

*Mexico Gulf of California swimming crab - pot/trap/ring net  
Three-Year Audit Report*

*Version 1.2, September 2021*

## *Purpose*

Fish Choice developed the three-year audit report template. The objectives of the three-year audit report are:

1. To assess the fishery's performance indicator scores
2. To verify the results of the FIP's environmental work plans as reported on FisheryProgress
3. Optional: To provide recommendations to the FIP on environmental workplan actions that should be modified, including recommending additional actions/tasks that should be taken or suggested changes to timelines to help the IP achieve their stated objectives.

## FIP Information

Target species scientific name(s) and common name(s)	Cortez Swimming Crab ( <i>Callinectes bellicosus</i> ) Arched Swimming Crab ( <i>C. arcuatus</i> )
Fishery location	Gulf of California on the shores and estuaries Sinaloa and Sonora States.
Gear type(s)	Pot / trap and ring net
Estimated FIP Landings (weight in tons)	20,434 metric tons
Vessel type(s) and size(s)	Small-scale vessels (Approx. < 10 meters in length)
Number of vessels	Number of small-scale vessels: 68
Management authority	National Fisheries Commission (CONAPESCA)
Auditor name(s)	Iván Martínez-Tovar
Auditor Organization/Affiliation	Ocean Outcomes
Date of report completion	June, 2023

## FIP Background

Mexico is the largest swimming crab producer in Latin America, with a big portion of the production sent to the export market, in particular the US. Between 2006 and 2013, the average swimming crab production of the country was around the 2,600 metric tons. However, in recent years, the annual average production reached around 23,000 metric tons, with a market value of US 17 million dollars. The Pacific Northwest produces >60% of the national landings, with the states of Sinaloa and Sonora as the main producers in the country. This is one of the most important small-scale fisheries in the region, with around 2,000 small-scale fishing vessels, 4,400 fishers and at least 139 fishing permits that are active in the Gulf of California. Considering the economic importance of the fishery, the Gulf of California swimming crab FIP was launched during the first half of 2009, which was coordinated by the Sustainable Fisheries Partnership (SFP), but this transitioned to be led by the industry on January 2015.

The project aims to strengthen the harvest strategy that currently is in place and includes some elements that aim to control access and the fishing effort. However, harvest control rules and other measures that are driven by the status of the stocks are lacking. For this reason, the project aims to improve the management system in order to reach a passing score against the performance indicators of the MSC Standard. To achieve this, the project aims to establish a fishery monitoring and data collection program, develop and publish a robust and comprehensive stock assessment for the target species, and develop and implement of a harvest strategy to meet the sustainability standards internationally accepted.

## Stakeholder Consultation & Meetings

The review team reviewed the background and material needed to understand the current status of MSC Performance Indicators (PIs) and the status of progress on the client action plans. The communications occurred through scheduled meetings. The list below provides information for participants on specific communications.

Name	Affiliation	Date and Subjects Discussed
<b>Mario Rojo</b>	President of the SPCP Arrecifes de Kino and Secretary of the Kino Bay Management Committee	<u>May 17th, 2023</u> <ul style="list-style-type: none"><li>● Management committee structure actions</li><li>● Major barriers</li><li>● FIP Actions</li><li>● Scope of the project</li></ul>
<b>Dr. Miguel Ángel Cisneros Mata and Dr. Raúl Molina</b>	Regional Center of Fisheries and Aquaculture Research, Guaymas, Sonora.	<u>May 18th, 2023</u> <ul style="list-style-type: none"><li>● Stock status of target species</li><li>● Management strategy</li><li>● FIP Actions</li><li>● Stock assessments</li></ul>

<p><b>Dr. Alejandro Balmori Ramirez</b></p>	<p>Regional Center of Fisheries and Aquaculture Research, Guaymas, Sonora</p>	<p style="text-align: right;"><u>May 18th, 2023</u></p> <ul style="list-style-type: none"> <li>● Management strategy</li> <li>● FIP Actions</li> <li>● Harvest control rules</li> <li>● Collaboration and coordination</li> </ul>
<p><b>Marco Antonio Reyes</b></p>	<p>IEMARSON S.A. de C.V. Crab processor and exporter from Sonora and Sinaloa</p>	<p style="text-align: right;"><u>May 19th 2023</u></p> <ul style="list-style-type: none"> <li>● Collaboration, the scope of project</li> <li>● Shopping practices</li> <li>● FIP needs</li> </ul>
<p><b>Mr. Rene Campos</b></p>	<p>Pro-commerce Inc. Crab processor and exporter from Sonora and Sinaloa</p>	<p style="text-align: right;"><u>May 19th 2023</u></p> <ul style="list-style-type: none"> <li>● Collaboration, the scope of project</li> <li>● Shopping practices</li> <li>● FIP needs</li> </ul>
<p><b>Yesica Hernandez</b></p>	<p>Alimentos del Mar Crab meat processor and exporter from Sonora and Sinaloa</p>	<p style="text-align: right;"><u>May 20th 2023</u></p> <ul style="list-style-type: none"> <li>● Collaboration, the scope of project</li> <li>● Shopping practices</li> <li>● FIP needs</li> </ul>

