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Global Standard for Responsible Supply of Marine Ingredients

Fishery Assessment Methodology and Template Report V2.0



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|---------------------------------|--|
| Fishery Under Assessment | Gulf of California Small Pelagics (Monterrey Sardine <i>Sardinops sagax</i>) FAO 77 Eastern Central Pacific |
| Date | January 2020 |
| Assessor | Jim Daly |

| Application details and summary of the assessment outcome | | | | |
|---|---------------|-----------------|-----------------------------------|------------------------|
| Name: Sardinas de Sonora S.A. de C.V. and others | | | | |
| Address: | | | | |
| Country: Mexico | | Zip: | | |
| Tel. No.: | | Fax. No.: | | |
| Email address: | | Applicant Code | | |
| Key Contact: | | Title: | | |
| Certification Body Details | | | | |
| Name of Certification Body: | | SAI Global Ltd | | |
| Assessor Name | Peer Reviewer | Assessment Days | Initial/Surveillance/R e-approval | Whole fish/ By-product |
| Jim Daly | Vito Romito | 3 | Surveillance 2 | Whole fish |
| Assessment Period | 2018-2019 | | | |

| | |
|---|--|
| Scope Details | |
| Management Authority (Country/State) | Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food SAGARPA. Mexico |
| Main Species | Monterrey (Pacific) sardine <i>Sardinops sagax</i> Thread herring <i>Crinuda Opisthonema</i> sp Chub mackerel Macarela Anchoveta <i>Engraulis mordax</i> Bocona sardine <i>Cetengraulis mysticetus</i> |
| Fishery Location | Gulf of California FAO 77 (Eastern Central Pacific) |
| Gear Type(s) | Purse Seine |

| Outcome of Assessment | |
|--|---------|
| Overall Outcome | PASS |
| Clauses Failed | NONE |
| Peer Review Evaluation | AGREE |
| Recommendation | APPROVE |
| Assessment Determination | |
| <p>The Gulf fishery targets the Northern/Central Gulf subpopulations of <i>Sardinops sagax</i> and the Thread herring complex (<i>Opisthonema</i> spp.), made up of three subspecies (<i>O. libertate</i>, <i>O. medirastre</i> and <i>O. bulleri</i>), known locally as <i>Sardina Crinuda</i> or Arenque de hebra (Spanish). Results of an observer programme undertaken in this fishery showed that, in addition to these two targeted species, Macarela Chub mackerel (<i>Scomber japonicus</i>), Anchoveta (<i>Engraulis mordax</i>), Bocona sardine (<i>Cetengraulis mysticetus</i>), Japanese sardine (<i>Etrumeus teres</i>) and Leather jackets (<i>Oligoplites</i>) sp are also landed.</p> <p>The catch of small pelagics represents around 30% of total landings in Mexico, with more than 80% by volume of captures taking place in the Gulf of California. Monterrey (Pacific) sardine <i>Sardinops sagax</i> is thought to consist of three subpopulations or stocks: a northern (“cold”) subpopulation (northern Baja California to Alaska), a southern subpopulation (outer coastal Baja California to southern California), and a Central Gulf of California subpopulation have been distinguished by population studies (Figure 1).</p> <p>Early descriptions about the behaviour of sardine populations indicated that their availability depends on wind patterns and inter-annual fluctuations in temperature in the central Gulf of California related to the El Nino Southern Oscillation (ENSO). The Mexican Fisheries Institute (INAPESCA, Small Pelagics Program) proposed that the best possible explanation for low catches of <i>Sardinops sagax</i> up to 2014/15 is that the stock shifted distribution to the North, to deeper waters making the fish unavailable to the fishery. An occurrence of a strong El Niño event was confirmed in 2015.</p> <p>The latest stock assessment for Monterrey (Pacific) Sardine estimates SSB to be well above the level producing MSY and fishing mortality rate far below the level producing MSY. The Kobe plot indicates that the stock is not over-exploited, and no overfishing is taking place. For Thread herring the Kobe plot (<i>O. libertate</i>) indicates that the stock is not over-exploited, and no overfishing is taking place. Chub mackerel has been included in acoustic surveys, but results have not been included in stock assessments for this species. The biomass dynamics model pools catch of Chub mackerel and indicates that recorded catches are far below estimated BMSY.</p> <p>For Anchoveta from 2010-2011 to 2013-2014, this fishery represented more than 18% of total catches of small pelagics. By 2014-2015 the proportion was down to 2%. Environmental variability may promote the predominance of other species including Monterrey (Pacific) Sardine in the</p> | |

ecosystem. Anchoveta passes the risk-based Category B assessment for those species with no species-specific management regime in place. For Bocona sardine Fishbase report an intrinsic population growth rate several times higher than that of Thread herring. Biomass is about twice the level producing MSY while fishing mortality rate has been much lower than the level producing BMSY. The species passes the Category B assessment.

Japanese sardine/Red-eye herring and Leather jackets Pineapple Sardine *Oligoplites sp.* are caught as bycatch in this fishery. No research or stock assessment activities are conducted specifically in relation to these species. The comparative lack of scientific information on the status of the population means that a risk-assessment style approach must be taken. Both species were assessed and pass the Category D risk-based assessment for bycatch species.

A revised Standard (Norma Oficial Mexicana NOM (NOM-003-SAG-PESC-2018) was published in Mexico's Official Gazette (DOF March 2019). Under the revised NOM there is now a mechanism to transform definitions in the Management Plan (technical guidance, harvest control rule) into management regulatory actions. Future SAI Global fishery assessments will verify implementation by the Competent Authority of this new harvest strategy through monitoring and enforcement of fishery closures when BAC's are approached.

Monitoring of ETP species encountered in the fishery has occurred during observer programs. Some mitigation measures were noted to be partially in place such as *"Scaring, by spraying water with a pressure hose to keep birds away from the buoy line of the net."* Continued monitoring and further development of mitigation strategies is needed.

Monterrey (Pacific) sardine; Thread Herring; Macarela; Anchoveta and Bocona sardine are approved for the production of fishmeal and fish oil under v 2.0 of the IFFO-RS standard for whole fish (Categories A, B): Japanese sardine/Red-eye herring and Leather jackets *Oligoplites sp.* are approved for the production of fishmeal and fish oil under v 2.0 of the IFFO RS standard for whole fish (Category D).

Peer Review Comments

The Government body with responsibility for fisheries management in Mexico including the small pelagics fishery is the Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food (Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación, SAGARPA).

The Small Pelagic Fisheries Management Plan (SPFMP) in the assessment area (Plan de manejo pesquero para la pesquería de pelágicos menores) aims to set out actions to develop the fisheries in a sustainable manner based on current knowledge of ecological, environmental, economic, cultural, social and biological aspects of the fisheries.

Outputs of the Age Structured Assessment Program (ASAP) model for Monterrey (Pacific) sardine in the Gulf of California include total biomass, recruits and exploitable biomass. The method fits

an age structured model to different types of data, including fishery independent indices of abundance including biomass estimated from acoustic surveys, last of which was conducted in 2018. Both acoustic estimates of abundance and CPUE from tows during surveys show a clear increasing trend in Monterrey (Pacific) sardine abundance from 2016 to 2018. The stock assessment (Nevarez-Martinez et al. 2019) estimated biomass of exploitable sardines to be 1,500,000 t. SSB is estimated as well above the level producing MSY and that similar to 2017 the fishing mortality rate was far below the level producing MSY. The stock is not over-exploited, and no overfishing is taking place. There is a mechanism in place by which total fishing mortality of this species is restricted.

The control rule is built with the intent of keeping a minimum amount of biomass unfished to protect the stock. The language in the Management Plan (SPFMP) is interpreted such that BAC (and the corresponding fraction) works as a Limit Reference Point (LRP) and therefore acts as a precautionary approach in the management of the fishery because, although no actual value has been provided, the Target Reference Point (TRP) in terms of fishing mortality would be lower than the level producing MSY.

Bocona sardine is passively managed under the SPFMP and NOM-003-PESC-1993 (2018). For passively managed species, the control rule determines that the BAC is simply 25% of the most recent estimate of SSB. Biomass is about twice the level producing MSY while the fishing mortality rate has been much lower than the level producing BMSY (707,900t). The species passes the Category B of the IFFO RS risk-based assessment.

Japanese sardine/Red-eye herring and Pineapple Sardine are caught as bycatch in this fishery. No research or stock assessment activities are conducted specifically in relation to these species. Both pass the Productivity-Susceptibility Analysis (PSA) for Category D data limited species.

Bycatch, habitat and ecosystem effects of the fishery are managed and considered quite limited.

The peer reviewer agrees that Monterrey (Pacific) sardine; Thread Herring Chub Mackerel Anchoveta Bocona sardine Japanese sardine and Leather jackets should be approved for the production of fishmeal and fish oil under v 2.0 of the IFFO-RS standard for whole fish (Categories A, B, D).

Notes for On-site Auditor

Note: This table should be completed for whole fish assessments only.

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 (Pacific) sardine/Sardina Monterrey | 16.4 | A1 | Pass |
| | | | A2 | Pass |
| | | | A3 | Pass |
| | | | A4 | Pass |
| Category A | Thread herring Crinuda | 25.8 | A1 | Pass |
| | | | A2 | Pass |
| | | | A3 | Pass |
| | | | A4 | Pass |
| Category A | Chub mackerel Macarela | 9.8 | A1 | Pass |
| | | | A2 | Pass |
| | | | A3 | Pass |
| | | | A4 | Pass |
| Category B | Anchoveta | 16.4 | PASS | |
| Category B | Bocona sardine Sardina bocona | 28.5 | PASS | |
| Category D | Japanese sardine Red-eye herring Sardina japonesa | 1.7 | PASS | |
| Category D | Leather jackets <i>Oilgoplites</i> | 1.2 | PASS | |

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.

Total landings (mt) of small pelagic species in the Gulf of California purse seine fishery is presented in Information from Nevarez-Martinez et al. (2016c). Landings data from 2010-2015 were averaged to complete the categorisation table:

Source:

Nevárez-Martínez M.O., M. A. Martinez-Zavala, M.E. Gonzalez-Corona, J.P. Santos Molina and A.E. Lopez-Laguna, 2016c. Informe Técnico: Capturas, Esfuerzo De Pesca Y Flota En La Pesquería De Pelágicos Menores Del Golfo De California. Instituto Nacional de Pesca. CRIP Guaymas, Sonora (cited in SCS Global Services Public Certification Report for the Small Pelagics Fishery in SONORA, GULF OF CALIFORNIA Jan 2018 363pp

| Common name | Latin name | Stock | % of landings | Management | Category |
|--|--------------------------------|--------|---------------|------------|----------|
| Monterrey sardine/Sardina Monterrey | <i>Sardinops sagax</i> | FAO 77 | 16.4 | Mexico | A |
| Thread herring Crinuda | <i>Opisthonema spp.</i> | FAO 77 | 25.8 | Mexico | A |
| Chub mackerel Macarela | <i>Scomber japonicus</i> | FAO 77 | 9.8 | Mexico | A |
| Anchoveta | <i>Engraulis mordax</i> | FAO 77 | 16.4 | Mexico | B |
| Bocona sardine Sardina bocona | <i>Cetengraulis mysticetus</i> | FAO 77 | 28.5 | Mexico | B |
| Japanese sardine Red-eye herring Sardina japonesa | <i>Etrumeus teres</i> | FAO 77 | 1.7 | Mexico | D |
| Leather jackets /Pineapple Sardine | <i>Oligoplites sp</i> | FAO 77 | 1.2 | Mexico | D |

Note:

According to the latest landings data Pacific Jack mackerel Charrito (*Trachurus symmetricus*) landings < .1% in this fishery so therefore not assessed

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 | PASS |
| | M1.2 | There is an organisation responsible for collecting data and assessing the fishery | PASS |
| | M1.3 | Fishery management organisations are publically committed to sustainability | PASS |
| | M1.4 | Fishery management organisations are legally empowered to take management actions | PASS |
| | M1.5 | There is a consultation process through which fishery stakeholders are engaged in decision-making | PASS |
| | M1.6 | The decision-making process is transparent, with processes and results publically available | PASS |
| Clause outcome: | | | PASS |
| <p>Evidence</p> <p>M1.1:</p> <p>The Government body with responsibility for fisheries management in Mexico including the small pelagics fishery is the Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food (Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación, SAGARPA.</p> <p>The Small Pelagic Fisheries Management Plan (SPFMP) in the assessment area (Plan de manejo pesquero para la pesquería de pelágicos menores) aims to set out actions to develop the fisheries in a sustainable manner based on current knowledge of ecological, environmental, economic, cultural, social and biological aspects of the fisheries. A relevant insertion in the SPFMP is the definition of a guidance to establish reference points. This Plan is reviewed annually during Small Pelagic Workshops (Taller de Pelágicos Menores); the latest of which to be published was the 26th Edition (June 2018).</p> <p>Biologically Acceptable Catches (BAC), published by SAGARPA through the National Fisheries Institute (INAPESCA) are computed as a fraction of estimated MSY. The SPFMP States that BAC'S are a "prudent level of catch" that can vary between 5% and 25% of estimated biomass. An additional definition in the SPFMP states that overfishing "occurs 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". The Plan further adds that "in the fishery of small pelagics, overfishing occurs if catch exceeds BAC". For the most part recorded catches have followed that of announced BAC's.</p> <p>Within SAGARPA, the National Commission on Aquaculture and Fisheries (Comisión Nacional de Acuacultura y Pesca, CONAPESCA) is directly responsible for management, co-ordination and policy development with regards to fisheries.</p> | | | |

Scientific advice is provided by the National Fisheries Institute (Instituto Nacional de Pesca, INP or **INAPESCA**), through which the National Fisheries Charter (**Carta Nacional Pesquera**) was developed. The Charter is an annually-updated summary of the status and scientific understanding of all commercial fishery resources in federal waters. The Charter is broadly divided between Pacific and Gulf of Mexico fisheries (**Figure 1**):



Figure 1. Operating regions for the Monterrey sardine fleet Region A: Baja California Region B Gulf and Coastal States Sinaloa-Nayarit Region C North of Jalisco to Chiapas (Border with Guatemala). NORMA Oficial Mexicana NOM-003-SAG/PESC-2018 **R1**

M1.2:

Scientific research and advice in support of the management of Mexican fisheries is provided by the National Fisheries Institute (**INP OR INAPESCA**). The mission of **INP** 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 (CNP) and the planning and conducting of research in support of these functions.

