

Basic guidelines for Harvest Control Rules and ABC calculation for FY2021

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I. Introduction

UN Convention on the Law of the Sea and Japanese Stock Management

With reference to the conservation of biological stock in the Exclusive Economic Zone (EEZ), Article 61 of the United Nations Convention on the Law of the Sea (UN Convention on the Law of the Sea) stipulates that, 1) The coastal State shall determine the allowable catch of the living resources in its exclusive economic zone¹, 2) The coastal State, taking into account the best scientific evidence available to it, shall ensure through proper conservation and management measures that the maintenance of the living resources in the exclusive economic zone is not endangered by over-exploitation², 3) Such measures shall also be designed to maintain or restore populations of harvested species at levels which can produce the Maximum Sustainable Yield (MSY), as qualified by environmental and economic factors, including the economic needs of coastal fishing communities and the special requirements of developing States, and taking into account fishing patterns, the interdependence of stocks and any generally recommended international minimum standards, whether sub-regional, regional or global.³

Japan, which has ratified the UN Convention on the Law of the Sea, also needs to make efforts to manage and conserve its own living marine stock. The amended Fisheries Basic Act, which was enforced in December 2019, states in Section 2 Article 13 that “to define a biological reference point that achieves MSY as a target value that the fishery resource to be sustained or recovered to, and to define Total Allowable Catch to sustain the resource at the biological reference point”. In the basic guidelines of stock management (Japan Fisheries Agency, 2020), which is based on the amended fisheries basic act, the concept of target and limit reference points, the management objective, and the harvest control rule to achieve the objective are defined. Based on these definitions, besides the internationally managed stocks, the harvest scenario is determined after stakeholder meetings and reviews for each fishery resource and published as “the specific management procedure for individual fisheries resource” within the basic guideline of fisheries management. The yield estimated from the

1 The coastal State shall determine the allowable catch of the living resources in its exclusive economic zone.

2 The coastal State, taking into account the best scientific evidence available to it, shall ensure through proper conservation and management measures that the maintenance of the living resources in the exclusive economic zone is not endangered by over-exploitation. (As appropriate, the coastal State and competent international organizations, whether subregional, regional or global, shall cooperate to this end.)

3 Such measures shall also be designed to maintain or restore populations of harvested species at levels which can produce the maximum sustainable yield, as qualified by relevant environmental and economic factors, including the economic needs of coastal fishing communities and the special requirements of developing States, and taking into account fishing patterns, the interdependence of stocks and any generally recommended international minimum standards, whether subregional, regional or global.

individual harvest scenario is provided as the Allowable Biological Catch (ABC) and considered as the upper limit of TAC as a fundamental rule.

Fisheries Research and Education Agency (hereafter referred to as FRA) is assigned to perform stock assessment from the minister of agriculture, forestry, and fisheries. In the present document, the guidelines to estimate biological reference points (hereafter; BRPs) and harvest control rules (HCR) that act as a basis for harvest scenarios based on the amended fisheries basic act and the determination method of harvest scenario in the guidelines to fisheries management are defined and described. The introduction defines the concept of MSY, risk management, and adaptive management. Harvest Control Rules based on the MSY and management are defined in Section II and subsequent sections.

MSY (Maximum Sustainable Yield)

MSY is generally defined as the maximum sustainable catch. The classic MSY is based on the surplus production model (Tanaka 1998), where if fishing is continued at a catch rate that is half of the natural increase rate, the biomass is maintained at half the initial biomass, and the maximum catch can be obtained permanently. However, the classic MSY has been criticized for ignoring the effects of uncertainties, for the inability to maintain a constant catch for fish species that are significantly affected by environmental impacts, for neglecting economic aspects, and for difficulty in estimation (Larkin 1976). In response to such criticism, the interpretation of MSY and the methodology applied to actual management have greatly evolved, and the concept of MSY can now be applied to actual management, taking into account various uncertainties and factors affecting MSY (Tanaka 1991, Mace 2001, Punt and Smith 2001).

