

# **VICTORIAN ROCK LOBSTER FISHERY**

## **Review of the Management Decision Framework used to Establish the Total Allowable Commercial Catch**

**A report by the Rock Lobster Resource Assessment Group**

**March 2012**

# VICTORIAN ROCK LOBSTER FISHERY

## Decision Framework Review

A requirement of the Victorian Rock Lobster Fishery Management Plan (the Plan) is for Fisheries Victoria, in consultation with relevant stakeholders, to undertake a review of the Decision Framework used to set the Total Allowable Commercial Catch (TACC) for each zone of the fishery.

The Decision Framework describes a series of stock performance indicators, such as available biomass and catch per unit effort, and sets out a course of action by weighting fishery performance against predetermined responses. The intent of developing predefined responses to components of the fished stock is to provide both industry and government with a predictable and transparent process for making future management decisions regarding the TACC.

The application of a decision framework should be straightforward and should enable decisions to be made that are based on explicit and targeted management objectives. Application of the current version of the Decision Framework has been the source of confusion and divergence amongst stakeholders and its application has led to uncertainty and limited confidence in the process.

During 2010, Fisheries Victoria established the Rock Lobster Resource Assessment Group (RLRAG), a stakeholder reference group involving participants from the industry, management, research and recreational sectors. One of the main tasks assigned to the RLRAG was to make recommendations in relation to the data, model, reference points and decision rules for the fishery. In line with this, the RLRAG was requested to review the robustness and effectiveness of the Decision Framework and associated reference points and where required, make recommendations for a revised version.

The RLRAG's review, rationale and the proposed modifications to the Decision Framework were discussed at the Rock Lobster and Giant Crab Fishery Management Workshop held in November 2011.

This paper summarises the discussions of the RLRAG and provides a rationale for the resultant proposed Decision Framework. The intent is to allow stakeholders the opportunity to comment on the recommended changes. The finalised Decision Framework will be in place prior to the TACC-setting process for 2012/13.

## **THE CURRENT ARRANGEMENT**

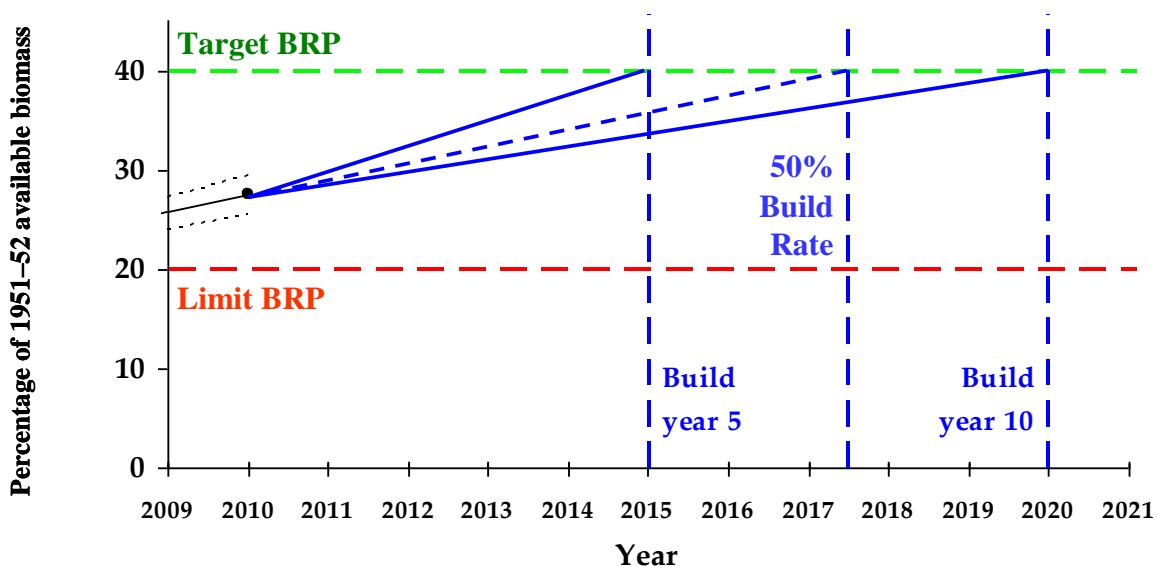
The Plan employs a range of target and limit reference points that are based on comparisons to the relative estimated biomass in 1951; the first year that catch per unit effort data was available. Target reference points can refer to the level of fishing or to the biomass that is considered to facilitate long-term sustainable exploitation of the stocks. In the case of Victoria's rock lobster population, we are aiming to rebuild the stocks to this target.