The CNP includes annual estimates of total landings and species composition in the small pelagic fishery and makes recommendations for the level of fishing in future years.

M1.3:

The mission of INP 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*”.

During a MSC First Surveillance Audit (Southern Gulf, Thread Herring Fishery (June 2018) SCS Global Services Ltd) minutes were presented of meetings between scientists and industry to discuss management plans for the small pelagics fishery in the southern Gulf. Discussions were undertaken about the need to determine potential mechanisms to shut operations as real time cumulative catches approach 90% of the allowable catch of the year.

Minutes were also presented where actual decisions were made between industry and authorities to stop fishing operations based on results of in-season monitoring of abundance and size. SAGARPA's 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".

M1.4:

Carta Nacional Pesquera (CNP):

The Carta Nacional Pesquera (CNP) is a binding instrument for the fisheries authorities' decision-making process. This Fisheries Charter includes the diagnosis and assessment of a fishery, fisheries and conservation indicators, and recommendations by INP for the management of fisheries.

Updates of CNP are prepared by INP every two or three years. Before updates are published in the Official Gazette (Diario Oficial, DOF) draft updates undergo a public review process by means of publication in the Diario Oficial (DOF). This allows the general public, non-governmental organizations and the academic sector, among others, to give their opinion of fisheries status. The latest version of the CNP (2017) was published by INP in June 2018.

Mexican National Rule for Small Pelagic Fisheries [Norma Oficial Mexicana (NOM)]:

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). The 2014 updates contained the following changes:

- Capture of sardine, anchovy or thread herring below the minimum catch size does not exceed 30% of the number of organisms per fishing season by region (less stringent than previous NOM).
- No further authorization for the entry of more vessels, except for replacement of existing vessels. Existing vessels have good cooling systems and do not increase the current carrying capacity (more stringent than previous NOM).
- INAPESCA undertake monthly reviews of the cumulative percentage of bycatch to determine when it has reached the allowable percentage (bycatch), at which point there will be a requirement to notify the National Commission of Aquaculture and Fisheries.

A further update of proposed NOM revisions (2018) was published in the Official Gazette on March 12th, 2019:

- A proposed modification to the rule defining minimum size and the proportion of the catch currently allowed to be under the size limit. The proposed change would not determine a minimum size but would maintain a limitation in size that would be determined every year by INAPESCA depending on information from monitoring surveys.
- A maximum volume of 20% (down from 30%) of annual catch limits for each small pelagic species below the minimum landing size for that species is permitted. This reduced rate of capture applies for sardine, thread herring and anchovy.

The control rule for the small pelagic fish in Mexico is well defined in the management plan but lacked the mechanism to convey scientific advice in form of a BAC to management and fishers. Because of this the resulting BAC was not considered a binding management mechanism by the SCS Assessment Team in 2018 (PCR Small Pelagics Fishery Report 2018 for MSC).

As part of the revised NOM (NOM-003-SAG-PESC-2018) INAPESCA conduct the stock assessment and compute BAC's based on stock status. Results are informed to other stakeholders including fishers and **CONAPESCA**. Procedures are agreed to start operations on the base of the limit in the BAC. There is now a mechanism to transform a definition in the Management Plan (technical guidance) into an actual management regulatory action, as laid down in the revised NOM.

M1.5

During an MSC First Surveillance Audit (Southern Gulf, Thread Herring Fishery (June 2018) SCS Global Services Ltd) minutes were presented of meetings between scientists and industry to discuss management plans for the small pelagics fishery in the southern Gulf. Discussions were undertaken about the need to determine potential mechanisms to shut operations as real time cumulative catches approach 90% of the allowable catch of the year.

As preparation for their First Surveillance Audit Report (Small Pelagic Fishery, Sonora, Gulf of California, June 2019) SCS Global Services compiled a list of over 25 individuals from 14 different organizations including representatives from Government, private sector and non-profit sectors working at regional and national levels.

Scientists have discussed and communicated to other interested parties' options to define reference points appropriate for the small pelagic fishery although caveats have been also identified and no conclusions reached yet. Scientists continue to investigate the best approach to stock assessments for small pelagic species and to attempt new methods.

M1.6

Before updates of the CNP are published in the Official Gazette draft updates undergo a public review process by means of publication in the Diario Oficial (DOF). This allows the general public, non-governmental organisations and the academic sector, among others, to give their opinion of fisheries status. The latest version of the Fisheries Charter was published by INP in June 2018.

| |
|--|
| R1-R10 |
| References p 59 |
| <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 | PASS |
| | M2.2 | There is a framework of sanctions which are applied when laws and regulations are discovered to have been broken | PASS |
| | M2.3 | There is no substantial evidence of widespread non-compliance in the fishery, and no substantial evidence of IUU fishing | PASS |
| | 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. | PASS |
| Clause outcome: | | | PASS |
| <p>Evidence</p> <p>M2.1:</p> <p>The Secretariat of Environment and Natural Resources (SEMARNAT), the Federal Attorney for Environmental Protection (PROFEPA), Marina (Mexican Navy); National Defense (SEDENA); 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 by adding equipment and personnel to promote protection and combat illegal trafficking of marine resources.</p> <p>M2.2:</p> <p>The Fisheries Law (Ley General de Pesca y Acuacultura Sustentables 2007) lays down details of infractions (Article 132) and sanctions (Article 133) to be applied:</p> <p>Sanctions include:</p> <ul style="list-style-type: none"> • A warning, reprimand • Fine (Article 138 details how fines are determined). • Additional fines for every day the infraction persists. • Administrative arrest for 36 hours. • Temporary/ permanent partial or total closure of installations where 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>In 2018 (August) the Government published updates of the Fisheries Law. Title IV outlines Fisheries Management Plans and their objectives. Title VII outlines how CONAPESCA will disseminate information on fishing and aquaculture through a new Portal: <i>National Fisheries and Aquaculture Information System</i>.</p> | | | |

M2.3:

COI carry out surveillance operations in the Upper Gulf by adding equipment and personnel to promote the protection of and combat illegal trafficking in marine resources. This inter-institutional programme in 2015-2016 resulted in the following actions:

- 1,424 trainings resulting in the inspection of: 2,794 landings, 10,888 people, 2,579 vehicles, 48 installations and 252 boats.
- The provision of 3 patrol vessels, 108 boats, 77 people, 17 vehicles for control purposes.
- Inspection of? A total of 23 specimens and 308 hauls of Totoaba (*Totoaba macdonaldi*), a marine fish (member of the Croaker family, endemic to the Gulf) a critically endangered species on IUCN red list.
- 505 articles of fishing gear confiscated.
- 106t of fish product seized.
- 17 tonnes of coral seized.
- Rescued alive one whale, one Totoaba and 11 Turtles.
- Monitoring of a total of 196 fishing grounds, 26 landing sites, 237 fishing facilities and installing a total of 36 checkpoints and 58 air surveillance operations.

The bulk of inspections detected illegal fishing activity in the *Totoaba* (Marine Croaker) fishery and other protected fisheries. Operations recovered 1,079 fishing nets which had been 'ghost fishing' in coastal waters. From a total of 2,794 landing inspections 106t of illegal fish product was seized.

Figures show (**Figure 6**) that for the most part the sardine catch has been under the Biologically Acceptable Catch (BAC); with the exception of 1986-1990 and 2007-2009 the stock has not been through periods of overfishing. If overfishing had been occurring this would have been detected through comprehensive inspection programmes in place (Upper Gulf).

PROFEPA (Environmental Government Watchdog, operationally separated from **SEMARNAT** handle environmental disputes related to all types of protected species, such as dolphins. **PROFEPA** perform inspections and provide training to **SAGARPA** staff to help catch and discourage IUU fishing practices. There is effective monitoring of each fishing boat's position at all times through a compulsory satellite detection system. Personnel from **CONAPESCA** perform regular inspection visits to processing plants and vessels.

M2.4:

There is effective monitoring of each fishing boat's position at all times through a compulsory satellite detection system; subject to sanctions when infringements are detected. Each landing operation is sampled by technical personnel from the Centro Regional de Investigación Pesquera (**CRIP**, Regional Center for Fisheries Research, a branch of **INAPESCA**). Personnel from **CONAPESCA** perform regular and frequent inspection visits to fish processing plants and boats to assert that all norms and precepts of the regulation are fully complied with.

The fishery generally complies with most regulatory mechanisms defined in Law. However, it was found that the small pelagic fishery had systematically exceeded allowable proportion of undersized

fish in the catch. A new approach to the allowed proportion of fish under the size limit was introduced through the revised NOM (2018, **A2.5**)

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 (MCS) of the fishery to ensure compliance. Landings are monitored and sampled; regular inspections take place at ports of landing/processing plants and on fishing vessels.

Until 2017, **INAPESCA** was responsible for the operational aspects of the observer program. A Technical Observer Program is now executed by Global Group, A.C. in coordination with **CONAPESCA** and with Technical Assistance from **INAPESCA**. All small pelagic fleets in the Gulf Fishery are covered.

During 2017-18 a total of 1,408 sets were made with observers. 59.87% in Guaymas and 40.13% in Yavaros. There is a total of 14 observers in the program; all certified by CONAPESCA. A total of 20 vessels participated in the observer program. All technical, biological and fishing operation information is recorded in physical logs; data then stored in electronic format.

During fishing operations, the mortality of birds and marine mammals is very low; in some seasons null and there is no impact on the abundance of their populations (source Observer data). Incidental catches do not exceed the 2% limit set by NOM-059-**SEMARNAT**: (**Table 1**):

From observed trip from the port of Yavaros (Sinaloa), a total of 86 species-groups of species were recorded. In terms of biomass, a total of 35,186.5t of small pelagic species was captured; representing 99.08% of total catch. Incidental catches represented 0.91% of total catch.

For vessels from Guaymas (Sonora) a total of 104 species-groups of species were recorded. In terms of biomass, a total of 76,246t of small pelagic species was captured; representing 99.03% of total catch. Incidental catches (bony fish) represented 0.97% of total catch:

Table 1: Volume (tonnes) and % species retained and discarded. Global Group A.C. Observer Scheme **R10**

| Groups of Species | Guaymas | | Yavaros | |
|-------------------|-------------------|--------------|-------------------|--------------|
| | Total catches (t) | % of catches | Total catches (t) | % of catches |
| Small pelagic | 76,246.8 t | 99.03% | 35,186.5 | 99.08% |
| Bone fish | 744.1 | 0.967 % | 321.92 | 0.907 % |
| Elasmobranch | 0.593 | 0.0% | 2.92 | 0.008% |
| Crustaceans | 1.1 | 0.0% | 0.53 | 0.0% |
| Mollusc | 0.011 | 0.0% | 0.010 | 0.0% |
| Echinoderms | 0.064 | 0.0% | 0.040 | 0.0% |
| Sea turtles | 0.00 | 0.0% | 0.0 | 0.0% |
| Sea mammals | 0.00 | 0.0% | 0.0 | 0.0% |
| Seabirds | 0.00 | 0.0% | 0.0 | 0.0% |

Incidental catches in the three operation zones (**Figure 1**) did not exceed 2% of total recorded catches.

Fishing Permits are issued by **CONAPESCA** based on technical opinions issued by **INAPESCA**. Permits are renewed every 5 years; fishing vessels are required to use Vessel Monitoring System (VMS) equipment to facilitate tracking spatial positions of fishing operations.

R6, R9-R12, R14, R17-R18

References p 59

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 (Pacific) 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. | PASS |
| | A1.2 | Sufficient additional information is collected to enable an indication of stock status to be estimated. | PASS |
| Clause outcome: | | | PASS |
| Evidence | | | |
| A1.1: | | | |
| Data on catch and effort is collected from the official 'Aviso de Arribo' or landing notification forms provided and collected by regional offices of CONAPESCA . Data are processed and analysed by INAPESCA and results presented in official reports of fishery catch and effort (Table 2). | | | |
| INAPESCA conducted an acoustic survey in June 2018. Abundance was estimated at 870,000t and 1,200,000t, depending on assumption about reflectivity parameters. Although these estimates are 38% to 40% lower than estimates in 2017, the area covered in the survey was also reduced by 35%, therefore, the estimated abundance from the 2018 survey is not comparable directly to abundance in 2017. | | | |
| Outputs of the Age Structured Assessment Program (ASAP) model include total biomass, recruits and exploitable biomass. The method fits an age structured model to different types of data, including fishery independent indices of abundance including biomass estimated from acoustic surveys. Both acoustic estimates of abundance and CPUE from tows during surveys show a clear increasing trend in Monterrey (Pacific) sardine abundance from 2016 to 2018 (Figure 2): | | | |

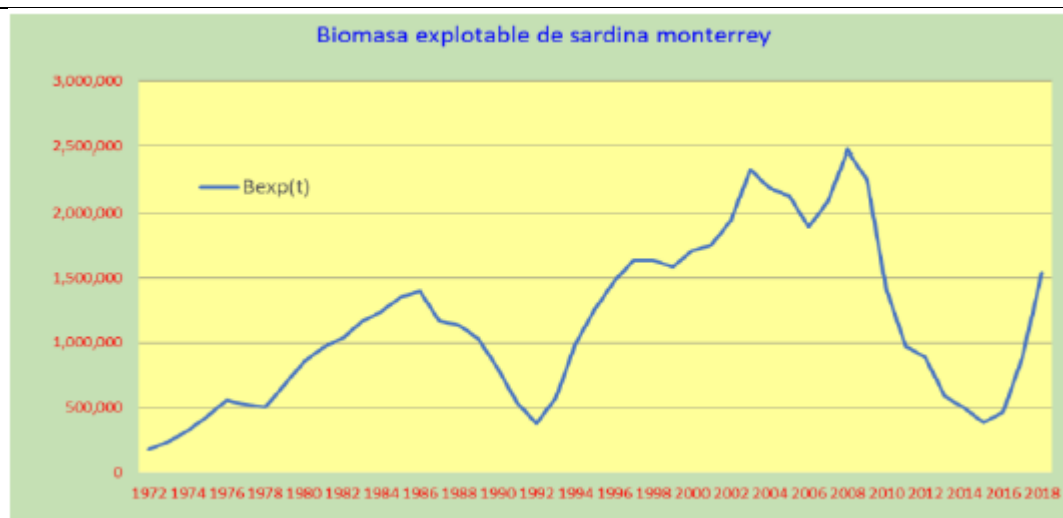


Figure 2 Time series of estimated exploitable biomass $B_{exp}(t)$ of Monterrey (Pacific) sardine in the Gulf of California. Reproduced from Nevarez-Martinez et al. (2019). **R9**

Model-based estimates were of a total abundance of near 2,800,000 t in 2018 while exploitable biomass used in the calculation of the BAC was estimated at 1,540,000 t.

