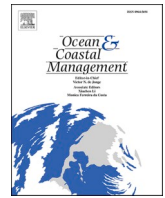




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Adaptive governance and coping strategies in the Yucatan Peninsula coasts facing COVID-19

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ABSTRACT

The COVID-19 pandemic has abruptly transformed all social structures around the world, and coastal zones where tourist and fishing activities take place is no exception. Due to the sanitary measures, restrictions to travel and lock down periods, the tourist sector has been one of the economic sectors most affected by this health and economic crisis. However, it is not the only sector to have been affected, the fisheries sector, being highly dependent on the export market, has also suffered the consequences of this crisis. In this article, we aim to identify the main characteristics and key aspects of the fishing and tourist sectors in the states of Yucatan and Campeche, in Mexico, under pandemic dynamics. What are the organizational and governance structures that have been developed in response to this world phenomena? To answer this question, we conducted phone interviews and reviewed governmental and community actions. Results show that individual survival strategies prevail as a response to COVID-19, over community or governmental actions. There was limited coordination among the different governance structures, between the community and governmental levels. However, this crisis has also been a period of learning and innovation to implement adaptive governance structures to build resilience and a “new normal social reality”.

1. Introduction

The outbreak of COVID-19 has impacted all sectors and economic activities around the world (Corlett et al., 2020). Government and private groups had to put measures in place in response to this global pandemic, and all social structures and economic sectors were forced to take prompt action in response to the resulting health and economic crises (Hakavirta and Denuwara, 2020). Measures that guarantee the safety of all users, workers, and employees were also considered in coastal zones. Some of these measures were lock downs, temporary shutdowns of some fisheries, closure of schools, travel bans, cancelling or postponing meetings, holidays, everyday work, and events, and getting used to a new way of communicating, working, and living (Bennett et al., 2020; Mangubhai et al., 2021).

Sudden events such as COVID-19, challenge the social system in its capacity to absorb disturbance and reorganize while undergoing change. This change affects interactions across spatial and temporal scales

challenging the capacity to reorganize (Folke et al., 2005). Thus, governance systems require novel forms of social behavior shifting to control change that would generate alternative strategies for social conduct and recovery initiatives in the face of COVID-19.

Governance in the coastal zones of Mexico depends on the interactions of key actors: federal, state and municipal governments, sectoral associations or groups, and the social sector, that can be part or not of the associations, such as communities (Rivera-Arriaga and Vidal-Hernández, 2020). Governance, in times of crisis, can be analyzed through adaptive governance, where vulnerability of the coastal zone can be conceptualized within a different governance design. COVID-19 has imposed a new reality in the coastal zones of the states of Campeche and Yucatán in Mexico and has challenged their decision-making processes to confront crises. In light of this, the coasts have suffered social, environmental and economic impacts, that resulted from a change in behavior and the availability of technology that could help to solve the challenges of daily life. The “stay at home” rule issued by the

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government, has forced users to refrain from going to the coastal zone to carry out many of their usual activities. This rule together with the “healthy distance” -also implemented by the government-has imposed the temporary closure of some ports and has limited the number of customers attending all hotels, commerce, and restaurants per day.

This has become a time, for both individuals and groups, to learn effectively from their own and others experiences to enhance organizational skills and, thereby, develop adaptive management strategies. Social groups have learnt from individuals’ ability to be flexible in the face of new situations, preparing them to deal with uncertainty. Social groups that are composed by rules, positions, and resources, and by networks of communication with individuals and organizations at different levels of interaction, represent the social group involved in adaptive governance (Westley, 1995, 2002).

Adaptive governance is an evolving research framework for analyzing the social, institutional, economic and ecological foundations of multilevel governance modes that can improve decision making in social-ecological systems to increase resilience posed by challenges at multiple scales (Folke et al., 2005). The framework involves the capacity to: 1) understand abrupt changes; 2) use this understanding for decision-making, 3) act on decisions in a coordinated manner that sustains resilience of desirable system states, and 4) knowledge sharing across scales (Evans et al., 2011). In this article, we analyze two coastal economic sectors: fisheries and tourist services, to determine: what are the main characteristics and key aspects of those sectors under pandemic dynamics? What are the key effects on resilience and adaptive governance from those sectors during the health crisis? What are the challenges for those sectors facing COVID-19?

2. A theoretical framework for adaptative governance in the COVID-19 crises

Undoubtedly the COVID-19 crisis is currently one of the most pressing global socioeconomical challenges. This crisis has been the source of abrupt unexpected changes on a massive scale affecting most economic sectors in every country around the world. These sudden changes are an appeal to re-design and implement adaptive governance systems to build and reinforce resilience. Resilience as the ability to self-organize, learn, and adapt (Carpenter et al., 2001), while undergoing change (Walker et al., 2004).

However, at the time of writing this study, it is still too early to imagine a post-COVID-19 world; therefore, current modes of governance must be flexible and adaptable to build resilience and be able to cope with sudden unexpected changes to recover peoples’ livelihood in the different economic sectors around the world. During the year 2020, one of the most affected economic sectors in coastal areas has been tourism and another, less appreciated, but also very much affected, has been the fishing industry. In countries like Mexico, both sectors are highly dependent on international markets. For instance, 20% of coastal tourism is foreign and about 80% of seafood products are exported. This situation is exacerbated in the Yucatan peninsula where tourism and fishing are important and are interlinked with economic activities in coastal communities. Thus, the sudden closing of international markets, lockdown periods and restrictions to travel have caused a deep economic crisis with the loss of thousands of jobs.

In the face of the continued unpredictable effects of COVID-19, the interconnections between adaptive governance and resilience must be better understood by identifying and explaining their main characteristics and how these can be present and/or developed in the local social capital. Governance is the process involved in creating the conditions for ordered rule and collective action (Stoker, 1998), where people make decisions and share power (Lebel et al., 2006). Djalante et al. (2011), indicated that the most common characteristics highlighted in adaptive governance approaches are: polycentric and multilayered institutions, participation and collaboration, self-organization and networks, understanding abrupt changes and learning and innovation. Polycentricity

is a fundamental concept in commons scholarship that connotes a complex form of governance with multiple centers of semiautonomous decision making (Carlisle and Gruby, 2017). Centers take each other into account for decision-making in competitive and cooperative relationships and have a conflict resolution mechanism. Adaptive governance should have some, or all these characteristics. Therefore, we contend that adaptive governance is the transformation of governance through multilayered institutions and social networks by a process of learning, and participative and self-organized actions where stakeholders would be able to reorganize and adapt to face different types of crisis. Adaptive governance is seen as an enhancer to resilience (Carpenter et al., 2012), it focuses on building resilience to achieve reorganization and adaptation (Djalante et al., 2011).

