Australian Government

Australian Fisheries Management Authority

Torres Strait Tropical Rock Lobster Harvest Strategy

Protected Zone Joint Authority

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Securing Australia's fishing future
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Contents

Version and date	Updates	Approver
1.0 - November 2019	First version	PZJA 33 – 19 November 2019
1.1 – December 2025	Revised empirical Harvest Control Rule (eHCR) and exceptional circumstances decision rules	PZJA – out of session

Glossary

Types of reference points:

Reference Point	Description
Metarule	A rule that describes how the RBCs obtained from an assessment should be adjusted in calculating a recommended TAC
Target	The desired state of the stock or fishery (for example, MEY or B_{TARG})[1]
Limit	The level of an indicator (such as biomass or fishing mortality) beyond which the risk to the stock is regarded as unacceptably high[1]
MEY	The sustainable catch or effort level for a commercial fishery that allows net economic returns to be maximised. In this context, maximised equates to the largest positive difference between total revenue and total cost of fishing[1]
MSY	The maximum average annual catch that can be removed from a stock over an indefinite period under prevailing environmental conditions[1]

Notation:

Notation	Description
B	Spawning biomass - the total weight of all adult (reproductively mature) fish in a population[1]
B_0	The unfished spawning biomass (determined from an appropriate reference point)
F	Fishing mortality rate
B_{LIM}	Biomass limit reference point - the point beyond which the risk to the stock is regarded as unacceptably high[1]
B_{TARG}	Biomass target reference point - the desired biomass of the stock[1]

Other acronyms:

Acronym	Description
CPUE	Catch per unit effort
CV	Coefficient of Variation

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[1] Definition sourced from the *Commonwealth Fisheries Harvest Strategy Policy: Framework for applying an evidence-based approach to setting harvest levels in Commonwealth fisheries* (June 2018)

eHCR	Empirical Harvest Control Rule
HCR	Harvest Control Rule - pre-determined rules that control fishing activity according to the biological and economic conditions of the fishery (as defined by monitoring or assessment). Also called 'decision rules'. HCR are a key element of a harvest strategy1
HSP	*Commonwealth Fisheries Harvest Strategy Policy: Framework for applying an evidence-based approach to setting harvest levels in Commonwealth fisheries* (June 2018)
HS	Torres Strait Tropical Rock Lobster Fishery Harvest Strategy
PZJA	Protected Zone Joint Authority
MSE	Management Strategy Evaluation - a procedure whereby alternative management strategies are tested and compared using simulations of stock and fishery dynamics1
RBC	Recommended Biological Catch
TRLRAG	Protected Zone Joint Authority Tropical Rock Lobster Resource Assessment Group
TRLWG	Protected Zone Joint Authority Tropical Rock Lobster Working Group
TAC	Total Allowable Catch- the annual catch limit set for a stock, species or species group. Used to control fishing mortality within a fishery1
Tiered approach	A framework that uses different control rules to cater for different levels of uncertainty about a stock
TIB	Traditional inhabitant boat
TVH	Transferrable vessel holder
TRL	Tropical Rock Lobster

Overview

The Torres Strait Tropical Rock Lobster Fishery (the Fishery) Harvest Strategy (HS) sets out the management actions needed to achieve the agreed Fishery objectives. The Fishery HS describes the performance indicators used for monitoring the condition of the stock, the fishery-independent survey and stock assessment procedures and the rules applied to determine the recommended biological catch (RBC) and the total allowable catch (TAC) each fishing season.

The HS uses a single tier approach with an empirical harvest control rule (eHCR) that is used to determine a RBC. The eHCR uses the pre-season survey index of abundance of juvenile (1+) and newly recruited (0+) Tropical Rock Lobster (TRL) and the catch per unit effort (CPUE) indices for the traditional inhabitant boat (TIB) and transferrable vessel holder (TVH) fishing sectors. The RBC is the best available scientific advice on what the total fishing mortality (landings from all sectors and discards) should be for the stock. The RBC is used to negotiate Australia-Papua New Guinea catch sharing and recommend TACs (an enforced limit on total catches).

The HS meets the requirements of the *Commonwealth Fisheries Harvest Strategy Policy: Framework for applying an evidence-based approach to setting harvest levels in Commonwealth fisheries* (June 2018) *(*HSP) by applying a precautionary approach to the reference points and measures to be implemented in accordance with the reference points. This is reflected in the use of proxy reference points that are more precautionary than those specified in the HSP. The eHCR is designed to decrease exploitation rate as the stock size decreases below the target reference point. The HS uses a biomass target reference point equal to recent levels (2005-2015) that take account of the fact that the resource is shared and important for the traditional way of life and livelihood of traditional inhabitants and is biologically and economically acceptable. The HS proxies are B_{LIM} is 32% of B_0, B_{TARG} is 65% of B_0.

Further work for the HS will include the development of a tiered approach. The tiered approach applies different types of control rules to cater for different amounts of data available and to account for changes to uncertainty on stock status. A tiered approach adopts increased levels of precaution that correspond to increasing levels of uncertainty about the stock status, in order to maintain the same level of risk across the different tiers.

The status of the stock and how it is tracking against the HS, is reported to the Tropical Rock Lobster Resource Assessment Group (RAG), Tropical Rock Lobster Working Group (TRLWG) and the Protected Zone Joint Authority (PZJA). The stock assessment is conducted periodically to evaluate stock status relative to reference levels and, in doing so, performance of the eHCR. The stock assessment includes considerations of the catch rates in current and previous fishing seasons, how the catches compare to the RBCs, stock status indicators in relation to the reference points and an RBC for the upcoming fishing season.

1　Background

This Torres Strait Tropical Rock Lobster Fishery (the Fishery) Harvest Strategy (HS) has been developed in accordance with the *Commonwealth Fisheries Harvest Strategy Policy: Framework for applying an evidence-based approach to setting harvest levels in Commonwealth fisheries* (June 2018) (HSP) and consistent with objectives of the *Torres Strait Fisheries Act 1984* (the Act).

