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Global Standard for Responsible Supply of Marine Ingredients

Fishery Assessment Methodology and Template Report V2.0

Version No.: 2.0

Date: July 2017



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Fishery Under Assessment	Monterrey sardine (<i>Sardinops sagax</i>)
Date	January 2018
Assessor	Deirdre Hoare

Application details and summary of the assessment outcome				
Name:				
Address:				
Country: Mexico		Zip:		
Tel. No.		Fax. No.		
Email address:		Applicant Code		
Key Contact:		Title:		
Certification Body Details				
Name of Certification Body:		SAI Global, Ireland		
Assessor Name	Peer Reviewer	Assessment Days	Initial/Surveillance/ Re-approval	Whole fish / By-product
Deirdre Hoare	Conor Donnelly	7	Initial	Whole fish
Assessment Period	2017			

Scope Details	
Management Authority (Country/State)	Mexico
Main Species	Monterrey sardine (<i>Sardinops sagax</i>)
Fishery Location	FAO 77 Gulf of California
Gear Type(s)	Purse seine
Outcome of Assessment	
Overall Outcome	Pass
Clauses Failed	
Peer Review Evaluation	Approve
Recommendation	Approve

Assessment Determination
<p>The components of the Mexico small pelagic fishery which operate for reduction purposes meet the requirements of the raw material sourcing section of the IFFO RS Standard. There is a management, control and enforcement framework in place which has a robust legal basis. Data collection activities are sufficient to provide a scientific basis for the management of the main target species. Sardine is the main reduction target, and the stock is currently estimated to be larger than the informal target and limit reference points. Thread herring makes up around 20% of the reduction catch, the current biomass is above the optimal level and that corresponding to the maximum sustainable catch. There is no evidence of any substantial interactions between the fishery and ETP species or the physical environment.</p> <p>However, it should be noted that although the stock assessment for thread herring is considered to be appropriate for the control rule and harvest strategy it does not appear to be peer reviewed. This fishery is MSC certified (small pelagics fishery, Sonora, Gulf of California) and the lack of peer review was identified in that assessment and a condition set (condition 1-7) requiring that by the third surveillance visit the assessment of stock status of thread herring has been subject to peer review. On that basis it is considered that a process is in place to deliver peer review of the stock assessment and criterion A2.4 is considered to pass, although progress in delivery of this MSC condition should be monitored in subsequent IFFO RS whole fish assessments.</p>
Peer Review Comments
Notes for On-site Auditor

General Results

General Clause	Outcome (Pass/Fail)
M1 - Management Framework	Pass
M2 - Surveillance, Control and Enforcement	Pass
F1 - Impacts on ETP Species	Pass
F2 - Impacts on Habitats	Pass
F3 - Ecosystem Impacts	Pass

Species-Specific Results

Category	Species	% landings	Outcome (Pass/Fail)	
Category A	Monterrey sardine Thread Herring	60 20	A1	Pass
			A2	Pass
			A3	Pass
			A4	Pass
Category B	Bocona sardine	10	Pass	
Category C	Chub Mackerel	5	Pass	
Category D	Red-eye round herring	5	Pass	

[List all Category A and B species. List approximate total %age of landings which are Category C and D species; these do not need to be individually named here]

HOW TO COMPLETE THIS ASSESSMENT REPORT

This assessment template uses a modular approach to assessing fisheries against the IFFO RS standard.

Whole Fish

The process for completing the template for a **whole fish** assessment is as follows:

1. ALL ASSESSMENTS: Complete the Species Characterisation table, to determine which categories of species are present in the fishery.
2. ALL ASSESSMENTS: Complete clauses M1, M2, M3: Management.
3. IF THERE ARE CATEGORY A SPECIES IN THE FISHERY: Complete clauses A1, A2, A3, A4 for **each** Category A species.
4. IF THERE ARE CATEGORY B SPECIES IN THE FISHERY: Complete the Section B risk assessment for **each** Category B species.
5. IF THERE ARE CATEGORY C SPECIES IN THE FISHERY: Complete clause C1 for **each** Category C species.
6. IF THERE ARE CATEGORY D SPECIES IN THE FISHERY: Complete Section D.
7. ALL ASSESSMENTS: Complete clauses F1, F2, F3: Further Impacts.

A fishery must score a pass in **all applicable clauses** before approval may be recommended. To achieve a pass in a clause, the fishery/species must meet **all** of the minimum requirements.

By-products

The process for completing the template for **by-product raw material** is as follows:

1. ALL ASSESSMENTS: Complete the Species Characterisation table with the names of the by-product species and stocks under assessment. The ‘% landings’ column can be left empty; all by-products are considered as Category C and D.
2. IF THERE ARE CATEGORY C BYPRODUCTS UNDER ASSESSMENT: Complete clause C1 for **each** Category C by-product.
3. IF THERE ARE CATEGORY D BYPRODUCTS UNDER ASSESSMENT: Complete Section D.
4. ALL OTHER SECTIONS CAN BE DELETED. Clauses M1 - M3, F1 - F3, and Sections A and B do not need to be completed for a by-product assessment.

By-product approval is awarded on a species-by-species basis. Each by-product species scoring a pass under the appropriate section may be approved against the IFFO RS Standard.

SPECIES CATEGORISATION

The following table should be completed as fully as the available information permits. Any species representing more than 0.1% of the annual catch should be listed, along with an estimate of the proportion of the catch each species represents. The species should then be divided into Type 1 and Type 2 as follows:

- **Type 1 Species** can be considered the ‘target’ or ‘main’ species in the fishery. They make up the bulk of annual landings and are subjected to a detailed assessment.

- **Type 2 Species** can be considered the ‘bycatch’ or ‘minor’ species in the fishery. They make up a small proportion of the annual landings and are subjected to relatively high-level assessment.

Type 1 Species must represent 95% of the total annual catch. Type 2 Species may represent a maximum of 5% of the annual catch (see Appendix B).

Species which make up less than 0.1% of landings do not need to be listed (NOTE: ETP species are considered separately). The table should be extended if more space is needed. Discarded species should be included when known.

The ‘stock’ column should be used to differentiate when there are multiple biological or management stocks of one species captured by the fishery. The ‘management’ column should be used to indicate whether there is an adequate management regime specifically aimed at the individual species/stock. In some cases it will be immediately clear whether there is a species-specific management regime in place (for example, if there is an annual TAC). In less clear circumstances, the rule of thumb should be that if the species meets the minimum requirements of clauses A1-A4, an adequate species-specific management regime is in place.

NOTE: If any species is categorised as Endangered or Critically Endangered on the IUCN Red List, or if it appears in the CITES appendices, it **cannot** be approved for use as an IFFO RS raw material. This applied to whole fish as well as by-products.

TYPE 1 SPECIES (Representing 95% of the catch or more)

Category A: Species-specific management regime in place.

Category B: No species-specific management regime in place.

TYPE 2 SPECIES (Representing 5% OF THE CATCH OR LESS)

Category C: Species-specific management regime in place.

Category D: No species-specific management regime in place.

Common name	Latin name	Stock	% of landings	Management	Category
Monterrey sardine	<i>Sardinops sagax</i>	FAO 77	60	Mexico	A
Thread herring	<i>Opisthonema spp.</i>	FAO 77	20	Mexico	A
Bocona sardine	<i>Cetengraulis mysticetus</i>	FAO 77	10	Mexico	B
Chub mackerel	<i>Scomber japonicus</i>	FAO 77	5	Mexico	C
Red-eye herring	<i>Etrumeus teres</i>	FAO 77	5	Mexico	D

MANAGEMENT

The two clauses in this section relate to the general management regime applied to the fishery under assessment. A fishery must meet all the minimum requirements in every clause before it can be recommended for approval.

