Assuring the long-term success of the network of fish refuges in the Mexican MAR

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Summary

The 27 months from July 2017 to October 2019 were particularly productive with COBI being able to consolidate, improve and scale our projects in the Mexican Caribbean, nationally and internationally. The spiny lobster fishery remains an excellently managed fishery which is an international example of sustainability and inter-sectorial collaboration, our six partner cooperatives catch approximately 200 tonnes of sustainable lobster per year. The five cooperatives who had the option to renew their fish refuges decided to do so and whilst there was a reduction in the overall area covered by the state´s fish refuges, from 187.8 km^2 to 178.2 km^2, critically spawning habitats for critically endangered grouper species will be protected, a direct application of the biophysical design principles generated during the grant. Six of the eight known fish spawning aggregations are now protected, and 39 potential sites have been characterized. The acoustic sensors for monitoring spawning fish have detected spawning groupers and we are beginning to collaborate with international researchers to expand the program. We have shared our work internationally, at conferences, fishery management meetings and as part of the MARFish spawning aggregation project. We´ve also begun developing new national projects, using the Mexican Caribbean as a testing ground, such as our "*gender equality at sea*" initiative, that includes fishermen and women from Quintana Roo, the "*giants of the past*" project which focuses on the shifting baseline theory and how large fish are disappearing from our seas, and the development of technological applications for fishery management, such as marine reserve costing and evaluation tools, and apps for direct use by fishers such as *pescadata*. Finally, we are seeing our work influence national public policy, with our proposals to include the marine reserve design principles in the modification of the fish refuge law, signing a collaborative agreement with the *Committee on Agriculture, Livestock, Fisheries and Rural Development of the Senate of the Republic*, and training senators, representatives and researchers in the use of sustainable fisheries in Mexico. COBI, also prides itself on its scientific production and during the grant we published 12 peer reviewed articles based on our work in the MAR.

Goals

General objective

Restore coral reef health and the main commercial fish species biomass in the Mexican MAR through the active participation of fishers, the protection of key habitats, the implementation of sustainable fishing practices, and the creation of replicable models that can influence both national and region fishing policy.

Specific objectives and expected results

Objective 1. Promote the implementation of sustainable fishing practices in the Mexican MAR:

1. The Sian Ka´an and Banco Chinchorro lobster fishery continues to be sustainable through its participation in a Fishery Improvement Project (FIP).
2. Sustainable practices are replicated in another fishery site in the Mexican MAR (Yum Balam).
3. Three new cooperatives in the Mexican MAR are identified to implement the next generation of fish refuges.

Objective 2. Support fishing cooperatives to be successful in financing initiatives of conservation and sustainable practices:

1. Mexican MAR lobster fishing cooperatives are aware of new options of sustainable markets.
2. The cost of implementing and maintaining fish refuges and sustainable fishing is known and shared among fishers.
3. At least one cooperative implements a strategy for the financial sustainability of their sustainable fisheries and fish refuges initiatives.

Objective 3. Protect fishing grounds, coral reefs, and Fish Spawning Aggregations (FSA) sites in the MAR from Tulum in the center to the Belize border in the south, through a network of fish refuges:

1. The 13 fish refuges established in 2012/13 are renewed for five more years.
2. Climate change monitoring (temperature and salinity) is incorporated in to the fish refuge monitoring program.
3. 50% (approx. 25 sites) of the grouper/snapper FSA sites in the Mexican MAR (from Tulum in the center to the Belize border in the south) are characterized and validated by fishers and COBI.

Objective 4. Scale up COBI's demonstrative models in public fishing policy in the Mexican MAR and at national scale:

1. The lobster fishery model developed in Sian Ka´an and Banco Chinchorro inspires other fishers in the MAR and decision makers to meet sustainability standards.
2. Design principles for fish refuges in the MAR are created through a collaborative process involving the four MAR countries.
3. Promote gender equality in fishing communities through capacity-building and an analysis of women's role in the lobster fishery[1].
4. Design a National Social-Impact (Generative) Network of best fishing practices with our community partners[1].

[1] Objective added July 2018

Project progress

During the grant period we worked in the field throughout the state of Quintana Roo and

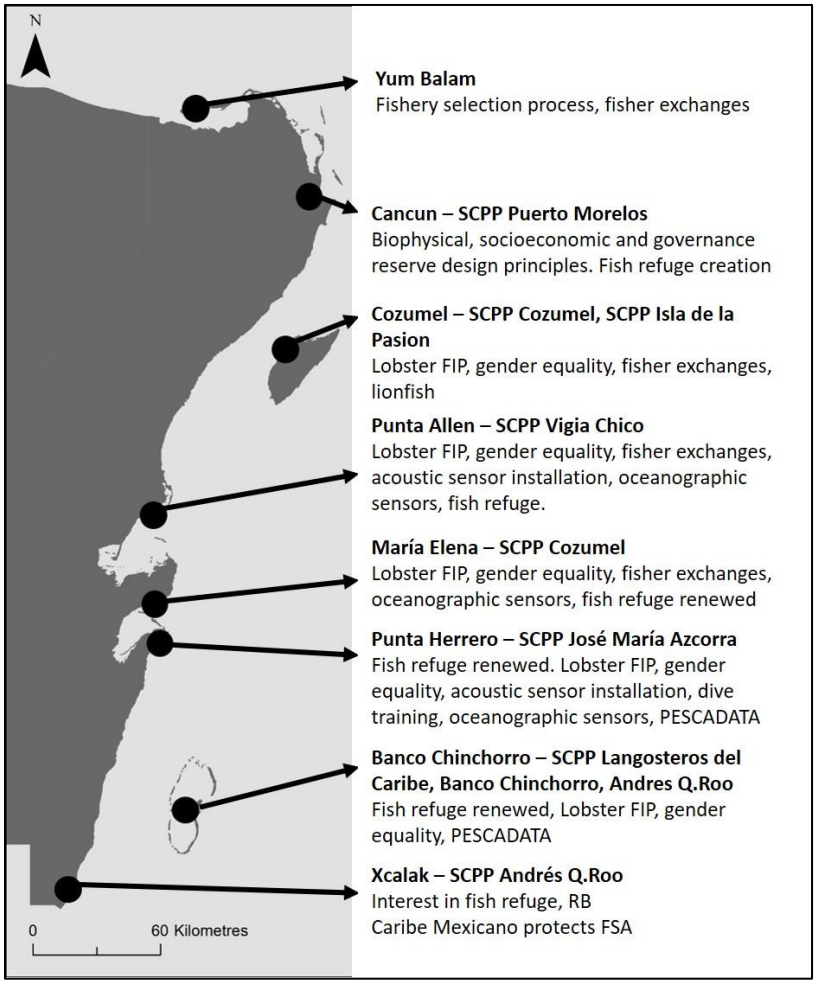

Figure 1 Map and summary of fishing communities, cooperatives and activities during the grant period

O1 Promote the implementation of sustainable fishing practices of the cooperatives in the Mexican MAR.

