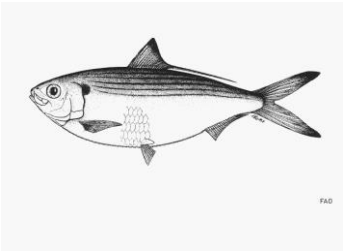
FISHERY ASSESSMENT REPORT

IFFO GLOBAL STANDARD FOR RESPONSIBLE SUPPLY OF FISHMEAL AND FISH OIL

R1a

R1b



R1c

FISHERY:	Middling thread herring (*Opisthonema medirastre*) 1a Pacific thread herring (*Opisthonema libertate*)1b Slender thread herring (*Opisthonema bulleri*) 1c
LOCATION:	FAO Area 77 (Eastern Central Pacific)
DATE OF REPORT:	October 2018 (December 2018 FPRC Updated)
ASSESSOR:	Jim Daly

1. APPLICATION DETAILS AND SUMMARY OF THE ASSESSMENT OUTCOME			
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Certification Body Details			
Name of Certification Body:	**SAI Global (Ireland)**		
Assessor Name	**Peer Reviewer**	**Assessment Days**	**Initial/Surveillance/ Re-certification**
Jim Daly	Virginia Polonio	3	Surveillance Year 2
Assessment Period	Year 2017		
Scope Details			
1. Scope of Assessment	IFFO RS Global Standard for Responsible Supply – Issue 1.6		
2. Fishery	Middling thread herring (*Opisthonema medirastre*) Pacific thread herring (*Opisthonema libertate*) Slender thread herring (*Opisthonema bulleri*)		
3. Fishery Location	FAO Area 77 (Eastern Central Pacific)		
4. Fishery Method	Purse Seine		
Outcome of Assessment			
5. Overall Fishery Compliance Rating	Medium		
6. Sub Components of Low Compliance	None		
7. Information deficiency	None		
8. Peer Review Evaluation	Maintain approval		
9. Recommendation	Maintain approval		

2. QUALITY OF INFORMATION

Good

3. COMPLIANCE LEVEL ACHEIVED

Medium

Recommendation

The Middling thread herring (*Opisthonema medirastre*); Pacific thread herring (*Opisthonema libertate*) and Slender thread herring (*Opisthonema bulleri*); collectively known as the thread herring fishery, are all managed as components of the small pelagic stock (Southern Gulf of California) within the assessment area (FAO Area 77). Fisheries management of these coastal shoals is concerned with the whole stock unit over its entire area of distribution and takes into account the biology of the species.

Two conditions set during a previous assessment **(R2)** have been closed:

1. Effort restrictions are in use; fishing seasons are decided based on the results of annual research cruises (two undertaken in 2017).
2. The definitive determination of reference points (*O.libertate*) in the Southern Gulf is in progress however further work is required.

There are currently two MSC Certified Thread Herring fisheries in the assessment area: Southern Gulf of California (Mexico; *Opisthonema* sp **R3**) and the Small Pelagics Fishery (Sonora, Gulf of California*, O. libertate*).

All three species are categorised by IUCN as species of least concern; these species do not appear in the current CITES list of endangered species (**R4** both sites accessed 24.09.18).

Based on the rationales for the scores proposed, the assessment recommends that the whole fish fishery continue to be approved under IFFO RS v 1.6 with a medium compliance rating.

R2-R4

4. GUIDANCE FOR ONSITE ASSESSMENT

5. ASSESSMENT DETERMINATION

Fisheries management is concerned with the whole stock unit over its entire area of distribution and takes into account the biology of the species.

An update of the Fisheries Management Plan (FMP) for the small pelagics fishery (Southern Gulf of California) was presented by Government Officials during the 2017 MSC Surveillance Audit. The update included all preliminary information from biology, status and other relevant aspects of the fishery. The plan is still missing a harvest strategy or description of how it would be linked with the fisheries plan for small pelagics in north-western Mexico. However work is ongoing and further progress should be noted during future assessments.

For the Opisthonema sp fishery (Southern Gulf of California) progress has been made on conditions related to reference point's stock assessment. However, definitive determination of reference points is still in progress, further work was noted but reference points require determination.

Current regulations do not include restrictions in the form of allowable catch or quotas. This was confirmed in 2017 when no quota was applicable through a 'dictamen tecnico' published by INAPESCA. Fishing effort is restricted (no further increase in vessel numbers) North of 20°N. This prohibition includes the addition of vessels

to the fleet unless they are to replace old active boats that are retired. Other management measures include a 160mm minimum landing size, limits on maximum seine capacity, and limited entry to the fishery.

Future assessments should note if new proposals on the calculation of a Biologically Acceptable Catch (BAC) are being implemented and also legislated for. These would eliminate some observed uncertainties in the assessment.

By-catch data is largely not collected and a long-term program is required to provide sufficient information to detect any significant changes of the impact of the fishery on bycatch species.

The assessment team considers a medium compliance rating appropriate for this fishery which is approved under IFFO-RS (whole fish) standard (fisheries assessment) v 1.6.

HIGH Compliance
B2, D1, E1, E2
MEDIUM Compliance
A1, A2, A3, B1, C1, D2, D3
LOW Compliance

SUMMARY OF LEVEL OF COMPLIANCE					
	The Management Framework and Procedures	Stock assessment procedures and management advice	Precautionary approach	Management measures	Implementation
legal and administrative basis	A1				
Fisheries management should be concerned with the whole stock unit	A2				
Management actions should be scientifically based	A3				
Research in support of fisheries conservation and management should exist		B1			
Best scientific evidence available should be taken into account when designing conservation and management measures		B2			
The precautionary approach is applied in the formulation of management plans			C1		
The level of fishing permitted should be set according to management advice given by research organisations				D1	
Where excess fishing capacity exist, mechanisms should be in established to reduced capacity				D2	
Management measures should ensure that fishing gear and fishing practices do not have a significant impact on non-target species and the physical environment				D3	
A framework for sanctions of violation of laws and regulations should be efficiently exists					E1
A management system for fisheries control and enforcement should be established					E2

KEY: Low Compliance: Medium Compliance: High Compliance:

6. RATIONALE OF THE ASSESSMENT OUTCOME

A. THE MANAGEMENT FRAMEWORK AND PROCEDURE

LEVEL OF COMPLIANCE	
A1. The management of the fishery must include a legal and administrative basis for the implementation of measures and controls to support the conservation of the fishery.	
LOW	An administrative framework that ensures an efficient management of the fishery for its conservation is not established.
MEDIUM	An administrative framework that ensures an efficient management of the fishery for its conservation is somehow established, but there is evidence of not being efficient to ensure the conservation of the stock.
HIGH	A legal and administrative framework that ensures an efficient management of the fishery for its conservation is established and works efficiently toward the conservation of the stock.