The social sources of resilience, social capital and social memory (McIntosh, 2000) are crucial to develop the capacity to adapt to and shape change (Folke et al., 2003). Social capital can be expressed in the capacity to develop or be part of a social network, and social memory relates to the experience acquired to deal with change. Learning and innovation are essential to adapt to change to recover from crises, learning being a driver of adaptive capacity, and an enhancer of resilience (Dunning, 2020). Resilience of human systems that depend on the institutional or community responses that determine resilience results (Adger et al., 2005).

Djalante et al. (2011) pointed out that polycentric and multilayered institutions are the key steps towards adaptive governance because they have a high potential to manage resilience, they allow institutional interactions that diversify responses and stimulate collaboration (Folke et al., 2005), to help social adaptation at the appropriate level (Lebel et al., 2006). In other words, different organizations at different levels allow opportunities for learning and innovation because they can provide multiple sources of knowledge that can result in better adaptation strategies (Ostrom, 2010).

Furthermore, self-organization can be done formally or informally through different social networks. The existence of formal or informal institutions allows for flexibility and the enhancement of capacity to cope with uncertainty by mobilizing different sources of resilience (Adger et al., 2005). One of the implicit advantages of informal institutions is to avoid long bureaucratic processes that characterize formal governmental institutions. Moreover, informal governance systems might be a self-organized response to rigid governmental structures, a multilevel social network that can stimulate innovation, collaboration, build trust, provide information and influence policies in a specific area (Folke et al., 2005). In times of rapid change, informal social networks can complement formal governmental bureaucracies, provide opportunities for new and innovative actions, and enhance flexibility, but not replace them (Gunderson et al., 1995; Kettl, 2000). Networks of collaboration emerge from different individuals and levels, including governmental actions when facing unexpected change. Adaptive governance conveys a multiple-objective reality when handling an abrupt change, and includes government intervention together with collaboration, partnerships and networks (Eckerberg, 2004).

Non-resilient social systems are vulnerable to external change and could amplify previously existing corrosive characteristics such as tension between outsiders and locals, corruption, race and class divisions that drive them to a more vulnerable condition (Jenkins, 2013). Whereas a resilient system may even make use of disturbances as opportunities to transform into more desired states (Folke et al., 2005) or could pull communities together by breaking social boundaries, promote innovation and change old traditional norms to act as a therapeutic community that pursues common goals (Jenkins, 2013).

Therefore, learning is a driver of adaptive capacity and organization, which can enhance resilience (Dunning, 2020), and all the triggering factors that are forcing a social response to the health and socioeconomic COVID-19 crises are major learning sources that can be useful to address the present crisis through the emergence of adaptive governance

systems.

3. Study context

3.1. Location

The Yucatan Peninsula is located at the southeast of the Gulf of Mexico. It contains the States of Campeche, Yucatán and Quintana Roo. Along its Southern border are Belize and Guatemala, to the Southeast is the Caribbean Sea, to the West there are the States of Chiapas and Tabasco, and to the Northwest the Gulf of Mexico.

3.2. The fishing activity

Campeche has an old fisheries tradition with 3,904 boats, of these 96.89% constitute the artisanal fleet with about 12,100 formal and informal fishers. In the coastal zone, there are eight fishery sites: Isla Arena, Campeche, Lerma, Seybaplaya, Champotón, Sabancuy, Isla Aguada, and Ciudad del Carmen, reporting 7, 428 formal fishers in 2015 (see [Table 1](#)) (Programa Sectorial de Pesca y Acuacultura 2016–2021). The fishery sector has a total catch of 55, 664 tons representing a total revenue of \$1, 589, 836 pesos ([Quinto Informe de Gobierno, 2019](#)). At the national level, Campeche's fisheries are eighth by volume and value and represent 2.73% of the national production.

Yucatan's fisheries tradition is more recent, dating from mid-1940's. The state has a semi-industrial fleet with 549 ships and an artisanal fleet with 4654 boats, 14,955 formal fishers and about 50% more informal fishers ([SAGARPA, 2017](#)) (see [Table 1](#)). There are also seven fishery sites: Celestún, Sisal, Progreso, Dzilam de Bravo, San Felipe, Río Lagartos and el Cuyo. Yucatan's fisheries are in 13th place by volume and sixth by economic value on the national level, with 48,213 tons per year representing 2.24% of national production.

3.3. The tourism activity

Tourist activities represent 8.7% of Mexican GDP mainly through the use and enjoyment of coastal areas where almost half of the country's population live ([INEGI, 2015](#)). The tourist sector is very important for the Yucatan Peninsula, representing 10.1% of the state's GDP and an economic spillover of \$ 8,264.9 million pesos per year; an amount that has increased annually by 17.7% in recent years ([INEGI, 2018](#)), likewise, it is estimated that 13.4% of the economically active population of Yucatan and 10.5% of its companies are engaged in tourism. For Campeche, tourism provides 8.7% of the state's GDP (PROSECTUR, 2016–2021).

Although Yucatán and Campeche are internationally known for their tourist attractions related to the Mayan archaeological zones and colonial sites, both states have developed some common coastal attractions, including: beach side holiday houses for local families that use them during holiday periods and alternative tourism businesses of small and medium size within coastal areas (e.g hotels and restaurants, ecotourism or nature tourism, recreational fisheries and sport fishing); both as a result of local, national and international public policies to highlight the importance of their use and conservation.

Table 1
Stakeholders in fisheries and tourism sectors in the coastal zone.