The Fishery HS takes into account key fishery specific attributes including:

a) there is potential for large, unpredictable inter-annual variations in availability and abundance of Tropical Rock Lobster (TRL);

b) TRL is a shared resource important for the traditional way of life and livelihood of traditional inhabitants, commercial and recreational sectors (Tropical Rock Lobster Resource Assessment Group (TRLRAG) 20, 4-5 April 2017); and

c) advice from the TRLRAG industry members to maintain stock abundance at recent levels (2005-2015) (TRLRAG 17, 31 March 2016).

1.1 Commonwealth Fisheries Harvest Strategy Policy

The objective of the HSP is the ecologically sustainable and profitable use of Australia's Commonwealth commercial fisheries resources (where ecological sustainability takes priority) - through implementation of harvest strategies.

To pursue this objective the Australian Government will implement harvest strategies that:

a) ensure exploitation of fisheries resources and related activities are conducted in a manner consistent with the principles of ecologically sustainable development, including the exercise of the precautionary principle

b) maximise net economic returns to the Australian community from management of Australian fisheries - always in the context of maintaining commercial fish stocks at sustainable levels

c) maintain key commercial fish stocks, on average, at the required target biomass to produce maximum economic yield from the fishery

d) maintain all commercial fish stocks, including byproduct, above a biomass limit where the risk to the stock is regarded as unacceptable (B_{LIM}), at least 90 per cent of the time

e) ensure fishing is conducted in a manner that does not lead to overfishing - where overfishing of a stock is identified, action will be taken immediately to cease overfishing

f) minimise discarding of commercial species as much as possible

g) are consistent with the *Environment Protection and Biodiversity Conservation Act 1999* and the *Guidelines for the Ecologically Sustainable Management of Fisheries*.

For fisheries that are managed jointly by an international organisation or arrangement, the HSP does not prescribe management arrangements. This includes management arrangements for commercial and traditional fishing in the Torres Strait Protected Zone, which are governed by provisions of the Torres Strait Treaty and the *Torres Strait Fisheries Act 1984*. However, it does articulate the government's preferred approach.

The HSP provides for the use of proxy settings for reference points to cater for different levels of information available and unique fishery circumstances. This balance between prescription and flexibility encourages the development of innovative and cost-effective strategies to meet key policy objectives. Proxies, including those that exceed the minimum standards, must be demonstrated to be compliant with the HSP objective.

With a harvest strategy in place, fishery managers and stakeholders are able to operate with pre-defined rules, management decisions are more transparent, and there are likely fewer unanticipated outcomes necessitating hasty management responses. However, due to the inherently natural variability of TRL abundance there may be a need for significant changes in recommended catch on an annual basis.

1.2 Development of the TRL Harvest Strategy

The HS was developed in consultation with the TRLRAG (meeting no. 17 on 31 March 2016; meeting no. 18 on 2-3 August 2016; meeting no. 19 on 13 December 2016; meeting no. 20 on 4-5 April 2017; meeting no. 22 on 27-28 March 2018; meeting no. 24 on 18-19 October 2018; and meeting no. 25 on 11-12 December 2018; out of session 16 September-9 October 2019) and TRLWG (meeting no. 6 on 25-26 July 2017; meeting no. 9 on 19-20 February 2019; out of session 16 September-9 October 2019). This HS replaces the interim HS developed for the Fishery in 2008.

The HS (the eHCR and Decision Rules) was revised in 2025, in consultation with TRLRAG 37 (9 October 2024), TRLRAG 38 and TRLWG 17 (10-12 December 2024) and TRLRAG 40 and TRLWG 18 (2-3 October 2025).

2 The TRL Harvest Strategy

2.1 Scope

This HS applies to the whole Fishery and it takes into account catch sharing arrangements between Australia and Papua New Guinea (PNG).

The HS outlines the control rules used to develop advice on the recommended biological catch (RBC) and to recommend total allowable catches (TACs) (an enforced limit on total catches). The HS sets the criteria that pre-agreed management decisions will be based on in order to achieve the HS objectives.

Over time the HS may be amended to use a tiered approach to cater for different amounts of data available and different types of assessments (for example mid-season surveys and annual assessments). Underpinning a tiered HS is increased levels of precaution with increasing levels of uncertainty about the stock status. Each tier has its own harvest control rule (HCR) and associated rules that are used to determine an RBC.

2.2 Objectives

The operational objectives of the HS are to:

a) Maintain the stock at (on average), or return to, a target biomass point B_{TARG} equal to recent levels (2005-2015) that take account of the fact that the resource is shared and important for the traditional way of life and livelihood of traditional inhabitants and is biologically and economically acceptable.

- o The agreed B_{TARG} is more precautionary than the default proxy B_{MEY} (biomass at maximum economic yield) level as outlined in the HSP.

b) Maintain the stock above the limit biomass level (B_{LIM}), or an appropriate proxy, at least 90 per cent of the time.

- o The agreed B_{LIM} is more precautionary than the default proxy HSP B_{LIM}.

c) Implement rebuilding strategies, if the spawning stock biomass is assessed to fall below B_{LIM} in two successive years.

2.3 Recommending TACs from RBCs

The RBC is the recommended total catch of TRL (both retained and discarded) that can be taken by all sectors within the TSPZ and waters declared as areas outside but near to the TSPZ, including Australian and PNG fishers. The HSP states that when setting the TAC for the next fishing season the HS should take into account all sources of fishing mortality.

The HS does not include catches taken by non-commercial fishing sectors, for example traditional, recreational or research catches. The TRLRAG recommended at meeting no. 18 on 2-3 August 2016 that non-commercial catches not be estimated in the stock assessment model or when setting the TAC at this time, noting the likely low level of overall catch and the lack of accurate data. However, if unaccounted fishing mortality were to increase significantly this may impact on the performance of the stock assessment. The HS may be updated in the future to account for changing circumstances in the Fishery, the review provisions are described in **Section 2.13**.

2.4 Monitoring

Biological data for the Fishery are monitored by a range of methods listed below. Currently there is no ongoing monitoring strategy in place to collect economic information.