Determination: Mexico has an administrative framework for fisheries management. Middling thread herring, Pacific thread herring and the Slender thread herring are managed as a component of the small pelagic stock. However the Fisheries Management Plan is still missing a harvest strategy or a description of how it would be linked with the fisheries plan for small pelagics in north-western Mexico. **Definitive determination of reference points is still in progress and further work required. A medium compliance rating is maintained for clause A1.**

Fishery management framework:

The Government body with responsibility for fisheries management in Mexico is the Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food (Secretaría de Agricultura, Ganadaría, Desarrollo Rural, Pesca y Alimentación, SAGARPA). SAGARPA is responsible for administering federal resources to rural development. It also promotes research for rural purposes (including seeds, plants, etc.), regulates fishing related activities and has in its control all medicines and food for domestic and farm animals; in addition to veterinarians and their respective clinics **(R16)**.

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) last updated in 2014 **(R5)**. Based on the contents of these laws, the SAGARPA mission statement includes a commitment to "facilitate the competitive and sustainable development of the fisheries and aquaculture sector in the country to increase the welfare of Mexicans".

The Fisheries Management Plan for the minor pelagic species (Plan de manejo pesquero para la pesquería de pelágicos menores) aims to set out the actions to develop the fisheries in a sustainable manner based on the current knowledge of ecological, environmental, economic, cultural, social and biological aspects of the fisheries. This Plan is reviewed annually during Small Pelagic Workshops (Taller de Pelágicos Menores); the most recent one (XXV) was convened in June 2017 **(R6)**.

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. Scientific advice is provided by the National Fisheries Institute (Instituto Nacional de Pesca, INP, see section B), 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. **(R 17, 18)**.

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

The National Fisheries Charter includes annual estimates of total landings and species composition in the small pelagic fishery, and also makes recommendations for the level of fishing in future years.

Carta Nacional Pesquera

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 Offical Gazette (Dario Oficial, DOF), the draft update undergoes a public review process by means of publication in the DOF. This allows the general public, non-governmental organisations and the academic sector, among others, to give an opinion of the fisheries status. The latest version of the CNP (2017) was published by INP in June 2018 (**R7**).

Mexican National Standard for Small Pelagic Fisheries (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, updated in 2014 (**R5**):

The 2014 updates contains the following changes:

- Capture of pilchard, 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 the requirement to notify the National Commission of Aquaculture and Fisheries.

A further update of proposed NOM revisions was provided in 2018 (**R3**):

- 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 survey.

An update of the Fisheries Management Plan (FMP) for the small pelagics fishery (Southern Gulf of California) was presented by Government Officials during the 2017 MSC Surveillance Audit (**R3**). The update included all preliminary information from biology, status and other relevant aspects of the fishery. The plan is still missing a harvest strategy or a description of how it would be linked with the fisheries plan for small pelagics in north-western Mexico (Jacob-Cervantes et al. 2016). This is sufficient to maintain clause A1 at a medium compliance level. Work is ongoing and further progress should be noted during future assessments.

For the *Opisthonema* sp fishery in the Southern Gulf of California progress has been made on conditions related to reference points stock assessment. However definitive determination of reference points is still in progress and further work is required.

R3, 5-6; 16-18

LEVEL OF COMPLIANCE	
A2. Fisheries management should be concerned with the whole stock unit over its entire area of distribution and take into account fishery removals and the biology of the species.	
LOW	Fisheries management is not concerned with the whole stock unit over its entire area of distribution and do not take into account any of the matters listed in 'A1'.
MEDIUM	Fisheries management is concerned with matters listed in 'A1' but not entirely. Fisheries, in relation to 'A1' statement, should improve to ensure the long term conservation of the marine resource.
HIGH	Fisheries management should be concerned with the whole stock unit over its entire area of distribution and take into account: • All fishery removals • The biology of the species

Determination: Fisheries management is concerned with all of whole stock units over its entire area of distribution and takes into account the biology of the three species. A TAC has not been set since 2012, however it has become clear that effort restrictions are used and fishing seasons are decided based on the results of a research cruise. A medium compliance rating is therefore maintained for clause A2.

Middling thread herring (*O. medirastre)*, Pacific thread herring *(O. libertate)* and Slender thread herring (*O. bulleri) and* are pelagic species which form coastal shoals. Middling thread herring is distributed from Los Angeles Bay (Ca, USA), in the Gulf of California to the Bay of Sachura, Peru (Lluch-Belda et al., 1995). Pacific thread herring and slender thread herring are both distributed from Santa Rosalita, Pacific coast of Baja, California, Mexico southward to Punta Sal and Punta Picos, Peru (**R8).**

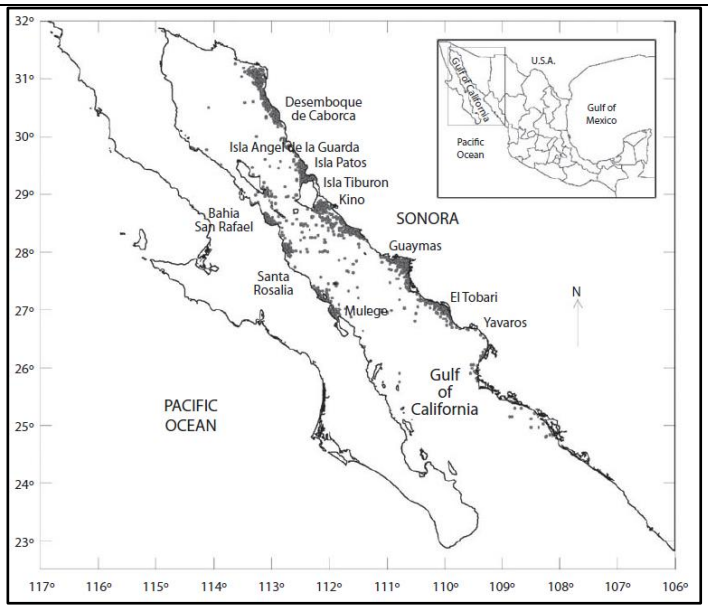

Figure 1. Landing distribution (dark grey points) of small pelagic fishery in the GC from 2002 to 2007. Source reference R8.