Sector	Category	Campeche	Yucatan
Fisheries	Formal Fishers	7, 428	14,955
Tourism	Nature-based tourism	3	24
	Marine	2	16
	Ecotourism and tourist parador	3	17
	Lodging	225	112
	Restaurants	488	128

Source: [Datatur., 2019](#), [Quinto Informe de Gobierno, 2019](#)

4. Method

4.1. Interviews

A qualitative methodology was used where one of the main sources of information were semi-structured interviews ([Strauss, 1987](#)). Interview questions were discussed by the authors and carefully worded to ask fishers and tourist service providers about their experiences and coping strategies during the lock down period and pandemic survival strategies. The main topics in tourism were: type of touristic services, origin of tourists, sectoral initiatives to alleviate COVID-19 economic impacts and individual and group strategies to address the health crisis. The main topics related to the fishing activity were: local coping strategies implemented during the lockdown period and to address the reduction in the fishers' income, reorganization of fish distribution channels, and, for both activities, information about governmental reactions and support given to each sector during and after the lockdown period. We had two interview guides one for the fishers and another for the tourist service providers from Campeche and Yucatán.

We used purposive sampling based on criteria described by [Polkinghorne \(2005\)](#) which suggests that in qualitative research, purposeful sampling should be conducted because it is not important how much data is collected from how many subjects. Instead, it is more important to collect the right data that is rich enough to better understand the meaning of the phenomenon. Therefore, respondent selection was carried out to cover key informants based on their knowledge, recognized roles, main representation in the activity, management positions or status in the community and/or fishing and tourist activities. Interviewees were state governmental tourism authorities, nature-based tourism service providers, artisanal fishers, governmental fisheries authorities, community members, and fish cooperative chiefs.

Thirty semi-structured telephone and zoom interviews ranging in duration from 40 to 60 min were conducted from September to November 2020 in the states of Campeche and Yucatan. Information collected through the semi-structured interview guide was audio recorded and transcribed. Some notes about key topics were identified and written aside to allow circular feedback of questions. Secondly, a qualitative method of latent content analysis was used; which consisted on a process of identifying, coding and categorizing primary data patterns taking into account their context ([Hsieh and Shannon 2005](#)). Several revision sessions of collected data were performed among the authors to assure rigor in their interpretation. Finally, the narrative about the scenarios was described. The interview schedule is provided as a supplementary material.

4.2. Secondary information

Official sectoral web pages and technical reports were also important for this research because they provided complementary material to triangulate and construct the argument presented in this study. This complementary information was derived from the activities that started to take action in May to November 2020 as a response to the consequences of the pandemic and to analyze the re-opening alternatives. The web pages considered for the analysis were: [DATATUR 2019](#); [Gobierno de México, 2020](#); [Inventur., 2020](#); [Programa Sectorial de Pesca y Acuacultura 2016–2021](#); [PROSECTUR, 2016–2021](#); [PROSECTUR, 2020](#); [Quinto Informe de Gobierno, 2019](#); [SEFOTUR](#); [SEMARNAT., 2020](#). The relevant information obtained from these technical reports and web pages were used to elaborate part of the results we are presenting.

5. Results

5.1. COVID-19, fisherfolk and tourism in Yucatan and Campeche

In Yucatán and Campeche, fishers are organized in cooperatives, regularly linked to freezing plants which buy their catch, or are linked to

chains of vendors for hotels and restaurants. Cooperatives are at the core of governance for fishers. It is the space to plan and decide; to discuss problems and settle conflicts. However, the governance built within these cooperatives that actively support their members through common efforts across diverse challenges, was not enough to solve the necessities of their members during the pandemic. Some interviewees said that they needed to use their saving when the pandemic started, but this money mitigated impacts for only few months. After that time, fishers needed to innovate multilevel governance strategies to survive until reopening of markets was possible. Furthermore, the freezing plant owners' participation to help fishers' communities to cope with this health crises was also very limited, as explained in this section.

In the case of tourism, since it is not considered an essential social activity, it was one of the first economic sectors to be confined in order to mitigate the transmission of the virus. In addition to the closure of airline operations, port entrance, cruise line navigation, public meetings and events, other essential activities for tourism such as: service without reservation in restaurants, accommodation service, the sale of alcoholic beverages, travel agency activities, beach use and alternative services were prohibited.

Campeche's tourist activities reached a historical minimum in the month of April 2020, with only 5% of hotel occupancy. Government actions for coastal tourism were to enhance capacities on sanitation measures and to implement compliance surveillance over these measures. In September, a total of 118 restaurants, hotels, travel agencies, tour operators and golf clubs received the certification of "clean point" (*punto limpio* in Spanish); however, the forecast is that the occupation rate will not surpass 40% in 2020.

Yucatán lost 95% of its regular tourist activities with an estimated loss of 1 million USD directly impacting 41,021 employees in the state due to the absence of visitors during the months from April until at least October. For the coastal communities in Yucatan, this represents a loss of at least 270 000 USD by service providers of alternative tourism, nautical marines, ecotourism, lodging and restaurants (official statistics of [Inventur 2020](#)) which could be the main source of income of almost 50,000 persons. In general, both state governments expect a slow recovery in the tourist sector that might take up two years to recover. [Table 1](#) shows the number of stakeholders directly affected by the measures taken to face the COVID-19 crises.

5.2. Coping strategies to survive the COVID-19 lock down period

One of the first actions implemented globally to avoid the transmission of the virus was to promote the message to "stay at home", isolate and avoid contact. Moreover, most fishing communities in Yucatan lack efficient health services and infrastructure making them more vulnerable to the effects of the virus ([Yucatan gob, 2018](#)). Therefore, most coastal communities in the state of Yucatan decided to limit the entrance to outsiders. This local policy began at the end of March and ended at the beginning of September 2020. This was different in Campeche where only Isla Arena from the eight fishery sites was isolated since the other seven sites are small cities with larger populations making it difficult to keep them closed.

In Yucatan, the global lockdown period resulted in the closure of local and export markets and prevention of the usual flux of tourists. Most seafood freezing plants that supply the national markets and export to Asia, the United States and Europe were closed for about 3–4 months. Any tourist service that implies contact with foreign people was also prohibited in all coastal sites, even the flux of local people to neighbor communities was restricted. Most distribution channels were unavailable and the demand for seafood and touristic services disappeared from one day to the other. Fishers, therefore, experienced a reduction in catch volume and in the price of their product; subsequently, the majority of them were fishing for self-consumption. In the case of tourist service providers, they were self-incorporated in commercial fishing activities and multi manual tasks.

