Draft Harvest Strategy

Victorian Eastern and Central Zone Blacklip Abalone Fishery

MAY 2019

VERSION HISTORY

Date	Version	Changes	Author
March 2018	Draft version 1	First draft incorporating AWG feedback following meeting on 19/02/2018	K.Simpson
February 2019	Draft version 2	Second draft incorporating recommendations following peer review and AWG meeting on 26/10/2018	K.Simpson
May 2019	Draft version 3	Third draft incorporating agreed changes to Eastern zone threshold reference points following annual review meeting with EO.	K.Simpson

Background

Harvest strategies provide a structured framework for assessing the status of a fishery and a clear set of rules to determine what the annual catch limits will be. Decisions regarding catch limits are therefore set out in advance, ensuring that fishers, fishery managers and other relevant stakeholders know what action will be taken in response to the conditions in the fishery.

Main concepts of the draft abalone harvest strategy for the Eastern and Central zones

- The harvest strategy uses performance indicators that have been converted to biomass units.
- Nominal catch per unit effort (CPUE) from commercial catch and effort logbook information is used as a long term and short term indicator of legal biomass. Standardised CPUE will replace nominal CPUE once an approach has been agreed. Commercial logger data is expected to replace log book data when sufficient data is available.
- The total allowable commercial catch (TACC) is set at the zonal scale (Eastern and Central) but management of the fishery occurs at a finer spatial scale defined by spatial management units (SMU). The harvest strategy recommends a catch target range for each SMU. The combined value of the selected catch targets for each SMU then equate to the recommended TACC.
- The proposed annual TACC is determined using an annual stock assessment process and a set of catch control rules applied to three performance indicators. The three performance indicators are combined to give an overall trend of biomass (i.e. increasing, stable or decreasing).
- The harvest strategy is designed to provide a level of consistency and predictability in catch ranges and avoid large annual changes. There are two catch control rules that control the annual change in the catch targets.
- The catch control rules are predetermined and applied based on the most recent CPUE result and length of time that CPUE has been in one of three categories. The three categories are below the limit reference point (red), between the limit and threshold reference point (orange) and above the threshold reference point (green).
- When CPUE is above the threshold reference point, the first catch control rule (CCR #1) will apply. The maximum change in the catch target for the first two years is 115%. If CPUE remains above the threshold reference point for more than two consecutive years, then the maximum change in the catch target can increase to 125%.
- If CPUE is between the limit and threshold reference point for more than five consecutive years the second (more severe) catch rule (CCR #2) is applied to improve the status of the fishery, otherwise the first catch control rule (CCR #1) applies.
- When CPUE is below the limit reference point, the second catch rule will always apply. The fishery is closed and a structured fishing program implemented if CPUE remains below the limit reference point for more than two years.

Operational objectives

This harvest strategy aims to achieve three main operational objectives, which link to the overarching objectives for the management of the fishery. These operational objectives are:

1. Maximise the likelihood of biomass remaining within the target range.

2. Minimise the risk of biomass falling to levels where it could impair recruitment.
3. Minimise the risk of biomass falling below the limit reference point.

(given available management levers)

Stock performance indicators

The performance of the fishery is assessed annually as part of the stock assessment and quota setting process. Performance indicators measure and track the performance of the stock against the operational objectives in this harvest strategy and are integral in determining the level the TACC will be set at.

Biological performance indicators

Three biological performance indicators are used in setting the TACC:

1. Primary Indicator: long term biomass trend measured using the four-year gradient CPUE[1].
2. Secondary Indicator: short term biomass trend measured using a two-year CPUE ratio[2].
3. Depending on the zone, the tertiary indicator is:
    a. Pre-recruit trend using the standardised average count of abalone from the fishery independent surveys (FIS) in the size range of the current legal minimum length (LML) to 20 mm below LML.
    a. Fishing mortality measured using the mean weight converted from commercial catch length measurements[3].

Additional performance indicators

Additional performance indicators will be used in the assessment of the fishery. These do not result in explicit catch range adjustments in the fishery. They are used to provide a more comprehensive picture of the status of the fishery and trends over time during the stock assessment meetings.

The additional performance indicators include:

1. Commercial diver observations
2. Commercial weight composition and logger data
3. Fishery independent survey data

Reference points for biological performance indicators

Reference points are the benchmarks of performance and are linked to defining acceptable levels of biological impact on a stock or the desired social and/or economic outcomes (Sloane et al 2014). Reference points are usually linked to the performance indicators and three types are commonly used; these are limit, threshold and target reference points.

All three reference points are calculated from a three-year moving average of the nominal CPUE from 1989 to 2015 for each commercial fishing zone and SMU (Table 1). The reference period was

[1] The linear regression has been calculated by fitting a straight line using the least squares method to CPUE over four years.
[2] The CPUE ratio has been calculated as the ratio of two consecutive years of CPUE values.
[3] Weight (g) = 3.34×10^4 X length $(mm)^{2.857}$

selected as the first year after quota was introduced (1989) to the available data at the time of the harvest strategy development (2015). Refer to appendix 1 for catch rate graphs.

Target reference point

The target reference point defines the level or value of an indicator that is considered ideal or desirable and in this harvest strategy is the target point for rebuilding and then maintaining the legal biomass.

The target reference point is the maximum value of the 1989-2015 series, rounded down to the nearest 10 kg/h.

For example: the maximum value is 116 kg/hr so this is rounded down to 110kg/hr.

Threshold reference point

The threshold reference point in this harvest strategy represents a value above which recruitment should be maintained and which legal biomass should not fall below.

The threshold reference point is the minimum value of the 1989-2015 series, rounded up to the nearest 10 kg/h.

For example: the minimum value is 72 kg/hr so this is rounded up to 80kg/hr.

Limit reference point

The limit reference point acts like a safety measure as it establishes the point at which there is significant risk to the sustainability of the stock.

In this harvest strategy the limit reference point is calculated from the minimum value of the 1989-2015 series. The limit value is 2/3 of the minimum value, rounded up to the nearest 10 kg/h.

For example: the minimum value is 72 kg/hr so 2/3 x 72 = 48 kg/hr which is then rounded up to 50kg/hr.

Table 1 Spatial management unit reference points

Zone	Spatial Management Unit (SMU)	Limit Reference Point	Threshold Reference Point	Target Reference Point
Central	Back Beaches	50	70	100
	Cape Liptrap	40	60	120
	Cape Otway	50	70	100
	Cliffy Group	40	60	110
	Flinders	50	70	100
	Kilcunda	50	70	110
	Phillip Island	50	70	110
	Port Phillip Bay	20	30	70
	Prom Eastside	40	50	80
	Prom Westside	50	70	100
	Shipwreck Coast	40	60	130
	Surfcoast	40	60	70

Zone	Spatial Management Unit (SMU)	Limit Reference Point	Threshold Reference Point	Target Reference Point
Eastern	Airport	50	80	110
	Mallacoota Central	50	80	110
	Mallacoota East	50	80	110
	Mallacoota Large	50	70	110
	Mallacoota Small	50	70	100
	Mallacoota West	50	80	120
	Marlo	50	80	120

Decision rules to set the TACC

The process for considering the draft harvest strategy outcomes and setting the TACC includes two key parts:

1. Estimation of recommended target catch ranges using the harvest strategy framework (Figure 1).
2. A workshop process that considers additional performance indicators to inform TACC recommendations.

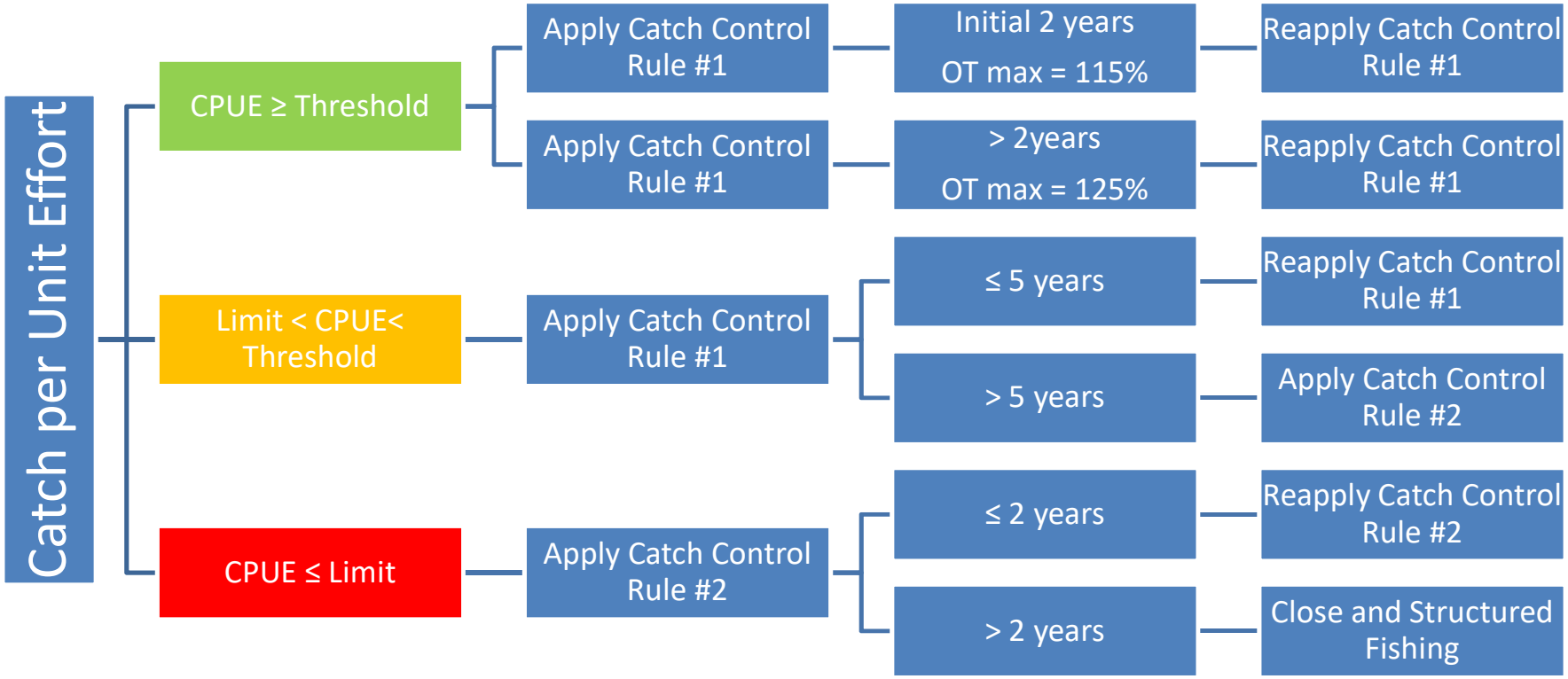


Figure 1 Harvest strategy framework

Estimation of target catch ranges

Estimation of recommended catch ranges using the harvest strategy framework follows a six-step process for each SMU within each zone. The process described below will be automated using R software coding.

