





RESEARCH ARTICLE

Between uncertainty and hope: Young leaders as agents of change in sustainable small-scale fisheries

Alejandro Espinoza-Tenorio , Romana Gabriela Ehuan-Noh , Gabriela Alejandra Cuevas-Gómez , Nemer E. Narchi , Dora Elia Ramos-Muñoz , Francisco J. Fernández-Rivera Melo , Antonio Saldívar-Moreno , José Alberto Zepeda-Domínguez , Juan Carlos Pérez-Jiménez , Alma Oliveto-Andrade , Jorge Torre 

Received: 16 April 2021 / Revised: 23 July 2021 / Accepted: 23 September 2021 / Published online: 2 November 2021

Abstract The path to sustainable small-scale fisheries (SSF) is based on multiple learning processes that must transcend generational changes. To understand young leaders from communities with sustainable SSF management practices in Mexico, we used in-depth interviews to identify their shared motivations and perceptions for accepting their fishing heritage. These possible future decision-makers act as agents of change due to their organizational and technological abilities. However, young people are currently at a crossroads. Many inherited a passion for the sea and want to improve and diversify the fishing sector, yet young leaders do not want to accept a legacy of complicated socioenvironmental conditions that can limit their futures. These future leaders are especially concerned by the uncertainty caused by climate change. If fishing and generational change are not valued in planning processes, the continuity of fisheries, the success of conservation actions, and the lifestyles of young fishers will remain uncertain.

Keywords Future · Influential youth · Leadership · Social learning · Social network · Sustainability process

INTRODUCTION

The path toward the sustainable use of natural resources requires multiple, dynamic, and intergenerational learning processes (Zurba and Trimble 2014). Hopes for achieving sustainability lie in young people and their increasing degree of participation in decision-making processes (Yunita et al. 2018) and local governance (Oosterom 2018). Young people ultimately benefit from the natural resources currently being conserved (Clark et al. 2020) and have shown growing empathy and concern for both present-day and future challenges (Thew et al. 2020).

Youth is a sociocultural construct dependent on time and space (Durham 2000), although it generally refers to a stage in life in which concepts of identity, society, values, ideology, and citizenship are developed and adopted by an individual (Martínez 2008). Young people are capable of participating in transformative community and political actions and are seen as a productive social group (Moeller et al. 2018). The motivations of individuals (the drivers needed to conduct an activity) are partially the result of cognitive development and extrinsic agents (Gagné and Deci 2005; Pajares and Urdan 2006). Socio-emotional factors at the family level (Nokelainen et al. 2007; Perry 2009) and the influence of external actors (Navarro-Cendejas 2017) help shape the decisions of young people. These individuals find themselves at a crossroads between a worldview they inherit from their families and culture and the one provided by mainstream society through school-based education and the media (Ramírez-Pacheco et al. 2018). To understand how young people integrate

Graphical abstract



Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s13280-021-01639-2>.

themselves into the productive and civil sectors of society, it is crucial to understand how their actions result from an initial stage of wanting, which aligns with their aspirations, and a subsequent stage of power, which echoes their expectations and underlies their motivation to surround themselves with productive activity (Leavy and Smith 2010).

The activities of small-scale fisheries (SSF) are not limited to extraction; they encompass all activities undertaken by men and women at sea and on land that comprise the value chain (FAO 2018). Little is known regarding the many drivers that influence young people to uphold inter-generational continuity within SSF value chains (Power et al. 2014; White 2015). The knowledge, beliefs, traditions, and practices that develop as a result of the interactions between people and their environments (Berkes and Turner 2006) are what young fishers seek to complement with their own actions and perceptions (Harker-Schuch et al. 2021). This implies reevaluating their expectations and aspirations based on their unique trajectories. Thus, it is not clear how the links between new generations of fishers and the sea will be built or rearranged in the future (Coleman et al. 2019), particularly in the marginalized environments of developing countries (Tam et al. 2018; Arulingam et al. 2019).

In the 1990s in Mexico, which is considered one of the top 20 fish producers worldwide, public fishing policies promoted sustainable fishing practices that resulted in timely advances in SSF management (Espinoza-Tenorio et al. 2011). Changes in national fisheries policies have had profound implications for the participation of young people in the entire fishery production chain. A new type of fisher, the young leader, has emerged with a new vision on how to live and take advantage of their fisheries management heritage (Fig. 1).

Leaders are often chosen for being superlative in traits, such as knowledge, trustworthiness, and prosociality (Von Rueden et al. 2014), and their potential to guide processes through influence over the community or acting as links with external relevant actors (Bodin and Crona, 2008); their relevance for fisheries governance have been clearly demonstrated, as they are recognized as one of the most important social-ecological factors for sustainability (Gutiérrez et al. 2011).

The objective of our research is to point out those factors that have carved out the character of young individuals determined to exert positive differential influence within their communities through leadership. Our study is based on in-depth interviews with young people (17–29 years old) who stand out for their abilities to lead, promote local self-organization, enforce rules, ameliorate attitudes associated with destructive practices, and resolve conflicts. These young leaders favor SSF sustainability in Mexico

and may be future decision-makers. Their responses allowed us to examine the balance between aspirations and expectations and how these influence their motivations and perceptions regarding their roles in sustainable fisheries management. The results of this study will contribute to an international discussion on the future of SSF (Pauly 2018), but more importantly, this study aims to shine a light on the multigenerational consequences of global fisheries management policies that are often ignored by authorities (Neis and Williams 1996). If generational changeover is not investigated, addressed, and incorporated into planning processes, the pressure on aquatic resources is likely to increase (Biswas 2011), endangering both the continuity of fisheries (Neis et al. 2013) and the way of life of these young fishers.

Sustainable fisheries management heritage in Mexico

Around 300,000 inhabitants in Mexico directly depend on SSF catches (CONAPESCA 2017). This number climbs to more than 2,000,000 when considering people who depend on the economic income and food provided by each link of the collective fisheries value chain (IMCO 2013). Most of these individuals live in rural coastal settlements (Espinoza-Tenorio et al. 2019) where a dependence on the marine environment is deep-rooted, and cultures have developed in which a fishing management heritage is passed on through the generations (Zepeda-Domínguez and Espinoza-Tenorio 2018).

An increasing demand for fish and their products in Mexico has led to overfishing, resource depletion, a loss of economic and human resources, and poor returns on investments (Fernández et al. 2010). Hence, civil society organizations (CSOs) and government agencies have collaborated with fishing communities to preserve marine resources and ecosystems while promoting the sustainable management of SSF. These alliances have allowed for improved compliance with regulations, a legitimization of the empirical knowledge held by fishers, and the promotion of ecosystem-based approaches to fisheries management (Fulton et al. 2019).

These collaborative efforts have shown varying degrees of consolidation. Communities in the Gulf of California and North Pacific stand out for the sustainable management of their highly productive fisheries (Espinoza-Romero et al. 2014). Communities in the Caribbean, which hosts the second-largest reef system in the world and constitutes a great development pole for tourism, have shown promising improvements in fisheries management (Ayer et al. 2018). In the Gulf of Mexico, fishing efforts have focused on the exploitation of finfish species, which operate



Fig. 1 Young women and men participating in different activities associated with sustainable fisheries management in Mexico. **1** Training to program temperature recorders in the Mexican Caribbean. **2** Informative mural on the implementation of fishing refuge areas in the Gulf of California. **3** Young fishers involved in the Lionfish eradication of the Mexican Caribbean. **4** Dive training and certification in Baja California. **5** Oceanographic data collection in the Gulf of California. **6** Training in dissection procedures to obtain samples of *Caulolatilus princeps* in Baja California. **7** Water sampling for environmental DNA analysis in the Mexican Caribbean. **1** © L. Tamayo. **2–7** © COBI A.C

simultaneously and unequally with efforts to extract hydrocarbons in shallow waters (Salazar-De la Cruz et al. 2020).