Limit reference points represent the minimum level of biomass that must not be breached, or alternatively, the maximum level of fishing mortality that must not be exceeded. Limits are designed to protect the stocks and conserve their capacity to replenish into the future. Also used in the Plan are the biomass performance indicators of available and spawning biomass. Available biomass refers to the abundance of stock that is above the legal minimum length and therefore available for harvest. Spawning biomass is a measure of the stock of mature females who contribute to recruitment.

These reference points and performance indicators form the basis of the primary management strategy of the Plan, which is to rebuild the available biomass in both zones of the fishery to 40% of  $B_{1951}$  by 2020/21.

The Plan specifies that the spawning and available biomass levels must be kept above the limit reference point of 20% of  $B_{1951}$  with a 75% probability. If either indicator were to fall below the limit reference point, TACC levels must be set so that the performance indicator returns to above the limit within two years.

An additional performance indicator, the biomass build-rate, was introduced in the Plan. The build-rate defined a fixed window within which all future biomass estimates were to lie, with the upper and lower bounds of the window defined by a five- and ten-year trajectory that achieved the target 40% of  $B_{1951}$  by 2020/21. The intent was that the window would be fixed in time, with a starting point in 2010/11, and that all future TACC levels would be adjusted to ensure the projected available biomass five years into the future lay within the bounds of the window (see Figure 1). It was also intended that the biomass build-rate would be evaluated at both zonal and regional scales. More details of these decision rules are provided in the Rock Lobster Fishery Management Plan 2009.



**Figure 1.** Generalised representation of the biomass build-rate window. BRP = biological reference point. From the Rock Lobster Fishery Management Plan 2009.

The above criterion, along with a number of additional conditions, make up the Decision Framework described in the Plan (see Figure 2). The Plan states that the results of the annual stock assessments are tested against the Decision Framework at the TACC Forum each year.