Step 1: Calculate the CPUE category

The first step in calculating the catch range for a SMU is identifying the CPUE category.

In this step the average CPUE value for the most recent quota year is compared against the reference points and placed in a category below the limit reference point (red), between the limit and threshold reference point (orange) or above the threshold reference point (green). This category then identifies which catch control rule applies.

For example: if the CPUE value is greater than the threshold reference point then the CPUE category is green and catch control rule #1 applies (Figure 2).

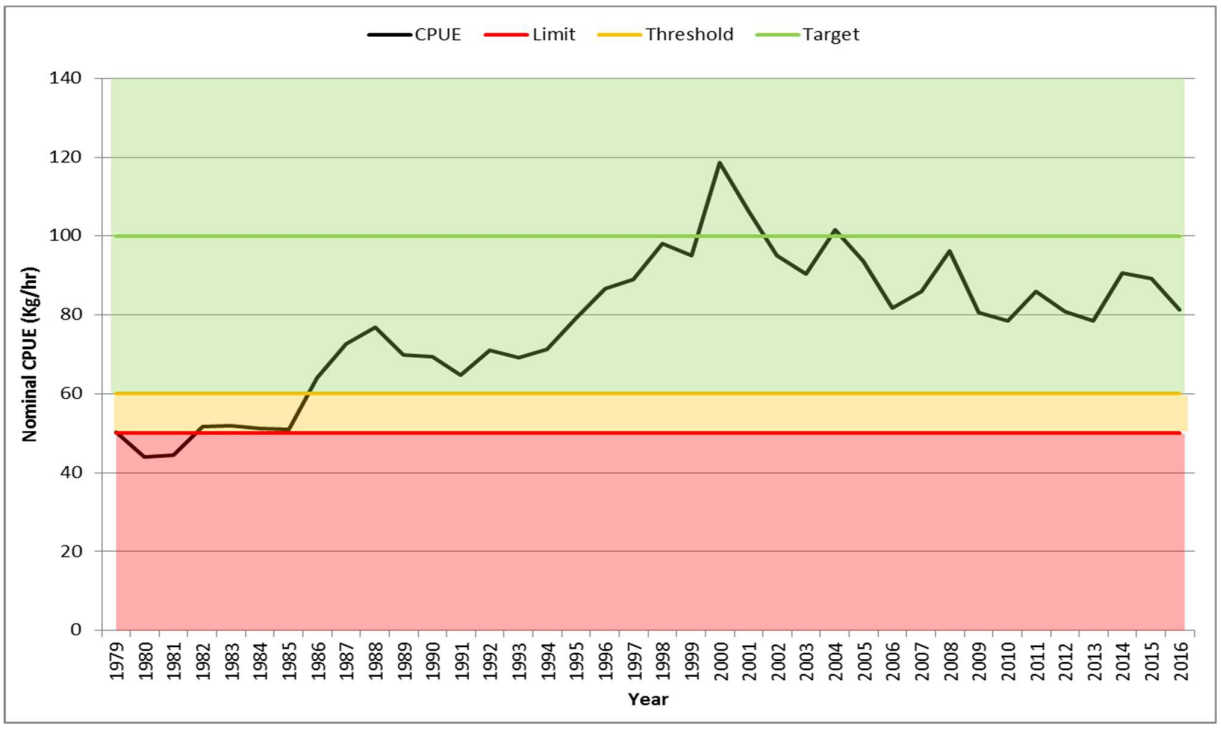


Figure 2 CPUE Categorisation system

Step 2: Calculate the percentage change in the performance indicators

The next step is to calculate the percentage change for each of the three performance indicators from the previous year. A category of increasing, stable or decreasing is then allocated to each of the three performance indicators based on the amount of change (Table 2).

Table 2 performance indicator change categories

Performance indicator % change	Category
> +5	Increasing
-5 to +5	Stable
< -5	Decreasing

Step 3: Calculate the primary categorisation result

The next step is to calculate the primary categorisation result. This primary performance indicator (four-year gradient CPUE) category and the secondary performance indicator (two year CPUE ratio) are combined to give a primary categorisation result using Table 3.

For example:

If the primary performance indicator has changed by -33%, this is classified as decreasing.

If the secondary indicator has changed by +20%, this is classified as increasing.

Using Table 3 the two categories are combined to give a primary categorisation result, which in this example is decreasing.

		Secondary indicator trend		
		Decreasing	**Stable**	**Increasing**
Primary indicator trend	**Decreasing**	Decreasing	Decreasing	Decreasing
	Stable	Decreasing	Stable	Stable
	Increasing	Stable	Increasing	Increasing

Table 3 Primary categorisation table

Step 4: Calculate the final categorisation result

The next step adds the tertiary performance indicator to the primary and secondary performance indicators. The primary categorisation result and tertiary performance indicator are combined to give a final categorisation score using Table 4

For example:

The primary categorisation result was decreasing (Table 3).

If the tertiary indicator has changed by +30% this is classified as increasing.

Table 4 is used to calculate the final categorisation result, which in this example is stable.

		Tertiary indicator trend		
		Decreasing	Stable	Increasing
Primary categorisation result	Decreasing	Decreasing	Decreasing	Stable
	Stable	Stable	Stable	Stable
	Increasing	Stable	Increasing	Increasing

Table 4 Final categorisation table

Step 5: Identify the percentage change to be applied

The next step identifies the amount of change that must be applied to the catch target for the SMU. This will vary depending on which catch control rule applies.

The percentage change for each category are different depending on the catch control rule, with catch control rule #2 being more precautionary (Table 5).

For example:

a final score of stable under catch control rule #1 means that the catch target for the SMU can be within the range of -5 to +5% of the previous years' catch target value.

a final score of stable under catch control rule #2 means that the catch target for the SMU can be within the range of -15 and -5% of the previous years' catch target value.

Table 5 Catch control rule percentage change categories

Catch Control Rule #1	% change	
Increasing	0 or 5	15
Stable	-5	5
Decreasing	-15	-5

Catch Control Rule #2	% change	
Increasing	- 5	5
Stable	-15	- 5
Decreasing	-25	-15

Step 6: Calculate the optimum target range for the SMU

The final step is to calculate the catch target range for each SMU. This is calculated in relation to the previous year's catch target.

For example:

Under catch control rule #1, if the catch target for the SMU in 2015 was 90.0 tonnes, then the upper and lower range of values for 2016 is ±5% as the final categorisation result was stable. This gives a catch target range of 85.5 – 94.5 tonnes for the SMU in 2016.

The catch target ranges are calculated for each SMU and these are added together to give the recommended TACC range for the zone. A report is prepared for consideration at each zonal workshop.

Workshop process to inform TACC recommendations

Zonal stock assessment and quota setting workshops are undertaken annually to provide advice to the Minister (or delegate) on the status of the fishery, general management issues and to inform recommendations on the TACC for the abalone fishery.

These workshops are open to all commercial licence and quota holders, commercial abalone divers, representatives of the recreational fishing sector and other relevant stakeholders.

The workshops are designed to:

- identify and maintain sustainable catch levels and appropriate legal minimum lengths for individual spatial management units;
- be responsive to changes in the fishery, both natural and anthropogenic;
- facilitate agreement over management actions;
- allow prioritisation of research and stock assessment effort; and
- increase industry participation in spatial management of the fishery.

The workshops will be facilitated by an independent chairperson selected by the industry entity for each zone and endorsed by the VFA.

The industry entity is responsible for arranging the venue and coordinating industry participation.

The VFA is responsible for advising representatives of the recreational fishing, conservation and Indigenous sectors and other relevant stakeholders of the workshop details and encourage these representatives to attend.

The information to be considered at the workshop includes:

- the estimated target catch ranges using the harvest strategy framework;
- additional performance indicators described in Table 6; and
- any other relevant scientific, environmental or supporting information.

The format for the workshops will be agreed between the VFA and industry entity for each zone, with consideration of the available information at both the zonal and SMU scale.

1. Zonal assessment and discussion considering the fishery dependent and independent data, any environmental or social considerations that may have influenced the fishery, and the TACC recommendation from the draft harvest strategy framework;
2. SMU scale assessment and discussion considering the draft harvest strategy target catch ranges, diver observations, fishery dependent and independent data.