M1	Management Framework – Minimum Requirements		
	M1.1	There is an organisation responsible for managing the fishery	Yes
	M1.2	There is an organisation responsible for collecting data and assessing the fishery	Yes
	M1.3	Fishery management organisations are publically committed to sustainability	Yes
	M1.4	Fishery management organisations are legally empowered to take management actions	Yes
	M1.5	There is a consultation process through which fishery stakeholders are engaged in decision-making	Yes
	M1.6	The decision-making process is transparent, with processes and results publically available	Yes
Clause outcome:			Pass
<p>Evidence</p> <p>The government body with responsibility for fisheries management in Mexico is Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food (Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación, SAGARPA).</p> <p>Scientific research and advice in support of the management of Mexican fisheries is provided by the National Fisheries Institute (INAPESCA).</p> <p>The mission of the INAPESCA is to “Coordinate and conduct scientific and technological research on fisheries and aquaculture resources with sustainability criteria for its management and conservation and promote research schemes with the participation and financial support from the sectors involved”. This includes the development of stock-specific management plans, the maintenance of the National Fisheries Charter, and the planning and conducting of research in support of these functions.</p> <p>The primary legal instruments are the Fisheries Law (Ley de Pesca) and the Regulation to the Fisheries Law (Reglamento de la Ley de Pesca NOM-003-PESC-1993, updated in 2014 NOM-003-SAG/PESC-2014)). Based on the contents of these laws, the SAGARPA mission statement includes a commitment to “facilitate the competitive and sustainable development of the fisheries and aquaculture sector in the country to increase the welfare of Mexicans”. The Fisheries Management Plan for the minor pelagic species (Plan de manejo pesquero para la pesquería de pelágicos menores) aims to set out the actions to develop the fisheries in a sustainable manner based on the current knowledge of ecological, environmental, economic, cultural, social and biological aspects of the fisheries.</p> <p>Prior to the publication of the Small Pelagics Fishery Management Plan (SPFMP), a period was opened to receive public comments through several meetings in 2012 at the different ports where this fishery is carried out (Guaymas March 16-18, Guaymas April 26-29, Ensenada May 26-27, and Guaymas June 21-24). A new version of the NOM-0003-PESC-1993 for the national small pelagic fishery is under revision at the COFEMER (Federal Commission for Regulation Improvement). The proposal for the modification of the NOM was published in the Official Gazette (DOF) from 4th of December 2014 to the 2nd of February for public comment.</p> <p>The decision-making process incorporates interchange of scientific information and collaboration in research through the Comité Técnico de Pelágicos Menores. Invitations to the annual workshops held by the Committee are sent to all participants in the Pacific sardine assessment. Members of the public sector (eNGOs and academics) attended and presented results of their work at these meetings in June 2013.</p>			

References www.comitepelagicosmenores.org Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación, SAGARPA http://www.gob.mx/sagarpa/que-hacemos
<i>Standard clauses 1.3.1.1, 1.3.1.2</i>

M2	Surveillance, Control and Enforcement - Minimum Requirements		
	M2.1	There is an organisation responsible for monitoring compliance with fishery laws and regulations	Yes
	M2.2	There is a framework of sanctions which are applied when laws and regulations are discovered to have been broken	Yes
	M2.3	There is no substantial evidence of widespread non-compliance in the fishery, and no substantial evidence of IUU fishing	Yes
	M2.4	Compliance with laws and regulations is actively monitored, through a regime which may include at-sea and portside inspections, observer programmes, and VMS.	Yes
Clause outcome:			Pass
Evidence <p>The Secretariat of Environment and Natural Resources (SEMARNAT), the Federal Attorney for Environmental Protection (PROFEPA), Marina (Mexican Navy) and National Defense (SEDENA) and the National Commission on Security (CNS), the Federal Police, and the National Commission of Aquaculture and Fisheries (CONAPESCA), work together under the Centro de Operaciones Interinstitucionales (COI) San Felipe directed by the Commandant of the Naval Sector. They carry out surveillance operations in the Upper Gulf of California by adding equipment and personnel to promote the protection and combat illegal trafficking of marine resources.</p> <p>The Fisheries Law (Ley General de Pesca y Acuacultura Sustentables 2007) lays down the details of infractions (Article 132) and the sanctions (Article 133) to be applied.</p> <p>Sanctions include</p> <ul style="list-style-type: none"> • A warning, reprimand • Fine (Article 138 details the how the fines are determined) • Additional fines for every day the infraction persists • Administrative arrest for 36 hours • Temporary/ permanent partial or total closure of the installations where the infractions occurred • Confiscation of vessels or vehicles, fishery equipment and/or products obtained by aquaculture or fishing directly related to the infractions committed • Suspension or revocation of corresponding fishing permits, concessions or authorisations. <p>There is no substantial evidence of widespread non-compliance in the fishery, and no substantial evidence of IUU fishing. The fishery generally complies with most regulatory mechanisms defined in the Law, the NOM, the CNP and the Management Plan. However, it was found that the fishery systematically exceeds the allowable proportion of undersized fish in the catch. This is being addressed in the proposal to modify the current NOM.</p> <p>Compliance with laws and regulations is actively monitored, through a regime which may include at-sea and portside inspections, observer programmes, and VMS. CONAPESCA and INAPESCA conduct monitoring, control and surveillance of the fishery to ensure compliance with current regulations. Landings are monitored and sampled and regular inspections take place at ports of landing/processing plants and on fishing vessels. Under CONAPESCA's National Inspection and Monitoring Program 26,895 inspections were undertaken of 15 priority fisheries by 2014.</p>			

No infractions have been recorded from CONAPESCA's inspections of the small pelagics fleet, a single infraction prior to 2010 for a vessel fishing in shallow waters was removed because the regulations did not restrict the vessel in relation to depth or area (Alvarez *et al*, 2017). An observer program was planned for 2016 but the data has not been published yet.

All fishing vessels have a permit issued by CONAPESCA based on technical opinion issued by INAPESCA. The permits have to be renewed every 5 years and fishing vessels are required to use Vessel Monitoring System equipment (VMS system) for tracking the spatial position of fishing operations.

References

Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación, SAGARPA

<http://www.gob.mx/sagarpa/que-hacemos>

Fisheries Management Plan for the minor pelagic species (Plan de manejo pesquero para la pesquería de pelágicos menores) http://dof.gob.mx/nota_detalle_popup.php?codigo=5276945

Reglamento de la Ley de Pesca 2014 NOM-003-SAG/PESC-2014

http://dof.gob.mx/nota_detalle.php?codigo=5374148&fecha=04/12/2014

Comisión Nacional de acuacultural y pesca <http://www.conapesca.gob.mx/wb/>

Instituto Nacional de Pesca <http://www.inapesca.gob.mx/portal/index.php>

National Fisheries Charter (Carta Nacional Pesquera)

<http://www.inapesca.gob.mx/portal/documentos/publicaciones/carta-nacional-pesquera/Carta-Nacional-Pesquera-2012.pdf>

Alvarez, C., Andraka, S., Anhalzer, G. and Morgan, S. (2017). Small Pelagics Fishery in Sonora, Gulf of California. MSC Fishery Assessment Report. December 19, 2017. SCS Global Services Ltd.

<https://fisheries.msc.org/en/fisheries/small-pelagics-fishery-in-sonora-gulf-of-california/@assessments>

Standard clause 1.3.1.3

CATEGORY A SPECIES

The four clauses in this section apply to Category A species. Clauses A1 - A4 should be completed for **each** Category A species. If there are no Category A species in the fishery under assessment, this section can be deleted. A Category A species must meet the minimum requirements of all four clauses before it can be recommended for approval. If the species fails any of these clauses it should be re-assessed as a Category B species.

Species Name		Monterrey sardine (<i>Sardinops sagax</i>)		
A1	Data Collection - Minimum Requirements			
	A1.1	Landings data are collected such that the fishery-wide removals of this species are known.	Yes	
	A1.2	Sufficient additional information is collected to enable an indication of stock status to be estimated.	Yes	
			Clause outcome:	Pass
Evidence				
Landings data are collected such that the fishery-wide removals of this species are known. Data on catch and effort is collected from the official 'Aviso de Arribo' or landing notification form provided and collected by the regional offices of CONAPESCA. The data are processed and analysed by INAPESCA and results presented in official reports of fishery catch and effort.				
Sufficient additional information is collected to enable an indication of stock status to be estimated. Estimates of abundance independent of the fishery have been obtained from hydroacoustic surveys carried out in the Gulf of California from 2008 to 2016.				
References				
Nevarez-Martinez et.al 2016 Evaluación poblacional de la sardina monterrry (<i>Sardinops sagax</i>) en el Golfo de California, Mexico, 1971/71 -2014/2015. Informe Técnico del Programa de Pelágico Menores. Instituto Nacional de Pesca, CRIP Guaymas, Sonora, 23pp.				
Standard clause 1.3.2.1.1				

A2	Stock Assessment - Minimum Requirements		
	A2.1	A stock assessment is conducted at least once every 3 years (or every 5 years if there is substantial supporting information that this is sufficient for the long-term sustainable management of the stock), and considers all fishery removals and the biological characteristics of the species.	Yes
	A2.2	The assessment provides an estimate of the status of the biological stock relative to a reference point or proxy.	Yes
	A2.3	The assessment provides an indication of the volume of fishery removals which is appropriate for the current stock status.	Yes
	A2.4	The assessment is subject to internal or external peer review.	Yes
	A2.5	The assessment is made publicly available.	Yes
Clause outcome:			Pass
Evidence A stock assessment is conducted annually, and considered all fishery removals and the biological characteristics of the species. Stock assessments using regular Virtual Population Analysis, length based (Jones') VPA and statistical catch at age using ASAP using catch and effort data from the fleet. The most recent assessment 2016 used auxiliary information including; a series of CPUE values from scientific cruises, the indices of abundance from acoustic			

surveys, an index of egg and larvae, an index representing spawning probability and the proportion of sardines in the diet of seabirds.