Moreover, since access to the ports and all coastal zones were limited to local people, fishers from neighboring towns were unable to access fish resources and tourist service providers were basically jobless for at least two months. These peoples' economies were the most affected. Consequentially, most fishing communities and tourist service providers had to appeal to their resilience skills and adaptation capacities to implement new forms of organization and economic activities to face this social, economic and health crisis. These resilience skills and adaptation capacities are described in the following paragraphs.

Among the survival strategies implemented by fishers in Yucatan and Campeche, older fishers used their savings during these months to cope with the reduction in their income. On the contrary, according to our interviews, younger fishers had more limitations because they have more tendency to spend much of their money on alcohol consumption. However, in both states the "dry law" (alcohol sale prohibition) issued by the government from both states, was implemented during the lockdown period, so fishers could not spend their money on alcohol and were able to use this income for basic needs. On the other hand, tourism providers have also turned to using their savings first, then to perform commercial fishing and multi-manual tasks, and others have resorted to selling their most valuable belongings to maintain minimum survivable expenses.

Another of the first actions taken by fishers was the implementation of new distribution channels. The value chain was shortened, from fishers to retailers or in some cases direct to final consumers. However, most of these new distribution channels were only available to those fishers that have personal contacts in the state capitals, Merida and Campeche. This distribution mechanism was a friend-to-friend fish trading network. The fish traded through these local distribution channels were essentially low value fish species and octopus. In Campeche, fishers found opportunities to sell their captures through their social networks Whatsapp and Facebook, offering fish, octopus and crabs, fresh and cooked, adding value to their products.

However, at the time of the study (July–November 2020), the situation in each port had few differences, for example in the port of Progreso (See [Fig. 1](#)), the largest port in Yucatán with the largest number of COVID cases, fishers did not stop fishing, rather low demand forced them to reduce the fishing effort. Thus, they would go fishing only 1 or 2 times a week, mainly to supply local markets and for self-consumption. Even in the months of August and September the fishing effort was still low, running at about 50% of its capacity. In this port, fishers did not implement new distribution channels or any other economic activity because few freezing plants continue buying low amounts of seafood. Fishers learnt to survive with lower income and the governmental financial support provided due to the COVID crises.

The same happened in Ciudad del Carmen with oil platforms and where the largest number of COVID cases have been recorded in Campeche. However, fishers were prohibited to fish by surveillance from the Mexican Navy which patrol the waters in front of Carmen, Isla Aguada, Sabancuy, Champoton, Lerma and Campeche city. Marine patrols compelled every boat to return to port for five months. However, in smaller sites without such strict surveillance, such as Isla Arena and Seybaplaya, fishers went out twice per week to fish to survive. Isla Arena did not report any COVID-19 cases, but several cases were reported in Seybaplaya. Fishers offered their daily catches fresh and cooked, adding value to their products, and selling them locally through social networks.

In Dzilam de Bravo, up until October there had been no reports of infection. Here, fishers decided not to go fishing for the first two months (April–May), only about 20 fishers would go fishing and would distribute the fish among the people from the community for self-consumption. Commercial fishing re-start from the 15th of June, and, at the same time, some fishers continue selling on a micro scale at no more than 100 kg per week, to the local distribution channels. Currently, some of these fishers prefer to continue with these direct sales because they can earn more. This new form of distribution from a friend, to a



Fig. 1. Ports location from Campeche and Yucatan
 Edited by: Marcos Granados Flores.

friend's friend in different neighboring communities has started to expand, and the demand for fish through this modality is increasing. Unfortunately, distribution in this way is only available to a few fishers, and export markets and wholesale sales were still very limited at least until the end of 2020. In this port, better known for social cohesion and better organization, even illegal fishers respected the no fishing agreement. Apparently, from about 200 illegal boats only about two or three would go fishing. Therefore, illegal fishing diminished for at least two months.

In Sisal, in October only about three people were reported to have been infected by COVID. The fishers also agreed at the beginning of the pandemic to go fishing only for self-consumption, but a few fishers hid any sales they made, they also decided to sell to their own local distribution channels using their friend-to-friend networks. Illegal fishing and poaching activities in this port were reported as more active than in other ports and the species targeted were lobster, turtles and turtle eggs. The interviewees assured that "there was a lot of turtle killing at night, some people would kill up to 5 to 6 turtles per night. They would sell them for about 3–4 hundred pesos per kg" (Sisal inhabitant). On the other hand, in addition to the friend-to-friend distribution channels, women in Sisal implemented several complementary economic activities to survive. They would home sale shoes, masks, prepared food or some fishers would try to work in different maintenance or cleaning services. In addition, the town organized to barter fish for fruit and vegetables, with neighboring non-coastal towns. They also organized to donate fish to some towns that were running low on food supplies.

In the port of Celestún, the second most important fishing port of Yucatán, there have been few people infected, at least five among the fishers. They also stopped fishing for about two months due to market closures and sanitary measures and reported that illegal fishing activities were reduced by about 80% during these weeks. However, they mentioned that they subsequently continued selling on a lower scale to the local freezing plants and did not implement different economic survival strategies. They survived using the financial aid from the government and by trying to reduce their expenses. Tourism service providers have marginally restarted their services, especially those that only

provide bird watching and nautical trips within the lagoon to US and Canadian citizens. Given that this area has several salt ponds with artisanal extraction, some of these service providers have been collecting salt from them all week long during the past eight months.

In San Felipe, which reported relatively large numbers of COVID-19 cases (about 58 in October), personal and vehicular sanitary control measures have been maintained until at least the end of 2020. Consequently, local people perceive an economic collapse of fisheries and tourist activities. From the month of September each tourist provider has operated none to one tour per week or per month, compared to 10 per week before the pandemic had begun. Some of the strategies that have been implemented by tourist service providers for survival purposes, include subsistence fishing, backyard poultry and sheep farming in neighboring noncoastal communities or the selling of their most valuable belongings. For this port, there is a common complaint regarding sectoral conflicts, tourist service providers reported that during low catch periods commercial fishers offer tourist services without proper credentials, security equipment and non-ethical behavior. This condition is considered unfair given that the activity is discredited when a bad service is provided and due to formal providers having to comply with all the requirements (e.g. nautical security certificate, tourist boat registration insurance, third party damage insurance, passenger insurance) with extra cost. They consider that given the high income needed and high competition for tourists, these conditions will prevail and increase during the pandemic.