Fishery Improvement Project (FIP) work plans (annex O1-1, O1-2) were developed for three years (2017-2020) in collaboration with six fishing cooperatives[2], CONAPESCA, INAPESCA, CONANP, ECOSUR and invited civil society organizations[3] (O1-3,O1-4). Dr. Eloy Sosa from ECOSUR completed a stock assessment and continued fishery monitoring each year (O1-5). The stock can be seen to be healthy and within the recommended limits for the majority of the past

[2] SCPP Pescadores de Vigía Chico, Cozumel, José María Azcorra, Pescadores de Banco Chinchorro, Andrés Quintana Roo, Langosteros del Caribe.
[3] Razonatura, Healthy Reefs Institute

30 years. In addition, we worked with programmers to develop an application - PESCADATA (https://pescadata.org/) including 21 species of commercial interest (lobster, finfish, conch, octopus etc.) and 36 catch areas on the coast of Quintana Roo and Yucatan (O1-6). The app has been piloted by the six cooperatives from Sian Ka´an and Banco Chinchorro (as well as in other areas of Mexico, including Campeche, the Gulf of California and Pacific Baja California) and the results obtained from the fishery logbook in PESCADATA will allow fishers to see the trends in catches by species, the sites with the highest fishing frequency and the sizes captured over time. We are currently working with sphaera.world to develop an integrated digital strategy for COBI that will include the PESCADATA app as a centrepiece, but also social networking (see O4) and sharing mechanisms for climate change adaptation, marine reserves and more. Fishing monitoring is a fundamental part of achieving improvements in a FIP. This had been funded by philanthropy during the early stages of the project. Funders such as Oak Foundation and Summit Foundation have played an important role covering these monitoring costs as the FIP progressed to maturity. During the last two years this has changed, with fishers investing in fisheries monitoring by financing three months fisheries monitoring with ECOSUR in Banco Chinchorro (see O3).

We conducted a workshop with 35 fishers from two cooperatives from Yum Balam in September 2017 to collect the information necessary for the analysis and selection of the most suitable fishery. We analysed seven fisheries with grouper, lobster and permit fisheries scoring highest for suitability and, based on this and the market possibilities identified by the fishers, we selected the lobster fishery for further work (O1-7, O1-8). We have not progressed further with the lobster fishery in Yum Balam as we have not been able to secure long-term funding. Components of the analysis included fisheries indicators (for example total catch, seasons and markets), biological indicators (susceptibility of the fishery to overfishing) and social indicators (conflicts and governance). We used Delphos software, developed by COBI and EcoTrust, to perform the multicriteria analysis.

The first of two fisher exchanges was held in February 2018 to share information on the lobster fishery. Eight fishers from two cooperatives in Yum Balam visited Punta Allen and then Maria Elena in Sian Ka´an to see how the cooperatives operate (O1-9). We conducted the second fisher to fisher exchange with eight fishers from Cozumel, María Elena and Punta Allen from 22-30 November 2018 (O1-10). We did not involve Yum Balam fishers in this exchange for three reasons: 1) changes in the leadership of some of the cooperatives in Yum Balam, 2) the secession of two of the cooperatives from the state Federation of cooperatives due to internal differences, and 3) a lack of match funds for COBI to provide continuity to our work in Yum Balam. The fishers that participated in the exchanges shared information on their fisheries, the fish refuges that they have established and how to control and monitor the lionfish population in their fishing grounds[4].

Through the actions of COBI and other members[5] of the Kanan Kay Alliance (KKA) we reached out to 21 of the 25 registered fishing cooperatives in the State of Quintana Roo. The Federation of Cooperatives helped provide an overview of the current situation of each of its cooperative members (O1-11). Of particular importance is the fact that all the newly approached cooperatives (n=13) are based in the north of the state, an area of great importance for the next generation of fish refuges. Seven cooperatives have already committed to creating marine reserves, and the SCPP Pescadores de Puerto Morelos completed the process by creating a nine-hectare fish refuge in Cancun, with support from CONANP, in April 2018 (O1-12). In Cozumel

[4] Video 1 - https://youtu.be/KCkQQoQlJOM Video 2 - https://youtu.be/Z9GZyf5mnok
[5] Healthy Reefs Initiative, CONANP, CONAPESCA, SCPP Cozumel, SCPP José María Azcorra

the SCPP Isla de la Pasión, COBI, the KKA and CONANP met on four occasions during the grant to discuss potentially creating new fish refuges. Results of these meetings have been twofold. Firstly, we have helped CONANP and the SCPP Cozumel formalize discussions with the SCPP Isla de la Pasión, a cooperative that was previously forgotten about and had a reputation for not respecting the MPA and closed seasons. Secondly, the SCPP Isla de la Pasión welcomed this approach, and has shared information about the location of potential fish spawning aggregation sites and has already begun discussing potential areas of new fish refuges. We will continue to follow up on their interest through our actions with the Kanan Kay Alliance.

The SCPPs Por la Justicia Social, Caribe, Isla Blanca, Pescadores de Makax, and Patria y Progreso created a 1,367 ha community marine reserve for lobster in partnership with the NGO Seacology near Isla Contoy[6]. COBI is not involved in the operation of the zone. Finally, current COBI partner, SCPP Andrés Quintana Roo, from Xcalak, had previously expressed interest in creating a fish refuge in its fishing grounds. The cooperative already participates with the fish refuge in Banco Chinchorro but would like to implement a fish refuge in Xcalak. Preliminary discussions with the cooperative at the start of this trimester highlighted the fact that the main goal of the cooperative was to create a fish refuge as a mechanism to control illegal fishing. However, as creating a fish refuge does not guarantee that CONAPESCA will implement enforcement, and as Xcalak already has several no take zones as part of the MPA we have not prioritized fish refuge creation in this area.

It is important to mention that, despite the interest of many cooperatives in creating fish refuges, COBI will only enter into a project if a long-term vision, including funding is secured. We prefer to develop long-term projects that can become self-sustaining and not end when philanthropic funding runs out. For this reason, we have yet to continue along the steps to create marine reserves or start sustainable fisheries projects in some of the communities mentioned.

Finally, during 2017 and 2018 we provided information to CONANP to justify the inclusion of two fish spawning aggregation sites in the subzoning of the Mexican Caribbean Biosphere Reserve. COBI´s information was used, and two sites were protected, including one near Xcalak.

Conclusions: The Sian Ka´an and Banco Chinchorro lobster fishery is close to completing its FIP process and COBI is applying an exit-strategy. The second fishery (lobster in the north of Quintana Roo) has been selected and the groundwork set for future FIP implementation (including fisher exchanges and creating links with the other FIP cooperatives). However due to a lack of long-term funding we have yet to begin this FIP. Twenty one of the 25 cooperatives in the state have participated in discussions regarding marine reserve implementation and at present 12 have implemented bottom-up spatial management schemes for marine conservation.

List of Deliverables:

- O1-1 Work plan: FIP 2017
- O1-2 Work plan: FIP 2018-2020
- O1-3 Report: FIP 2018
- O1-4 Report_ FIP 2019
- O1-5 Report: Lobster monitoring report 2018
- O1-6 Information sheet: PescaData

[6] https://www.seacology.org/project/contoy-island/

- O1-7 Report: Yum Balam fishery selection process (including list of participants and photos)
- O1-8 Report: Presentation of results of fishery selection
- O1-9 Report: Yum Balam fisher exchange
- O1-10 Report: Sian Ka´an fisher exchange
- O1-11 Report: Areas of opportunity for new fish refuges
- O1-12 Decree: Canal Nizuc fish refuge
- Photos: FIP and Fisher Exchange

Additional relevant resources:

- Website: FIP progress https://fisheryprogress.org/fip-profile/mexico-quintana-roo-spiny-lobster-casitas
- Website and App: https://pescadata.org/
- Management plan Mexican Caribbean Biosphere Reserve

O2 Support fishing cooperatives to be successful in financing initiatives of conservation and sustainable practices.