In the amended fisheries basic act, MSY is defined as the maximum yield obtainable sustainably under the current and rationally expected future natural conditions. Additionally, MSY in the present document is defined as the maximum yield obtainable with a stable fishing pressure under a condition expectable from the currently available data considering the uncertainties of stock assessment and MSY estimation.

Risk-based ABC calculation and adaptive management

The collection of fishery stock data and the assessment of Stock based on it generally have significant uncertainties. Therefore, depending only on point estimation based on deterministic models involves the risk that stock management will be incorrect and desired results will not be obtained (Punt et al. 2016). Therefore, this guideline focuses on risk evaluation based on a probabilistic future stock prediction model. For this reason, statistical and simulation techniques were used to select management rules that are believed to enable sustained fishing based on evaluations that consider the effects of environmental fluctuations and the uncertainties associated with data sampling, parameter estimation, and management practices.

Even with the reference values that are used as target and limit values for fisheries management, the estimated reference values include uncertainties due to lack of biological data and time-series data, errors in Stock assessment, etc. Therefore, the BRPs for stock management (the objective values of biomass and fishing pressure, and threshold values) in Japan are basically reviewed and updated every five years (adaptive management that allows flexible change depending on data availability). Even during this short-term management period, if new knowledge is obtained that entails a considerable risk in executing the management policy, and if it is assessed that it is better to change the BRPs, the BRPs are updated as appropriate (Appendix: Guidelines to change Biological Reference Points and HCRs during the management period).

Considering the characteristics of individual Stock

Fishery stocks in Japan include a lot of stock whose biomass fluctuates greatly in response to changes in the atmospheric and marine environment (Watanabe et al. 1995, 1996), and is characterized by a long history of fishing and the existence of voluntary management systems by fishery cooperatives (Makino 2011). For some stocks, it is difficult to reliably estimate the maximum sustainable yield due to a lack of accuracy and insufficient data for stock assessment. Although this document stipulates the basic guidelines for BRPs and HCRs, alternative rules suitable to the purpose of management can also be used for each population stock with appropriate scientific explanations and the agreement of the relevant scientific institutions. An “appropriate scientific explanation” must take into account objectivity (the method of calculating the underlying numerical values is objective), reproducibility (can be reproduced by anyone), and transparency (can explain why such rules were used).

II. Types of Stock Assessment Systems in Japan

Overview of Stock Assessment

In the stock assessment for each population stock, in order to take the biological features of the target species into account to the maximum extent possible, a population dynamics model incorporating information on the age composition wherever possible is used to estimate the biomass, BPRs, and reproductive relationships. The population dynamics model used for estimating the Biomass preferentially uses cohort analysis (Virtual Population Analysis, VPA) and Statistical Catch At Age (SCAA) analysis taking the age composition into account. If age information is not available, a stock assessment model that does not use age composition is used (Example: Chapters 2 and 5 of Quinn and Deriso 1999). It is recommended to use an appropriate Stock assessment model according to the features of each population stock.

Like VPA, when a method that does not estimate the reproductive relationship-related parameters within the stock assessment model, is used, the reproductive relationship is estimated outside the population dynamics model using the estimated recruitment and Spawning Stock Biomass (SSB) obtained from the model.

In addition, in order to utilize information on the relative fluctuation trends of the Stock, it is recommended to use effort information in addition to the catch when estimating the Biomass. When the Catch Per Unit Effort (CPUE), which is the catch obtained in fisheries and surveys divided by the unit effort, is used as the abundance index, standardization is required to eliminate the factors that bias the abundance index values and to approach the true trends in the biomass (Maunder and Punt 2004). If the estimation result is not obtained by the stock assessment model or its reliability is considered to be low, the stock status is judged from the aging of the abundance index. When the abundance index is not valid, the aging of the catch and the biological information of the catch is used as a criterion to decide the fluctuations in the biomass, but this is a short-term provisional measure, and it is encouraged to make an effort to obtain an effective abundance index as soon as possible.

Even if there is insufficient information to estimate the absolute or relative value of the biomass, or even if a reliable abundance index has not been obtained, efforts should be made to collect survey data and information on catch and effort and to monitor the stock trend continuously.