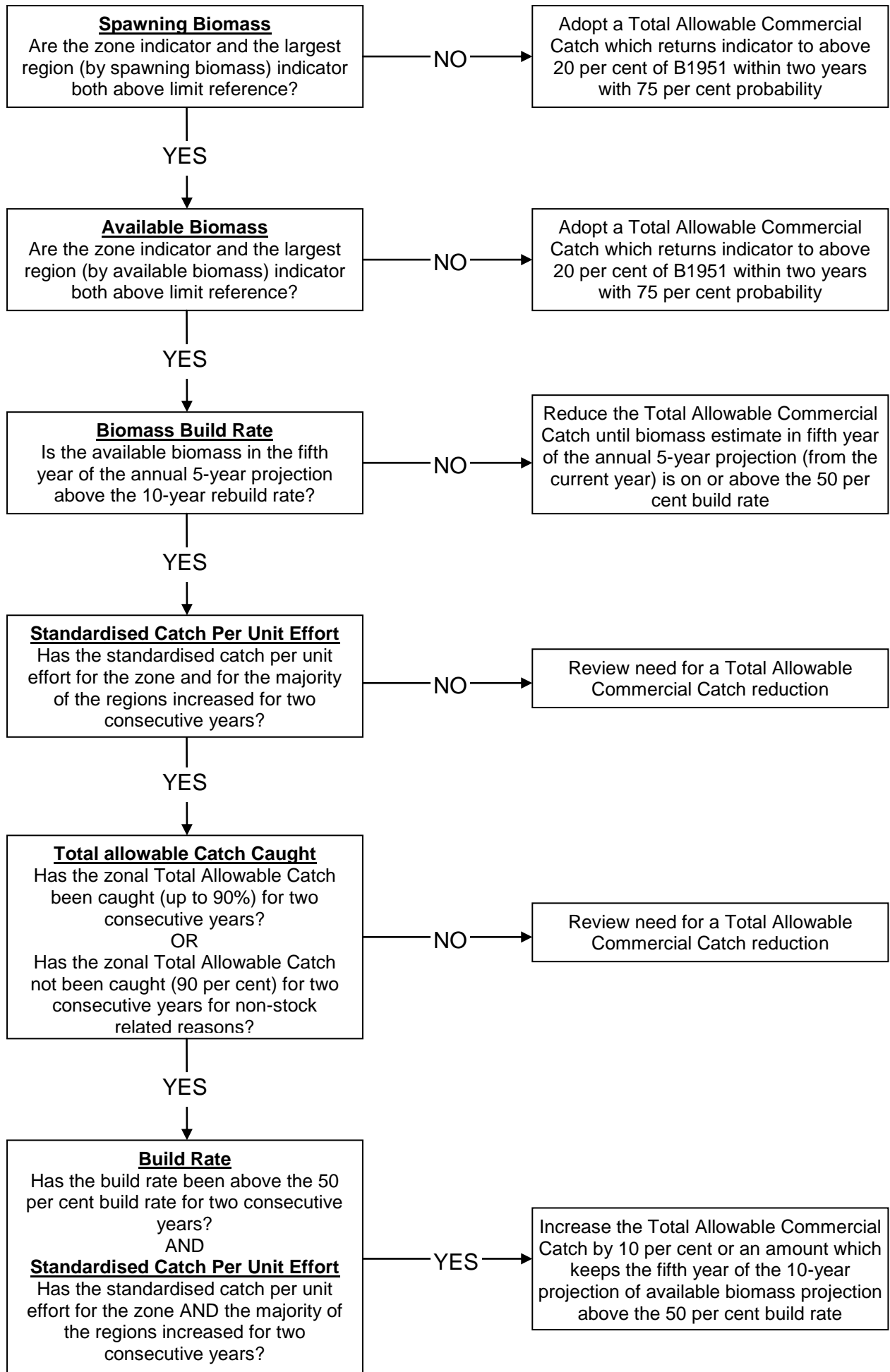


Figure 2. Hierarchical management decision framework from the Victorian Rock Lobster Fishery Management Plan 2009.

## THE REVIEW

### General Comments

It is important to note that in conducting this review, the RLRAG was not being asked to review the entire Management Plan, but just the reference points and decision rules. Also, the RLRAG was not requested to review the overall management of the fishery, nor the management tools used. As such, it was acknowledged that the current TACC/individual transferable quota management, the legal minimum size limit, and the two zones (Eastern and Western) remained unchanged.

Overall, the RLRAG agreed to retain the primary strategy of the Plan – to rebuild stocks to the target of 40% of  $B_{1951}$  within a specified timeframe (noting that the equivalent target percentage will be determined for the new reference year of 2001). The RLRAG acknowledged that the Decision Framework was generally well designed to meet the objectives of the Plan, and in this respect, it is a conservative harvest strategy that ensures the rebuilding of the stock.

Preliminary application of the Decision Framework during the 2011/12 TACC setting process highlighted a number of areas for improvement. It became evident that the hierarchical structure had some unintended consequences and that a simpler method for determining the TACC would be beneficial.

Decision rules should be reasonably easy to understand and apply, and the complexity of the current Decision Framework was questioned when considered in the context of the simple primary strategy of the Plan. The results of the RLRAG review, including the rationale for recommendations, are detailed in Table 1. The major elements of the review are discussed below.