## Summary of Findings

Based on the conversation with FIP stakeholders, some of the main comments are summarized below:

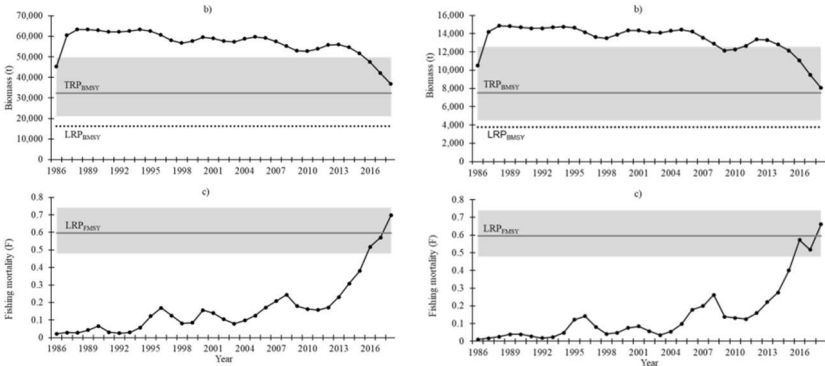
- In terms of management, the Kino Bay Region has in place a small committee formed by a group of producers, buyers and processors that meets several times a year. Specially before and after the end of the season to discuss and agree on the measures to be implemented for the management of the fishery during the season. These meetings are attended by state and federal fisheries authorities, in particular, the scientific group of the National Institute of Fisheries and Aquaculture (INAPESCA) that carries out the monitoring of the fishery. In addition INAPESCA representatives present to the committee the results of studies on distribution, abundance and size structure of crab in the area, as well as forecasts on the production.
- During the fishing season the committee meets to evaluate the progress of the season in addition to reviewing and discussing aspects related to the fishery, such as possible acts of illegal fishing and strategies to contain it, including the formation and operation of community monitoring committees.
- Regarding compliance and application of regulations, it was commented that in the last five years there has been a change in fishing equipment from the typical "Chesapeake" model trap to a collapsible double ring trap. This new fishing system was included in the *"Draft Amendment to the Official Mexican Standard NOM-039-PESC-2003, Responsible fishing of crab in waters of federal jurisdiction of the Pacific Ocean coast"*.
- Regarding the sizes of legal minimums and the protection of egged females, it was commented that the purchase agreements between processors and producers cover these aspects.
- In relation to the status of the populations of target species, an peer review study (published on Nov 2022) showed the result of the status that stocks, where although these are facing increasing fishing pressure overfishing was not occurring. Authors reported that by segmenting the distribution area of the resource, local populations face different levels of pressure that increase in direct relation to the concentration of population dedicated to target the species.
- With regard to the harvesting strategy and catch control rules, the interviewees consider that the current strategy, measures (minimum sizes, protection of females with exposed roe), limits on fishing effort (number of fishing equipment per unit of production) and the off-season (May 1 to July 10) are effective. But added, that the harvest strategy should be strengthened with measures to protect particularly areas that operate as nursery grounds.
- Management representatives shared that INAPESCA has standardized fishing effort per area and constantly monitors the mortality, recruitment and catch rates. Researchers added that institute recently completed an analysis of gene flows and metapopulations in the state of Sonora that allowed them to identify the areas that work as larvae source and those that function more as receiving areas. Several added the need to replicate similar efforts in Sinaloa, in order to magnify the impact.
- In terms of market participation, the stakeholders mentioned that their purchase and quality control policies allow them to monitor that there is only organisms above minimum legal size. They have seen fluctuations in production in recent years and consider the need to research the impact of climate

change on the fishery. Finally, producers mentioned that off-season has not been as effective as expected on the recovery of the biomass, and shared that production that normally was collected in four months, was commercialized in two, which decreased the quality of the product and prices too.

## Recommendations

- Stakeholders mentioned the need to push for the completion of the NOM update process for the crab fishery.
- Several also mentioned the need to update the fishery impact studies as well as to analyze the controls to the number of fishing equipment per vessel since they are estimated for traps but are not considered equivalences with double rings.
- In addition, there is a need to continue the genetic and metapopulation analysis on the coasts of the state of Sinaloa to identify possible export areas and biomass sinks.
- Promote the creation and operation, of regional fishery management councils in the other important production areas identified in the Fishery Management Plan; including: Playa del Sol-Bahía de Lobos and Tobari-Agiabampo Bay in Sonora, and the Colorado-Navachiste and Santa Maria Bay in Sinaloa.
- Update the study catch composition and impacts of the fishery on secondary species and ETP, in order to provide most recent information/evidence of the impacts.
- Promote the update of the fishery management plan to include special management measures for areas that export biomass and establish Total Allowable Catches based on the reference points defined in the recently published stock assessment and reference points report.