Stock assessments should be performed on a regular basis (it is especially recommended to estimate basic information such as biomass, exploitation rate, etc., every year). In addition, when applying new knowledge and methods not known in the past to stock assessment, prompt peer-review through academic journals is encouraged.

Classification of Japanese Fishery Stock (Stock 1, Stock 2, Stock 3)

The Japanese stock is classified into the following three categories according to the available information and the method of biomass estimation, and the Harvest Control Rules are defined for each taxonomical group.

Stock 1: When the biomass is estimated by the population dynamics model based on the information of the catch and effort, and all BRPs and estimates of future absolute Biomass and catch rates are available by assuming the reproductive relationships.

Stock 2: When information such as catch and effort is valid, but it is difficult to apply the population dynamics model, and one of the estimated values of absolute biomass, exploitation rate, or BRPs is not available.

Stock 3: When only the catch information is valid, and there is no effort information, so the stock abundance index cannot be used, and it is necessary to rely only on the biological information and the catch information.

III. Reference points and Harvest Control Rules (Stock 1)

Biological reference points are set to achieve the stock management goal of Japan. The target reference point of total biomass and SSB are defined as B_{target} and SB_{target} , respectively. The limit reference point is defined as B_{limit} and SB_{limit} , respectively, and the fishing ban level is defined as B_{ban} and SB_{ban} , respectively. These reference points are proposed by the research institutes based on the following guidelines. Advantages and disadvantages of reference points and its reason to be proposed need to be attached when multiple candidates of reference points and standards are presented. In this document, SSB is used as the basis of stock management however similar methodology is applied when total biomass is used instead of SSB.

Stock-recruitment relationship

In order to predict the mid-and-long term⁴ catch and SSB, it is necessary to determine a stock-recruitment relationship that describes the relationship between SSB and its recruitment, and the population dynamics model that explains the growth and depletion of the recruited individuals. Beverton-Holt stock-recruitment model (BH) and Ricker stock-recruitment model (RI) are widely utilized as stock-recruitment models using age-structured models, however, these models may estimate SB_{msy} (SB that yields MSY) outside the range of historically observed SBs. Therefore, Hockey-Stick stock-recruitment model (HS) that allows stable estimation of the growth rate and avoids extreme extrapolation is used as the standard model (Ichinokawa et al. 2017). When considered as appropriate, BH, RI, and model averages can be utilized. The criteria for selection of a stock-recruitment relationship is described in the guideline of selection of the stock-recruitment relationship for FY 2021 (FRA-SA2021-ABCWG01-03).

An estimated stock-recruitment relationship with plausible SSB and recruitment is used to estimate BRPs and their derivatives – SB_{msy} and F_{msy} (MSY reference point) – considering uncertainty. When a single stock-recruitment relationship is not suitable due to mid-and-long term environmental variability such as regime shift, multiple stock-recruitment relationships can be applied to estimate BRPs. When multiple stock-recruitment relationships can be considered, and each BRPs are different dramatically, the most rational relationship (including multiple-model approach and model average) is selected with an agreement of scientists upon criteria of robustness against uncertainty.

When a stock assessment model without age composition (*i.e.*, production model) is applied, the assumption on the shape of surplus-production curve dramatically affects BRP estimation. Typically,

⁴ In the present document, the temporal term is considered as follows: short as 1-5 years, short-and-mid as 1-10 years, middle as 10-30 years, mid-and-long as 10-100 years, and long as 30-100 years.

it is difficult to estimate the parameters for the production model. Therefore, the uncertainty of parameters such as shape parameters that determine the shape of surplus-production curve and robustness of management procedure needs to be carefully considered.

Target Reference Point (SB_{target})

The SB_{target} is based on the Spawning Biomass level (SB_{msy}) at which the average catch is maximized when fishing at a constant Fisheries Coefficient in future forecasts taking into account the necessary uncertainties such as recruitment fluctuations. The maximum average catch at that time is MSY, and the corresponding Fisheries Coefficient is F_{msy}.