The Monterrey (Pacific) sardine can be a predominant species in the catch but at times can be equally important relative to all other species together or may be practically insignificant. Environmental variability may promote the predominance of other species in the ecosystem (**Figure 3**):

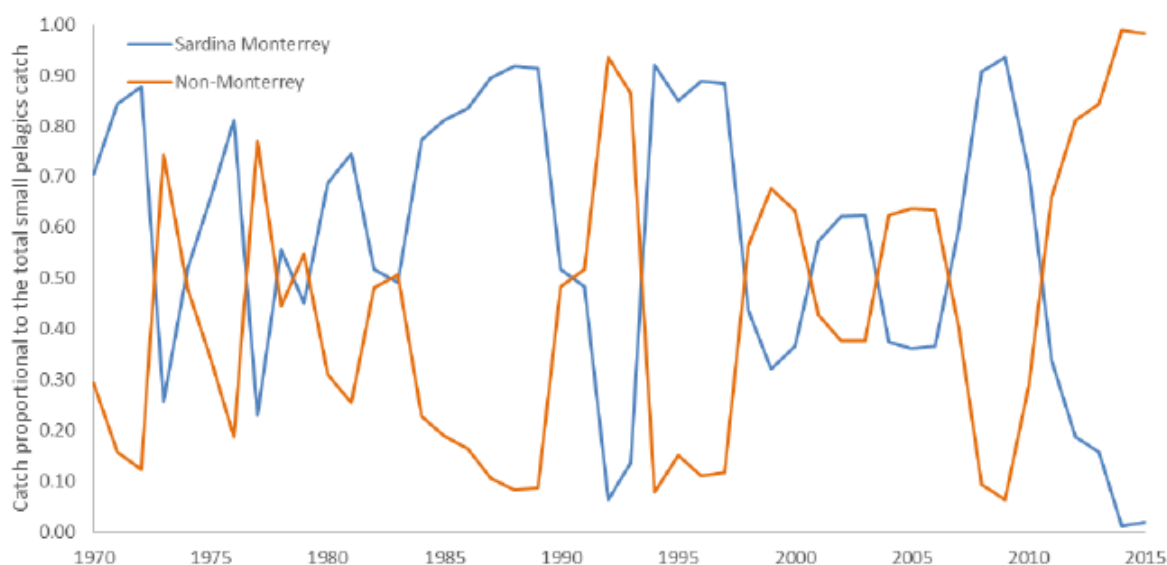


Figure 3 Proportional contribution of Monterrey (Pacific) sardine to total catch of small pelagic fish in the central Gulf of California (1970-2015) compared to all other small pelagics. **R9**

A1.2:

Stock assessments, since 2000, have been conducted using a stochastic age-structured model with density dependent recruitment and catch and effort data, estimating the number of individuals at age using Virtual Populations Analysis (VPA) and a Shepherd's stock-recruitment model. The ASAP model continues being used to evaluate stock status and to estimate management parameters.

R9, R19

References p 59

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. | PASS |
| | A2.2 | The assessment provides an estimate of the status of the biological stock relative to a reference point or proxy. | PASS |
| | A2.3 | The assessment provides an indication of the volume of fishery removals which is appropriate for the current stock status. | PASS |
| | A2.4 | The assessment is subject to internal or external peer review. | PASS |
| | A2.5 | The assessment is made publically available. | PASS |
| Clause outcome: | | | PASS |
| <p>Evidence</p> <p>A2.1:</p> <p>Scientists have discussed and communicated to other interested parties' options to define reference points appropriate for the fishery although caveats have been also identified and no conclusion reached yet. INAPESCA Scientists continue to investigate the best approach to stock assessments.</p> <p>The most recent stock assessment was conducted in 2019 (Nevarez-Martinez et al. 2019). The ASAP model continues being used to evaluate stock status and to estimate management parameters.</p> | | | |



Figure 4. Abundance of Pacific sardine in the Gulf of California estimated using the ASAP analysis. N total = total population, NR = recruit abundance, Nrep = adult abundance **R19**

A2.2:

The stock assessment (Nevarez-Martinez et al. 2019) estimated biomass of exploitable sardines to be 1,500,000 t. SSB is estimated as well above the level producing MSY and that similar to 2017 the fishing mortality rate was far below the level producing MSY.

Kobe plot indicates that the stock is not over-exploited, and no overfishing is taking place. Estimated F actual was 0.086 while F_{MSY} was estimated at 0.321:

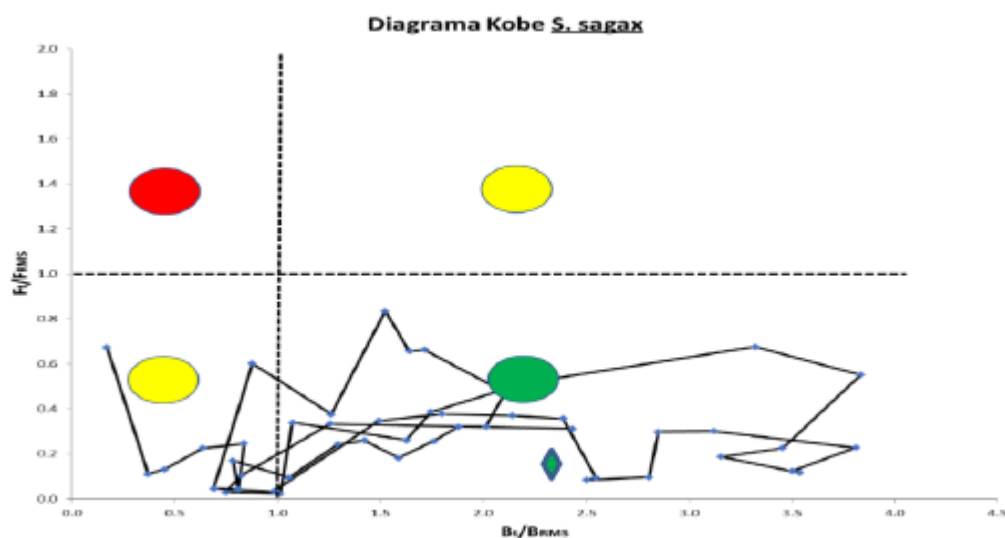


Figure 5 Kobe plot of biomass and fishing mortality rate relative to their respective levels producing MSY for the Monterrey sardine in the central/northern Gulf of California. Biomass is SSB. Reproduced from Nevarez-Martinez et al. (2019b). **R10**

Evidence of stock status showed a sharp decline in catches from a historic high of around half a million tons (2007/08) down to 3,571 tons in season 2013/14 (**Figure 3**). Although these catches were obtained in seasons when the fleet agreed to suspend effort on Pacific sardine, records represented historic lows for the fishery.

Stock assessments at the time concluded that recruitment is highly variable and suggested that environmental conditions may play an important role in such variability. Early descriptions about the behaviour of sardine populations indicated that availability depends on wind patterns and inter-annual fluctuations in temperature in the central Gulf related to the El Niño Southern Oscillation (**ENSO**).

Despite the fishery collapsing down to less than 3% of maximum production there is historical evidence of this stock's capacity to recover quickly after two years, as happened in 1993-1994 and 2014-2015 (**Figure 3**). During periods of low sardine abundance, fish concentrate around the large midriff islands of the Gulf of California, where cool water from tidal currents creates a region of high productivity called the Center of Biological Activity, and although reproduction may be reduced, the Center of Biological Activity serves as a refuge in extremely adverse conditions, making these fish unavailable to the fishery (source **INAPESCA**). The occurrence of a strong El Niño event was confirmed in 2015.

A discussion of stock assessment results with **INAPESCA** staff (PCR Report (SCS Global Services)) for MSC 2018)) has indicated that, with the exception of 1986-1990 and 2007-2009 the stock has not been through periods of overfishing. Figures shows that for the most part the catch has been under the Biologically Acceptable Catch (**BAC**) with the exception of the above years (**Figure 6**):



Figure 6 Comparison of catch records (green line) of Pacific sardine in the Gulf of California with the estimated Biologically Acceptable Catch (blue bars) obtained with the control rule in the Management Plan **R9**

A2.3:

The control rule described in the management plan is used to compute the Biologically Acceptable Catch: $BAC = (B - B_{min}) * Fraction$, where Fraction is defined as the proportion of biomass, above B_{min} , that can be removed by the fishery.

Fraction was being used as a known constant fishing mortality rate from a previous investigation that presented desirable properties for fishery management. During a recent site visit from the SCS Global Services Assessment Team (2019, First Surveillance Audit) it was agreed that Fraction should be better used as a true harvest rate.

A harvest rate was proposed to be computed as $HR = 1 - \exp(-F_{msy})$. In the latest stock assessment (Nevarez-Martinez et al., 2019b), the BAC was computed using this pre-agreed harvest rate as described above. **INAPESCA** computed the BAC for Monterrey sardine (2017/18) at 390,000 t while total reported catches were 177,929 t.

The SCS Assessment Team in 2018 had determined, in consultation with **INAPESCA**, that Monterrey (Pacific) sardine is a Key Low Trophic Level (LTL) stock; considerations at the time were given for its assessment as such under Principle 1 (source SCS Global Services (2019) First Surveillance Report Small Pelagic Fishery (Sonora)).

Considering that Monterrey sardine is a key low trophic level species, the B_{min} variable was increased from a base value of 55,000 t to 65,000 t based on estimates of fish consumption by sea birds. For 2018/2019 the agreed BAC was 292,600t; computed using an additional factor in the rule to account for ecosystem services (ecosystem approach).

A2.4:

The Carta Nacional Pesquera (**CNP**) is a binding instrument for the fisheries authorities' decision-making process. This Charter includes the diagnosis and assessment of a fishery, fisheries and conservation indicators, and recommendations by the National Institute of Fisheries and Aquaculture (INAPESCA), for the management of the fisheries that are included in the CNP.

Updates of CNP are prepared by **INAPESCA** every two or three years, but before the updates of the CNP are published in the Official Gazette (**Diario Oficial, DOF**), the draft update undergoes a public review process. This allows the public, non-governmental organisations and the academic sector, among others, to give an opinion of the fisheries status.

In advance of their onsite visit (March 2019) SCS identified relevant stakeholders for this fishery through professional networks of SCS and the audit team and know-how of the organizations working in the area. A list of over 25 individuals from 14 different organizations was compiled. Stakeholders were informed of audit announcements through MSC's website and email.

A2.5:

The revised official NOM (Mexican National Standard Number) NOM-003-SAG-PESC-2018, regulating the operations of this fishery has been published in the Official Federal Gazette (**DOF**). The revised document includes language that allows formal implementation and application of the new harvest control rule. This NOM also includes proposed modifications to regulations related to allowable size limits on capture. Percentages allowed below this size will be modified according to the technical opinion of **INAPESCA** and announced through regulatory agreements published in the **DOF**.

The latest version of the **CNP** (Carta Nacional Pesquera (National Fisheries Chart) was published by **SAGARPA** though **INAPESCA** in June 2018. The **CNP** is a document summarizing the state of a large number of fisheries including the small pelagic fishery in the Gulf. The **CNP** also includes general provisions and recommendations that must be observed by the fishing authorities when adopting and implementing instruments and measures to control fishing effort.

R1, R3, R9-R10, R19

References p 59

Standard clause 1.3.2.2, 1.3.2.1.2, 1.3.2.1.4

| A3 Harvest Strategy - Minimum Requirements | | | |
|---|------|--|-------------|
| A3 | A3.1 | There is a mechanism in place by which total fishing mortality of this species is restricted. | PASS |
| | 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. | PASS |
| | 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). | PASS |
| Clause outcome: | | | PASS |
| Evidence | | | |
| A3.1: | | | |
| <p>The control rule is built with the intent of keeping a minimum amount of biomass unfished to protect the stock. If the minimum biomass is reached; the fleet is expected to stop fishing. Given low availability during fishing seasons 2013/14 and 2014/15 (Figure 3) the industry voluntarily avoided fishing on Monterrey (Pacific) sardine. It was concluded at the time that the fishery has not exceeded the threshold level determined by the yearly computed BAC in almost all years (A3.2).</p> | | | |
| <p>The revised NOM includes language that allows formal implementation and application of the new harvest control rule. Also, under the revised NOM SAGARPA may establish periods and zones for the capture of small pelagic species to improve fishery management tools, resource conservation and interaction with other fisheries. These periods and zones will be taken according to the technical</p> | | | |

criteria of **INAPESCA** after discussion with the industry and will be published in **DOF** through regulatory agreements.

During a previous Audit (**R9**) by SCS Global Services minutes were presented of meetings between scientists and industry that discussed the Management Plan. Discussions were undertaken about the need to determine potential mechanisms to shut operations as real time cumulative catches approached 90% of allowable annual catch.

Minutes were presented where actual decisions were made between industry and authorities to stop fishing operations based on results of in-season monitoring of abundance and size. Other mechanisms to restrict fishing mortality included temporary closures, pre-emptive research surveys in advance of declaring the fishery open and maintaining geographically protected areas.

The SCS Global assessment team (2018 PCR Report **R9**) defined BAC as a limit reference point, since the point beyond BAC is considered by the authorities as 'not a desirable state', where overfishing occurs.

The language in the Management Plan (SPFMP) is interpreted such that BAC (and the corresponding fraction) works as a Limit Reference Point (LRP) and therefore acts as a precautionary approach in the management of the fishery because, although no actual value has been provided, the Target Reference Point (TRP) in terms of fishing mortality would be lower than the level producing MSY (source **R9**).

A3.2:

A comparison of catch records (green line) of Pacific sardine in the Gulf of California with estimated **BAC** (blue bars) obtained with the control rule in the Management Plan (**Figure 6**) shows that, for the most part, total fishery removals did not regularly exceed the level indicated or stated in the stock assessment.