O. medirastre, O. libertate and O. bulleri are all managed as a component of the "Pelagicos menores" (small pelagic) stock, fished only in Pacific waters. Management measures in place include 160mm minimum landing size, limits on maximum seine capacity, and limited entry. Data on catch and effort is collected from the official 'Aviso de Arribo' or landing notification form provided and collected by the regional offices of CONAPESCA. The data are processed and analysed by INAPESCA and results presented in official reports of fishery catch and effort (**R9**). There does not appear to be a TAC set for the fishery as a whole nor the individual species, although the INP does make recommendations (700,000t for all small pelagic species in the 2012 National Fisheries Charter). This TAC needs to be technically justified in future assessments, and efforts are to be made to achieve accurate assessments of population abundance by species.

The NOM does not include restrictions in the form of allowable catch or quotas. This was confirmed in the most recent CNP (2017, **R7**) where no quota was applicable through a 'dictamen tecnico' published by INAPESCA. However effort in the NOM is restricted (no further increase in vessel numbers) North of 20°N. This prohibition includes the addition of vessels to the fleet unless they are to replace old active boats that are retired.

R7-9

LEVEL OF COMPLIANCE	
A3. Management actions should be based on long-term conservation objectives	
LOW	Management actions are not based on long term management objectives.
MEDIUM	Management actions are based on long term management objectives. However the actions are not scientifically formulated.
HIGH	Management actions are based on long term management objectives, and actions are science based.

Determination: Management actions are based on long term management objectives, and actions are science based. The management plan was put in place in 2012 and has been reviewed in 2017, which fulfils the condition placed on it in the initial assessment. A new approach to assess stock status (Thread Herring Complex Southern Gulf of California) was introduced by the INAPESCA staff (2017). Improvements were

reported in the calculation of the BAC. However further work is required to determine what reference points are required and if they can be estimated. For this reason a medium compliance rating is awarded.

The Small Pelagics Management Plan was published in July 2011 (**R10**) and the final version was passed into law in November of 2012. A relevant insertion in the Plan is the definition of guidance to establish reference points. A *Biologically Acceptable Catch* (BAC) (equivalent to a Limit Reference Point) is computed as a fraction of the estimated MSY. The Plan states that the BAC is a "prudent level of catch" that can vary between 5 and 25% of the estimated biomass. An additional definition in the Plan 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 on the long term". The Plan further adds, operationally, "in the fishery of small pelagic, overfishing occurs if the catch exceeds the BAC".

Update on Biologically Acceptable Catch (BAC):

A new approach to assess stock status (Thread Herring Complex Southern Gulf of California) was introduced by the INAPESCA staff using an age structured model fit to catch and acoustic based indices of abundance (**R11**). Model predicted abundance is estimated for the whole complex and each species separately. Outputs include management oriented parameters such as harvest and fishing mortality rates. A development of the model includes a discussion of what reference points are appropriate for the stock (Southern Gulf of California) and if they can be estimated.

An Improvement was reported (**R3**) in the calculation of the BAC; replacing the quantity FRACTION with a harvest rate computed as HR = 1-exp (-FMSY) (INAPESCA unpublished meeting minutes, 2017). For now, FMSY still is the default 0.25 suggested in the management plan (**R11**), but the INAPESCA staff is considering substituting this value with an estimated parameter once the model operates to the satisfaction of the assessment needs. The calculation of the allowable catch with this control rule also needs to use as input the most recent abundance available, which in this case is the biomass estimated with the population dynamics model.

Future assessments of the fishery should take into account development of this new method to calculate and assess stock status; in particular how this method compares with results derived from the acoustic surveys.

The Small Pelagic Fisheries Management Plan (SPFMP, **R10**) includes a diagnosis of the fishery, the objectives of the plan, a set of management measures, a research program, an estimation of cost of management, enforcement issues and measures for the implementation and update of the plan. The SPFMP is reviewed annually through an internal process and only when there is a relevant event or amendment is n updated version made public. It was last reviewed by the Small Pelagic Technical Committee (Comité Técnico de Pelágicos Menores) during the Small Pelagic workshop (XXV Taller de Pelágicos Menores June 2017, **R6**).

R3,6,10,11

B. STOCK ASSESSMENT PROCEDURES AND MANAGEMENT ADVICE	
LEVEL OF COMPLIANCE)	
B1. Research in support of fisheries conservation and management should exist.	
LOW	Research to support the conservation and management of the stock, non-target species and physical environment does not exist
MEDIUM	Research to support the conservation and the management of the stock, non-target species and physical environment exists, however research programmes could be significantly improved to decrease scientific advice uncertainty.

HIGH	Research to support the conservation and the management of the stock, non-target species and physical environment exist, and existent research is considered most adequate for the long term conservation of the target, non-target and physical environment

Determination: Fisheries research in Mexico is conducted by a dedicated scientific organisation. Research to support the conservation and the management of the stock, non-target species and physical environment exists, however research programmes could be significantly improved to decrease scientific advice uncertainty. A medium compliance rating is maintained.

Fisheries independent data is being collected via hydro-acoustic surveys which began in 2008. Findings were summarised for the period between 2008 and 2012 (**R9, 12**). The work included over five acoustic surveys carried out in the Gulf of California during spring 2016 aboard INAPESCA research vessels. Two acoustic surveys were conducted in 2017. On both occasions the survey found the small pelagic fish to be too scattered causing low representation in verification tows (**R3**).