## Summary of MSC Performance Indicator Scores

Principle	Component	Performance Indicator	Previous Score	Current Score	Rationale or Key Points
1	Outcome	1			<p>As part of the FIP action progress, in 2022 the study title “Evaluation and estimation of reference points for the crab stocks (Callinectes spp.) from the Gulf of California and the west coast of Baja California Sur, Mexico” was published. The study used fisheries production records, to run data the Catch-Maximum Sustainable Yield (C-MSY) method that allows estimation of reference points that can be used for management of a fishery, such as maximum sustainable yield (MSY), the biomass associated with MSY (<math>B_{MSY}</math>) and the fishing mortality associated with maximum sustainable yield (<math>F_{MSY}</math>)(Rivera-Parra et al 2022).</p> <p>Based on the analysis, the authors reported that the MSY for Cortez crab within the Gulf of California (GC) was ~19,200 metric tons (mt), and found that production was far below the MSY limit during most of the timeframe, but started showing an increasing trend towards MSY in most recent years, until, in 2015 when the catches exceeded MSY. A similar pattern was found for fishing mortality. With F values below the <math>F_{MSY}</math> limit, but from 2012 fishing mortality increased markedly, reaching a maximum value in 2018, located above the LRF <math>F_{MSY}</math>. For Arched Swimming crab, the behavior was similar, with an MSY value close to the 4, 400 mt. Production was below the MSY, until 2015 when the landings were reported to be above MSY. Similarly, fishing mortality increased markedly in recent years (2012) reaching their maximum value in 2018 with an exploitation rate above the <math>F_{MSY}</math>. Figures below show these tendencies on Cortez (left) and Arched (right) crab species.</p> 

						<p>The figure consists of two side-by-side Kobe plots. The left plot is for the Cortez swimming crab (WC-GC) and the right plot is for the Arched swimming crab (CC-GC). Both plots have <math>F/F_{MSY}</math> on the y-axis (ranging from 0.0 to 2.0) and <math>B/B_{MSY}</math> on the x-axis (ranging from 0.0 to 2.0). The plots are divided into four quadrants: red (top-left, <math>F &gt; 1, B &lt; 1</math>), orange (top-right, <math>F &gt; 1, B &gt; 1</math>), yellow (bottom-left, <math>F &lt; 1, B &lt; 1</math>), and green (bottom-right, <math>F &lt; 1, B &gt; 1</math>). Data points for 1990 (circles), 2014 (squares), and 2018 (triangles) are plotted. Gray shaded areas represent iso-probabilities for the current status (2018) in each quadrant: 67.7% for orange, 23.5% for green, 40.2% for orange, and 31.7% for green. Vertical lines are drawn at <math>B/B_{MSY} = 0.5</math> and <math>1.0</math>.</p>
					<p><i>Figure 1. Kobe plot for the Cortez swimming crab (WC-GC) and Arched (CC-GC) swimming crabs in the Gulf of California, Mexico. The gray areas indicate iso-probabilities (Rivera-Parra et al. 2022)</i></p> <p>The Kobe plots for the Cortez and Arched swimming crab fisheries in the Gulf of California (figure 1), showed the evolution of fishery exploitation over time. The trajectory of the different values showed that these fisheries remained at healthy capture levels (green quadrant) for most of the time series, but with increasing fishing mortality rates and decreasing relative biomass values from 2014. Authors reported that there was a 67.7% probability that the current status of the Cortez crab to be in the orange quadrant (not overfished but experiencing overfishing), and a 40.2% probability that the current status of the Arched species is in the same state. For both fisheries, stock status remained in good condition for many years but rapidly changed over the last four years to move into less favorable status. Based on the results, it is highly likely that the stocks are above the <math>PRI</math>, and the stocks have been fluctuating around <math>B_{MSY}</math> in the most recent years.</p>	
		1.1.2	Stock rebuilding		<p>Considering the results of the evaluation exercise (see PI 1.1.1) there might not be a need for a rebuilding strategy. However, considering the increasing tendencies on <math>F</math>, it will be important to monitor this and plan accordingly.</p>	



