

## Rebuilding, reference points and the advice framework

### 1 Purpose

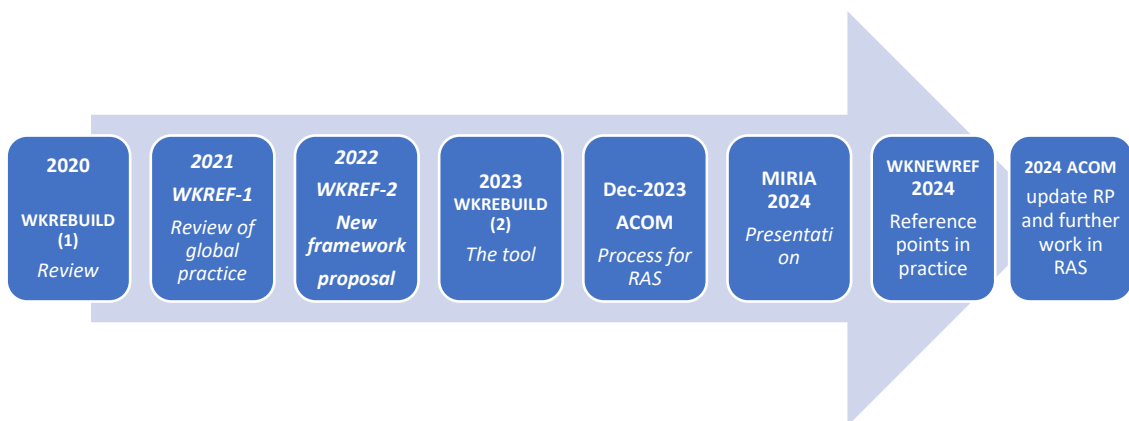
To inform MIACO of the rebuilding and reference points activities in 2024 and the future work in the advice framework in 2025 and 2026.

To inform MIACO of the changes to reference points agreed by ACOM based on the recommendations of WKNEWREF.

To discuss with MIACO what role they might play and how we might organise dialog around the next evolution of the reference points and advice framework.

### 2 Background

ICES started investigating rebuilding management strategies in 2020 and new reference points framework in 2021 (Figure 1). In both cases the focus is on category 1 and 2 medium- and long-term lived stocks. Since then, the experts have actively contributed to the development of the tools and analysis of the performance of rebuilding strategies and reference points. In parallel, in MIRIA and MIACO, advice requesters and stakeholders have been continuously informed about the developments. In 2024 a MIRIA subgroup was established to discuss rebuilding advice scenarios further. Additionally, ACOM agreed to update the reference points guidelines partially and to continue working in rebuilding advice scenarios.



**Figure 1. Main milestones in the development of rebuilding scenario advice and new reference point framework (RAS = rebuilding advice scenarios, RP = reference points).**

## Rebuilding scenarios

The ICES work on rebuilding scenarios was initially motivated by three main concerns:

- 1) The standard Advice Rule where ICES gives zero catch for stock below  $B_{lim}$  is considered unhelpful by some ACOM members (and some managers).
- 2) The Advice Rule was modified to give positive catch advice if the stock can rebuild above  $B_{lim}$  with 50% probability in the short term and may not be in-line with the Precautionary Approach.
- 3) In the past ICES advised to implement rebuilding plans when specific stocks fell below  $B_{lim}$  however there are no ICES guidelines for such plans.

A first workshop on guidelines and methods for the design and evaluation of rebuilding plans for category 1-2 stocks, [WKREBUILD](#) (ICES, 2020), took place in 2020. It generated a guidance on best practices for evaluation of rebuilding plans against potential criteria of acceptability.

A follow up workshop [WKREBUILD2](#) (ICES, 2023a) developed a simulation tool for rebuilding and tested it on three case study stocks. Additionally, ACOM made a proposal for providing rebuilding scenarios in the advice. MIRIA discussed this in 2024 and established a subgroup to investigate rebuilding scenarios further.