A3.3:

Given low availability during fishing seasons 2013/14 and 2014/15 (**Figure 4**) the industry voluntarily avoided fishing on Monterrey (Pacific) sardine. The rule was computed to evaluate past catches; it was concluded at the time that the fishery has not exceeded the threshold level determined by the yearly computed BAC in almost all years (**Figure 6**).

The primary legal instruments are the Fisheries Law (Ley de Pesca) and the Regulation to the Fisheries Law (Reglamento de la Ley de Pesca). Based on the contents of these laws, the **SAGARPA** mission statement includes a commitment to "facilitate competitive and sustainable development of the fisheries and aquaculture sector in the country to increase the welfare of Mexicans".

The Fisheries Management Plan (**SPFMP**) for the minor pelagic species aims to set out 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. The MSY control rule,

for actively managed stocks including sardine is that which reduces exploitation when biomass declines.

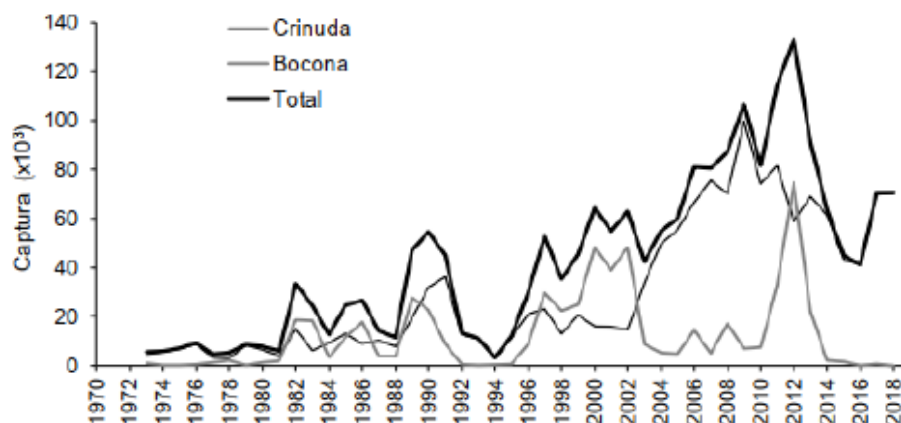
The revised NOM (2018) Includes language that allows formal implementation and application of the new harvest control rule. In this way technical guidance has been transformed into an actual management regulatory action. The absence of evidence of monitoring and enforcement to implement the harvest strategy and stop the fishery operation as BAC is approached was noted by the SCS Assessment Team (2019). Future SAI Global fisheries assessments will look for evidence of monitoring and enforcement in this domain.

R1; R9-R10; R12-R14

References P59

Standard clause 1.3.2.1.3

| A4 | Stock Status - Minimum Requirements | | |
|--|--|---|-------------|
| | A4.1 | <p>The stock is at or above the target reference point, OR IF NOT:</p> <p>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:</p> <p>The stock is estimated to be below the limit reference point or proxy, but fishery removals are prohibited.</p> | PASS |
| Clause outcome: | | | PASS |
| <p>Evidence</p> <p>A4.1:</p> <p>The latest stock assessment has estimated exploitable biomass at 1,500,000 t. SSB is estimated as well above the level producing MSY and that, similar to 2017, the fishing mortality rate was far below the level producing MSY. Kobe plots indicate that the stock is not over-exploited, and no overfishing is taking place.</p> <p>Evidence that stock availability has shifted rather than declined and that catch has historically remained below BAC supports the conclusion that it is highly likely that the stock is at or above target reference point.</p> <p>R9-R10; R19</p> | | | |
| References p 59 | | | |
| <i>Standard clause 1.3.2.1.4</i> | | | |

| | | | |
|--|--|---|------|
| Species Name | | Thread herring Crinuda (<i>Opisthonema</i> sp) | |
| A1 | Data Collection - Minimum Requirements | | |
| | A1.1 | Landings data are collected such that the fishery-wide removals of this species are known. | PASS |
| | A1.2 | Sufficient additional information is collected to enable an indication of stock status to be estimated. | PASS |
| Clause outcome: | | | PASS |
| Evidence | | | |
| A1.1: | | | |
| Data on catch and effort is collected from the official 'Aviso de Arribo' or landing notification forms provided and collected by regional offices of CONAPESCA . Data are processed and analysed by INAPESCA and results presented in official reports of fishery catch and effort. | | | |
| The Sinaloa fleet (which captures mostly Thread herring) received MSC certification in October 2016. The Sonora fleet, the largest of the four fleets, primarily targets Pacific sardines and secondarily targets Thread herring (Figure 1). | | | |
| Total landings (Thread herring and Bocona sardine) in the 2017/2018 fishery from the assessment area were 63,380t. The opportunistic nature of the small pelagic fleet makes it difficult to interpret CPUE on a particular species, as the fleet prefers Pacific sardine (<i>Opisthonema libertate</i>) but will opportunistically capture any of the marketable small pelagic species it encounters (Figure 7): | | | |
|  | | | |
| Figure 7: History of observed catches of Thread herring (<i>Crinuda</i>) and Bocona sardine (<i>Cetengraulis mysticetus</i>) in the southern Gulf. Reproduced from Jacob-Cervantes et al. (2019) R29 | | | |
| A1.2: | | | |
| For the 2018 surveys INAPESCA Staff used the same age structured estimation model using alternative assumptions about natural mortality but also added a comparison of model performance using two forms of stock-recruitment relationship (Beverton-Holt and Ricker, Figure 8): | | | |

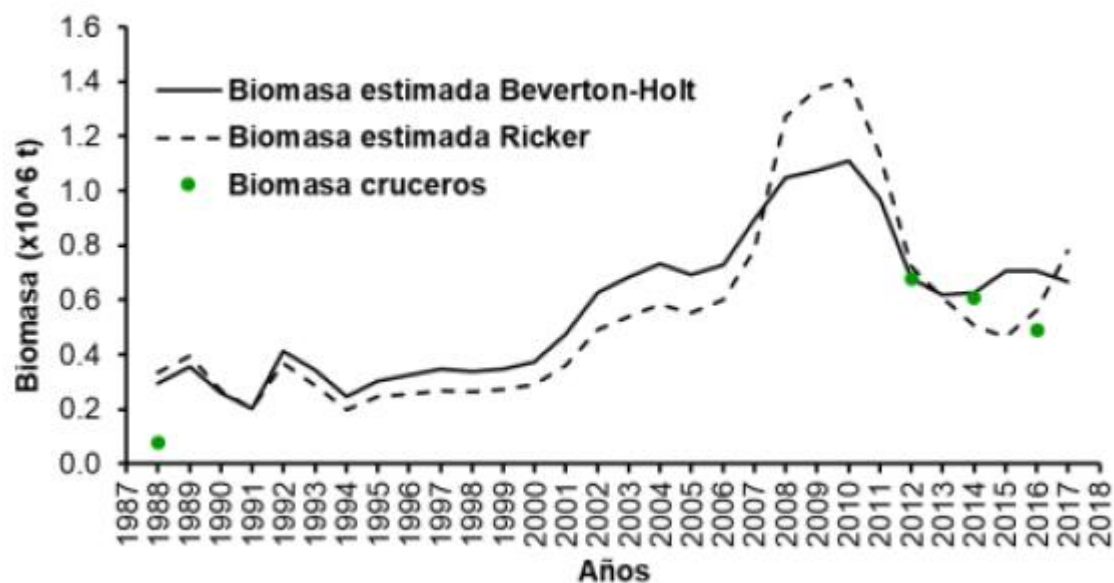


Figure 8: Biomass trend of the thread herring complex in the southern Gulf of California as predicted using two alternative age structured models fit to acoustic based estimates of abundance (dots). Trends obtained under the assumption of natural mortality $M=0.6$. **R29**

Total biomass was estimated based on acoustic detections processed using Echoview software using a target strength (TS) function requiring a species-specific acoustic reflectivity parameter. For small pelagics in Mexico, there is currently no information on values specific for Thread herring.

INAPESCA scientists used a known value for *Sardinops ocellatus* and also a generic value for the *Clupeidae* family. Estimated biomass abundance under the *S. ocellatus* TS assumption was 749,538t; under the *Clupeidae* assumption 1,034,650 t.

R9-R10; R29-R31

References p 59

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. | PASS |
| | A2.2 | The assessment provides an estimate of the status of the biological stock relative to a reference point or proxy. | PASS |
| | A2.3 | The assessment provides an indication of the volume of fishery removals which is appropriate for the current stock status. | PASS |
| | A2.4 | The assessment is subject to internal or external peer review. | PASS |
| | A2.5 | The assessment is made publically available. | PASS |
| Clause outcome: | | | PASS |

Evidence

A2.1

Annual biomass trends of the thread herring complex have been predicted since 1987. Scientists have discussed and communicated to other interested parties' options to define reference points appropriate for the fishery although caveats have been also identified and no conclusion reached yet.

INAPESCA Scientists continue to investigate the best approach to stock assessments.

After the sharp decline of previous years, the trend in catches of previous years has reverted and increased in 2017 and 2018 (**Figure 9, Table 2**):

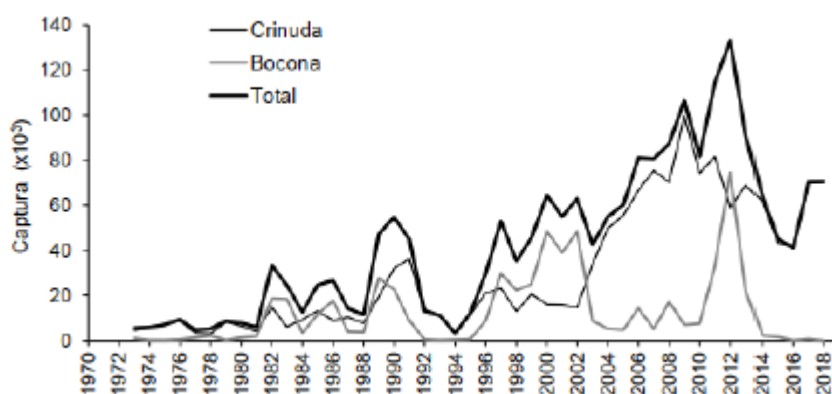


Figure 9: History of observed catch of thread herring and bocona sardine in the southern Gulf of California. Reproduced from Jacob-Cervantes et al. (2019). **R29**

A2.2:

For now, Fmsy still is the default 0.25 suggested in the Management Plan but **INAPESCA** staff substituted this value with an estimated parameter in 2018. **INAPESCA** scientists are also aware the calculation of the allowable catch with this control rule needs to use as input the most recent abundance estimates available, which in this case is biomass estimated (population dynamics model) and does not rely on outdated survey-based estimates.

In 2018 the Biologically Acceptable Catch (BAC) was computed again using the model-based estimate of F_{msy} (0.194) and abundance estimates using an age structured model (382,740 t). It's worth noting the default F_{msy} value of 0.25 used was originally estimated for the Pacific sardine *Sardinops sagax*.

Assuming that $B_{min} = 12,000$ t, the BAC obtained for 2018 was 65,522 t. According to the latest stock assessment (2018 data, published in 2019) SSB producing MSY was estimated to be 460,000t. The Kobe plot (*O. libertate*) indicates that the stock is not over-exploited, and no overfishing is taking place:

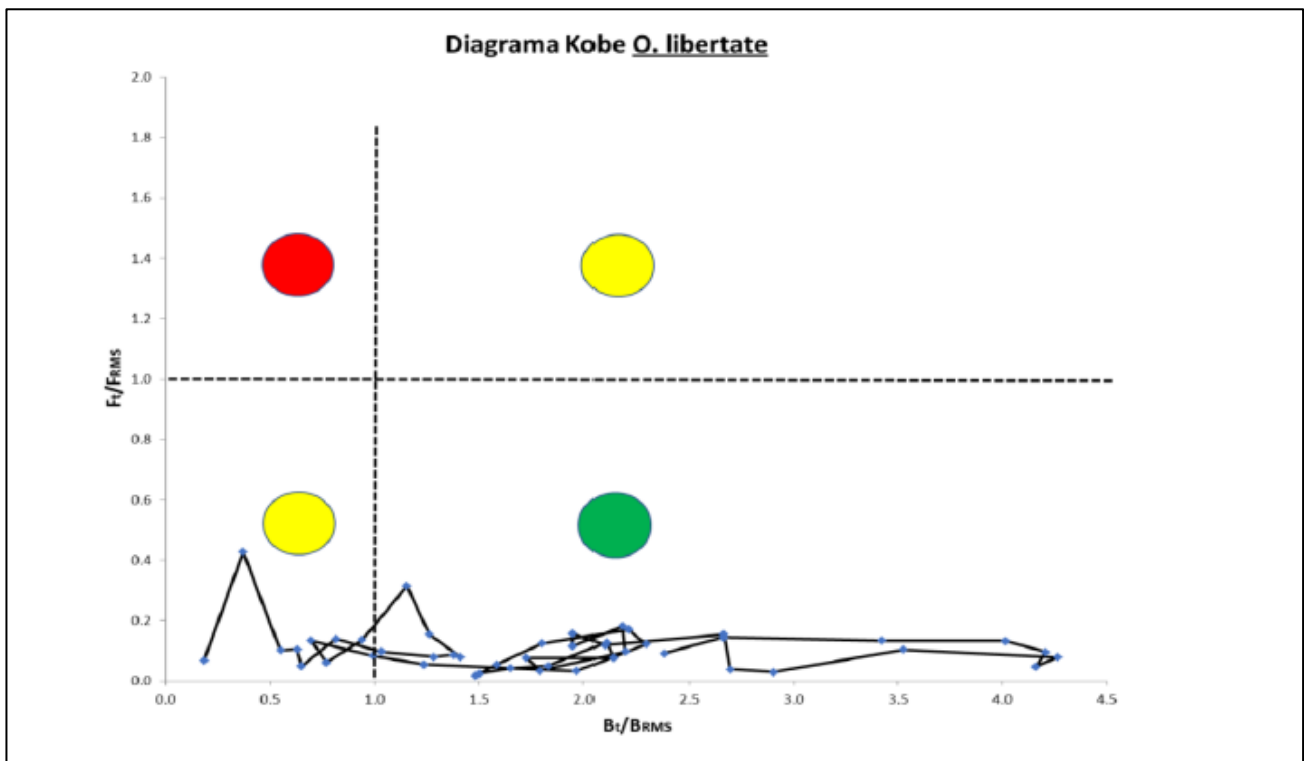


Figure 10: Kobe plot of biomass and fishing mortality rate relative to their respective levels producing MSY for the thread herring in central/northern Gulf of California. Biomass is SSB **R30**

A2.3:

For species that are “actively managed” the Management Plan (FMP) has added an MSY-based control rule that, based on the application of a harvest rate, forces the catch to be reduced if the biomass declines until eventually, if a biomass threshold is reached, the fishery stops operating.