		1.2.1	Harvest Strategy			<p>A harvest strategy has the main goal to control fishing mortality to biologically sustainable levels through a combination of monitoring (particularly in relation to stock abundance and exploitation rates), stock assessment, harvest control rules (HCRs) and management actions required for maintaining fishery sustainability.</p> <p>The crab fishery in the Gulf of California it is managed by the combination of a FMP for the states of Sonora and Sinaloa (the main producers in the region) as well as a Federal Official Norm (NOM-039-PESC-2003) that combined a series of measures that form a harvest strategy. The measures include a combination of gear specifications, and limits on fishing effort, minimum size limits as well as off-fishing seasons and protection of bearing females (prohibition). There is some evidence that the HS is achieving its objectives (PI 1.1.1), and that it is reviewed periodically (the NOM was reviewed and updated on 2019). Monitoring of the fishery, however, still occurs on an ad hoc basis, and a systematic or comprehensive collection of fishery data has not been implemented yet. Overall, the strategy needs to prove that is responsive to the state of the stocks, which according to the FIP action plan is something plan as part of the next steps. Current information and progress available, confirms that score for this PI.</p>
	Management	1.2.2	Harvest control rules and tools			<p>HCRs are a set of defined, pre-agreed rules and management actions that will be taken in response to changes in indicators of stock status with respect to reference points. HCRs are regarded as ‘well-defined’ when they exist in some written form that has been agreed by the management body, ideally with stakeholders, and clearly state actions that will be taken at specific trigger reference point levels. Current measures that are in place, both in the FMP and the Official Norm, do not use the MSY values as a reference. Instead, there is a target of the average abundance of the past five years and a limit reference point of 350g/gear/day (84 kg/gear/year) but there is scarce information to assess if this target has been approached by the fishery. It is not clear how a single LRP applies to a wide mix of species that changes geographically; so it is unclear if such limit protects the different species in the fishery.</p> <p>Current management in place states that if the fishery were to approach the limit reference point (0.35 kg/gear/day or 84 kg/gear/year), researchers from INAPESCA would provide a warning opinion to CONAPESCA, which would have the option to establish a precautionary total allowable catch, closing the fishery, or reducing the number of open fishing days to slow down catch rates. It is not clear how this would work in practice if CPUE dropped below 0.35kg/day. CPUE does not always track biomass in a reasonable way, so further documentation of HCRs is required to know if CPUEs are standardized of how exactly the system would react to low CPUEs at the end of the year.</p>

						Based on the results of the recent assessment (see PI 1.1.1) new HCR are plan to be defined. Currently, these are not part of the management, and it needs to be clear that uncertainties tied to the stock evaluation are better understood.
		1.2.3	Information and monitoring			Based on the fact that this is one of the most important resources in the region, sufficient information related to the species stock structure, productivity, and fleet composition is available to support a harvest strategy. Managers monitor production via landing tickets (“Avisos de arribo”), which are mandatory and allow the estimate CPUE, which is use as an abundance indicator by managers. The project has in place an action that aimed to develop a protocol to collect dependent and independent data, and agreed on a methodology. However, the program has not been put in action and there is still the need to have a similar level of detail from other sources of fishery removal (e.g. other fleets operating in the same region and other fleets targeting the same stocks).
		1.2.4	Assessment of stock status			The recent population evaluations seem adequate based on the information available. The methodology allows estimating the stock status relative to generic reference points appropriate to the species categories. The authors estimated the biomass needed to achieve the MSY and the fishing effort in place to maintain the MSY. They also considered uncertainty into account and recognized that with more robust data (both fishery dependent and independent data), other models could be applied, which could reduce the uncertainties inherent to the catch data approach. However, concluded that the methodology is appropriate for a data limited fishery such as the swimming crab and management recommendations can be produced based on the results. Considering that the best assessment methodology has been defined and this might be improved as the project increases data availability and reduce the amount of uncertainties, this PI could reach a passing score.
2	Primary species	2.1.1	Outcome			Based on the catch composition information that is available for the fishery, the pot/traps are highly selective with limited impact on non-target species. Among those identified, none are managing species that will be categorized as primary species. For this reason, this PI will have a passing score.
		2.1.2	Management strategy			Since, there are no primary species caught in this fishery, scoring for this PI will reach a passing score at the >80 level. Considering that the scoring issues a (partial strategy necessary), b (measures are effective) and c (some evidence of the success of the measures) can be corroborated by the existent information. However, actions related to gear loss prevention are still not in place SG100 is not met.

		2.1.3	Information			Some quantitative information exists and allows to confirm that there are no main primary species as part of the catch composition of the fishery. For this reason this PI could score a >80.
	Secondary species	2.2.1	Outcome			Based on the information available, pink snail is the only secondary main species within the catch composition of the UoA. Currently, there is no information available to confirm the current status of the species. The 2018 report within the National Fisheries Chart (CNP) stated that status was unknown. Considering the species is part of a commercial fishery that until 2016 was showing production levels increasing, is it likely that is above biological based limits, but mor information is required to increase the likelihood of this statement.
		2.2.2	Management strategy			Considering that based on information available, the only secondary main species, is the Chinese pink snail ( <i>Hexaplex erythrostomus</i> ), which has a limited number of management measures that could be considered a partial strategy (access permits, minimum size length, off-season). In addition, according to the National Fisheries Chart (CNP), a extraction strategy is in place that allows an extraction quota between the 20 and 25% of the population size (DOF 2018). However, it is not clear that these measures are designed to keep the species above PRI, and that monitoring is sufficient to determine if the status changes. According to landings up to 2016 and the status on the CNP of 2018, there is some objective basis for confidence that the partial strategy might be working, but there is no evidence that the measures/ partial strategy is being implemented successfully. Considering that the legal gears (traps and rings) are very selective and represent a relatively low risk to primary species, this indicator receives a conditional pass. Even if few (or only one) primary species are impacted by the fishery, regulations must address bycatch and how to manage it if higher levels occur.
		2.2.3	Information			Based on a few studies (Torre-Cosio 2002)(Cisneros-Mata et al. 2014) traps catch low amounts of nontarget species. In Sinaloa and Sonora, the swimming crab traps' bycatch composition and proportion were assessed in 2012 by Balmori et al. (2012). The authors reported that the crab bycatch proportion on average was 1:0.31 for Sonora and 1:0.06 for Sinaloa, with greater retention of bycatch in traps (an average 230 g per 1 kg of crab) compared to rings (an average 10 g per 1 kg of crab) (Balmori et al. 2012). Of the 28 bycatch species, thee primary bycatch species was pink-mouthed murex snail ( <i>Phyllonotus erythrostomus</i> ) (~75% of the total weight of bycatch), while the most commonly caught finfish species was spotted sand bass ( <i>Paralabrax maculatofasciatus</i> ) (4.71% of the total bycatch) No other species reported reached more than 5% of the catch. A more recent