The assessments provide an estimate of the status of the biological stock relative to a reference point or proxy. In the SPFMP, the Biologically Acceptable Catch (BAC) is a fraction of the estimated MSY and is used as a limit reference point (LRP). It is considered a prudent level of catch that can vary between 5 and 25% of the estimated biomass although fishing mortality rate producing MSY has been estimated in the most recent stock assessment at 0.29 (Nevarez-Martinez 2016, cited in Alvarez *et al*, 2017). Overfishing, which is defined as when fishing takes place at a rate that is high enough to risk the stock's ability to continuously produce MSY in the long term, occurs if the catch exceeds BAC (Alvarez *et al*, 2017). The target reference point is the optimum yield (OY) which is defined as a catch level that is equal to or less than the BAC, but in practice must be less than the BAC to avoid overfishing. The BAC is estimated using a harvest control rule and is calculated annually (Alvarez *et al*, 2017).

The stock assessments have been conducted for many years and have evolved to the current use of a statistical catch at age model, fit to several indices of abundance. The stock assessment has been peer reviewed (Hill, 2015) and is considered to be appropriate for the control rule and the harvest strategy.

Stock assessments must be requested from INAPESCA, some are available on line, for example:

http://www.sardinagolfodecalifornia.org/wp-content/uploads/2015/12/InfTec_Evaluaci%C3%B3n-sardina-monterrey_2015.pdf

References

Nevarez-Martinez et.al 2016 Evaluación poblacional de la sardina monterrey (Sardinops sagax) en el Golfo de California, Mexico, 1971/71 -2014/2015. Informe Técnico del Programa de Pelágico Menores. Instituto Nacional de Pesca, CRIP Guaymas, Sonora, 23pp.

Hill et. al 2015. Assessment of the Pacific sardine resource in 2014 for U.S.A management in 2014-2015. Stock Assessment Report. Southwest Fisheries Science Center, NOAA NMFS. La Jolla, California. 182pp.

Alvarez, C., Andraka, S., Anhalzer, G. and Morgan, S. (2017). Small Pelagics Fishery in Sonora, Gulf of California. MSC Fishery Assessment Report. December 19, 2017. SCS Global Services Ltd.

<https://fisheries.msc.org/en/fisheries/small-pelagics-fishery-in-sonora-gulf-of-california/@assessments>

Standard clause 1.3.2.2, 1.3.2.1.2, 1.3.2.1.4

A3	Harvest Strategy - Minimum Requirements		
	A3.1	There is a mechanism in place by which total fishing mortality of this species is restricted.	Yes
	A3.2	Total fishery removals of this species do not regularly exceed the level indicated or stated in the stock assessment. Where a specific quantity of removals is recommended, the actual removals may exceed this by up to 10% ONLY if the stock status is above the limit reference point or proxy.	Yes
	A3.3	Commercial fishery removals are prohibited when the stock has been estimated to be below the limit reference point or proxy (small quotas for research or non-target catch of the species in other fisheries are permissible).	Yes
Clause outcome:			Pass

Evidence

There is a mechanism in place by which total fishing mortality of this species is restricted. The harvest strategy for the fishery of small pelagics in Mexico is set out in the SPFMP and is expected to achieve stock management objectives reflected in the target and limit reference points. Specific mechanisms in the SPFMP operate such that its definition of 'sustainable levels' is consistent with MSY. The main reference point (BAC, a LRP) is established and expected to keep biomass above the level producing MSY. This works through use of a control rule applied to species that are subject to active management. The control rule is also built with the intent to keep a minimum amount of biomass unfished to protect the stock. If the minimum biomass is reached; the fleet stops operating (Alvarez *et al*, 2017).

Total fishery removals of this species do not regularly exceed the level indicated or stated in the stock assessment. The stock assessment has estimated that the annual fishing mortality has been kept under the estimated F_{msy} .



Figure 1. Estimated Fishing mortality F and exploitation rates E in the Pacific sardine fishery of the Gulf of California, Mexico. Exploitation rates expressed as $E = F/Z$ and $E = C_{tot}/B_{vulnerable}$, $F_{msy} = 0.29$. Nevarez-Martinez et. al 2016.

References

Nevarez-Martinez et.al 2016 Evaluación poblacional de la sardina monterrey (*Sardinops sagax*) en el Golfo de California, Mexico, 1971/71 -2014/2015. Informe Técnico del Programa de Pelágico Menores. Instituto Nacional de Pesca, CRIP Guaymas, Sonora, 23pp.

Alvarez, C., Andraka, S., Anhalzer, G. and Morgan, S. (2017). Small Pelagics Fishery in Sonora, Gulf of California. MSC Fishery Assessment Report. December 19, 2017. SCS Global Services Ltd.
<https://fisheries.msc.org/en/fisheries/small-pelagics-fishery-in-sonora-gulf-of-california/@assessments>

Standard clause 1.3.2.1.3

A4	Stock Status - Minimum Requirements	
	A4.1	The stock is at or above the target reference point, OR IF NOT: The stock is above the limit reference point or proxy and there is evidence that a fall below the limit reference point would result in fishery closure OR IF NOT: The stock is estimated to be below the limit reference point or proxy, but fishery removals are prohibited.
		Yes
		Clause outcome: Pass

Evidence

In recent years the status of the Monterrey sardine has been of concern due to a sharp decline in catches from a historic high of around half a million tons in seasons 2007/08 and 2008/09 down to 3,571 tons in season 2013/14 and 4,455 tons in season 2014/15 (figure 2). Although these catches were obtained in seasons when the fleet agreed to suspend the effort on Pacific sardine, the records represent historic lows for the fishery. The stock assessments concluded that recruitment is highly variable and suggested that environmental conditions, notably El Niño events, may play an important role in such variability. These assessments also indicate that total abundance closely follows the trend in recruitment (Alvarez *et al*, 2017).

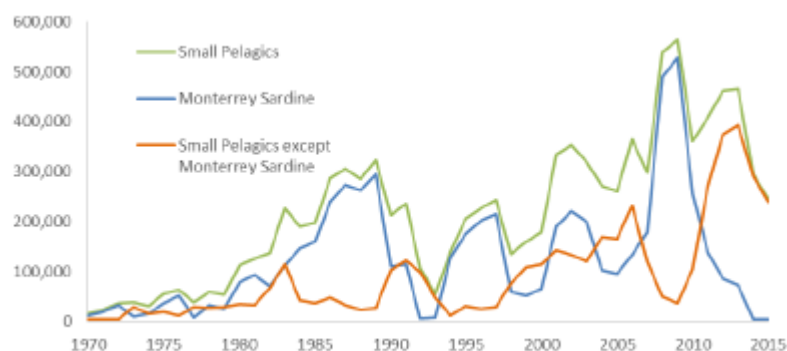


Figure 2. Comparative trends of catch history for Pacific sardine vs all other small pelagic species in the fishery of the northern/central Gulf of California, Mexico. From data of Nevárez-Martínez *et al.* 2016a. Source: Alvarez *et al*, 2017.

However, Alvarez *et al*, 2017 refer to evidence that indicates overfishing may have played a role in the fall of the Monterrey sardine stock in the early 1990s (figure 3). Comparison of the reported trend in the catch compared to the estimated historic values of the BAC shows that in the late 1980s and early 1990s, the actual catch may have been close to the BAC or exceeded it (Nevarez-Martinez *et al.* 2016 cited in Alvarez *et al*, 2017). A similar pattern appears more recently from around 2008 and overfishing may have taken place momentarily as a result of unfavourable environmental conditions not being accounted for in management (Alvarez *et al*, 2017).

