

Rationale for MSC scores changing

October 15th, 2022

Indicator	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Stock status outcome (1.1.1)	60-79	60-79	60-79	60-79	80+	80+
Stock rebuilding outcome (1.1.2)	60-79	60-79	60-79	N/A	N/A	N/A
Harvest strategy (1.2.1)	< 60	< 60	< 60	< 60	60-79	80+
Harvest control rules & tools (1.2.2)	60-79	60-79	60-79	60-79	60-79	60-79
Harvest strategy information & monitoring (1.2.3)	60-79	60-79	60-79	60-79	60-79	80+
Assessment of stock status (1.2.4)	80+	80+	80+	80+	80+	60-79

PI 1.2.1 – Harvest strategy

PI 1.2.1	There is a robust and precautionary harvest strategy in place		
Scoring Issue	SG 60	SG 80	SG 100
a	Harvest strategy design		
Guide post	The harvest strategy is expected to achieve stock management objectives reflected in PI 1.1.1 SG80.	The harvest strategy is responsive to the state of the stock and the elements of the harvest strategy work together towards achieving stock management objectives reflected in PI 1.1.1 SG80.	The harvest strategy is responsive to the state of the stock and is designed to achieve stock management objectives reflected in PI 1.1.1 SG80.
Met?	Yes	Yes	No
Rationale			

At the SG80 level, Sla includes three main requirements: a) that the strategy is responsive to the state of the stock; b) that the elements of the strategy work together; and c) that the strategy must work towards achieving the objectives reflected in PI 1.1.1 at SG80.

Guidance of the MSC Fisheries Standard (v2.01) in GSA2.4, indicating that:

Key elements of harvest strategies include:

- The control rules and tools in place, including the ability of the management system to control effort, taking into account issues such as overcapacity and its causes;
- The information base and monitoring stock status and the responsiveness of the management system and fleet to stock status.

CABs should also consider whether there are issues that might compromise the effectiveness of the harvest strategy.

For Peruvian fisheries in general, the Supreme Decree 008-2012-PRODUCE, establishes measures for the conservation of hydrobiological resources. Articles in this regulatory document provide some mechanisms to control fishing pressure in different methods. Article 4 declares the procedure for application of closures, whereas article 5 is more specific in ways to control fishing effort, including restrictions in number of days per week, successive operation by different authorized vessels at consecutive times, limiting the number of trips per day, other measures established by Ministerial Resolution. All such measures must be presented with the opinion of the *Instituto del Mar del Perú* (IMARPE), including consideration of their socio-economic impact. Finally, article 6 present rules for the protection of juvenile fish that include immediate suspension of operations in the zone where individual vessels exceed the limit established for a particular stock.

Specifically, for the anchovy fishery, the Protocol to build the Decision Table to determine the Maximum Limit of Total Allowable Catch by fishing season in the fishery of the North-Central Stock of the Peruvian anchovy (the Protocol), is a document with a description of methods used by IMARPE, includes a detailed technical description about how risk analyses are conducted twice a year to produce decision tables, the results are recommendations by IMARPE to PRODUCE about acceptable harvest rate levels, which in turn will be used to compute a TAC.

There are other accessory tools (such as protecting juveniles), but the main way to control effort is by presenting a seasonal limit to the allowable catch. The procedure in the Protocol to calculate the maximum

allowable harvest rate is what the MSC calls an “in place” and “generally understood” harvest control rule but it is not “well defined” as it is discussed in PI 1.2.2. The rule as described in the Protocol, is expected to reduce exploitation rate as the limit reference point is approached and has the potential to be responsive to the state of the stock as required in this PI because in the decision table, it is possible to identify the maximum catch that would allow the spawning biomass to be maintained above the target and limit reference points. The rule however, lacks a clear and explicit definition of actions that would be taken at specific trigger reference point levels.