MATERIALS AND METHODS

A total of 15 men and 10 women from 13 locations in the Gulf of California, Caribbean Sea, Gulf of Mexico, and northern Mexican Pacific were interviewed for this study

(Appendix S1). These young people are members of fishing communities, and their domestic units are economically associated with 14 SSF (Fig. 2), as either members of cooperative societies or as individual permit holders. Although some of these young people live in urban areas, they are mainly associated with rural populations with varying degrees of social marginalization, of which only five and three areas have the infrastructure for upper secondary education and higher education, respectively. All fishing communities in which the interviewees live have

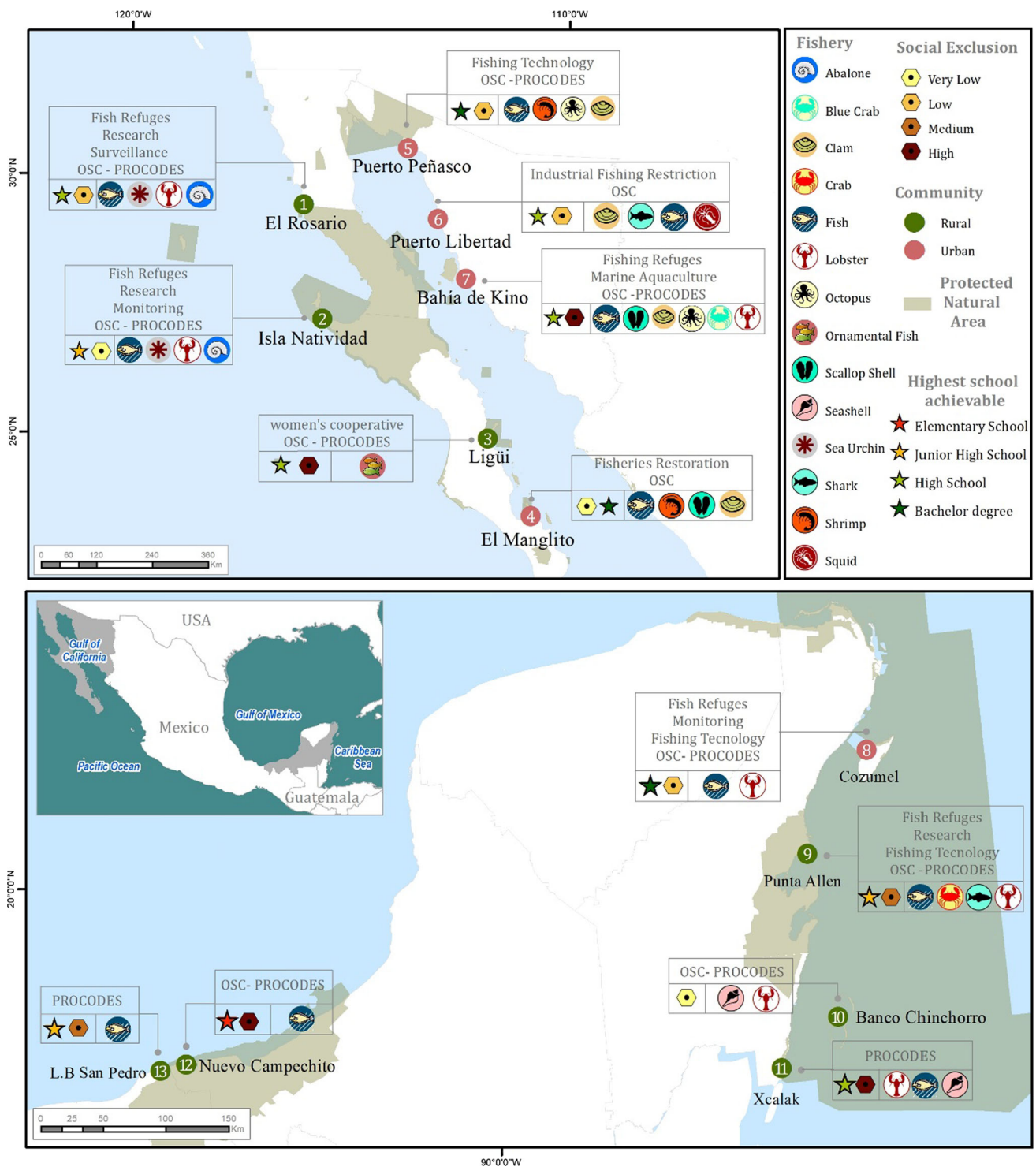


Fig. 2 The locations and socioeconomic and educational descriptions of the localities in which the interviewees lived. The main fisheries and their sustainable management projects linked to Civil Society Organizations (CSOs) and the Program for the Protection and Restoration of Ecosystems and Species at Risk (PROREST) are presented. Figure created from the information obtained from the interviews, CONAPO (2015), and CONANP (2020)

been supported by CSO projects and the National Commission of Natural Protected Areas (CONANP) and its Conservation Program for Sustainable Development (PROCOCODES) that have sought to implement sustainable practices and strengthen fisheries management.

To study future fisheries leaders, we used judgment sampling (Malterud et al. 2016) to purposively select informants in 2020 in different regional contexts given their specific age and gender. To include influential and highly motivated young people interested in involving themselves in management decisions (Gutiérrez et al. 2011), 12 adult leaders of cooperatives involved in sustainable fisheries suggested young people that met at least two of the following criteria: (1) they were members of families that supported and promoted sustainable fishing practices; (2) they were linked to the training efforts of CSOs and CONANP to develop and promote sustainable fisheries; and (3) they worked in a link of a productive fisheries value chain subject to sustainable management practices (e.g., in fishing refuges or as survey divers conducting citizen science). Both interviewees and adult leaders were provided with all the pertinent information pertaining to this study (i.e., the objectives, goals, funding information, possible risks and benefits, and contact information).

In September and October 2020, virtual interviews were conducted through video conferences and telephone calls due to the Covid-19 pandemic. The ethical standards of informed participation of the Code of Ethics of the International Society of Ethnobiology were followed (ISE 2006). Participation in the study was voluntary. Interviewees were given the option to reserve their answers to specific questions, refuse to participate, or stop participating at any time without providing a reason and without any associated sanctions or consequences. Approval was obtained to record the interviews, and consent was obtained from the guardians of any minors.

In-depth interview

A mixed questionnaire was divided into seven sections (Appendix S2). Close-ended questions in sections I–III were used to characterize the interviewees and their family environments. Sections IV–VI were semi-structured to capture agreements and disagreements concerning aspirations and expectations as well as real-life fishing stories to identify the motivations for embracing their fishing management heritage. Aspirations (i.e., utopian and idealized longings) are understood to be what one wants to become or have and are linked to an ideal of what life should be, while expectations (i.e., realistic evaluations of probabilities) differ in that they are founded on lived reality. To evaluate aspirations and expectations, the reference

framework used by Patton and Creed (2007) was adopted. This proposes a method for observing perceived barriers and identifying potential discrepancies between two possible life projects and their subsequent consequences.

In section VII, the perceptions of young people regarding the processes that favor SFF sustainability were identified. An infographic was designed (Appendix S3), and the scale of maximum difference (MaxDiff; Louviere et al. 2015) was used to determine the level of importance attributed to each of the eight processes stemming from voluntary guidelines to achieve sustainability in SSF (FAO 2018). Each young person was asked to explain the progress and challenges associated with the three processes that they considered to be the most relevant in their fishing communities.

Analysis

Answers to each question were transcribed and categorized in Atlas.ti 8 (ATLAS.ti Scientific Software Development GmbH, Berlin, Germany) to identify information patterns (e.g., topic frequencies; Saldaña 2013). Categorized responses of the interviewees were analyzed with SankeyMATIC (Bogart 2018), and flow diagrams of internet use and the stories of young people were constructed according to three age stages: childhood (< 10 years), adolescence (10–21 years), and young adult (22–29 years). Atlas.ti was also used to identify the 50 most frequently used words by the interviewees, which were used to build a word cloud (see Graphical Abstract).

Standard deviation (SD) and range are shown as a measure of variability. A t-test was used to test whether there were differences in age between young men and women. Independent test was conducted to test for independence between genre and educational level.

RESULTS

People interviewed in this study were 24 years old on average (SD = 3.4; range 17–29 years). The age of men (\bar{x} = 24, SD = 3.3) and women (\bar{x} = 24.1, SD = 3.7) was not statistically different ($t = -0.07$, $P = 0.94$). Of these, 14 people were single and lived with their parents, five people were married, and six people were in common-law partnerships. Only three of the single men lived on their own, and nine people were parents. The women (\bar{x} = 19.5 years, $n = 2$) became mothers before the men became fathers (\bar{x} = 21.3 years, $n = 7$).

Thirteen interviewees said that they obtained medical care from the Mexican Social Security Institute, either because they had access to this system as students or because their parents were affiliated in some way. When

young people conclude their studies, stop studying, or emancipate from their parents, they often use low-cost private clinics offered by pharmacy chains to cover their health needs and occasionally turn to traditional medicine or the free public system.

Generational change

Most of the interviewees were originally from the locality in which they now work (Fig. 3a). The fathers and mothers of the interviewees, on the other hand, had migrated from other localities in the same state or from other states within the region.

The interviewees went to high school, and some obtained technical specializations (e.g., ecotourism; Fig. 3b). Almost a third of the interviewees began undergraduate studies, and some completed them. In contrast, their fathers and mothers mostly attended high school, except for one mother in the Caribbean. Educational level is statistically independent of gender in young people ($X^2 = 0.04$, $P = 0.98$) and their fathers and mothers ($X^2 = 1.5$, $P = 0.67$). According to the people interviewed, they studied because their parents worried about the

problems inherent to fishing, such as economic instability or being away from home for long periods.