In the opinion of the External Peer Reviewer technical problems (including scattering of fish during surveys) should be urgently resolved because of the effect on survey accuracy and resulting limited return of information from costly acoustic surveys.

Abundance from acoustic surveys shows a moderate declining trend from 2012 to 2016 although the age structured model fit to these data predicts a stabilization of the trend around 600,000 t (Figure 2, **R11**)

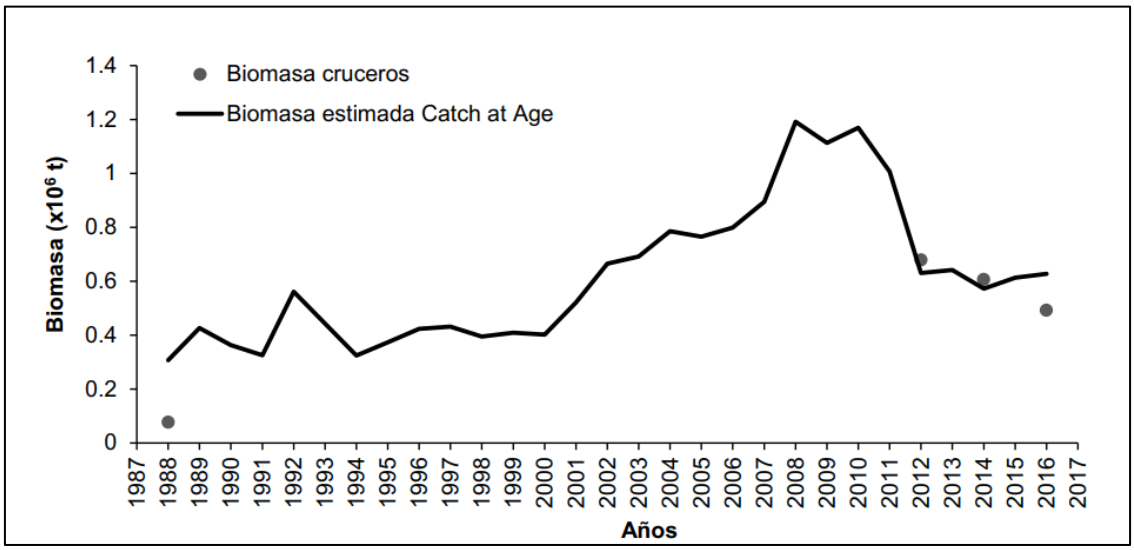

Figure 2. Biomass trend of the thread herring complex in the southern Gulf of California as predicted using an age structured model fit to acoustic based estimates of abundance (dots). Estimation was conducted under the assumption of natural mortality M=0.6. Reproduced from Jacob-Cervantes et al. (2017a). **R11**

Estimates of abundance specifically obtained for thread herring are available for 2016 and are presented in Table 1. Figure 3 summarises distribution of small pelagic species captured in ground-truth hydro-acoustic surveys, from different locations around the Gulf of California, Mexico, by year (**R9**):

Table 1. Estimated biomass of thread herring in the Gulf of California during spring of 2016 by means of hydroacoustic surveys. Estimates differ depending on the value of the TS parameter used.

Year	Average length (mm)	Weight (gr)	b_{20}	TS	Individuals per area	Average biomass	Biomass
2016	148	74.5	-70.5	-47.09	492,248.8	36.69	355,924
			-71.9	-48.49	679,492	50.56	491,312