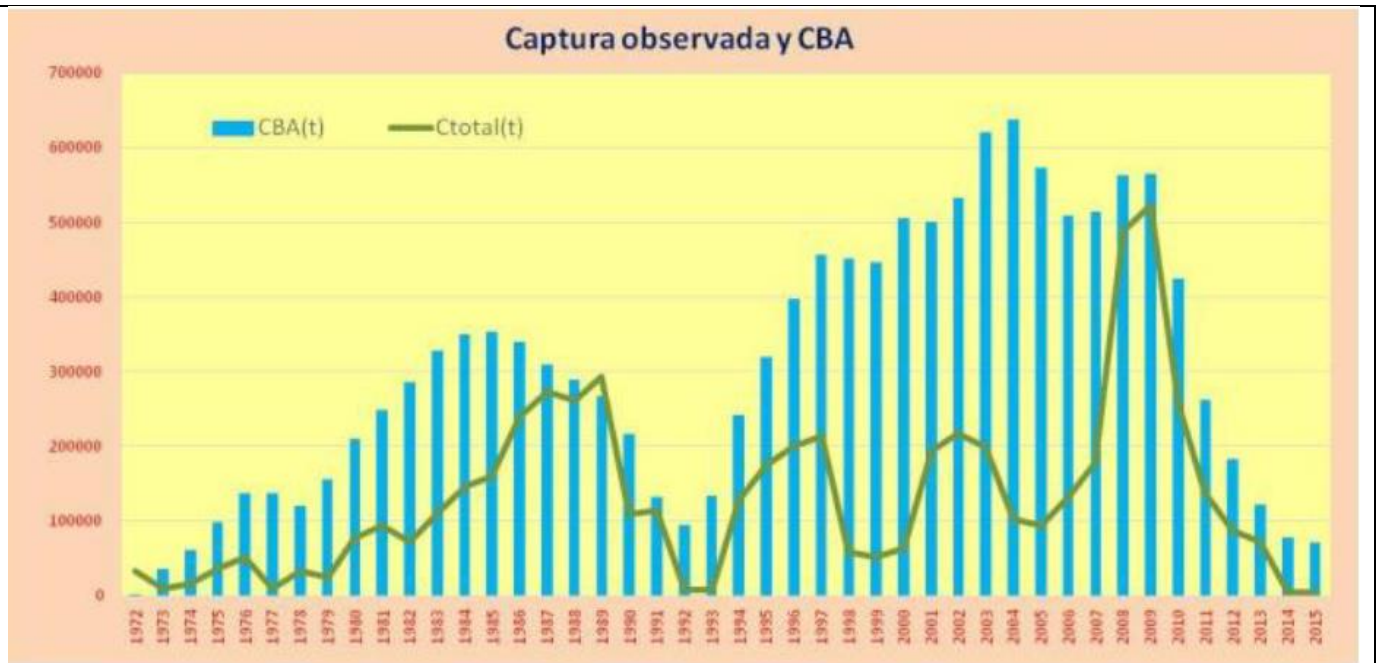


Figure 3. Comparison of catch records (green line) of Pacific sardine in the Gulf of California with the estimated Biologically Acceptable Catch (bars) obtained with the control rule in the Management Plan. Reproduced from Nevarez-Martinez et al. 2016. Source: Alvarez *et al.*, 2017.

The occurrence of a strong El Niño event was confirmed in 2015. Under these oceanographic conditions INAPESCA consider that the best possible explanation for the recent low catches is that the stock has shifted distribution to the north of the Gulf, and to deeper waters making the fish unavailable to the fishery. Fisheries independent cruises, with the ability to detect biomass to a depth of 250m were conducted by INAPESCA in 2014 and showed that most small pelagic species, including the Monterrey sardine, were scattered and in low abundance which reflected the low availability to the fishery which operates between 40 and 100m (Alvarez-Trasviña et al. 2015 cited in Alvarez et al. 2017). The expectation is for the abundance of Pacific sardine to continue at low levels until the 2020s.

The most recent assessment by Nevarez-Martinez et al. (2016, cited in Alvarez *et al.*, 2017) estimated total biomass at nearly one million tonnes whereas adult biomass was estimated to be around 420,000 tonnes between 2013/14 and 2014/15. The biomass was estimated by acoustic methods, but Alvarez et al (2017) note expert advice that these are underestimates of the true abundance as a result of technical issues with the survey.

The assessment estimated that F was, for most of the time series under 0.15 with the exception of the periods in the late 1980s/early 1990s and from 2008 to 2013. During these periods the harvest rate exceeded 0.18 which corresponds to 0.29, the ASAP estimate of the fishing mortality rate producing MSY (F_{msy}). It is therefore estimated that except for these periods, the stock has not been through periods of overfishing and has been under the BAC (consistent with achieving MSY).

References

Alvarez, C., Andraka, S., Anhalzer, G. and Morgan, S. (2017). Small Pelagics Fishery in Sonora, Gulf of California. MSC Fishery Assessment Report. December 19, 2017. SCS Global Services Ltd.
<https://fisheries.msc.org/en/fisheries/small-pelagics-fishery-in-sonora-gulf-of-california/@assessments>

Standard clause 1.3.2.1.4

Species Name		Thread herring (<i>Opisthonema spp.</i>)		
A1	Data Collection - Minimum Requirements			
	A1.1	Landings data are collected such that the fishery-wide removals of this species are known.	Yes	
	A1.2	Sufficient additional information is collected to enable an indication of stock status to be estimated.	Yes	
			Clause outcome:	Pass
Evidence				
Landings data are collected such that the fishery-wide removals of this species are known. Data on catch and effort is collected from the official 'Aviso de Arribo' or landing notification form provided and collected by the regional offices of CONAPESCA. The data are processed and analysed by INAPESCA and results presented in official reports of fishery catch and effort.				
Sufficient additional information is collected to enable an indication of stock status to be estimated. Estimates of abundance independent of the fishery have been obtained from hydroacoustic surveys carried out in the Gulf of California from 2008 to 2016.				
References				
Nevarez-Martinez et.al 2016 Evaluación poblacional de la sardina crinuda (<i>Opisthonema libertate</i>) en el Golfo de California, Mexico, 1971/72 -2013/2014. Informe Técnico del Programa de Pelágico Menores. Instituto Nacional de Pesca, CRIP Guaymas, Sonora.				
Standard clause 1.3.2.1.1				

A2	Stock Assessment - Minimum Requirements		
	A2.1	A stock assessment is conducted at least once every 3 years (or every 5 years if there is substantial supporting information that this is sufficient for the long-term sustainable management of the stock), and considers all fishery removals and the biological characteristics of the species.	Yes
	A2.2	The assessment provides an estimate of the status of the biological stock relative to a reference point or proxy.	Yes
	A2.3	The assessment provides an indication of the volume of fishery removals which is appropriate for the current stock status.	Yes
	A2.4	The assessment is subject to internal or external peer review.	Yes
	A2.5	The assessment is made publicly available.	Yes
Clause outcome:			Pass
Evidence <p>A stock assessment is conducted annually, and considers all fishery removals and the biological characteristics of the species. Stock assessments using regular Virtual Population Analysis, the ASAP model and using a biomass dynamics model. The most recent assessments in 2014 and 2016 used a form of statistical catch at age using the software ASAP. Two relative abundance indices obtained independently from the fishery were added, catch in kg of biomass per tow (in research cruise sets) and biomass based on eggs and larvae per 10 square m.</p> <p>The assessment provides an estimate of the status of the biological stock relative to a reference point or proxy. The optimum yield is a fraction of the Biologically Acceptable Catch. The $F_{MSY}=0.312$, the fishing mortality rate has been historically well under the LRP. BAC is consistent with MSY, and F producing BAC is interpreted as the Limit Reference Point. Fishing mortality near MSY (90%) is assumed to be a generic value of 0.25 in the SPFMP and the <i>Carta Nacional Pesquera</i> (CNP) and is used as a reference point. According to the latest available data, current</p>			

biomass of this stock is thought to be at or above levels that sustain maximum sustainable yield (MSY). The most recent stock assessment suggests that the stock is healthy and is not overfished.

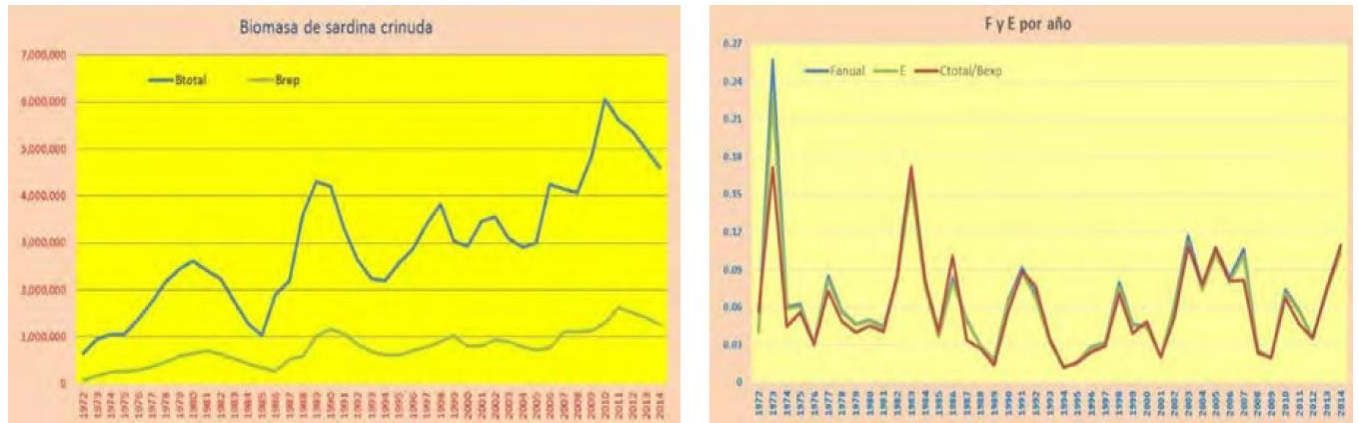


Figure 4. Time series of adult (Brep) and total (Btotal) biomass (left) and fishing mortality rate (right) of thread herring in the Gulf of California obtained in the 2016 ASAP assessment. Nevarez-Martinez et. al. 2016.