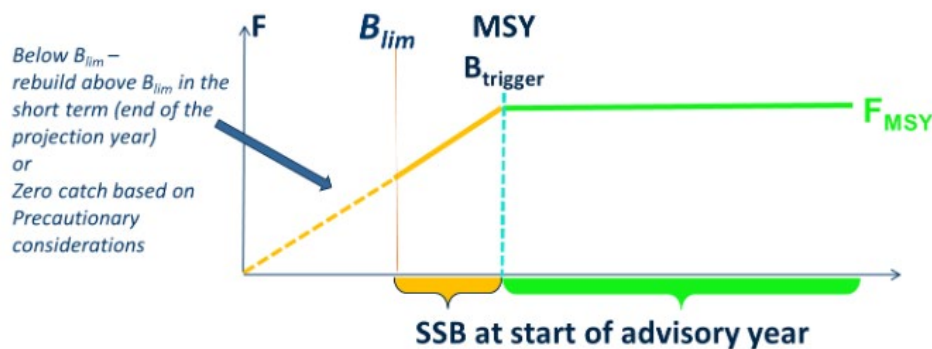


Figure 2 ICES advice rule for category 1–2 stocks

## Reference points

ICES reference points should be fit for purpose and inline management objectives and global standards. ICES reference points have evolved over the last 25 years and the current reference point framework was developed around a decade ago ([Silvar-Viladomiu, 2022](#)). The ICES approach to advice on fishing opportunities integrates the precautionary approach with the objective of achieving maximum sustainable yield (MSY), unless otherwise requested ([ICES, 2023b](#)). The aim is, in accordance with the aggregate of international guidelines, to inform policies for high, long-term yields while maintaining productive fish stocks in marine ecosystems that meet expected environmental standards (e.g. good environmental status [GES] in the EU). It is predicated on the principle that we should avoid stocks dropping below  $B_{lim}$  and that we only control fishing mortality and not biomass. The reference point guidelines are complex, poorly understood and in some cases not consistently followed ([Silvar-Viladomiu, 2022](#)). ACOM is

continuously looking at ways to improve and simplify the estimation of reference points and associated guidelines ([ICES, 2021](#)).

### 3 Activity in 2024

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#### Rebuilding scenarios

ACOM proposal for rebuilding advice scenarios was presented to MIRIA in 2024. The implementation of rebuilding advice in 2024 was considered too ambitious by MIRIA, and ACOM agreed to postpone it in its March meeting.

Legal systems place as strong emphasis on following ICES advice and advice requesters highlighted the importance of continuous dialogue with scientists and agreed approaches when implementing new approaches to provide advice on fishing opportunities. Thus, A MIRIA subgroup met twice along 2024 to better understand the performance of the rebuilding scenarios and discuss future possible implementation.

Five key elements to focus on when defining rebuilding scenarios were identified: category of stocks in need of rebuilding, the shape of a harvest control rule (HCR), the process for the selection of the HCR, the relative rebuilding time frame ( $2 \times T_{\min}$ ) and the legal aspects of rebuilding plans.

Advice requesters found it difficult to implement the ACOM proposed process on rebuilding advice scenarios, especially for shared stocks.

An in-depth analysis of rebuilding HCRs for two stocks (Celtic Sea whiting and Western Baltic Herring), found that the less precautionary version of the ICES MSY AR was unable to rebuild the stocks under a low productivity scenario. This raises concerns about the adequacy of the current implementation of the ICES MSY AR. On the contrary, the most precautionary version (i.e. where there is zero catch below  $B_{\lim}$ ) performed as well compared with the rebuilding strategies tested.

#### Reference points

In 2020 ICES began a process to revise the reference point framework for category 1 and 2 stocks focusing on medium- and long-term lived stocks. In 2024, WKNEWREF ([ICES, 2024](#)), the third workshop in a series of meetings, was conducted. Previous workshops, WKREF1 ([ICES, 2022a](#)) and WKREF2 ([ICES, 2022b](#)), focused on reviewing the ICES reference point framework and other frameworks used globally. The goal of WKNEWREF was to put the recommendations of WKREF2 into practice. WKNEWREF implemented those recommendations in around 20 category 1 stocks and empirically identified the strengths and weakness of the proposed reference points.

Furthermore, WKNEWREF suggested revisions to the current ICES guidelines for calculating reference points, which were then approved by ACOM in December 2024, and will be implemented in the coming benchmarks:

- *Allee effect*: The Allee effect is where there is reduced reproductive capacity below a certain stock size which leads to impaired recovery even when fishing mortality is low.  $B_{\lim}$  should be always set above the Allee effect threshold if it exists and can be estimated.