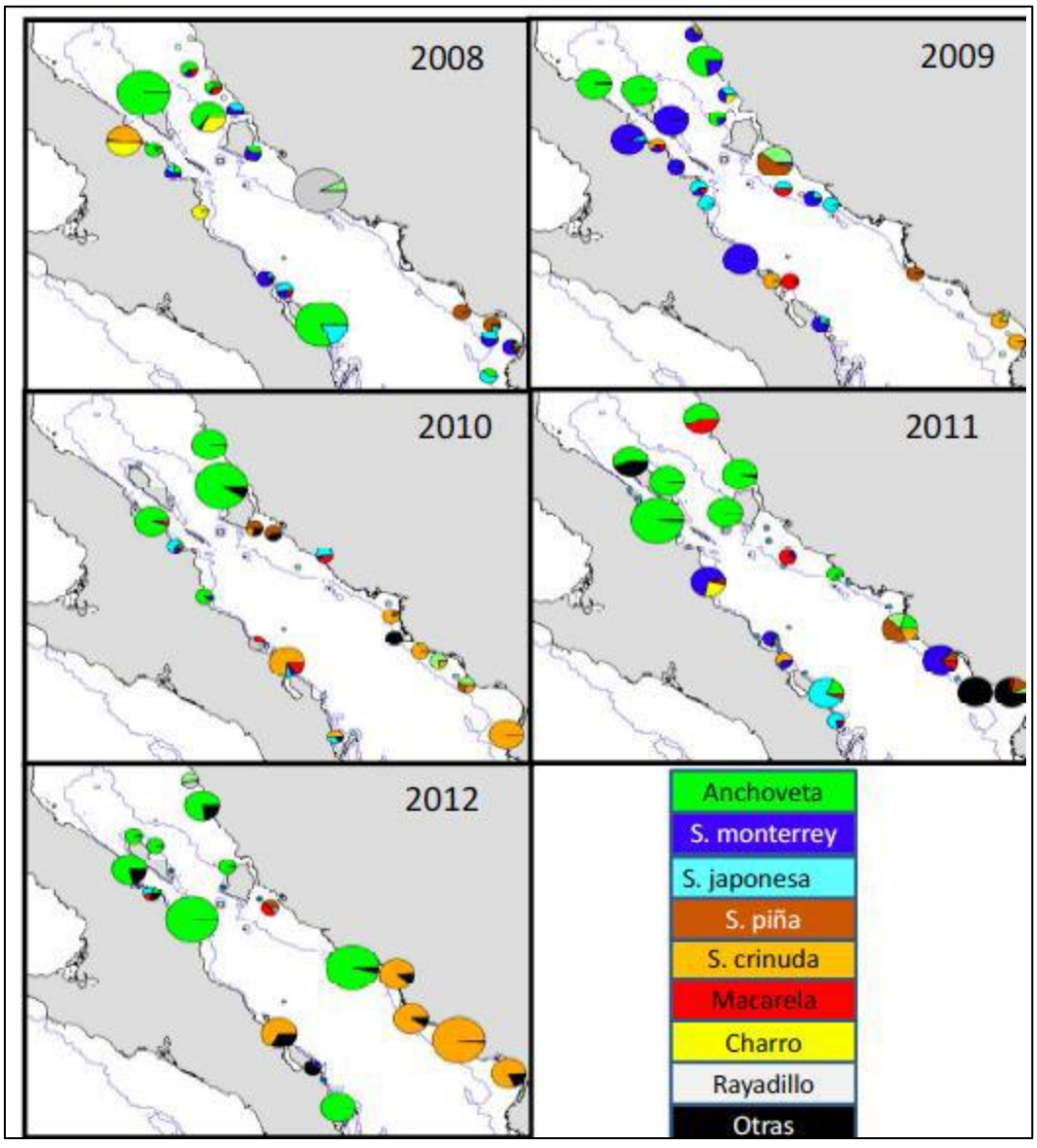

Figure 3. Distribution of small pelagic species captured to ground-truth hydro-acoustic surveys, from different locations around the Gulf of California, Mexico, by year (**R9**).

Scientists have discussed and communicated to other interested parties options to define reference points that are appropriate for the fishery (**R3**) although caveats have been also identified and no conclusion has been reached yet. Scientists continue to investigate the best approach to the stock assessment (Thread

Herring Complex Southern Gulf of California) and attempt new methods. A medium compliance assessment is considered appropriate for this clause.

Update on Small Pelagics Fisheries Management Plan:
An update of the Plan (Southern Gulf of California) was presented during the 2017 SMSC Surveillance Audit (**R3**). The update included all preliminary information from biology, status and other relevant aspects of the fishery. The plan is still missing a harvest strategy or a description of how it would be linked with the fisheries plan for small pelagics in north-western Mexico. Evidence in the form of minutes was presented documenting the collaboration of the industry with authorities to determine the specifics of how the fishing season would stop if the BAC is reached. A medium compliance assessment is considered appropriate for this clause (**R3**).
R3, 9, 11,12

LEVEL OF COMPLIANCE	
B2. Best scientific evidence available should be taken into account when designing conservation and management measures.	
LOW	Scientific advice is not taken into account when designing conservation and management measures.
MEDIUM	Scientific advice is taken into account, when designing conservation and management measures. However some areas of discrepancy are identified that could have a significant impact in the long term conservation of the marine environment.
HIGH	Scientific advice is taken into account, when designing conservation and management measures, in a comprehensive manner.

Determination: Scientific advice is taken into account, when designing conservation and management measures, in a comprehensive manner. Although further work remains, improvements have been noted in the calculations of BAC and Reference Points. A high compliance rating is therefore maintained.

The new Fisheries Management Plan (FMP) describes that some species are to be actively managed, while others will be passively managed. The purpose of these two categories of management is to use institutional resources as efficiently and effectively as possible to meet management goals. *O. medirastre, O. libertate and O. bulleri* are all actively managed. For species that are "actively managed" the 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 (**R10**):

The general formula for the harvest control rule is as follows:

$C=(B-B_{min})*FRACTION$

C= Target Catch level

B= Biomass of fish aged 1 and older

Bmin= Biomass necessary to conserve the resource and the ecosystem

Fishable fraction= 25 %

An Improvement was reported (**R3**) in the calculation of the Biologically Acceptable Catch (BAC); replacing the quantity FRACTION with a harvest rate computed as HR = 1-exp (-FMSY). For now, F_{MSY} still is the default 0.25 suggested in the management plan but INAPESCA staff are considering substituting this value with an estimated parameter once the model operates to the satisfaction of the assessment needs. An important development was discussed in the management system review which included a proposal to modify the harvest control rule as currently defined in the management plan. Future assessments should note if these new proposals are been implemented and legislated.

The FMP indicates that to compute the harvest rate, different sources of information can be used, including catch and fishery data (catch and effort, sizes, ages and weights) as well as fishery independent data (census of eggs and larvae, hydro-acoustic data, etc.). As part of the fishing strategy, before the season starts, a research cruise is carried out on board a fishing or research vessel. The goal of the cruise is to assess the reproductive state of the adult s and proportion of juveniles in the samples from the fishing areas. During the cruises the oceanographic conditions are also gathered, mainly by sea surface temperature distribution. Based on these results, the date for the opening of the fishing season is decided by agreement between the fisheries researchers and the fishery operators during official meetings where agreements are signed by the participants.

The status of the Thread Herring complex have been evaluated using VPA and a surplus production model (**R9**). Results show that each stock has either been stable for a long time or have been increasing since the late 1990s. Despite limitations in both analytical approaches (VPA and SPM), estimates of fishing mortality rates for the Thread Herring Complex are below the 0.25 reference point suggested by the FMP.

R3,9,10

C. THE PRECAUTIONARY APPROACH

LEVEL OF COMPLIANCE	
C1. The precautionary approach is applied in the formulation of management plans.	
LOW	The precautionary approach is not applied in the formulation of management plans.
MEDIUM	The precautionary approach is applied, however not all uncertainties are taken into account.
HIGH	The precautionary approach is applied, taking into account uncertainties relating to the dynamic of fish population (recruitment, mortality, growth and fecundity), and the impact of the fishing activities, such as discards and by-catch of non-target species as well as on the physical environment (Habitats).

Determination: The precautionary approach is applied, however not all uncertainties are taken into account. A medium compliance rating is therefore maintained.

The fishery for small pelagic fish in Mexico is managed using a control rule that is based on removing a fraction of the allowable biomass above a minimum threshold. Such fraction can oscillate between 5 and 25% and it is assumed that if "fraction is approximately equal to F_{msy}, then the harvest rate in the control rule will not exceed F_{msy}". The language in the Plan is interpreted such that this BAC (and the corresponding fraction) works as a Limit Reference Point (LRP) and therefore is acting 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 will be lower than the level producing MSY. Future assessments should note if new proposals on the calculation of BAC are being implemented and legislated. Scientists have discussed and communicated options to define reference points appropriate for the fishery (**R3**) although caveats have been also identified and no conclusions have been reached yet.