The results of the stock assessment indicate that there is a high variability in the biomass of Thread Herring. The assessment provides an indication of the volume of fishery removals which is appropriate for the current stock status as $F_{MSY} = 0.575$ and MSY about 354,000tons.

Stock assessments have been conducted for many years and have evolved to the current use of a statistical catch at age model, fit to several indices of abundance. The stock assessment have not been peer reviewed but are considered to be appropriate for the control rule and harvest strategy. This fishery is MSC certified (small pelagics fishery, Sonora, Gulf of California) and the lack of peer review was identified in that assessment and a condition set (condition 1-7) requiring that by the third surveillance visit the assessment of stock status of thread herring has been subject to peer review. On that basis it is considered that a process is in place to deliver peer review of the stock assessment and criterion A2.4 is considered to pass, although progress in delivery of this MSC condition should be monitored in subsequent IFFO RS whole fish assessments.

Stock assessments must be requested through the INAPESCA website.

References

Nevarez-Martinez et.al 2016 Evaluación poblacional de la sardina crinuda (*Opisthonema libertate*) en el Golfo de California, Mexico, 1971/72 -2013/2014. Informe Técnico del Programa de Pelágico Menores. Instituto Nacional de Pesca, CRIP Guaymas, Sonora.

Standard clause 1.3.2.2, 1.3.2.1.2, 1.3.2.1.4

A3	Harvest Strategy - Minimum Requirements		
	A3.1	There is a mechanism in place by which total fishing mortality of this species is restricted.	Yes
	A3.2	Total fishery removals of this species do not regularly exceed the level indicated or stated in the stock assessment. Where a specific quantity of removals is recommended, the actual removals may exceed this by up to 10% ONLY if the stock status is above the limit reference point or proxy.	Yes
	A3.3	Commercial fishery removals are prohibited when the stock has been estimated to be below the limit reference point or proxy (small quotas for research or non-target catch of the species in other fisheries are permissible).	Yes

Evidence

There is a mechanism in place by which total fishing mortality of this species is restricted. The harvest strategy for the fishery of small pelagics in Mexico is outlined in the SPFMP and is expected to achieve stock management objectives reflected in the target and limit reference points. Specific mechanisms in the SPFMP operated such that its definition of 'sustainable levels' is consistent with MSY. The main reference point (BAC, a LRP) is established and expected to keep biomass above the level producing MSY. This works through use of a control rule applied to species that are subject to active management. The control rule is also built with the intent to keep a minimum amount of biomass unfished to protect the stock. If the minimum biomass is reached; the fleet stops operating (Alvarez *et al*, 2017).

Total fishery removals of this species do not regularly exceed the level indicated or stated in the stock assessment. The stock assessment has estimated that the annual fishing mortality has been kept under the estimated F_{msy} (Figures 5 and 6).

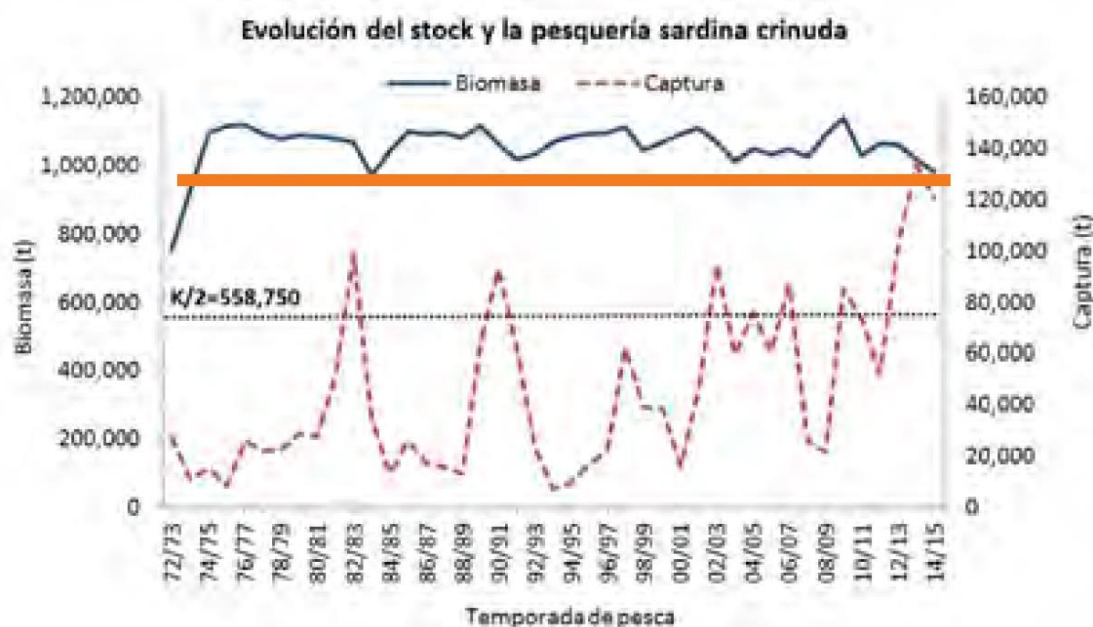


Figure 5. Biomass trajectories of Thead herring in the Gulf of California estimated using a biomass dynamics model with environmental forcing. Nevarez-Martinez *et. al* 2016.

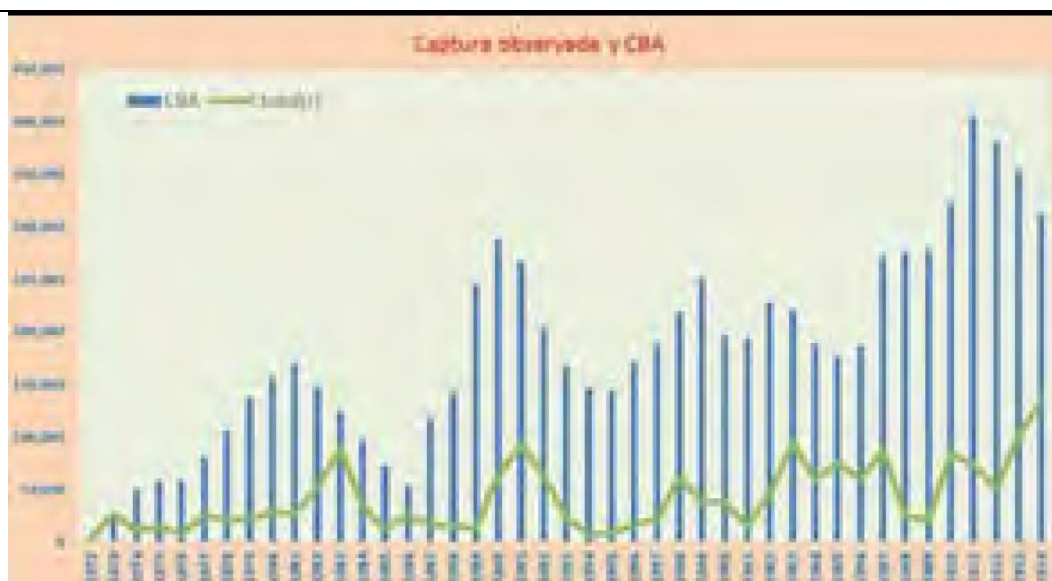


Figure 6. Blue bars represent the yearly values of BAC, the green line is the recorded catch.

References

Nevarez-Martinez et.al 2016 Evaluación poblacional de la sardina crinuda (*Opisthonema libertate*) en el Golfo de California, Mexico, 1971/72 -2013/2014. Informe Técnico del Programa de Pelágico Menores. Instituto Nacional de Pesca, CRIP Guaymas, Sonora.