Despite the evident family support toward studying, half of the interviewees interrupted their education, either voluntarily or by dropping out of school (four men) due to a lack of money, uncertainty regarding what to continue studying, or little interest. A young Caribbean fisher (C-BC2) who became a father at 19 years of age dropped out of high school due to “the poor financial stability of my parents, and [...] we made the mistake of starting to earn money; we worked outside of school and then the ambition for money won me over.” The women who abandoned their studies left due to limited financial resources and sometimes due to the lack of family support.

Interviewees participated in more fishing sectors than their parents, who also worked in other professions (Fig. 3c). However, a labor bias driven by gender and age was present. Younger and older men mainly worked extracting fishery resources, while young women mainly worked in the administration of fishing organizations. The mothers of the interviewees primarily worked as housewives, in other economic activities, or in fishing but without direct economic remuneration (C-X1). Therefore, economic activity depends on gender in young people

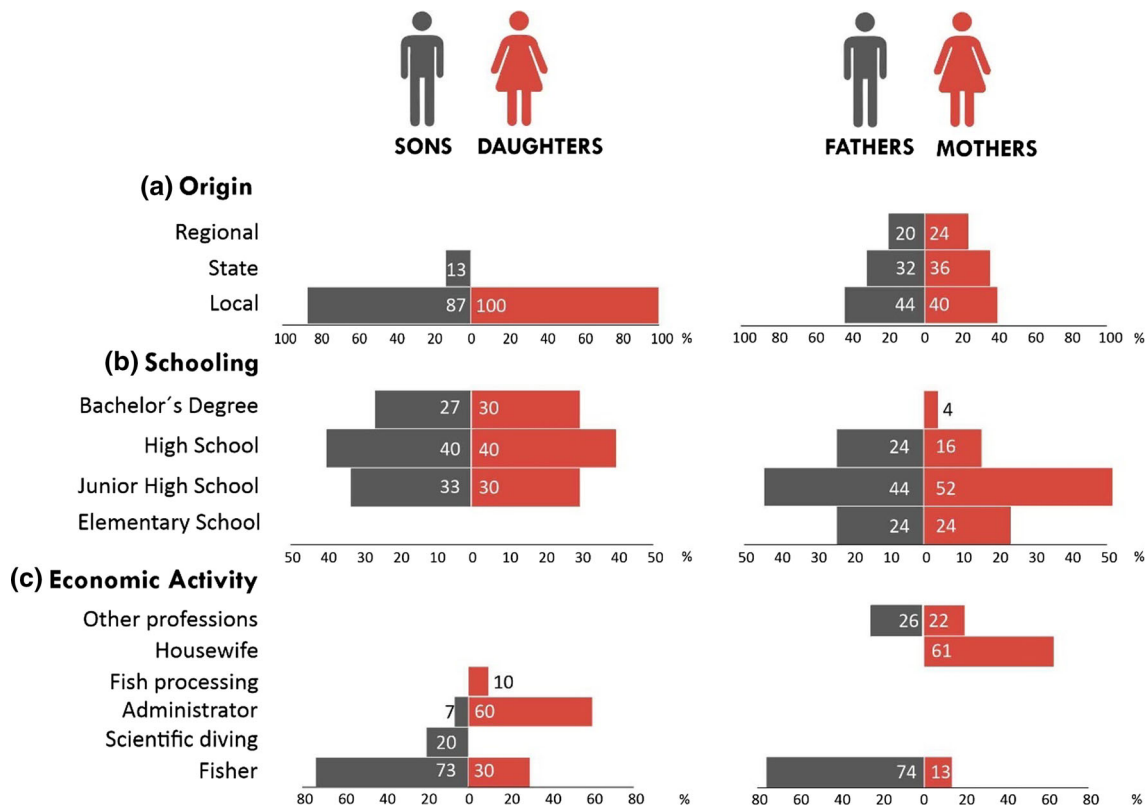


Fig. 3 Comparison of the profiles of the interviewees (i.e., sons and daughters) with those of their fathers and mothers who participated in sustainable fishing in Mexico. Gender comparison among men (gray) and women (red), including their geographical origin, educational level, and main economic activity. Figure created from the information obtained from interviews

($X^2 = 10.3$, $P < 0.01$) and their fathers and mothers ($X^2 = 23.8$, $P < 0.0001$).

The new digital tools

Twenty interviewees said they accessed the internet using modems from communication companies or from public or community satellite dishes in rural areas (Fig. 4). Four interviewees used a prepaid system and only one young woman (GC-L) from an isolated location did not have a permanent internet connection and often traveled to access one.

On the Internet, people use social networks, such as Facebook, WhatsApp, and Instagram, as hobbies and a means of communication with family and friends. Additionally, these social networks are used to promote and coordinate the activities of the organizations in which they work. These platforms and email provide access to nine different categories of content, including fishing information, environmental news, news in general, and leisure and entertainment topics.

The intricate path to becoming a fisher

From a review of the fishing activities that the interviewees conducted since childhood, it was determined that they participated in 16 activities within 12 fisheries (Fig. 5). Men and women followed different staggered and gradual trajectories to learn the trade. During childhood, the

interviewees reported participating as apprentice companions or in recreational fishing for household consumption in coastal protected places like lagoons and beaches. At the beginning of adolescence, the type of fishery work generally changed depending on whether someone was a man or woman. While young women mostly worked processing fishery products, young men became apprentices (waiter/fishing or eventual companion), which is a decisive step toward extracting fishery resources. In this period, young people also moved away from fishing activities to attend school, which sometimes implied leaving their rural communities.

As young adults, most men became boat captains or survey divers, while coeval women of the same age were primarily positioned in administrative posts or in processing-related activities. Many women take on these jobs after having studied, regardless of fishing experience. Additionally, some women carry out these activities because they married a fisher.

Aspirations vs expectations: a crossroads between the dream and reality

A successful life in fishing for young people is not guaranteed, as real opportunities and their ideals interfere with their destinies as young fishers. The main benefit that the interviewees perceived from working in fishing was the possibility of obtaining food, although men tended to also value economic income, while women valued the

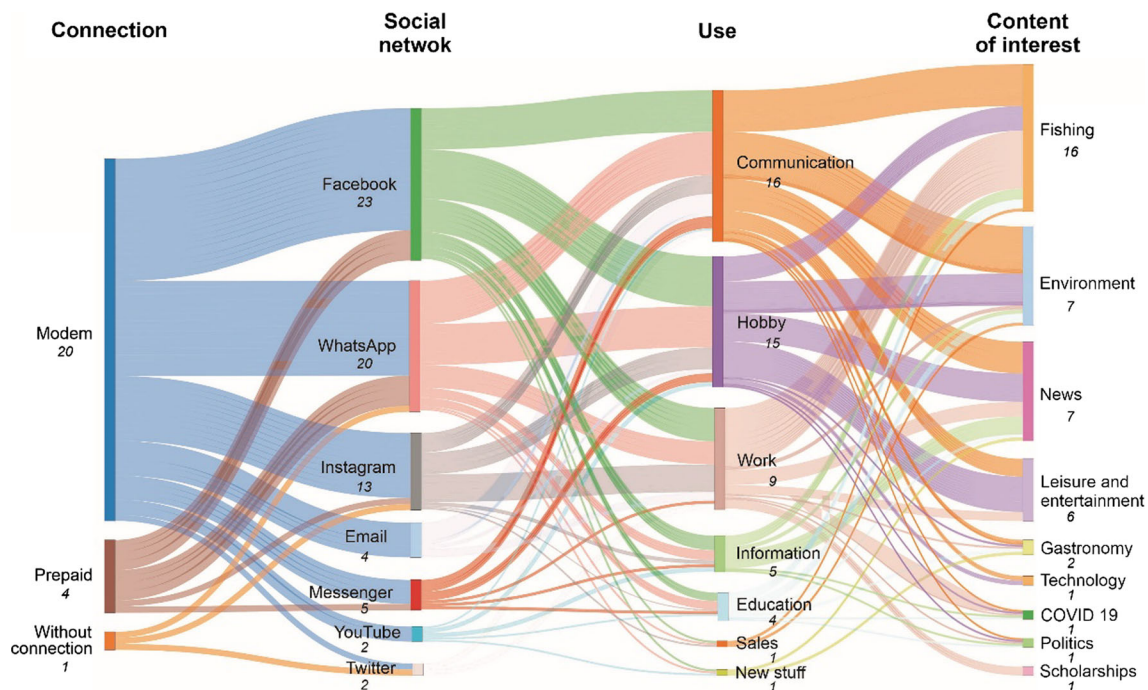


Fig. 4 Internet access and the use of social networks among the young people interviewed who participated in sustainable fishing in Mexico. The number in italics indicates the number of answers that were the same among interviewees