R3

D. MANAGEMENT MEASURES

LEVEL OF COMPLIANCE	
D1. The level of fishing permitted should be set according to management advice given by research organisations.	
LOW	The level of fishing permitted is not set according to management advice given by research organisations.
MEDIUM	The level of fishing permitted is higher than management advice given by research organisations. However, the difference is not considered to have a significant impact of the sustainability of the stock
HIGH	The level of fishing permitted is set according to management advice given by research organisations.

Determination: The level of fishing permitted is set according to management advice given by research organisations. The level of fishing is controlled by fishing seasons and effort restrictions. The Carta Nacional

Pesquera (CNP) is a binding instrument for fisheries authorities and includes recommendations by the National Institute of Fisheries and Aquaculture (INAPESCA). A high compliance rating is awarded.

The total catch of small pelagics for the 2015/2016 season was 203,037t; 41,428 MT smaller than the 2014/2015 season. However, catches of thread herring complex increased. The opportunistic nature of the small pelagic fleet makes it difficult to interpret CPUE on a particular species, as the fleet prefers Pacific sardine (*O. libertate*) but will opportunistically capture any of the marketable small pelagic species it encounters.

Table 2. Total landings (t) of small pelagic species in the Gulf of California purse seine Fishery (**R9**)

Year	Total –Small Pelagics	Thread Herring sp/ Sardina crinuda (*Opisthonema spp*.)	Boats	Nominal effort (trips)
12/13	465,486	101,814	51	3,601
13/14	293,686	133,452	49	2,685
14/15	244,465	120,919	45	2,147
15/16	203,037	109,177	45	1,943

During 2016 (Southern Gulf Thread Herring fishery, **R3)** total landings were reported as follows:

Table 3. Total landings (Thread Herring Complex) in the Southern Gulf (2016) (**R9**)

Year	TAC	Thread Herring Complex (t)	Boats	Nominal effort (trips)
2016	94,779	*O.libertate* =15,701 *O.medirastre* =11,143 *O. bullieri* =14,368.	8	989

Within the UOC examined the TAC (2016) was not exceeded for the Thread Herring Complex. Within the assessment area for this Report (FAO 77) a TAC has not been set since 2012. INP made recommendations (700,000t) for all small pelagic species in 2012 (**R13**). The level of fishing is controlled by fishing seasons and effort restrictions.

R3,9,13

LEVEL OF COMPLIANCE	
D2. Where excess fishing capacity exist, mechanisms should be in established to reduced capacity to allow for the recovery of the stock to sustainable levels.	
LOW	Mechanisms to allow for recovery of the stock to sustainable levels are not established.
MEDIUM	Mechanisms to allow for recovery of the stock to sustainable levels are somehow established. However there is no evidence of the efficiency of the methods used.
HIGH	Mechanisms are established to reduce capacity to allow for the recovery of the stock to sustainable levels and there are evidences of recovery.

Determination: Mechanisms to allow for recovery of the stock to sustainable levels are somehow established. However there is no evidence of the efficiency of the methods used. Further work is needed. A medium compliance rating is maintained.

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

Minutes were presented where actual decisions were made between the industry and authorities to stop fishing operations based on results of in-season monitoring of abundance and size. This is a positive setting for future determinations on mechanisms that could be agreed to implement the operation of the control rule and make the harvest strategy effective in reducing effort as the stock approaches the limit reference point.

A relevant situation was discussed at the onsite point out the difficulties to implement a control rule over a stock complex that could require a low allowable catch level on one component of the complex while other components are abundant but could not be harvested in full because the fishery cannot separate the least abundant species from the most abundant. The industry need to be aware of this problem to discuss with the scientific staff and start working with them to develop a strategy to address this issue.

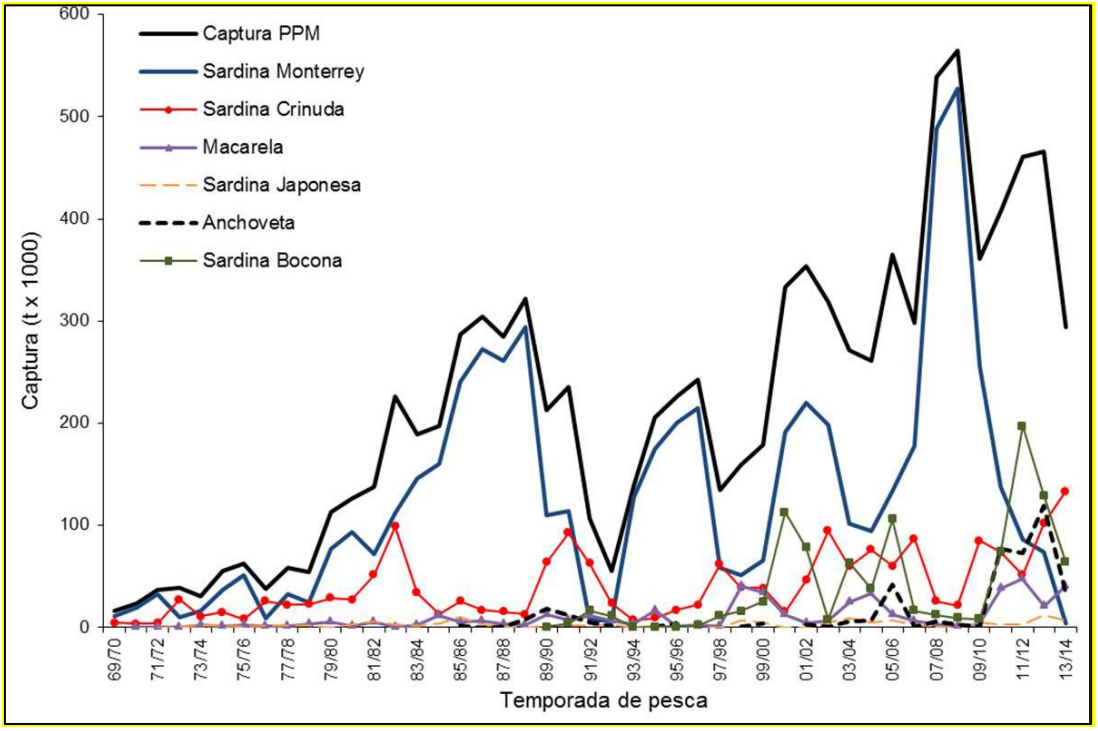

Figure 4. Landings in tonnes by fishing season since 1970. S.crinuda = O.libertate

Reproduced from 2015 onsite presentation to MSC by CRIP Guaymas, Program on Small Pelagics. **R9, R11**

LEVEL OF COMPLIANCE	
D3. Management measures should ensure that fishing gear and fishing practices do not have a significant impact on non-target species and the physical environment.	
LOW	There are no management measures to prevent the impact of the fishing methods and fishing practices on non-target species and the physical environment.
MEDIUM	There are management measures to prevent the impact of the fishing methods and fishing practices on non-target species and the physical environment. However it is not science based.