In most ports, fish hoarders were buying at such low prices that fishers' income was not even enough to pay for the gasoline for fishing trips. Few owners of the freezing plants would buy seafood products at very low prices because markets were closed, and with the intention to bulk seafood, and to sell it when the export markets would open, and the prices would increase.

From July onwards the owners of the freezing plants and the export licenses started to buy seafood products, but low prices continue. Wholesalers are paying about 50 pesos for octopus and 80 for fish, whereas last year octopus season ended up with a price of 80 pesos per kg, and 150 for fish. Some fishers continue selling their catch directly in

Mérida, because in this way they earn more. On the other hand, fishers also mentioned that catch levels are low compared to last year.

In Campeche, the boardwalk at the coastal border contains most of the restaurants and small shops for tourists which were closed from March to September. To remain in business, some of them opened a food delivery strategy for customers through social networks and Apps. The government of Campeche implemented a program called *Punto Limpio* (clean spot in Spanish), during the period of closure, to ensure that the conditions were optimal for operation and now at opening. The *Punto Limpio* Program was implemented in hotels and restaurants in Campeche, Champoton and Carmen city. Another strategy was the Travel Safety Stamp, which was granted by the World Travel & Tourism Council to Campeche city as a safe destination for tourists due to the low number of COVID-19 cases recorded in the past two months (September and October), thus providing international and national visitors with health security.

Hotel occupation in Campeche during April was 5%, during May 5.7%, and June 10%; meanwhile 85% of the hotels were closed. In July the occupation was only 14.1% in hotels, but in August this percentage went up to 35% (PROSECTUR 2020). It is important to mention that during those months, the tourist sector did not receive any monetary aid to cope with the lock down period. In Isla Arena, all tourism activities were closed during the lock down period because the island was closed to foreigners; nevertheless, tourist service providers managed to survive on their own savings and fishing products that the community managed to catch.

In September, Campeche's health authorities have given the state a green light for tourism, and considering this, the government had made an Alliance with the Mayan World tourist project, together with the states of Yucatán, Quintana Roo, Tabasco and Chiapas, for sharing protocols and practices to keep tourists safe from COVID-19. In addition, sport fishing, as a tourism activity in Campeche, was closed for five months and are only now starting to offer their services again.

In Yucatán, tourism authorities requested that service providers receive a certificate in good sanitary practices to be prepared for the reopening of tourism activities; this certificate included having a special facility to perform sanitary inspection and sanitization process. Thus, these service providers have been looking for government financial support to install the requested facilities. In addition, municipal authorities from the ports were controlling the entrance to the communities and have been verifying the activities that can be carried out in the open spaces. As an example; in Sisal, the local representative of the municipal authorities (commissioner) drew up an internal regulation that included: preparing a register of owners of second-homes, issuing certificates of temporary residence, authorizing the controlled entry of non-permanent residents and of trucks supplying basic goods (food, water and gas), ensuring a brief confinement of people leaving and returning to the port, allowing fishing practice only on weekends, avoiding the use of public spaces (beaches included) and verifying the use of face masks. There was only an initiative to raise funds by the owners of temporary residences that would be used to enhance local control, but it was rejected. According to this regulation, non-compliance with these rules would result in a penalty of US \$60.

Moreover, in Yucatan's tourism activities, a new model of service emerged, some tourists would bargain for a reduction calling it a "COVID-price" for a tour, without considering that trip costs depend mostly on gasoline prices that have not diminished. This kind of trip promotes an informal and cheaper tourism service which has been described by formal service providers as follows: "they don't care about quality, cost of permits and proper training, thus they can charge for any low-quality service".

Therefore, most coping strategies were implemented by the fisher's communities and the tourist service providers but, in addition, during the lockdown period some of them received some governmental support. In general, the fishers that belong to cooperatives received two different governmental financial aids to overcome the lack of income

during the months of closure. One of these aids came from the state government in Yucatan, about 90 USD for two months (180 USD in total), and 328 USD from the federal government. Furthermore, according to a governmental plan called "COVID -19 and tourism in Yucatán" (Plan COVID-19 TY), ecotourism cooperatives were granted a temporary employment subsidy equivalent to a current minimum wage of \$ 6 USD/day for a period of three months in exchange for carrying out maintenance activities on the cooperative's facilities, assuring their destination met regulations for health certification, beach cleaning and reforestation actions. But none of the service providers on the coast that were interviewed commented on having received such a subsidy. According to the service providers, during the first stage of the pandemic financial support and incentives were provided by the State, including \$ 224–250 USD (by CULTURE sector) distributed to those registered in local tourism inventory, \$ 63 USD to unemployed coastal residents, or \$ 112 USD to commercial fisherman to discourage them from fishing for red grouper during the closed season (February and March). None received more than one subsidy, but some of them also received one or two food pantries during the first four months of the pandemic.

A few NGOs in Yucatan provided basic food supplies to the neediest families of fishers and tourism service providers on six different occasions. In Campeche, fishers only received federal aid through the state government channels and some cooperatives were able to provide some help in food supplies to fishers' wives. Some freezing plants provided small jobs for fishers and paid them some money in exchange.

In general, governmental intervention can be considered as low due to the few actions taken to support the coastal communities from the impacts of COVID-19 and each coastal community has responded to the crisis in different ways (Fig. 2). Illegal fishing has been one of the socioeconomic consequences impacting the local organizational forms that govern the access and trade of fish resources, but even illegal fishing has had different perspectives and impacts on each port. Illegal tourist activities will also increase as well as the conflicts between commercial fishers and between formal tourist service providers; times, areas used and impacts on shared resources will probably overlap even more.

5.3. Multilevel government initiatives for reopening economic activities

Responses to the COVID-19 pandemic have been a great challenge to planning the reopening of economic activities on both national and local levels. Starting from the month of March 2020, the states of Campeche and Yucatan organized different planification meetings. These included specialists from different sectors such as scientists, government officials and representatives from the main economic activities in each state, multiple proposals resulted from these meetings for each sector of the economy.

In Campeche, the government contracted a consultant, the *Consejo Coordinador Empresarial* de Campeche, to develop a proposal for economic reactivation of key sectors, but it was not available for public knowledge. However, following the development of the proposal, the state government created an Emerging Program for Economic Reactivation that can be consulted on the government web page (<https://sedeco.campeche.gob.mx>). This program is divided into two main guiding actions: Guide to economic reopening and productive reconversion. The first one is a guide to the sanitary measures that must be followed to reopen economic activities, and the second is to improve its competitiveness and minimize the negative economic impacts caused by COVID-19, Campeche has begun the transformation of its economic activity through a technological productive reconversion.