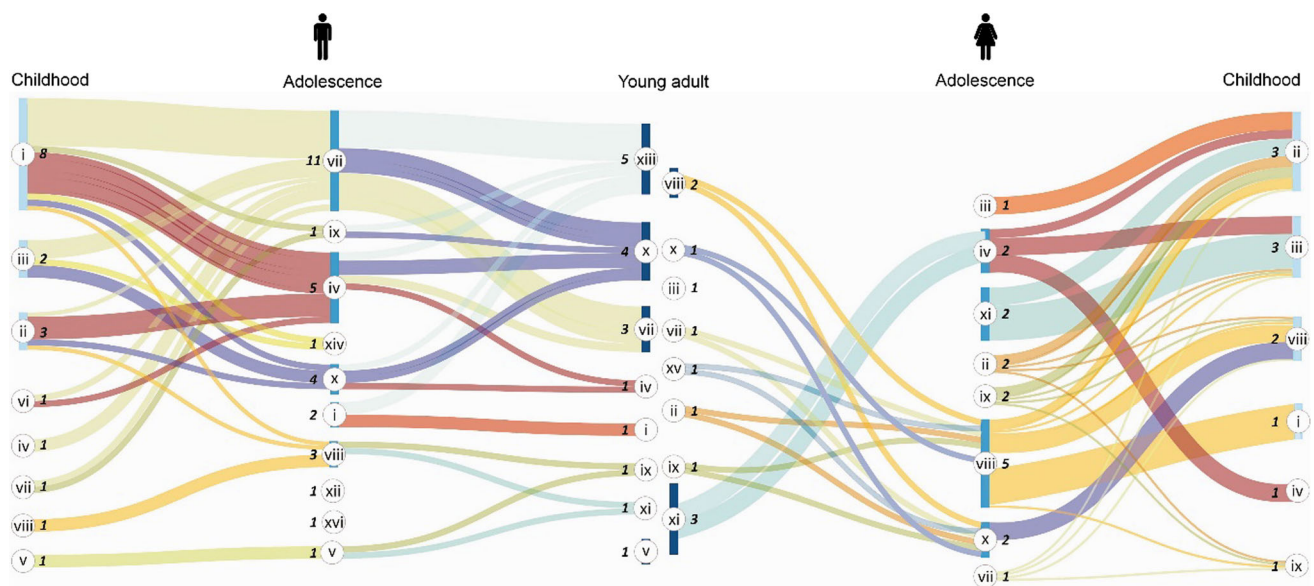


Fig. 5 The trajectories of young fishers in Mexico and their staggered participation in the fisheries: (i) apprentice companion, (ii) coastal fishing, (iii) recreational fishing, (iv) eventual companion, (v) embarking/disembarking, (vi) beach cleaning, (vii) waiter/fishing companion, (viii) processing and (ix) selling fishery products, (x) survey diver, (xi) administrator, (xii) trainer, (xiii) captain, (xiv) sport fishing, (xv) cooperative leader, and (xvi) aquaculturist. The Arabic number in italics indicates the number of answers that were the same between interviewees. Figure created from the information obtained from the interviews

knowledge they obtained of natural resources and the opportunities for paid work. Both men and women appreciated the benefits obtained by belonging to a cooperative (e.g., medical insurance) and the way of life in their communities.

The interviewees were also interested in fishing because they enjoyed life near the sea and coast, including the landscapes, food, opportunities for relaxation, and knowledge that this lifestyle provides. In addition, the interviewees also valued the potential for adventures, social connections, and personal challenges that come from being a working fisher. A free diver from the coral reefs of Banco Chinchorro (C-BC2) said that his activity “...is an unbeatable [and] indescribable experience because the sea gives us a new experience every day.” The interviewees did not like fishing that was economically unstable or, as a young man who works in ecotourism considered (C-A4), fishing without restrictions, which can result in “decreases in the populations of animals in the ecosystem.”

Young people who view fishing as an ideal activity have histories of participating in fishing since childhood and have not sought other job opportunities, as they consider that there are ample opportunities within the value chain like those within the lobster fishery in the Caribbean Sea, which is perceived as having viable fish stocks and high levels of community organization. If it becomes challenging to continue fishing in their places of origin, the interviewees planned to achieve their aspirations through activities complementary to fishing that offered improved economic autonomy and personal satisfaction (i.e.,

professionals or environmental activists). A young engineer (C-X1) in environmental sciences who was single and the daughter of a Caribbean fisher said that although she would like to live in cities with greater services and safety, fishing is “... not something that could be left behind.”

Some young people continue fishing for personal satisfaction, although they have little hope of continuing in the activity. This crossroads is due to the high degree of uncertainty in the fishing sector, such as the collapse of the pen shell (*Atrina tuberculosa*) and catarina scallop (*Argopecten ventricosus*) fisheries or greater fishing restrictions in the Gulf of California. In the absence of fishing, the interviewees would consider engaging in non-fishing activities and taking advantage of regional opportunities, such as those related to tourism services (e.g., receptionists and cooks).

Other interviewees would also leave fishing if they found a job that allowed them to obtain sufficient and stable salaries. These young people only participate in fishing due to a lack of better jobs or because they have been affected by crises in other productive sectors (e.g., the hydrocarbon industry). It is common for these young people to have pursued the professional careers available in their region (e.g., those related to administration, tourism, and engineering), although possibly not the ones they would have liked, such as architecture or international relations. Occasionally, acquired skills support local SSF (e.g., administration and being technologically savvy), even without fishing jobs being the first choice of young people.

Living with what is necessary and restoration

The interviewees relate sustainability to conservation and the responsible use of fishing resources. For a young descendant of farmer-fishers (C-BC1), the message is clear, “*live using only what is necessary.*” In addition, given the evident deterioration of the fisheries, the interviewees saw the recovery of resources as an integral part of sustainability, saying “we are going to make use of a resource, but we are going to do something to make it return to a level that is the same or even better” (GC-M1). The interviewees showed greater concern for fisheries due to risks associated with disasters and climate change, although other concerns were also present (Table 1). However, priorities differed between genders, and the ten women interviewed had more concerns related to sustainable resource management, governance, and gender equality.

The worst is yet to come

The visions of the future for the interviewees included climate change as the greatest external threat to fishing since it may threaten the ability to continue fishing. The interviewees were aware that “climate change [...] affects or benefits, but more than anything it affects” (P-R3), and they had concerns about coral bleaching, changes in marine currents, and the increased risk of hurricanes. It is “... as if the planet was withering away” (C-BC2).

The interviewees recognized local strategies to mitigate the possible impacts of climate change in marine communities. However, they perceived that improved awareness and community training are needed since this issue does not receive the degree of attention it requires while concrete measures to mitigate disasters are lacking.

Table 1 Weighted importance assigned by young fishers to sustainable fishing processes

| Priority | Process | Score | | |
|----------|---|------------|------------|------------|
| | | Man | Women | Total |
| 1 | Disaster risks and climate change | 5.9 | 3.8 | 5.0 |
| 2 | Sustainable resource management | 4.5 | 5.3 | 4.8 |
| 3 | Information, research, and communication | 5.3 | 3.9 | 4.7 |
| 4 | Value chains, post-harvest, and trade | 4.6 | 4.7 | 4.6 |
| 5 | Policy coherence, institutional coordination, and collaboration | 4.5 | 4.3 | 4.4 |
| 6 | Responsible governance of tenure | 3.7 | 5.2 | 4.3 |
| 7 | Gender equality | 3.7 | 4.8 | 4.2 |
| 8 | Social development, employment, and decent work | 3.9 | 4.0 | 3.2 |

The highest scores for each category are in bold

Dialogue and consensus

The interviewees were aware of the efforts made by their cooperatives to implement responsible fishing practices, but they were also aware that most fishers sometimes cannot respect closed areas or periods because “they live day to day and need money to live” (C-C). In addition, although fishers are kept informed through general assemblies, most prefer to simply deliver their product and fully delegate the responsibility for its sale, administration, and dealings with the authorities to cooperative leaders. As such, given the excessive bureaucracy and intersectoral lack of coordination, it is common for people to distrust the authorities.

The interviewees suggested that the problems that persist in their communities may be addressed through dialogue with government authorities. Management based on organization was summarized by one person who said “if everyone were organized, there would be no fishers to obtain the product” (GC-BK1). This dialogue would allow the fishing organizations to overcome scenarios of apathy, fines, punishments, or conflicts.

You must learn before you extract

According to the interviewees, it is necessary for all generations of fishers to receive training on the rational use of resources and climate change, advice on how to value the way of life of fishing families, and information on local, sustainable management practices for resource utilization and conservation. For several of the respondents, this basic knowledge implies understanding how to work as a team, sell the product (e.g., knowing the price of the product in international markets), operate within the laws that regulate fishing, collaborate with institutions, and work with a focus on gender equality in all areas. To achieve this, fishers must commit to learning and understanding sustainable fishing. In addition, the interviewees identified an essential element of sustainability in social co-responsibility and the need to disseminate information among consumers and themselves.