The evidence provided indicates that the harvest strategy is based on the determination of a TAC or quota, limiting the harvest rate to a fixed maximum, and the protection of juveniles by means of brief closures in time and space. The TAC is obtained by multiplication of the harvest rate adopted by PRODUCE, times the biomass abundance estimated twice a year, either from data collected in dedicated surveys that include acoustic methods or using model-based projections. The harvest rate is usually recommended to be conservative and no larger than 0.35. Its calculation incorporates uncertainty around some parameters such as natural mortality and growth, also adding the status of current environmental conditions. Once a total TAC is computed, it is then distributed to Individual Vessel Quotas (IVQs) which are associated to a single vessel and only transferable to other vessels property of the same owner and could be associated to one or more vessels.

The TAC system is complemented with constant monitoring of the proportion of juveniles by areas in the entire fishing zone along the Peruvian coastline. There is evidence of short periods of closure in areas where there are more than 10% of fish under 12 cm. Another parameter used for monitoring the situation of the stock is the gonadosomatic index.

Reports of the seasonal surveys with estimates of abundance and oceanographic data are available every six months to inform the control rule (e.g., IMARPE 2020a; IMARPE 2020b). Frequent estimates of absolute abundance using acoustic methods, provide an appropriate way to monitor stock status and to adjust the next season allowable catch. This could make the strategy responsive to the state of the stock by means of a generally understood rule which multiplies the estimated abundance times a harvest rate. Because environmental conditions play a relevant role in recruitment, growth and survival, the vessel surveys collect a vast amount of oceanographic information that is used to condition the process of estimating biomass outcomes under alternative management options. Size information is also collected to monitor the income of new cohorts and to determine the distribution and abundance of juveniles to prevent excessive fishing pressure upon these size classes. Usually, there is no model based stock assessment, but the information from the vessel surveys is relevant and sufficient to produce recommendations about applicable harvest rates, time and areas to allow fishing operations. The Protocol however, considers that when oceanographic anomalies are weak or moderate, then biomass abundance is obtained using population dynamics models that do not conduct statistical inference about parameters, but only projecting the abundance from previous ship surveys. The elements of the harvest strategy work together towards achieving the goals to protect the stock and the ecosystem as discussed by Tam et al (2020).

The harvest strategy of the Peruvian anchovy fishery is *expected* to achieve stock management objectives reflected in PI 1.1.1 SG80 and meets SG60. The harvest strategy is required to be responsive to the state of the stock and that its elements work together towards achieving stock management objectives reflected in PI 1.1.1 SG80. In 2015 the fishery adjusted the harvest rate and biomass to produce a precautionary catch limit making the system to be responsive to stock status, thus meeting SG80. However, because there is no clear and unambiguous definition of the action that needs to be taken if abundance is under the target reference point, assuring that the strategy will always be responsive, SG100 is not met.

b	Harvest strategy evaluation
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	Guide post	The harvest strategy is likely to work based on prior experience or plausible argument.	The harvest strategy may not have been fully tested but evidence exists that it is achieving its objectives.	The performance of the harvest strategy has been fully evaluated and evidence exists to show that it is achieving its objectives including being clearly able to maintain stocks at target levels.
	Met?	Yes	Yes	No

Rationale

Trends in biomass, catch and harvest rates indicate that, while the stock fluctuates due to natural environmental variability, the harvest strategy appears to be achieving the objective to maintain the stock above the target reference point. The performance of the harvest strategy was tested using an MSE framework. The results present a variety of scenarios suggesting that a constant harvest rate of 0.35 results in the lowest short and long term biomass for all assumptions, but will result in higher biomass if the steepness parameter in the stock recruitment relationship is higher, indicating high productivity. Also, for the case of where recruitment is more dependent of environmental variability (as expected for the anchovy), although the short term biomass was still the lowest for a HR =0.35, it was not too different than other tested strategies. Potential variations were tested and may represent scenarios that are representative of the fishery. All of this means that even if the harvest strategy has not been *fully* evaluated, the fishery meets SG80 but not SG100.

c	Harvest strategy monitoring			
	Guide post	Monitoring is in place that is expected to determine whether the harvest strategy is working.		
	Met?	Yes		

Rationale

The fishery conducts two vessel surveys every year to collect acoustic, biological and environmental data to monitor stock status and to provide advice on the fishing pressure that the stock can sustain in the short term. This allows the management system to compare the current estimated biomass with the prediction previous to the beginning of the fishing season relative to reference points. The fishery meets the standard at SG60.

d	Harvest strategy review			
	Guide post			The harvest strategy is periodically reviewed and improved as necessary.
	Met?			