						<p>study in Sonora found that, for each kilogram of swimming crab, between 0.30 and 0.74 kg of bycatch was cached (Loaiza-Villanueva, R. 2020). Similarly to Balmori, A. et al. (2012), this study's author reported that the most important species in terms of percentage of the catch were pink-mouthed murex. Overall, there is enough quantitative information to define bycatch for the fishery and the quantitative information available is adequate to assess productivity and susceptibility attributes for the main secondary species and support the management strategy for the species. But more recent information is required to adequate assess this with a high degree of certainty and estimate the impact on minor secondary species.</p>
ETP species	2.3.1	Outcome				<p>No ETP species have been identified in previous studies of the fishery. The qualitative and quantitative information allowed to inferred the direct effects of the UoA on ETP species. No records of ETP species and it has been considered that the swimming crab fishery does not interact with ETP species. Therefore, per the FIP portion of the fishery seem to have no impact on these types of species. Similarly, there is nothing that could lead to assume that the fishery could inflict an indirect level of mortality on any ETP species. However, in order to have a high degree of confidence that there are no significant detrimental direct, and indirect effects of the UoA on ETP species, more information should be collected and analyzed.</p>
	2.3.2	Management strategy				<p>Based on the previous quantitative information, the UoA seems to have no significant interactions with ETP species. None of the bycatch species registered in the existent bycatch studies fell under ETP protections international or national NOM-059-SEMARNAT-2010 (DOF, 2010). Considering the nature of the gear, this could be considered and strategy that is expected under objective basis to be effective (based on existent reports). If the monitoring program that will be launch as part of the FIP start reporting and confirming these details, the PI could be increase to 100.</p>
	2.3.3	Information				<p>Some qualitative and quantitative information was available during the pre-assessment, that was considered adequate to assess the related mortality and impact and to determined that the fishery does not represent a threat to protection and recovery of any ETP species. None of the bycatch species registered in the previous studies fell under ETP protections international or national NOM-059-SEMARNAT-2010 (DOF, 2010). Based on those reports it could be established that the fishery does cause any level of mortality in ETP species, however, the planned monitoring program for the FIP is not active yet and most recent</p>

						information is not available to confirmed trends and support and strategy to manage potential impacts. This PI remains as is.
Habitats	2.4.1	Outcome				The fishery occurs primarily on sandy and muddy bottoms, and scientists and managers' report very little interactions with other areas, such as seagrass. According to available reports, no sensitive habitats have been reported in the region and therefore is expected that the UoA unlikely reduce the structure and function of the encountered habitats. Although ghost fishing traps is are known to occur at a low level in the fishery (Torre et al 2004), the vulnerability of the habitat to interactions is sufficiently well known to have some level of confidence that the fishery is highly unlikely to reduce structure and function of the commonly encountered habitats to a point where there would be serious or irreversible harm. However, more recent data is needed to increase this likelihood, as well as generate evidence that this is the case.
	2.4.2	Management strategy				The fishery has no explicit habitat management strategy, but there are some measures that could be considered as a partial strategy. For example there are gear specifications within the NOM that could mitigate impacts, such as the limit on the number of gears, the time the gear can be in the water, as well as the use of materials that could reduce the ghost fishing if gear get lost (DOF 2019). In addition, there are other restrictions that are applied to other fisheries, such as the prohibition of the trawling activities in coastal zones close to the shore (DOF 2012). Based on the nature of the gear, the information available, there is some confidence that the partial strategy will work. However, there is the need to generate some quantitative evidence that the partial strategy is being implemented successfully.
	2.4.3	Information				Swimming crab traps can be considered as having low impact, particularly because these are used in sandy and muddy areas (Torre et al 2004)(Balmori 2012), these habitats are relatively resilient (Johnston et al 2012). Overall, and considering that the region has a strong importance for other fisheries (beyond swimming crab) such as shrimp and finfish species, there is a high level of understanding about the nature, distribution and vulnerability of habitats within the coastal area where the fishery occurs. The level of information available was adequate to identify potential main impacts, however there is a need to continue collecting this type of information. In order to be able to detect changes on the level of impacts.