Less catch, more value

For the interviewees, the future of the market is “where less product is produced, but it is worth more” (P-R2). There are fisheries in the Caribbean, the Gulf of California, and the North Pacific that have moved toward sustainability, expanding their value chains to a predominantly international market. In these fisheries, young people are satisfied with their profits, as a young lobster fisher (C-BC2) mentions, “...with exports they pay us much better than with local trade.” In addition, young people do not have a good view of the national markets because they distrust intermediaries, as “they do not offer a legal guarantee of payment” (GC-PL2).

Interviewees wish for SSF to benefit from the market by diversifying and creating new processes that add value to their products, eliminate intermediaries, and improve resource management. To do this, the interviewees proposed avoiding ineffectual administrations, having human resources with the necessary knowledge to export the products, and acquiring storage equipment to process and pack products. The interviewees also proposed strengthening electronic marketing strategies with web pages and social networks.

Inspection and support

For the interviewees, inter-institutional coordination and collaboration are essential for promoting a consensual work program among fishers, government authorities, and CSOs. One limitation is the centralization of governmental institutions and elaborate procedures, which results in a lack of dialogue among the interested parties, as there are no local officials that have been empowered to develop or establish agreements. In some regions, the implementation of conservation programs oriented toward surveillance has resulted in territorial conflicts. For example, interviewees from the Gulf of California mentioned critical family changes when they had to move away from their fishing areas due to the establishment of no-fish zones (i.e., protected areas, fishing refuges, and community reserves). As they witnessed the socioeconomic implications that these changes caused, interviewees were concerned that if illegal fishing and the over-exploitation of fishing resources continued, closed periods and no-fishing zones would be increased and expanded. “There is going to come a time when there is an eternal ban; you will not even be able to fish,” emphasizes a diver and fisher from the Gulf of California (GC-BK3).

The sea for those who care for it

According to an adolescent daughter of a fisher (GC-PL1), law enforcement should be equitable, and it is “... the responsibility of the fishers to respect them [the laws] and the responsibility of the government to sanction [offenders].” However, the right to access and use their fishing areas is still a matter of concern for young people. The interviewees pointed out that even though taxes are paid to the government to be able to sell fishery products, their rights are violated daily as there is no security in their communities and illegal fishing is not properly addressed (e.g., respecting the anonymity of complaints) while mechanisms have not been put in place to guarantee fair and equitable fees for their products.

The young interviewees proposed that a commitment to responsible fishing should be an unconditional requirement for everyone who wants to enter the fishing sector. By

knowing and understanding their rights and responsibilities, it is possible to prevent the dispossession of territories that form part of their fishing heritage. In the words of the son of a fisher (C-A4) “...the sea is for those who really know how to take care of it [...]; if I don’t know how to take care of it, sustainably use it; I should not have that right, although someone who does value it should.”

Same job, same pay

According to the interviewees, although the prioritization of gender equality is different between young men and women, they receive the same pay for the same tasks, regardless of gender. Men consider that women who participate in extraction activities, although they are still very few, deserve admiration and support. Moreover, all women were proud to take on an activity that has been historically linked to men. “Being a woman makes me proud because the truth is I’m good at fishing,” says a fisher from the North Pacific (P-R1). Being a woman survey diver or engaging in the direct extraction of fishery resources represents an achievement considering the limits imposed on their mothers and grandmothers. However, some of the interviewees felt that they are still not considered in the decision-making process. For them, men still predominantly occupy jobs within cooperatives. Even in administrative positions, women are yet restricted to performing minor tasks and are paid less.

How to live from fishing

The demands of the interviewees were linked to an overall lack of conformity regarding the needs of their communities. Despite constituting an important productive sector of the nation, fishing communities have not yet been provided with basic rights and services (e.g., public safety, health, housing, and education). In some communities, water, electricity, and access to the internet have had to be provided by the community members themselves. The growing insecurity for fishers at sea, drug addiction, and the threat of organized crime have not been addressed. Fishing must be valued and promoted so that young people see it as a relatively quick way to earn money. In some places, such as the Caribbean, young people have complemented fishing activities with ecotourism to compensate for declines in their income during closed seasons or during periods when catches are low.

DISCUSSION

The sustainability of SSF has been built on lessons learned, successes, and failures (Salas et al. 2019). Achievements in

sustainable fisheries will endure over the long run if they are maintained, enriched, and expanded upon by future generations (Berkes 2003). Therefore, maintaining the progress that has been made will largely depend on continuing efforts from young people to propose and implement actions to alleviate or reverse environmental degradation. New generations of fishers will inherit a complicated legacy that they must decide to adapt, assimilate, or deny given a highly uncertain future. Nowadays, young fishers operate in new and complex contexts with different knowledge, tools, and motivations than those of their parents.

The interviewees look forward to maintaining coastal livelihoods, and their hopes lie in continuing to participate in SSF. They are heirs of a fishing culture rooted in teaching children about the sea (Malm 2015). Thus, like their predecessors, young fishers constantly adapt to the changing conditions that are inherent to the seas and oceans (Tolentino-Arévalo et al. 2019) and to the complexity and heterogeneity of SSF (Coronado et al. 2020). Due to the relationship between biocultural heritage and the identity of individuals (McRuer and Zethelius 2017), the territories in which young people grow and their histories influence their opportunities to achieve long-term goals. For this reason, young people are strongly influenced by socio-environmental contexts, and their vision of sustainability reflects the different needs of each region and fishing community.

Fisheries management heritage is not fixed. It will always be necessary to integrate new knowledge, systems, technologies, and ways of dealing with changing socio-environmental conditions. Therefore, young people face socio-environmental challenges when creating opportunities, diversifying their activities, or adopting new practices (Glover and Sumberg 2020). The new generation aspires to both fish and carry out other activities, achieving a balance between their aspirations and expectations in the places they want to live. Young people add new empirical and scientific knowledge and tools to the skillsets of their parents. These additions allow them to identify problems that previous generations were slow to address. For this reason, young people are essential for innovation and diversification (Zurba and Trimble 2014). During the COVID-19 pandemic, fishers have shown a great capacity to technologically adapt to lockdown measures and market closures (Lopez-Ercilla et al. 2021). Young people played a key role in helping their parents learn to use digital media and videoconferencing software, the internet, and social media to participate in electronic commerce.

In emergent economies like Mexico, SSF face complex challenges when adapting to the new conditions of international markets, the increasingly strict regulations for

fishing activities, a lack of basic rights and services, and general socio-environmental vulnerability. This has generated an ambivalence in young people between frustration and hope. The frustration of not fulfilling their aspirations was notable among the 25 young people included in this study. The interviews with young women and men revealed that educational levels have improved compared to those of their parents. In addition, the gender gap in fisheries has reduced, cooperative work is appreciated, and digital capabilities have opened new doors. However, young people continue to face precarious conditions, including interrupted education, a lack of preferred work in fisheries, a lack of health care and services, and the relegation of women to performing minor tasks.

Competing under disadvantageous conditions in the labor market creates conditions of hopelessness, which may even be greater among young people who are part of SSF and who are not yet part of sustainable practices. In the rest of the country, most young fishers share a deep sense of belonging to a fishery, but they are growing up under more adverse socioeconomic conditions than those who were interviewed in this study (e.g., no social security; Fernández-Reyes 2018), and thus, participation in SSF is unappealing to them (Castro-Mondragon et al. 2015). Nonetheless, fishing constitutes the only labor source that many young people in rural zones have (Coleman et al. 2019). One of the young interviewees clearly described this unattended issue: "...unfortunately most of the people who enter [...] fishing do so because they no longer have any other option" (C-BC1).

In addition, the gerontocratic systems still present within fishing organizations limited participation of young people in decision-making processes, hindering the integration of innovative fishing practices (Zepeda-Domínguez and Espinoza-Tenorio 2018) or bidirectional learning. Under these circumstances, activities designed to foster exchanges among fishers are particularly important because they provide opportunities for fishers to share the lessons, knowledge, and skills they have acquired while exploring new ideas that will allow them to learn, adapt, and strengthen their understanding (Jenkins et al. 2017). Although there is a lack of interest in formal education, learning from experience and the information that is connected through different contexts is valued by young fishers. As in other societies that survive by collecting and hunting (Lew-Levy et al. 2017), it is through these empirical learning spaces and by learning about other regions that fishers can identify possibilities for transformation. In doing so, they gain the opportunity to anticipate situations and design preventive or alternative measures before negative impacts occur in their communities.

Youth priorities for sustainability

Although all axes for sustainable fishing are equally important, the interviewees, like other young people in the world (Harker-Schuch et al. 2021), were especially concerned with the environmental future of their coastal zones. These areas are vulnerable to extreme natural phenomena, especially in emerging countries with precarious coastal infrastructure (Reguero et al. 2015). With rapid demographic changes and low incomes, the economies in these areas are mostly dependent on natural resources (Maja and Ayano 2021).