Fishery independent surveys

A key component of the monitoring program is the fishery independent survey which provides a timeseries of relative abundance indices for TRL. Fishery independent surveys have been conducted in the Fishery since 1989. Historically (1989-2014 and 2018), midseason (July) surveys focused on providing an index of abundance of the spawning (age 2+) and juvenile (age 1+) lobsters. Mid-season surveys have been replaced with preseason (November) surveys (2005-2008; 2014 to current) which focus on providing an index of recruiting (age 1+) lobsters as close as possible to the start of the fishing season to support the transition to quota management and setting of a TAC. Pre-season surveys also provide indices of recently-settled (age 0+) lobsters, which may become useful under quota management as they allow forecasting of stock one year in advance and are used in the eHCR.

Catch and effort information

Fishers in the transferrable vessel holder (TVH) sector are required to record catch and effort information in the Torres Strait Tropical Rock Lobster Daily Fishing Log (TRL04). The following

data are recorded for each TVH fishing operation: the port and date of departure and return, fishing area, fishing method, hours fished and the weight (whole or tails) of TRL retained. Fishers in both the TVH and traditional inhabitant boat (TIB) sectors are required to record catch information in the Torres Strait Fisheries Catch Disposal Record (TDB02). The provision of effort information under the TDB02 is voluntary. Some processors previously (2014-2016) reported aggregate TIB catch information directly to AFMA predominantly through the Torres Strait Seafood Buyers and Processors Docket Book (TDB01).

2.5 Integrated stock assessment model

The stock assessment model (termed the 'Integrated Model') (Plagányi *et al.* 2009) was developed in 2009 and is an Age-Structured Production Model, or Statistical Catch-at-Age Analysis (SCAA) (e.g. Fournier and Archibald 1982). It is a widely used approach for providing RBC advice and the associated uncertainties.

The model integrates all available information into a single framework to assess resource status and provide an RBC. The model addresses all of the concerns highlighted in a review of the previous stock assessment approach (Bentley 2006, Ye *et al*. 2006, 2007). The model is fitted to the midseason and preseason survey data and TIB and TVH catch per unit effort (CPUE) data. The growth relationships used in the model were revised from the previous stock assessment model (Ye *et al*. 2006) to ensure that the modelled individual mass at age more closely resembled field measurements. The model has been used as an Operating Model in a Management Strategy Evaluation (MSE) framework to support the management of the Fishery (Plagányi *et al.* 2012, 2013, 2018, 2025).

The stock assessment model is non-spatial and assumes (conservatively) that the Torres Strait Tropical Rock Lobster Fishery stock is independent of the Queensland East Coast Tropical Rock Lobster Fishery stock. A spatial version of the model has been developed as part of an earlier MSE project, and can be used to investigate plausible linkages between these stocks (Plagányi *et al*. 2012, 2013).

The model includes three age-classes only (0+, 1+ and 2+ age lobsters) as it is assumed that lobsters migrate out of the Torres Strait in October each year. Torres Strait TRL emigrate in spring (September-November) and breed during the subsequent summer (November-February) (MacFarlane and Moore 1986; Moore and Macfarlane 1984). A Beverton-Holt stock-recruitment relationship is used (Beverton and Holt 1957), allowing for annual fluctuation about the average value predicted by the recruitment curve. The model is fitted to the available abundance indices by maximising the likelihood function. Quasi-Newton minimisation is used to minimise the total negative log-likelihood function (using the package AD Model Builder[TM]) (Fournier *et al*. 2012).

2.6 Empirical harvest control rule (eHCR)

The 2025 revised empirical harvest control rule (eHCR) (the Osprey rule) uses the pre-season survey 1+ and 0+ indices, both standardised CPUE indices (TVH and TIB), applies a tuning parameter of 619 and a term based on the most recent pre-season 1+ survey and its precision, with the cubed-root applied to this last term to dampen its influence relative to the longer-term trend information. The RBC is scaled up or down based on

(i) the most recent Pre-season survey 1+ index in year y $\left(S_y^{presurv,1}\right)$, relative to the long-term (2005-2023) median reference level $\left(\overline{S}^{presurv,1}\right)$; and

(ii) inversely proportional to the exponential of $CV_y^{presurv,1}$, the coefficient of variation of the most recent 1+ survey in year y (survey standard error divided by survey observed index value). Using the cubed root of this term dampens the variability of its influence on the RBC so that it does not overly dominate relative to the longer-term trend information.

This is paired with an upper catch limit of 1000 tonnes and a lower limit of 300 tonnes.

The relative weightings of the eHCR indices are 70 per cent pre-season survey 1+ index, 10 per cent pre-season survey 0+ index, 10 per cent TIB sector standardised CPUE and 10 per cent TVH sector standardised CPUE.

The basic formula is:

$$RBC_{y+1}^{osprey} = \left[0.7\cdot\left(1+s_y^{presurv,1}\right)+0.1\cdot\left[\left(1+s_y^{presurv,0}\right)+\left(1+s_y^{CPUE,TVH}\right)+\left(1+s_y^{CPUE,TIB}\right)\right]\right]\cdot SSC_y * C^{tune}$$

and:
$$SSC_y = \left(\left(\frac{s_y^{presurv,1}}{\overline{S}^{presurv,1}}\right)\Big/\exp\left(CV_y^{presurv,1}\right)\right)^{1/3}$$

or if

$$RBC_{y+1} > 1000 \ then \ RBC_{y+1} = 1000$$

$$RBC_{y+1} < 300 \ then \ RBC_{y+1} = 300$$

where:

$s_y^{presurv,1}$	is the slope of the logarithms of the preseason survey 1+ abundance index, based on the 5 most recent values;
$s_y^{presurv,0}$	is the slope of the logarithms of the preseason survey 0+ abundance index, based on the 5 most recent values;
$s_y^{CPUE,TVH}, s_y^{CPUE,TIB}$	is the slope of the logarithms of the TVH and TIB CPUE abundance index, based on the 5 most recent values;
0.7, 0.1	are tuning parameters
$S_y^{presurv,1}$	most recent Pre-season survey 1+ index in year y
$CV_y^{presurv,1}$	the coefficient of variation of the most recent 1+ survey in year y (survey standard error divided by survey observed index value).
$\overline{S}^{presurv,1}$	the long-term (2005-2023) median pre-season survey reference level

2.7 Reference Points

The HS reference points are:

a) The unfished biomass B_0 is the model-estimate of spawning stock biomass in 1973 (start of the Fishery). $B_0 = B_{1973}$.

