the holder must not fish within 3 nm of the location at which the shot is hauled for a period of 24 hours'. SERAG at their October 2019 meeting agreed to retain the move-on provision for the 2020-21 season.

Data Collection

Table 1 Length frequency collection - Annual achieved

Blue warehou	Target	Annual Achieved Lengths (SET)			
	Annual Target	Total	Observers	Port Samplers	% Collected
2016 East	1000	1949	56	1893	195%
2016 West	1000	72	0	72	7%
2017 East	1000	2214	955	1259	221%
2017 West	1000	183	80	103	9%
2018 East	1000	1587	761	826	158%
2018 West	1000	123	46	77	12%
2019 East (as at August)	1000	651	313	338	65%
2019 West (as at August)	100	248	248	0	25%

Table 2 Otolith collection - Annual achieved

Blue warehou	Target	Annual Achieved Otoliths (SET)			
	Annual Target	Total	Observers	Port Samplers	% Collected
2016 East	375	214	57	157	60%
2016 West	375	24	0	24	7%
2017 East	375	139	138	1	31%
2017 West	375	79	50	29	18%
2018 East	375	246	144	102	65%
2018 West	375	40	23	17	10%
2019 East (as at August)	375	234	130	104	62%
2019 West (as at August)	375	32	32	0	8.5%

Targeting analysis

Based on previous targeting analyses, a species is considered to have been targeted where it makes up more than 50% of the retained catch in a particular shot.

Of the 559 shots that contained blue warehou in the 2018-19 fishing season, only 77 shots (13.7%) retained more than 100kg of blue warehou. Of those 77 shots, blue warehou constituted more than 50% of the retained catch for 18 (23%) shots.

- This was spread across six vessels
- Four of these vessels where in the top 10 vessels catching blue warehou in the 2018-19 fishing season, two of which being the top two
- Of the shots that contained more than 50% 10 contained more than 500 kg, four contained more than 1 t.
- The largest shot of blue warehou was 1888 kg which blue warehou constituted 77% of the catch

Of the 187 shots that contained blue warehou in the 2019-20 fishing season (as at 11 November 2019), only 14 shots (7%) retained more than 100 kg of blue warehou. Of those 14 shots, blue warehou constituted more than 50% of the retained catch for 3 (21%) shots.

- This was spread across two vessels, both of which were also identified in the 2018-19 fishing season
- Both of these vessels are currently in the top five vessels catching blue warehou in the 2019-20 season
- Of the shots that contained more than 50%, only one contained more than 500 kg at 1100 kg
- In one of the shots blue warehou constituted 100% of the catch, 375 kg.
- There has been five shots in the 2019-20 season where operators have reported catches more than 200kg in a shot (retained or discarded), on all occasions the operator has not fished within 3nm of the previous shot.