- *Regime shifts*: Climate change causes trends or shifts in the environment and productivity of marine ecosystems. The robustness of the ICES AR to changing productivity scenarios should be tested.
- *Stock recruitment relationship*: Properly characterising the relationship between spawning stock size and subsequent recruitment is fundamental to modelling future stock development but it is also notoriously uncertain. The current ICES guidelines to define the stock-recruitment relationship should be revised to make them more precise. The sensitivity of the parameters to historical data points should be evaluated before selecting the year range to use for the calculation of reference points.
- *B<sub>lim</sub>*: Current ICES guidelines define B<sub>lim</sub> as a deterministic biomass limit below which a stock is considered to have reduced reproductive capacity ([ICES, 2021](#)). A review with 79 Category 1 ICES stocks found that that lowest observed level of biomass (B<sub>loss</sub>) is typically used as a B<sub>lim</sub> when there is no clear SR relationship which was the majority of stocks ([Silvar-Viladomiu, 2022](#)). Several, recommendations in relation to B<sub>lim</sub> were made:
  - 1) Quantitative criteria to assign the stock type for the definition of B<sub>lim</sub> should be defined.
  - 2) For type 5 stocks (stocks showing no evidence of impaired recruitment or with no clear relation between stock and recruitment), B<sub>loss</sub> should be replaced by the empirical B<sub>lim</sub> (the average of the lowest k SSB estimates that resulted in above median recruitment where typically k is set from 1 to 3).
  - 3) When defining B<sub>lim</sub> the corresponding B<sub>0</sub> percentage should be calculated as an alternative sense check. If B<sub>lim</sub> was lower than 15% of B<sub>0</sub>, for example, which is the average value obtained for the WKNEWREF stocks, possible reasons for such low percentage should be identified and analysed to ensure that B<sub>lim</sub> is defined adequately. Ideally, alternative methods to evaluate the adequacy of B<sub>lim</sub> should be defined.
  - 4) The percentage of B<sub>0</sub> can be used to define B<sub>lim</sub> for model ensembles and production models.
  - 5) When the B<sub>lim</sub> derived from the current six stock types is not considered reasonable, defining it as a percentage of B<sub>0</sub> may be considered. In such cases percentages used in the literature and obtained in the ICES database for different families should be considered as a reference value.
- *F<sub>msy</sub> and F<sub>pa</sub>*: F<sub>msy</sub> and F<sub>pa</sub> should be calculated including the time lag between management and advice.
- *F<sub>lim</sub>*: F<sub>lim</sub> should be removed from the reference points set as F<sub>pa</sub> is already, by definition, the highest fishing mortality that is consistent with precautionary approach as defined by ICES.

## 4 Recent ACOM discussions on rebuilding scenarios

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In December 2024, ACOM was informed about the difficulties in the implementation of bespoke rebuilding strategies. ACOM will discuss on March the possibility of replacing the current way of providing advice when SSB is estimated to be below  $B_{lim}$  in the last assessment year with the most precautionary version of the ICES advice rule.

Under current practice, the stock is projected until the end of the advice year, and positive catch advice is provided if there is a fishing mortality that results in an SSB at the end of the advice year with a greater than 50% probability of exceeding  $B_{lim}$ . The projection of the population from the last data year to the end of the advice year relies on several assumptions about recruitment level, biological parameters and fishing mortality level in the intermediate year and is highly uncertain. In practice, it is usually over-optimistic when the stock is at a low biomass level, which increases the risk that the stock will not be above  $B_{lim}$ .

Using the most precautionary version of the ICES MSY advice rule is consistent with the current advice framework, does not require projecting the population, and avoids the need to test and select a rebuilding strategy on a case-by-case basis. If this approach was applied in 2024 it would have resulted in zero catch advice for two additional stocks.

## 5 Evolving the framework

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ACOM recognises that reference points and the advice framework is a sensitive and complex issue for MIRIA and MIACO. There is often a communication gap between how scientist think about reference points (i.e. as an assessment derived output linked to the biology and fishery for a particular stock) and how managers and stakeholders think about them (i.e. legal parameters enshrined in the implementation of regulations and policies such as the CFP, MAPs, UK Fisheries Act, Norwegian Marine Resources Act, Icelandic Fisheries Management Act etc.). Constructive dialogue is needed to build a shared appreciation of how the framework should develop.

From a science perspective the next step in evolving the reference points framework is to examine the standard ICES advice rule and reference points for defining stock status. In WKREF2 it was suggested to separate the operational reference points in the ICES advice rule from the stock status reference points.

This might involve setting the target fishing mortality below the theoretical  $F_{msy}$  (Note: this is often already done in some management plans) and establishing a new status reference point,  $B_{safe}$ , which would be linked to for example  $B_{MSY}$  (Figure 3). The framework revision would also address the method of defining MSY  $B_{trigger}$ . While WKNEWREF conducted a preliminary exploration, no recommendations were made.

In [September 2022](#) (ICES, 2022c) and [March 2023 \(ICES, 2023c\)](#), ACOM agreed in principle that WKREFFRAME should address these issues once WKNEWREF delivered its report. ACOM will again discuss the WKREFFRAME Terms of Reference and process again. A workshop could be scheduled for quarter 4 2025 or at the beginning of 2026 and would be open to both scientist, managers and stakeholders.