b) The target biomass B_{TARG} is the spawning biomass level equal to recent levels (2005-2015) that take account of the fact that the resource is shared and important for the traditional way of life and livelihood of traditional inhabitants and is biologically and economically acceptable. B_{TARG} is the proxy for B_{MEY}, $B_{TARG} = 0.65 B_0$.

   o The agreed B_{TARG} is more precautionary than the default proxy B_{MEY} (biomass at maximum economic yield) level as outlined in the HSP. The TRLRAG noted a B_{TARG} higher that the HSP default was considered important for the Fishery because: 1) the stock is a shared resource that is particularly important for traditional fishing; 2) the stock has high variability; and, 3) all industry members recommended the HS maintain the stock around the relatively high current levels (TRLRAG meeting no. 17, 31 March 2016 and meeting no. 18, 2-3 August 2016).

c) The limit biomass B_{LIM} is the spawning biomass level below which the risk to the stock is unacceptably high and the stock is defined as 'overfished'. B_{LIM} is agreed to be half of B_{TARG}, $B_{LIM} = 0.32 B_0$.

   o The agreed B_{LIM} is more precautionary than the default proxy HSP B_{LIM}.

d) If the limit reference point (B_{LIM}) is triggered in two successive years, then the Fishery is closed.

e) The target fishing mortality rate F_{TARG} is the estimated level of fishing mortality rate that maintains the spawning biomass around B_{TARG}. $F_{TARG} = 0.15$.

   o $F_{TARG} = 0.15$ is the target fishing mortality rate that corresponds to an optimal level in terms of economic, biological and social considerations (TRLRAG meeting no. 18, 2-3 August 2016).

Rationale for reference points

The HSP recognises that each stock/species/fishery will require an approach tailored to the fishery circumstances, including species characteristics. The HSP identifies that the selection of reference points within harvest strategies need to be realistic with respect to the scale or nature of the fishery and the resources available to manage it. Reference points should be set at levels appropriate to the biology of the species and the proper functioning of the broader marine ecosystem. Further, stocks that fall below B_{LIM} will be subject to the recovery measures stipulated in the HSP. A number of adaptive management approaches may be used to deal with this, such as pre-season surveys to provide estimates of abundance to which the eHCR is applied.

The Fishery is characterised by a highly variable stock where majority of the catch (since 2001 due to the introduction of a minimum size limit) is from a single cohort. The stock assessment model and MSE testing have identified the target biomass should be set between 65 and 80 per cent of the unfished biomass to account for the importance of the stock for the traditional way of life and

livelihood of traditional inhabitants and to achieve biological and economic objectives. The HS's higher average target biomass level, compared to the default HSP target of 0.48 per cent of unfished biomass, reduces the risk of recruitment being compromised.

The unfished biomass (B_0) is calculated within the stock assessment model; the value of unfished biomass and target biomass have therefore varied over time in response to annual data updates and model parameter settings and estimates. Estimates of unfished biomass and target biomass are particularly sensitive to changes to parameter *h*, which determines the steepness of the stock-recruit relationship, and the input parameter that controls the level of stock-recruit variability.

Independent of variability to the unfished biomass value, the target fishing mortality rate F_{TARG} = 0.15 is applied to maintain the spawning biomass around the biomass target reference point (B_{TARG}), which is the average level over the past two decades. This is assumed to be a proxy for B_{MEY} because stakeholders agreed that this target level corresponded to an optimal level in terms of economic, biological and social considerations (TRLRAG meeting no. 18, 2-3 August 2016).

The biomass limit reference point (B_{LIM}) is 32 per cent of unfished biomass. The higher limit reference point, compared to the HSP proxy of 20 per cent of unfished biomass, is supported by recommendations of similar limit reference points for other highly variable species such as forage fish (Pikitch *et al.* 2012). Due to the changing values of unfished biomass and target biomass the value of the limit reference point, taken as half the target reference point, has previously varied between 32 and 40 per cent of unfished biomass.

Recent MSE testing identified that a limit reference point of 40 per cent unfished biomass is too conservative, it would result in the limit reference point being breached more frequently and add unnecessary precaution to the HS. The TRLRAG agreed to set the limit reference point at 32 per cent of unfished biomass with the condition that if the stock falls below the limit reference point in two successive years it triggers a Fishery closure. The eHCR is more precautionary than the HSP criterion to 'maintain all commercial fish stocks, including byproduct, above a biomass limit where the risk to the stock is regarded as unacceptable (B_{LIM}), at least 90 per cent of the time'. The HSP provides for the designation of a limit reference point above the proxy (B_{20}) where this has been estimated or is deemed appropriate.

2.8 eHCR and stock assessment cycle

The eHCR and stock assessment cycle is as follows:

- A start-of-season TAC of 200 tonnes is determined before the commencement of the fishing season on 1 December.

- The eHCR is run in early December each year to provide an RBC for that fishing season.

- A stock assessment is run on a three-year cycle by March, unless the stock assessment is triggered by a decision rule **(Section 2.10)**. The stock assessment determines the Fishery stock status and evaluates the performance of the eHCR and identifies if any revisions to the eHCR are required.

- If the eHCR needs to be revised, the stock assessment is conducted annually to estimate the RBC until the revised eHCR is agreed.

2.9 Data summary

The annual data summary reviews the nominal and standardised CPUE from the TIB and TVH sectors, as well as total catch from all sectors, the size-frequency information provided from a sub-sample of commercially caught TRL and the fishery-independent survey indices of 0+ and 1+ age lobsters. The data summary is used as an indicator to identify if catches correspond to the RBC, and to monitor CPUE.

2.10 Decision Rules

The decision rules for the HS are:

Maximum catch limit

- The eHCR includes a maximum catch limit of 1000 tonnes.

Minimum catch limit

- The eHCR includes a minimum catch limit of 300 tonnes.

Pre-season survey trigger

- If in any year the pre-season survey 1+ index is 1.25 or lower (average standardised number of 1+ age lobsters per survey transect) it triggers a stock assessment.