		2.5.1	Outcome			The UoA may be highly unlikely to disrupt key elements in the ecosystem structure because of the highly selective nature of the fishery (based on the catch composition) and the species ecology (high productivity and fast growth). However, there is a need for more evidence to confirm this point.
	Ecosystem	2.5.2	Management strategy			The current combination of measures described within the NOM and Management plan, combined with the high productivity of swimming crabs provide some measure of assurance that harvest of crab will not impede crab recruitment, which tends to maintain the trophic structure of the ecosystem. Based on this, there is some objective basis for confidence that the measures/ partial strategy will work, based on some information directly about the UoA and/or the ecosystem involved. And current status of the impacts can be considered as some evidence that these are effective. However, the behaviour of the last two fishing seasons and the results of the biological and fishing monitoring of the fishery show signs of deterioration of the fishery, besides this, the effects of climate change are difficult to understand and should be considered in the strategy. More clear evidence should be produced in order to confirm that the strategy is effective.
		2.5.3	Information			Since this is one of the most important fisheries not only in the region, but in the country, there has been a substantial research and information is adequate to broadly understand the key elements of the ecosystem where the fishery takes place. Similarly, the main impacts of the fishing activities on these key ecosystem elements can be inferred from existing information. In addition, the project aims to continue generating information, and this data should be use to better understand the impacts on target and associated species as well as functions and impact on the ecosystem, which currently are known but should continue to be monitored. Although, currently, the data collection program is not in place yet.
3	Governance and Policy	3.1.1	Legal and customary framework			<p>The general legal and customary framework associated with fishing activities in Mexico (and the red snapper fishery) is consistent and well-known by all parties involved. The federal management system sets governance and policy through the national fishery law. This instrument allows two bodies with management (CONAPESCA) and research activities (INAPESCA). The national legal system includes a space for cooperation with other parties, to deliver management outcomes consistent with Principles 1 and 2 of the MSC.</p> <p>The management system allows stakeholders to participate in the deliberations process; regarding management decisions, the process is open, and details are transparent. Finally, the environmental and fisheries laws and regulations</p>

						recognize the dependence on fishing for food and livelihood and include clauses generally respecting these people's customary or traditional legal rights.
		3.1.2	Consultation, roles, and responsibilities			<p>The organizations and individuals involved in the management process are well-identified. Their roles and responsibilities have been explicitly defined within the General Fisheries Law. Each institution involved in the process, has explicit functions, roles and responsibilities. When management measures are developed, consultation processes between lead organizations (CONAPESCA and INAPESCA) exist and producers and other stakeholders are normally included.</p> <p>In the case of the Swimming crab fishery, there is a National and State Crab Product System Committees who also participates in the administration and management of fishery and aquaculture resources, through the National Council for Fisheries and Aquaculture and the State Councils for Fisheries and Aquaculture. Finally, the management system includes consulting processes that regularly seek and accept relevant information, including local knowledge. Additionally, when the regulatory update processes are in action, they must be published on the National Commission for Regulatory Improvement web page and in the DOF (Official Federation Paper). This PI remains with no change.</p>
		3.1.3	Long-term objectives			The General Law of Fisheries and Aquaculture explicitly defines long-term objectives and these are well-defined in the CNP. Objective I state: <i>to establish and define the principles for ordering, promoting and regulating the integral management and sustainable use of fisheries and aquaculture, considering social, technological, productive, biological and environmental aspects</i> . Similarly, objective III states: <i>To establish the bases for the management, conservation, protection, repopulation and sustainable use of fishery and aquaculture resources, as well as the protection and rehabilitation of the ecosystems in which these resources are found</i> . Overall, Mexican regulations have long-term objectives that guide decision-making consistent with the MSC criteria and the precautionary approach.
	Fishery specific management system	3.2.1	Fishery-specific objectives			<p>The fisheries management plan central objective states "<i>Crab fishing in Sinaloa and Sonora is sustainable.</i>" And a series of strategic objectives for the fishery:</p> <ul style="list-style-type: none"> <li>• Produce scientific knowledge on biological and fishery aspects to improve management of the fishery.</li> <li>• Maintain exploitation levels in line with biomass availability.</li> <li>• Promote technical advances and modernizing the industry to offer a profitable and high-quality product.</li> </ul>