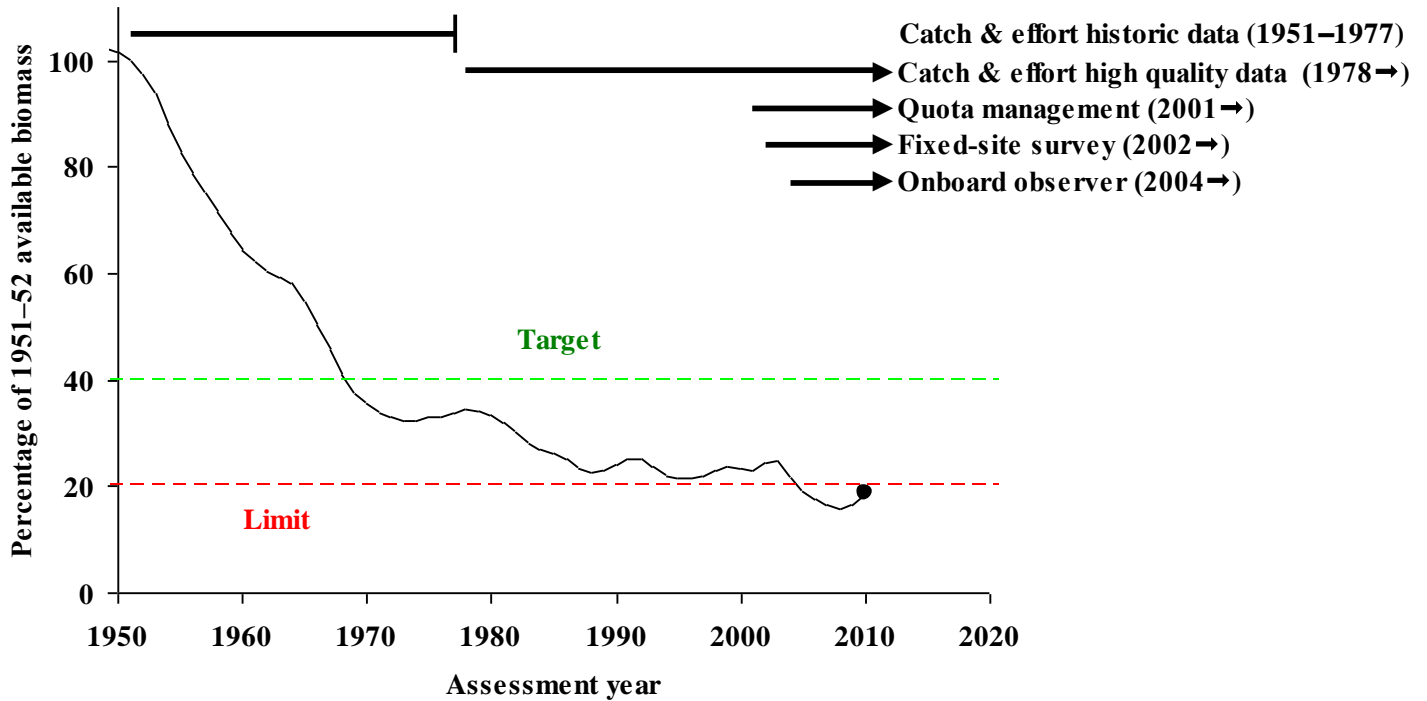
### Indicators and reference points

#### Reference Year

The Plan uses a reference year of 1951, as this represents the first year for which catch per unit effort data was available. The fishery had been operating for many decades by 1951, so in that respect the target and limit reference points do not refer to a virgin stock. A limit reference point of 20%  $B_{1951}$  is not the same as, nor as conservative as, a limit reference point of 20%  $B_0$  (20% of virgin biomass). Although acknowledging that a reference to virgin biomass would be preferable, it was recognised that at this stage, there is very limited historical information on which to base an assessment that could provide a robust estimate of virgin biomass. As such, the RAG agreed to retain the intent of the target and limit reference points with respect to a proportion of  $B_{1951}$  acknowledging that there is a level of uncertainty about where these lie with respect to the virgin biomass and that quantifying this difference is not currently possible, particularly in terms of absolute abundance.

Given that 1951 was not the beginning of the fishery, the RLRAG considered whether this was the most appropriate reference year and noted that information available for the fishery has improved considerably over time (Figure 3). Another important consideration was that the introduction of TACCs had a marked effect on the operation of the fishery and represented a period before which it is more difficult to apply reference indicators which remained quantitatively relevant to the current fishery. Based on this, the RLRAG recommended that a reference year of 2001 would be more appropriate, but agreed to adapt the target and limit reference points to be equivalent to the previous 1951 references. In other words, the

reference year is changed from 1951 to 2001 but there is no fundamental change in the target and limit biomass reference points, which now become relative to 2001. These relative values will be derived from the 2011 assessment because it retained analyses across the entire period since 1951. The historical data will continue to be used to provide long-term time series comparisons.



**Figure 3.** Example plot of the percentage of available biomass (West) with an overlay of periods of data availability in the Victorian Rock Lobster Fishery.

**Spawning Biomass**

The RLRAG noted that use of the term “spawning biomass” was technically incorrect in its application to the rock lobster stock assessment and agreed it should be changed to “egg production”. Egg production is a measure of the number of eggs produced by the mature female rock lobsters in the population. The revised Decision Framework will use this terminology. This term is also consistent with the Tasmanian and South Australian stock assessments.