Biomass limit reference point triggered

- If the pre-season survey trigger is triggered in the first year, a stock assessment update must be conducted in March.

  o If after the first year the stock is assessed below the biomass limit reference point, it is optional to conduct a mid-season survey, the pre-season survey must continue annually.

- If the pre-season survey trigger is triggered two years in a row, a stock assessment must be conducted in December (of the second year).

Fishery closure rules

- If the stock assessment determines the stock to be below the biomass limit reference point in two successive years, the Fishery will be closed to commercial fishing.

  o MSE testing of the eHCR has shown that it is extremely unlikely (<1%) for the Fishery to be closed based on its current performance (Plagányi *et al.* 2018).

Re-opening the Fishery

- Following closure of the Fishery, fishery-independent mid-season and pre-season surveys are mandatory. The Fishery can only be re-opened when a stock assessment determines the Fishery to be above the biomass limit reference point **(Attachment A, Figure 5)**.

Based on the decision rules, there are four alternative possible scenarios **(Section 2.11)** that may occur under the application of the eHCR. Graphic representations of the four scenarios are provided in **Attachment A**.

Exceptional circumstances

If there are no updated data from the most recent fishing season to inform setting an RBC (for example, unable to undertake the pre-season survey), the TAC must be set at 300 tonnes with any follow up action to be determined as soon as practicable by the RAG or PZJA Standing Committee. This is consistent with the precautionary approach that dictates that a precautionary, low TAC should be set that accounts for the greater uncertainty of not using updated indicators of stock status.

2.11   Decision rule scenarios

Scenario 1 – Pre-season survey trigger not triggered and the eHCR does not require revision

- The pre-season survey trigger is not triggered.

- The eHCR RBCs appear to remain within ranges tested by MSE.

- The updated stock assessment does not indicate any need for revision of the eHCR.

- Application of the eHCR continues unchanged.

- A graphic representation of Scenario 1 is provided in **Attachment A, Figure 1**.

Scenario 2 – Pre-season survey trigger not triggered, eHCR and stock assessment require revision

- The pre-season survey trigger is not triggered.

- The eHCR RBCs appear to remain within ranges tested by MSE.

- The updated stock assessment indicates the eHCR recommended RBCs are outside the revised ranges tested by MSE, indicating that the eHCR should be revised.

- Annual RBCs need to be set using annual stock assessments until a revised eHCR has been agreed, after which the revised eHCR is applied.

A graphic representation of Scenario 2 is provided in **Attachment A, Figure 2**.

Scenario 3– Pre-season survey trigger is triggered, eHCR is reviewed by stock assessment and the biomass limit reference point is not breached

- The pre-season survey trigger is triggered in one year.

- A stock assessment update (March) is required to confirm if the biomass limit reference point has been breached. This assessment update determines that the biomass limit reference point has not been breached.

- If the biomass limit reference point is breached once, discussions will be held on preventative measures to reduce the risk of closure.

- The eHCR RBC is applied and consideration is given to revising the eHCR to prevent future incorrect indications that the biomass limit reference point may have been breached.

- The stock assessment continues on a three-year cycle, unless triggered to occur by a decision rule.

- A graphic representation of Scenario 3 is provided in **Attachment A, Figure 3**.

Scenario 4 – Pre-season survey trigger is triggered, stock assessment confirms the biomass limit reference point is breached

- The pre-season survey trigger is triggered in one year.

- A stock assessment update (March) is required to confirm if the biomass limit reference point has been breached. This assessment update determines that the biomass limit reference point has been breached.

- The pre-season survey trigger is triggered for a second successive year.

- A second stock assessment update (December) is required to confirm whether the biomass limit reference point has been breached a second time. This assessment update determines that the biomass limit reference point has been breached a second time.

- The commercial fishery is closed until an assessment update confirms that the stock has recovered to above the biomass limit reference point.

  - If the Fishery is closed to commercial fishing, discussions are held on future management arrangements.
  - Fishery-independent mid-season and pre-season surveys are mandatory and conducted on an annual basis. The Fishery will only re-open when the Fishery is assessed to be above the biomass limit reference point by the stock assessment.
  - The eHCR must be revised before being re-implemented to reduce the risk of the Fishery breaching the biomass limit reference point and for the eHCR to incorporate rebuilding requirements.

- A graphic representation of Scenario 4 is provided in **Attachment A, Figure 4**.

2.12 Governance

The status of the Fishery and how it is tracking against the HS is reported to the TRLRAG, TRLWG and the PZJA as part of the yearly RBC and TAC setting process.

2.13 Review

Harvest strategies are to be reviewed every five years. However, it may be necessary to amend harvest strategies earlier if:

- a marked change in stocks targeted occurs, leading to a change in which stocks are categorised as key commercial

- new information substantially changes understanding of the fishery, leading to revised estimates of indicators relative to reference points

- external drivers have unexpectedly increased the risk to a fishery and fish stocks, including environmental or climate drivers that have substantially altered the productivity characteristics (growth or recruitment) of the stock

- performance indicators show that harvest strategies are not working effectively, and that the intent of the HSP is not being met.

Early review may be triggered when either:

- harvest strategies are implemented without formal testing or evaluation using methods such as MSE

- MSE testing did not take adequate account of the changes in risk factors subsequently observed, or

- subsequent estimates of the performance indicators used in the HCR are biased or uncertain to the extent that application of the control rule using these indicators fails to appropriately adjust fishing pressure.