HIGH	There are management measures to prevent the impact of the fishing methods and fishing practices on non-target species and the physical environment. Measures are based on scientific information.

Determination: There are some management measures to prevent the impact of the fishing methods and fishing practices on non-target species and the physical environment. The observer programme has been reinstated but mitigation strategies have yet to be developed and implemented. A medium compliance rating is maintained.

Thread herring 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 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.

Retained species: Data from landings records and the observer programme over the last 25 years (1990 – 2015) show the main retained species were composed of Bocona sardine *Cetengraulis mysticeus* (14%), Chub mackerel *Scomber japonicus* (7%), California anchovy *Engraulis mordax* (4%), Red-eye round herring *Etrumeus teres* (0.5%) and Leatherjackets *Oligoplites spp.* (0.5%).

Bycatch species: The 2012 Small Pelagics Fisheries Management Plan (SAGARPA 2012) cites the following species as comprising bycatch and/or discards in the small pelagic fishery: Rayadillo (*Orthopristis* spp.), Sierra (*Scomberomorus* spp.), Yellowtail (*Seriola* spp.), Skipjack (*Katsuwonus pelamis*), Giant squid (*Dosidicus gigas*) and Cochito (*Balistes polylepis*) but none are amongst species that are numerically common, as noted by observers.

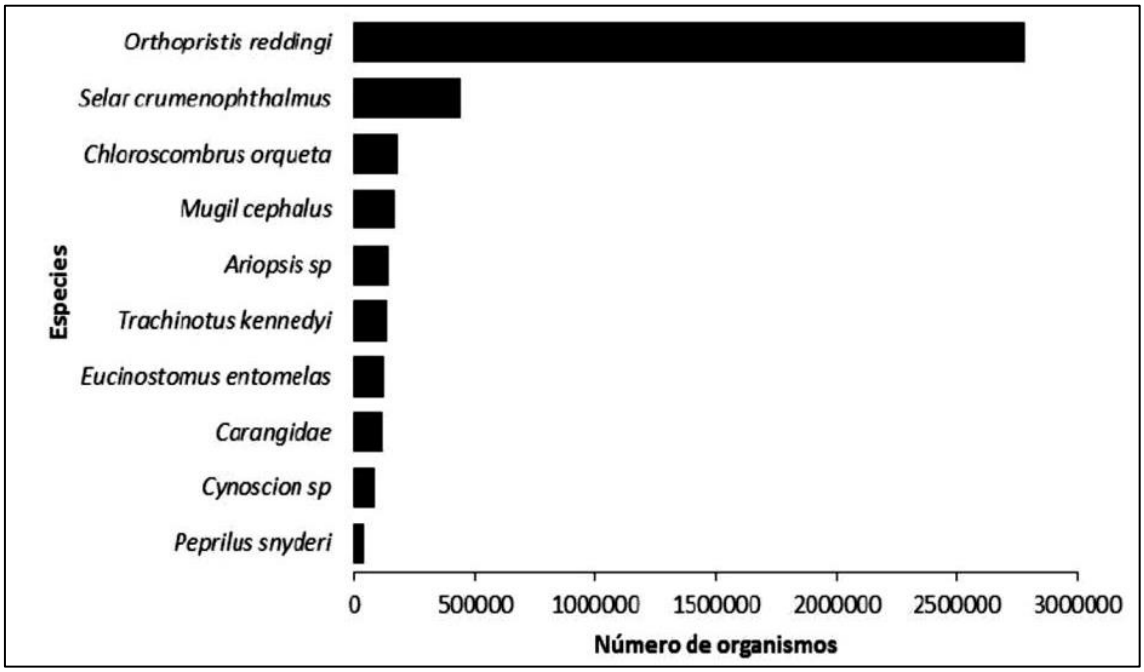

Figure 5. Captures of fish, by abundance, as bycatch in the small pelagic purse seine fishery January 2013 – August 2014 (**R14**).

ETP species: Monitoring of ETP occurred during the observer program in 2013/2014 and results are presented below in Table 4. 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.

Observer Programme update:

A total of five vessels of the fleet (Southern Gulf Purse Seine (Sinaloa & Nayarit, Mexico) of nine operational vessels carried on-board observers in 2017. The observer manual includes information on the regulations of the fishery, outlines the responsibilities of the observers and details the type of information that needs to be collected according the specific forms.

Improvements noted in the coverage and training of the observer program has resulted in an increase in the number of by catch species registered. As a result of the changes in the fishery the overall proportion of bycatch species was reduced. The number of registered bony fishes increased from 38 to 83 species between the first season (2012-2013) and the most recent season (2016-2017); in elasmobranchs the number of registered species increased from 5 to 12 species, and in crustaceans the number of registered species increased from 2 to 13. (**R3**)

Table 4 shows ETP species captured in observed purse seine sets (n=2,134) from January 2013 – August 2014 (Gulf of California) (**R14**). Columns give the species Spanish common name, Latin name, observed sets, percentage of all individuals within each species guild, total number of organisms observed and the number of organisms with lethal interactions:

Table 4: Adapted from: Padilla-Serrato, J.G, et al 'Programa de observadores a bordo de la flota cerquera en el Golfo de California' INAPESCA-SARGARPA. 69pp R14