**Limit Reference Point**

Limit reference points are usually put in place to prevent critical stock sustainability situations and provide a significant management response if they are breached. The RLRAG was supportive of the approach in the current Plan that imposed the condition whereby the triggering of the limit reference point (LRP) would require catch levels to be set that ensured recovery of the stock to above the LRP with a 75% probability in two years. The RLRAG considered that this level of probability (rather than the median) and the rapid response timeframe was appropriately conservative for a stock whose indicators had breached the limit reference point.

Currently, the Plan applies four different LRPs: an available biomass LRP for a zone, an available biomass LRP for the largest region within that zone, a spawning biomass LRP for a

zone and a spawning biomass LRP for the largest region within that zone. The RLRAG considered that a combination of four limit reference points was unduly complex. Further, it was not clear what additional management response would be triggered if a breach of the “largest region” indicator occurred, given that a potential TACC cut would apply across the zone - not to an individual region.

The spawning biomass LRP is regarded as the most critical factor in ensuring stock sustainability, consequently also having a LRP for available biomass was unnecessary. As an LRP is typically put in place to prevent stock collapse, it was recommended that the LRP be simplified to only apply to the egg production at the zone level.

An unintended outcome of the current Decision Framework is that a TACC increase can occur even when stock indicators are below the LRP. During the 2011 TACC meeting, one of the indicators triggered the LRP, but the response in the Plan was to **“Adopt a TACC which returns indicator to above 20% of B<sub>1951</sub> within two years with 75% probability”**. Because the indicator was only marginally below the LRP, the assessment predictions showed that a TACC increase could legitimately occur. This was not considered an appropriate management response for a stock in this situation. The RLRAG recommended that the management response to a breach of the LRP be amended to **“Reduce or maintain the TACC to return the egg production to above the LRP within two years with 75% probability”**.

### **Target Reference Point**

The Plan is even more complex with respect to the target reference points (TRPs) than it is for LRPs. Three separate indicators are used, including the biomass build rate, standardised catch per unit effort (CPUE) and the percentage of the TACC taken. Further, the decision rule for the biomass build rate incorporates indicators of the 10-year build rate, 5-year build rate, 50% build rate and 5<sup>th</sup> year projection of the build rate. Finally, there is one TRP that combines the 50% build rate, zone standardised CPUE and majority region standardised CPUE.

Again, the RLRAG considered that the intent of the decision rules was consistent with the Plan and conservative to the point that would likely force the stock to rebuild to the TRP prior to 2020/21. The RAG highlighted that by simply translating the B<sub>1951</sub> reference point to 2001, there was no improved certainty in the appropriateness of the TRP or what it represented in terms of actual biomass compared to the virgin state. The complexity of the interplay of the LRP and TRP decision rules, however, was considered to undermine their value and application. This issue alone was considered by the RLRAG to be a valid reason to simplify the reference points.

With stock sustainability and the prevention of collapse protected by the LRP applied to egg production, the RLRAG considered the target could simply apply to the available biomass. The use of this as the main target indicator is entirely consistent with the primary objective of the Plan to “rebuild the available biomass in both zones to the target reference point...”. It was proposed that the methodology for achieving the available biomass target, and as a result the process for setting the TACC, be simplified. Rather than using the build rate window and the associated principles as outlined in the Plan, the RLRAG recommended to use only an available biomass target (Figure 4). The target can potentially be set for any year (eg. 2020/21) without the need to alter the Decision Framework. The methodology required modification to accommodate situations where the stock is above the target reference point, as this stock position is not accommodated adequately in the current decision rules.