In terms of tourism, with a green traffic light, Campeche has been announced as the first safe tourist destination in Mexico. In addition, the state government has announced that it will distribute 30 million pesos amongst 800 enterprises, the loans range from 50 thousand pesos up to 5 million with an interest rate of 13.9% annually, despite tourist enterprises applying for this economic support there is not a specific economic plan of recovery for the tourist sector.

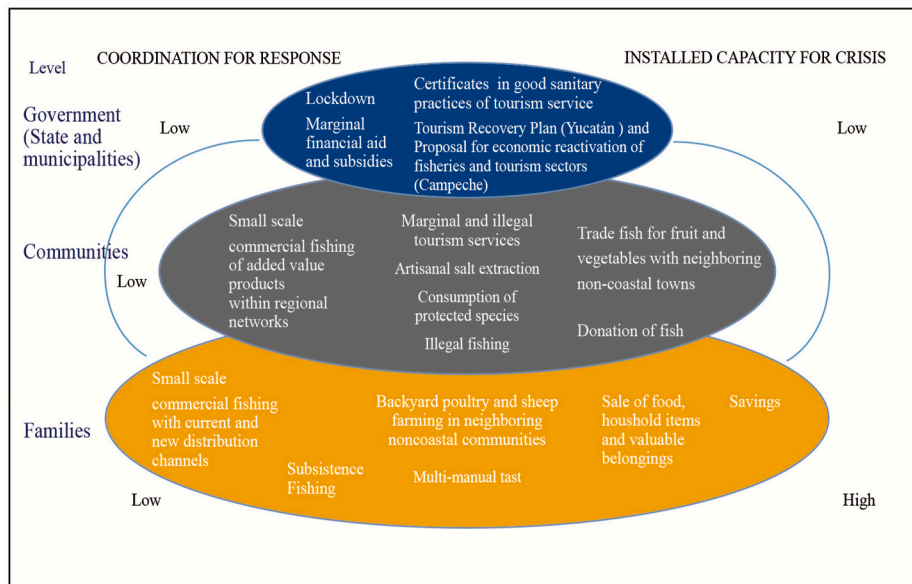


Fig. 2. Multilevel governance response to face COVID-19 crises.

In Yucatan, the strategy was somewhat different, the state government held several working meetings and from these meetings different documents were elaborated and shared by request. In April, the Secretariat of Tourism Development (SEFOTUR) elaborated a COVID Tourism Recovery Plan focused on mitigating the effects of the economic and labor crisis in the sector based on world predictions, trends in “new tourism” from the World Bank and the recommendations of the World Tourism Organization and the National Tourism Business Council. Three assumptions were considered: a) the end of the crisis is unknown and the recovery from it must be gradual for at least 14 months, b) the entire value chain in the industry has been affected and will require reconstructing connectivity, c) the supply of services will be under limited market conditions, budget and infrastructure, and d) tourists, their behaviors and their resources will have changed after the pandemic; therefore, the sector will have to adapt to these conditions.

The four stages of Plan COVID-19 TY presented various governance tools and specific activities contemplating a new profile of the post-covid-19 tourist. It focused on five objectives: preserve the health of employees in the sector and the users, preserve jobs and the tourist offer, invest in rebuilding destinations, strengthen infrastructure and promote the local tourist offer (Table 2).

In terms of capacity building, the general guidelines for tourism of the COVID-19 TY Plan indicates that tourism service providers should receive a certificate of good health practices in Yucatan to continue with their services. Therefore, certified nature operators received in August from SEFOTUR a short and free course on hygiene management in their tourist activities and participated in a workshop on the protocol for the reduction of sanitary risks in tourism operations following federal normative specifications. Key actors in the ports and among the authorities mentioned that between 10% and 25% of the service providers on the coast took the training. Poor cellular connectivity and internet signal prevented that more coastal people would take the sessions.

Another reopening strategy proposed by tourism authorities in Yucatan was “sanitary bubbles”. This involves restricting activities to one selected group at a time, with all the service providers free of virus (confirmed) and with extreme cleaning facilities. This strategy was successfully adopted and applied on cruises. Yucatan governmental authorities recognized that its efficiency in coastal environments needs to be proved since single travelers might not be able to pay for the full cost of a tourist package.

Particular actions of the COVID-19 TY Plan, related to the recovery of

coastal tourism, include the improvement of tourist port infrastructure, facilitating the entry requirements for foreigners, a Quality Program for the protection of beaches, species and natural areas and, a 100% tax incentive granted to the lodging tax for the months from March to June 2020. Relevant indicators that have been set to guide the necessary decision or strategy to be taken include percentage of occupation (50%, 75% and 100%) by tourist service by phase.

From March 2020, when the first COVID-19 case was reported in Yucatán, until the time of this study (November), expectations of implementing the COVID-19 TY Plan have not been fulfilled, thus there are constant formal and informal adjustments each month regarding access to the beaches, service hours of the restaurants and activities that can be carried out in public areas of coastal municipalities. According to a federation agreement that establishes the reopening of economic activities in México (DOF May 14, 2020), Campeche, Yucatan and municipal authorities are responsible for taking measures regarding tourist activities on beaches and ecotourism. Emphasis must be placed on health training; environmentally, culturally and socially responsible travels; modification of operational measures that ensure hygiene and physical distancing conditions, and implementation of biosafety protocols based on the Regional Epidemiological Risk Traffic Light system. Some of these measures have been considered adequate (though drastic) in coastal communities (e.g. San Felipe, Dzilam de Bravo), while in other cases such as in Sisal and Celestún they are considered extreme since they have affected nature operators and tourist operators along the coast, consequently compromising up to 90% of their income since March. Service providers commented that they only participated in the Good Practices Certification Program since it was presented as mandatory to continue providing their services and that they have no knowledge of the other actions of the COVID-19 TY Plan. Additionally, they recognize that indicators for tourist control include information from airports and lodgings used mainly in Mérida, but not for nature tourism since there are no communication channels with municipal and government authorities from Yucatan to provide or receive information.