Two workshops were held to establish connections between buyers and fishers. The first workshop "*Co-creation of sustainable fishing: solving market access challenges*" (O2-1), in Mexico City in November 2016 had four objectives that were met successfully:

1) Connecting the work of the cooperatives with the current needs and challenges of the market.
2) Providing tools to cooperatives that allow them to improve their marketing skills.
3) Generate a connection between different stakeholders in the lobster value chain.
4) Encourage the possibilities of new commercial relationships between producers and future buyers.

In March 2018, in Cancun, the "*2nd Workshop for the co-creation and commercialization of sustainable fishing: Lobster*" was held (O2-2). The aim was to open potential new marketing channels for lobster and establish new methods to follow up on the challenges posed by the commercialization of sustainable fishing products. A total of 58 people participated in the workshop, representing hotels, chefs, producers, fishers, funders, and civil society organizations (CSOs) with knowledge of the fishery and commerce. With NUUP a list of fishers and buyers (O2-3), plus cooperative fact sheets were prepared (O2-4). While fishers have explored some of the options, and some new market connections made (for example the Cozumel Cooperative shipping to Mexico City), the cooperatives are relatively cautious about taking risks with new buyers, often preferring not to lose current connections.

We completed the development of the costing application for marine reserves (O2-5). It is now available as an open-source program[7] and in November 2018 we conducted a training course (O2-6) for 14 people from 11 organizations based in Mexico, Belize, Guatemala and Honduras. The course included the MAREA marine reserve evaluation App[8]. In August 2019 we also shared this information with the Cozumel cooperative to help them prepare a proposal for direct CONAPESCA funding.

Our work to develop a fund specifically for marine reserves and sustainable fishing has not been

[7] https://turfeffect.shinyapps.io/AppCosteo/
[8] https://turfeffect.shinyapps.io/marea/

100% successful as we have not found an effective way for the cooperative to manage the fund, including adequate safeguards to prevent misuse. The Cozumel Cooperative did agree to implement the fund in the future (O2-7, O2-8), however, as a direct measure, and for the first time, the three cooperatives invested $1,000 dollars each in 2018 and 2019 ($6000 total) to cover the fishery monitoring with ECOSUR. This is the first time the cooperatives invest in this, and, in addition, the fishers provided lodging and food (for technicians) during the monitoring activities. This allows both main goals of the fund to be met – 1) the monitoring costs are covered, and 2) clear and simple accounting, and will be continued in coming years as part of the FIP agreements.

At the same time, at the national level Fondo Mexicano para la Conservación de la Naturaleza (FMCN) was working with WWF, CONABIO, CONANP, CONAPESCA, CONAFOR (National Forestry Commission), INNECC (National Ecology and Climate Change Institute), SEMARNAT (Environmental Ministry), on a large initiative which included a marine sustainability fund, as well as components for fish refuges and other no-take zones, and endowments for monitoring and surveillance. For this initiative, COBI compiled the information, in collaboration with Gulf of California NGOs, CEDO & Niparajá, and provided the justification and cost scenarios towards maintaining and expanding the networks of fully-protected marine reserves in Mexico. However, this process came to an end following the federal administration change at the end of 2018. FMCN has since offered technical support for the marine reserve fund creation with a signed agreement (O2-9). We suggested aligning the fund with the PROMAR fund (for marine conservation, restoration, research in CONAPESCA) that is already included in the Fisheries Law (LGPAS) but has not yet been activated. We then met with the new CONAPESCA Commissioner (Raul Elenes) in March and proposed activating the PROMAR fund. To our surprise, the Commissioner had recently discussed this directly with the president and suggested creating a working group for PROMAR. We will provide follow-up on the Commissioner´s suggestion. In parallel we have also held discussions with CONABIO (Comisión Nacional para el Conocimiento y Uso de la Biodiversidad) to explore options with their trust funds for environmental restoration. This work will continue beyond this grant as we look for sustainable financing solutions for marine reserves.

We also analysed all of COBI´s partners´ marine reserves in Mexico from a financial perspective (O2-10). How much does each reserve costs and what options are available to finance them? The MAR network of marine reserves (15 reserves covering 178 km^2) requires $1,021,764 pesos ($53,000 USD) per year to complete the biophysical monitoring.

Conclusions: Our 2025 goal is that the conservation and sustainable fishing initiatives of the six cooperatives in Sian Ka´an and Chinchorro are financially independent from philanthropic funding and can maintain their reserves and sustainable fisheries indefinitely. Three of the cooperatives are already contributing to monitoring costs in Banco Chinchorro (paying $1000 USD each per year). Our work to create a national fund for marine reserves that can contribute to these monitoring costs is on track, with agreements with FMCN, discussions with CONAPESCA and costing exercises for each activity.

List of Deliverables:

- O2-1 Report: Workshop 1 Co-creation of sustainable fishing
- O2-2 Report: Workshop 2 Workshop for the co-creation and commercialization of sustainable fishing Lobster
- O2-3 Fact sheets: six cooperatives
- O2-4 List: fishers and buyers on NUUP database

- O2-5 Tool: Excel costing
- O2-6 Online costing tool: https://turfeffect.shinyapps.io/AppCosteo
- O2-7 Agreement: Signed agreement with SCPP Cozumel for fund
- O2-8 Report: Fund work plan with SCPP Cozumel
- O2-9 Agreement: Signed agreement with FMCN
- O2-10 Report: How much does my marine reserve cost?

Additional relevant resources:

- Training materials: MAREA and costing app (https://jcvdav.github.io/curso_marea/)

O3 Protect fishing grounds, coral reefs, and Fish Spawning Aggregations (FSA) sites in the MAR (from Tulum in the center to the Belize border in the south) through a network of fish refuges.

The 13 fish refuges that were up for their five-year renewal during the grant period have now been renewed. Each site was monitored by a group of fisher citizen scientists (75 men and six women) during 2017, 2018 and 2019.

- Maria Elena, Sian Ka´an – Eight fish refuges (11.9 km^2) were renewed at the beginning of the grant period (O3-1, O3-2, O3-3).
- Punta Herrero, Sian Ka´an – The cooperative had four fish refuges (11.2 km^2) however following nine months of negotiations, three fish refuges will not be renewed, whilst the remaining fish refuge will be expanded (1.6 km^2) to cover newly discovered grouper and snapper spawning sites. The three sites that are not being renewed have not shown improvements during the five years of establishment and do not meet the standards for site selection set by the design principles. The renewal was published in August 2019 (O3-4, O3-5, O3-5).
- Banco Chinchorro – the 122.6 km^2 fish refuge was renewed in May 2019 after the three cooperatives agreed to renew the site (O3-7, O3-8, O3-9).

A complete monitoring report was completed (O3-10)

We completed the characterization of all the FSA sites in the Mexican MAR (O3-11). Thirty-nine sites have been visually explored by trained small-scale fishers (45 fishers from six cooperatives) and bathymetric maps created. Eight[9] of the sites have been confirmed to host spawning fish and six are now protected (with no take area covering 59.9 km^2) (O3-12, O3-13). We monitored four of the known and protected FSA sites in Punta Allen (two sites) and Punta Herrero (two sites), with the local fishing community during the spawning periods for grouper (December-March) and snapper (May-July) in 2017, 2018 and 2019. We also trained 19 fishers from Punta Allen, Xcalak, and Chiquila, including four women to join the monitoring teams between February and July 2017. We have now effectively characterized all of the FSA in this region (with the exception of Banco Chinchorro, see *obstacles*) and with support from MARFund/FMCN[10] we were able to characterizing nine sites in Cozumel and Puerto Aventuras, creating bathymetric maps and including all the sites in a priority conservation index.