Limit Reference Point (SB_{limit})

The SB_{limit} is a threshold value for maintaining the Spawning Biomass level below that level to achieve a significantly lower sustainable yield and to prevent the potential Stock from not being fully utilized. In future forecasts considering the necessary uncertainties such as recruitment fluctuations, it is based on the Spawning Biomass that produces 60% catch of the MSY when fishing is conducted at a constant Fisheries Coefficient.

Fishing ban level (SB_{ban})

The SB_{ban} is the Spawning Stock level at which there must be zero catch, as stock recovery below this level is considered to be extremely delayed or that the stock will not recover. In future forecasts taking into account the necessary uncertainties such as recruitment fluctuations, it is based on a Spawning Biomass corresponding to 10% catch of the MSY when fishing is conducted at a constant Fisheries Coefficient.

The above BRPs are basic definitions, however, depending on the characteristics of individual population stocks, possible alternative values can be proposed with reasonable scientific explanations and the agreement of the relevant scientific institutions. For example, when the reproductive relationship is poorly applied, when the BRPs are significantly extrapolated, when the reproductive relationship is affected by long-term environmental changes, and when a clear autocorrelation is seen in the reproductive relationship.

As long as there are no significant revisions or changes to the prerequisite reproduction curve or population dynamics model, these BRPs should continue to be used within the short-term management unit (basically five years). After five years, the reproductive relationship is re-examined by updating the information to determine whether to use new BRPs. This process is basically repeated every five years to respond to major environmental changes and information updates.

Harvest Control Rules

The harvest scenario to calculate the ABC is based on the HCRs that is agreed by meetings of stakeholders and council meetings of fisheries policy after proposed by the research institutions. In the present guidelines, the following basic rule is recommended as a candidate of HCRs based on Okamura et al. (2020). However, when a proposal of an alternative management rule (alternative rule) is requested by stakeholder meetings and subsidiary group of council meetings of fisheries policy, it is possible to propose an alternative rule after examined by research institutions with consideration of the effect of the alternative rule on the target stock. Similar to BRPs, the same harvest scenario is basically applied in a short-term (basically five years) management unit. However, such application is only sometimes applied when the stock status deviates dramatically from the future forecast to determine harvest scenarios. The details of a situation when to propose an amendment of the harvest scenario is described in the appendix (the guidelines for amending BRPs and HCRs during the management

period).

The Basic Harvest Control Rules (Basic Rule)

In the basic rule, fisheries coefficient F is determined depending the stock status as following (Figure 1):

$$F_t = \begin{cases} 0 & \text{if } SB_t < SB_{ban} \\ \gamma(SB_t)F_{target} & \text{if } SB_{ban} \leq SB_t < SB_{limit} \\ F_{target} & \text{if } SB_t \geq SB_{limit} \end{cases}$$

Here, β is an adjusting coefficient that takes into account of uncertainty (basically $0 < \beta \leq 1$), SB_t is the Spawning Stock Biomass for year t ($SB_t = \sum_a m_{t,a} w_{t,a} N_{t,a}$: $m_{t,a}$ is the maturity rate at year t and age a , $w_{t,a}$ is the average weight at year t and age a , and $N_{t,a}$ is the stock in number at year t and age a). The coefficient $\gamma(SB_t)$ is a coefficient that changes according to the SB in order to accelerate the recovery when the SB falls below the limit value, and is defined as

$$\gamma(SB_t) = \frac{SB_t - SB_{ban}}{SB_{limit} - SB_{ban}}$$

Since the start year of management involves a time delay from the last year of valid data, a probabilistic future forecast simulation taking into account recruitment fluctuations is performed, and ABC is calculated as its expected value.

The robustness of the above Harvest Control Rules has been confirmed by simulations based on information such as typical biological parameters of Japan's first population stock (Okamura et al. 2020). The same simulation shows that if $\beta = 0.8$, the long-term performance is similar to the 40 – 10 management rule used in the United States (HCRs with $SB_{limit} = 0.4SB_0$, $SB_{ban} = 0.1SB_0$, where SB_0 is the average SB assuming the stock is unfished for a long time; Thorson et al. 2015) and for the short-term performance, the present rule is advantageous over the 40 – 10 rule. In this rule, $\beta = 0.8$ is preferred to recover a stock with high uncertainty and the low-status stock ($0.2SB_{msy}$) within an average of 10 years.