Alvarez, C., Andraka, S., Anhalzer, G. and Morgan, S. (2017). Small Pelagics Fishery in Sonora, Gulf of California. MSC Fishery Assessment Report. December 19, 2017. SCS Global Services Ltd.
<https://fisheries.msc.org/en/fisheries/small-pelagics-fishery-in-sonora-gulf-of-california/@assessments>

Standard clause 1.3.2.1.3

A4 Stock Status - Minimum Requirements		
A4.1	The stock is at or above the target reference point, OR IF NOT: The stock is above the limit reference point or proxy and there is evidence that a fall below the limit reference point would result in fishery closure OR IF NOT: The stock is estimated to be below the limit reference point or proxy, but fishery removals are prohibited.	Yes
Clause outcome:		Pass
Evidence According to the latest available data, current biomass of this stock is thought to be at or above levels that sustain maximum sustainable yield (MSY). The most recent stock assessment suggests that the stock is healthy and is not overfished. The main reference point (BAC, a LRP) is established and expected to keep biomass above the level producing MSY. This works through use of a control rule applied to species that are subject to active management. The control rule is also built with the intent to keep a minimum amount of biomass unfished to protect the stock. If the minimum biomass is reached; the fleet is expected to stop fishing.		
References Nevarez-Martinez et.al 2016 Evaluación poblacional de la sardina crinuda (<i>Opisthonema libertate</i>) en el Golfo de California, Mexico, 1971/72 -2013/2014. Informe Técnico del Programa de Pelágico Menores. Instituto Nacional de Pesca, CRIP Guaymas, Sonora.		

CATEGORY B SPECIES

Category B species are those which make up greater than 5% of landings in the applicant raw material, but which are not subject to a species-specific research and management regime sufficient to pass all Category A clauses. If there are no Category B species in the fishery under assessment, this section can be deleted.

Category B species are assessed using a risk-based approach. The following process should be completed once for each Category B species.

If there are estimates of biomass (B), fishing mortality (F), and reference points

It is possible for a Category B species to have some biomass and fishing mortality data available. When sufficient information is present, the assessment team should use the following risk matrix to determine whether the species should be recommended for approval.

Table B(a) - F, B and reference points are available

Biomass is above MSY / target reference point	Pass	Pass	Pass	Fail	Fail
Biomass is below MSY / target reference point, but above limit reference point	Pass, but re-assess when fishery removals resume	Pass	Fail	Fail	Fail
Biomass is below limit reference point (stock is overfished)	Pass, but re-assess when fishery removals resume	Fail	Fail	Fail	Fail
Biomass is significantly below limit reference point (Recruitment impaired)	Fail	Fail	Fail	Fail	Fail
	Fishery removals are prohibited	Fishing mortality is below MSY or target reference point	Fishing mortality is around MSY or target reference point, or below the long-term average	Fishing mortality is above the MSY or target reference point, or around the long-term average	Fishing mortality is above the limit reference point or above the long-term average (Stock is subject to overfishing)

If the biomass / fishing pressure risk assessment is not possible

Initially, the resilience of each Category B species to fishing pressure should be estimated using the American Fisheries Society procedure described in Musick, J.A. (1999). This approach is used as the resilience values for many species and stocks have been estimated by FishBase, and are already available online. For details of the approach, please refer to Appendix A. Determining the resilience provides a basis for estimating the risk that fishing may pose to the long-term sustainability of the stock. Table B(b) should be used to determine whether the species should be recommended for approval.

Table B(b) - No reference points available. B = current biomass; B_{av} = long-term average biomass; F = current fishing mortality; F_{av} = long-term average fishing mortality.

B > B_{av} and F < F_{av}	Pass	Pass	Pass	Fail
B > B_{av} and F or F_{av} unknown	Pass	Pass	Fail	Fail
B = B_{av} and F < F_{av}	Pass	Pass	Fail	Fail
B = B_{av} and F or F_{av} unknown	Pass	Fail	Fail	Fail
B > B_{av} and F > F_{av}	Pass	Fail	Fail	Fail
B < B_{av}	Fail	Fail	Fail	Fail
B unknown	Fail	Fail	Fail	Fail
Resilience	High	Medium	Low	Very Low

Assessment Results

Species Name		Bocona sardine
B1	Species Name	<i>Cetengraulis mysticetus</i>
	Table used (Ba, Bb)	Ba
	Outcome	Pass
Evidence Bocona sardine is passively managed under the SPFMP. For passively managed species, the control rule determined that the BAC is simply 25% of the most recent estimate of the SSB. The biomass is about twice the level producing MSY while the fishing mortality rate has been much lower than the level producing the MSY .		



Figure 7. Biomass trajectory of bocona sardine in the Gulf of California estimated using a biomass dynamics model with environmental forcing. Nevarez-Martinez et. al 2016

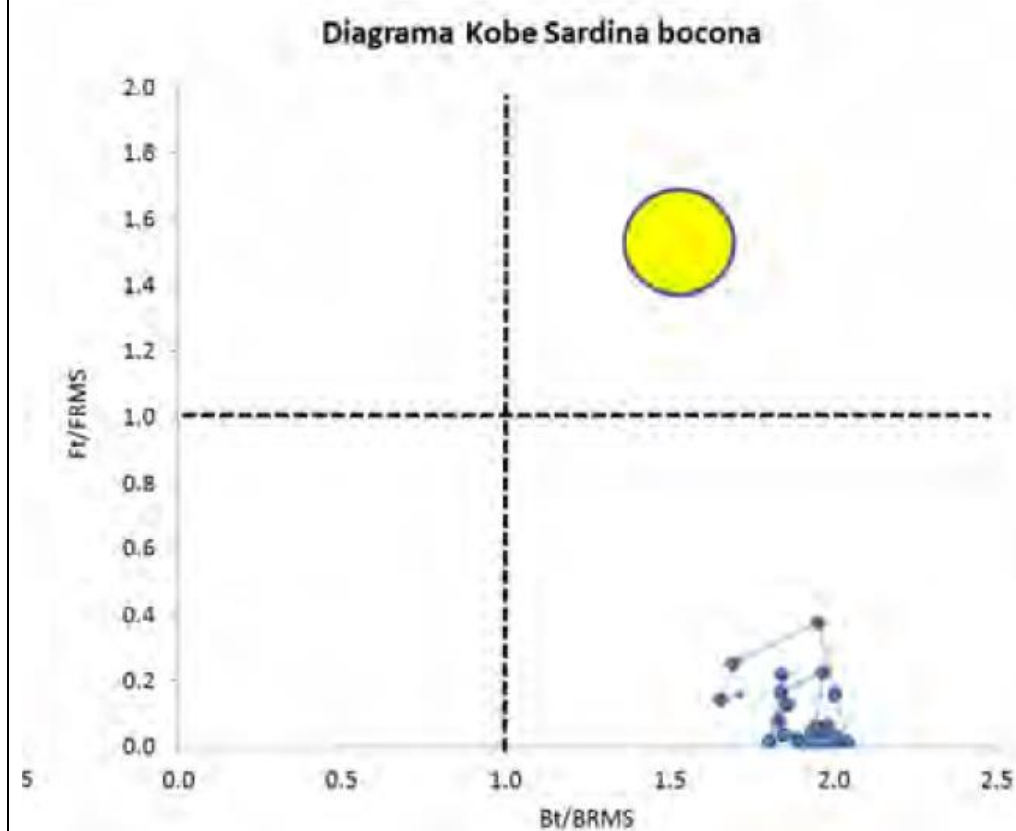


Figure 8. Kobe plot with stock status history of bocona sardine in the Gulf of California. Nevarez-Martinez et.al 2016

References
<i>Standard clauses 1.3.2.1</i>

CATEGORY C SPECIES

In a whole fish assessment, Category C species are those which make up less than 5% of landings, but which are subject to a species-specific management regime. In most cases this will be because they are a commercial target in a fishery other than the one under assessment. In a by-product assessment, Category C species are those which are subject to a species-specific management regime, and are usually targeted species in fisheries for human consumption.

Clause C1 should be completed for **each** Category C species. If there are no Category C species in the fishery under assessment, this section can be deleted. A Category C species does not meet the minimum requirements of clause C1 should be re-assessed as a Category D species.

Species Name		Pacific chub mackerel – <i>Scomber japonicus</i>	
C1	Category C Stock Status - Minimum Requirements		
	C1.1	Fishery removals of the species in the fishery under assessment are included in the stock assessment process, OR are considered by scientific authorities to be negligible.	Yes
	C1.2	The species is considered, in its most recent stock assessment, to have a biomass above the limit reference point (or proxy), OR removals by the fishery under assessment are considered by scientific authorities to be negligible.	Yes
Clause outcome:			Pass
Evidence			
Fishery removals of Pacific chub mackerel are included in the stock assessment process. Information is collected by the Federal Fishing Offices - SAGARPA and catch and effort statistics from the landing tickets (Aviso de Arribo).			
Biological reference points are defined based on the reduction of the spawning biomass and the estimation of the fishing mortality.			
Table 1. Biomass model parameter and biological reference points for chub mackerel (<i>Scomber japonicus</i>) in the Central-Northern Gulf of California fishery. From Nevárez-Martínez et al. 2016			
Parameter		Chub mackerel	
R		0.700	
K		400,000	
B ₀		360,000	
B _{MSY}		200,000	
MSY		70,000	

F_{MSY}	0.350
f_{MSY}	1,964
q_{med}	1.78E-04

The biomass dynamics model pools catch of chub mackerel indicate that recorded catches are far below the estimated B_{MSY} for all of its trajectory.