We have also begun to implement technological advances that will increase the ease and effectiveness of our FSA monitoring program. We have installed seven oceanographic sensors in four fish refuges (O3-14, O3-15) that measure temperature and one sensor that also measures sea level height. Five fishers took part in the installation and we are collaborating with ECOSUR

[9] Previously reported as nine sites, we have revised this to eight as one no take zone protects the spawning areas of grouper and snapper, in an area that was previously considered to be two separate sites.
[10] A1705006 MEX 9-018

and UNAM to calibrate and maintain the sensors. An acoustic sensor was installed in Punta Allen in late 2017. Ten fishers have been trained to use it. With complementary funding we were able to acquire two more acoustic sensors to install in Punta Herrero and Xcalak FSA. Until now poor weather and uncertainty over the exact spot of the FSA has held back deployment of the sensor. The acoustic sensors allow us to simultaneously monitor several sites at the same time, even during bad weather, which is common during grouper spawning season (December-March) that can prohibit SCUBA monitoring with the fishers.

In May 2017, we conducted a fisher exchange to Belize, in collaboration with Dr. Will Heyman and Southern Environmental Association (SEA) to share experiences between three Mexican fishers and Belizean counterparts. The fishers saw how long-term monitoring has occurred, how tourism can operate at FSA sites and the benefits and problems associated with both.

Conclusions:

Target 2018	**2018 Value reached**	**Comments**
Target lobster abundance: 580ind/ha	2018 lobster abundance: 190ind/ha	Lobster abundance deceased in the fish refuges during this period, but catches remained stable.
Target commercial fish biomass: 175g/m^2	2018 commercial fish biomass: 66g/m^2	Commercial fish biomass decreased significantly in both the fish refuges and fishing sites. We believe the sargassum influx is related.
Target coral cover: 14.4%.	2018 coral cover: 11.9%	Coral cover declined slightly but remains in line with MAR averages.
60 fishers from six cooperatives participate in the search for FSA	45 fishers from six communities have been trained to SCUBA dive and monitor FSA sites. An additional 20 fishers have participated as captains and assistants.	Fisher participation continues to be a key component of successful conservation.
By 2025, 20,000ha are protected in the MAR	In 2018, 80,701 ha of the MAR is protected from fishing, protecting 6/8 FSA sites	The area under protection has increased significantly during the grant period, with a combination of fish refuges and core zones of MPAs (eg. The RB Caribe Mexicano)

Despite the area under protection increasing significantly, reef health continues to decline. The huge amounts of sargassum that arrived on Mexican shores in 2018/2019 appears to have affected the fishery and reef health. The new coral disease (SCTLD) that is spreading through the Caribbean will only make this worse. These threats, and the continued decline in reef health, highlight the need for new methods for conservation. What we are doing is not working. This forms part of COBI´s 2020 strategy – how can we work with fishers to adapt to a changing world, whilst maintaining sustainable practices?

List of Deliverables:

- O3-1 Decree: Renovation María Elena
- O3-2 Report: Fish Refuge renewal workshop Sian Ka´an
- O3-3 Data Report: María Elena 2012-2017
- O3-4 Proposal: Fish Refuge Punta Herrero
- O3-5 Decree: Renovation Punta Herrero
- O3-6 Data Report: Banco Chinchorro 2013-2018
- O3-7 Proposal: Fish Refuge Banco Chinchorro

- O3-8 Decree: Renovation Banco Chinchorro
- O3-9 Data Report: Punta Herrero 2013-2018
- O3-10 Data report: Fish Refuges 2018
- O3-11 Report: FSA protection viability index
- O3-12 Map: All mapped FSA sites
- O3-13 Map: Verified FSA sites
- O3-14 Data report: Sensor data
- O3-15 Report: Sensor training
- Sounds: grouper spawning sounds

O4 Scale up COBI's demonstrative models in public fishing policy in the Mexican MAR and at national scale.

To scale our experience with the sustainable lobster fishery we organized a training course ("*training course for sustainable fishing and promoting fishery evaluation*") for 30 people, including of our staff, INAPESCA staff from regional offices around the country, CONAPESCA and senators from the Senate Fisheries Commission (O4-1, O4-1a). The Marine Stewardship Council in Spain provided the instructors and the course was held in March 2019 in Mexico City. This has allowed COBI and the government to better implement standards in the MAR region, and in Mexico generally (by having the "in-house capacity"), but it does present a diversion from our project activity 4.1 as we did not conduct the workshop in the north of Quintana Roo. This was for two reasons, 1) we were unable to secure complementary funding[11] to work in the Yum Balam area for 2018, and 2) it will allow us to have a wider impact, across the country into the future.

The biophysical design principles for marine reserves in the MAR were completed in 2017 (O4-2, O3-3) and published in English and Spanish. With a consultant, we ran a gap analysis exercise (O4-4) using the design principles to see if Quintana Roo´s marine reserve network meets the standards. Overall, the 72 no take zones in the region (from both CONANP and CONAPESCA): 1) protect 14% of the coral reef and 13% of the sea grass (target 20-30%); 2) are well distributed along the coast; 3) are on average too small to protect the life history of key species, and 4) have been established long enough to create biological impacts. We are now replicating this nationally.

In June 2018 we held a two-day workshop in Cancun with 31 participants from 18 organizations (including fishing cooperatives, civil society, researchers and governmental conservation and fisheries agencies) to create and adapt the socioeconomic and governance design principles for the Mexican Caribbean. This work was published as a workshop report (O4-5). In parallel, COBI has been working to incorporate the design principles into the national agenda. We have now developed biophysical, socioeconomic and governance design principles for Mexico´s three main marine ecosystems (rocky reef, coral reef and kelp forest). In 2019, the Norma-049[12] (which regulates the creation of fish refuges by CONAPESCA) was five years old and could be opened to review or modification. In October 2018 COBI, along with cooperatives from Baja California and the MAR sent letters to CONAPESCA asking them to include the revision of the law in the 2019 work plan. It was included and we made a technical proposal in collaboration with other CSOs (Niparaja, EDF, TNC and CEDO) based on the design principles and our

[11] From the MARFund small grants program
[12] http://www.dof.gob.mx/nota_detalle.php?codigo=5340568&fecha=14/04/2014

collective experience with fish refuges (O4-6). The new NOM-049 is currently in public consultation and includes references to the design principles.

For gender equality, we organized an innovative workshop (the Civic Laboratory) to facilitate civil society's participation in building an action plan to address gender inequality in fisheries. The workshop was held in September 2018 in Mexico City with 20 participants (18 women, two men) (O4-7). The principle problem addressed was related to the lack of high-quality data about women's participation in different paid and unpaid activities within the fisheries production chain. Women's contributions are often not acknowledged, resulting in low participation of women in decision-making. The working group ("civic team") decided to work collectively towards developing a methodology based on international best practices, with indicators that evidence the contribution of women in the fishing sector. During 2019, we gathered literature, methodologies and indicators from national and international public policies. We will continue to analyse the information which will be completed in 2020, to co-design a comprehensive methodology for public agencies (e.g. Instituto Nacional de las Mujeres, Instituto Nacional de Estadística y Geografía, Consejo Nacional de Evaluación de la Política de Desarrollo Social) to adopt in order make visible women's contributions and hence reduce gender inequality in fisheries.