						<ul style="list-style-type: none"> <li>• Create instruments for social participation that allow catch shares as a means to define management measures with the participation of fishery stakeholders.</li> </ul> <p>Likewise, the NOM 039 describes a sustainability objective by stating that the regulations are designed to assure adequate recruitment. These components, lines of action and specific actions are considered consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are explicit within the fishery-specific management system.</p>
		3.2.2	Decision-making processes			<p>Mexican legislation has in place a decision-making process that is defined within the general structure of management system described in PI 3.1.1 and 3.1.2. In addition, the Swimming crab fishery management plan, the NOM-039-PESC-2003 and CNP also include specifications and recommendations that allow the implementation of management through measures and strategies achieved by a multistakeholder decision-making processes. The contents of the Fisheries National Chart are intended to be binding in the decision-making and adoption/implementation of management measures.</p> <p>Furthermore, the laws, regulations, standards, specifications and recommendations are published in the official gazette (Diario Oficial de la Federación DOF), these often respond to important issues and the public has the opportunity to comment and influence the resulting final decision. Although scientific advice is not always incorporated into the decisions, or can take a long time, even years, before recommendations are considered in the regulation, the process in general is considered transparent, adaptive and inclusive. Finally, there is evidence suggesting that the precautionary approach has been used in the decision-making processes for the swimming crab fishery in the state of Sonora. To date, the fishery has implemented several tools to protect stock, recruitment and avoid overfishing.</p>
		3.2.3	Compliance and enforcement			<p>In Mexico, the General Directorate of Inspection and Surveillance aims to preserve CONAPESCA's systems and species. A task force of ~168 active federal agents (Causa Natura 2023) collaborate via inter-institutional coordination with other competent authorities to enforce the fishing regulatory framework. Despite these efforts, enforcement is still considered the weak link of the fishery management system in Mexico (not just for crab fisheries). A not so robust monitoring, control and surveillance system is in place in the fishery and has demonstrated an ability to enforce relevant management measures, strategies and/or rules (e.g. when some producers are harvesting females or fishing off-season). The legislation is clear about the sanctions to deal with when non-</p>



						<p>compliance exists, and some data related to these is available but unclear how consistently applied are these sanctions when found, although interviewees mentioned that these have proved to be an effective deterrence. In a report that evaluated the effectiveness of enforcement actions developed by Causa Natura via a general index, Cisneros and Rolon (2020) showed that overall the Baja California, Baja California Sur and Sonora presented the highest values of these index, while Sinaloa remained within the average of the coastal states. This could be considered as some evidence that demonstrate fishers comply with the management system, which is complements with their participation providing information to the effective management of the fishery via the FIP. Overall, this can information allows to inferred that there is no systematic non-compliance for participants. However, more evidence demonstrating the ability to enforce the management measures is still lacking. Similarly, stronger evidence that allows a high degree of confidence that fishers comply and sanctions are constantly applied is needed.</p>
		3.2.4	Management performance evaluation			<p>There are mechanisms to evaluate key parts of the fishery-specific management system. The National Fisheries Chart is a binding management mechanism that provides summary information about where, when, and how much fishing is allowed without altering the ecological balance and the most appropriate way to extract species susceptible to exploitation. The fishery chart (or profile) was most recently updated in 2018 (DOF 2018), while the NOM was update in 2019 (DOF 2019). Although, the management plan for Sonora and Sinaloa was published in 2014 (DOF 2014) no updates or revisions were reported/found. But overall, the current improvements on the key parts (NOM and CNP profile) had shown to be regularly review via internal and external processes. This PI reaches a passing score. However, it will be important that all parts of the fishery-specific management system are evaluated regularly and through internal and external processes.</p>

## Environmental Workplan Results

Result	Related Action on Fishery Progress	Related MSC Performance Indicator	Explanation
Stock status of the species against reference points	<p>Actions: <i>Assessment methodology and A complete harvest strategy is in place and responds to status of the stocks.</i></p>	<p>1.1.1, 1.1.2, 1.2.1, 1.2.2, 1.2.3 and 1.2.4</p>	<p>A stock assessment for the targeted species (<i>Callinectes bellicosus</i> and <i>C. arcuatus</i>) was completed. The results were published in a peer review magazine and within the report, the authors estimated reference points (i.e., catch at maximum sustainable yield, the biomass associated with MSY, and the fishing mortality associated with maximum sustainable yield) using official landing data from 1980 to 2018 to determine the level of exploitation of all crab species and conclude that the methodology was robust and managers could use the result for decision processes.</p>
Data collection program is approved, standardized and validated by managers.	<p>Action: <i>Data collection protocol and Data collection program to fulfill information gaps for the fishery management</i></p>	<p>1.2.3, 1.2.4, 2.3.3, 2.3.4, 2.3.2, 2.5.3, 2.5.2, 2.4.2, 2.1.3, 2.1.2, 2.2.3</p>	<p>During a workshop conducted in 2019 with different stakeholders, a data collection protocol agreed on the use of a standardized methodology. (versión included in the FIP profile)</p> <p><i>Loaiza-Villanueva, (2009). Metodología para monitoreo poblacional de Jaiba Callinectes spp. en la Costa Norte de Sonora en el Corredor Bahía Adhair-Desemboque de Caborca 2008-2010, Región Puerto Peñasco, Sonora. Centro Intercultural de Estudios de Desiertos y Océanos, A.C. Puerto Peñasco, Sonora, México.</i></p>