Views from MIACO on the concept of, process and timeframe revising the Advice Rule would be welcome.

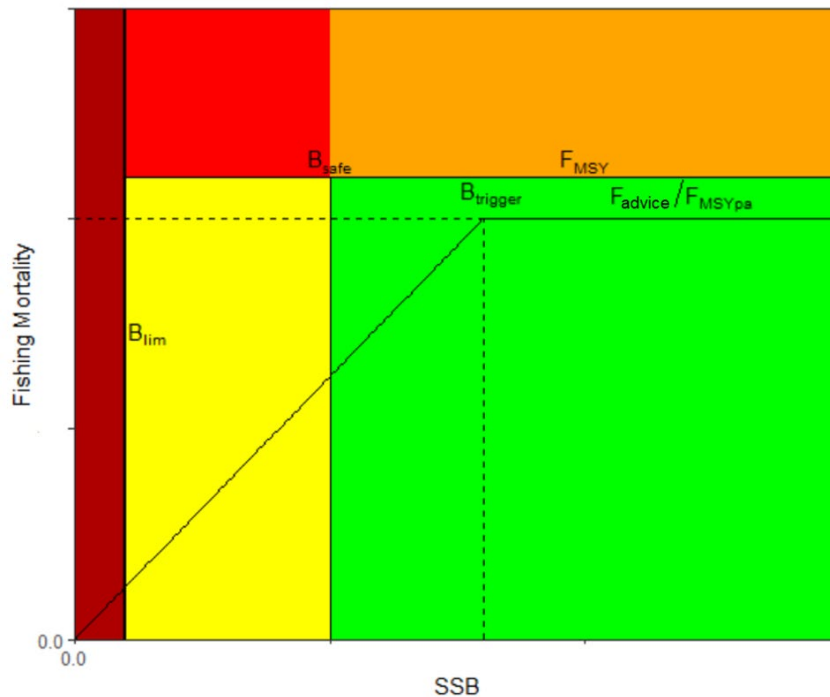


Figure 3. Reference point and advice rule framework proposed by WKREF2 (ICES, 2022).

## 6 References

ICES. 2020. Workshop on guidelines and methods for the evaluation of rebuilding plans (WKREBUILD). ICES Scientific Reports. 2:55. 79 pp. <http://doi.org/10.17895/ices.pub.6085>

ICES. 2021. ICES fisheries management reference points for category 1 and 2 stocks. Technical Guidelines. In Report of the ICES Advisory Committee, 2021. ICES Advice 2021, Section 16.4.3.1. <https://doi.org/10.17895/ices.advice.7891>

ICES. 2022a. Workshop on ICES reference points (WKREF1). ICES Scientific Reports. 4:2. 70 pp. <http://doi.org/10.17895/ices.pub.9822>

ICES. 2022b. Workshop on ICES reference points (WKREF2). ICES Scientific Reports. 4:68. 96 pp. <http://doi.org/10.17895/ices.pub.20557008>

ICES. 2022c. Minutes of the Meeting of the ICES Advisory Committee (ACOM), September 2022. ICES Business Reports, 3:3. 16 pp. <http://doi.org/10.17895/ices.pub.21915417>

ICES. 2023. Workshop on guidelines and methods for the design and evaluation of rebuilding plans for category 1-2 stocks (WKREBUILD2). ICES Scientific Reports. 5:112. 79 pp. <https://doi.org/10.17895/ices.pub.24763293>

ICES. 2023a. Advice on fishing opportunities. In Report of the ICES Advisory Committee, 2023. ICES Advice 2023, section 1.1.1. <https://doi.org/10.17895/ices.advice.22240624>

ICES. 2023b. Minutes of the Meeting of the ICES Advisory Committee (ACOM), March 2023. ICES Business Reports, 3:11. 51 pp. <http://doi.org/10.17895/ices.pub.22795355>

ICES. 2024. Workshop on the calculation and evaluation of new reference points for category 1–2 stocks (WKNEWREF). ICES Scientific Reports. 6:100. 241 pp. <https://doi.org/10.17895/ices.pub.27905664>

Silva-Viladomiu, P.; Batts, L; Minto, C.; Miller, D.; and Lordan, C. 2022. An empirical review of ICES reference points. ICES Journal of Marine Science, Volume 79, Issue 10, December 2022, Pages 2563–2578, <https://doi.org/10.1093/icesjms/fsac194>