We also held a workshop with the Cozumel Cooperative to analyse women and men´s roles in the lobster's value chain (O4-8). This workshop took place in Cozumel, during June 2018 with 35 participants (11 women, 24 men). Different participatory dynamics where proposed in order for participants to develop critical thinking regarding sex and gender social-constructions. After collectively building the value chain diagram, the cooperative noted that the fishery lobster employs (O4-9, O4-10):

- 6 women and 147 men, working directly in the lobster fishery.
- 71 women and 2 men, working part-time and indirectly in the lobster fishery.

Direct jobs include pre-harvesting (fishing gear preparation, infrastructure and boat maintenance), harvesting (marine resource extraction) and post-harvesting activities (processing, size-sorting, quality inspections, commercialization). Indirect jobs include administrative work (permits, insurance, accounting), cleaning and hygiene, and transportation.

In August 2018, Inés López (COBI Capacity Building Coordinator) was accepted into the MAR Leadership program, teamed with fishers and conservation practitioners from Mexico and Honduras, to design the principles of the social-impact (regenerative) network. This led to understanding that an assessment of previous collaboration dynamics with fishing organizations was needed in order to co-design a solid community-based social impact network. Thus, a workshop with MAR community members in December 2018, in Tulum, was organized to start the co-design process. Five fishing organizations (out of six in the region) from four fishing communities were represented by 12 people (10 men, two women). This process was replicated in other regions of Mexico (Baja California and Gulf of California) with support of additional funding (O4-11). The network will continue to operate beyond the grant financing period using the digital infrastructure discuss in O1, and it will be scaled and developed for national impact.

Finally, we have been working on creating products that use our experience from the Mesoamerican Reef that we can apply throughout Mexico. These include national protocols for marine reserve monitoring, spawning aggregation monitoring, oceanographic monitoring and a national website focused on the protection of top predators called Giants of the Past. This final product is now the central hub for information, in Spanish, on large marine predators (such as

groupers and snappers and others listed on the IUCN Red List) for Latin America. Similarity, we have provided technical support to CONABIO to review and improve the information on the conservation and fishing status of more than 600 fish species[13].

Conclusions:
Our 2025 goal is that our participatory models are being replicated in the MAR and beyond. To date, we have been able to create design principles for marine reserves for each of Mexico´s key ecosystems which have been included in to Mexican law; a gender equality program that is generating interest internationally[14]; and we have trained Mexican decision makers in sustainable fishing standards. COBI´s impact is clear, of the 43 fish refuges created in all of Mexico, COBI has been involved in 72%; of the FIP processes, COBI has been involved in 38% (9/24).

List of Deliverables:

- O4-1 Report: Training course of sustainability standards MSC
- O4-2 Report: Biophysical design principles for marine reserves
- O4-3 Report: Biophysical design principles workshop
- O4-4 Report: Biophysical design principle gap analysis.
- O4-5 Report: Socioeconomic and governance design principles for marine reserves
- O4-6 Proposal: NOM-049 with design principles.
- O4-7 Action Plan: Civic Lab
- O4-8 Report: Gender and Value chain
- O4-9 Infographic: Cozumel Value chain and gender
- O4-10 List: Value Chain participants
- Photos: Civic Lab, Design principles and value chain

Additional relevant resources

- www.igualdadenelmar.org
- www.gigantesdelpasado.org
- www.biodiversidad.gob.mx/usos/alimentacion/peces/

Obstacles

At the regional and national level, this period was dominated by the presidential elections. The current federal administration ended in 2018 and a new six-year presidency has begun. In Mexico, this often creates a bipolar situation in the government, ranging from full paralysis to rapid actions and results, with no clear strategy, as was noted with the closure of the exiting government. The new president is, for the first time, from a leftist party, and his party (MORENA) also have a majority in the Senate and Lower Chamber, which creates both opportunity and uncertainty, particularly as it is becoming apparent that his party lacks experience in office.

Luckily for our work in the Mexican Caribbean, many of the conflicts between conservation and fisheries (such as the Upper Gulf of California/Vaquita, Golfo de Ulloa fish/wildlife refuges, seabed mining, and a possible MPA around the whole of Baja California Sur) are not present in this region. One local consequence of the rapidly changing government decisions, was CONAPESCA´s approval of a project submitted by two cooperatives and COBI in April 2018 for US$60,000, on the back of the CONAPESCA commissioner's declaration in the World Ocean

[13] http://www.biodiversidad.gob.mx/usos/alimentacion/peces/
[14] Including Ecuador and Guatelama,

Summit held in Cancun in March 2018 in which he said that CONAPESCA´s budget for fish refuge work would be increased 50%. However, in October CONAPESCA informed us that they had run out of budget and the project had been cancelled. Whilst the project could be considered again in the future, it created expectations amongst the fishers that they were going to receive government support for their conservation actions. During 2020, with support from UNDP, we will be working with the fishers to improve their proposal writing, follow up and project management skills to try to increase their success.

The market aspect of the project has proven to be more complicated than expected. The results from NUUP for the first analysis of buyers showed a lower than expected level of interest in sustainable products at the national level and there is a severe disconnect between fishers and buyers relating to payments (fishers tend to live day to day, but big buyers can deposit months after the purchase) and professionalism (fishers need to operate a professional operation with high quality products, packaging and timely delivery for high-end chains).

Links with other organizations

We continue to work closely with the Kanan Kay Alliance[15]. At the start of the grant period, Ines Lopez was the Kanan Kay Alliance Coordinator, and Stuart Fulton the Kanan Kay Alliance Executive Coordinator. COBI decided to reduce its influence over the Alliance and allow the Alliance to operate more independently, both technically and financially. A new Executive Coordinator was hired in July 2018 but did not complete the trial period. More recently Minerva Rosette has joined the AKK from CEMDA as Executive Coordinator. Jacobo Caamal is now the coordinator of the fish refuge group and Inés López has joined the socioeconomic development group.

At the national level we have developed an excellent relationship with the senate fisheries commission, through the presidential transition, as well as maintaining a strong working relationship with CONAPESCA and INAPESCA at the national level, even if the relationship is weaker at the state level.

Scientific production

This period was a particularly productive time for applied conservation science. In 2018 COBI published 22 peer reviewed scientific papers and below we include the relevant papers from this grant period:

Ayer, A., Fulton, S., Caamal-Madrigal, J. A., & Espinoza-Tenorio, A. (2018). Halfway to Sustainability: management lessons from community-based, marine no-take zones in the Mexican Caribbean. Marine Policy, 93, 22-30.

Chollett, I., Garavelli, L., Holstein, D., Cherubin, L., Fulton, S., & Box, S. J. (2017). A case for redefining the boundaries of the Mesoamerican Reef Ecoregion. *Coral Reefs*, *36*(4), 1039-1046.

Cuevas Gómez G.A., E. Gastélum Nava, Iastro, A. Hernández Velasco, S. Fulton, F.J. Fernández Rivera Melo, l. Rocha Tejeda, A. Hudson Weaver, M.J. Espinosa Romero. 2019. México y la pesca: Conociendo las herramientas de manejo. Biodiversitas. 146

Espinosa-Romero, M. J., Torre, J., Zepeda, J. A., Solana, F. J. V., & Fulton, S. (2017). Civil society contributions to the implementation of the small-scale fisheries guidelines in Mexico. In *The small-scale fisheries guidelines* (pp. 423-449). Springer, Cham.

[15] www.alianzakanankay.org

Fernández Rivera-Melo FJ, L Rocha-Tejeda, E Gastélum-Nava, N Goldman, JB Sánchez-Cota, C Ortiz-Lugo, A Gómez-Gómez y MJ Espinosa- Romero (2018). Criterios de sustentabilidad pesquera: una guía fundamental para conservar los recursos pesqueros en México. Biodiversitas (140) 8-11.