An improvement was reported (First Surveillance Audit Thread herring fishery **R30**) in the calculation of the Biologically Acceptable Catch (BAC); replacing the quantity FRACTION with a harvest rate computed as $HR = 1 - \exp(-F_{MSY})$. For now, F_{MSY} still is the default 0.25 suggested in the FMP.

There does not appear to be a TAC set for the thread herring fishery as a whole nor for individual species, although INAPESCA make recommendations (700,000t for all small pelagic species in the 2012

CNP). This TAC needs to be technically justified in future assessments, efforts are been made to achieve more accurate assessments of population abundance by species.

A2.4:

The Carta Nacional Pesquera (**CNP**) is a binding instrument for the fisheries authorities' decision-making process. This Charter includes the diagnosis and assessment of a fishery, fisheries and conservation indicators, and recommendations by the National Institute of Fisheries and Aquaculture (INAPESCA), for the management of the fisheries that are included in the **CNP**.

Updates of **CNP** are prepared by **INAPESCA** every two or three years, but before the updates of the CNP are published in the Official Gazette (Diario Oficial, DOF), the draft update undergoes a public review process. This allows the public, non-governmental organisations and the academic sector, among others, to give an opinion of the fisheries status.

A2.5:

The revised NOM (2018) includes proposed modifications to regulations related to allowable size limits on capture. Percentages allowed below this size will be modified according to the technical opinion of **INAPESCA** and announced through regulatory agreements published in the DOF.

The latest version of the **CNP** (Carta Nacional Pesquera (National Fisheries Chart) was published by **SAGARPA** through **INAPESCA** in June 2018. The CNP also includes general provisions and recommendations that must be observed by the fishing authorities when adopting and implementing instruments and measures to control fishing effort.

R9-R10; R29-R31

References p59

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. | PASS |
| | 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. | PASS |
| | 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). | PASS |
| Clause outcome: | | | PASS |
| Evidence | | | |
| A3.1: | | | |
| <p>Fishing effort in the NOM is restricted (no further increase in vessel numbers) North of 20°N. This prohibition also includes no addition of vessels to the fleet unless they are to replace retired active boats. The fishery is managed using a control rule based on removing a fraction of allowable biomass above a minimum threshold. The language in the Management Plan (FMP) is interpreted such that this BAC (and corresponding FRACTION) works as a Limit Reference Point (LRP). Although no actual value has been provided, the Target Reference Point (TRP) in terms of fishing mortality will be lower than the level producing MSY.</p> <p>A maximum volume of 20% (down from 30%) of annual catch limits for each small pelagic species below the minimum landing size for that species is permitted. This reduced rate of capture applies for Monterey sardine (<i>Sardinops sagax</i>), Thread herring Crinuda (<i>Opisthonema</i> spp.) and Californian anchovy (<i>Engraulis mordax</i>). This amount may be revised through technical opinions provided by INAPESCA and published in DOF.</p> | | | |
| A3.2: | | | |
| <p>Methodological differences with previous assessments make it difficult to interpret how estimated harvest rates have changed, but despite an increase in the last two years, the harvest rate appears to continue fluctuating around the same average of the last ten years at least (Figure 9). The Kobe plot (<i>O. libertate</i>) indicates that the stock is not over-exploited, and no overfishing is taking place (Figure 10).</p> | | | |
| A3.3: | | | |
| <p>The Management Plan has added an MSY-based control rule which, based on the application of a harvest rate, requires catches to be reduced if biomass declines. If a biomass threshold is reached, the fishery stops operating.</p> <p>Other management actions employed when reaching or exceeding one or more reference points include temporary or zone closures, establishment or change of minimum size limits and change of allowable catch levels by species and effort restrictions. SAGARPA act according to technical criteria</p> | | | |

of **INAPESCA** following discussion with the industry. All revisions of the Regulation are published in the DOF.

The revised NOM (2018) Includes language that allows formal implementation and application of the new harvest control rule. In this way technical guidance has been transformed into an actual management regulatory action.

R9-R10; R29-R31

References p 58

Standard clause 1.3.2.1.3

| A4 | Stock Status - Minimum Requirements | | |
|---|--|---|-------------|
| | A4.1 | <p>The stock is at or above the target reference point, OR IF NOT:</p> <p>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:</p> <p>The stock is estimated to be below the limit reference point or proxy, but fishery removals are prohibited.</p> | PASS |
| Clause outcome: | | | PASS |
| <p>Evidence</p> <p>A4.1:</p> <p>According to the latest assessment (2018 data, published in 2019) SSB producing MSY was estimated to be 460,000 t. The Kobe plot indicated that the stock was not over-exploited, and no overfishing was taking place.</p> <p>Data provided to MSC auditors (Second Surveillance Audit Thread herring fishery 2019) confirmed estimates of fishing mortality rates for the Thread herring complex were below the current 0.25 reference point suggested by the Management Plan.</p> <p>BAC obtained for 2018 was 65,522 t.; against a Bmin of 12,000t. Total catches for 2018 (Thread herring complex and Bocona sardine) were 63,380t.</p> <p>R9-R10; R29-R31</p> | | | |
| References p 59 | | | |
| <i>Standard clause 1.3.2.1.4</i> | | | |

| Species Name | | Chub mackerel <i>Macarela Scomber japonicus</i> | | | | | | | | | |
|--|--|---|---|--|---|--|---|---|---------------|------------|------------------------|
| A1 | Data Collection - Minimum Requirements | | | | | | | | | | |
| | A1.1 | Landings data are collected such that the fishery-wide removals of this species are known. | | | | | | | | | PASS |
| | A1.2 | Sufficient additional information is collected to enable an indication of stock status to be estimated. | | | | | | | | | PASS |
| Clause outcome: | | | | | | | | | | | PASS |
| Evidence | | | | | | | | | | | |
| A1.1: | | | | | | | | | | | |
| Data on catch and effort is collected from the official ‘Aviso de Arribo’ or landing notification form provided and collected by regional offices of CONAPESCA . Data are processed and analysed by INAPESCA; results presented in official reports of fishery catch and effort. | | | | | | | | | | | |
| Landings data for Chub mackerel have been recorded since 1999. Chub mackerel present trends of variable abundance. Peaks appear to be on an approximate five-year cycle. Highest landings, over 40,000 mt, were recorded in 1998/99 (40,535 mt) when it accounted for 25% of catch composition of the fishery and in 2011-12 (47,600 mt) representing 10% of total catch (Table 2): | | | | | | | | | | | |
| Table 2: Total landings (mt) of small pelagic species in the Gulf of California purse seine fishery R31 | | | | | | | | | | | |
| Year | Total Landings | Pacific sardine <i>Sardinops sagax</i> | Thread Herring <i>Opisthionema</i> spp. | Chub Mackerel <i>Scomber japonicus</i> | Red-eye round herring <i>Etrumeus teres</i> | California Anchovy <i>Engraulis mordax</i> | Bocona sardine <i>Cetengraulis mysticetus</i> | Leather-jackets <i>Oligoplites</i> spp. | Mixed Species | No vessels | Nominal effort (trips) |
| 99/00 | 178,902 | 65,593 | 38,510 | 34,240 | 5,006 | 4,493 | 25,229 | 4,741 | 1,091 | 28 | 1,603 |
| 00/01 | 333,370 | 190,862 | 15,834 | 13,003 | 345 | | 112,954 | 277 | 75 | 28 | 2,533 |
| 01/02 | 353,903 | 220,360 | 46,666 | 4,493 | 270 | 2,853 | 78,261 | 890 | 110 | 32 | 2,827 |
| 02/03 | 318,379 | 198,757 | 94,956 | 6,992 | 4,889 | 1,100 | 7,682 | 3,309 | 693 | 31 | 2,745 |
| 03/04 | 271,638 | 102,034 | 59,685 | 25,507 | 8,858 | 5,717 | 63,253 | 5,494 | 1,090 | 28 | 2,121 |
| 04/05 | 260,859 | 94,559 | 76,183 | 32,943 | 4,683 | 7,354 | 38,031 | 4,233 | 2,874 | 30 | 2,074 |
| 05/06 | 365,164 | 133,567 | 60,560 | 13,191 | 7,178 | 41,820 | 106,062 | 945 | 1,841 | 36 | 2,922 |
| 06/07 | 297,867 | 178,205 | 87,172 | 6,616 | 3,088 | 1,271 | 16,491 | 2,530 | 2,495 | 38 | 2,499 |
| 07/08 | 538,669 | 488,639 | 25,726 | 3,988 | 698 | 5,885 | 12,303 | 238 | 1,190 | 42 | 3,861 |
| 08/09 | 564,298 | 528,094 | 21,564 | 963 | 422 | 2,620 | 9,537 | 212 | 885 | 47 | 3,757 |
| 09/10 | 360,952 | 256,409 | 85,116 | 3,527 | 5,545 | 481 | 8,315 | 520 | 1,039 | 50 | 2,761 |
| 10/11 | 407,114 | 138,068 | 73,507 | 38,762 | 3,040 | 76,849 | 74,067 | 2,382 | 441 | 49 | 3,306 |
| 11/12 | 461,058 | 86,470 | 51,780 | 47,600 | 2,560 | 73,124 | 197,354 | 666 | 1,503 | 50 | 3,358 |
| 12/13 | 465,486 | 72,802 | 101,814 | 20,557 | 12,587 | 118,833 | 129,296 | 3,947 | 5,649 | 51 | 3,601 |
| 13/14 | 293,686 | 3,571 | 133,452 | 40,640 | 6,684 | 33,772 | 64,135 | 10,869 | 564 | 49 | 2,685 |
| 14/15 | 244,465 | 4,455 | 120,919 | 35,503 | 7,173 | 3,888 | 67,960 | 4,168 | 399 | 50 | 2,223 |
| A1.2: | | | | | | | | | | | |
| Chub mackerel has been included in acoustic surveys, but results have not been included in stock assessments for this species. Under the Management Plan (SPFMP) chub mackerel is classified as an “actively” managed species; using a harvest rate constrained between 5 and 25% of estimated SSB, over a cut-off of minimum biomass. | | | | | | | | | | | |

Using a biomass dynamics model Nevarez-Martínez et al. (2016) **R17** calculated biological reference points for Chub mackerel. The biomass dynamics model pools catch of chub mackerel and indicates that recorded catches are far below estimated BMSY for all of its trajectory (**see A2.3**).

R2, R6, R17, R31

References p 60

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. | PASS |
| A2.2 | The assessment provides an estimate of the status of the biological stock relative to a reference point or proxy. | PASS |
| A2.3 | The assessment provides an indication of the volume of fishery removals which is appropriate for the current stock status. | PASS |
| A2.4 | The assessment is subject to internal or external peer review. | PASS |
| A2.5 | The assessment is made publically available. | PASS |

Clause outcome: PASS

Evidence

A2.1:

Chub mackerel has been present in the catch of the Sonora small pelagics fleet from the start of the fishery in the early 1970s, although initially with low volumes. As with other small pelagic species, chub mackerel also presents trends of variable abundance. Peaks appear to be on an approximate five-year cycle (Figure 3).

A2.2:

Fishing mortality rate at MSY (Nevarez-Martínez et al. (2016)) was estimated to be 0.350 and MSY at 70,000 mt (Table 3). No estimates of fishing mortality rates using ASAP are available for this species. Biomass dynamics model pools catch of chub mackerel and indicates that recorded catches are far below estimated BMSY for all of its trajectory:

Table 3: Biological Reference Points for Chub mackerel R17

| 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 |

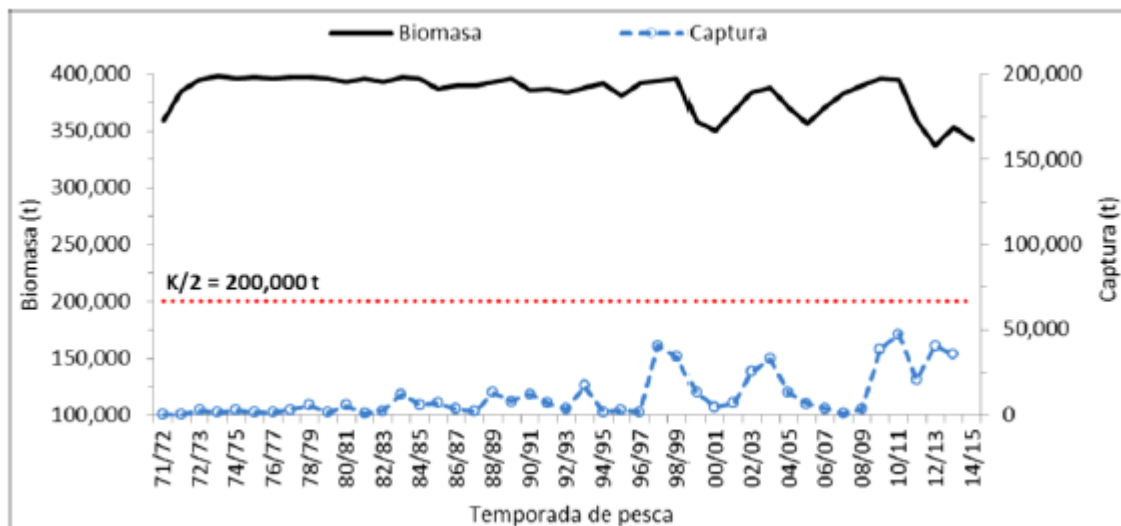


Figure 11: Biomass trajectories of Chub mackerel in the Gulf of California. Red line = B_{MSY} **R17**

Kobe plots for the assessment of chub mackerel show positive results in terms of exploitation and current state of the population, with all years indicating that estimated biomass is above B_{MSY} and average fishing mortality rate remains below F_{MSY} , thus there is no risk of overfishing:

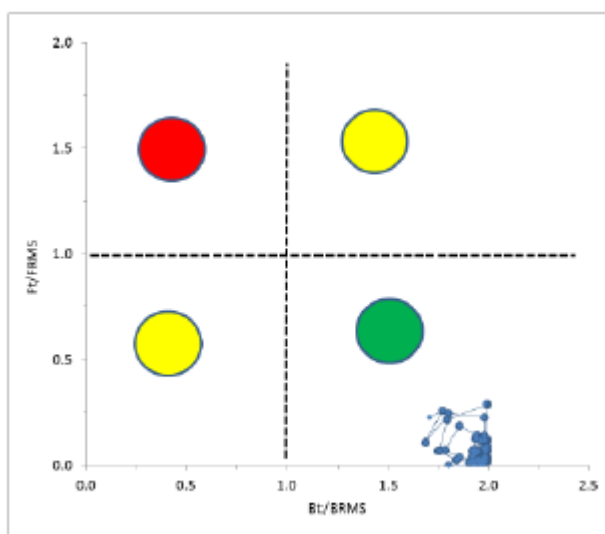


Figure 12: Kobe plots with stock status of mackerel (*Scomber japonicus*) in Gulf of California **R31**

A2.3:

For actively managed species the control rule described in the management plan is used to compute the Biologically Acceptable Catch: $BAC = (B - B_{min}) * Fraction$, where Fraction is defined as the proportion of biomass, above B_{min} , that can be removed by the fishery.