Table 6 Workshop performance indicators and information

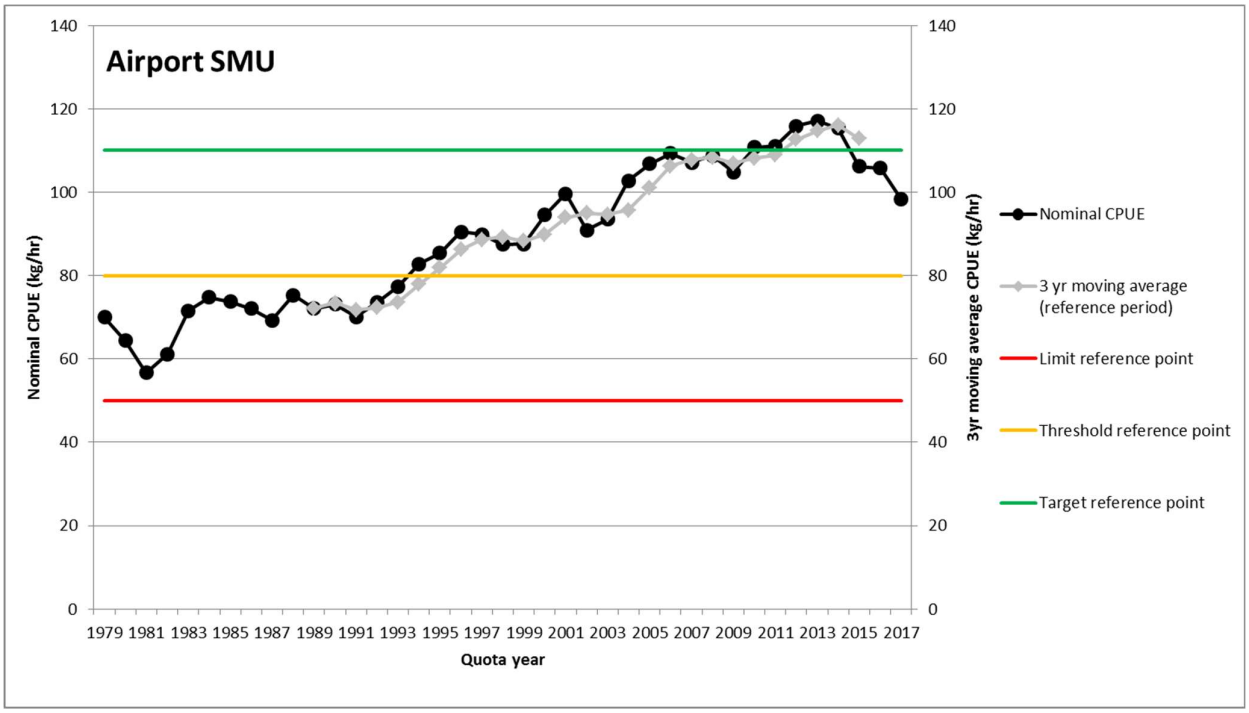
Performance indicator/ information	Description	Output
Harvest strategy report	Report of recommended catch ranges using harvest strategy framework	VFA harvest strategy report
Commercial diver observation questionnaire	Qualitative observations of the fishery compared to previous years	Industry summary report and graphics of diver observations by reef code and SMU
Commercial weight composition	Indicator of fishing impacts/mortality Mean weight and proportion of fish above LML Weight converted from lengths using: Weight (g) = 3.34 x 10^4 X Length $(mm)^{2.857}$	Industry summary report and graphics at SMU scale of: - mean weight; - proportion of fish above LML - commercial logger data
Commercial logger data (kg/ha)	Indicator of exploitable biomass	
FIS 'legal'	Indicator of exploitable biomass Counts converted to kg/ha for abalone at or over the current LML	VFA summary trend report and graphics at zonal scale of: - FIS 'legal' - FIS 'mature' - FIS 'unders' - FIS mean weight and proportion for each category above
FIS 'mature'	Indicator of changes in mature biomass over time Counts converted to kg/ha of sexually mature Maturity sizes: WZ: 102mm; CZ: 88mm; EZ: 99mm	
FIS 'unders'	Indicator of fish about to enter the exploitable biomass Counts converted to kg/ha of abalone below current LML to 20mm under current LML Longer term trend data (1995 sites)	
FIS weight composition	As above for commercial weight composition	

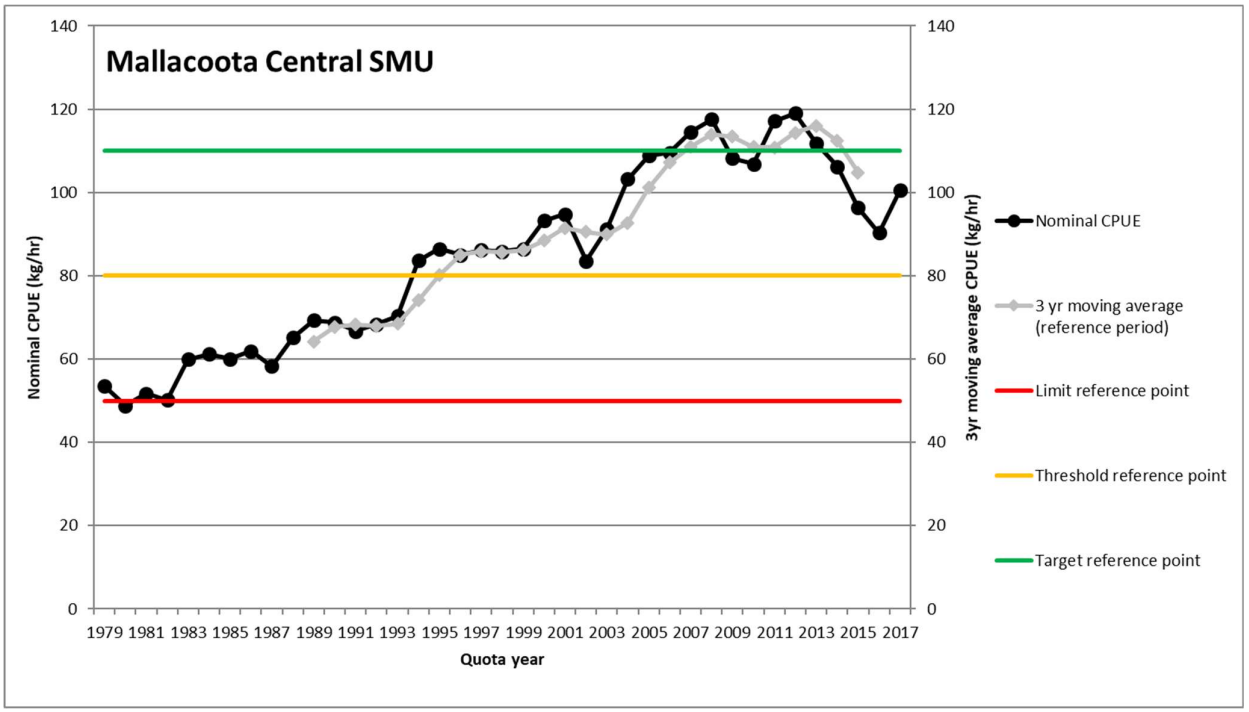
TACC setting process and timelines

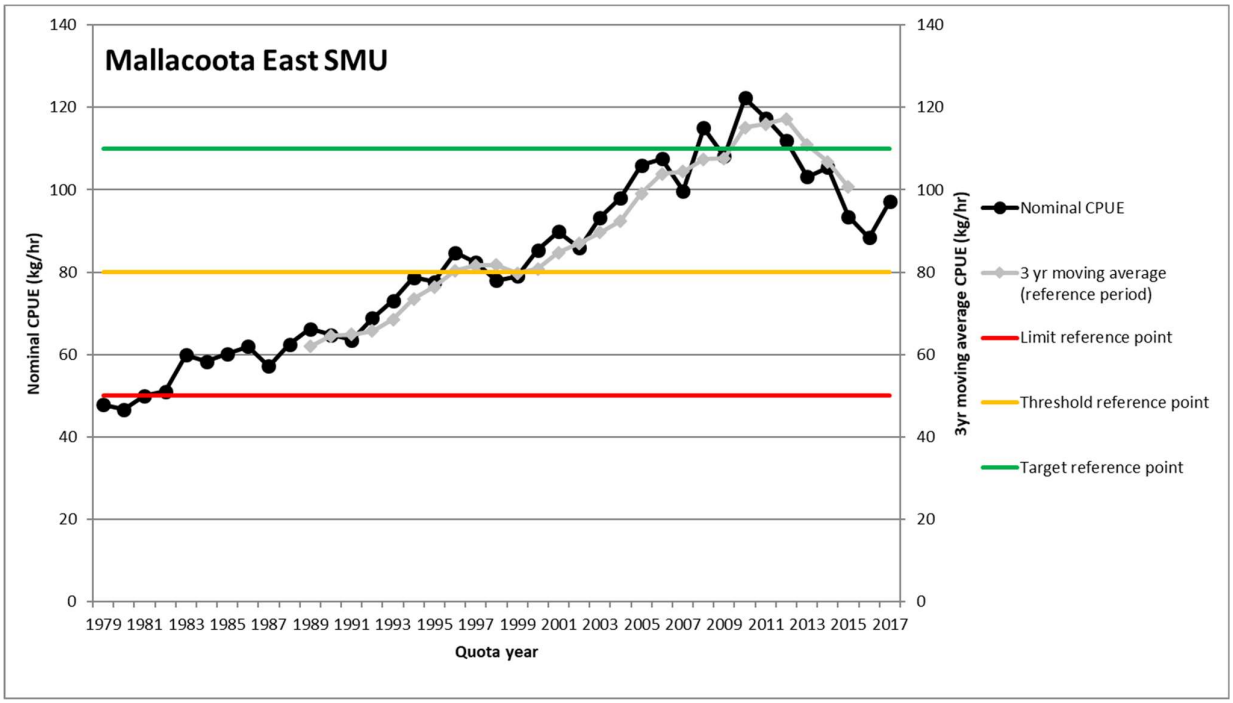
The following details how the TACC will be set each year and the timelines for this to occur.