Fernández Rivera-Melo FJ, Rocha-Tejeda, L., Cuevas-Gómez, G. A., Gastélum-Nava, E., Sánchez-Cota, J. B., Goldman, N., & Espinosa-Romero, M. J. (2018). Criterios internacionales de sustentabilidad pesquera:¿ Dónde estamos y qué necesitamos para mejorar?. *Ciencia Pesquera*, *26*(2), 65-88

Fulton, S., Caamal-Madrigal, J., Aguilar-Perera, A., Bourillón, L., & Heyman, W. D. (2018). Marine Conservation Outcomes are More Likely when Fishers Participate as Citizen Scientists: Case Studies from the Mexican Mesoamerican Reef. Citizen Science: Theory and Practice, 3(1).

Fulton, S., Hernández-Velasco, A., Suarez-Castillo, A., Fernández Rivera-Melo FJ., Rojo, M., Sáenz-Arroyo, A., ... & Torre, J. (2019). From Fishing Fish to Fishing Data: The Role of Artisanal Fishers in Conservation and Resource Management in Mexico. In *Viability and Sustainability of Small-Scale Fisheries in Latin America and The Caribbean* (pp. 151-175). Springer, Cham.

Fulton, S., López-Sagástegui, C., Weaver, A. H., Fitzmaurice-Cahluni, F., Galindo, C., Fernández-Rivera Melo, F., ... & Torres-Bahena, E. (2019). Untapped Potential of Citizen Science in Mexican Small-Scale Fisheries. *Frontiers in Marine Science*, *6*, 517.

López-Ercilla, I., López-Sagástegui, R. 2018. Las mujeres y el sector pesquero en México. DataMares. InteractiveResource. https://doi.org/10.13022/M30K9N

López-Ercilla, I., Solano, N., Marcos, S., Valdez, D. (2019): Participación de las mujeres en la cadena de valor de tres pesquerías ribereñas en México. DataMares. InteractiveResource. https://doi.org/10.13022/M33357

Marcos-Camacho, S. A., Nalesso, E., Caamal-Madrigal, J. A., & Fulton, S (2017). Caracterización de la pesquería de tiburón en el norte de Quintana Roo, México.

Palacios-Abrantes, J., Cisneros-Montemayor, A. M., Cisneros-Mata, M. A., Rodríguez, L., Arreguín-Sánchez, F., Aguilar, V., ... & Rivera-Campos, R. (2019). A metadata approach to evaluate the state of ocean knowledge: Strengths, limitations, and application to Mexico. *PloS one*, *14*(6), e0216723.

Villaseñor-Derbez, J. C., Aceves-Bueno, E., Fulton, S., Suarez, A., Hernández-Velasco, A., Torre, J., & Micheli, F. (2019). An interdisciplinary evaluation of community-based TURF-reserves. *PloS one*, *14*(8), e0221660.

Villaseñor-Derbez, J. C., Faro, C., Wright, M., Martínez, J., Fitzgerald, S., Fulton, S., ... & Torre, J. (2018). A user-friendly tool to evaluate the effectiveness of no-take marine reserves. *PloS one*, *13*(1), e0191821.

Project development table

Objective	Output / Expected Result	Activity	Trimester								No-cost extension				Performance indicator	Sources and means of verification	Impact Indicator	Assumptions & risks	% of Completion
			1	2	3	4	5	6	7	8	1	2	3	4					
O1 Promote the implementation of sustainable fishing practices of the cooperatives in the Mexican MAR.	The Sian Ka´an and Banco Chinchorro lobster fishery continues to be sustainable through its participation in a Fishery Improvement Project (FIP).	1. Update, validate and implement the FIP through multi-sectoral collaboration (cooperatives, federation, local and federal government and OSCs). 2. Update and implement the FIP for 2019 and ensure long-term continuity[16].	X	X	X	X	X	X	X	X	X	X	X	X	(3) Meetings with the fishers, technical working group (COBI, ECOSUR, INAPESCA, CONANP) and fish buyers from Sian Ka´an.	Updated FIP document uploaded to https://fisheryimprovementprojects.org/ [17] Minutes and presentations (ppt) from meetings with fishers, technical working group and buyers to develop FIP, List of participants and photos.	By 2018, two fisheries (lobster and newly selected fishery) will participate in Fishery Improvement Projects (sustainable fishing practices). By 2025 the 25 fishing cooperatives that form the Federation of Cooperatives of Quintana Roo (2,000 fishers) have committed to and are implementing sustainable fishing practices that are reflected in fishery stock and ecosystem health.	Assumptions rely on continued ecosystem health/minimal impacts of climate change on the fisheries. Contact has been made with the Federation to measure interest, however individual cooperatives may not show sufficient interest in implementing new practices if the goals are unclear.	100% The 2018 and 2019 work plans were updated and implemented with the fishing communities and researchers
	Sustainable practices are replicated in another fishery site in the Mexican MAR (Yum Balam)	1. To collect data of lobster, grouper and octopus' fisheries to run a multicriteria analysis using Delphos program 2. Run the multicriteria analysis using Delphos to select another fishery based on standards for sustainable fishing in the Mexican MAR to start in a FIP.			X	X	X	X							(2) Visits are held in Yum Balam with the fishing cooperatives to collect data. (1) Meeting to run the Delphos analysis with the fishers to select the most appropriate fishery in Yum Balam.	A final report including a description of the analysis, selection process for the fishery, and the involvement of the fishing cooperatives. Minute, photos from meeting and list of participants			100% We have conducted two visits to Holbox the Delphos analysis to select the fishery.
	Three new cooperatives in the Mexican MAR are identified to implement the next generation of fish refuges.	1. To identify with the federation three cooperatives to implement the new generation of fish refuges. 2. To disseminate the ecological and economic benefits of the fish refuge.			X	X	X	X							(1) Meeting with the federation to identify the three new cooperatives (2) Fishers exchanges (8 fishers from Maria Elena community, where they have fish refuges and at least two fishers of the three new cooperatives identified).	Minute, photos from meeting, fisher exchange and list of participants.			100% We have met with the federation. We did two exchanges with fishers from Yum Balam, Sian Ka´an and Cozumel

[16] COBI will ensure that the cooperatives, government agencies and researchers have the tools to ensure that the Sian Ka´an – Banco Chinchorro lobster fishery continues to be fully transparent and meets the FIP requirements beyond 2019, even at formal FIP activities come to a close.
[17] https://fisheryprogress.org/fip-profile/mexico-quintana-roo-spiny-lobster-casitas