As part of the scientific research objectives in the SPFMP, commercial fisheries landings are monitored. The status of the stock of these species are assessed every 3-4 years. For chub mackerel there is also a work plan for future evaluations, including: processing of biological data (growth

parameters, mortality indices), processing of size distribution, application of independent abundance indices, processing of information from the acoustic data, and application of age-based methods to the stock status.

A2.4:

The Carta Nacional Pesquera (CNP) is a binding instrument for the fisheries authorities' decision-making process. This Charter includes the diagnosis and assessment of a fishery, fisheries and conservation indicators, and recommendations by the National Institute of Fisheries and Aquaculture (**INAPESCA**), for the management of the fisheries that are included in the CNP.

Updates of CNP are prepared by **INAPESCA** every two or three years, but before the updates of the CNP are published in the Official Gazette (Diario Oficial, DOF), the draft update undergoes a public review process. This allows the public, non-governmental organisations and the academic sector, among others, to give an opinion of the fisheries status.

A2.5:

The revised NOM (2018) includes proposed modifications to regulations related to allowable size limits on capture. Percentages allowed below this size will be modified according to the technical opinion of **INAPESCA** and announced through regulatory agreements published in the DOF.

The latest version of the **CNP** (Carta Nacional Pesquera (National Fisheries Chart) was published by **SAGARPA** through **INAPESCA** in June 2018. The CNP also includes general provisions and recommendations that must be observed by the fishing authorities when adopting and implementing instruments and measures to control fishing effort.

R1-R2, R9, R17, R31

References p60

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. | PASS |
| | 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. | PASS |
| | 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). | PASS |
| Clause outcome: | | | PASS |
| Evidence | | | |
| A3.1: | | | |
| <p>Fishing effort in the NOM is restricted (no further increase in vessel numbers) North of 20°N. This prohibition also includes no addition of vessels to the small pelagic fleet unless they are to replace retired active boats. The fishery is managed using a control rule based on removing a fraction of allowable biomass above a minimum threshold. The language in the Management Plan (FMP) is interpreted such that this BAC (and corresponding FRACTION) works as a Limit Reference Point (LRP). Although no actual value has been provided, the Target Reference Point (TRP) in terms of fishing mortality will be lower than the level producing MSY.</p> <p>A maximum volume of 20% (down from 30%) of annual catch limits for each small pelagic species (including <i>Scomber japonicus</i>) below the minimum landing size for that species is permitted. This amount may be revised through technical opinions provided by INAPESCA and published in DOF.</p> | | | |
| A3.2: | | | |
| <p>Catch and effort statistics information for chub mackerel come from the landing tickets (Aviso de Arribo) of the smaller pelagic catches from the Guaymas and Yavaros ports, Sonora. Informal information suggests that discards occur when the fenced school is too large to fit in the hold or when small sizes are caught. No information was provided on discards volumes for chub mackerel. As with other small pelagic species, chub mackerel present trends of variable abundance. Peaks appear to be on an approximate five-year cycle (Table 2).</p> | | | |
| A3.3: | | | |
| <p>Chub mackerel is designated under the active management category. For species that are actively managed, the Management Plan (SPFMP) has added an MSY-based control rule which, based on the application of a harvest rate, requires the catch to be reduced if the biomass declines. Eventually, if a biomass threshold is reached, the fishery stops operating.</p> <p>The SFPM lists other types of control rules including CPUE, minimum size. There are also emerging management actions that can be employed when reaching or exceeding one or more reference</p> | | | |

| |
|---|
| points. These include temporary or zone closures, establishment or change of minimum size limits, change of allowable catch levels by species and effort restrictions R1-R2, R9, R17, R31 |
| References p 60 |
| <i>Standard clause 1.3.2.1.3</i> |

| A4 Stock Status - Minimum Requirements | | | |
|--|------|--|-------------|
| A4 | A4.1 | The stock is at or above the target reference point, OR IF NOT: | PASS |
| | | 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. | |
| Clause outcome: | | | PASS |
| Evidence A4.1: Kobe plots for the assessment of chub mackerel show positive results in terms of exploitation and current state of the population, with all years indicating that estimated biomass is above BMSY and average fishing mortality rate remains below FMSY (Figure 12). R31 | | | |
| References p 60 | | | |
| <i>Standard clause 1.3.2.1.4</i> | | | |

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 |

| Species Name | | Anchoveta <i>Engraulis mordax</i> |
|--|---------------------|--|
| B1 | Species Name | Anchoveta |
| | Table used (Ba, Bb) | Ba |
| | Outcome | PASS |
| <p>Evidence</p> <p>Anchoveta are passively managed and therefore not subject to a species-specific management regime sufficient to pass all A Clauses. Since 2000 catches caught in this fishery have been documented through landing slips and catch records for each jurisdiction. Data are processed and analysed by INAPESCA and results presented in official reports of fishery catch and effort.</p> <p>Anchoveta can be a predominant species in the catch but at times can be equally important relative to all other species together or may be practically insignificant. Environmental variability may promote the predominance of other species including Monterrey (Pacific) Sardine in the ecosystem (Figure 3, Table 2).</p> <p>For passively managed species the control rule determines that BAC) is computed as 25% of the most recent estimate of SSB. Monitoring of vessel discharges and determination of abundance indices are considered sufficient for managing passively managed stocks. At the discretion of INP passively managed stocks may revert to being actively managed.</p> <p>From 2010-2011 to 2013-2014, the California anchovy/<i>E.mordax</i> fishery represented more than 18% of total catches of small pelagics. By 2014-2015 the proportion was down to 2%. (Table 2). The IFFO-RS assessment team are not of the view that there may be a problem with this stock.</p> <p>In our opinion populations of small pelagic fish undergo wide variations in their contribution to total catch that are associated with their availability due to environmental fluctuations. The California</p> | | |

anchovy/*E.mordax* stock is not a regular or frequent component of the catch of small pelagics in the assessment area. By 2014/2015 the catch declined and if the pattern continues the team do not expect to see it again any time soon (**Table 4**):

Table 4: Percentage of small pelagic species landed in the Gulf of California sardine purse seine fishery by weight since the 1999-2000 fishing season. **R9**

| Year | Total Landings | Pacific sardine <i>Sardinops sagax</i> | Thread Herring <i>Opisthoptera</i> spp. | Chub Mackerel <i>Scomber japonicus</i> | Red-eye round herring <i>Etrumeus teres</i> | California Anchovy <i>Engraulis mordax</i> | Bocona sardine <i>Cetengraulis mysticetus</i> | Leather-jackets <i>Oligoplites</i> spp. | Mixed Species |
|-------|----------------|---|--|---|--|---|--|--|---------------|
| 99/00 | 178,902 | 37 | 22 | 19 | 3 | 3 | 14 | 3 | 1 |
| 00/01 | 333,370 | 57 | 5 | 4 | 0 | 0 | 34 | 0 | 0 |
| 01/02 | 353,903 | 62 | 13 | 1 | 0 | 1 | 22 | 0 | 0 |
| 02/03 | 318,379 | 62 | 30 | 2 | 2 | 0 | 2 | 1 | 0 |
| 03/04 | 271,638 | 38 | 22 | 9 | 3 | 2 | 23 | 2 | 0 |
| 04/05 | 260,859 | 36 | 29 | 13 | 2 | 3 | 15 | 2 | 1 |
| 05/06 | 365,164 | 37 | 17 | 4 | 2 | 11 | 29 | 0 | 1 |
| 06/07 | 297,867 | 60 | 29 | 2 | 1 | 0 | 6 | 1 | 1 |
| 07/08 | 538,669 | 91 | 5 | 1 | 0 | 1 | 2 | 0 | 0 |
| 08/09 | 564,298 | 94 | 4 | 0 | 0 | 0 | 2 | 0 | 0 |
| 09/10 | 360,952 | 71 | 24 | 1 | 2 | 0 | 2 | 0 | 0 |
| 10/11 | 407,114 | 34 | 18 | 10 | 1 | 19 | 18 | 1 | 0 |
| 11/12 | 461,058 | 19 | 11 | 10 | 1 | 16 | 43 | 0 | 0 |
| 12/13 | 465,486 | 16 | 22 | 4 | 3 | 26 | 28 | 1 | 1 |
| 13/14 | 293,686 | 1 | 45 | 14 | 2 | 12 | 22 | 4 | 0 |
| 14/15 | 244,465 | 2 | 49 | 15 | 3 | 2 | 28 | 2 | 0 |

Recent very rapid change in species composition makes it very difficult for scientists doing the monitoring, analysis and modelling of the fishery to respond to changes. In addition, the principal emphasis on ecosystem management of the pacific sardine fishery recommended in previous assessments should now be expanded to focus on ecosystem management of a variable complex of small pelagics, including Californian anchovy/*E. Mordax*.

The very flat, near B_0 , time series of biomass for by-catch species such as Californian anchovy imply that the density-dependence which determines the sustainable and/or optimum exploitation rate cannot possibly be assessed until the biomass of these genera falls below 50% of B_0 .

The stock passes the Category B risk-based assessment with a medium resilience rating.

R1-R2, R9, R31

References p 60

Standard clauses 1.3.2.1

Assessment Results

| Species Name | | Bocona sardine <i>Cetengraulis mysticetus</i> |
|--------------|---------------------|---|
| B1 | Species Name | <i>Cetengraulis mysticetus</i> |
| | Table used (Ba, Bb) | Ba |
| | Outcome | PASS |

Evidence

B1:

Bocona sardine is also passively managed under the SPFMP (Management Plan) and NOM-003-PESC-1993 (2018). There is in place a sampling program to collect landing data and surveys to gather size data. Stock assessments have been conducted for this species, but not recently. For passively managed species, the control rule determines that BAC is simply 25% of the most recent estimate of SSB.

Data on catch and effort from the official 'Aviso de Arribo' or landing notifications are collected by regional offices of **CONAPESCA** and then forwarded to and processed by **INAPESCA** scientists. Results are presented in official reports of fishery catch and effort (**Figure 13**):

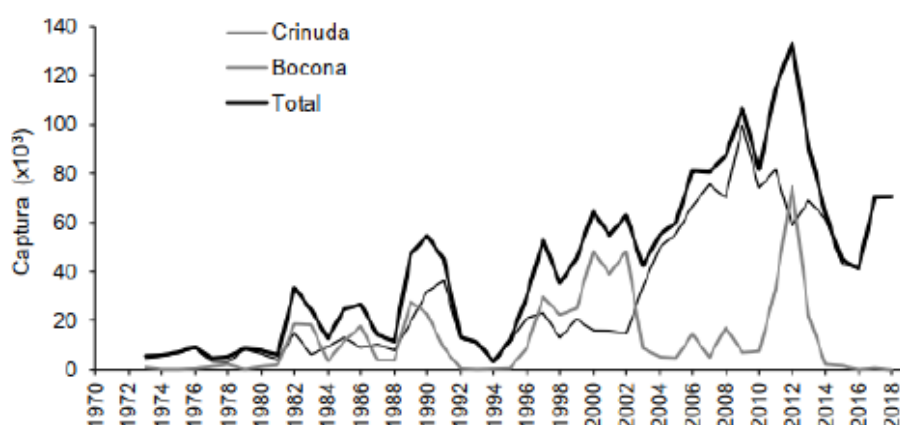


Figure 13 History of observed catches of Thread herring (*Crinuda*) and Bocona sardine (*Cetengraulis mysticetus*) in the Southern Gulf. **R29**

Some biological reference points are available. Fishing mortality rate at MSY was estimated to be 0.2620 and MSY equivalent to 185,485 mt:

Table 5 Biological Reference Points Bocona sardine **R17**

| Parameter | <i>Bocona sardine</i> |
|------------------|-----------------------|
| R | 0.5240 |
| K | 1,415,800 |
| B ₀ | 360,000 |
| B _{MSY} | 707,900 |
| MSY | 185,485 |
| F _{MSY} | 0.2620 |
| f _{MSY} | 3,885 |
| α _{med} | 6.7452E-05 |

B_{MSY} is equivalent to $K/2 = 707,900\text{t}$ (**Figure 14**):

Fishbase report an intrinsic population growth rate several times higher than that of Thread herring. Therefore, given the high productivity of the species and opportunistic nature of the catch, it is reasonable to assume the species is being harvested at levels that are highly likely to keep the stock within biologically based limits.