Zone	Action	Timeframe
Central	Fishery Resource Advisory Group (FRAG) meeting to review previous years assessment and any other matters	July
Central	FRAG meeting to consider the stock assessment report and current data analysis as well as follow up on items identified from the July FRAG meeting	October - November
Central	FRAG meeting to review updates on data from the fishery and stock assessment. Initial TACC figures to be placed into the Harvest Strategy for consideration at FRAG	December
All zones	Industry and VFA convene an annual zonal stock assessment and quota setting workshop with all relevant stakeholders.	December – January (no later than 2nd week)
All zones	Zonal TACC recommendations and advice from the workshop are recommended to the Minister or delegate	End January
All zones	The VFA prepares a draft further abalone quota order for statutory consultation (minimum 2 weeks), with the quota for each zone included.	February
All zones	The Minister (or delegate) makes a decision regarding the TACC, following consideration of all available information and consultation submissions.	Start March

Appendix 1. Catch rate graphs (to 2017): Eastern and Central zone






Mallacoota East SMU
Nominal CPUE (kg/hr)
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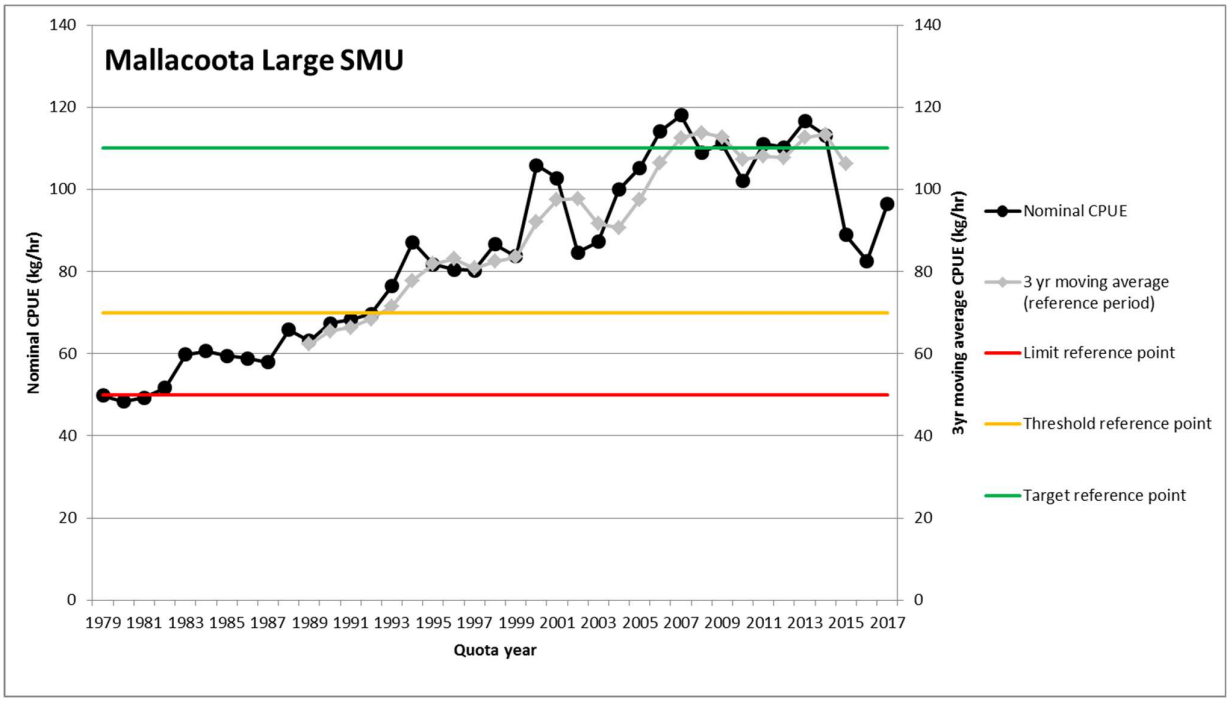
Mallacoota Large SMU
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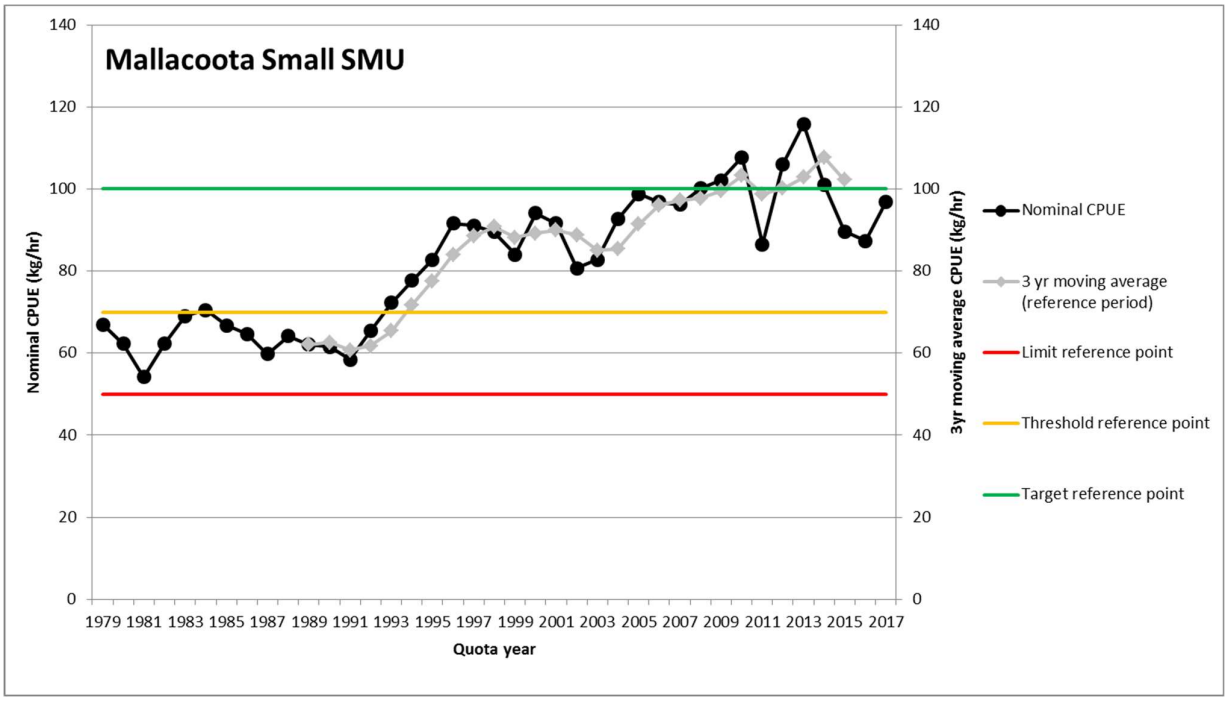