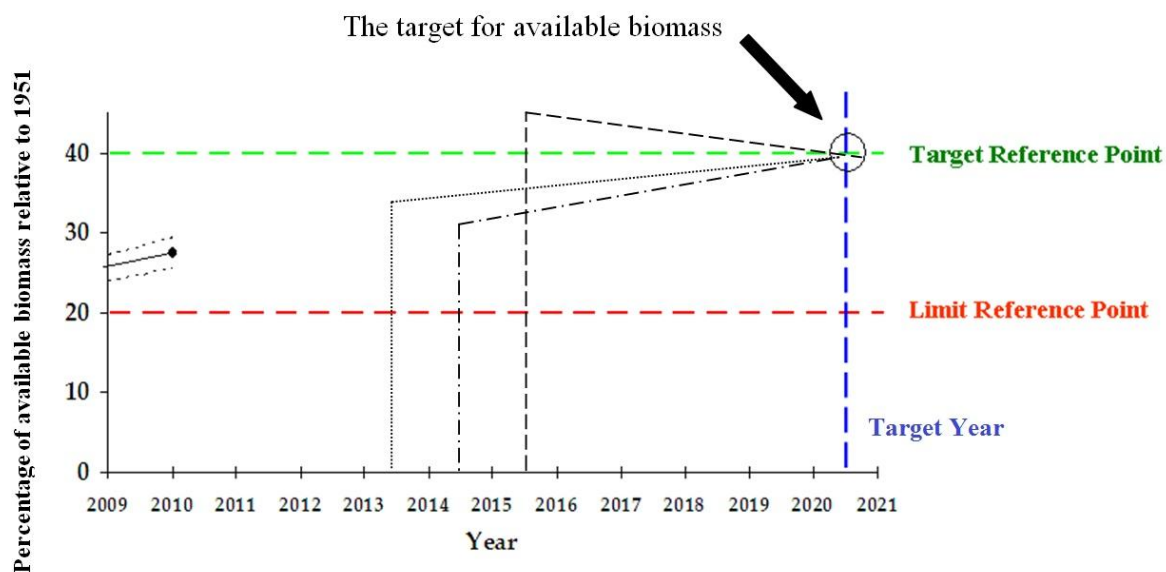


Figure 4. Proposed simplified method for determining the TACC, with hypothetical examples of trajectories for illustration purposes only.

Under this simplified arrangement, the TACC for an upcoming season would be derived from the estimated current available biomass and the time series of similar TACCs required to achieve the target by a specified year. This output from the model can be recalculated each year following the stock assessment.

Currently, the timeframe to achieve the target is ten years (that is, by the end of the 2020/21 fishing season). Fisheries Victoria requested the inclusion of an option to rebuild stocks within a five-year timeframe; under the simplified decision rules this can now be calculated without the need to alter the decision rule framework<sup>1</sup>. It is also important to note that this approach remains the same whether the stock is below, above, or at the target prior to the target year and can operate irrespective of future recruitment pulses or slumps.

### The Decision Rules

The current Decision Framework is made up of six levels (Figure 2). The intent of the hierarchical approach commencing with spawning biomass (now replaced with egg production) and stepping down to available biomass was considered appropriate, as was the aim of the management response if egg production falls below the limit reference point.

With the recommendation to simplify the concept of the biomass build rate to instead be the Plan's available biomass target, the decision rule for the available biomass simply becomes '**Is the available biomass at the target reference point?**' This also generates much simpler management responses:

- if the current available biomass is above or below the target, the TACC is set so that that the target is reached within the timeframe, or
- if the current available biomass is at the target, a TACC is set that maintains the target reference point.

The RAG highlighted that as the year that the decision rule was applied approached the 2020/21 reference year, there was a greater probability large changes in TACCs may result to achieve only minor changes in relative stock abundance. This situation should be avoided.

<sup>1</sup> Note, the shorter timeframe would only be implemented with industry support.



Conducting a review well before 2020/21 of either the decision rule or the reference year, would address this issue.

If triggered, the next two levels of the current Decision Framework (standardised CPUE and TACC caught) terminate in the action “**Review the need for a TACC reduction**”. This is not a clearly defined action and does not describe a definitive outcome and therefore does not achieve the intent of the decision framework to provide predetermined responses.

The RLRAG also noted that standardised CPUE is a major input into the stock assessment model that has a large bearing on the outcome of the assessment and was concerned that the use of standardised CPUE as an additional indicator was redundant and a backward step after considerations of model outputs.

The RLRAG did consider, however, that there was a legitimate place for consideration of raw CPUE as an indicator. Industry members have repeatedly stated that raw CPUE has been a reasonably good indicator of stock status over the history of the fishery and RLRAG members noted that this is the prime indicator used in the South Australian rock lobster harvest strategy.