In the month of May 2020, the government of Yucatan organized an event called “Consultation for the gradual and responsible reopening of economic activities” as a response to the COVID-19 crisis. The aim of this activity was to listen to the proposals and comments of the different economic sectors about the actions developed by the state government for the gradual and responsible opening of economic activities. Participants from the primary sector, particularly fisheries identified the need

Table 2
Tourism recovery plan in the State of Yucatán (Plan COVID-19 TY).

Governance tools/Stages	Governance tools/Stages	Preservation of supply and reconstruction of destination	Reactivation of destination	Recovery of economy
Public administration measures	Preventive measures, and biosecurity protocols, suspension of tourism promotion campaigns, Health, labor and tax decrees	Management of support during the contingency: credits to support employment, unemployment insurance, distribution of food pantries, temporary employment, Plan for reactivation and recovery of the destination, Protocol for handling future crises, Plan for better opportunities tourism post COVID	State Plan for tourist reactivation, protocols for reactivation and recovery by segment, Infrastructure Plan and temporary employment support in cooperatives, update of the Work Plan with promotion strategies with the new needs, markets and objectives, State Safeguarding Plan Patrimonial	Economic recovery plan based on resilience and sustainability, Market recovery plan, Tourist promotion of the destination with a 360° marketing strategy. Magic towns
Diagnosis	Monitoring of crisis evolution Tourist thermometer	Tourist thermometer, Monitoring of trends and global guidelines	Tourist thermometer Modernization of monitoring systems, statistics and attention to tourists	Tourist thermometer Tourist observatory
Training	Training on COVID, Logistical support with cancellation of events Certificate of Good Sanitary Practices Yucatán	Remote training and professionalization on crisis and tourism issues	SEFOTUR Quality Plan, digitization of processes in establishments, tourism offer and promotion	
Information	Informative brochures on COVID-19 for companies, messages on crisis management, Information Portal	Seminars, webinars and forums with the national tourism industry, good health practices, new website, virtual videographic and infographic materials, update of tourist inventories	Communication on opening and measures health services for tourists and establishments, awareness for domestic tourism, update of InvenTur Post COVID-19, information to recover connectivity, mobility and investment, Social awareness against tourism phobia	Post COVID tourism information, 360° tourism Tianguis
Regulation	Closure of tourist establishments	Compulsory quarantines, "health or sanitary bubbles"	Staggered reactivation according to segments, markets and type of offer, health bubbles, control of informal trade, updating of the Law for Sustainable Management of Tourism in the State of Yucatan	Combating informality in the port of Progreso
Incentives	Tax decrees for lodging	Tax exemptions, Health Certification	Certificate of Good Health Practices Yucatan, bank support and exemption from quotas to the value chain	Tourist appointments and distinctives
Guides Participation	Practical Guide COVID-19, Best Tourism Practices	Planning with actors of the sector through Chambers and Tourism Associations on strategies of preservation of the offer, investment and connectivity, participation of destination in seminars, webinars and forums		Tourist events, business rounds, conferences, work with opinion leaders
Stimulating behavior	contingency and deactivation	Promotion of new alternative business models ("I order from home" and "Buy for tomorrow"), new tourism products adapted to contingency Domestic tourism campaign	Alternative economy program to promote and encourage tourist sales, encourage disruptive innovation in establishments, Domestic tourism campaign Local and regional market recovery campaign	Stimulate product diversification, Reactivation campaign, Promotions and incentives, Domestic tourism campaign, local, regional and national market recovery campaign

Source (SEFOTUR 2020):

for credits for the required inputs to re-open the fishing activity; moreover, they proposed promotional campaigns to encourage the consumption of local products; a nutrition program promoting the consumption of Yucatecan products in supermarkets, restaurants and fishmongers; a general training program to learn how to live under COVID-19 circumstances; more specific meetings by economic sector; combating illegal fishing, which accounts for 30% of the total production found in the market; sanitary surveillance with international standards, for when it would be possible to export; and access to statistical data to make a proposal for fisheries reactivation.

In Campeche, the productive reconversion plan includes different types of credits and financial and technological training. The credits also applied to the fishing sector, and the amounts offered ranged from five thousand to five hundred thousand pesos (from about 250 to 25,000 USD), which were provided for a period ranging from six to sixty months with an interest rate of 8% annually. Advanced payment of the Ban and Low Catch Program in support of coastal, deep-sea and permit-holder fishers. Boosting electronic commerce and the fluidity of the supply chain through digital tools to persuade, encourage, stimulate and motivate local purchasing.

6. Discussion and lessons learned

The learning and exchange of knowledge across governmental and social scales are key elements in adaptive governance since they tend to emphasize the development of social norms and cooperation (Levin, 2006; Vincent, 2007), to allow nested and coordinated organizational structures (Folke et al., 2007) and to promote coordinated decision-making within and across multiple scales (Olsson et al., 2007). Our results show that most adaptive strategies to cope with the COVID-19 pandemic were economic response-based actions from the Campeche and Yucatan governments, as well as informal driven actions taken at the individual level. There were very few group strategies implemented by each economic sector, fisher cooperatives or by communities as a whole. Unfortunately, this might be an example of the lack of organizational skills of most fishers' and tourist service providers in Mexico. Their cumulative organizational knowledge is limited to their fishing activity, but when it comes to post-harvest activities or activities not necessarily related to fishing, these coastal communities have more difficulties to demonstrate a non-fisheries-based or non-recreative-based resilience.

Among the key findings we can highlight the consequences and responses by fishers identified in both Campeche and Yucatan. The

consequences of the pandemic included disruption to the fish supply chain, a lack of alternative livelihoods available and the reduction of sales and prices as a consequence of the reduction of consumption, the loss of tourist markets and the measures taken to mitigate the effects of the health crises. The dynamical responses were also similar to those employed in other Small-Scale fisheries systems around the world, including the re-design of the networks focusing in local and distributional channels, the use of technology to their advantage and the focus on flexibility (Basset et al., 2021; Campbell et al., 2021; Mangubhai et al., 2021; Sunny et al., 2021).

Results also show that for the tourist sector it is possible to note some strategic initiatives aligned between the federal and state levels, both in Yucatan and Campeche, but in operational aspects there is an apparent divergent course. The focus of the federation in ecotourism activities (Environmental sector) is to take the opportunity to promote a “new normal tourism”, based on the natural capacity of coastal ecosystems and their ecosystem services. However, for the state of Yucatan (tourist sector), it seems more an opportunity to try new business models, without an environmentalist perspective of ecotourism of coastal activities. The state of Campeche seems to limit its promotion of tourism and services to only those that implement the sanitation process of the *Punto Limpio* Program.