Additionally, a probabilistic future forecast is performed per stock assessment of individual stock to implement the stock characteristics and short-mid-term effect. The simulation changes β from 0 to 1, and the percentage of SB outperforming target and limit reference points and fishing ban level are considered. Likewise, the yield at each β is estimated. The appropriate β (or range of β) is determined from information on the difference in performance of management method and risk between the particular β and the general simulation ($\beta = 0.8$), and recommended to the manager.

When the stock and fishery characteristics are different from the typical pattern, such as stock status is extremely poor or data for the stock-recruitment relationship is deficient, an appropriate β is suggested to be estimated with different simulations. In short-mid-term future forecasts, when there is certain evidence, it is preferred to run simulations with recruitment dynamics from the most recent few (e.g., five to ten) years or the most recent biological information to estimate the uncertainty of short-mid term recruitment and biological characteristics. Discussion and agreement shall be made between scientists upon the rationale and robustness on the assumptions if such assumptions are different from the ones used in the short-mid-term future forecast used to estimate BRPs.

Alternative Harvest Control Rules (Alternative rule)

When there is an HCR that outperforms or is equivalent to the basic HCR, the different HCR (alternative harvest control rule, *i.e.*, alternative rule) can be adopted under sufficient ground from simulations and agreement between research institutions. When a request to consider the alternative

rule to the research institutions has been made from stakeholder meetings and/or council meetings of fisheries policy, simulations based on the alternative rule shall be performed, and obtain an agreement between research institutions on whether the harvest scenario can be used to calculate ABC. When the future forecast explicitly expects a dramatic shift in catch due to the application of basic HCR, an alternative rule can be considered by research institutions to reduce the impact of a shift in catch if necessary and provided to the managers.

The alternative rule which is recommended scientifically needs to match the management objective defined in the guidelines of fisheries management (e.g., to surpass the target reference point in 10 years with 50% of probability) and to maintain the level of risk and sustainability of the stock compared to the basic rule. Therefore, the categorical performance metrics need to be presented in order to decide whether the alternative rule matches the management objective and whether the level of risk and sustainability of the stock is equivalent to that of the basic rule. The details of categorized HCR based on the performance metrics is described in “the guidelines to propose the alternative harvest control rules for FY2021 (FRA-SA2020-ABCWG02-06)”.

IV. Harvest Control Rules (Stock 2)

When the biomass cannot be estimated using the population dynamics model, or when MSY biological reference points cannot be estimated due to an uncertain stock-recruitment relationship, ABC estimates cannot be obtained by the product of estimated biomass and appropriate fishing pressure as applied in Stock 1. Therefore, in Stock 2 which only time-scale data of catch and fisheries indices (CPUE) are available, empirical HCR is applied that determines the ABC for two years from the time when changes in indices are observed due to the changed amount in the catch.

The stock abundance index to be used should be estimated as an index that is considered to adequately represent changes in the relative abundance of the stock, based on available data, biological and fishery knowledge of the target stock, and through examination using statistical methods such as standardization. The stock abundance index should be used with an appropriate scientific explanation.

In the empirical HCR defined in this section, the target level (B_T) and limit level (B_L) of the stock abundance index can be defined however, they are expedient values and not equivalent to the target and limit reference point of Stock 1. These values are treated as threshold values that catch can be increased from the recent catch when the stock abundance index surpasses target level or catch needs to be decreased dramatically when stock abundance index is below the limit level.

In the HCR of Stock 2, ABC is calculated as follows:

$$ABC = \alpha_t \beta \bar{C}_t = \exp[k_t(D_t - B_t)] \times \beta \times \bar{C}_t,$$

where β is an adjustment coefficient with the default value of 1. The coefficient in the exponential k_t is expressed as following equation (Fig. 2):

$$k_t = \begin{cases} \delta_1 & D_L > B_L \\ \delta_1 + \delta_2 \exp[\delta_3 \log(AAV_t^2 + 1)] \frac{B_L - D_t}{D_t - B_B} & B_B < D_T \leq B_L \\ \infty & D_T \leq B_B \end{cases}$$

where \bar{C}_t is a five-year average of catch, D_t is the stock year of the current year t and it is calculated between 0 and 1 with cumulative gaussian distribution of past CPUE.