Rationale

SG100 is not analyzed for this review				
e	Shark finning			
	Guide post	It is likely that shark finning is not taking place.	It is highly likely that shark finning is not taking place.	There is a high degree of certainty that shark finning is not taking place.
	Met?	NA	NA	NA
Rationale				
This fishery does not target sharks, therefore this scoring issue does not need to be scored.				
f	Review of alternative measures			
	Guide post	There has been a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock.	There is a regular review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock and they are implemented as appropriate.	There is a biennial review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock, and they are implemented, as appropriate.
	Met?	NA	NA	NA
Rationale				
There is not unwanted catch as defined in SA3.1.6: "the part of the catch that a fisher did not intend to catch but could not avoid, and did not want or chose not to use". As far as the evidence that was reviewed, all catch, including juveniles when present in the nets, are used and not discarded. No need to score this SI.				
References				
IMARPE. 2020a. Situación del stock norte-centro de la anchoveta peruana (<i>Engraulis ringens</i>) al mes de mayo de 2020 y perspectivas de explotación para la primera temporada de pesca del año. Oficio No. 330. http://imparpe.gob.pe/imarpe/archivos/Informe-correspondiente-Oficio-330-2020-IMARPE-PE.pdf				
IMARPE. 2020b. Situación del stock norte-centro de la Anchoveta peruana (<i>Engraulis ringens</i>) al mes de noviembre y perspectivas de explotación para la segunda temporada de pesca del año 2020. Oficio No. 1118-2020-IMARPE/PE				
Draft scoring range			≥80	

PI 1.2.3 – Information and monitoring

PI 1.2.3		Relevant information is collected to support the harvest strategy		
Scoring Issue		SG 60	SG 80	SG 100
a	Range of information			
	Guide post	Some relevant information related to stock structure, stock productivity and fleet composition is available to support the harvest strategy.	Sufficient relevant information related to stock structure, stock productivity, fleet composition and other data are available to support the harvest strategy.	A comprehensive range of information (on stock structure, stock productivity, fleet composition, stock abundance, UoA removals and other information such as environmental information), including some that may not be directly related to the current harvest strategy, is available.
	Met?	Yes	Yes	Yes
Rationale				
<p>At the SG80 level, this SI requires that there be sufficient relevant information related to stock structure, stock productivity, fleet composition and other data are available to support the harvest strategy. Moreover, the Fisheries Standard in SA2.6.1 clarifies that this information should be relevant for the design and effective operational phases of the harvest strategy and the control rule.</p> <p>The available evidence shows a wide range of information related to stock structure, stock productivity and fleet composition, stock abundance, UoA removals and environmental information is presented by IMARPE's status of the north-central Peruvian anchovy stock and alternatives for harvesting that is produced for two fishing seasons each year. Abundance is estimated using acoustic data and is accompanied with oceanographic information to compute a TAC. To complement the abundance and oceanographic data, IMARPE reports also inform the harvest strategy with information about the size structure of the stock previous to the start of the fishing season. In addition to a comprehensive range of information on UoA removals, stock productivity, and information related to the harvest strategy, there is also information collected on oceanographic conditions, as it relates to building future strategies for climate change adaptation. It is considered that the fishery has a comprehensive range of information obtained from a strategic research plan connected to the Protocol to construct the decision tables used to make management decisions. The fishery meets the requirements at SG80 and even SG100.</p>				
b	Monitoring			
	Guide post	Stock abundance and UoA removals are monitored and at least one indicator is available and monitored with sufficient frequency to support the harvest control rule.	Stock abundance and UoA removals are regularly monitored at a level of accuracy and coverage consistent with the harvest control rule, and one or more indicators are available and monitored with sufficient frequency to support the harvest control rule.	All information required by the harvest control rule is monitored with high frequency and a high degree of certainty, and there is a good understanding of inherent uncertainties in the information [data] and the robustness of assessment and management to this uncertainty.