3 References

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Attachment A – Alternative annual harvest control rule application scenarios

(Figure 1) Decision rule scenario 1
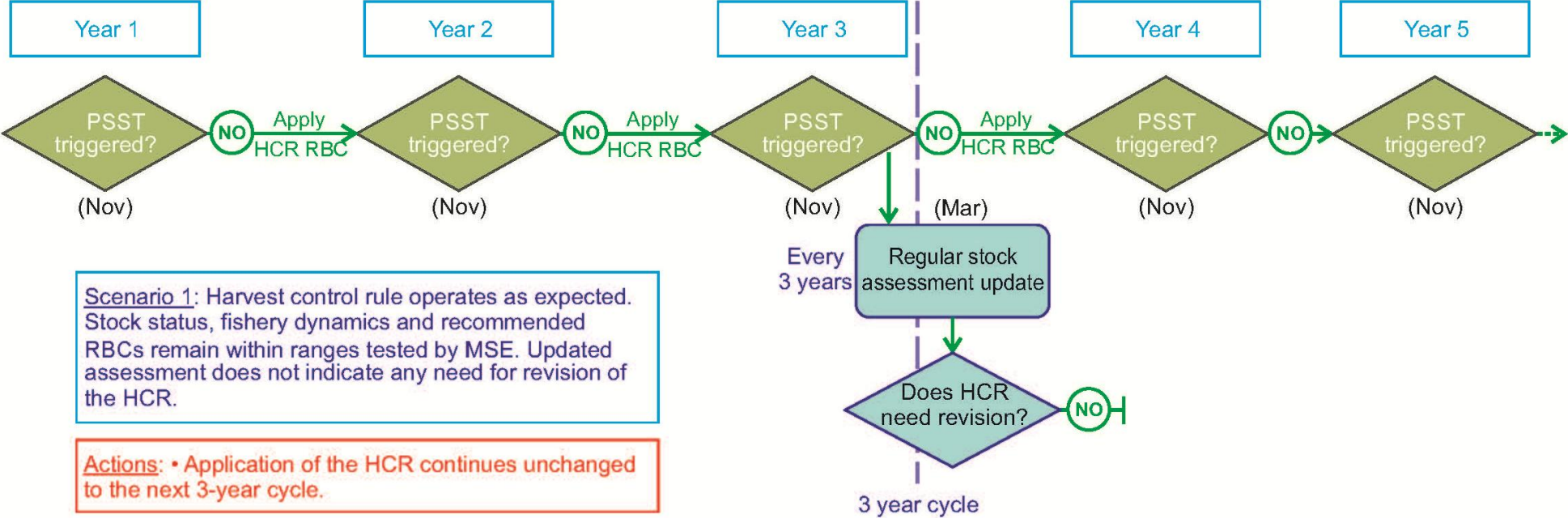
(Figure 2) Decision rule scenario 2
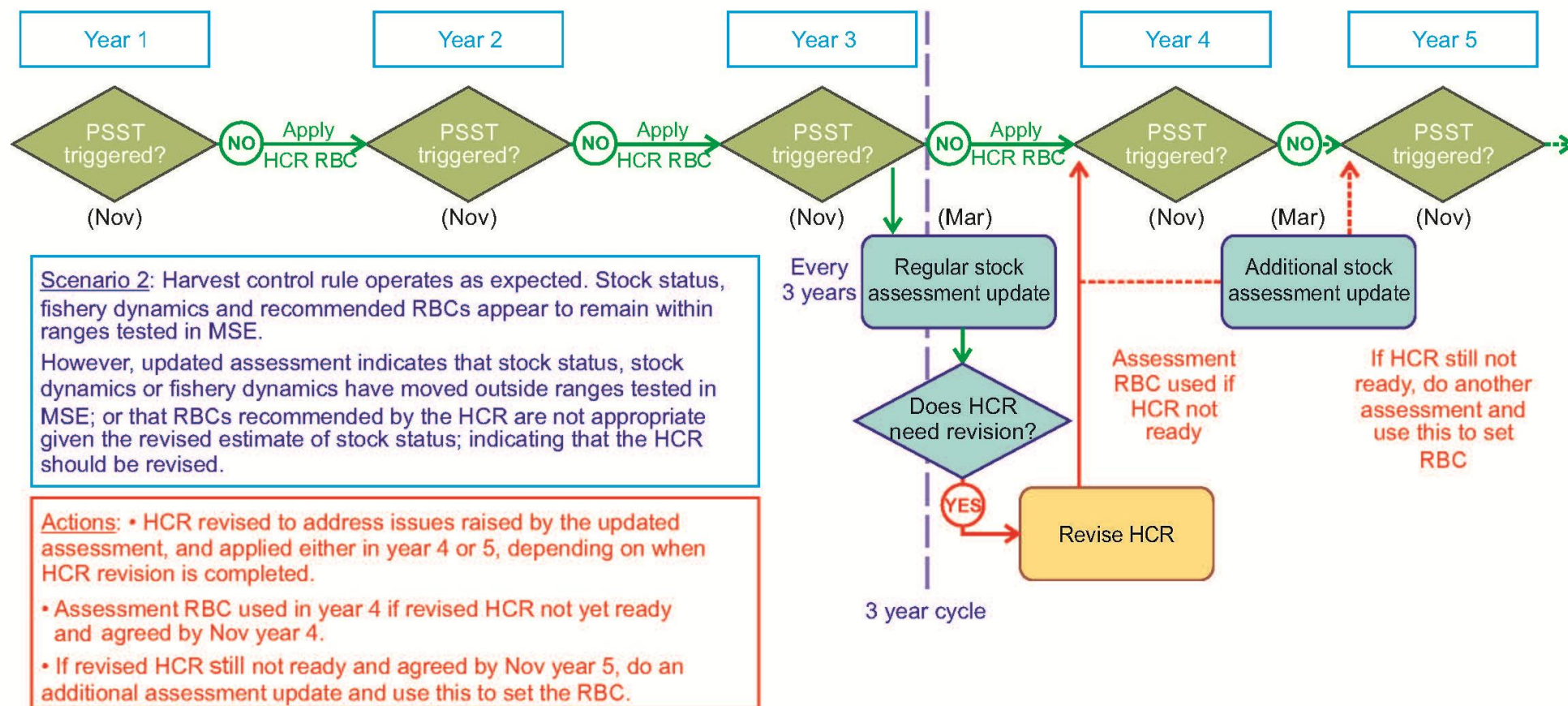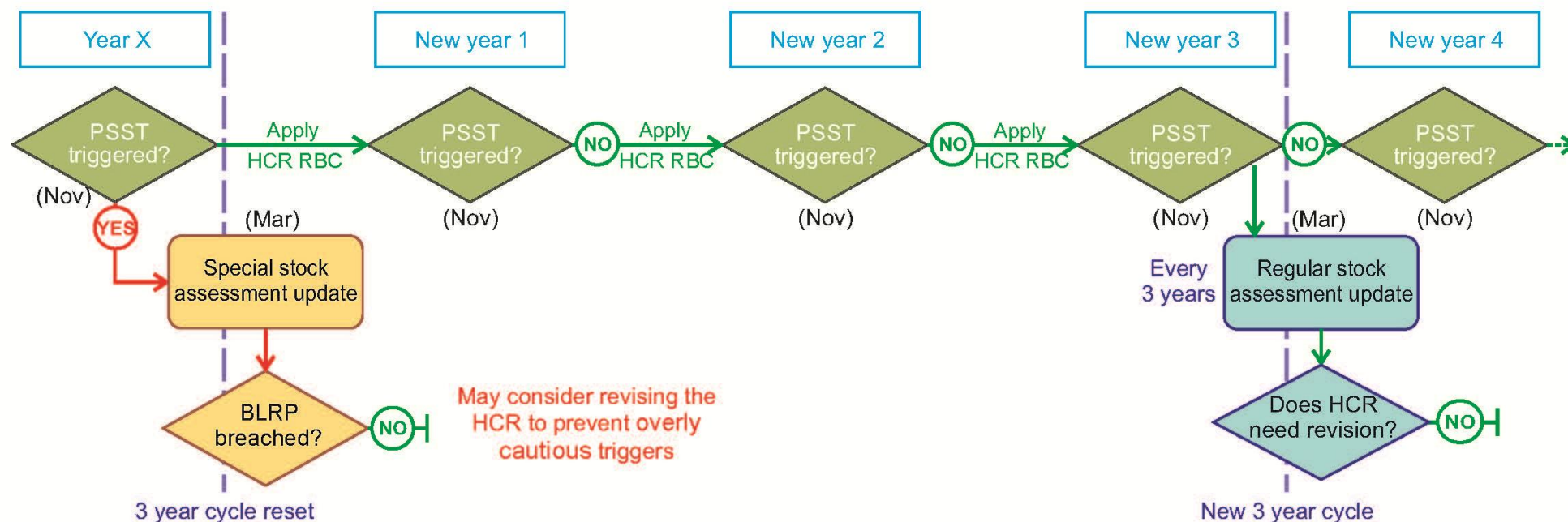
| Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |

PSST triggered? —NO→ Apply HCR RBC — PSST triggered? —NO→ Apply HCR RBC — PSST triggered? —NO→ Apply HCR RBC — PSST triggered? —NO→ PSST triggered?

(Nov)   (Nov)   (Nov)   (Mar)   (Nov)   (Mar)   (Nov)

Scenario 2: Harvest control rule operates as expected. Stock status, fishery dynamics and recommended RBCs appear to remain within ranges tested in MSE.

However, updated assessment indicates that stock status, stock dynamics or fishery dynamics have moved outside ranges tested in MSE; or that RBCs recommended by the HCR are not appropriate given the revised estimate of stock status; indicating that the HCR should be revised.

Actions: • HCR revised to address issues raised by the updated assessment, and applied either in year 4 or 5, depending on when HCR revision is completed.

• Assessment RBC used in year 4 if revised HCR not yet ready and agreed by Nov year 4.

• If revised HCR still not ready and agreed by Nov year 5, do an additional assessment update and use this to set the RBC.

Notes: PSST means the pre-season survey trigger.

Every 3 years — Regular stock assessment update

Does HCR need revision? — YES → Revise HCR

3 year cycle

Additional stock assessment update

Assessment RBC used if HCR not ready

If HCR still not ready, do another assessment and use this to set RBC
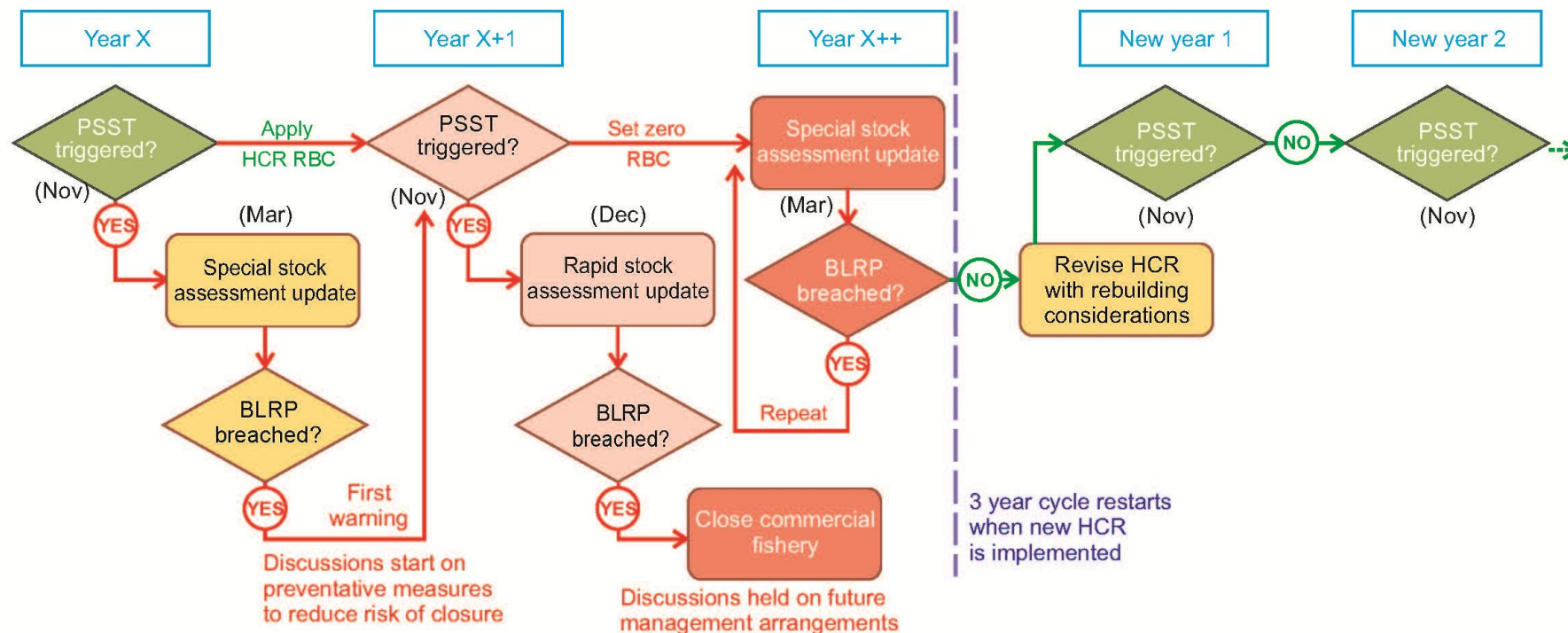
(Figure 3) Decision rule scenario 3

Scenario 3: Application of the HCR in a particular year results in the PSST being triggered, requiring a special assessment update to confirm whether the BLRP has been breached. However, this assessment update determines that the BLRP has not been breached.