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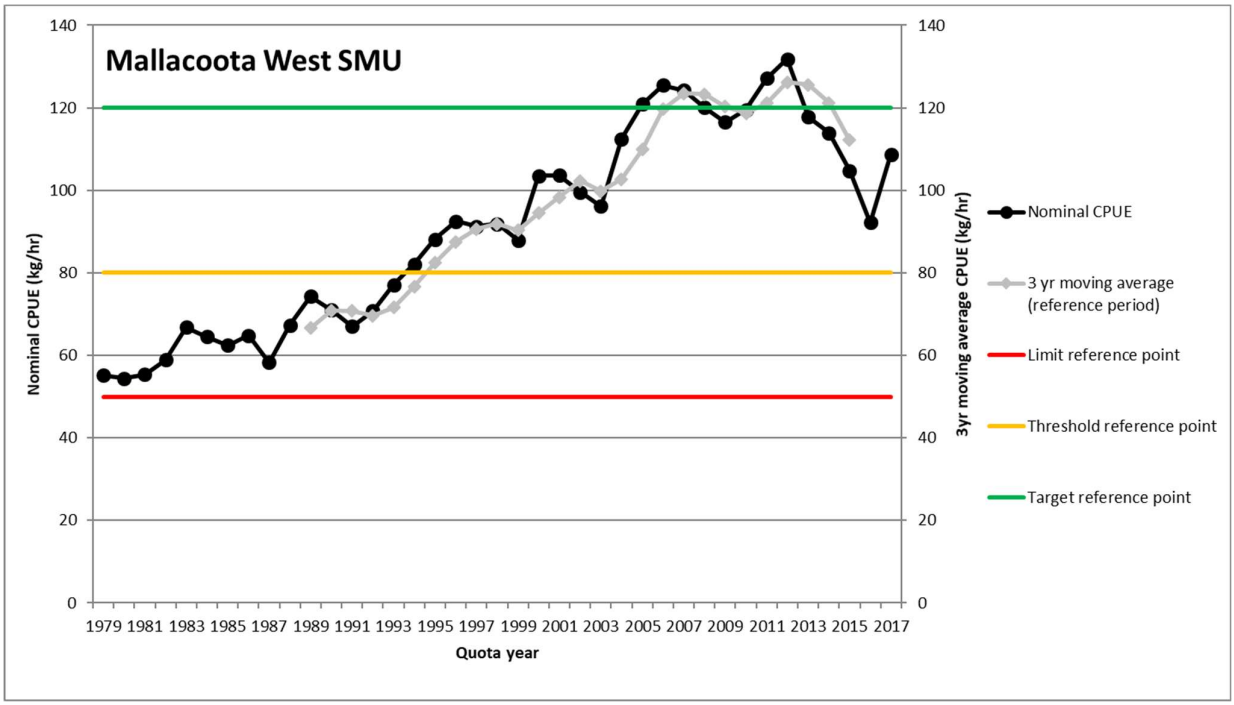
Mallacoota West SMU
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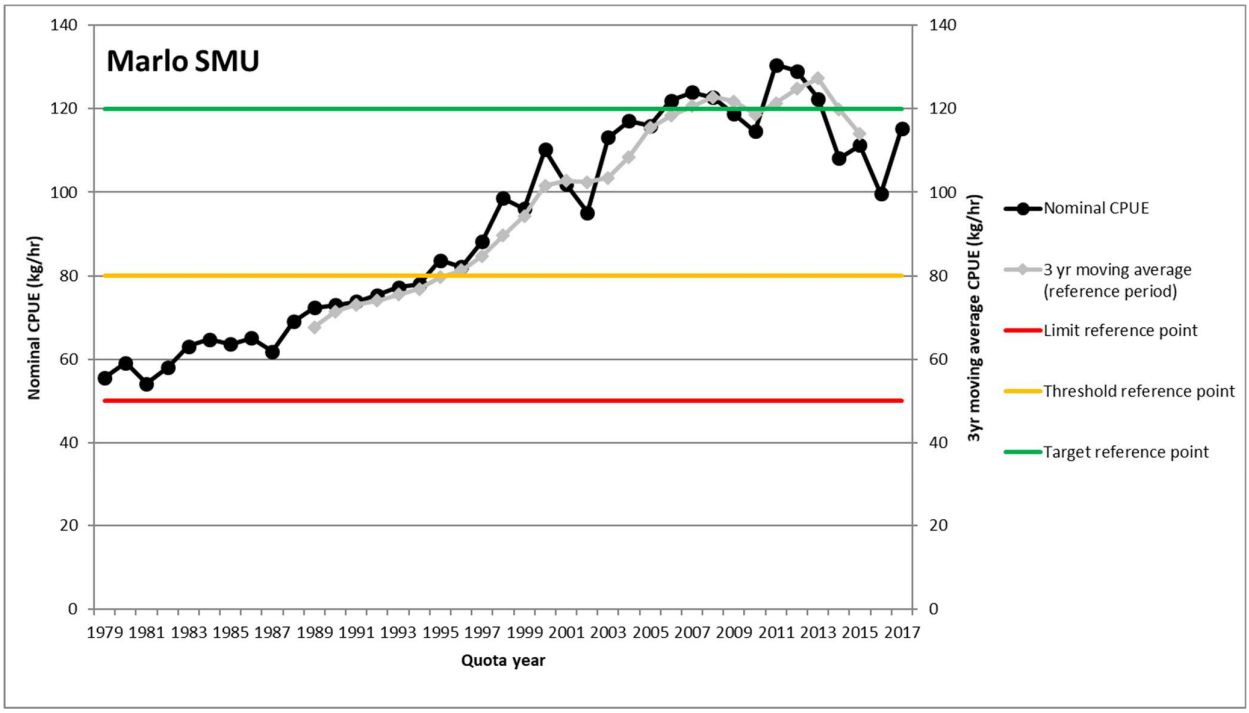
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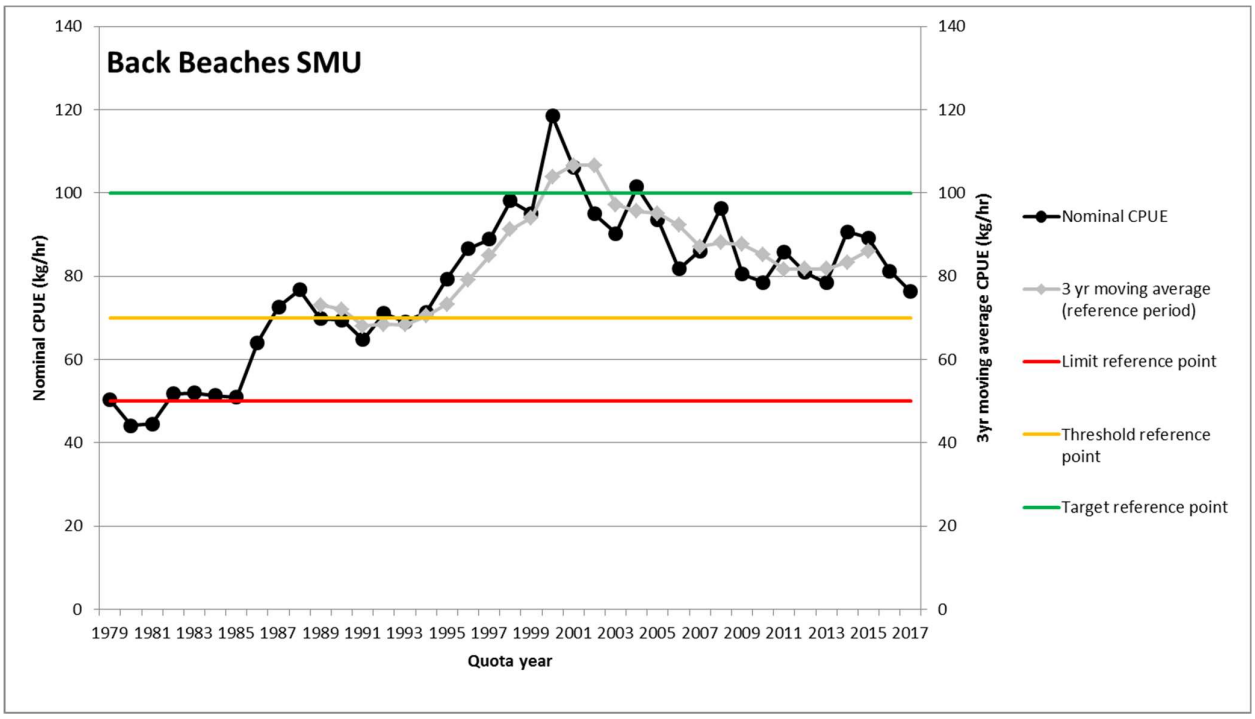
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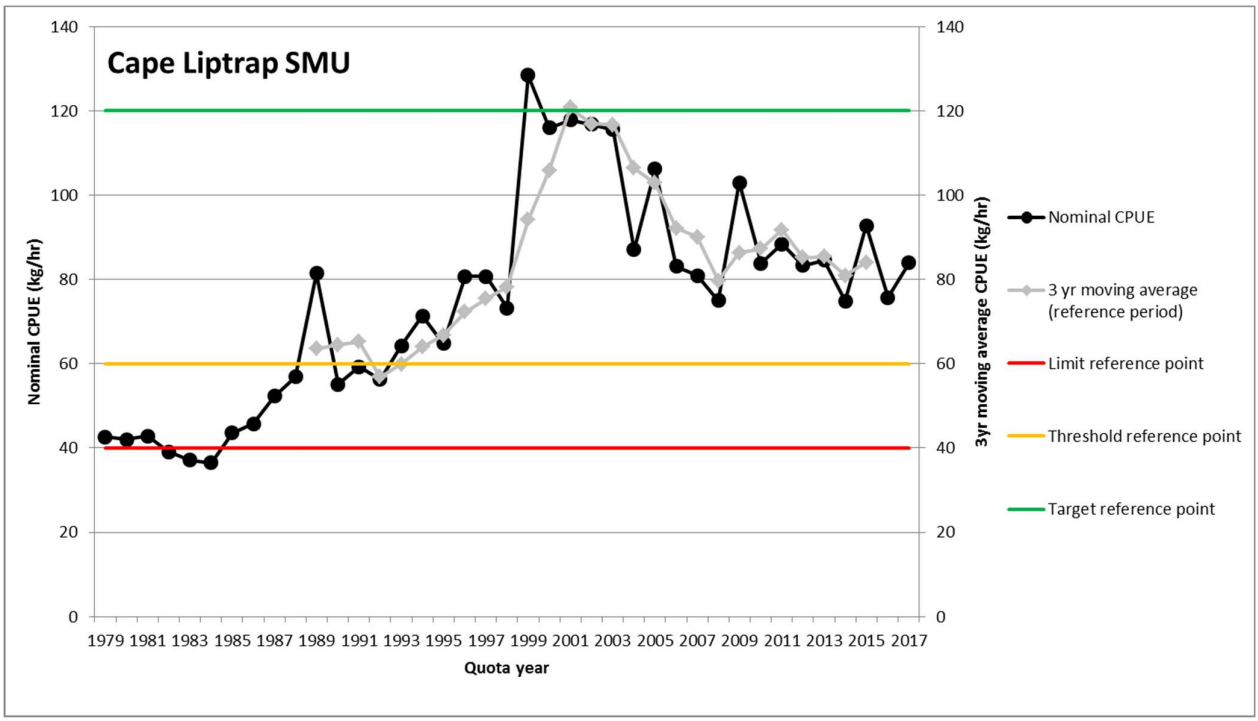
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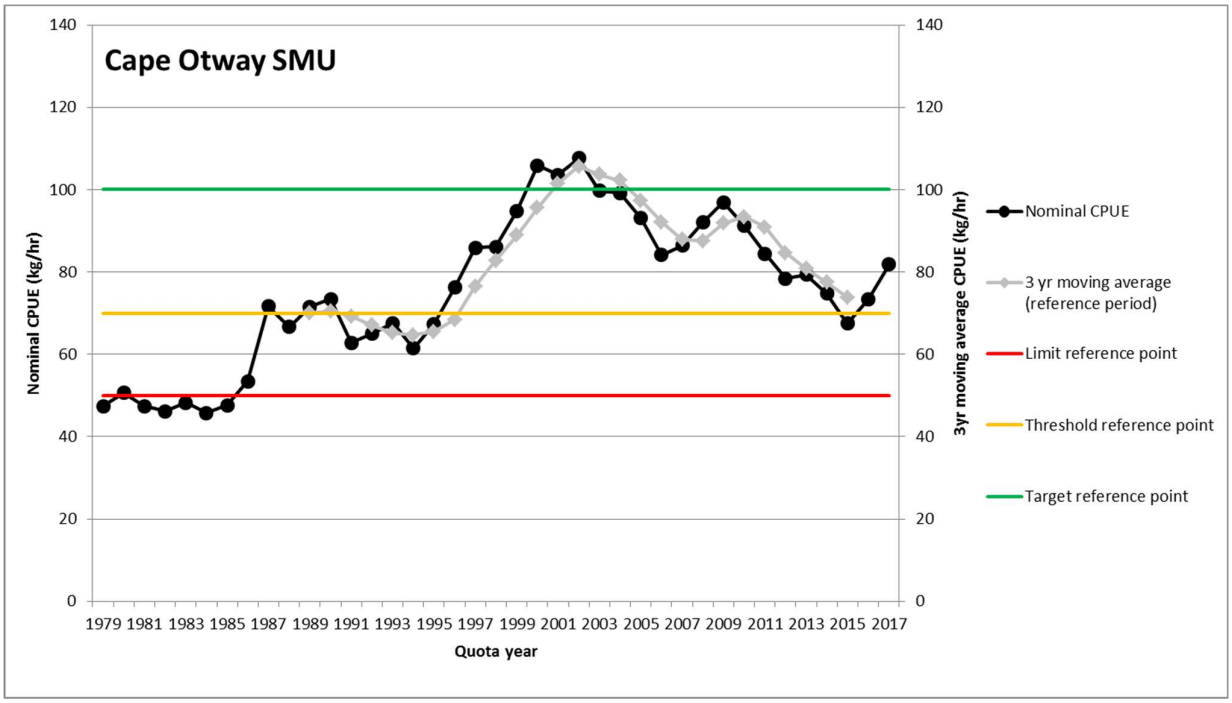
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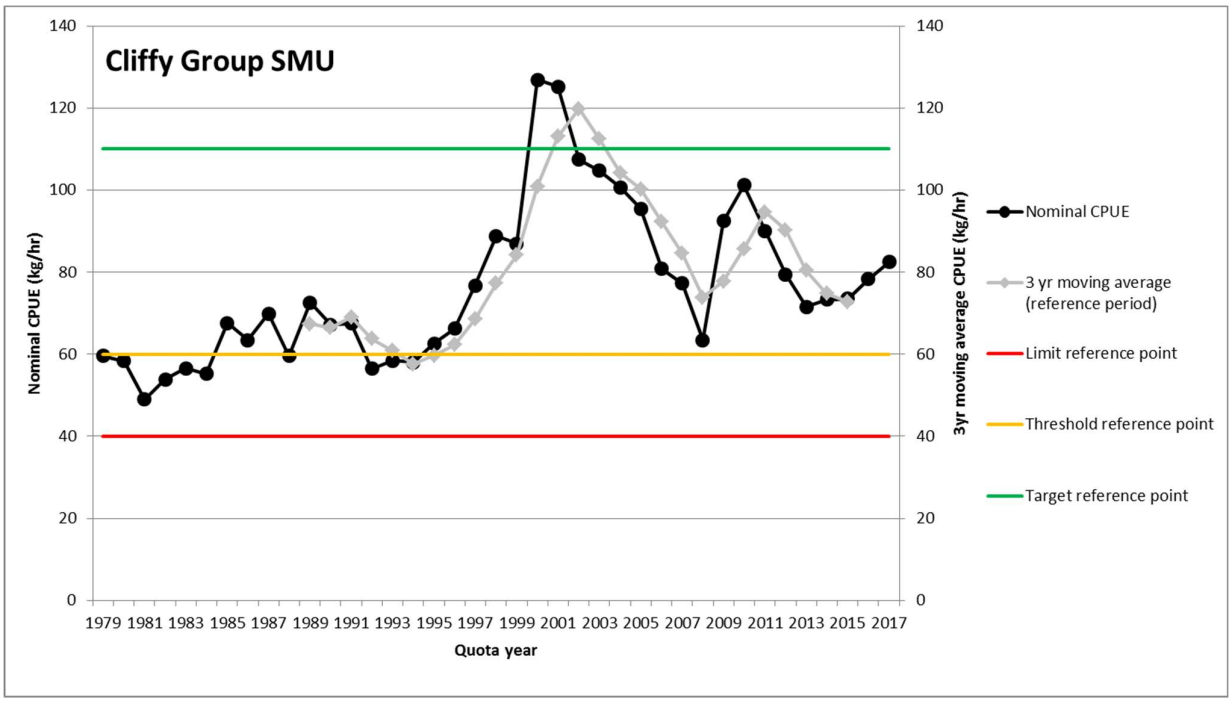
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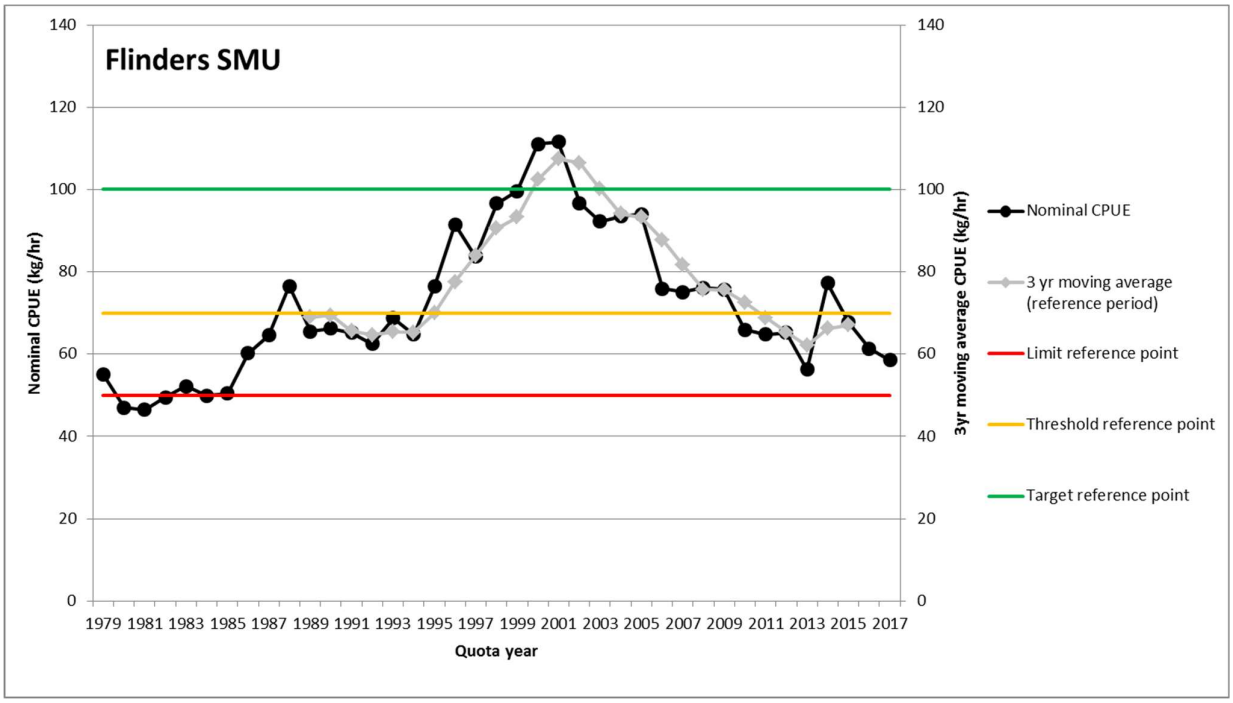