O2 Support fishing cooperatives to be successful in financing initiatives of conservation and sustainable practices.	Mexican MAR lobster fishing cooperatives are aware of new options of sustainable markets.	1. To establish connections and relationships between fishers and buyers 2. To include the fishers in the NUUP platform of sustainable producers and buyers.	X	X	X	X	X	X							(1) Workshop held in Mexico City with fishers (>20) and buyers (>3). (3) Meetings with NUUP.	Minutes from workshop and meeting. List of participants and photos. (6) Fact sheets of the cooperatives with information of the lobster fishery for buyers. List of fishers and buyers included in NUUP database.	By 2025, six fishing cooperatives (24%) of the 25 of the federation are self-financing their sustainable fishing and fish refuges.	Fishers could potentially be demotivated if added-value commercializati on is not achieved for their sustainable products.	100% We held three workshops (1st in Mexico City, 2nd in Chetumal) to include the fishers´ information in the NUUP platform, and discuss QRoo markets.
	The cost of implementing and maintaining fish refuges and sustainable fishing is known and shared among fishers.	1. Develop a tool (Excel sheet) to quantify the costs of implementing and maintaining fish refuges and sustainable fishing in the MAR. 2. Publish the tool on COBI´s website and train fishers in its use.				X	X	X	X	X					(1) Meeting with COBI´s fish refuges team and accountant. (6) Interviews with six fishing cooperatives to review the costs of implementing fish refuges and sustainable fishing in the MAR. (3) Interviews with members of the Kanan Kay Alliance to review the costs of implementing fish refuges and sustainable fishing in the MAR. (8) fishers trained to budget marine reserve monitoring.	Tool in Excel spreadsheet format. Tool published on COBI´s website.			100% The information for the tool is now in a user-friendly platform and managers and CSOs have been trained. We also conducted an analysis on costs, fisher contributions and subsidies.
	At least one cooperative implements a strategy for the financial sustainability of their sustainable fisheries and fish refuges initiatives.	1. Develop a work plan for financing the implementation of fish refuges and sustainable fishing. 2. To develop an agreement for the implementation of the work plan.					X	X	X	X	X	X	X	X	(7) meetings, (1) for each cooperative, then (1) for the 6 cooperatives in Chetumal, Quintana Roo. (1) meeting to sign an Agreement detailing work plan.	Cooperatives data base. Work plan Signed Agreement Photos and minute from the meetings. List of participants. Account balance of monitoring fund.			75% One cooperative has committed to the fund, and three cooperatives are financing fisheries monitoring, however we shifted focus to the national level to increase impact.
O3 Protect fishing grounds, coral reefs, and Fish Spawning Aggregations (FSA) sites in the MAR (from Tulum in the center to the Belize border in the south) through	The 13 fish refuges established in 2012/13 are renewed for five more years.	1. Renew the 13 current fish refuges (14,400 hectares) established for five more years.			X	X	X		X	X	X	X			(50) Fishers complete the annual biological evaluations of the fish refuges. (2) Renewal proposals that included the 13 fish refuges submitted to CONAPESCA.	(2) Annual biological monitoring report. (2) Submitted proposal for renewing the 13 fish refuges Publication of renovation in the Mexican Federal Register.	By 2018, biological changes in the fish refuges will be: • Lobster abundance. 2016: 527 ind ha^{-1}. 2018 target: 580 ind ha^{-1}.	The cooperatives have already communicated their desire to continue with the fish refuges however a convincing case for renewing the	100% Three of three decrees renewed. Monitoring completed for 13/13 fish refuges in 2018 and 2019.

a network of fish refuges.	Climate change monitoring (temperature and salinity) is incorporated in to the fish refuge monitoring program	1. Train 10 fishers to install and maintain oceanographic sensors. 2. Install and maintain oceanographic sensors in four fish refuges. 3. Share with all sectors the data obtained with the sensors.			X	X	X	X	X	X				(10) Fishers trained to install and provide maintenance to the oceanographic sensors. (5) Sensors installed to measure temperature and salinity in four fish refuges (one in Banco Chinchorro, one in Punta Allen, one in Punta Herrero and two in Maria Elena). (4) workshops, one in each community (Punta Herrero, Banco Chinchorro, Punta Allen, and Maria Elena), to share data. (1) Presentation of the results to Kanan Kay Alliance.	Minutes from workshops. List of participants and photos. Oceanographic sensors installed. Data from sensors included in technical report and shared.	• Fish biomass (commercial species). 2016: 159.5 g m^{-2}. 2018 target: 175 g m^{-2}. • Coral Cover. 2016: 14.4% hard coral cover. 2018 target: coral cover remains at the same level as 2016. By 2018, sixty fishers from six cooperatives participate in the search for fish aggregation sites. By 2025, the network of fish refuges in the Mexican MAR has increased in area from the current 14,400 ha to 20,000 ha, that protect FSA sites.	fish refuges must be presented, using monitoring data collected by the fishers themselves.	100% Six oceanographic and two acoustic sensors have been installed (in Punta Allen, Maria Elena, and Punta Herrero), and workshops completed in two communities (Punta Allen and Punta Herrero).
	50% (approx. 25 sites) of the grouper/snapper FSA sites in the Mexican MAR are characterized and validated by fishers and COBI.	1. To characterize FSA in the center and south of the Mexican MAR (from Tulum in the center to the Belize border in the south). 2. To monitor previously explored FSAs 3. Install two new acoustic sensors for FSA and train fishers to identify the sounds detected.	X	X	X		X	X	X	X				(10) site visits covering a total of 25 sites. (19) fishers participating in the characterization of 15 new FSA. 10 FSA sites monitored once a year by 41 fishers. (3) FSA sites with acoustic sensors. (10) fishers trained to detect FSA sounds.	Characterization report and priority index for conservation for each FSA site. Bathymetric maps. Video and Photo. Sounds of FSA sites			100% 30 sites have been characterized and monitored.
O4 Scale up COBI's demonstrative models in public fishing policy in the Mexican MAR and at national scale.	The lobster fishery model developed in Sian Ka´an and Banco Chinchorro inspires other fishers in the MAR and decision makers to meet sustainability standards.	1. Promote the implementation of standards for sustainable fishing in other fisheries with fishers and decision makers, using the lobster fishery as case study.		X	X	X	X	X						(1) Workshop (two days) held in the north of Quintana Roo with four fishing cooperatives (>30 fishers) and decision makers (CONAPESCA, INAPESCA, CONANP).	Minute from workshop. List of participants and photos.	By 2025, the results from the participatory models in the MAR are replicated and/or incorporated in to regional and national fish policies in Mexico led by CONAPESCA, INAPESCA and CONANP.	Not applicable.	100% We held a sustainability workshop with fishers from the MAR during the first year. A second workshop, held in the Senate trained government, NGOs and researchers in sustainable fishing standards

	Design principles for fish refuges in the MAR are created through a collaborative process involving the four MAR countries.	2. Develop design principles (biophysical, socioeconomic and governance) for fish refuges network that include fisheries, biodiversity and climate change objectives for Mexican coral reefs	X	X	X	X	X	X	X					(2) Workshops conducted with key stakeholders from the MAR region (Mexico, Belize, Guatemala, Honduras) with approx. 30 participants in each workshop. The first workshop will be held in Cancun, the second will be confirmed during the first workshop.	Publication of design principals for marine reserves in the MAR. Workshop minutes, photos and list of participation with researchers, government officials and key stakeholders in the MAR.			100% Biophysical, socioeconomic and governance principles are complete.
	Promote gender equality in fishing communities through capacity-building and an analysis of women's role in the lobster fishery.	1. Facilitate civil society's participation in building an action plan to address gender inequality in fisheries.					X	X	X	X					(1) Workshop (2-3 days) with 15 participants to co-design a critical route for gender inclusion and equality in fisheries. It will be held in Mexico City.	Action Plan that will focus on 1-3 advocacy strategies to contribute to gender equality in fisheries.			100%. The first workshop was held in September 2018 with participation of 20 people (18 women, 2 men). The second workshop was held in Jun 2018, in Cozumel Island with 35 fishers from the Cozumel Cooperative.
		2. Analyse the role of women in the lobster fishery.					X	X	X						(1) Workshop with the Cozumel cooperative (approx. 8 participants) to understand how women contribute to the value chain of lobster fishery.	Report evaluating women's role in the value chain of the lobster fishery.			
	Design a National Social-Impact (Generative) Network of best fishing practices with our community partners.	1. Develop a common vision and action plan for the regenerative network.							X	X	X	X	X	X	(1)Workshop (2 days) with 20 community leaders and 25 cooperatives. The workshop's venue will be defined in the future.	Workshop minutes, photos and list of participants.			100% Between November 2018 and August 2019, four workshops and four feedback meetings were held around Mexico, including in Tulum, to develop the common vision for the network

Lessons learned: Emphasize, besides the technical issues, the social and administrative aspects that may be useful in future projects regarding the same topic or developed under similar conditions.