For the interviewees, the key to improving fisheries management lies in knowledge and organization. The interviewees shared a collective identity that was reflected in their aspirations to become part of a cooperative, which is related to the axes of governance and dignified employment. Young fishers want to break down communication barriers and bridge the communication gap between authorities and fishers.

The hierarchical organization of priorities differs between genders. The ten women interviewed assigned greater importance to the issue of gender equality than did the men. Women had an optimistic view of the future, as their experiences seem different from those of their mothers. Young women influence administrative aspects and do so with a higher level of education and to a greater extent than do men. However, creating mechanisms that women can use to become active participants in decision-making processes must be prioritized (Solano et al. 2021).

CONCLUSION

Young fishers are the engine of transformation in fisheries management, although they are still invisible to the fishing system in practical terms. In Mexico, young people represent 24.6% of the total population (INEGI 2020) and ignoring them is to discard a real agent of change. Society will need to quickly adapt to their vision of the future and recognize the problems they face. Acknowledging the contributions and efforts of young people in SSF will generate opportunities to improve sustainability and living conditions. Therefore, to bridge the gap between the aspirations and expectations of young people for becoming effective agents of change and sustainability, they must be included in decision-making processes and spaces must be created for them to exert their power. Society will also have to truly value the fishing trade, by establishing fishing as a decent and highly valued job within communities for young people so that their needs and those of their families may be met (Larson et al. 2018). However, young men and

women are not the same; as we have shown, they have different interests and require different support.

In the transition from one generation to the next, fisheries institutions must adequately prepare and support men and women to claim a way of life that is fundamental for conserving marine environments and fostering food security. Building spaces for hope (Harvey 2000) has become a central component of organization, social participation, and environmental awareness strategies. However, failure to do so may put SSF at greater risk, both in Mexico and elsewhere.

As such, it is important to consider young people as future community and fisheries leaders. This poses significant challenges for the design of public policies capable of effective responses, which must comprehensively address challenges related to decision-making, fair and equitable labor dynamics, and overall opportunities that currently limit the potential well-being of young fishers. Therefore, it is not only the management and inclusion model that must change but also the accumulation model as well. A new accumulation model in which fishing cooperatives can reinvest part of their profits in shares and institutions that strengthen the social capital of their communities is needed (Barkin and Rosas 2006). It is essential to understand young people in the context of educational, labor, and research policies to see them as agents of social transformation and open for dialogue. Governments, CSOs, and researchers must redouble their efforts to incorporate, train, and understand young men and women as future decision-makers in more comprehensive and profound ways than before.

Acknowledgements We thank the young fishers for the generosity when sharing their visions of the future. We also wish to thank the cooperatives that supported us in identifying young people to participate in this study, namely S.C.P.P. Jóvenes Ecopescadores, S.C.P.P. Vigía Chico, S.C.P.P. Mujeres del Golfo, S.C.P.P. Buzos y Pescadores de la Baja California, S.C.P.P. Andrés Quintana Roo, C.P.B.S. Pescadores de Nuevo Campechito, S.C.P.P. Ensenada, S.C.P.P. Buzos líderes de Kino, S.C.P.P. Banco Chinchorro, S.C.P.P. Cozumel, S.C.P.P. Andrés Quintana Roo, S.C.P.P. Mojarra del Arrecife, and S.C.P.P. Camayabelo S.C. by R.L. This research was supported by the Walton Family Foundation, The David and Lucile Packard Foundation, The Marisla Foundation, Summit Foundation, Sandler Foundation, and Sac-Tun. We are grateful to S. Castillo-Dominguez for the illustrations of Figures 3, 4, and 5.

Author contribution Conceptualization: AET, RGEN, NEN, DERM, ASM, JAZD; data curation: AET, RGEN, GACG, AOA; formal analysis: AET, RGEN, GACG, NEN, DERM, ASM, JAZD; funding acquisition: GACG, FJFR, JT; investigation: AET, RGEN, GACG, AOA; methodology: AET, RGEN, GACG, NEN, DERM, ASM; project administration: AET, RGEN, GACG, FJFR; resources: AET, GACG, GACG; software: AET, RGEN, AOA; supervision: GACG, FJFR, JT; validation: AET, RGEN, GACG; visualization: AET, RGEN; writing—original draft: AET, RGEN, GACG, NEN, DERM, FJFR, ASM, JAZD, JT; writing—review & editing: AET, NEN.

Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

REFERENCES

- Arulingam, I., L. Nigussie, S. S. Sellamuttu, and L. Debevec. 2019. Youth participation in small-scale fisheries, aquaculture and value chains in Africa and the Asia-Pacific. Penang: CGIAR Research Program on Fish Agri-Food Systems. Program Report: FISH-2019-14.
- Ayer, A., S. Fulton, J.A. Caamal-Madrigal, and A. Espinoza-Tenorio. 2018. Halfway to sustainability: Management lessons from community-based, marine no-take zones in the Mexican Caribbean. *Marine Policy* 93: 22–30. <https://doi.org/10.1016/j.marpol.2018.03.008>.
- Barkin, D., and M. Rosas. 2006. Is an alternate accumulation model possible? A proposal for the New Rurality. *Polis* 13: 15 (in Spanish).
- Berkes, F. 2003. Alternatives to conventional management: Lessons from small-scale fisheries. *Environments* 31: 5–20.
- Berkes, F., and N.J. Turner. 2006. Knowledge, learning and the evolution of conservation practice for social-ecological system resilience. *Human Ecology* 34: 479–494. <https://doi.org/10.1007/s10745-006-9008-2>.
- Biswas, N. 2011. Turning the tide: Women's lives in fisheries and the assault of capital. *Economic and Political Weekly* 46: 53–60.
- Bodin, Ö., and B.I. Crona. 2008. Management of natural resources at the community level: Exploring the role of social capital and leadership in a rural fishing community. *World Development* 36: 2763–2779. <https://doi.org/10.1016/j.worlddev.2007.12.002>.
- Bogart, S. 2018. A Sankey diagram builder for everyone. Retrieved 5 April, 2021, from <https://sankeymatic.com/>
- Castro-Mondragon, H., R. Flores-Garza, J.L. Rosas-Acevedo, P. Flores-Rodríguez, S. García-Ibáñez, and A. Valdez-González. 2015. Biological fishing and socio-economic scenario of coastal mollusc fishing in Acapulco. *Revista Iberoamericana De Ciencias* 2: 7–24 (in Spanish).
- Clark, H., A.M. Coll-seck, A. Banerjee, S. Peterson, S.L. Dalglish, S. Ameratunga, D. Balabanova, H.S. Sachdev, et al. 2020. A future for the world's children? A WHO-UNICEF-Lancet Commission. *The Lancet Commissions* 395: 605–658.
- Coleman, J., C. Carothers, R. Donkersloot, D. Ringer, P. Cullenberg, and A. Bateman. 2019. Alaska's next generation of potential fishermen: A survey of youth attitudes towards fishing and community in Bristol Bay and the Kodiak Archipelago. *Maritime Studies* 18: 47–63. <https://doi.org/10.1007/s40152-018-0109-5>.
- CONANP. 2020. Conservation for sustainable development program. Retrieved noviembre, 2020
- CONAPESCA. 2017. Aquaculture and fisheries statistical yearbook 2017. Mexico: SAGARPA-CONAPESCA (in Spanish).
- CONAPO. 2015. Marginalization index by locality 2015. Retrieved agosto, 2020, Accessed http://www.conapo.gob.mx/es/CONAPO/Datos_Abiertos_del_Indice_de_Marginacion.
- Coronado, E., S. Salas, E. Torres-Irineo, and R. Chuenpagdee. 2020. Disentangling the complexity of small-scale fisheries in coastal communities through a typology approach: The case study of the Yucatan Peninsula Mexico. *Regional Studies in Marine Science* 36: 101312. <https://doi.org/10.1016/j.rsm.2020.101312>.
- Durham, D. 2000. Youth and the social imagination in Africa: Introduction to Parts 1 and 2. *Anthropological Quarterly* 73: 113–120. <https://doi.org/10.1353/anq.2000.0003>.
- Espinosa-Romero, M.J., L.F. Rodríguez, A.H. Weaver, C. Villanueva-Aznar, and J. Torre. 2014. The changing role of NGOs in Mexican small-scale fisheries: From environmental conservation to multi-scale governance. *Marine Policy* 50: 290–299. <https://doi.org/10.1016/j.marpol.2014.07.005>.
- Espinoza-Tenorio, A., I. Espejel, M. Wolff, and J.A. Zepeda-Domínguez. 2011. Contextual factors influencing sustainable fisheries in Mexico. *Marine Policy* 35: 343–350. <https://doi.org/10.1016/j.marpol.2010.10.014>.
- Espinoza-Tenorio, A., N.I. Millán-Vásquez, N. Vite-García, and M.G. Alcalá-Moya. 2019. People and blue carbon: conservation and settlements in the mangrove forests of Mexico. *Human Ecology* 47: 877–892. <https://doi.org/10.1007/s10745-019-00123-6>.
- FAO. 2018. Voluntary guidelines for securing sustainable small-scale fisheries in the context of food security and poverty eradication. Rome, Italy: Food and Agriculture Organization of the United Nations.
- Fernández-Reyes, A. 2018. Young sand. Artisanal fishing, cultural schemes and identity in Armería, Colima, Mexico. Colima, México: Universidad de Colima (in Spanish)
- Fernández, J., P. Álvarez, F. Arreguín, L. López, G. Ponce, A. Díaz, E. Arcos, and P. P. Del Monte. 2010. Coastal Fisheries of Mexico. In Coastal Fisheries of Latin America and the Caribbean, ed. S. Salas, R. Chuenpagdee, A. Charles, and J. Seijo, 229–282. Roma: FAO Fisheries Technical Paper. No. 544.
- Fulton, S., C. López-Sagástegui, A.H. Weaver, F. Fitzmaurice-Cahluni, C. Galindo, F.J. Fernández-Rivera Melo, S. Yee, M.B. Ojeda-Villegas, et al. 2019. Untapped potential of citizen science in Mexican Small-Scale Fisheries. *Frontiers in Marine Science*. <https://doi.org/10.3389/fmars.2019.00517>.
- Gagné, M., and E.L. Deci. 2005. Self-determination theory and work motivation. *Journal of Organizational Behavior* 26: 331–362. <https://doi.org/10.1002/job.322>.
- Glover, D., and J. Sumberg. 2020. Youth and food systems transformation. *Frontiers in Sustainable Food Systems* 4: 1–15. <https://doi.org/10.3389/fsufs.2020.00101>.
- Gutiérrez, N.L., R. Hilborn, and O. Defeo. 2011. Leadership, social capital and incentives promote successful fisheries. *Nature* 470: 386–389. <https://doi.org/10.1038/nature09689>.
- Harker-Schuch, I., S. Lade, F. Mills, and R. Colvin. 2021. Opinions of 12 to 13-year-olds in Austria and Australia on the concern, cause and imminence of climate change. *Ambio* 50: 644–660. <https://doi.org/10.1007/s13280-020-01356-2>.
- Harvey, D. 2000. 2012. Spaces of hope. Madrid: Akal. (in Spanish)
- IMCO. 2013. Illegal and irregular fishing in Mexico: a barrier to competitiveness. Retrieved 12, September, 2021, From https://imco.org.mx/pesca_ilegal_una_barrera_a_la_competitividad2/
- INEGI. 2020. Statistics on the occasion of international youth day (August 12) national data. Press Release 393/20 (in Spanish). Retrieved septiembre, 2021, from https://www.inegi.org.mx/contenidos/saladeprensa/aproposito/2020/Juventud2020_Nal.pdf
- ISE. 2006. International Society of Ethnobiology code of ethics (with 2008 additions). <http://ethnobiology.net/code-of-ethics/>
- Jenkins, L.D., K.R. Thompson, L. Bourillon, and S.H. Peckham. 2017. The scope of fisheries learning exchanges for