## Supporting References

- Balmori, A.; J. Torre; M. Rojo and R. Loaiza. 2012. *La fauna de acompañamiento de jaiba en el Golfo de California (Sonora y Sinaloa)*. COBI A.C./INAPESCA/CEDO A.C. 24 p.
- Causa Natura 2023. *Conapesca, una institución compuesta de ausencias*. <https://reportajes.causanatura.org/conapesca-institucion-compuesta-de-ausencia>
- Cisneros, A., and Rolon, E. *Pescando Datos. Índice de efectividad en inspección y vigilancia pesquera*. <https://pescandodatos.causanatura.org/combate-a-pesca-ilegal/Indice-de-efectividad-en-inspeccion-y-vigilancia-pesquera.pdf>
- Cisneros-Mata M., Ramirez-Felix, E., Garcia-Borbon, J., Castañeda-Fernandez de Lara, V., Labastida-Che, A., Gomez-Rojo C., and Madrid-Vera, J. 2014. *Pesca de jaiba en el litoral del Pacífico mexicano*. <https://www.inapesca.gob.mx/portal/documentos/publicaciones/LIBROS/Pesca-de-jaiba-x1a.pdf>
- DOF 2010. *NORMA Oficial Mexicana NOM-059-SEMARNAT-2010, Protección ambiental-Especies nativas de México de flora y fauna silvestres-Categorías de riesgo y especificaciones para su inclusión, exclusión o cambio-Lista de especies en riesgo*. <https://www.dof.gob.mx/normasOficiales/4254/semarnat/semarnat.htm>
- DOF 2014. *Acuerdo por el que se da a conocer el Plan de Manejo Pesquero de Jaiba (Callinectes spp.) de Sinaloa y Sonora*. 15 Julio 2014. <https://www.gob.mx/inapesca/documentos/plan-de-manejo-pesquero-de-jaiba-de-sinaloa-y-sonora>
- DOF 2018. *ACUERDO mediante el cual se da a conocer la actualización de la Carta Nacional Pesquera*. 11/06/2018.
- DOF 2019. *PROYECTO de Modificación a la Norma Oficial Mexicana NOM-039-PESC-2003, Pesca responsable de jaiba en aguas de jurisdicción federal del litoral del Océano Pacífico. Especificaciones para su aprovechamiento*. 25/11/2019 [https://www.dof.gob.mx/nota\\_detalle.php?codigo=5579717&fecha=25/11/2019#gsc.tab=0](https://www.dof.gob.mx/nota_detalle.php?codigo=5579717&fecha=25/11/2019#gsc.tab=0)
- DOF 2022. *ACUERDO mediante el cual se da a conocer la actualización de la Carta Nacional Pesquera*. 26 de Julio 2022.
- Loaiza-Villanueva, R. 2020. *Reporte preliminar. Programa de monitoreo de la fauna de acompañamiento en la pesquería de Jaiba en el corredor biológico-pesquero Puerto Peñasco-Puerto Lobos, Sonora, Mexico*. 2020. [https://fisheryprogress.org/sites/default/files/documents\\_actions/2.1.6%20Bycatch%20monitoring%20program%20report%20nov2020.pdf#overlay-context=node/10491/improvement](https://fisheryprogress.org/sites/default/files/documents_actions/2.1.6%20Bycatch%20monitoring%20program%20report%20nov2020.pdf#overlay-context=node/10491/improvement)
- Rivera-Parra, G., Balmori-Ramirez, A., Garcia-Caudillo, J.M., and Morales-Azpeitia, R. 2022. *Evaluación y estimación de puntos de referencia para las poblaciones de cangrejos (Callinectes spp.) del Golfo de California, México*. *Ciencia Pesquera* (2022) 30 (1-2): 9-23. [https://www.gob.mx/cms/uploads/attachment/file/809802/Ciencia\\_pesquera\\_30\\_-\\_1\\_y\\_2.pdf](https://www.gob.mx/cms/uploads/attachment/file/809802/Ciencia_pesquera_30_-_1_y_2.pdf)

- Torre, J., L. Bourillón y A. H. Weaver. 2004. *La Pesquería de la jaiba verde (Callinectes bellicosus) en la región de Bahía de Kino y Canal de Infiernillo entre 1998 y 2002. Informe Interno. Comunidad y Biodiversidad, A.C. (COBI), Bahía Bacochibampo s/n, Frac. Lomas de Cortés, Guaymas, Sonora, México 85450. +52(622)221-2670, 2212671 www.cobi.org.mx*
- Yozell, S. 2020. *A qualitative Assessment of SIMP Implementation in four countries. STIMSON. <https://www.stimson.org/wp-content/uploads/2020/02/Stimson-Final-Traceability-Report.pdf>*