Biomass is about twice the level producing MSY while the fishing mortality rate has been much lower than the level producing B_{MSY} (707,900t). The species passes the Category B risk-based assessment (**Table B(a)**):

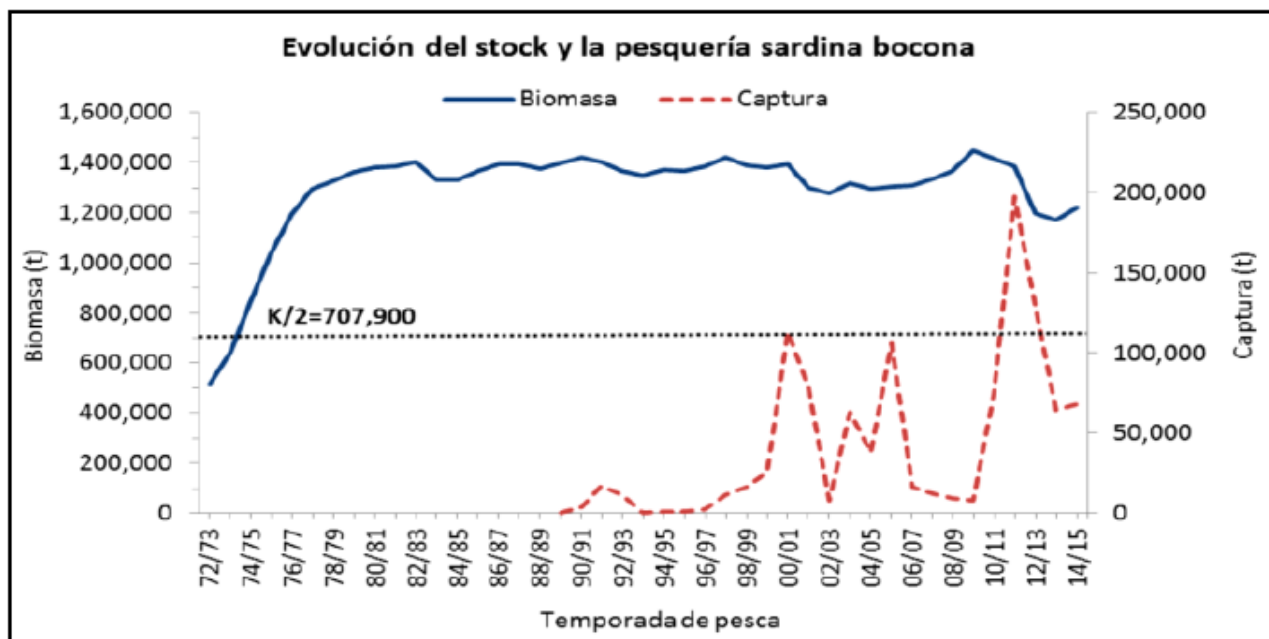


Figure 14 Biomass trajectory of bocona sardine in the Gulf of California estimated using a biomass dynamics model with environmental forcing **R17**:

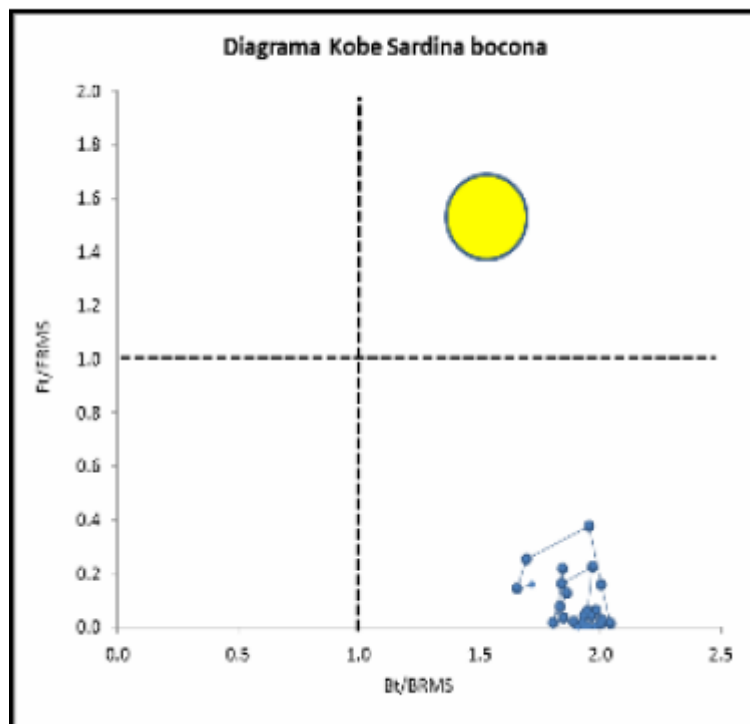


Figure 15. Kobe plot with stock status history of bocona sardine in the Gulf of California **R17**

R1-R2; R17, R29-R31

References p 60

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: | Japanese sardine Red-eye herring <i>Etrumeus teres</i> synonym <i>sadina</i> | |
| | Productivity Attribute | Value | Score |
| | Average age at maturity (years) | 2 | 2 |
| | Average maximum age (years) | 3 | 2 |
| | Fecundity (eggs/spawning) | Egg >10000 | 1 |
| | Average maximum size (cm) | 33 | 1 |
| | Average size at maturity (cm) | 16.4 | 1 |
| | Reproductive strategy | Pelagic eggs | 1 |
| | Mean trophic level | 3.6 | 3 |
| | Average Productivity Score | | 1.6 |
| | Susceptibility Attribute | Value | Score |
| | Overlap of adult species range with fishery | <25% | 1 |
| | Distribution | Not used | - |
| | Habitat | Not used | - |
| | Depth range (most conservative) | 0-125m | 3 |
| | Selectivity | Up to 4m length | 3 |
| | Post-capture mortality | Alive after hauling | 2 |
| | Average Susceptibility Score | | 2.25 |
| | PSA Risk Rating (From Table D3) | | PASS |

Evidence:

Japanese sardine/Red-eye herring is caught as bycatch in this pelagic fishery. No research or stock assessment activities are conducted specifically in relation to this species. There is an obligation to report all landings in the logbooks, therefore by-catch information is available. Regulations targeting other species are likely to affect the level and nature of fishing pressure on the species.

The comparative lack of scientific information on the status of the population means that a risk-assessment style approach must be taken. The species is assessed as a Category D species. This species has not yet been assessed by the IUCN Red List and currently does not appear in any CITES appendices of endangered species (websites accessed 19.12.19).

Using the Productivity-Susceptibility Analysis (PSA) for Category D species this species is approved (whole fish) under the current IIFO RS Standard 2.0.

Distribution (D1):

Mainly inshore but has been occasionally taken 120 km from the Ecuador coast. Usually occurs in large schools. Epipelagic; feeding mainly on euphausiids and copepods. Oviparous, with planktonic eggs and larvae.

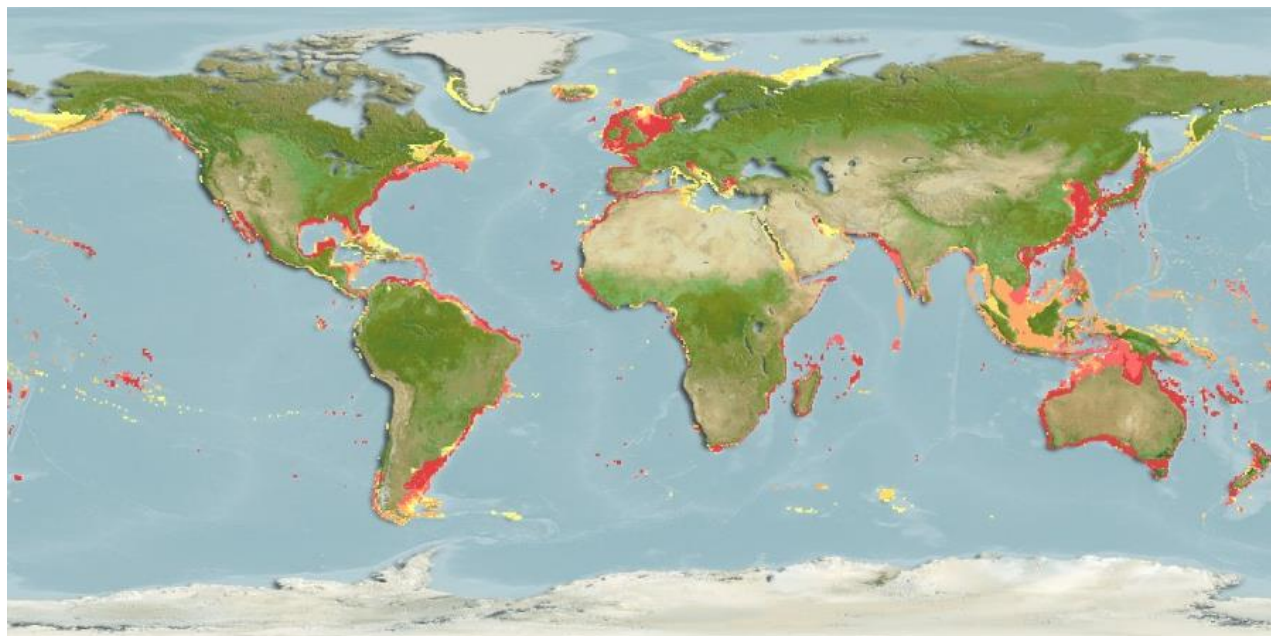


Figure D1: Global distribution Japanese Sardine Red Eye Round Herring *Etrumeus teres* **D1**

References

D1 Fishbase: Japanese Sardine Red Eye Round Herring *Etrumeus teres*

<http://www.fishbase.org/Summary/SpeciesSummary.php?ID=1455&AT=ROUND+HERRING>

D2 Lluch-Belda et al (1995). Atlas Pesquero de México. Pesquerías Relevantes. Secretaría de Pesca/Instituto Nacional de Pesca/Universidad de Colima (Cenedic).:

https://www.academia.edu/20999997/Fisheries_of_Northwest_Mexico

Standard clauses 1.3.2.2

| | | | |
|-----------|---|--|--------------|
| D1 | Species Name: | Leather jackets Pineapple Sardine <i>Oligoplites</i> sp. | |
| | Productivity Attribute | Value | Score |
| | Average age at maturity (years) | 2.2 | 2 |
| | Average maximum age (years) | 9.5 | 1 |
| | Fecundity (eggs/spawning) | No data | - |
| | Average maximum size (cm) | 58.1 | 1 |
| | Average size at maturity (cm) | 32.1 | 2 |
| | Reproductive strategy | Egg scatterers | 1 |
| | Mean trophic level | 4.1 | 3 |
| | Average Productivity Score | | 1.66 |
| | Susceptibility Attribute | Value | Score |
| | Overlap of adult species range with fishery <25% (Figure D2) | | 1 |
| | Distribution | Not used | - |
| | Habitat Marine; brackish; benthopelagic | Trawl interaction moderately likely | 2 |
| | Depth range | Not used | - |
| | Selectivity | >2 x mesh | 3 |
| | Post-capture mortality | Most retained | 3 |
| | Average Susceptibility Score | | 2.25 |
| | PSA Risk Rating (From Table D3) | | PASS |
| | Evidence: | | |
| | <p>Leather jackets Pineapple Sardine <i>Oligoplites</i> sp. are caught as bycatch in this pelagic fishery. No research or stock assessment activities are conducted specifically in relation to this species. There is an obligation to report all landings in the logbooks, therefore by-catch information is available. Regulations targeting other species are likely to affect the level and nature of fishing pressure on the species.</p> <p>The comparative lack of scientific information on the status of the population means that a risk-assessment style approach must be taken. The species is assessed as Category D species. This species has not yet been assessed by the IUCN Red List and currently does not appear in any CITES appendices of endangered species.</p> <p>Using the Productivity-Susceptibility Analysis (PSA) for Category D species this species is approved (whole fish) under the current IIFO RS Standard 2.0.</p> | | |
| | References | | |
| | <p>D3 Fishbase Life history tool <i>Oligoplites altus</i>: https://www.fishbase.in/popdyn/KeyfactsSummary_2v2.php?ID=1945&GenusName=Oligoplites&SpeciesName=altus&vStockCode=2141&fc=314</p> | | |

Distribution:

[Native range](#) | [All suitable habitat](#) | [Point map](#) | [Year 2100](#)



This map was computer-generated and has not yet been reviewed.

Oligoplites altus [AquaMaps](#) Data sources: [GBIF](#) [OBIS](#)

Figure D2: Global Distribution *Oligoplites altus* **D3**

Life History Data on *Oligoplites altus* Longjaw leatherjacket

| | | | |
|---|---|--|--|
| Family: | Carangidae Jacks and pompanos | | |
| Max. length (Lmax): | = 58.0 cm FL | <input type="button" value="Recalculate"/> | |
| L infinity (Linf): | = 58.1 s.e. <input type="text"/> - <input type="text"/> cm FL | <input type="button" value="Recalculate"/> | |
| L maturity (Lm): | 32.1 s.e. 23.9 - 43.0 cm FL Estimated from Linf. | | |
| L max. yield (Lopt): | 36.7 s.e. 31.0 - 43.4 cm FL Estimated from Linf. | | |
| K: | <div> <input type="text"/> /year Estimate K from Linf, Lm and tm: Lm = 32.1 cm FL tm = <input type="text"/> years Estimate K from Linf and tmax: tmax = <input type="text"/> years Enter Linf and K: Linf = 58.1 cm FL K = 0.3 /year </div> | <input type="button" value="Recalculate"/> <input type="button" value="Recalculate"/> <input type="button" value="Recalculate"/> | |
| to: | -0.48 years Estimated from Linf and K. | | |
| Natural mortality (M): | <input type="text"/> s.e. 0.36 - 1.12 /year Estimated from Linf. and annual mean temp. = 25.0 °C | <input type="button" value="Recalculate"/> | |
| Life span (approx.): | 9.5 s.e. 0.8 - 1.7 years Estimated from Linf., K and to. | | |
| Generation time: | 2.9 s.e. 2.1 - 4.1 years Estimated from Lopt, Linf., K and to. | | |
| Age at first maturity (tm): | 2.2 s.e. 1.8 - 2.8 years Estimated from Lm, Linf., K and to. | | |
| Length-weight: | 58.1 cm TL => 1855 g (wet weight) $W = 0.0063 * L^{3.10000}$ | <input type="button" value="Recalculate"/> Length-weight data | |
| Nitrogen & protein: | Weight 1854 (g) => whole-body nitrogen (N) 52.0 (g) => whole-body crude protein 325.2 (g) | <input type="button" value="Recalculate"/> | |
| Relative Yield per Recruit (Y'/R): | 0.5 Estimate Y'/R from M/K, Lc/Linf and E. Lc = 23.2 cm FL E = 0.5 /year Emsy <input type="text"/> /year Eopt <input type="text"/> /year Fmsy <input type="text"/> /year Fopt <input type="text"/> /year | <input type="button" value="Recalculate"/> | |
| Exploitation: | Z = <input type="text"/> F = <input type="text"/> E = <input type="text"/> Estimate Z, F, E from Lc, Lmean, Linf, K, M Lc = 23.2 cm FL Lmean = <input type="text"/> cm FL | <input type="button" value="Recalculate"/> | |
| Resilience / productivity: | Medium; decline threshold 0.95 Vulnerable to extinction if decline in biomass or numbers exceeds threshold over the longer of 10 years or 3 generations. | | |
| Intrinsic rate of increase (rm): | <input type="text"/> /year Lr = 23.2 cm FL Estimated from Fmsy at Lc = length of recruitment (Lr). | <input type="button" value="Recalculate"/> | |
| Main food: | mainly animals (troph. 2.8 and up) | | |
| Trophic level: | 4.1 Estimated from diet data. Diet | | |