It was also acknowledged that both the egg production and available biomass indicators are derived entirely from the stock assessment model. Use of raw CPUE was suggested as a way of bringing in a ‘reality check’ to the decision making process to compare against the outputs of the model. This check will consider raw CPUE against the estimated available biomass by determining if the trends of each over a two-year period (not just a single year) are consistent. Consistency between the two indicates that outputs of the stock assessment model are accurate. If however, the trends over two years are in conflict with each other, it has been recommended that the RLRAG re-examines the data inputs and stock assessment outputs to either explain or rectify the difference. If necessary, an alternative TACC could be recommended based on the outcomes of this analysis.

The current Decision Framework refers to the percentage of the TACC caught in the previous year. This not considered to be an appropriate indicator to use in the TACC-setting process. The stock assessment model explicitly uses actual catch as an input, not the TACC. Further, there are a number of economic and logistical reasons that have the potential to impact on the percentage of the TACC taken and these issues should not necessarily impact on the TACC set for the following year. If the lack of catch is associated with stock issues, it will be apparent through either the stock assessment or the raw CPUE indicator.

The final (sixth) level of the Decision Framework refers again to the build rate and the standardised CPUE, consequently it has been recommended that this also be removed.

The proposed revised Decision Framework is at Figure 5.

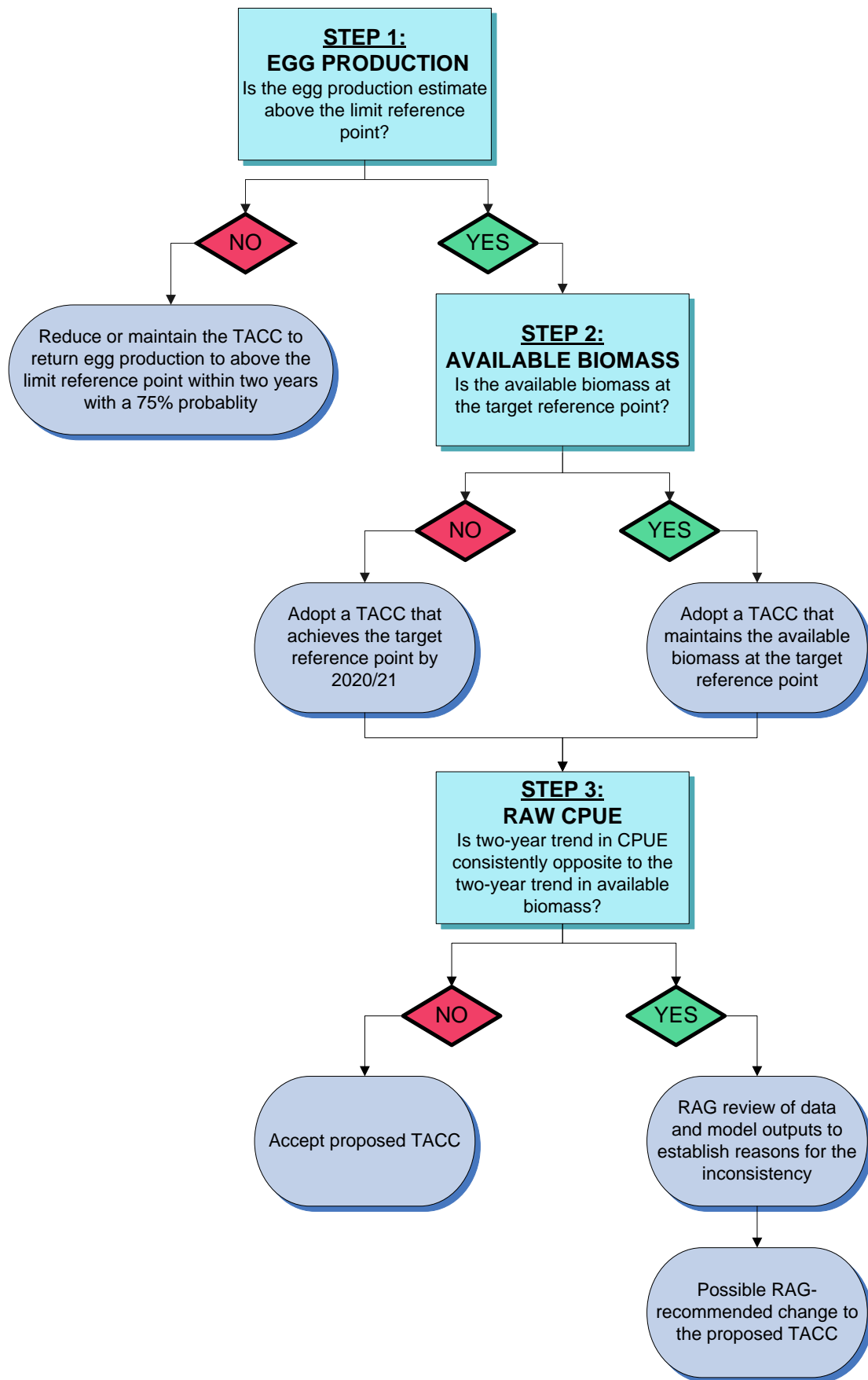


Figure 5. The proposed revised Decision Framework to be used to set the TACC for Victoria's Rock Lobster Fishery

Table 1: Results of the review of performance indicators and reference points in the Victorian Rock Lobster Fishery Management Plan

<b>Performance Indicator</b>	<b>2009 Management Plan</b>	<b>Recommended Change</b>	<b>Rationale</b>
Reference year	1951	2001	The time series of catch data began in 1951 however the robustness of this early data is limited and may affect the resultant model projections. Data from 2001 onwards represents the introduction of quota and therefore more stringent catch and effort recording. All catch data is still considered in the analyses of stock abundance.
Primary management strategy	Rebuild the available biomass in both zones to the target reference point of 40% of $B_{1951}$ by 2020/21	Rebuild the available biomass to the target reference point of 173% of $B_{2001}$ in the western zone and 219% of $B_{2001}$ in the eastern zone by 2020/21	The primary strategy of the 2009 MP is sound. The change reflects the modification to the reference year