	Met?	Yes	Yes	No
Rationale				
<p>The available evidence indicates that, consistent with the requirements at SG80, stock abundance and UoA removals are regularly monitored at the level of accuracy and coverage consistent with the harvest control rule, as reflected by IMARPE's status of the stock reports (e.g. Resolucion Ministerial No. 353-2015-PRODUCE, No. 302-2020-PRODUCE, establishing procedures and tools for size and weight sampling, etc; Oficio No. 1118-2020-IMARPE/PE reporting stock status, oceanographic conditions and size structure, and recommending a harvest rate for the following fishing season).</p> <p>At the SG80 level, the standard also requires that one or more indicators are available and frequently monitored to support the harvest control rule. Indicators such as percentage of juveniles in catch and harvest rate are in place and monitored each fishing season to support the harvest control rule with sufficient frequency to support pre-emptive closures due to juvenile abundance or reaching the MLTAC (IMARPE 2020a, 2020b, IMARPE 2021). Therefore SG 80 is achieved.</p> <p>At the SG100, the Standard requires that "All information required by the harvest control rule is monitored with high frequency and a high degree of certainty, and there is a good understanding of the inherent uncertainties in the information [data] and the robustness of assessment and management to this uncertainty". Although it is clear that there are parts of the information that are frequently obtained with high accuracy (e.g. acoustic based biomass abundance), there are also uncertainties derived from novel approaches that are too new to have been resolved; whether the uncertainties derive from data quality or needs or are more related to model structure it is still undetermined. This is particularly important in the ecosystem approach which requires large amounts of information and implies a highly complex modelling effort. For now, the fishery cannot meet SG100.</p>				
c	Comprehensiveness of information			
	Guide post		There is good information on all other fishery removals from the stock.	
	Met?		Yes	
Rationale				
There is sufficient information on all removals from the stock including IHC, DHC and estimations of the non-reported fraction. SG80 is met.				
References				
Draft scoring range			>80	

PI 1.2.4 – Assessment of stock status

PI 1.2.4	There is an adequate assessment of the stock status			
Scoring Issue	SG 60	SG 80	SG 100	
a	Appropriateness of assessment to stock under consideration			

	Guide post		The assessment is appropriate for the stock and for the harvest control rule.	The assessment takes into account the major features relevant to the biology of the species and the nature of the UoA.
	Met?		Yes	Yes
Rationale				
<p>The Protocol to construct the decision table used in the calculation of the total allowable catch indicates that stock status is assessed using data from vessel surveys only or using population dynamics models. Abundance from surveys is estimated using regular acoustic methodologies. A simple size-structured model is used to adjust spawning biomass estimated from acoustic surveys if oceanographic anomalies are detected during the assessment surveys at sea; the resulting abundance is the expected fish biomass without the effect of oceanographic anomalies.</p> <p>Abundance estimated by means of vessel surveys conducted twice a year collecting acoustic data, as well as biological and oceanographic information, has been used since 1994 according to evidence provided. The data used in these assessments include the major features relevant to the biology of the species and the nature of the UoA. For a key LTL species, the assessment includes a large amount of oceanographic data that is used to calibrate the calculation of the TAC.</p> <p>Although there are references to earlier model-based approaches to assess stock status, no recent model-based stock assessment for the Peruvian anchovy fishery was available before the middle of 2021, however, we note that this is not a requirement under the MSC Fisheries Standard. In August 2021 IMARPE made available a model-based approach to assess stock status. The model used a simple surplus production model modified to account for environmental variability within a Bayesian framework. This approach provided an estimate of the biomass before the fishery became relevant, an estimate of the MSY, as well as the values of F and B producing it. Because the results of this assessment come from of a single species analysis, estimated parameters for management were compared to MSC default definitions to determine stock status in the ecosystem framework required by PI1.1.1A. Statements about stock status are not made in probabilistic ways.</p> <p>An ecosystem-based analysis of the fishery described the performance of the fishery according to the requirements of PI 1.1.1A for key LTL species and there is consideration of limits in the harvest rate that could be useful to recommend a potential harvest rate for the season, although at this point, it appears it would only be a quantity constant in time.</p> <p>Any of the three assessment approaches described are appropriate for the nature of the UoA and the HCR, and they take into account the major features relevant to the biology of the species. The fishery meets SG100.</p>				
b	Assessment approach			