Spanish Common Name	Species	Status NOM-059	No. of observed sets	% of observed sets	No. Org. Encountered	No. Mortalities
Peces/Fishes						
Caballito de mar	*Hippocampus ingens*	Vulnerable	9	0.28	9	5
Ángel de Cortez	*Pomacanthus zonipectus*	Least Concern	2	0.093	2	2
Marlín rayado	*Kajikia audax*	Near Threatened	3	0.14	5	5
Gavilán dorado	*Rhinoptera steindachneri*	Near Threatened	5	0.23	43	43
Guitarra espinuda	*Platyrhinoidis triseriata*	Least Concern	1	0.04	1	1
Raya eléctrica ocelada	*Diplobatis ommata*	Vulnerable	1	0.093	1	1
Manta diabla	*Mobula munkiana*	Near Threatened	1	0.04	4	4
Tiburón arenero	*Carcharhinus obscurus*	Vulnerable	1	0.04	1	1
Tiburón martillo	*Sphyrna lewini*	Endangered	7	0.33	10	10
Tiburón ballena	*Rhincodon typus*	Vulnerable	2	0.09	1	-
Tortugas/Turtles						
Tortuga golfina	*Lepidochelys olivacea*	Vulnerable	3	0.14	3	-
Tortuga prieta	*Chelonia agassizii*	Endangered	3	0.14	3	-
Aves/Birds						
Pardela pata rosada	*Puffinus creatopus*	Vulnerable	14	0.99	34	-
Pardela mexicana	*Puffinus ophistomelas*	Endangered	23	1.6	43	-
Bobo pata azul	*Sula nebouxii*	Least Concern	261	12.23	9,236	101
Pelicano pardo	*Pelecanus occidentalis*	Least Concern	1305	61.15	67,357	83
Gaviota ploma	*Larus heermanni*	Near threatened	542	23.5	22,438	2
Gaviota pata amarilla	*Larus livens*	Least Concern	69	3.23	687	-
Charran elegante	*Thalasseus elegans*	Near Threatened	16	0.75	230	-
Mamíferos/Marine Mammals						
Delfín	*Delphinus spp*	Special Protection	94	4.4	1,085	34
Lobo marino	*Zalophus californianus*	Least Concern	984	46.11	9,375	1

Habitat: The purse seine fleet in the Gulf of California small pelagic fishery operates in mid-water between 40 and 100 meter depths and generally avoids bottom contact. Contact is intentionally avoided as the small mesh nylon netting is easily damaged. There is no documented evidence that this fishing activity or any purse seining has had irreversible effects on any marine habitat.

Mitigation measures

Workshops for training captains in mitigation measures have taken place (June 2013 with fishing vessel operators; December 2014 with 30 captains; September 2015 with 12 captains). This training was based on the following initial mitigation measures that were proposed in the INAPESCA Observer Program Report:

Birds:
-Scaring, by spraying water or hazard sounds.
- Physical installations

Turtles, sharks, mammals:
- avoid setting nets on these animals
- Return to the sea alive, release from net

A review of existing and new mitigation measures to reduce impacts on ETP species and reduce bycatch (Southern Gulf fishery) was presented during an INAPESCA workshop (October 2016). One of the goals of the course was to provide an opportunity for the participants to share ideas, experiences and knowledge to assist in the implementation of "best practices". In October 2017 INAPESCA in collaboration with Maz Sardina completed the 5th "Best Practices workshop. A Manual for Mitigation Measures and Best Practices was published in 2015. This includes guidelines in manipulation of rays, sharks and sea turtles. Excluder grids are being used to filter organisms such as rays and return them to the ocean before the catch is stored in the haul.

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 put in place to reward the crew for trips with a proportion of bycatch ≤2% of catch.

R3, R10, R14.

E. IMPLEMENTATION

LEVEL OF COMPLIANCE	
E1. There should be a framework for sanctions of violation of Laws and regulations.	
LOW	A framework for sanctions of violation of Laws and regulations do not efficiently exist.
MEDIUM	A framework for sanctions of violation of Laws and regulations do exist but do not work efficiently.
HIGH	A framework for sanctions of violation of Laws and regulations exists and is proven to be efficient.

Determination: A framework for sanctions of violation of Laws and regulations exists and is proven to be efficient. A high compliance rating is awarded.

The Fisheries Law (Ley General de Pesca y Acuacultura Sustentables 2007) lays down the details of infractions (Article 132) and the sanctions (Article 133) to be applied:

Sanctions include:

- A warning, reprimand
- Fine (Article 138 details the how the fines are determined)
- Additional fines for every day the infraction persists

- Administrative arrest for 36 hours
- Temporary/ permanent partial or total closure of the installations where the infractions occurred
- Confiscation of vessels or vehicles, fishery equipment and/or products obtained by aquaculture or fishing directly related to the infractions committed
- Suspension or revocation of corresponding fishing permits, concessions or authorisations.

R5, R7, R10, R15

LEVEL OF COMPLIANCE	
E2. A management system for fisheries control and enforcement should be established.	
LOW	A management system for fisheries control and enforcement is not established.
MEDIUM	A management system for fisheries control and enforcement is established but do not work efficiently.
HIGH	A management system for fisheries control and enforcement is established and work efficiently.

Determination: A management system for fisheries control and enforcement is established and works efficiently. A high compliance rating is awarded.

A management system for fisheries control and enforcement is established and works efficiently. The Secretariat of Environment and Natural Resources (SEMARNAT), the Federal Attorney for Environmental Protection (PROFEPA), Marina (Mexican Navy) and National Defense (SEDENA) and the National Commission on Security (CNS), the Federal Police, and the National Commission of Aquaculture and Fisheries (CONAPESCA), work together under the Centro de Operaciones Interinstitutionales (COI) San Felipe directed by the Commandant of the Naval Sector.

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

- 1,424 training days 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.
- A total of 23 specimens and 308 hauls of totoaba (*Totoaba macdonaldi)* – critically threatened 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.

There is effective monitoring of each fishing boat's position at all times through a compulsory satellite detection system and subject to sanctions. Each and every 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, formally identified, 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. There is no evidence of systematic non-compliance. **R10, R15**.	

7. KEY STAKEHOLDERS

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