Figure D3: Life history data on *Oligoplites altus* **D3**

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. | PASS |
| | F1.2 | There is no substantial evidence that the fishery has a significant negative effect on ETP species. | PASS |
| | F1.3 | If the fishery is known to interact with ETP species, measures are in place to minimise mortality. | PASS |
| Clause outcome: | | | PASS |
| Evidence | | | |
| F1.1: | | | |
| In 2016 the captain's logbook (Bitacora de capitan) was modified to include additional information on the landing declaration (Aviso de Arribo) to allow crew record more detailed information on discards, retention and transshipment of small pelagic species, capture of bycatch and ETP species (retained and discarded) and their status (live or dead). | | | |
| In October 2018 INAPESCA carried out the 6th Course on Good Practices of Fishing of Minor Pelagic Fish. Among objectives of this workshop were to examine results of the last observers' campaign, as well as a review of the MSC standard, regulations in force, the use of logbooks and impact mitigation measures for interaction with ETP species, among others. A total of 19 ETP species interactions were recorded by the observer program (F1.2). These included seven seabirds, four marine mammals, two sea turtles, and six fish species. | | | |
| F1.2: | | | |
| An observer report for the 2017-2018 season was prepared by Global GRUPO A.C. (Global Grupo A.C. 2018). Information collected has allowed establish that during fishing operations the mortality of birds and marine mammals is very low and, in some seasons, null and there is no impact on the abundance of their populations (source SCS Global Services Report 2019). Incidental catches did not exceed the 2% limit set by NOM-059-SEMARNAT. | | | |

A total of 1,408 sets were made with observers. 59.87% in Guaymas and 40.13% in Yavaros. There is a total of 14 observers in the program; all certified by **CONAPESCA**. A total of 20 vessels participated in the observer program. All technical, biological and fishing operation information is recorded in physical logs; data is then stored in electronic format.

From observed trips from the port of Yavaros (Sinaloa), a total of 86 species-groups of species were recorded. In terms of biomass, a total of 35,186.5t of small pelagic species was captured; representing 99.08% of total catch. Incidental catches represented 0.91% of total catch. For vessels from Guaymas (Sonora) a total of 104 species-groups of species were recorded. In terms of biomass, a total of 76,246t of small pelagic species was captured; representing 99.03% of total catch. Incidental catches (bony fish) represented 0.97% of total catch (**M2.4 Table 1**).

Four individuals of Totoaba (*Totoaba macdonaldi*, a fish species member of the Croaker or Sciaenidae Family) were registered by the observer program. This species is endemic to the Gulf of California and considered to be critically endangered by IUCN and Mexican legislation (NOM-059-SEMARNAT-2010). In 1975 a permanent fishing moratorium on totoaba; prohibiting its commercialization, was established throughout the Gulf and Baja California.

The capture of Totoaba with gill nets is associated with incidental capture of the Vaquita (*Phocoena sinus*); an endangered porpoise endemic to the Northern Gulf. The Federal government implemented a number of regulatory measures focused mainly on restrictions of fishing activity and use of gill nets in the Northern Gulf and Colorado River Delta. Records from the observer program (purse seine fleet) document that at least two Totoaba individuals captured were retained for consumption by the crew.

In conjunction with the 'Best Practices Workshop's and the 'Mitigation Measures' the fishery established a traceability program to ensure that only trips with a maximum of 2% bycatch could be considered eligible to enter chain of custody. A financial incentive program was also put in place to reward the crew for trips with a proportion of bycatch $\leq 2\%$ of catch.

F1.3:

In addition to training, there is specific documentation for fishermen and boats in the form of triptychs or posters, so they can consult procedures more quickly and effectively. A Manual for Mitigation Measures and Best Practices was published in 2015, including guidelines on the manipulation of rays, sharks and sea turtles.

Some mitigation measures were noted to be partially in place such as "Scaring, by spraying water with a pressure hose to keep birds away from the buoy line of the net." Continued monitoring and development of mitigation strategies is needed. During a recent workshop impact mitigation measures were analysed to treat different individuals, in case of being hoisted on board, to cause them least possible damage and facilitate their release in the shortest time.

R9; R22-R24

References p 60

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. | PASS |
| | F2.2 | There is no substantial evidence that the fishery has a significant negative impact on physical habitats. | PASS |
| | F2.3 | If the fishery is known to interact with physical habitats, there are measures in place to minimise and mitigate negative impacts. | PASS |
| Clause outcome: | | | PASS |
| Evidence | | | |
| F2.1: | | | |
| <p>Monterrey (Pacific) sardine in the Gulf of California are fished with purse seine nets. Compared to many other fishing methods purse seine gear is relatively selective, since it is done in the open water column (40m-100m depth range) and directed at schools of targeted species. Fishing vessels capture large aggregations of small pelagic species that shoal in mid-water by surrounding these concentrations with a curtain of netting which is supported by surface floats. Contact with the seabed is intentionally avoided as the small mesh nylon netting is easily damaged and expensive to replace.</p> <p>The revised NOM (Section 4.6) States: "The Secretariat may establish periods and closed areas for the capture of smaller pelagics to apply dynamic management of the fishery, avoid interaction with other fisheries, as well as contribute to the conservation of other biological resources and the ecosystem."</p> <p>Mechanisms outlined in the revised NOM allow for elements of the harvest strategy to work together monitoring the status of the stock and react if the point at which recruitment is impaired or ecosystem-based reference points are approached. Future SAI Global assessments will verify the implementation by the Competent Authority of this harvest strategy through the monitoring and enforcement of fishery closures when BAC's are approached.</p> | | | |
| F2.2: | | | |
| <p>Measures for protected species relevant to this fishery are those prohibiting the extractive use, whether for subsistence or commercial use and restricting fishing activities in protected areas, including the upper Gulf refuge area created for the protection of the Vaquita.</p> <p>There is no documented evidence that purse seining or purse seine fishing elsewhere, even when touching bottom, has had irreversible effects on marine habitats. Currently there is no zoning or depth regulation for the small pelagics purse seine fleet apart from protected areas.</p> | | | |
| F2.3: | | | |
| <p>The General Law on Wildlife (LGVS), includes relevant provisions for the conservation of marine species and populations at risk (Title VI, Chapter I): Article 60:</p> <p>"The Secretariat shall promote and drive conservation and protection of at-risk populations, through the development of conservation and recuperation projects, the establishment of special measures for</p> | | | |

management and conservation of critical habitats and areas of refuge to protect aquatic species, the coordination of sampling programs and permanent monitoring, as well as certification of sustainable use”.

The General Fisheries Law (2015) states that SEMARNAT will coordinate with SAGARPA to issue measures to protect chelonians, marine mammals and aquatic species subject to a special state of protection. These measures, implemented through agreements or NOMs provide specific regulations on criteria such as equipment, fishing gear, fishing zones or methods to be authorized.

R1; R10; R12-R14; R25

References p 60

Standard clause 1.3.3.2

| F3 | Ecosystem Impacts - Minimum Requirements | | |
|--|---|---|-------------|
| | F3.1 | The broader ecosystem within which the fishery occurs is considered during the management decision-making process. | PASS |
| | F3.2 | There is no substantial evidence that the fishery has a significant negative impact on the marine ecosystem. | PASS |
| | 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. | PASS |
| Clause outcome: | | | PASS |
| <p>Evidence</p> <p>F3.1:</p> <p>Ecosystem interactions relevant to the Northern Gulf small pelagic fishery include impacts of the removal of low trophic level fish biomass on the structure and function of the ecosystem. Removing lower trophic-level species has the potential to impact dynamics and abundance of their predator populations.</p> <p>Monterrey (Pacific) sardine has been defined as Key Low Trophic Level (LTL) stock (SCS Global Services PCR Report to MSC 2018). The stock holds a key role in the ecosystem, as a member of the family Clupeidae and a large proportion of trophic connections in the ecosystem involve this stock, leading to significant predator dependency. Monterrey (Pacific) sardine can be a predominant species in the catch but at times can be equally important relative to all other species together or may be practically insignificant (A1.1 Figure 3).</p> <p>An estimated threshold harvest rate for Monterrey (Pacific) sardine to risk irreversible disruption of ecosystem structure and function is established at 36%. INP scientists are working on determine B_{min} based on ecosystem needs.</p> <p>The Fishery Management Plan (2012) includes short and long-term objectives and management advice associated with research plans. The Plan also contains formal consideration of the role of the resource on ecosystem maintenance and requires evidence that these considerations have been incorporated into future harvest control rules.</p> | | | |

Monterrey (Pacific) sardine is actively managed as it is a stock with biologically significant catch levels, and/or socioeconomic or ecological considerations that demand relatively intense management procedures.

INAPESCA developed an Ecopath model (2013) with a total of 23 functional groups (including one group for sea birds, five bony fish, two cartilaginous fish and one marine mammal group). The aim of the work was to describe and understand in more detail functional relationships of sardines and the effects of abundance in the ecosystem. Describing a "bottom up" system Arizmendi-Rodriguez et al. (2015) determined that Monterrey (Pacific) sardines are an important component in the diet of seabirds, large pelagics, and sharks and that changes in the abundance of small pelagics may influence the distribution of populations of its predators.

F3.2:

Ecosystem interactions including impacts of the removal of Monterrey (Pacific) sardine biomass on the structure and function of the Gulf ecosystem are examined in **F3.1**.

Hernández-Padilla et al. (2015) analysed the importance of the ecological role of thread herring and bocona sardine in the southern Gulf. Removals of thread herring are reflected in ecosystem order maintenance, whereas removal of bocona relates to ecosystem decay. The authors conclude that these results provide information in a precautionary sense about which species will warrant greater attention when generating measures that regulate exploitation.

F 3.3:

Monterrey (Pacific) sardine has been defined as a Key Low Trophic Level (LTL) stock (SCS Global Services PCR Report to MSC 2018). The stock holds a key role in the ecosystem, as a member of the family Clupeidae and a large proportion of trophic connections in the ecosystem involve this stock, leading to significant predator dependency.

For species that are actively managed (including Monterrey (Pacific) Sardine the SPFMP control rule uses a harvest rate that can vary among species at different times but is constrained between 5 and 25% of the estimated SSB. The rule also forces the biologically acceptable catch to be reduced if the SSB declines until eventually, if a biomass threshold (B_{min}) is reached, the fishery stops operating.

R2, R9, R26-R27

References

- R1** Diario Oficial (March 2019): Reglamento de la Ley de Pesca 2018 NOM-003-SAG/PESC-2018 15pp http://briogropecuario.com/wp-content/uploads/2019/03/2019_03_12_MAT_sader.pdf
- R2** Fisheries Management Plan (Oct 2012) 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
- R3:** Carta Nacional Pesquera (Diario Oficial 2018) Acuerdo por el que se da a conocer la actualización de la Carta Nacional Pesquera. (Continúa en la Tercera Sección).
https://www.gob.mx/cms/uploads/attachment/file/334832/DOF_-CNP_2017.pdf
- R4:** Programas SAGARPA: <https://www.gob.mx/sader/acciones-y-programas/programas-y-componentes-de-la-sagarpa>
- R5** Instituto nacional de pesca centro regional de investigación pesquera (CRIP_ de guaymas XXV Taller del Comité Técnico de Pelágicos Menores 82pp http://www.sardinagolfodecalifornia.org/wp-content/uploads/2017/11/MEMORIAS-XXV-TALLER-CTPM_Junio-2017.pdf
- R6** CONAPESCA <https://www.gob.mx/conapesca>
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<https://fisheries.msc.org/en/fisheries/southern-gulf-of-california-thread-herring/@assessments>
- R9** SCS Global Services Report. 2018. Small Pelagics Fishery In Sonora, Gulf of California. MSC Fishery Assessment Report- Public Certification Report. 363 pp. <https://fisheries.msc.org/en/fisheries/small-pelagics-fishery-in-sonora-gulf-of-california/@assessments>
- R10** Small Pelagics Fishery in Sonora, Gulf of California, First Surveillance Audit Report (SCS Global Services) June 2019 82pp <https://fisheries.msc.org/en/fisheries/small-pelagics-fishery-in-sonora-gulf-of-california/@assessments>
- R11** Centro de Operaciones Interinstitucionales COI <https://www.gob.mx/profepa/prensa/realiza-gobierno-federal-100-operaciones-maritimas-y-40-aereas-en-alto-golfo-de-california-coi>
- R12** Reglamento de la Ley de Pesca 2017 <https://legalzone.com.mx/reglamento-de-la-ley-de-pesca-2017-mexico/>
- R13:** Mexico Fisheries Law (2018 Updates): Mexico Economy Secretariat (2018):
<http://187.191.71.192/portales/resumen/46044>
- R14** FAO FISHERY COUNTRY PROFILE: Mexico (2003 11pp):
http://www.fao.org/fishery/docs/DOCUMENT/fcp/en/FI_CP_MX.pdf
- R15** La Procuraduría Federal de Protección al Ambiente (PROFEPA),
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- R16** Centro de Operaciones Interinstitucionales COI <https://www.gob.mx/profepa/prensa/realiza-gobierno-federal-100-operaciones-maritimas-y-40-aereas-en-alto-golfo-de-california-coi>
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Standard clause 1.3.3.3