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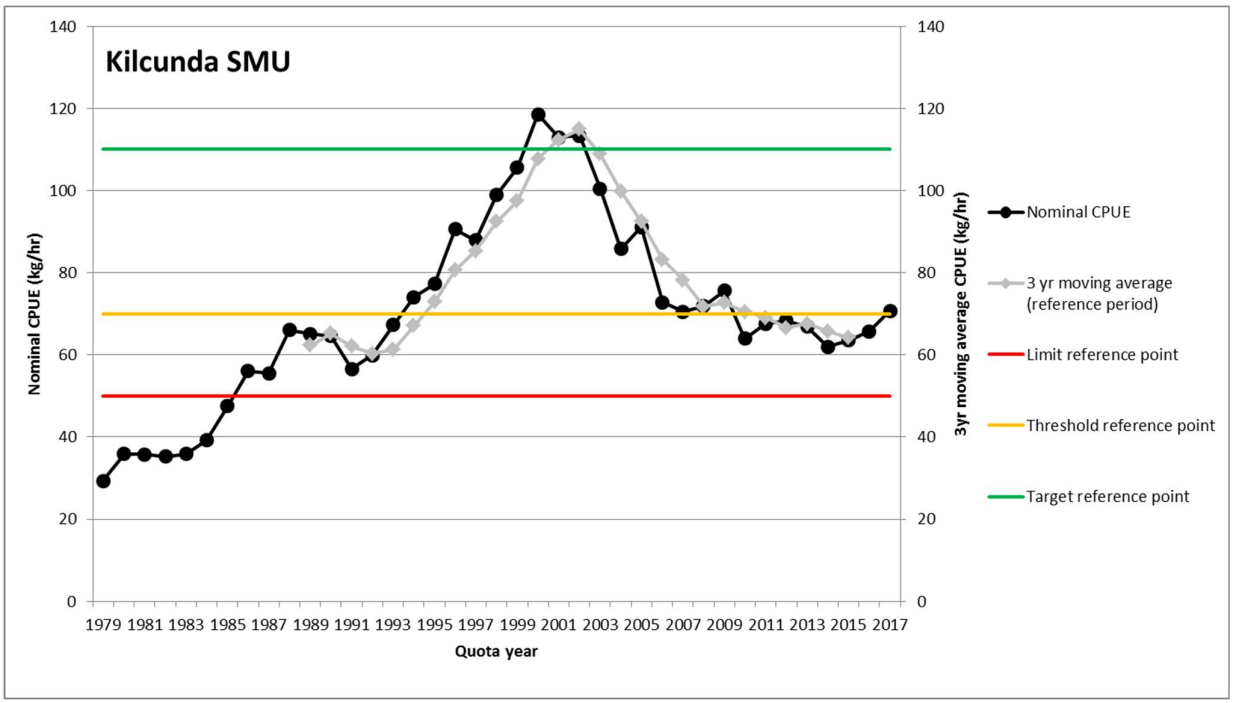
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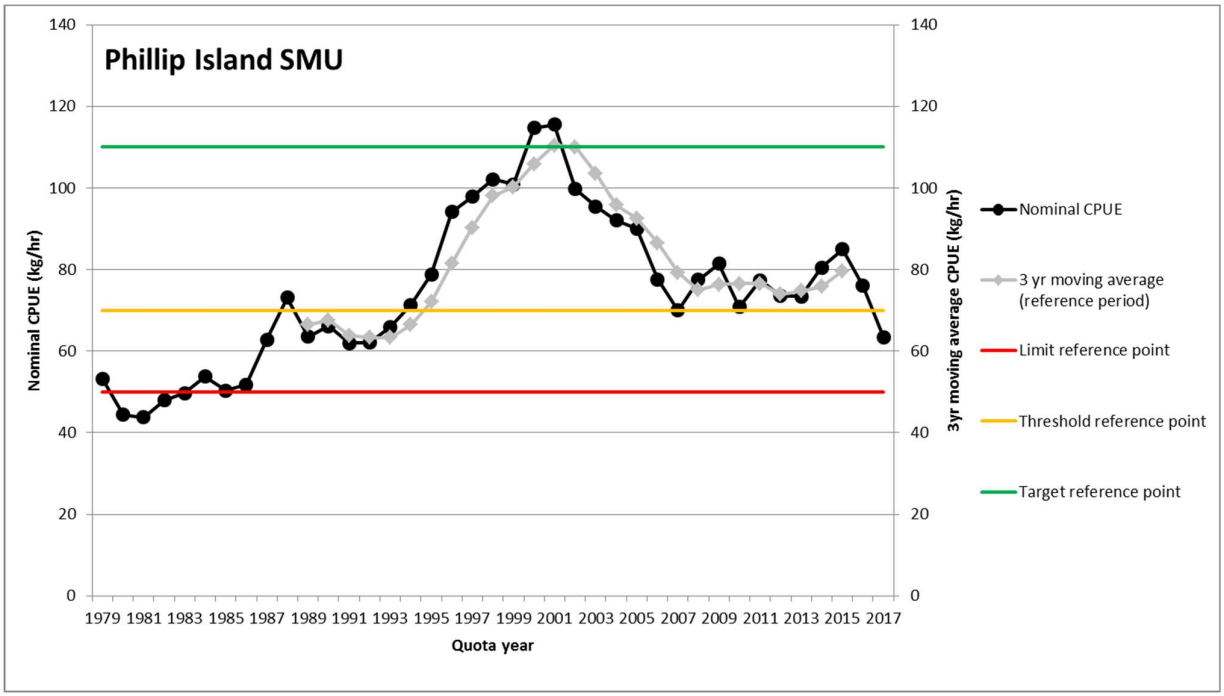
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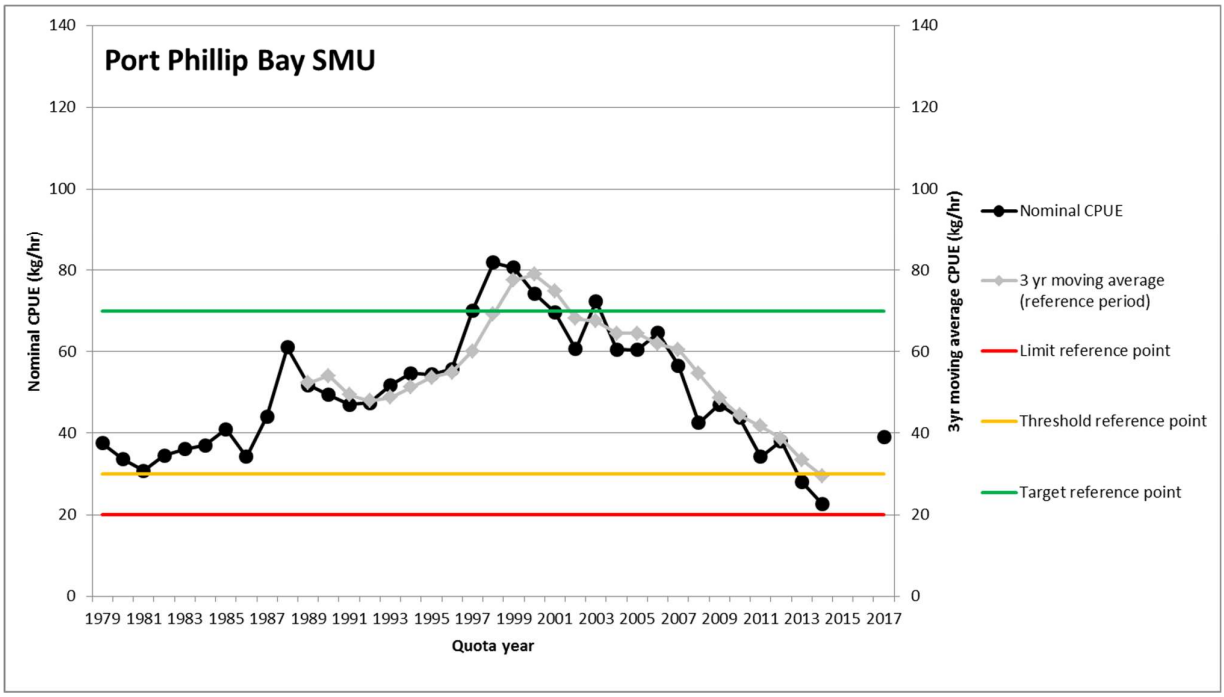
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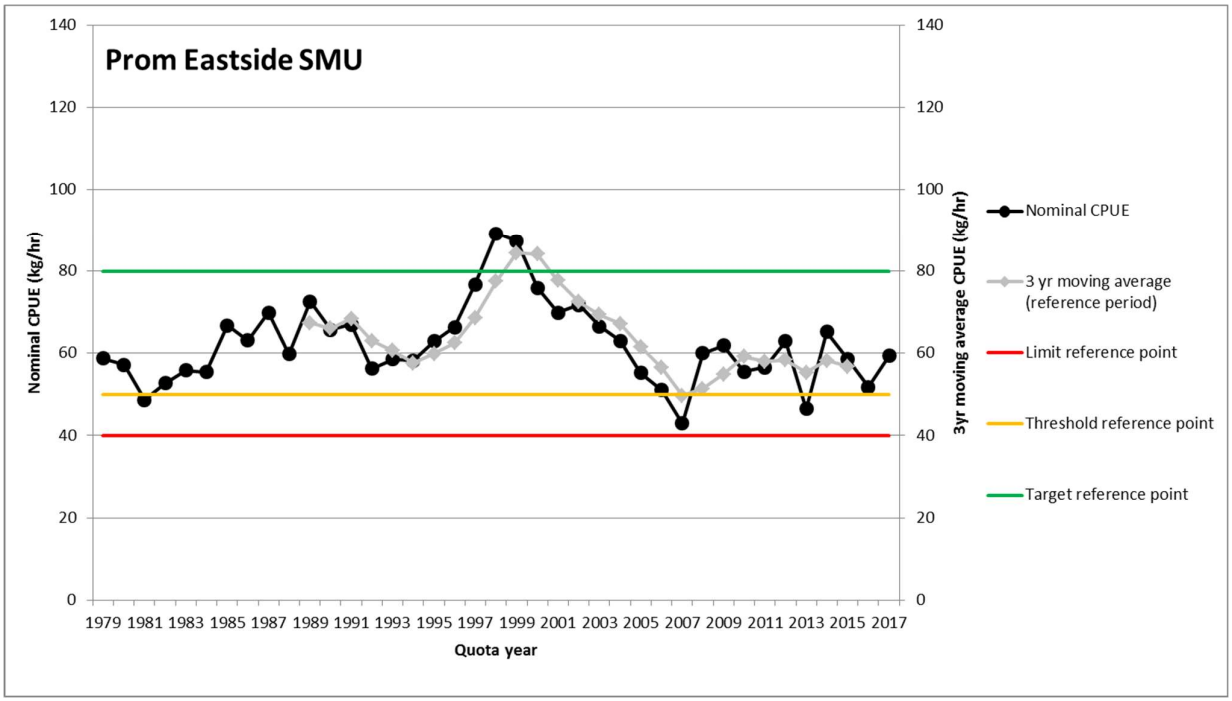
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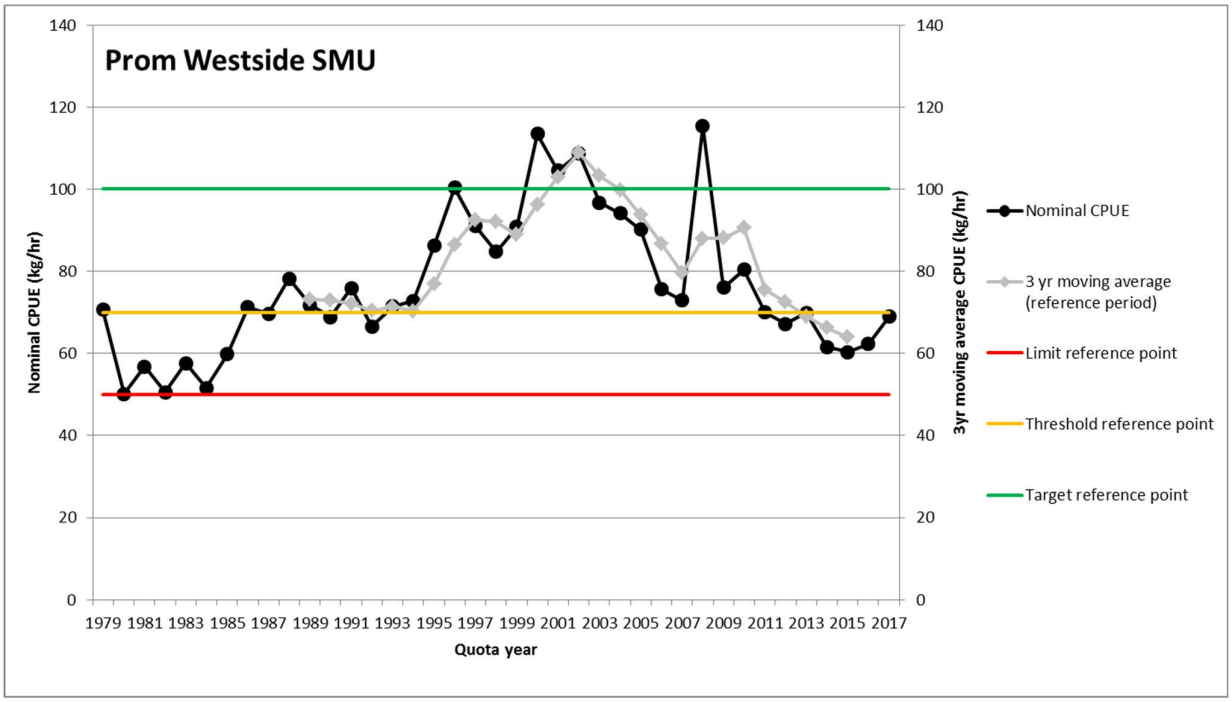
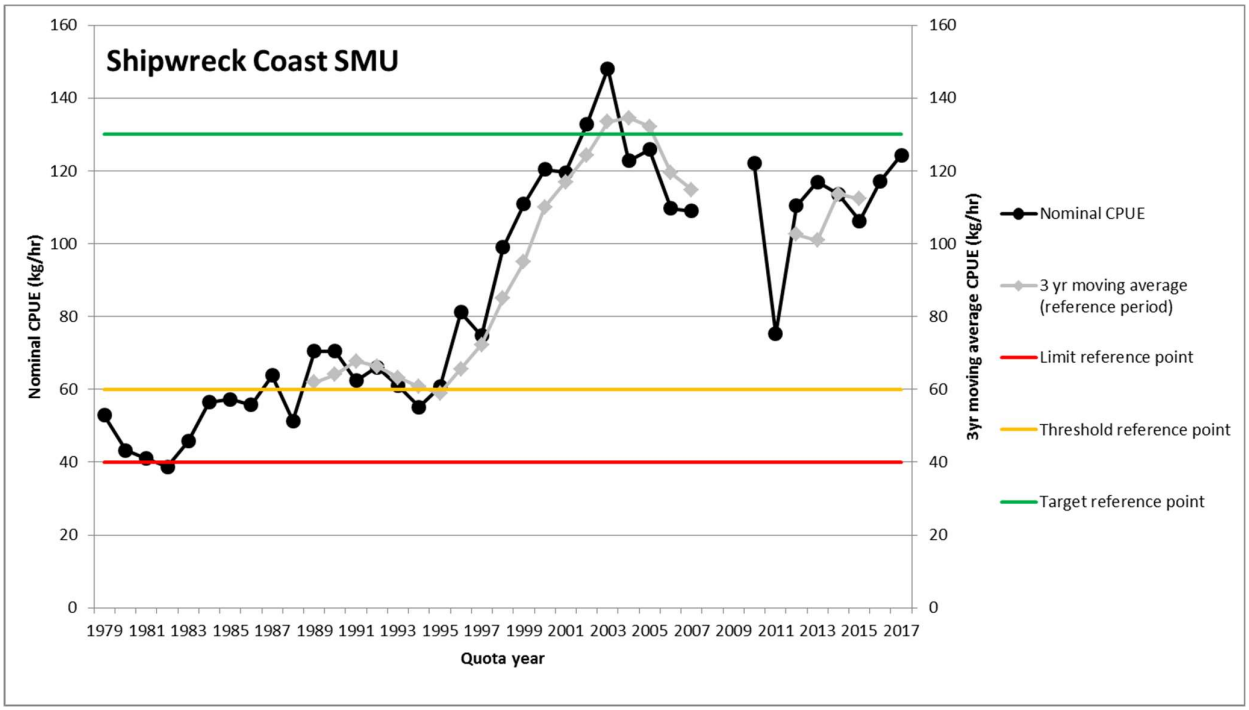
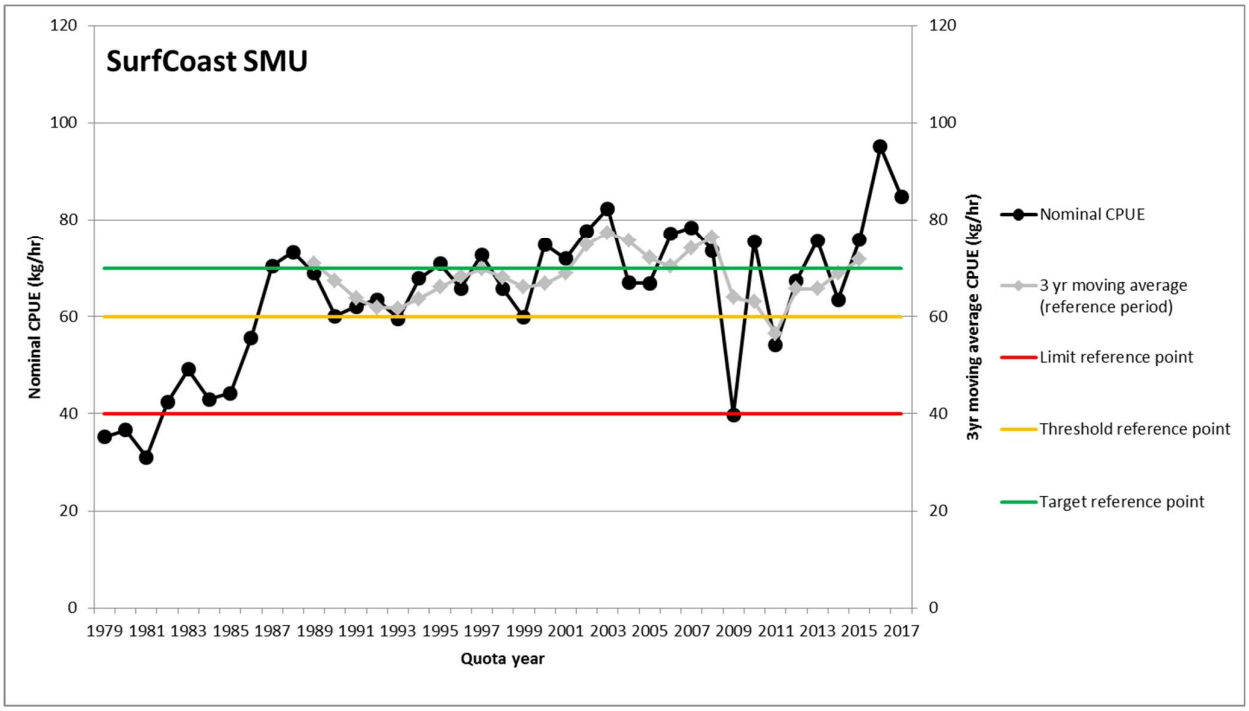
3 yr moving average (reference period)
Limit reference point
Threshold reference point
Target reference point


Prom Westside SMU
Nominal CPUE (kg/hr)
3yr moving average CPUE (kg/hr)
Quota year
0
20
40
60
80
100
120
140
1979 1981 1983 1985 1987 1989 1991 1993 1995 1997 1999 2001 2003 2005 2007 2009 2011 2013 2015 2017
Nominal CPUE
3 yr moving average (reference period)
Limit reference point
Threshold reference point
Target reference point


Shipwreck Coast SMU
Nominal CPUE (kg/hr)
3yr moving average CPUE (kg/hr)
Quota year
Nominal CPUE
3 yr moving average (reference period)
Limit reference point
Threshold reference point
Target reference point


SurfCoast SMU
Nominal CPUE (kg/hr)
3yr moving average CPUE (kg/hr)
Quota year
Nominal CPUE
3 yr moving average (reference period)
Limit reference point
Threshold reference point
Target reference point