- conservation. *Marine Policy* 77: 196–204. <https://doi.org/10.1016/j.marpol.2016.05.025>.
- Larson, S., N. Stoeckl, D. Jarvis, J. Addison, S. Prior, and M. Esparon. 2018. Using measures of wellbeing for impact evaluation: Proof of concept developed with an Indigenous community undertaking land management programs in northern Australia. *Ambio* 48: 89–98. <https://doi.org/10.1007/s13280-018-1058-3>.
- Leavy, J., and S. Smith. 2010. Future farmers: Youth aspirations, expectations and life choices. *Future Agricultures Discussion Paper* 13: 1–15.
- Lew-Levy, S., R. Reckin, N. Lavi, J. Cristóbal-Azkarate, and K. Ellis-Davies. 2017. How do hunter-gatherer children learn subsistence skills?: A meta-ethnographic review. *Cross-Cultural Research* 52: 213–255. <https://doi.org/10.1007/s12110-017-9302-2>.
- Lopez-Ercilla, I., M.J. Espinosa-Romero, F.J. Fernandez Rivera-Melo, S. Fulton, R. Fernández, J. Torre, A. Acevedo-Rosas, A.J. Hernández-Velasco, et al. 2021. The voice of Mexican small-scale fishers in times of COVID-19: Impacts, responses, and digital divide. *Marine Policy* 131: 104606. <https://doi.org/10.1016/j.marpol.2021.104606>.
- Louviere, J.J., T.N. Flynn, and A.A.J. Marley. 2015. *Best-worst scaling: Theory, methods and applications*. Cambridge UK: Cambridge University Press.
- Maja, M.M., and S.F. Ayano. 2021. The impact of population growth on natural resources and farmers' capacity to adapt to climate change in low-income countries. *Earth System and Environment* 5: 271–283. <https://doi.org/10.1007/s41748-021-00209-6>.
- Malm, T. 2015. The Catch of Maui: Coral Gardens in the Past and Present of the Tongan Islands. In *Ethnobiology of Corals and Coral Reefs*, 1st ed., ed. N.E. Narchi and L.L. Price, 133–155. New York: Springer.
- Malterud, K., V.D. Siersma, and A.D. Guassora. 2016. Sample size in qualitative interview studies: Guided by information power. *Qualitative Health Research* 26: 1753–1760. <https://doi.org/10.1177/1049732315617444>.
- Martínez, M. 2008. Service, learning and construction of active citizenship in the university: the social and civic dimension of academic learning. In *Service, learning and social responsibility of universities*, ed. M. Martínez, 11–26. España: Octaedro (in Spanish).
- McRuer, J., and M. Zethelius. 2017. The difference biocultural “place” makes to community efforts towards sustainable development: Youth participatory action research in a marine protected area of Colombia. *International Review of Education* 63: 847–870. <https://doi.org/10.1007/s11159-017-9690-x>.
- Moeller, J., R. Kühne, and C. De Vreese. 2018. Mobilizing youth in the 21st Century: how digital media use fosters civic duty, information efficacy, and political participation. *Journal of Broadcasting and Electronic Media* 62: 445–460. <https://doi.org/10.1080/08838151.2018.1451866>.
- Navarro-Cendejas, J. 2017. Exceptional mathematics talent and professional prospects. Paths of Mexican participants in international mathematics Olympiads. *Innovación Educativa* 17: 49–77 (in Spanish).
- Neis, B., and S. Williams. 1996. ‘Women and children first’: Fishery collapse and women in Newfoundland and Labrador. *Cultural Survival Quarterly* 20: 67–71.
- Neis, B., S. Gerrard, and N.G. Power. 2013. Women and children first: the gendered and generational social- ecology of smaller-scale fisheries in Newfoundland and Labrador and Northern Norway. *Ecology and Society* 18: 64. <https://doi.org/10.5751/ES-06010-180464>.
- Nokelainen, P., K. Tirri, J.R. Campbell, and H. Walberg. 2007. Factors that contribute to or Hinder academic productivity: Comparing two groups of most and least successful Olympians. *Educational Research and Evaluation* 13: 483–500. <https://doi.org/10.1080/13803610701785931>.
- Oosterom, M. 2018. Youth Engagement in the Realm of Local Governance: Opportunities for Peace? IDS Working Paper 508. Brighton, UK: Institute of Development Studies.
- Patton, W., and P. Creed. 2007. The relationship between career variables and occupational aspirations and expectations for Australian high school adolescents. *Journal of Career Development* 34: 127–148. <https://doi.org/10.1177/0894845307307471>.
- Pauly, D. 2018. A vision for marine fisheries in a global blue economy. *Marine Policy* 87: 371–374. <https://doi.org/10.1016/j.marpol.2017.11.010>.
- Pajares, F., and T. Urdan. 2006. *Self-efficacy beliefs of adolescents*. Greenwich, CT: Information Age.
- Perry, D. 2009. Fathers, sons and the State: Discipline and punishment in a Wolof hinterland. *Cultural Anthropology* 24: 33–67. <https://doi.org/10.1111/j.1548-1360.2009.00026.x>.
- Power, N.G., M. Norman, and K. Dupré. 2014. “The fishery went away”: The impacts of long-term fishery closures on young people’s experience and perception of fisheries employment in Newfoundland coastal communities. *Ecology and Society*. <https://doi.org/10.5751/ES-06693-190306>.
- Ramírez-Pacheco, A.A., D.E. Ramos-Muñoz, R.A. Mena-Farrera, and A. Analco-Martínez. 2018. Now that we have internet! Uses of the internet among rural youth from Quintín Arauz, México. *EntreDiversidades. Revista De Ciencias Sociales y Humanidades* 11: 199–228 (in Spanish).
- Reguero, B.G., I.J. Losada, P. Díaz-Simal, F.J. Méndez, and M.W. Beck. 2015. Effects of climate change on exposure to coastal flooding in Latin America and the Caribbean. *PLoS ONE* 10: 1–19. <https://doi.org/10.1371/journal.pone.0133409>.
- Salas, S., M.J. Barragan-Paladines, and R. Chuenpagdee. 2019. *Viability and sustainability of small-scale fisheries in Latin America and the caribbean*. New York: Springer.
- Salazar-De la Cruz, C.C., J.A. Zepeda-Domínguez, A. Espinoza-Tenorio, and D.E. Ramos-Muñoz. 2020. Governance networks in marine spaces where fisheries and oil coexist: Tabasco, México. *Extractive Industries and Society* 7: 676–685. <https://doi.org/10.1016/j.exis.2020.03.012>.
- Saldaña, J. 2013. *The Coding Manual for Qualitative Researchers Discourse*, 2nd ed. Thousand Oaks: SAGE Publications.
- Solano, N., I. López-Ercilla, F.J. Fernández-Rivera Melo, and J. Torre. 2021. Unveiling women’s roles and inclusion in Mexican small-scale fisheries (SSF). *Frontiers in Marine Science* 7: 1201. <https://doi.org/10.3389/fmars.2020.617965>.
- Thew, H., L. Middlemiss, and J. Paavola. 2020. “Youth is not a political position”: Exploring justice claims-making in the UN Climate Change Negotiations. *Global Environmental Change* 61: 102036. <https://doi.org/10.1016/j.gloenvcha.2020.102036>.
- Tam, J., K.M. Chan, T. Satterfield, G. Singh, and S. Gelcich. 2018. Gone fishing? Intergenerational cultural shifts can undermine common property co-managed fisheries. *Marine and Policy* 90: 1–5. <https://doi.org/10.1016/j.marpol.2018.01.025>.
- Tolentino-Arévalo, O., M. Markantoni, A. Espinoza-Tenorio, and M.A. Mesa-Jurado. 2019. Drivers of adaptive capacity to climate change in coastal fishing communities of Tabasco, Mexico. In *Viability and sustainability of small-scale fisheries in Latin America and the Caribbean*, ed. S. Salas, M. Barragán-Paladines, and R. Chuenpagdee, 125–147. New York: Springer.
- Von Rueden, C., M. Gurven, H. Kaplan, and J. Stieglitz. 2014. Leadership in an egalitarian society. *Human Nature* 25: 538–566. <https://doi.org/10.1007/s12110-014-9213-4>.
- White, C.S. 2015. Getting into Fishing: Recruitment and Social Resilience in North Norfolk’s ‘Cromer Crab’ Fishery UK. *Sociologia Ruralis* 55: 291–308. <https://doi.org/10.1111/soru.12101>.