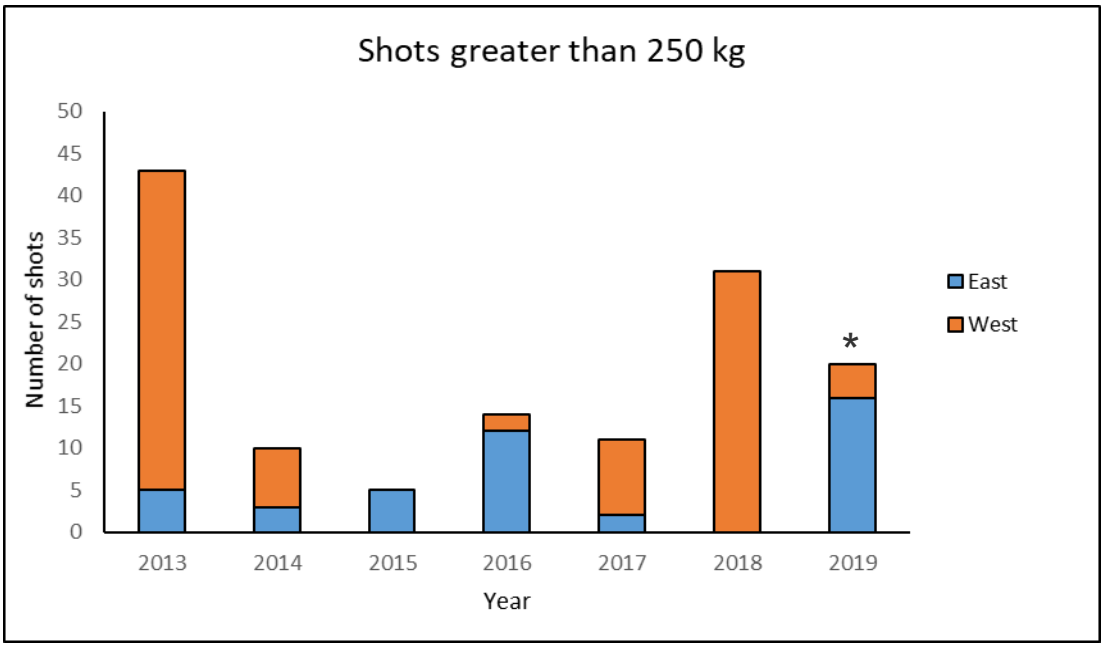

*Figure 6: Shots containing greater than 250kg retained blue warehou (east and west). * Year to date (as at 10 October 2019).*

- In two of the five shots where operators have reported catches more than 200kg in a shot (retained or discarded) blue warehou constituted more than 50% of the retained catch.
- On all occasions when more than 200kg of blue warehou was caught the vessel complied with the move on provision.

East and west catch trigger split percentage review and reporting regime (Blue Warehou Stock Rebuilding Strategy Appendix B) update and review

The catch limit in the eastern zone is 27 t.

- Approximately 11.9 t was landed in the eastern zone during the 2018-19 fishing season (logbook reported).

The catch limit in the western zone is 91 t.

- Approximately 28.5 t was landed in the western zone during the 2018-19 fishing season (logbook reported).

Number of crew length samples and database status

There is currently no crew-based data collection for blue warehou. Crew collected length frequency data from 2012-2014 is now included in the data summary.

Catches by the top 10 boats (boat names not provided) as an indication changes to fishing operations

Table 4 Total catch by top 10 boats, and as a percentage of total catch (CDR weight)

	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
Catch by top 10 vessels	60,029	14,338	1,942	12,517	27,258	49,446	8,349
Total catch	65,446	16,350	2,424	17,066	32,203	57,148	8,615
% of total catch	91.7	87.6	80.1	73.3	84.6	86.5	96.9

- In 2016/17, 2017/18 and 2018/19 the same vessel had the largest landing weight of blue warehou however this vessel is not currently in the top 10 for 2019/20
- In 2018/19 all of the top 10 vessels landed more than 1 t of blue warehou, this is the first year this has happened since 2013/14.
- To date, in 2019/20 only three of the top 10 vessels have landed over 1 t of blue warehou and these three vessels predominately fish west.

Recommended changes to management measures or data collection

At their 2019 meetings, SERAG discussed and provided future recommendations for the following:

- Close-kin genetic assessments
    - CPUE for blue warehou is unlikely to be a useful index of abundance due to avoidance by industry, unknown discards and low catches. Close-kin genetic assessments can provide an estimate of absolute abundance and should be considered for this species. The 2020/21 SESSF research plan included a COMRAC proposal for a close-kin scoping study that includes blue warehou.
- Companion species
    - A companion species analysis using a métier analysis approach found that changes in the flathead TAC have the most impact on catches of redfish, and to a lesser extent, blue warehou and eastern gemfish. While the analysis does not provide an indication of targeting, this can be inferred from observations, catch composition or a combination of inputs
    - The RAG agreed that the métier approach could be used to update estimates of unavoidable bycatch and would complement the multi-species harvest strategy approach. However, the recent analysis only used SESSF logbook and ABARES price data for the period 2012-2017. SERAG supported this type of analysis in the future; provided it was using up to date information.
- ISMP Program
    - The RAG noted the importance of onboard observers for data collection, particularly discard estimates; and emphasised the need for this program to continue to collect data for this species.
- Recreational catches
    - Tasmania Department of Primary Industries, Parks, Water and Environment (DPIPWE) provide AFMA with recreational catch data.
- Move on provision
    - SERAG recommended that the move-on provision be retained for the 2020-21 fishing season.
    - Educative campaigns should be utilised to reinforce the existence of this provision.
- Climate change
    - Concerns were raised about ecosystem shifts that may lead to non-recovery of some stocks.
    - There is a declining trend in commercial CPUE for 27 of the 34 SESSF quota stocks, despite a decrease in effort over time.
    - There is currently an FRDC-funded project to investigate changes in species' biological parameters that may be associated with climate change.
    - Dr Knuckey and Dr Little are in the process of drafting an application to utilise the CSIRO Research Vessel *Investigator* for ongoing survey to collect periodic snapshots of environmental data and species distributions.