Estimated biomass is above B_{MSY} and average fishing mortality rate remains below F_{MSY} , thus there is no risk of overfishing.

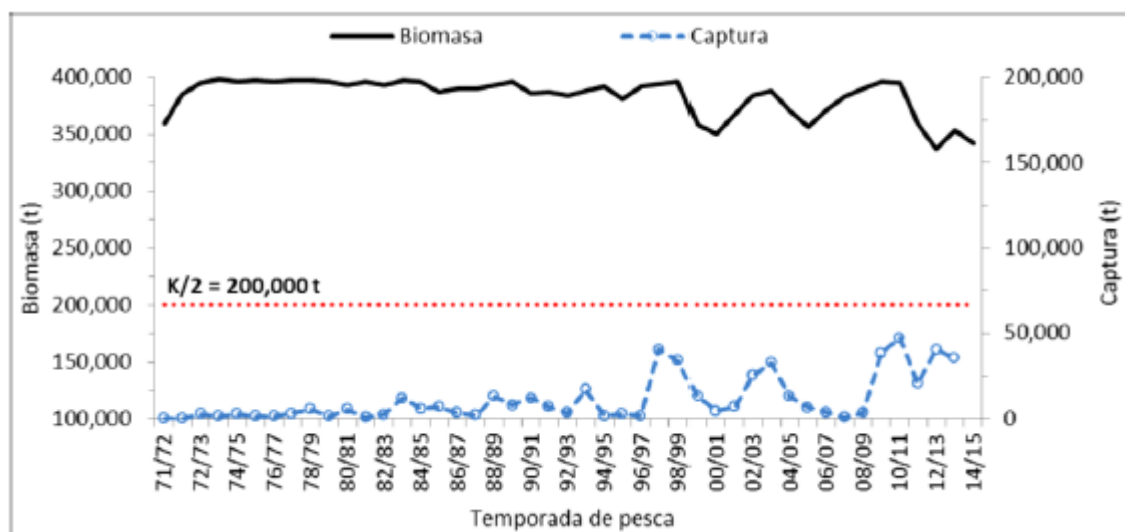


Figure 9. Biomass trajectories of chub mackerel in the Gulf of California. From Nevárez-Martínez et al. 2016

References

IUCN Red List <http://www.iucnredlist.org/details/170306/0>

Nevárez-Martínez M.O., M.A. Martínez-Zavala, C. Enciso-Enciso and M.E Gonzalez-Corona. 2016. Evaluación pesquera de la macarea (*scomber japonicus*) del Golfo de california, México. Instituto Nacional de Pesca CRIP Guaymas, Sonora.

Standard clauses 1.3.2.2

CATEGORY D SPECIES

In a whole fish assessment, Category D species are those which make up less than 5% of landings and are not subject to a species-specific management regime. In the case of mixed trawl fisheries, Category D species may make up the majority of landings. In a by-product assessment, Category D species are those which are not subject to a species-specific management regime. In both cases, the comparative lack of scientific information on the status of the population of the species means that a risk-assessment style approach must be taken.

The process for assessing Category D species involves the use of a Productivity-Susceptibility Analysis (PSA) to further subdivide the species into 'Critical Risk', 'Major Risk' and 'Minor Risk' groups. If there are no Category D species in the fishery under assessment, this section can be deleted.

Productivity and susceptibility ratings are calculated using a process derived from the APFIC document "Regional Guidelines for the Management of Tropical Trawl Fisheries, which in turn was derived from papers by Patrick *et al* (2009) and Hobday *et al* (2007). Table D1 should be completed for each Category D species as follows:

- Firstly, the best available information should be used to fill in values for each productivity and susceptibility attribute.
- Table D2 should be used to convert each attribute value into a score between 1 and 3.
- The average score for productivity attributes and the average for susceptibility attributes should be calculated.
- Table D3 should be used to determine whether the species is required to meet the requirements of Table D4. A species which does not need to meet the requirements of D4 is automatically awarded a pass.
- Table D4 should be used to assess those species indicated by Table D3 to determine a pass/fail rating.
- Any Category D species which has been categorised by the IUCN Red List as Endangered or Critically Endangered, or which appears in the CITES appendices, automatically results in a fail.

D1	Species Name	Red eye round herring <i>Etrumeus teres</i>	
	Productivity Attribute	Value	Score
	Average age at maturity (years)	0.5	1
	Average maximum age (years)	3	1
	Fecundity (eggs/spawning)	7,446-19,699	1
	Average maximum size (cm)	33	1
	Average size at maturity (cm)	22	1
	Reproductive strategy	Oviparous, pelagic eggs & larvae	1
	Mean trophic level	3.6	3
	Average Productivity Score		1.29
	Susceptibility Attribute	Value	Score
	Overlap of adult species range with fishery	>50% occurs in area fished	3
	Distribution	Not scored if overlap scored	
	Habitat	Pelagic-neritic	1
	Depth range	0-125m	3
	Selectivity	1-2 times mesh size	2
	Post-capture mortality	Retained, dead	3
	Average Susceptibility Score		2.75
	PSA Risk Rating (From Table D3)		Pass
	Compliance rating		Pass

References

IUCN Red List <http://www.iucnredlist.org/details/82626288/0>

Fish Base <http://www.fishbase.se/summary/Etrumeus-sadina.html>

Information on IUCN Red List and Fishbase is for *Etrumeus sadina* which is a synonym of *Sadina teres* (see FAO reference below)

Distribution (FAO: <http://www.fao.org/fishery/species/2902/en>):



Standard clauses 1.3.2.2

Table D2 - Productivity / Susceptibility attributes and scores.

Productivity attributes	Low productivity/ High risk	Medium productivity/ Medium risk	High productivity/ Low risk
	Score 3	Score 2	Score 1
Average age at maturity (years)	>4	2 to 4	<2
Average maximum age (years)	>30	10 to 30	<10
Fecundity (eggs/spawning)	<1 000	1 000 to 10 000	>10 000
Average maximum size (cm)	>150	60 to 150	<60
Average size at maturity (cm)	>150	30 to 150	<30
Reproductive strategy	Live bearer, mouth brooder or significant parental investment	Demersal spawner "berried"	Broadcast spawner
Mean trophic level	>3.25	2.5–3.25	<2.5

Susceptibility attributes		High susceptibility/ High risk	Medium susceptibility/ Medium risk	Low susceptibility/ Low risk
		Score 3	Score 2	Score 1
Availability	1) Overlap of adult species range with fishery	>50% of stock occurs in the area fished	Between 25% and 50% of the stock occurs in the area fished	<25% of stock occurs in the area fished
	2) Distribution	Only in the country/ fishery	Limited range in the region	Throughout region/ global distribution
Encounterability	1) Habitat	Habitat preference of species make it highly likely to encounter trawl gear (e.g. demersal, muddy/sandy bottom)	Habitat preference of species make it moderately likely to encounter trawl gear (e.g. rocky bottom/reefs)	Depth or distribution of species make it unlikely to encounter trawl gear (e.g. epi-pelagic or meso-pelagic)
	2) Depth range	High overlap with trawl fishing gear (20 to 60 m depth)	Medium overlap with trawl fishing gear (10 to 20 m depth)	Low overlap with trawl fishing gear (0 to 10 m, >70 m depth)
Selectivity		Species >2 times mesh size or up to 4 m length	Species 1 to 2 times mesh size or 4 to 5 m length	Species <mesh size or >5 m length
Post capture mortality		Most dead or retained Trawl tow >3 hours	Alive after net hauled Trawl tow 0.5 to 3 hours	Released alive Trawl tow <0.5 hours

Note: Availability 2 is only used when there is no information for Availability 1; the most conservative score between Encounterability 1 and 2 is used.

D3		Average Susceptibility Score		
		1.00 – 1.75	1.76 – 2.24	2.25 – 3.00
Average Productivity Score	1.00 – 1.75	PASS	PASS	PASS
	1.76 – 2.24	PASS	PASS	TABLE D4
	2.25 – 3.00	PASS	TABLE D4	TABLE D4

FURTHER IMPACTS

The three clauses in this section relate to impacts the fishery may have in other areas. A fishery must meet the minimum requirements of all three clauses before it can be recommended for approval.