These findings led us to emphasize the need for multiple improvements: 1) it is necessary to review and socialize the legitimate authority of each governmental level to make and enforce rules within their circumscribed policy arena (Ostrom, 2005); for this case, a balance of personal freedom of society members to perform activities in public spaces and the conditions to keep adequate safety measures while doing them, 2) it is necessary to construct polycentric governance systems that not only have clear legitimate authority and autonomy to self-organize, but also that interact and link with other authorities to achieve a balance between collaboration and autonomy (Schoon et al., 2015), 3) multi-level governance that allows the opportunities for experimentation and innovation of different policies at different geographic scales, and as a consequence the entire system learns (Brondizio et al., 2009), but it requires a common arena to share experiences and information; in this case sharing processes seems to occur only at the microregional scale (neighboring municipalities), 4) it is necessary to capitalize on scale-specific knowledge (e.g. traditional and local knowledge) that have worked during different crises (Olsson et al., 2004); weak sanitary policy and insufficient financial aid provided by the federal government for disaster attention during this pandemic event (Gobierno de México, 2020) should encourage local (or regional) development of capabilities to prevent and react under adverse circumstances, probably with more local governance leadership that will emphasize material dependencies rather than central organizational dependencies such as those described by Van Assche et al. (2020). One example of this decentralized resilience response to COVID-19 crisis has happened in England where intergovernmental cooperation has been proven to be fragile during the reactivation phase (RevistaIdeas, 2020).

During this pandemic, there were several social lessons that were identified to strengthen the fisheries sector: 1) information provided by governments about COVID-19 and the sanitary measures to prevent the spread of the virus, 2) fishers consulted with state authorities and in their cooperatives developed strategies to cope with the lock down period, 3) fishers' involvement in social informal networks to keep themselves informed and pursuing some temporary jobs proved to be more effective than governmental aids, 4) fishers building new networks with other fishers to commercialize their products, 5) fishers empowered themselves crafting several strategies to survive during the pandemic. For the coastal tourism sector, it seems necessary to improve a coordinated response (even within cooperatives) that can build on strategies for adaptive governance.

Other lessons that have been learned include, that “this crisis has taught fishers and tourist service providers to better organize, to be more supportive and to learn how to manage the little money they have”. In

addition, some people have started to create micro businesses. This will be a great opportunity for Campeche and Yucatan governments to implement the initiatives proposed in their containment of “COVID-19 Plan” and Plan COVID-19 TY in the tourist and fisheries sectors to provide economic alternatives, fight informal-illegal activities, improve sanitary bubbles, and create new strategies. Additionally, there is a consistent request among coastal tourist service providers to receive information about the sector, and that their needs and their special conditions are considered, such as their limited phone connectivity and access to digital information. Moreover, local authorities seem to have a limited knowledge about economic incentives, monitoring strategies, temporal employments and training courses needed to reactivate their economic activities.

One of the most critical aspects to address in a post-COVID-19 pandemic adaptive governance structure in the coastal zones in Campeche and Yucatan, will be the recovery of jobs. Ecotourism services and cultural attractions are an excellent opportunity to rescue the value of contact with nature and arts which, due to the pandemic, would reduce stress and the associated emotional burdens, but would also trigger local businesses (SEMARNAT, 2020; UNESCO, 2020). Some jobs in accommodation, recreation, food services and handicraft, will need to be incorporated into the new normal tourism, in addition to jobs regarding zoning design and sectorization of recreational activities, operation of reservation systems, online payment and digital information, development of protocols for visitors based on physiographic areas and visitation dynamics, surveillance and control activities of protection measures, hygiene management in common areas and, collection and management of waste will be needed to adapt service requirements. However, coordinated action with private sector and local governments will be required to implement new services offering models and improving local capacities through training (OECD, 2020).

We have not found strong arguments to define Campeche and Yucatan fishery and tourism sectors as non-resilient social or resilient systems. Each port has shown characteristics of both conditions at different times during the COVID-19 pandemic. Maybe a medium time analysis will clarify whether the adaptation of governance to the event is enough to deal with the crisis or whether a transformation process is needed.

7. Conclusions

The COVID-19 crisis can be seen as a social driver of change, which has encouraged the implementation of new and different forms of governance influencing the fisheries and tourist contexts, which at the same time depend on market demands and community needs. Mexican fisheries in general and the tourist sector, and those of Yucatán and Campeche in particular, are also reacting in different ways to this global crisis in order to survive.

The COVID-19 pandemic has been a triggering factor of social response to a crisis where social learning and experience were not related to pandemic situations. Coastal communities in the Yucatán peninsula have a long social memory of prior disaster experiences including natural hazards such as floods, hurricanes or red tide, but not on how to face a pandemic. This type of situation might even skip a generation because, despite being part of human history, they are not present very often. At least not a pandemic of this nature.

However, COVID-19 might also have had a temporary beneficial effect on the environment, some fishers and scientists believe that the low fishing effort and the general limited access to the sea, is likely to benefit fish production in the near future.

State governments have also learnt how to address the crisis by offering economic support to the fishers and tourist sectors, organized multi-stakeholders' meetings to design a COVID-19 counter plan or find extra funding for credits. Governments worked through fisher organizations to deliver aid for transparency and accountability and relied on enhancing capacities for the tourist sector through on-line courses for

granting visitors a healthy environment in hotels and restaurants.

Within the tourist coastal sector most consequences of COVID-19 have had extreme negative impacts while the majority of governmental initiatives are unknown and thus inapplicable.

Most service providers are surviving by acting as isolated individuals rather than as cooperative members, which reveals poor coordination and entrepreneur abilities within those groups. This could also be an opportunity for local authorities to induce sectorial training that drive responses to crisis in a more proactive way, since financial support will never be enough to assist all economic sectors and society members, but also to prepare them for another potential crisis.

For coastal areas such as those observed here, a coordinated non-sectoral approach and a multi-level governance strategy to recover from the COVID-19 pandemic and economic crises are needed, probably with more local governance leadership.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ocecoaman.2021.105814>.

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