Spawning biomass	The measure of the stock of mature females contributing to recruitment	The term 'egg production' will replace spawning biomass.	Egg production is used internationally as the descriptor for the reproductive status of the stock
Spawning biomass limit reference point	Above 20% of $B_{1951}$ with a 75% probability	Egg production to be no less than 35% of $B_{2001}$ in the western zone and 104% of $B_{2001}$ in the eastern zone, with 75% probability	Egg production is considered to be the critical factor in stock sustainability. The value is estimated by the model and must be kept above the limit reference point to ensure stocks are not at risk of collapse

Spawning biomass target reference point	Above 40% of $B_{1951}$ with a 50% probability	Removed	With the primary strategy of the Management Plan to achieve a target related to available biomass, and egg production protected by the limit reference point, it was considered unnecessary to have the extra complexity of another target reference point
Available biomass limit reference point	Above 20% of $B_{1951}$ with a 75% probability	Removed	The sustainability of the stocks is protected by the egg production limit reference point, therefore it was considered unnecessary to have the extra complexity of a second limit reference point
Available biomass target reference point	Above 40% of $B_{1951}$ with a 50% probability	Target reference point of 173% of $B_{2001}$ in the western zone and 219% of $B_{2001}$ in the eastern zone by 2020/21, with a 50% probability	This is the primary target of the Management Plan. The only changes reflect the recalculation to the reference year of 2001
Rebuild rate	10 years	10 years. Fisheries Victoria would like to include the option to also have a five-year rebuild rate	No change to original timeframe, but inclusion of an option to implement a faster rebuild rate if necessary
Rebuild rate window	The starting point for the window will be the biomass for the 2010/11 year and the upper and lower bounds defined by the time required to reach the 40% target between 2016 (5-year build rate) and 2020/21 (10-year build rate). The TACC will be set to ensure the projected available biomass five years into the future lies within the build rate window	Removed.	The rebuild window has caused considerable confusion and uncertainty in application and outcomes. The need for this complexity is not justified given the very simple primary strategy of the Management Plan

Rebuild rate window (cont.)	If the 5-year available biomass projection is below the build-rate window, the TACC must be set to bring the projections above the 50% build-rate within five years	Removed	This is a component of the rebuild rate window and has therefore been removed
Rebuild rate window (cont.)	If the build rate projection is above the 50% mid-point for two consecutive years, the TACC may be increased by up to 10% providing the build rate remains above the 50% line	Removed	This is a component of the rebuild rate window and has therefore been removed