Our strategies of local-scale project co-creation and implementation with fishers continues to be effective, and we have been able to impact public policy (e.g. the modified NOM-049 fish refuge law, and our work with the Senate´s Fishery Commission[18]). COBI continues to be involved in most fish refuge and sustainable fisheries projects at the national level. For example, COBI has been involved in the design or implementation of 72% of the 44 fish refuges in Mexico, and 38% of 24 Fishery Improvement Projects. Despite this, a change of strategy is necessary. What we are doing is not enough. Our experience over the past two decades of working with 34 Mexican coastal communities for marine conservation and sustainable fisheries shows that fishing communities are particularly vulnerable to global shocks and changes. The impacts of traditional frameworks for the protection of natural resources are being diluted by these shocks, creating new challenges, which can impact previous conservation efforts. However, in the face of change, fishers will still go to fish every day. They are flexible and make daily decisions to adapt, using their experience and available information. Some of their choices move them towards sustainability and social benefits, others do not. They can switch from one fishery to another, create new fishing techniques, and find new markets quickly. In addition, fishers are embracing new tools, including social media, mobile technologies, and other innovations for information sharing and decision-making. In contrast, policy design and implementation (e.g. climate and environmental change) takes years, in some cases, decades. Political and bureaucratic processes are less flexible, creating a gap between policy making and day-to-day fishing practices in a changing climate and changing world.

COBI´s new five-year plan (2020-2025) proposes breaking free from the traditional conservation model of civil society organizations, to leverage technology and trust to connect fishers and work collectively to address large scale conservation challenges. This paradigm shift requires COBI to begin to work like a tech start-up, using digital infrastructure to connect all 300,000 Mexican fishers to mobilize knowledge and innovations that can be adopted in Mexico, Latin America and beyond. The connected fishers, from >5,000 communities, will accelerate idea sharing and implementation for resilient coastal communities and healthy oceans. This scalable infrastructure will facilitate the incubation of ocean solutions by and for fishers. It will be hosted in a new entity co-owned by COBI and its partners, including fishers, fishing cooperatives, NGOs and investors.

[18] In 2019 we signed a collaborative agreement with the Senate's Fisheries Commission to formalize our collaboration. Within the framework of the agreement we have carried out the following activities: technical advice for the definition of sustainable fishing and sustainable aquaculture as well as a first review of the current fisheries law. In addition to that, the organization of the national Sustainable Fisheries and Aquaculture Awards.

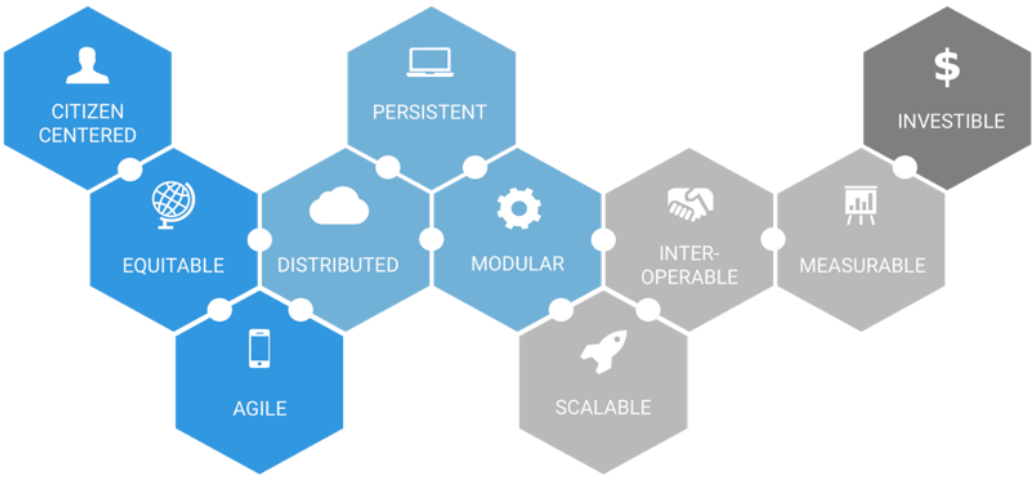

Figure 2 Infrastructure components for COBI´s 2020-2025 strategy. From https://trillions.global

Effects of the project: Have the results of the project promoted environmental, social or economic changes? How was this determined/measured?

The impacts of the project can be measured through the results of the scientific papers. Ayer et al. (2018) found that the fishers perceive that their marine reserves help them achieve sustainability, even if biological recovery is not significant. The paper also detects the need for increase enforcement from federal agencies, particularly in Banco Chinchorro. Similarly, Villaseñor-Derbez et al. (2019) found that the marine reserves have not statistically increased biodiversity or abundance since their establishment in 2012/2013, but that fishers consider them to be important tools for conservation and a source of pride in the community. Finally, Fulton et al. (2018, 2019) found that involving fishers as citizen scientists increases the probabilities of conservation success. Many organizations are concerned that involving fishers in conservation will lead the fishers to then exploit the resource that they are supposed to be protecting. Whilst this may occasionally happen, it is misguided because in a region with poor enforcement (like the MAR), conservation organizations need allies to implement their project and ensure long term viability. This has happened in the Mexican Caribbean and we aim to continue to scale this work. Similarly, our work to document women´s roles in the fishery has opened the eyes of many of the male fishers who did not previously recognize the role of women in the value chain. The difference between “fishing” (extractive activity, usually male dominated) and “the fishery” (the whole value chain where many women are involved) is an important distinction.

Communication of results: What mechanisms have been used or will be used to communicate the results, and to what audiences?

For the general public and fishers, COBI maintains an active social media presence and we plan to leverage our digital infrastructure during the implementation of our 2020-2025 strategy. We aim to produce open-access and free to use tools and publications that can be shared by resource users and decision-makers alike. Our scientific output during this grant phase was productive, with 12 peer-reviewed journal articles being published that highlight the need and success of participatory, science-led conservation efforts. During 2020 we will be working at the national level

to translate and disseminate information from scientific publications (which are generally technical and in English) into Spanish and with the fishers.

Project continuity: Will the processes established by this project continue operating? How will it be done? Who will provide follow-up?

The process developed during this project will continue operating, and as the project title suggests, our goal was to establish solid foundations for the fishers to continue these projects on their own in the long term. The first test of this strategy is the end of COBI´s participation in the FIP process. The fishers now have the capacity and ability to advance the project on their own and we will no longer participate. Exiting from the marine reserve program will be more complex, due to equipment and cost requirements, but the information generated during this project (such as associated costs and potential financial mechanism) will stand us in good stead for reducing COBI´s financial involvement in the established marine reserves in Quintana Roo, and free up our time to work with other fishers in other regions (e.g. the north of Quintana Roo).

Due diligence:

- Updated list of Board Members
- Bylaws of the organization (if there were modifications during the project)
- Last annual report
- Last institutional external audit
- Certificate of Legal registration
- Tax clearance (Certificate of good standing)