	Guide post	The assessment estimates stock status relative to generic reference points appropriate to the species category.	The assessment estimates stock status relative to reference points that are appropriate to the stock and can be estimated.	
	Met?	Yes	No	
Rationale				
<p>Results of the stock assessment are used to make projections of abundance under alternative levels of fishing pressure and evaluating the results relative to remanent biomass reference points that apparently are appropriate to the species category or the stock. The fishery needs to provide a better description about the origin, nature and ways to calculate the reference points. In particular, it needs to be described how such reference points are appropriate for a key LTL such as the anchovy and how having a static biomass level is justified in a highly variable, environmentally dependent stock. The fishery meets SG60 but not SG80 in accordance with MSC interpretation of this SI in relation to key LTL species (https://mscportal.force.com/interpret/s/article/Key-LTL-species-and-PI1-2-1-1527586956232).</p>				
c	Uncertainty in the assessment			
	Guide post	The assessment identifies major sources of uncertainty.	The assessment takes uncertainty into account.	The assessment takes into account uncertainty and is evaluating stock status relative to reference points in a probabilistic way.
	Met?	Yes	Yes	Yes
Rationale				
<p>While the Protocol to build the Decision Table to determine the Maximum Limit of Total Allowable Catch, is not a stock assessment methodology in itself, it is an integral description about how to use the abundance estimated from acoustic vessel surveys to project the population, adding uncertainty by means of stochastic forward projections until the next recruitment period, and sampling parameters from statistical distributions. In addition, alternative scenarios of environmental conditions are also considered to evaluate the abundance outcome of applying different fishing intensities. Under this construction, multiple trajectories are produced in which the final abundance is determined to be above or below target and limit reference points. The risk (probability) of being under the TRP is therefore computed as the proportion of all trajectories that ended under the reference point. The team observed that the fishery has conducted different approaches to assess the status of the Peruvian anchovy using alternative methodologies, of which at least three have been presented for this evaluation and have been used to score different components of the MSC Principle 1. However, to make actual management decisions, the Protocol dictates only two routes in stock assessment to recommend the allowable catch or harvest rate, and both include the use of the acoustic data from vessel surveys. Since there is no regular model-based stock assessment to estimate stock status relative to reference points that could incorporate uncertainties, evaluation of this SI considers the treatment of uncertainty in the application of procedures described in the Protocol. The team concluded that, even if there are still unresolved questions about reference points, the conceptual structure of the Protocol meets the standard at SG100 as it takes uncertainty into account and incorporates stock status relative to reference points in a probabilistic way.</p>				
d	Evaluation of assessment			

	Guide post			The assessment has been tested and shown to be robust. Alternative hypotheses and assessment approaches have been rigorously explored.
	Met?			
Rationale				
SG100 is not analyzed				
e	Peer review of assessment			
	Guide post		The assessment of stock status is subject to peer review.	The assessment has been internally and externally peer reviewed.
	Met?		No	No
Rationale				
The assessment of stock status has been subject to peer review, the fishery does not meet SG80.				
References				
Díaz-Acuña <i>et al.</i> 2021				
Draft scoring range			60-79	