Actions: •Application of the HCR continues unchanged, although consideration may be given to revising the HCR to prevent overly cautious triggering of the PSST (refer to Scenario 2).

• The three-year cycle is reset, postponing the next regular assessment update to retain the 3 year spacing between assessments, provided the PSST is not triggered again in that period.

Notes: PSST means the pre-season survey trigger. BLRP means biomass limit reference point.

(Figure 4) Decision rule scenario 4
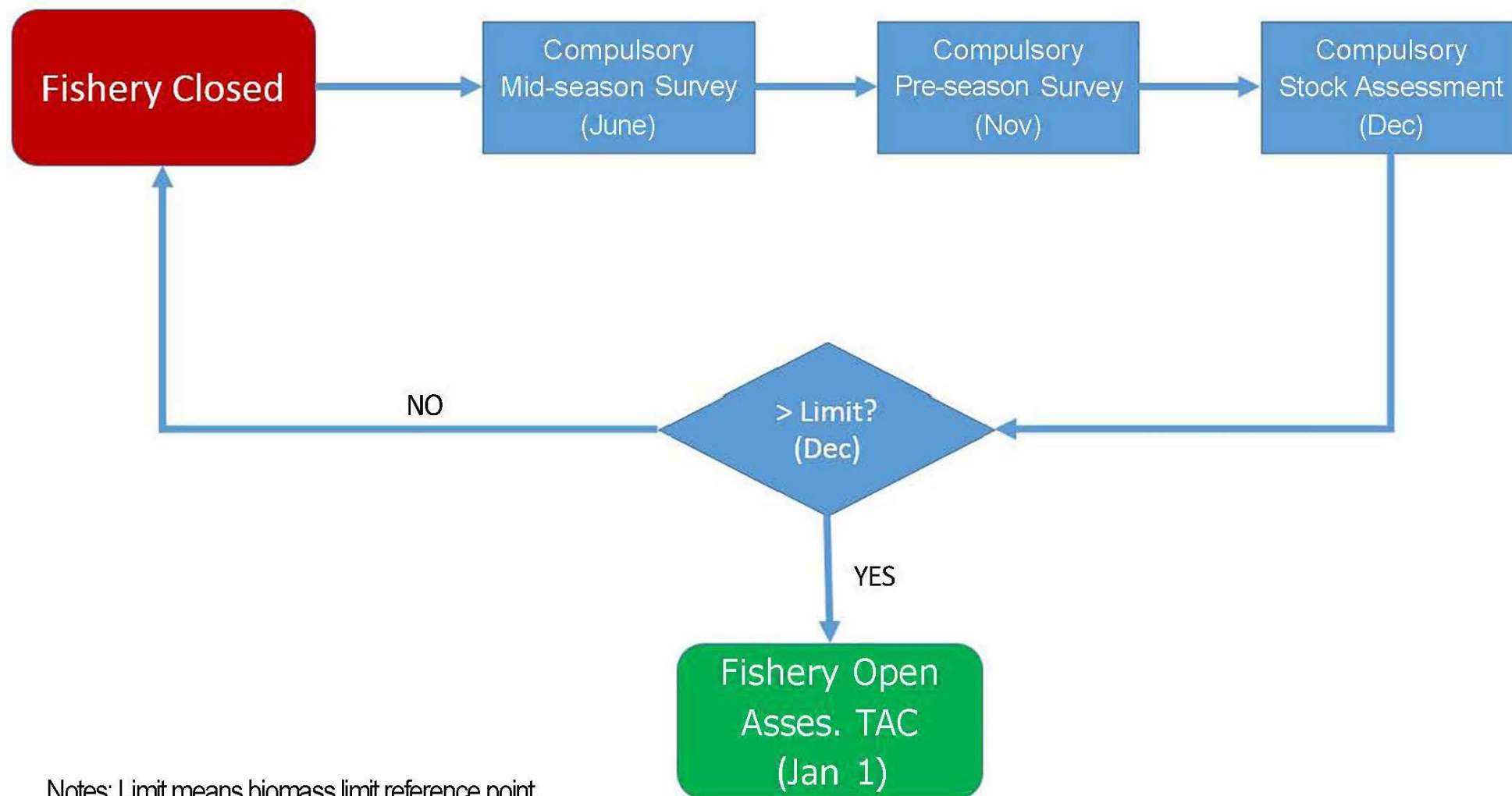

Scenario 4: Application of the HCR in a particular year results in the PSST being triggered, requiring a special assessment update to confirm whether the BLRP has been breached. Special assessment update confirms that the BLRP has indeed been breached.

Application of the HCR the following year results in the PSST being triggered for the second successive year, requiring a second rapid assessment update to confirm whether the BLRP has been breached a second time. Assessment update confirms that the BLRP has been breached again.

The commercial fishery is closed until an assessment update confirms that the stock has recovered to above the BLRP.

Actions: • When it has been confirmed that the BLRP has been breached the first time, discussions will be held on preventative measures to reduce the risk of closure.
• If it is confirmed that the BLRP has been breached for a second year and that the commercial fishery must be closed, discussions will be held on future management arrangements to reduce the risk of future closures.
• If the fishery is closed, annual assessments will be done until an assessment update confirms that the stock has recovered to above the BLRP.
• Before being re-implemented, the HCR will be revised to reduce the risk of breaching the BLRP in future and to incorporate rebuilding requirements.

Notes: PSST means the pre-season survey trigger. BLRP means biomass limit reference point.

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(Figure 5) Fishery closure and re-opening rule

Notes: Limit means biomass limit reference point.