F1	Impacts on ETP Species - Minimum Requirements		
	F1.1	Interactions with ETP species are recorded.	Yes
	F1.2	There is no substantial evidence that the fishery has a significant negative effect on ETP species.	Yes
	F1.3	If the fishery is known to interact with ETP species, measures are in place to minimise mortality.	Yes
Clause outcome:			Pass
Evidence <p>An observer program is in operation that covers 10% of the fishing trips. Observers record information on ETP interactions.</p> <p>The number of ETP species affected by the fishery including marine mammals, sea turtles, fish and sharks, and other sea bird species are very low and the status of the population of most ETP species as qualified via listing in NOM 029 are considered to be of 'Least Concern' by the IUCN.</p> <p>There are a number of measures that indirectly contribute to the managing of the impacts of the small pelagics fishery on ETP species; input controls including limited entry, gear restrictions and regulations for the permitted fishing gear, fleet and fishing capacity limitations, restriction on fishing effort, temporary spatial closures, biologically acceptable catch and monitoring of landings. Measures specifically designed to manage the impacts of the fishery on ETP species include the observer program, mitigation measures (water curtains for seabirds, avoid setting on turtles, shark and dolphin aggregations or herds), workshops and training material for captains on mitigation measures, protected areas that control fishing activities and federal regulations that prohibit retention of protected species.</p>			
References <p>MSC Small pelagics fishery in Sonora, Gulf of California. PCDR report SCS Global Services https://fisheries.msc.org/en/fisheries/small-pelagics-fishery-in-sonora-gulf-of-california/@assessments</p>			
Standard clause 1.3.3.1			

F2	Impacts on Habitats - Minimum Requirements		
	F2.1	Potential habitat interactions are considered in the management decision-making process.	Yes
	F2.2	There is no substantial evidence that the fishery has a significant negative impact on physical habitats.	Yes
	F2.3	If the fishery is known to interact with physical habitats, there are measures in place to minimise and mitigate negative impacts.	Yes
Clause outcome:			Pass
Evidence			
<p>Potential habitat interactions are considered in the management decision-making process. There are several MPAs established in the Gulf of California which contribute to minimize the impact of the fishery.</p> <p>The purse seine fishery in the Gulf of Mexico operates in mid-water between 40 to 100m deep and generally avoids bottom contact. Contact is intentionally avoided as it damages the small mesh nylon netting. Therefore, there is no substantial evidence that the fishery has a significant negative impact on physical habitats.</p> <p>The fishery does not interact with physical habitats, therefore measures are not required although MPAs are in place.</p>			
References			
<p>MSC Small pelagics fishery in Sonora, Gulf of California. PCDR report SCS Global Services https://fisheries.msc.org/en/fisheries/small-pelagics-fishery-in-sonora-gulf-of-california/@assessments</p>			
<i>Standard clause 1.3.3.2</i>			

F3	Ecosystem Impacts - Minimum Requirements		
	F3.1	The broader ecosystem within which the fishery occurs is considered during the management decision-making process.	Yes
	F3.2	There is no substantial evidence that the fishery has a significant negative impact on the marine ecosystem.	Yes
	F3.3	If one or more of the species identified during species categorisation plays a key role in the marine ecosystem, additional precaution is included in recommendations relating to the total permissible fishery removals.	Yes
Clause outcome:			Pass
Evidence			
<p>Arreguin-Sanchez et. al (2016) estimated for the Upper Gulf of California a limit of biomass loss generated by biomass extraction that would prevent ecosystem deterioration. A maximum allowable harvest rate was identified for each functional group or species according to their trophic level. For Pacific sardines and thread herring, the maximum allowable harvest rate was estimated to be 36%. Trends of exploitation rates for Pacific sardine and thread herring indicate that the fishery has never exceeded a 25% harvest rate threshold.</p> <p>Information is available from monitoring of landings, independent surveys and stock assessments and the measures in place are considered sufficient to prevent ecosystem deterioration.</p> <p>Pacific sardine in the Gulf of California is considered to be a key low trophic level stock. The estimated ecosystem limit reference point is about 30% high than the Fmsy based limit reference point estimated in the latest stock assessment (Nevarez-Martinez et. al. 2016). Therefore, under the current management scheme, although based on a single species approach, the limit reference point is already accounting for ecosystem safety.</p>			
References			
<p>Arreguín- Sánchez et. al. 2016 Ecosystem entropy and harvest rates for fisheries. Internal CICIMAR report.</p>			

Arreguín- Sánchez et. al. 2016. Balanced harvesting and ecosystem production. Reporte interno de investigación, Instituto Politécnico Nacional, Centro Interdisciplinario de Ciencias Marinas. La Paz, Baja California Sur, México.

<i>Standard clause 1.3.3.3</i>

SOCIAL CRITERION

In addition to the scored criteria listed above, applicants must commit to ensuring that vessels operating in the fishery adhere to internationally recognised guidance on human rights. They must also commit to ensuring there is no use of enforced or unpaid labour in the fleet(s) operating upon the resource.

Appendix A - Determining Resilience Ratings

The assessment of Category B species described in this assessment report template utilises a resilience rating system suggested by the American Fisheries Society. This approach was chosen because it is also used by FishBase, and so the resilience ratings for many thousands of species are freely available online. As described by FishBase, the following is the process used to arrive at the resilience ratings:

“The American Fisheries Society (AFS) has suggested values for several biological parameters that allow classification of a fish population or species into categories of high, medium, low and very low resilience or productivity (Musick 1999). If no reliable estimate of r_m (see below) is available, the assignment is to the lowest category for which any of the available parameters fits. For each of these categories, AFS has suggested thresholds for decline over the longer of 10 years or three generations. If an observed decline measured in biomass or numbers of mature individuals exceeds the indicated threshold value, the population or species is considered vulnerable to extinction unless explicitly shown otherwise. If one sex strongly limits the reproductive capacity of the species or population, then only the decline in the limiting sex should be considered. We decided to restrict the automatic assignment of resilience categories in the Key Facts page to values of K , t_m and t_{max} and those records of fecundity estimates that referred to minimum number of eggs or pups per female per year, assuming that these were equivalent to average fecundity at first maturity (Musick 1999). Note that many small fishes may spawn several times per year (we exclude these for the time being) and large live bearers such as the coelacanth may have gestation periods of more than one year (we corrected fecundity estimates for those cases reported in the literature). Also, we excluded resilience estimates based on r_m (see below) as we are not yet confident with the reliability of the current method for estimating r_m . If users have independent r_m or fecundity estimates, they can refer to Table 1 for using this information.”

Parameter	High	Medium	Low	Very low
Threshold	0.99	0.95	0.85	0.70
r_{max} (1/year)	> 0.5	0.16 - 0.50	0.05 - 0.15	< 0.05
K (1/year)	> 0.3	0.16 - 0.30	0.05 - 0.15	< 0.05
Fecundity (1/year)	> 10,000	100 - 1000	10 - 100	< 10
t_m (years)	< 1	2 - 4	5 - 10	> 10
t_{max} (years)	1 - 3	4 - 10	11 - 30	> 30

[Taken from the FishBase manual, “Estimation of Life-History Key Facts”,
<http://www.fishbase.us/manual/English/key%20facts.htm#resilience>]

Appendix B – Background on the 5% catch rule

The proposed fishery assessment methodology uses a species categorisation approach to divide the catch in the assessment fishery into groups. These groups are:

- **Category A:** “Target” species with a species-specific management regime in place.
- **Category B:** “Target” species with no species-specific management regime in place.
- **Category C:** “Non-target” species with a species-specific management regime in place.
- **Category D:** “Non-target” species with no species-specific management regime in place

The distinction between 'target' and 'non-target' species is made to enable the assessment to consider the impact of the fishery on all the species caught regularly, without requiring a full assessment be conducted for each. Thus 'target' species are subjected to a more detailed assessment, while 'non-target' species are considered more briefly. For the purposes of the IFFO RS fishery assessment, 'target' and 'non-target' species are defined by their prevalence in the catch, by weight. Applicants must declare which species are considered 'target' species in the fishery, and the combined weight of these must be at least 95% of the annual catch. The remaining 5% can be made up of 'non-target' species. Note also that ETP species are considered separately, irrespective of their frequency of occurrence in the catch.

The proposed use of 5% as a limit for 'non-target' species is one area in which feedback is being sought via the public consultation. The decision to propose a value of 5% ensures consistency with other fishery assessment programmes, such as the MSC which uses 5% to distinguish between 'main' and 'minor' species (see MSC Standard, SA3.4 and GSA3.4.2); and Seafood Watch, which uses 5% when defining the 'main' species for the assessment (see Seafood Watch Standard, Criterion 2). The value is also consistent with the approach used in Version 1 of the IFFO RS Standard, in which up to 5% of the raw material could be comprised of 'unassessed' species.