- Yunita, S.A.W., E. Soraya, and A. Maryudi. 2018. “We are just cheerleaders”: Youth’s views on their participation in international forest-related decision-making fora. *Forest Policy and Economics* 88: 52–58. <https://doi.org/10.1016/j.forpol.2017.12.012>.
- Zepeda-Domínguez, J.A., and A. Espinoza-Tenorio. 2018. Lessons of governance from traditional fisheries: The Huaves of San Francisco del Mar Pueblo Viejo, Oaxaca. In *Coastal heritage and cultural resilience*, ed. L.L. Price and N.E. Narchi, 63–73. Berlin: Springer.
- Zurba, M., and M. Trimble. 2014. Youth as the inheritors of collaboration: Crises and factors that influence participation of the next generation in natural resource management. *Environmental Science and Policy* 42: 78–87. <https://doi.org/10.1016/j.envsci.2014.05.009>.

Publisher’s Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

AUTHOR BIOGRAPHIES

Alejandro Espinoza-Tenorio is a Researcher at the Department of Sustainability Science, El Colegio de la Frontera Sur, Campeche. His research interests include sustainable management of coastal socio-ecological systems and ecosystem-based fishery management.

Address: Department of Sustainability Science, El Colegio de la Frontera Sur, Av. Rancho Polígono 2-A, 24500 Lerma, Campeche, Mexico.

e-mail: aespinoza@ecosur.mx

Romana Gabriela Ehuan-Noh is independent consultant and graduate from El Colegio de la Frontera Sur, Campeche. Her research interests include sustainability of coastal socio-environmental systems, fisheries management, and marine anthropology.

Address: Department of Sustainability Science, El Colegio de la Frontera Sur, Av. Rancho Polígono 2-A, 24500 Lerma, Campeche, Mexico.

e-mail: gabyehuan@gmail.com

Gabriela Alejandra Cuevas-Gómez is a curator at Comunidad y Biodiversidad A.C. (COBI). Her research interests include small-scale fisheries management, citizen science, use of digital tools for sustainable fishing and social wellbeing, transfer the knowledge to promote the use of traditional ecological knowledge for good resource management, knowledge transfer for the new generation of fishers.

Address: Comunidad y Biodiversidad A.C., Isla del Peruano No. 215, CP: 85448 Guaymas, Sonora, Mexico.

e-mail: gcuevas@cobi.org.mx

Nemer E. Narchi (✉) is an associate researcher and professor at the Center for the Study of Human Geography in El Colegio de Michoacán. His research includes coastal ethnobiology and social oceanography, food justice and environmental violence.

Address: Colegio de Michoacán, Cerro de Nahuatzen 85, Fracc. Jardines del Cerro Grande, La Piedad, Michoacán, Mexico.

e-mail: nenarchi@gmail.com

Dora Elia Ramos-Muñoz is a Researcher at the Department of Society and Cultura, El Colegio de la Frontera Sur, San Cristóbal de las Casas. Her research interests include social consequences of science and technology, disasters and social change, women’s work, and rural-urban development.

Address: Department of Society and Cultura, El Colegio de la

Frontera Sur, Carretera Panamericana y Periférico Sur s/n Barrio María Auxiliadora, 29290 San Cristóbal de Las Casas, Chiapas, Mexico.

e-mail: dramos@ecosur.mx

Francisco J. Fernández-Rivera Melo is a Catalyst of Change at Comunidad y Biodiversidad A.C. (COBI). His research interests include small scale fisheries co-management, citizen science, gender equality in fisheries and transfer the knowledge related to management and conservation to the new generations of fishers.

Address: Comunidad y Biodiversidad A.C., Isla del Peruano No. 215, CP: 85448 Guaymas, Sonora, Mexico.

e-mail: ffernandez@cobi.org.mx

Antonio Saldívar-Moreno is a Researcher at the Department of Society and Cultura, El Colegio de la Frontera Sur, San Cristóbal de las Casas. His research interests include education and social innovation, intercultural education, systematization and evaluation of educational processes, social participation and community development and education for sustainability.

Address: Department of Society and Cultura, El Colegio de la Frontera Sur, Carretera Panamericana y Periférico Sur s/n Barrio María Auxiliadora, 29290 San Cristóbal de Las Casas, Chiapas, Mexico.

e-mail: asaldivar@ecosur.mx

José Alberto Zepeda-Domínguez is an Associate Professor at the Universidad Autónoma de Baja California-Facultad de Ciencias Marinas. His research interests include socioecological systems, sustainability sciences, environmental governance and resilience.

Address: Universidad Autónoma de Baja California-Facultad de Ciencias Marinas, Carretera Transpeninsular Ensenada - Tijuana No. 3917. Colonia Playitas, CP 22860 Ensenada, Baja California, Mexico.

e-mail: zepeda.jose@uabc.edu.mx

Juan Carlos Pérez-Jiménez is a researcher at the Department of Sustainability Science, El Colegio de la Frontera Sur, Campeche. His research interests include fisheries assessment, fisheries management, and fishing social-ecological systems.

Address: Department of Sustainability Science, El Colegio de la Frontera Sur, Av. Rancho Polígono 2-A, 24500 Lerma, Campeche, Mexico.

e-mail: jcperez@ecosur.mx

Alma Oliveto-Andrade is a master’s student at Colegio de la Frontera Sur. Her research interest is the sustainable management of fisheries, especially small-scale fisheries.

Address: Department of Sustainability Science, El Colegio de la Frontera Sur, Av. Rancho Polígono 2-A, 24500 Lerma, Campeche, Mexico.

e-mail: alma.oliveto@posgrado.ecosur.mx

Jorge Torre is the Development Director of Comunidad y Biodiversidad, A.C. (COBI). His research has been based on generating practical answers to marine conservation problems using biophysical, socioeconomic, and governance information. Currently, he is focus promoting gender equality in fisheries management decisions. Likewise, to identify the best way to transmit the knowledge of conservation and management generated in the last two decades to the next generation of fishers to achieve adaptation to global changes that are impacting the coastal communities daily.

Address: Comunidad y Biodiversidad A.C., Isla del Peruano No. 215, CP: 85448 Guaymas, Sonora, Mexico.

e-mail: jtorre@cobi.org.mx