$$D_t = \int_{-\infty}^{CPUE_t} \phi \left[\frac{x - E(CPUE)}{SD(CPUE)} \right] dx$$

Here, ϕ is a standardized Gaussian distribution, $E(CPUE)$ is the average of CPUE, $SD(CPUE)$ is the

standard deviation of CPUE. The value of AAV_t is an index of yearly variability of stock abundance index calculated from the CPUE to year t . When the number of valid CPUE is N (= length of CPUE years – 1 – number of missing values), AAV_t is described as;

$$AAV_t = \frac{1}{N} \sum_{u=1}^t \frac{2|CPUE_u - CPUE_{u-1}|}{CPUE_u + CPUE_{u-1}}$$

The value of B_T is a probabilistic value of the target level of stock abundance index converted using the cumulative Gaussian distribution and sits between 0 and 1 (i.e., smoothing process to reduce the effect of errors of CPUE). Limit level and fishing ban levels are B_L and B_B , respectively, and represent $100 \times P_L$ percent ($B_L = P_L \times B_T$) and $100 \times P_B$ percent ($B_B = P_B \times B_T$), respectively. ABC is set to gradually reach the target level when the stock level is close to B_T , and ABC is reduced to make CPUE to rapidly reach the target level when the stock level is below B_L (Fig 2).

The coefficient δ_2 is a coefficient to recover the stock when the stock is at the low level. Also, since it is preferred to recover the stock quickly when the uncertainty of CPUE is high, coefficient δ_3 increases the recovery speed of the stock when the AAV of CPUE is large.

Using the simulations of the surplus-production population dynamics model by Ichinokawa et al. (2015), the performance of this rule (Stock 2 HCR) is evaluated, and great improvement had been observed in stock preservation and stabilization of ABC than those of the existing rule (unpublished). When the performance is evaluated using the management objectives focusing stock preservation, increase in the average catch, and minimization of catch variability, the standard values for each parameter are selected as $B_T = 0.8$, $P_L = 0.7$ ($B_L = 0.56$), $P_B = 0.0$ ($B_B = 0.0$), $(\delta_1, \delta_2, \delta_3) = (0.5, 0.4, 0.4)$.

In addition to the basic simulation scenarios, robustness tests are conducted for cases with large observation errors in the CPUE, as well as cases with hyperstability and hyperdepletion (Hashimoto et al. 2018). In such cases, the HCR for Stock 2 is considered robust for various uncertainties. However, to ensure that the performance of stock protection is the same as that of the basic simulation scenario even when uncertainty is greater than the basic scenario, the β in the ABC formula should be set to 0.9.

V. Harvest Control Rules (Stock 3)

TBD

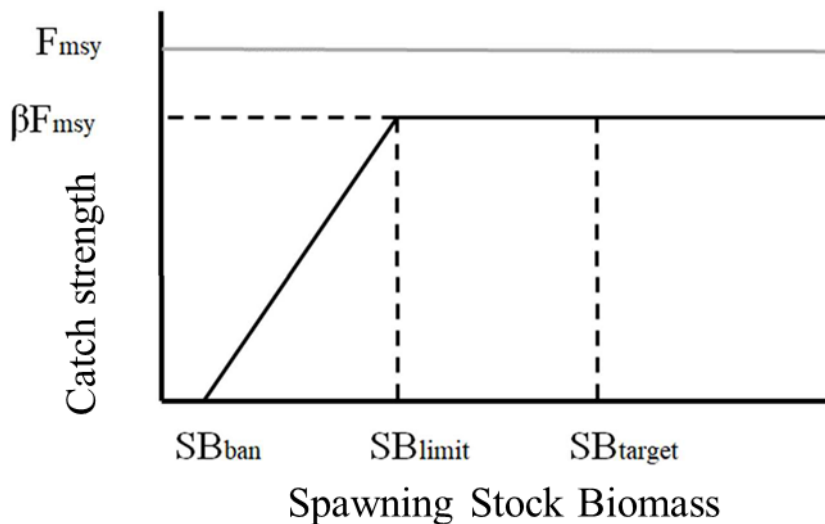


Figure 1. Schematic diagram of Harvest Control Rules for the population of Stock 1

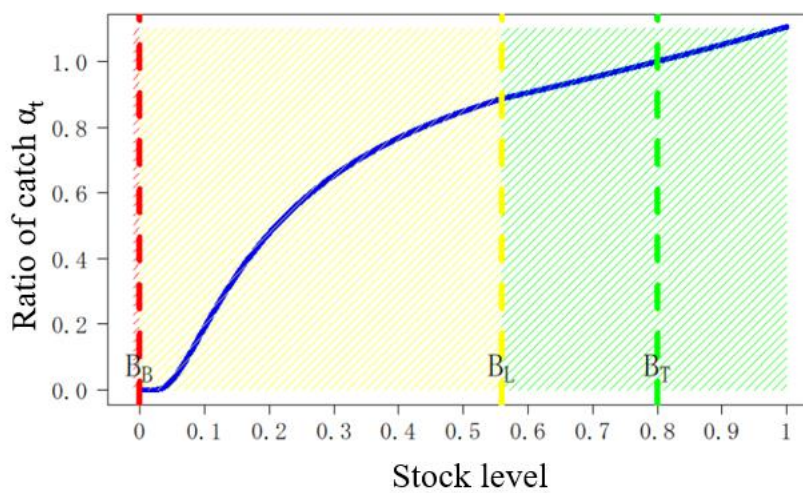


Figure 2. Schematic diagram of Harvest Control Rules for the population of Stock 2

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Appendix: Guidelines to change Biological Reference Points and Harvest Control Rules during the management period

The Harvest Control Rules (HCRs) and Biological Reference Points (BRPs) remain the same for five years after agreement and enforcement. When the values need to be changed as a result of renewed assessment five years after the previous benchmark assessment, HCRs and BRPs are subject to be renewed. This process is implemented to avoid dramatic fluctuations in ABC due to frequent changes in BRPs. However, when events that were not predicted during the determination of BRPs and HCRs have occurred after the enforcement of management, and when the existing ABC calculated from the previously agreed HCRs has a substantial risk of sustainability of fisheries resource and fishery itself, BRPs and HCRs can be reset by reconsidering the new data even within the five-year period. Such process consists of two sections: (1) determining whether an unexpected event has occurred, and (2) countermeasures to be taken in the event of unexpected events.

- (1) Determining whether an unexpected event has occurred.
 - When the future projections are **different from the initial assumptions** due to a series of years in which the recruitment and its variability are larger or smaller than expected.
 - When the future projections are **different from the initial assumptions** due to significant changes in data or method of stock assessment.
 - Following probabilities are considered when the future projections are different from the initial assumptions:
 1. The risk of stock biomass falling below the limit reference point in short the term (e.g., unpredictably high probability of estimated SSB to fall below SB_{limit} and SB_{ban} in the five-year management period, etc.)
 2. The probability of maintaining the stock at the target reference point in the medium term (e.g., when the probability of reaching to SB_{target} in ten years becomes extremely high or low from the expected forecast, etc.)
- (2) Countermeasures to be taken in the event of unexpected events.
 - Consider whether recalculation of BRPs is necessary
 - Consider whether the event can be solved by adjusting the value of β
 - It is possible to propose a change in HCRs even within five years management period when fishery can be conducted safely under the new uncertainty considering the unexpected event by recalculation of BRPs and/or adjustment of β . Particularly, proactive recommendations should be made when there is a high probability of recourse decline, and some action is likely to be required.
 - When a drastic change in ABC is expected due to HCRs, it is preferable to put effort to minimize the change of ABC (e.g., Even if the ABC is expected to increase by twice, limit the change to be 20% in increase of the ABC. Likewise, if the risk is small enough, limit the change to 20% in decrease of the ABC when ABC is expected to be halved, etc.)
 - When the change in BRPs and/or the value of β are proposed and applied within the five-years management period, the five-year review will be conducted as usual.